BENJAMIN J. CAYETANO GOVERNOR STATE OF HAWAII



KALI WATSON CHAIRMAN HAWAHAN HOMES COMMISSION

JOBIE M. K. M. YAMAGUCHI DEPUTY TO THE CHAIRMAN

STATE OF HAWAII DEPARTMENT OF HAWAIIAN HOME LANDS P.O. BOX 1879 HONOLULU, HAWAII 96805

April 24, 1996

Mr. Gary Gill, Director Office of Environmental Quality Control 220 South King Street, 4th Floor Honolulu, Hawaii 96813

Dear Mr. Gill:

SUBJECT: Kula Residence Lots, Unit 1 Kula, Island of Maui <u>TMK (2) 2-2-02:56 and por. of 14</u>

Enclosed are four (4) copies of the Final Environmental Assessment (Negative Declaration) for the proposed Kula Residence Lots, Unit 1. Based on the analysis of the conditions and impacts presented in the Environmental Assessment, we have concluded that the proposed project will have no significant effect on the Environment. Therefore, we are filing a Negative Declaration for the proposed project.

We request that this Negative Declaration be published in the next OEQC Bulletin. A completed OEQC Bulletin Publication Form is enclosed as required.

Should you have any questions, please call me at 586-3815 or have your staff call Patrick Young of my staff at 586-3818.

Sincerely,

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Mike Crozier, Administrator Land Development Division

MC:PY: ATA.OEQ

cc: Austin Tsutsumi & Assoc. Munekiyo & Arakawa, Inc.

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## Final **Environmental Assessment DHHL Kula Residential** Lot, Unit 1

Prepared for

State of Hawaii, Dept. of Hawaiian Home Lands 

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## Final Environmental Assessment DHHL Kula Residential Lot, Unit 1

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State of Hawaii, Dept. of Hawaiian Home Lands April 1996



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- dated July 24, 1995 Traffic Impact Analysis Report Preliminary Engineering Report D E

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# Chapter

**Project Overview** 

#### I. PROJECT OVERVIEW

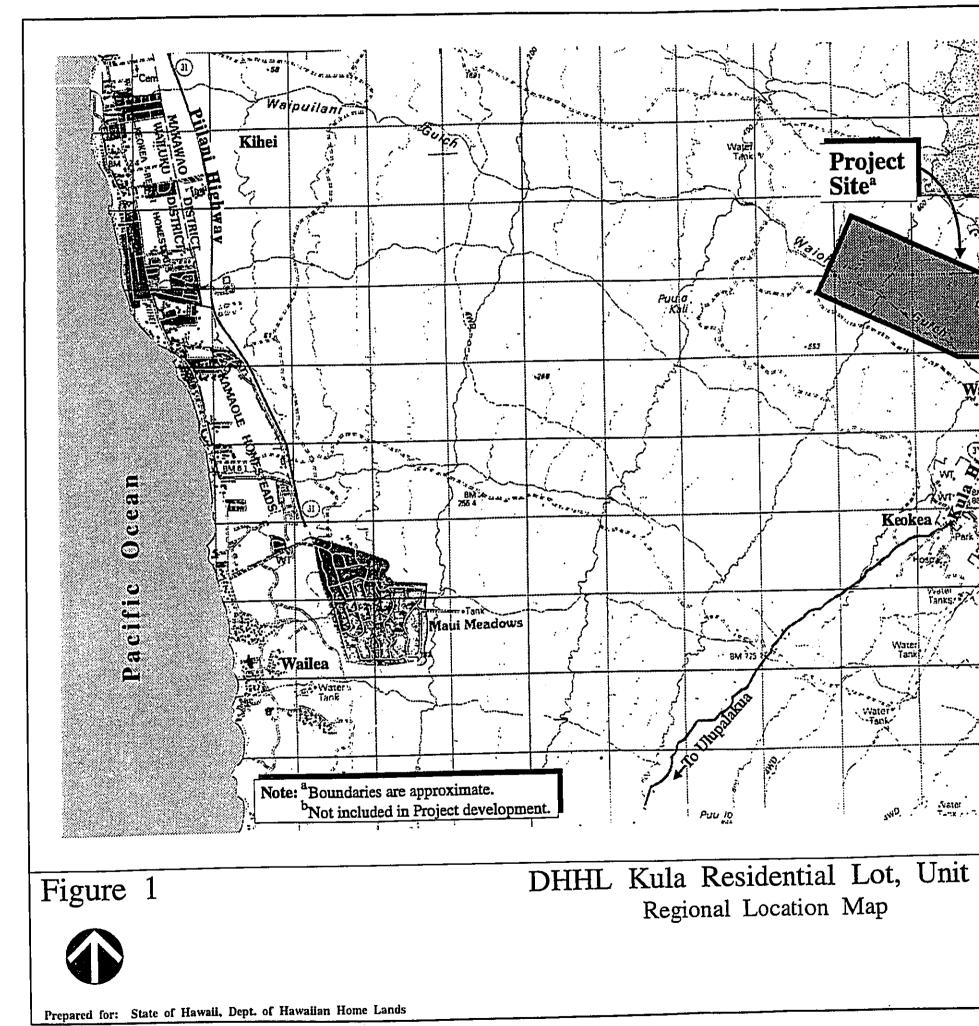
A. <u>PROJECT LOCATION, EXISTING USE, AND LAND OWNERSHIP</u> The applicant, the State of Hawaii, Department of Hawaiian Home Lands (DHHL), proposes to develop a residential subdivision on Hawaiian homestead lands in Kula, Maui, Hawaii. Identified by TMK's (2) 2-2-02:56 and por. 14, approximately 668 acres of DHHL homestead lands are in the process of being consolidated and resubdivided. Upon completion of the subdivision process, the proposed project will encompass approximately 460 acres of the total subdivided land area. The lands underlying the project site fall within the State Land Use "Agricultural" district.

It should be noted that five (5) privately owned kuleanas are located within the project site and are excluded from the proposed development. Existing access to these parcels from Kula Highway will continue to be maintained. See Figure 1.

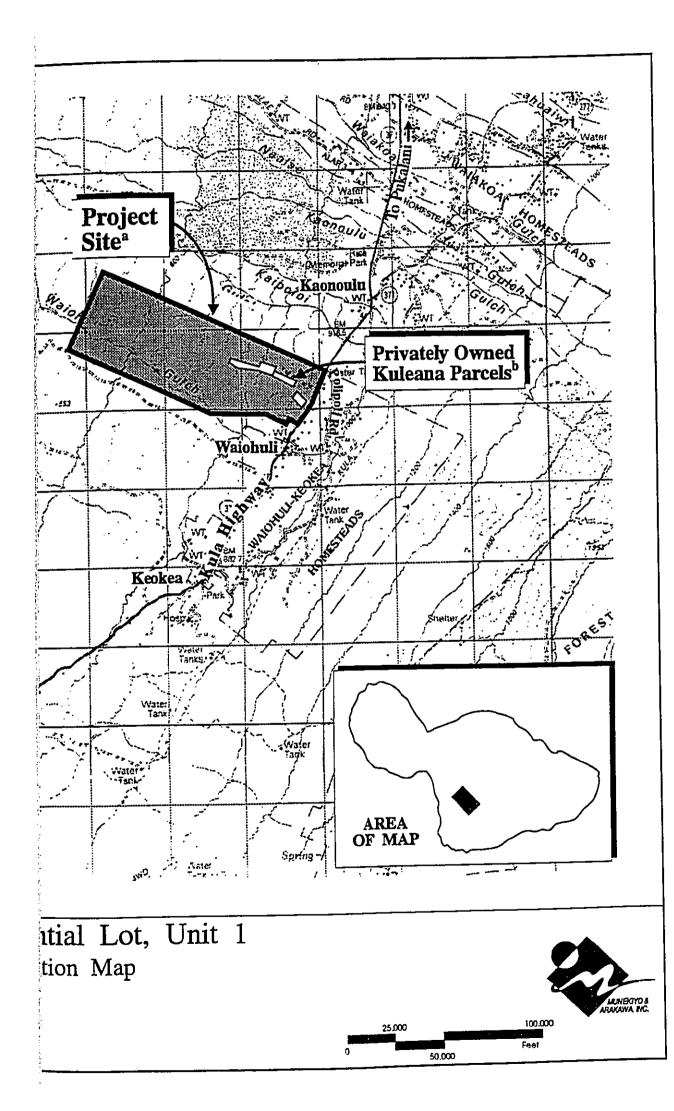
Situated on the southwestern flank of Haleakala, the project site is located immediately west of Kula Highway and is surrounded by lands engaged in rural and agricultural activities. The town of Pukalani lies approximately eight (8) miles to the north of the project site, and the community of Kihei, although not directly accessible, is about four (4) miles to the west.

Currently, the project site is undeveloped and predominantly vegetated with kikuyu grass and black wattle trees at the upper elevations, and kiawe, lantana, and prickly pear cactus (a.k.a., panini) at the lower elevations.

The lands underlying the project site are owned by the DHHL.



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#### B. <u>PROJECT NEED</u>

The Hawaiian Homes Commission Act (HHCA) set aside between 188,000 and 203,000 acres of ceded lands for homesteading by Native Hawaiians.

During the 73 years since the HHCA was signed into law, only 17.5 percent, or fewer than 3,800 families, actually reside, farm, or ranch on the lands which were originally set aside. In 1990, over 19,000 Native Hawaiians throughout the State were on the waiting list for homestead awards. As of June 30, 1994, there were a total of 4,991 Native Hawaiians on the waiting list for homestead lands on Maui. Of the total, 189 applicants were registered for pastoral awards, 2,388 had signed-up for agricultural lands, and 2,414 are waiting for residential lots (telephone conversation with DHHL employee, Joseph Chu, September 1994; Office of Hawaiian Affairs, 1991).

Of the 22,964 acres of homestead lands on Maui, there are twelve (12) acres in Waihee, 61 acres in Paukukalo, 6,111 acres in Kula, and 16,780 acres in Kahikinui. The Paukukalo site has been substantially developed and occupied. Subdivision improvements for the Waihee site have been completed and housing construction has commenced (telephone conversation with DHHL employee, Joseph Chu, September 1994; Office of Hawaiian Affairs, 1991).

The DHHL has plans to distribute approximately 1,700 acres of vacant land at Kahikinui for homesteading purposes. Situated along the southern slopes of Haleakala, the distribution would provide approximately 125 undeveloped lots ranging in size from ten (10) to twenty (20) acres. In this light, the project site remains as the only viable alternative for

providing developed homestead lots (telephone conversation with Pat Young, DHHL employee, April 1996).

Pursuant to Section 204 of the HHCA, the proposed project addresses the demand for developed homestead lots for Native Hawaiians by providing them with residential homesteading opportunities.

#### C. PROPOSED IMPROVEMENTS

The proposed project will involve the development of a subdivision consisting of single-family homesites and related infrastructure improvements. See Figure 2. It should be noted that pursuant to Section 220 of the HHCA, Hawaiian homestead lands utilized for the purposes of the Act are exempt from County regulatory requirements.

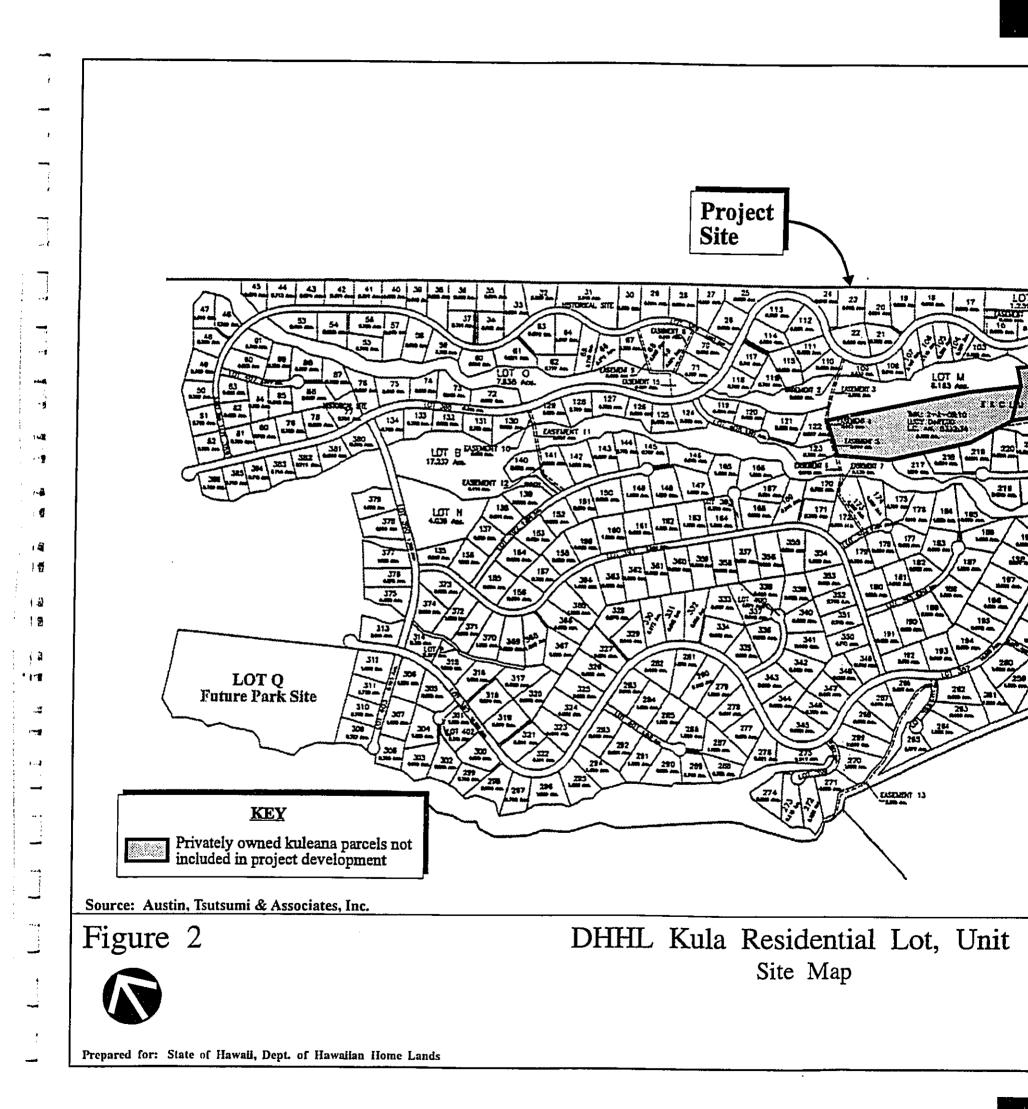
#### 1. <u>Subdivision Lots</u>

The proposed subdivision will consist of 386 residential lots and includes lots ranging in size from one-half to one (1) acre. The construction of single-family residential units will be the responsibility of the individual lot owners. In addition to Lot Q, a 16-acre parcel which will be utilized for future park development, additional parcels will also be set aside to serve as sites for water storage tanks and electrical substations, as well as for other community-related needs.

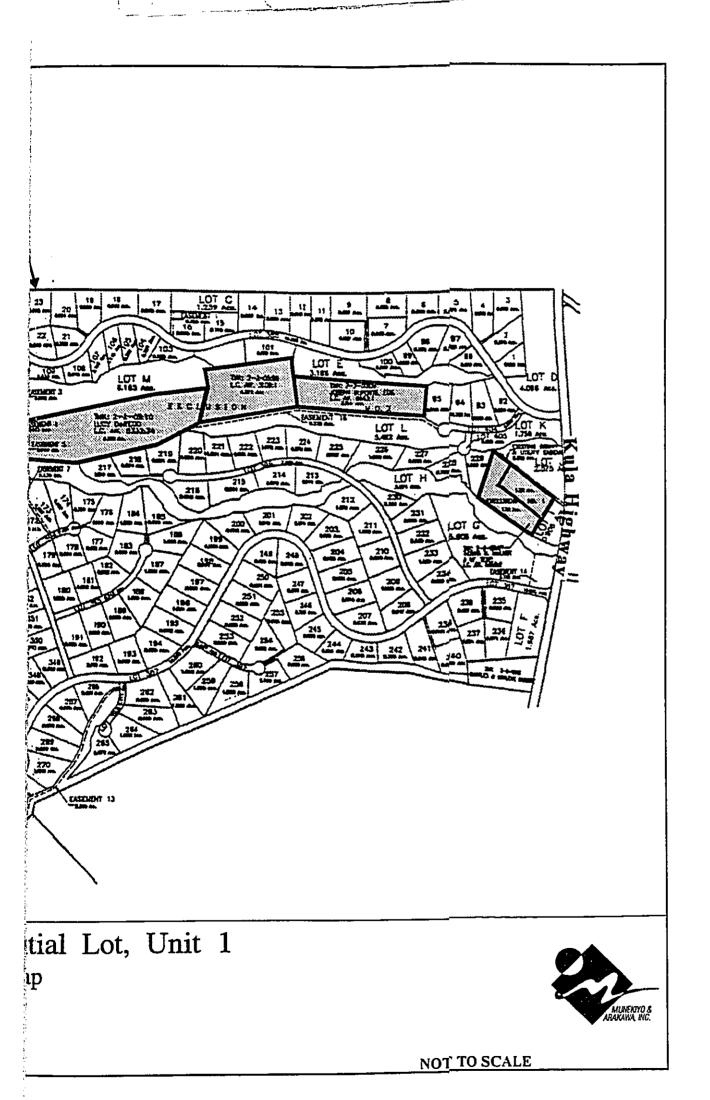
#### 2. <u>Roadways</u>

The proposed roadway system will include cul-de-sacs, as well as collector and minor streets. Identified as project access roads, the collector streets will feature right-of-way and pavement widths of 50 feet and 24 feet, respectively. The minor streets will include right-of-way and pavement widths of 40 feet and 22 feet, respectively.

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With a right-of-way width of 40 feet, the proposed cul-de-sacs will consist of a pavement width of 22 feet.

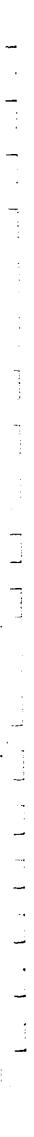
Materials utilized in the construction of the proposed roadway improvements will include 2-inch asphaltic concrete pavement, 6inch crushed rock base course, and 6-inch subbase course where required. Concrete (i.e., Portland cement) pavement will be utilized for road slopes that exceed the paving limits of asphaltic concrete.

#### 3. <u>Wastewater</u>

The proposed project will utilize cesspools as individual wastewater systems for each lot. Since the proposed project will exceed the 50-lot limit established by the State Department of Health (DOH), a variance from this standard will be sought in order to allow the project to be developed by utilizing cesspools as individual wastewater systems.

#### 4. <u>Water</u>

The proposed water system will consist of four (4) service zones, and with the exception of zone 1, which will connect to the existing Upper Kula System, will consist of reservoir tanks ranging in capacity from approximately 0.1 to 1.5 million gallons (MG), as well as related waterline improvements. Water from the Lower Kula System will flow into the approximately 0.2 MG tank proposed in zone 3 via a new transmission line from Naalae Road and will then be pumped to the approximately 1.5 MG tank proposed in zone 2. Water system improvements will be constructed in accordance with the standards of the County Department of Water Supply (DWS).



It should be noted that a separate Environmental Assessment was prepared for the new offsite water transmission line. (Final Environmental Assessment for the Kula Water Transmission Main, Phase I, R.T. Tanaka Engineering, Inc., September 1995). Consisting of approximately 9,000 linear feet of 18-inch ductile iron pipe, the transmission line will connect to the existing 18-inch lower Kula waterline at Naalae Road and proceed in a southwesterly direction toward the project site. The transmission line is intended to meet the needs of the proposed subdivision and is not anticipated to result in any adverse short- or long-term environmental impacts. It should be noted that the transmission line will also serve the kuleana parcels within the subdivision, as well as the privately owned parcels along its alignment.

#### 5. <u>Drainage</u>

Drain lines, manholes, and catch basins will be provided within the proposed roadway right-of-way. Drainage culverts, with inlet and outlet structures, will be provided under sections of the roadway to convey drainage flows through the project site.

#### D. PROJECT COSTS AND IMPLEMENTATION

Preliminary project infrastructure costs are estimated to be approximately \$20 million. Upon the receipt of all applicable permits, construction of the project is anticipated to commence in January 1997, with completion targeted for October 1997.

Since the proposed project involves State lands and funds, an Environmental Assessment has been prepared pursuant to the requirements established by Chapter 343, Hawaii Revised Statutes, and Title 11, Chapter 200, Administrative Rules of the State Department of Health.

It should noted that pursuant to Section 220 of the HHCA, Hawaiian homestead lands utilized for the purposes of the Act are exempt from County regulatory requirements. In this regard, the proposed project will be developed in accordance with County design standards with the exception of the following exemptions:

- 1. Grass and paved swales will be utilized instead of curbs and gutters;
- 2. Sidewalks will not be installed;
- 3. Cul-de-sacs may be more than 550 feet in length or serve more than twenty (20) lots;
- 4. Flag lots will be allowed to be situated back-to-back;
- 5. Street trees will not be planted. Trees will be planted in the front of each parcel and will be maintained by the individual lot owners; and
- 6. Power, telephone and cable T.V. lines will be allowed to be installed overhead.

It should be noted that the preceding exemptions are in the interest of the public, will not substantially endanger human health or safety, and that conformance with the applicable standards would produce serious hardship without equal or greater benefit to the awardee and public.

## Chapter II

## Description of the Existing Environment

#### II. DESCRIPTION OF THE EXISTING ENVIRONMENT

#### A. PHYSICAL SETTING

#### 1. <u>Surrounding Land Uses</u>

The Kula region is located on the western slopes of Haleakala, with the population focused on two (2) principal settlement areas. The towns of Makawao and Pukalani reflect a mixture of suburban and rural land uses, while the Kula area is characterized by a combination of rural and agricultural uses. Kula is renown for its produce and flowers which are exported to domestic, mainland, and international markets.

The Makawao-Pukalani-Kula region is popularly referred to as Upcountry, reflecting first its location and elevation on Haleakala and secondly, the social qualities of its small rural, agricultural towns and villages.

Land uses in the vicinity of the project site are reflected by lowdensity rural residential properties, small farms, and lands engaged in agricultural cultivation and ranching activities.

#### 2. <u>Climate</u>

Kula's climate is typical of most mountainous areas in Hawaii, with climatic conditions varying according to altitude and wind direction. Lowland areas are generally typified by arid to semi-tropical climates, while higher elevations are characterized by more temperate conditions.

The Kula region is relatively dry with rainfall measuring from 20 to 30 inches annually. Generally, temperatures range from the low 50's during the winter, to the mid-80's during the summer. Maui is

cooled by the northeast tradewinds throughout most of the year. These winds are constant during the spring and summer months. Kona weather conditions, ranging from strong southerly winds with heavy rains, to calm, humid, or rainy weather, are in evidence during the winter months.

#### 3. <u>Topography and Soil Characteristics</u>

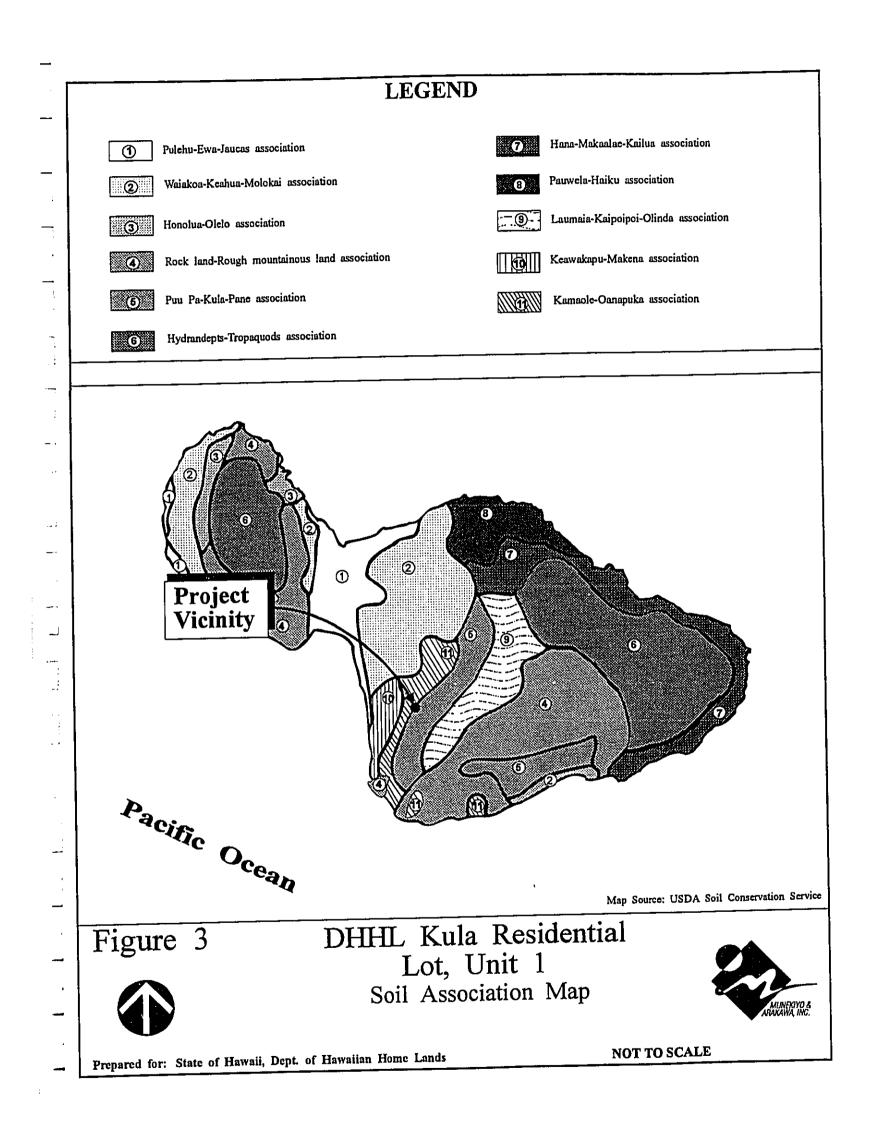
Located on the southwestern flank of Haleakala, the project site slopes away from Kula Highway in a northwesterly direction at an average of 10 to 15 percent. Elevations at the project site range from 3,000 feet above mean sea level (AMSL) at Kula Highway to 1,800 feet AMSL along the western extent of the site. As the lands ascend, the terrain becomes steeper and guiches and intermittent stream beds caused by erosion are evidenced.

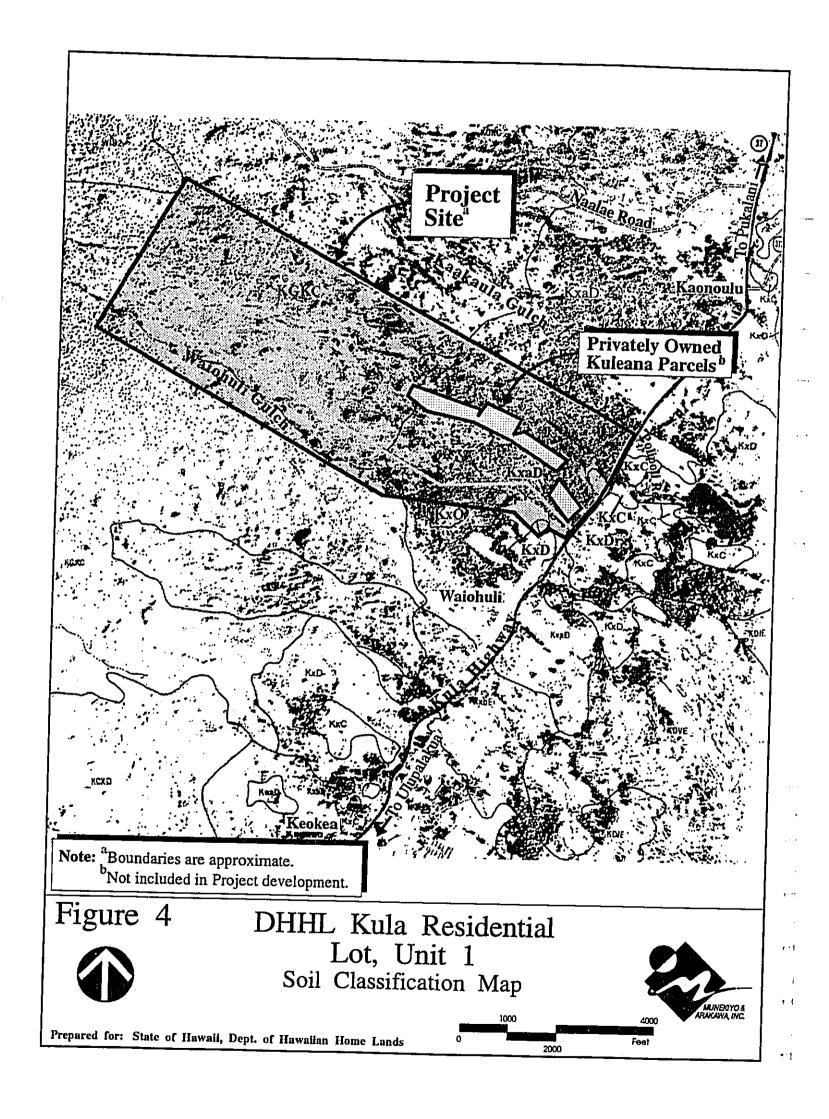
Underlying the site and surrounding lands are soils belonging to the Puu Pa-Kula-Pane and Kamaole-Oanapuka associations. See Figure 3. The Puu Pa-Kula-Pane soil association is found on the intermediate and high uplands, and consists of deep, gently sloping to steep, well-drained soils that have a medium or moderately textured subsoil. This association is used for orchards, pastures, truck crops, and wildlife habitat. The Kamaole-Oanapuka association is found on the low and intermediate highlands, and is characterized by gently sloping to moderately steep, well-drained, very stony to extremely stony soils that have a fine or mediumtextured subsoil. This association is utilized for pasture and wildlife.

The soil types specific to the site are the Kula cobbly loam, 12 to 20 percent slopes (KxaD), and Kamaole very stony silt loam, 3 to 15 percent slopes (KGKC). See Figure 4. Kula cobbly loam and

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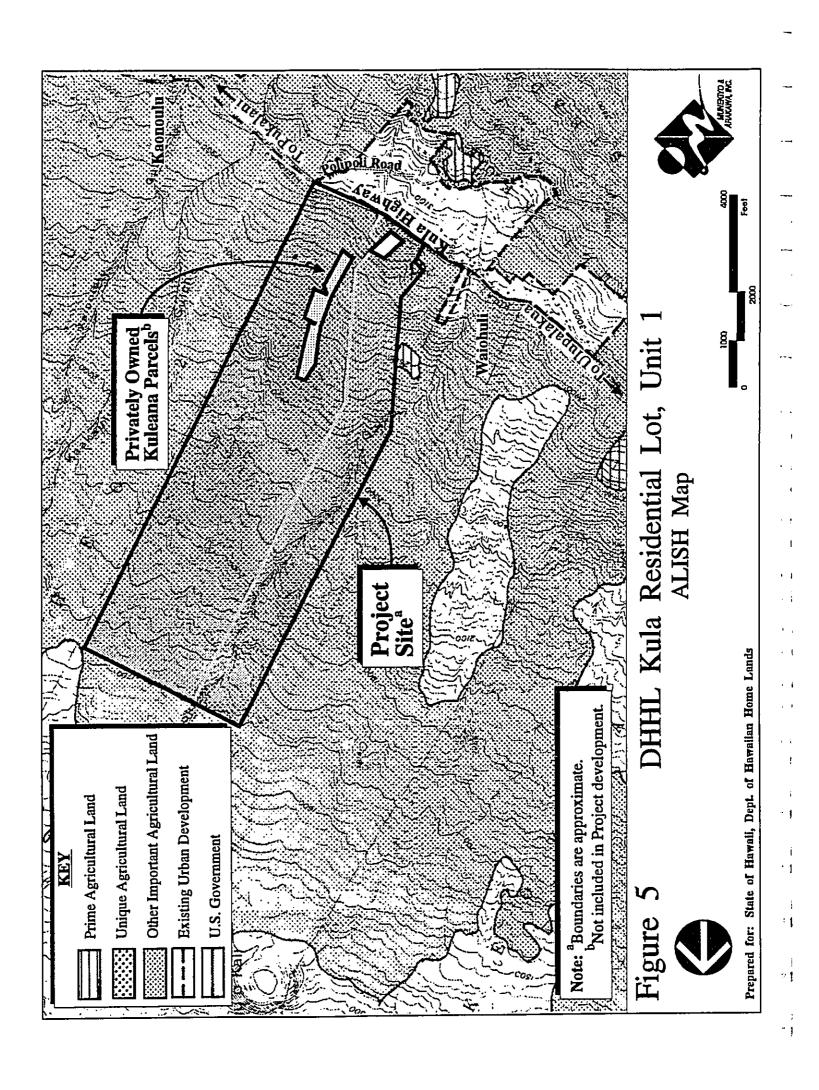


Kamaole very stony silt loam soils are well-drained soils developed in volcanic ash. For Kula cobbly loam soils, permeability is moderately rapid, runoff is medium, and erosion hazard is moderate. For Kamaole very stony silt loam, permeability is moderate, runoff is slow to medium, and the erosion hazard is slight to moderate.

Lands underlying the project site are designated "C" and "E" by the University of Hawaii Land Study Bureau. According to the classification system, land productivity characteristics are rated on a scale from "A" through "E", with the designations "A" and "E" representing the highest and lowest ratings, respectively.

The State Department of Agriculture has established three (3) categories of Agricultural Lands of Importance to the State of Hawaii (ALISH). "Prime" agricultural lands have the soil quality, growing season, and moisture supply needed to produce sustained high crop yields economically when treated and managed according to modern farming methods. "Unique" agricultural lands possess a combination of soil quality, location, growing season, and moisture supply currently used to produce sustained high yields of a specific crop when treated and managed according to modern farming methods. "Other" important agricultural lands include those which have not been rated "prime" or "unique".

As indicated by the ALISH map, the lands in the project area fall within the "other" important agricultural lands category. See Figure 5.



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#### 4. Flood Hazard

As indicated by the Flood Insurance Rate Map, the proposed project site is situated in Zone C, an area of minimal flooding.

#### 5. <u>Flora</u>

A botanical survey encompassing the project site was undertaken by Char & Associates in September 1994. See Appendix A. The primary objectives of the survey were to identify and inventory major vegetation types, search for rare, threatened, and endangered plant species, and identify potential environmental impacts and propose appropriate mitigation measures.

Three (3) major vegetation types were identified during the survey. Ranging from the Kula Highway to an elevation of approximately 2,350 feet, a dense forest of black wattle trees characterizes the vegetation type occurring on the upper section of the project site. Extending from the 2,350 foot elevation downslope to the project's boundary and beyond, dense patches of lantana and clumps of prickly pear cactus (a.k.a., panini) characterize the second vegetation type. Gulch vegetation comprises the third vegetation type and typically consists of dense clumps of Guinea grass with scattered stands of Chinaberry trees.

The vegetation within the project site is dominated primarily by introduced or alien species. Of a total of 112 plant species inventoried, 95 are introduced or alien species, two (2) are originally of Polynesian introduction, and fifteen (15) are native. Of the native species, twelve (12) are indigenous, that is native to the Hawaiian Islands and elsewhere, and three (3) are endemic, that is native only to the Hawaiian Islands.

#### 6. <u>Fauna</u>

A survey of avifauna and feral mammals within the project site was undertaken by Environmental Consultant Faunal Surveys in November 1994. See Appendix B. The objectives of the survey were to document bird and mammal species, provide data on the abundance of each species, note the presence or likely occurrence of any native fauna, particularly those listed as threatened or endangered, and determine any significant impacts to the native fauna in the region.

The only endemic native landbird recorded during the survey was the Common Amakihi, the most abundant and widespread of the native landbirds. Although the Short-earred Owl (a.k.a., Pueo) occurs in the Kula and the Upcountry region, none were recorded during the survey. The Pacific Golden-Plover was the only indigenous native migratory species observed during the survey and is the most abundant of the shorebird species which winters in Hawaii. The only other migrant species which may occur in this region is the Ruddy Turnstone. No indigenous native seabirds or waterbirds were recorded, or would be expected on the project site. During the survey, a total of fourteen (14) exotic birds, that is introduced to the Hawaiian Islands, were recorded.

Mammals recorded during the survey include cats, Axis Deer and the Small Indian Mongoose. During the survey, a Hawaiian Hoary Bat was once observed foraging above the pasture lands near the Kula Highway at the northeast edge of the project site. This species is known to roost solitarily in trees and forages for flying insects using echolocation. In addition, these bats have been reported from a variety of habitats including ranch and agricultural

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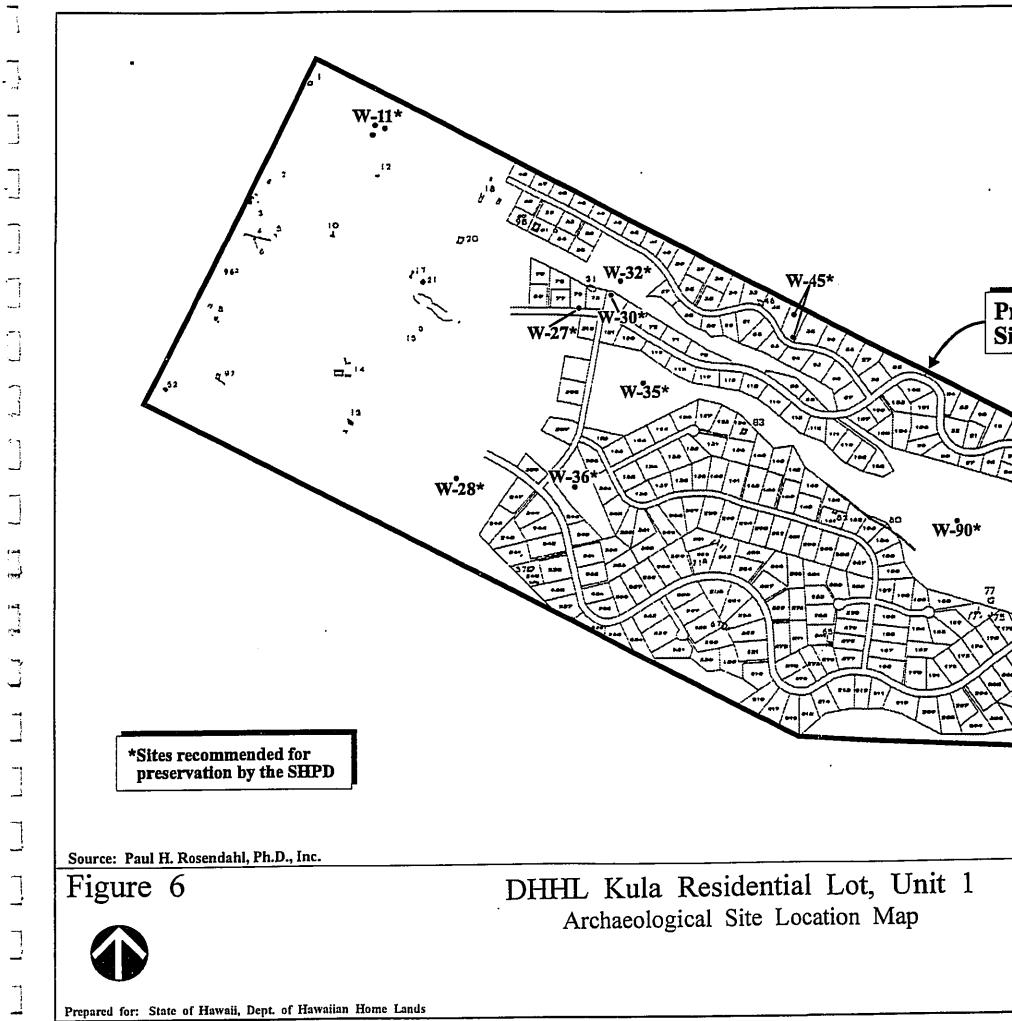
lands, native forest and alpine environs, ponds and bays, second growth forest, and urban areas. Since the occurrence and abundance of the Hawaiian Hoary Bat on Maui has not been extensively studied, little is known about the life history of this endemic and endangered species.

#### 7. Archaeological Resources

An archaeological inventory survey of the DHHL's Waiohuli and Keokea sites was conducted by Paul H. Rosendahl, Inc. (PHRI) in 1989. See Appendix C. The inventory survey encompassed 674 acres in Waiohuli and 351 acres in Keokea, and included aerial reconnaissance as well as variable-intensity pedestrian surveys. Of the 159 sites identified during the survey, 51 sites were located in Waiohuli. See Figure 6.

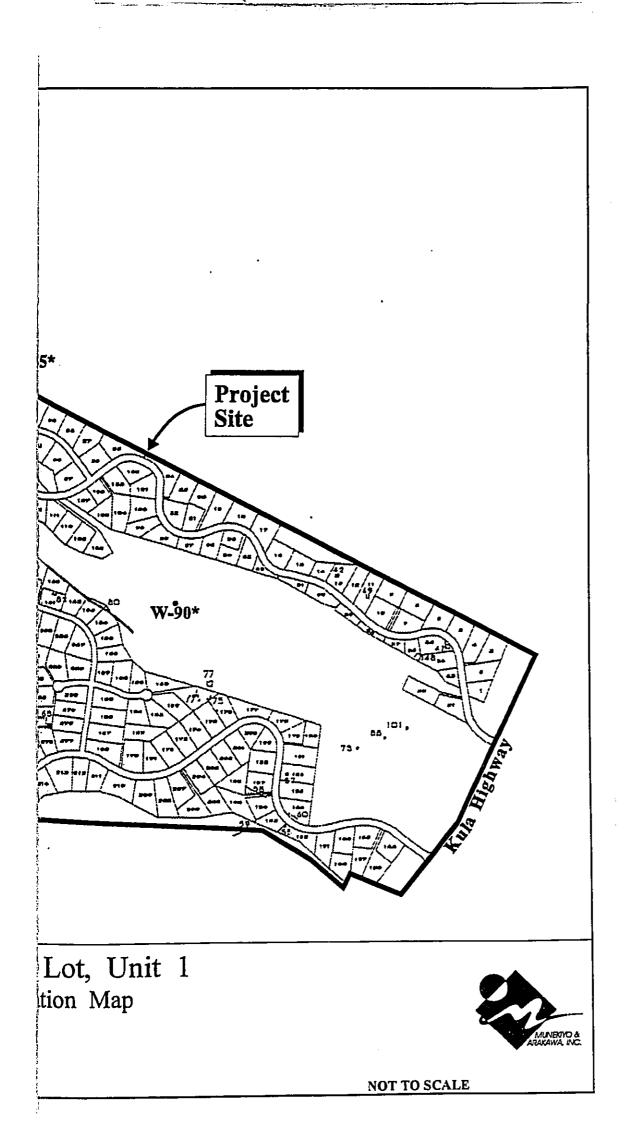
Of the 51 sites located in Waiohuli, 42 were assessed as significant for information content. Thirty-three (33) of the 42 sites were recommended for further data collection, while nine (9) required no further work. Three (3) of the remaining nine (9) sites were assessed as significant for information content and as culturally significant (Sites W-27, W-28, W-36). Further data collection and preservation with interpretive development were recommended for those three (3) sites. Two (2) of the remaining six (6) sites were assessed as significant for information content and were provisionally assessed as having cultural value (Sites W-30, W-32). In addition to further data collection, preservation with interpretive development was provisionally recommended for those two (2) sites. The final four (4) sites were variously assessed with differing treatments recommended (Sites W-11, W-35, W-45, W-90).

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The following Waiohuli sites were recommended for either preservation as is, or preservation with some level of interpretive development: Sites W-11, W-27, W-28, W-30, W-32, W-35, W-36, W-45, and W-90.

It should be noted that Site W-11, provisionally assessed for preservation with some level of interpretive development, is situated well beyond the limits of the project site.

#### 8. <u>Air Quality</u>

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There are no point sources of airborne emissions in the immediate vicinity of the project site. The air quality in the Kula region is considered good, with existing airborne pollutants attributed primarily to vehicle-generated exhaust from the region's roadways. Other sources of airborne pollutants typically include dust and equipment emissions resulting from agricultural activities and smoke from sugar cane harvesting operations occurring in the Central Maui plain. These sources are considered intermittent and the generated particulates are quickly dispersed by the prevailing tradewinds.

#### 9.

#### Noise Characteristics

Noise levels in the Kula region are characteristic of its rural surroundings and are considered relatively low. Ambient noise levels in the vicinity of project site are attributed to natural (e.g. wind) conditions, traffic along the Kula Highway, and agricultural activities involving the intermittent operation of equipment, such as tractors, sprayers, and trucks.

#### 10. <u>Scenic and Open Space Resources</u>

Situated on the slopes of Haleakala, Kula provides expansive scenic views of the Central Maui isthmus, off-shore islands, and the West Maui Mountains. From clearings throughout the project site, Maui's central isthmus and the northern and southern shorelines of Maui can be seen makai (northwest and southwest, respectively) of the project area. Mauka of the site, Haleakala is clearly visible, while makai of the site, the West Maui Mountains are visible. Further off in the distance, to the southwest, are the islands of Lanai and Kaho'olawe.

#### B. SOCIO-ECONOMIC ENVIRONMENT

#### 1. <u>Community Character</u>

From a regional standpoint, the project site is part of the Makawao-Pukalani-Kula Community Plan region. The region includes a diverse range of physical and socio-economic environments. With its temperate climate, fertile soil, and sweeping views, Kula has grown steadily over the past few years. The project site is situated along the southwestern flank of Haleakala in an area which is generally characterized by low-density rural residential properties, small farms, and lands engaged in agricultural cultivation and ranching activities.

#### 2. <u>Population</u>

The population of Maui County has exhibited relatively strong growth over the past decade with the July 1990 population of 101,400 reflecting a 41.6 percent increase over the July 1980 population of 71,600 (Maui County Data Book, December 1993). Growth in the County is expected to continue, with resident population projections to the years 2000 and 2010, estimated to be ."

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124,562 and 145,872, respectively (Community Resources, Inc., January 1994).

The 1990 population of the Makawao-Pukalani-Kula region was 18,923. A projection of the region's population shows an increase to 21,760 by the year 2000 and 24,613 by the year 2010 (Community Resources, Inc., January 1994).

#### 3. Economy

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Agriculture and tourism are vital components of Maui's economy. The cultivation of pineapple and sugar cane and the visitor industry provide for much of the island's economic stability.

The economy of Kula is heavily dependent upon agriculture. Its rich soil has made the region renown for the quality of its produce and flowers which are exported to domestic, mainland, and international markets. Cattle ranching and alternative ranching activities, such as sheep and llama herding, are also an important element of Kula's economy.

#### C. <u>PUBLIC SERVICES</u>

#### 1. Police and Fire Protection

The Maui Police Department (MPD) is responsible for the preservation of the public peace, prevention of crime, and protection of life and property. On Maui, the MPD consists of 369 administrative, patrol, and support personnel. MPD's Uniformed Services Bureau includes the uniformed patrol services in the following patrol districts: Wailuku, Lahaina, Hana, Molokai, and Lanai. The Wailuku station, which services the Haiku, Paia, and

Makawao-Pukalani-Kula regions, is situated to the northwest, approximately nineteen (19) miles from the project site.

Police services for the Makawao-Pukalani-Kula beats are provided by two (2) patrol officers per eight-hour shift. A single patrol officer is assigned to each of the Haiku and Paia beats and is responsible for responding to emergency situations involving the Upcountry beats. The Makawao and Paia beats also include a single community police officer permanently assigned to each town (telephone conversation with Maui Police Department employee, Sgt. Larry Hudson, September 1994).

Fire prevention, protection, and suppression services are provided by the Maui Fire Department's (MFD) recently completed Kula station. Situated approximately three (3) miles northeast of the project site, the Kula facility contains a new 750 gallon pumper with a delivery rate of 1,500 gallons per minute (GPM).

The new facility is staffed by one (1) officer, one (1) driver, and three (3) firefighters per eight-hour shift.

The Makawao and Paia fire stations provide additional firefighting support for the Kula region, and are situated approximately eight (8) and fourteen (14) miles to the north of the project site, respectively. The Makawao and Paia stations also include a single pumper and a staff of five (5) men (telephone conversations with Maui Fire Department employees, Deputy Chief Ron DeMello and Capt. Charles Ledward, September 1994). ~

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#### 2. <u>Medical Facilities</u>

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Maui Memorial Hospital, the only major medical facility on the island, is approximately nineteen (19) miles to the northeast of the project site.

The 145-bed, State-operated facility provides acute, emergency, general, and obstetric care services. Several medical and dental care facilities are located in Makawao and Pukalani to serve Upcountry residents.

Consisting of 105 total beds, Kula General Hospital is situated about two (2) miles to the southwest of the project site. The Stateowned facility provides 94 beds for long-term care, eight (8) beds for the developmentally disabled, two (2) beds for acute care, and one (1) bed for tuberculosis (TB) care.

An out-patient clinic for the area's residents operates from 8:00 a.m. to 4:30 p.m. on weekdays, and is staffed by two (2) physicians, a registered nurse, and a clerk. Hospital pharmacy services are also available to the clinic's patients (telephone conversation with Kula Hospital employee, Natalie Kahoohanohano, September 1994).

#### 3. <u>Solid Waste</u>

Single-family residential waste collection service is provided by the County of Maui on a once-a-week basis.

Residential solid waste disposal is provided on a weekly basis by the County's Department of Public Works and Waste Management (DPWWM), Solid Waste Division.

With the closure of the County's Makani Sanitary Landfill in Makawao in June 1992, all solid waste generated in the Upcountry region is transported to the Central Maui Landfill off Pulehu Road, approximately six (6) miles northwest of the project site. Other than the Hana Landfill, the Central Maui Landfill is the only disposal site on the island of Maui which accepts County-hauled residential waste, commercially-hauled commercial waste, and self-hauled waste. .

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According to the <u>Solid Waste Characterization Study</u> that was prepared for the DPWWM, Solid Waste Division (R.W. Beck/DPWWM, December 1994), the Central Maui Landfill accommodates approximately 146,000 tons of solid waste annually. Of the estimated 400 tons of solid waste accommodated daily by the Central Maui Landfill, approximately 64 tons are attributable to the Makawao-Pukalani-Kula region.

The study also indicated that regional solid waste quantities are consistent with the demographics and socio-economic conditions for the respective geographic areas. For example, in the Upcountry region, much of the solid waste is self-hauled due to the region's close proximity to the landfill.

#### 4. <u>Schools</u>

The State of Hawaii, Department of Education (DOE), operates four (4) public schools in Upcountry Maui. They are (with 1994 enrollment in parenthesis): Makawao Elementary School (778), Pukalani Elementary School (551), Kula Elementary School (573), and Kalama Intermediate School (1,284). Makawao, Pukalani, and Kula Elementary Schools provide educational services for students from Kindergarten to Grade 5, while Kalama Intermediate School in Makawao, provides instruction for students from Grades 6 to 8.

Students in Grades 9 to 12 currently attend Maui High School in Kahului, approximately 17 miles northwest of the project site. During the 1993 school year, Maui High School had an enrollment of 1,928 students.

It is noted that the new King Kekaulike High School, will service students beginning in September, 1995. During its first year of operation, the new facility is projected to have an enrollment of 410 students and a staff of 25 to 30.

By the 1998 school year, enrollment is estimated to reach 1,605 students (telephone conversation with Department of Education employee, Peter Daniels, September 1994).

The region is also served by privately operated facilitles such as Haleakala School (Grades K to 8) and Seabury Hall (Grades 6 to 12).

#### 5. <u>Recreational Facilities</u>

County recreational facilities in the Upcountry region include five (5) neighborhood parks and three (3) district parks, with a total of 74.6 acres.

Neighborhood parks and facilities include Haliimaile Park, Kula Community Center, Waiakoa Gym, Harold Rice Memorial Park, and

Keokea Ball Park. The district parks include the Eddie Tam Memorial Center, Pukalani Park and Community Center, and the recently completed Kula Recreational Center.

Situated along the higher elevations of Haleakala, Polipoli State Park, and Haleakala National Park provide camping, hiking, and sight-seeing opportunities for residents and visitors alike.

Recreational facilities within the region include four (4) tennis courts, nine (9) sports fields, three (3) sports courts, five (5) community centers, and three (3) gyms. In addition, the existing public schools in the area do have limited recreational space and facilities that are available as a supplement to the community's residents. It is also anticipated that the recreational facilities for the King Kekaulike High School will contribute toward meeting the park needs of the community (telephone conversations with Department of Parks and Recreation employees, Leonard Costa and Pat Matsui, September 1994; R. M. Towill Corp., August 1992).

#### D. INFRASTRUCTURE

#### 1. <u>Roadways</u>

Access to the Upcountry region from Central Maui is provided by a network of arterial, collector, and rural roadways. See Appendix D.

Hana Highway is the primary roadway connecting Central and East Maui. To the east of its intersection with Haleakala Highway, Hana Highway functions as a two-lane roadway, while to the west, Hana Highway operates as a four-lane, divided highway with major, channelized intersections.

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Haleakala Highway is the principal roadway linking the Upcountry region with Central Maui. Between Hana Highway and the Pukalani Bypass, Haleakala Highway consists of two (2) lanes in the southbound direction and one (1) lane in the northbound direction. Extending from the northern junction of the Bypass to Hana Highway, contra-flow operations during AM peak hour traffic provide two (2) northbound lanes and one (1) southbound lane. Between its intersection with the Bypass and Kula Highway (a.k.a., Five Trees), Haleakala Highway functions as a two-lane roadway serving the town of Pukalani. Proceeding east from this intersection, Haleakala Highway functions as a two-lane roadway while continuing on toward Haleakala Crater.

Extending from its northern junction with Haleakala Highway, the Pukalani Bypass consists of two (2) southbound lanes and one (1) northbound lane as it proceeds to Makawao Avenue. From its intersection with Makawao Avenue, the Bypass transitions to two (2) lanes as it proceeds in a southbound direction toward Five Trees.

Kula Highway is a two-lane roadway serving the Upcountry region. Extending from Five Trees to Ulupalakua, the Kula Highway is a north-south arterial which serves the region's rural communities.

Keakaulike Avenue is a two-lane roadway which originates at Kula Highway and extends north, where it terminates at Haleakala Highway. This north-south collector also serves the region's residential and agricultural communities.

Omaopio and Pulehu Roads are two-lane roadways which originate at Kula Highway and extend northwest toward the town of Kahului. These curving, rural roadways provide alternative routes to the Upcountry region.

#### 2. <u>Wastewater</u>

The Makawao-Pukalani-Kula region is not serviced by a County wastewater treatment system. A portion of Pukalani is serviced by a private wastewater treatment system, while the remainder of the Upcountry area is served by cesspools or septic tanks. The State Department of Health (DOH) has designated a critical wastewater disposal area throughout most of the island, including the Makawao-Pukalani-Kula region. Within the critical area, septic tanks are required for wastewater disposal, while in the non-critical area, cesspools are permitted with DOH approval. The project site is located within the non-critical wastewater disposal area (Wilson Okamoto & Associates, Inc., September 1992).

#### 3. <u>Water</u>

Although Makawao and Pukalani are gradually evolving into suburban communities, the Upcountry area remains rural and agricultural in nature. Dominant water uses in the region are attributed to agricultural activities.

Water service to the Makawao-Pukalani-Kula region is provided by the County Department of Water Supply (DWS). The region is supplied primarily by surface water sources, with distribution handled by the Makawao and Kula systems.

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The Kula system consists of an upper and lower system, with the upper system located along the 4,000 foot elevation, and the lower system originating at the 3,000 foot elevation. The Lower Kula System serves the Omaopio, Olinda, and lower Kula communities, while the Upper Kula System serves the remaining communities. The upper system collects water from Haipuaena, Puohakamoa, and Waiakamoi Streams, while the lower system diverts water from the Haipuaena, Puokakamoa, Waiakamoi, and Honomanu Streams.

The DWS operates a water treatment plant at Olinda with a capacity of 1.7 million gallons per day (MGD). Major storage reservoirs supporting the Upper Kula System include a 10 million gallon (MG) upper Waiakamoi dam/reservoir, a lower Waiakamoi concrete dam, two (2) 15 MG Waiakamoi concrete tanks, and a 3 MG Olinda steel tank. The recently constructed Kahakapao Reservoirs, consisting of two (2) 50 MG reservoirs in the vicinity of the Waiakamoi Reservoirs, also provide additional storage capacity for the upper system.

During dry periods, the Kula system is supplemented by water pumped from the Makawao system (Wilson Okamoto & Associates, September 1992).

There is no existing water system within the project site. See Appendix E. Situated within proximity of the project site, the DWS owns and maintains 6-inch waterlines that terminate at Kula Highway's intersections with Polipoli Road and Lepelepe Place. Both waterlines are serviced by the Upper Kula System.

#### 4. <u>Drainage</u>

The Upcountry region is situated along the upland slopes of Haleakala and ranges from 800 to 10,000 feet above mean sea level (AMSL).

Most of the developed and agricultural areas are located between the 1,500 to 3,000 foot elevations. The Upcountry region is characterized by broad, rolling ridge tops; deep, precipitous gulches; and slope increases along ridges as terrain ascends in elevation. Due to the many gulches separating the region's arable lands into smaller areas, the Upcountry area is considered better suited for smaller-scale agricultural operations.

Currently, storm runoff sheetflows in northwesterly direction across the project site. Gullies and gulches located within the project site convey runoff through the site toward Kaakaulua Gulch to the north and Waiohuli Gulch to the south. Refer to Appendix E.

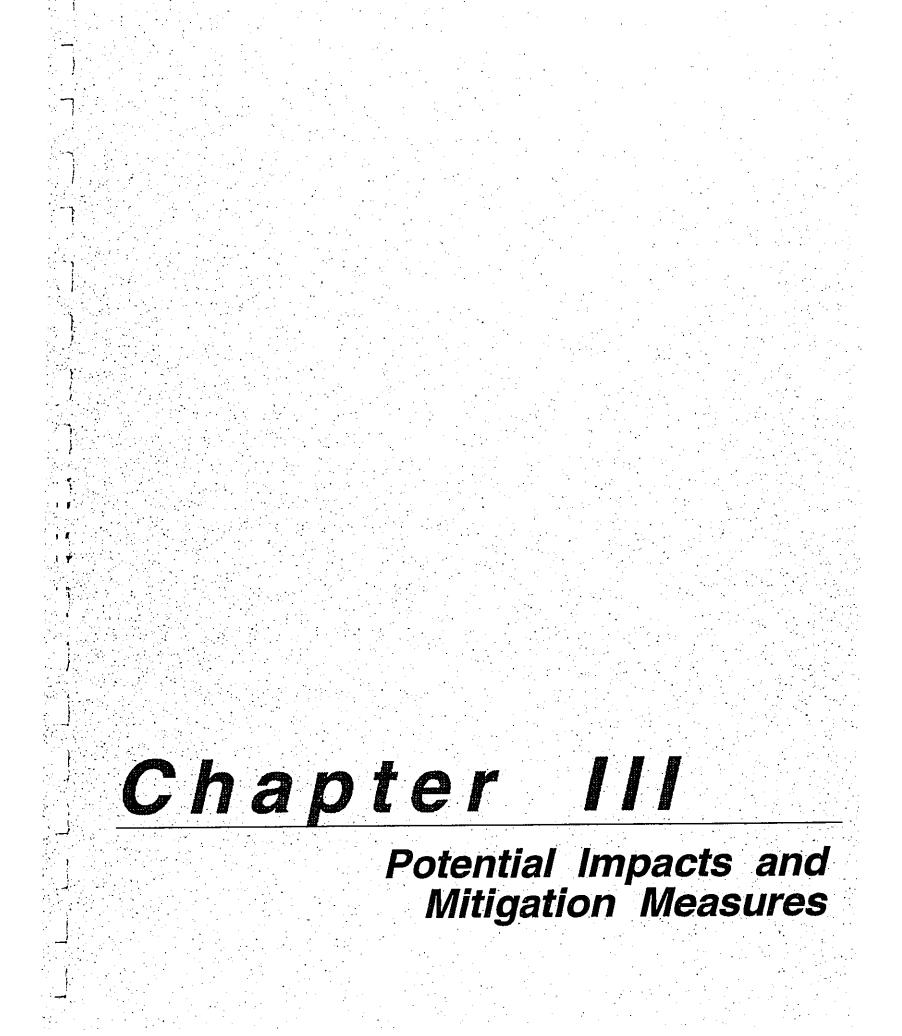
Downstream of the project site, Kaakaulua Gulch and Waiohuli Gulch discharge runoff into Kulanihakoi Gulch and Waipuilani Gulch, respectively. Runoff from these gulches is ultimately discharged into the ocean.

#### 5. <u>Electrical and Telephone Services</u>

Electrical and telephone service to the project site will be provided by Maui Electric Company, Ltd. and GTE Hawaiian Telephone, respectively.

Electricity and telephone service in the vicinity of the project site is currently provided by existing overhead facilities.

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### III. POTENTIAL IMPACTS AND MITIGATION MEASURES

#### A. IMPACTS TO THE PHYSICAL ENVIRONMENT

#### 1. <u>Surrounding Land Uses</u>

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The project site is located in a rural, agricultural area characterized by low-density residential housing units and lands engaged in farming and ranching activities. Interspersed pockets of rural designated lands, characterized by single-family dwellings, lie along the mauka (eastern) side of Kula Highway in proximity of the project site. Agricultural zoned properties, consisting of farm, pastoral and undeveloped lands, adjoin the makai (western) side of the highway and also extend mauka of existing rural residential development.

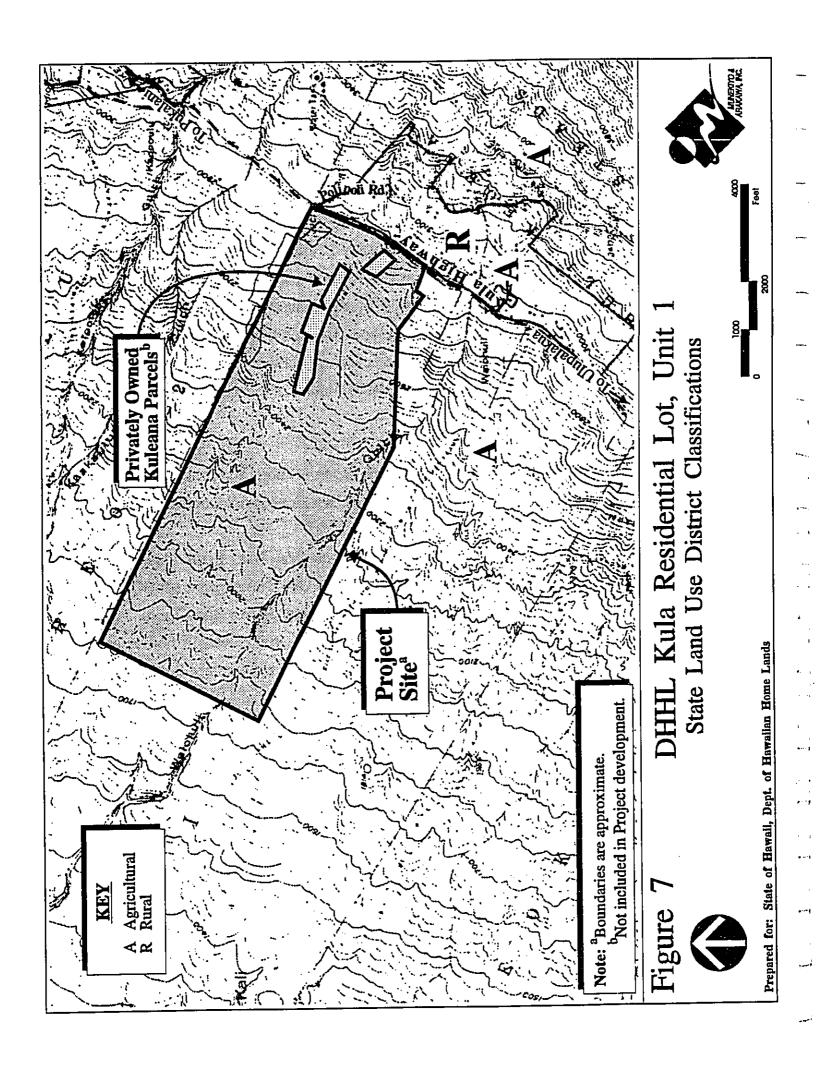
Ranging in size from one-half to one (1) acre, the proposed project will establish a low-density, rural residential neighborhood.

The land underlying the project site has been designated "Agricultural" by both the State Land Use Commission (SLUC) and the Makawao-Pukalani-Kula Community Plan. See Figure 7 and Figure 8. It should be noted, however, that Hawaiian homestead lands utilized for the purposes of the Act are exempt from County regulatory requirements.

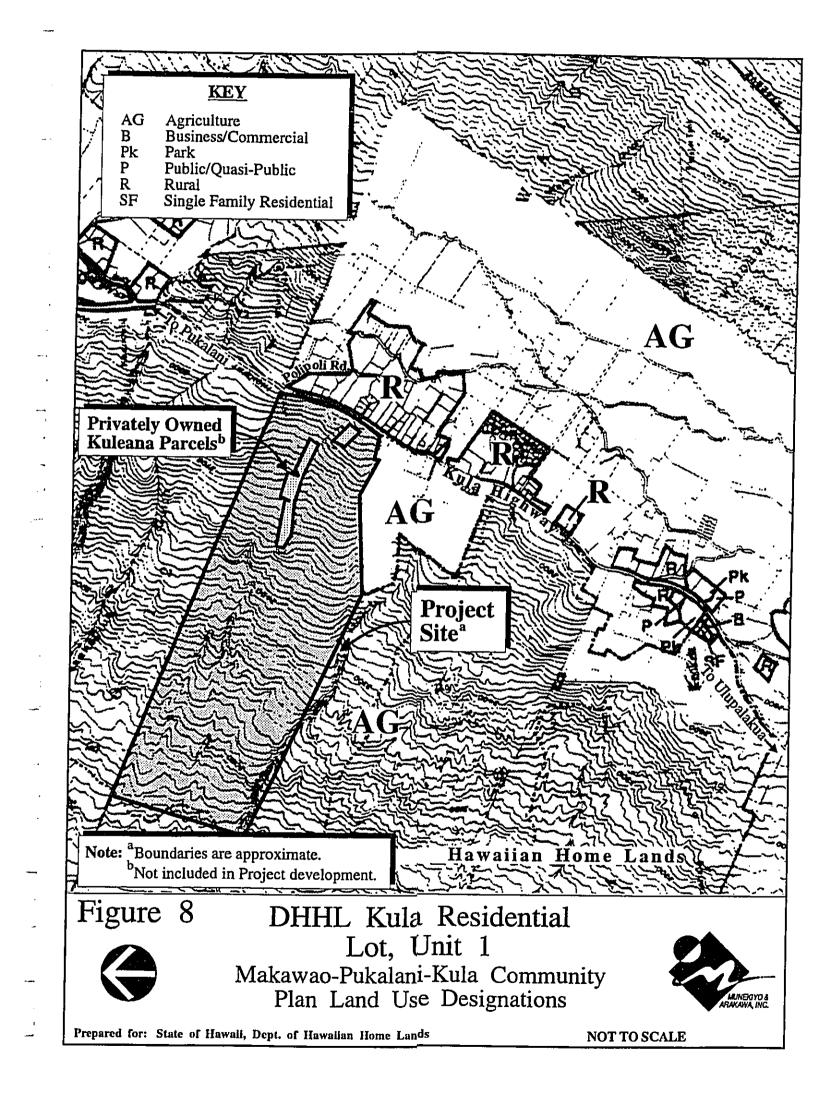
Although the proposed project will result in changes relating to land use density, the overall rural, residential character of the project is not considered inconsistent with surrounding uses.

#### 2. <u>Topography and Landform</u>

The proposed project will involve the clearing, grubbing and grading of approximately 460 acres of land that is presently



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undeveloped. Grading for the project site will involve excavation and embankment within the roadway right-of-way and within some of the adjoining lots. In general, finished contours will follow existing grades to minimize earthwork costs and maintain existing drainage patterns. Therefore, the proposed project is not expected to result in any adverse effects to the topography or landform.

#### 3. <u>Flora</u>

As previously indicated, the botanical survey of the project site identified three (3) major vegetation types. Refer to Appendix A. Ranging in elevation from approximately 3,000 to 2,350 feet, a dense forest of black wattle trees predominate the upper section of the project site. Dense patches of lantana and clumps of prickly pear cactus (a.k.a., panini) encompass an area extending from the black wattle forest to the project's boundary and beyond. Gulch vegetation, typified by dense clumps of guinea grass with scattered stands of Chinaberry trees, comprise the third vegetation type observed during the survey.

There are no known rare, endangered or threatened species of flora within the project site. As such, the removal of existing vegetation is not considered an adverse impact to this component of the environment.

#### 4. <u>Fauna</u>

A survey of avifauna and feral mammals was undertaken to record birds and mammals within the project site. Refer to Appendix B. As reflected by the survey, the only endemic native landbird recorded was the Common Amakihi, while the Pacific Golden-Plover was the only indigenous native migratory species observed.

Although the Short-earred Owl (a.k.a., Pueo) occurs in the Kula and Upcountry region, none were located during the survey. None of the avifauna, with the exception of the Pueo, which is endangered on the island of Oahu, is listed as rare, threatened or endangered.

Mammals recorded during the survey include cats, Axis Deer, and the Small Indian Mongoose. A Hawaiian Hoary bat was once observed foraging above the pasture lands near the Kula Highway at the northeast edge of the project site. Since, the occurrence and abundance of the Hawaiian Hoary Bat on Maui has not been extensively studied, little is known about the life history of this endemic and endangered species. With the exception of this sighting, none of the mammals observed are listed as rare, threatened, or endangered species.

#### 5. Archaeological Resources

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As a result of the current consolidation and resubdivision process involving the project site, the State Historic Preservation Division (SHPD) was consulted to confirm the significance assessments of the 51 sites identified by PHRI's archaeological inventory survey. In addition, recommendations for appropriate buffer zones and mitigation measures for each of the significant sites was also requested. See Appendix C-1.

As indicated by the SHPD, nine (9) sites required no further data collection. Since a reasonable amount of significant information was collected from these sites, they are considered "no longer significant". Of the remaining 42 sites, two (2) different mitigation measures are recommended.

Thirty-three (33) sites are considered significant solely for their information content and will require further data collection. Refer to Appendix C. Prior to any data recovery work, a data recovery plan will be submitted to the SHPD for approval. Until data recovery has been completed, the SHPD has indicated that 15-foot buffer zones around each site's perimeter will be required. Upon the completion of data recovery operations, these sites can be either preserved or destroyed.

Nine (9) sites are recommended for preservation as is, or preservation with interpretive development. These sites are identified as W-11, W-27, W-28, W-30, W-32, W-35, W-36, W-45, and W-90. Refer to Appendix C-1. These sites will require larger buffer zones to allow the surrounding terrain to preserve the visual and physical context of the site.

Typically, buffer zones are adjusted to the terrain. As an example, Sites W-35 and W-90 are located in gulches, while Site W-11 is situated well beyond the limits of the project site. Accordingly, these three (3) sites will not require any buffer zones, provided of course, that these sites are not affected by any construction activities.

It should be noted that coordination with the SHPD will be continued in order to establish acceptable buffer zones for the remaining six (6) sites. In addition, preservation plans for these sites will also be submitted to the SHPD for approval prior to their implementation.

Individual lot owners will also be notified of the presence of sites on their lots that have not yet been data recovered, or the presence of sites on their lots that are scheduled for preservation. Mitigation and preservation concerns will also be explained to the awardees. Prior to any land altering construction activities, buffer zones will be delineated with plastic construction fencing and their locations verified by an archaeologist.

Upon the execution of the SHPD's recommendations, the proposed project will have "no adverse affect" on the significant historic sites.

#### 6. <u>Air Quality</u>

Emissions from construction equipment and other vehicles involved in construction activities may temporarily affect the ambient air quality within the immediate vicinity. However, these effects can be minimized by properly maintaining construction equipment and vehicles.

In addition, dust generated during construction, especially from earth-moving operations, such as clearing, excavating, and trenching, may also result in a temporary decrease in ambient air quality. Mitigation measures include utilizing dust barriers, waterwagons and/or sprinklers to control dust, and watering graded areas after construction activity has ceased for the day. Water is also recommended during weekends and holidays to the extent practicable.

On a long-term basis, once construction activities have been completed, project-related vehicular traffic will generate automotive

emissions. However, these emissions are not expected to adversely impact local and regional ambient air quality conditions.

#### 7. <u>Noise Characteristics</u>

Ambient noise conditions will be temporarily affected by construction activities. Heavy construction equipment, such as bulldozers, dump trucks, front-end loaders, and material-transport vehicles, are anticipated to be the dominant noise-generating source during the construction period.

Proper equipment and vehicle maintenance are anticipated to minimize noise levels. In addition, equipment mufflers or other noise attenuating equipment may be necessary if noise levels are determined to be excessive. All construction activities are expected to be limited to daylight working hours.

Once completed, vehicles traveling along the region's roadways will be the primary source of long-term noise in the project area. However, vehicular traffic is not expected to generate any significant and unfavorable noise conditions.

#### 8. <u>Scenic and Open Space Resources</u>

The Kula region includes a diverse range of scenic and open spaces. Cultivated fields, pastoral ranch lands, and vacant, undeveloped properties typify the rural open space character of the region. The project site is situated along the southwestern slopes of Haleakala between the elevations of 1,800 to 3,000 feet. Due to its elevation and depending on topography and vegetation, views of the Central Maui plain, offshore islands, and coastline are available from the project site.

The proposed subdivision is not part of a scenic corridor and is not expected to have an adverse impact upon the visual character of the surrounding area.

### B. IMPACTS TO THE SOCIO-ECONOMIC ENVIRONMENT

#### 1. <u>Community Character</u>

The community character of the Makawao-Pukalani-Kula region is generally thought of as rural and agricultural. Flower and vegetable farms comprise the agricultural fabric of the region and range from small growers raising truck crops to larger operations cultivating crops for export. Although there are a few large working ranches, ranching activities are generally characterized by smaller family operations. Small neighborhood enterprises provide commercial goods and services to the local community. In addition to individually developed residential parcels, the Kula region also includes areas which contain low-density rural and agricultural subdivisions.

The proposed subdivision will consist of approximately 460 acres and will include 386 residential homestead lots ranging from onehalf to one (1) acre.

Ranging in size from 0.45 to 5,966.72 acres, Agricultural zoned parcels adjoin the project site along the mauka side of Kula Highway. The similarly zoned parcels surrounded by the project site range in size from 1.25 to 8.20 acres. Along Kula Highway, across from the project site, Rural zoned parcels range in size from 0.21 to 15.20 acres. Within the immediate vicinity, single-family dwellings appear to occupy at least one-half of the parcels within proximity of the project site.

With lot sizes ranging from one-half to one (1) acre, the proposed development is anticipated to maintain the rural, residential character of the Kula region. At full build-out, the 386 residential units will add to the diversity of residential settings in the Makawao-Pukalani-Kula region.

#### 2. <u>Population and Local Economy</u>

The population of Maui has exhibited relatively strong growth over the past decade, with the 1990 population of 91,361 reflecting a 45 percent increase over the 1980 population of 62,823.

Population gains were especially pronounced in the 1970's as the rapidly developing visitor industry attracted many new residents to Maui in search of employment.

Just as the island's population has grown, the resident population of the Upcountry region has increased significantly in the last two (2) decades.

The 1990 resident population of the Makawao-Pukalani-Kula region was approximately 18,923. Regional projections for the years 2000 and 2010 reflect population estimates of 21,760 and 24,613, respectively. Compared to 1990, these estimates reflect increases of approximately 15 percent and 30 percent for the years 2000 and 2010, respectively (Community Resources, Inc., January 1994).

Based on the 6,179 households in the Upcountry region noted in 1990, projections for the years 2000 and 2010 reflect increases of approximately 17 and 35 percent, respectively. These estimates

respectively reveal a total of 7,216 and 8,313 households for the years 2000 and 2010 (Community Resources, Inc., January 1994).

Assuming three (3) persons per household, and a total of 386 new households upon full build-out, the proposed subdivision is anticipated to contribute an estimated 1,158 residents to the region's population.

From a regional perspective, Wailuku and Kahului serve as the population and employment center of Maui. In the long-term, the proposed development is not anticipated to be a significant employment source.

On a short-term basis, the proposed project will support construction and construction-related employment.

Once fully developed and occupied, the subdivision's residents are anticipated to contribute to the long-term support of the regional economy through their purchases of goods and services from local merchants.

#### 3. <u>Police and Fire Protection</u>

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The MPD's Wailuku headquarters, located approximately nineteen (19) miles from the project site, services the Makawao-Pukalani-Kula region.

Currently, the Upcountry region is served by two (2) police beats, with each beat patrolled by a single officer. Additional support, if required, is provided by officers from the Haiku and Paia beats, with supplemental assistance provided by officers from the Kahului,



Wailuku, and Kihei beats, respectively. Due to MPD's centralized facilities and the Upcountry region's topography and large geographical area, response times to incidents in outlying areas can be delayed.

In the short-term, additional beats may be created in the Upcountry region as population increases warrant the need for further police services.

On a long-term basis, the MPD is projecting the development of a sub-station facility in the Upcountry region in the next ten (10) years (R. M. Towill Corp., August 1992; telephone conversation with Maui Police Department employee, Sgt. Larry Hudson, September 1994).

Fire protection services for the Upcountry region are provided by the MFD's Kula and Makawao station. The recently completed Kula facility is situated approximately three (3) miles to the northeast of the project site, while the Makawao station is approximately eight (8) miles to the north. Additional assistance, if required, is provided by the Paia station about fourteen (14) miles to the north, and the Kahului and Wailuku stations about sixteen (16) and nineteen (19) miles to the northwest, respectively.

Previously, the Makawao station was the only facility serving the Upcountry region. The recently completed Kula facility has reduced the service area radius of the Makawao station and improved fire protection service in the Upcountry region. The proposed subdivision is located within the two (2) to three (3) mile residential service radius of the Kula station.

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On a short-term basis, the MFD projects the assignment of a 3,000 gallon tanker and a driver/firefighter to the Kula station. A similar assignment is also anticipated for the Paia station.

In the long-term, the MFD is projecting the development of a fire station in Haiku. This facility would provide the Upcountry stations with additional fire protection support as needed (R.M. Towill Corp., August 1992; telephone conversations with Maui Fire Department employees, Deputy Chief Ron DeMello and Capt. Charles Ledward, September 1994).

The proposed project is not anticipated to adversely affect police and fire protection services in the region.

#### 4. <u>Medical Facilities</u>

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Kula Hospital is located approximately two (2) miles from the project site and provides out-patient medical services for the Kula region. In addition, several medical and dental care facilities are located in Makawao and Pukalani to serve Upcountry residents.

The hospital, in connection with the State Department of Health (DOH), has recently submitted a five (5) year strategic plan which requests a legislative appropriation for the expansion of services and facilities for the existing out-patient clinic (telephone conversation with Kula Hospital employee, Natalie Kahoohanohano, September 1994).

The proposed project is anticipated to increase the need for additional medical care services in the Upcountry region.



#### 5. <u>Solid Waste</u>

Solid waste from the Upcountry region is currently transported to the Central Maui Landfill near Puunene, approximately nine (9) miles from the project site.

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

The County of Maui is currently negotiating to acquire additional acreage from A & B, Inc. for the expansion of the existing landfill. If successful, the expanded facility would be able to accommodate solid waste disposal needs for the next twelve (12) to twenty (20) years. In addition, the County has also commenced planning efforts for an integrated solid waste management system. Locations for a new regional landfill site are also being examined (conversation with Solid Waste Division employees, Dave Wissmar and Andy Hirose, July 1994).

Upon completion of the project, solid waste collection and disposal services will be provided by the County of Maui. The proposed project will require additional solid waste collection service from the County of Maui. However, this additional requirement is not considered significant. The project is not anticipated to adversely impact solid waste disposal facility requirements.

#### 6. <u>Schools</u>

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The State Department of Education (DOE) estimates that the proposed project will generate an additional 140 students for Grades K to 5, 55 students for Grades 6 to 8, and 62 students for Grades 9 to 12 (telephone conversation with Department of Education employee, Tom Saka, September 1994).

Kula Elementary School has an estimated 1994 enrollment of 573 students, while Kalama Intermediate School has an estimated 1994 enrollment of 1,284 students. King Kekaulike High School, scheduled to open in 1995, has a projected first year enrollment of 410 students, with projections for the years 1996 to 1999 revealing enrollments ranging from 818 to 1,623 students.

Currently, there are no facility expansion plans for Kula Elementary School. In order to accommodate the 140 students projected for Grades K to 5, portable classrooms will have to be developed. A re-districting alternative, which would permit students to attend Pukalani Elementary School, may also be considered. However, the effect of this alternative is considered nominal since Pukalani Elementary School is not anticipated to absorb the majority of grade school students generated by the project.

Eight (8) classroom buildings were recently constructed on the Kalama Intermediate School campus. In addition, new library and administration facilities are being proposed to replace the temporary structures currently being used. Upon completion of the new facilities, the former library and administration buildings will be utilized for classrooms.

With a design enrollment of 1,740 students, King Kekaulike High School has sufficient capacity to accommodate the 62 students generated by the proposed project (Wilson Okamoto & Associates, May 1991; R.M. Towill Corp., August 1992; telephone conversation with Department of Education employee, Peter Daniels, September 1994).

With the exception of Grades K to 5, the students generated by the proposed project are not expected to create a significant increase in facility requirements.

Coordination with the DOE shall be undertaken to discuss alternative measures for providing adequate educational facilities for the additional students in Grades K to 5 generated as a result of the proposed project.

#### 7. <u>Recreational Facilities</u>

County recreational facilities in the Upcountry region consist of five (5) neighborhoods and three (3) district parks. Neighborhood parks in the Kula area include Kula Community Center, Waiakoa Gym, Harold Rice Memorial Park, and Keokea Ball Park.

The Upcountry region's expansive geographic area and widely dispersed population centers limit the provision of recreational services due to the travel involved to reach the larger park facilities. In addition, development and maintenance costs also affect the establishment of new park facilities or the expansion of those currently existing. Consequently, the development of larger, more centralized facilities may be considered as an alternative.

Dedicated in 1994, Kula Recreational Center is located approximately three (3) miles from the project site and is anticipated to accommodate the current need for recreational facilities in the Kula area. The recently completed 10.3-acre facility serves as the region's only district park and includes multi-purpose ball fields, picnic sites, a fitness area with exercise stations, paved pathways, a comfort station, and parking areas (R.M. Towill Corp., August 1992; telephone conversations with Department of Parks and Recreation employees, Leonard Costa and Pat Matsui, September 1994).

The proposed subdivision consists of a 16-acre park site which will be set aside for future development. In the short-term, the proposed project is not anticipated to generate an immediate demand for recreational facilities. On a long-term basis, the development of the park site will expand the Upcountry region's network of recreational facilities, as well as accommodate the recreational needs of the community.

#### C. IMPACTS TO THE INFRASTRUCTURE

#### 1. <u>Roadways</u>

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... ز نسب A Traffic Impact Analysis Report (TIAR) has been prepared for the proposed project. See Appendix D. The findings and conclusions of the report are summarized below.

The TIAR analyzed five (5) existing and two (2) future intersections within the study area. These intersections were analyzed during the AM and PM peak traffic hours with respect to existing conditions, the Year 2005 Base without project conditions, and the Year 2005 with project conditions. These intersections include:

1.	Hana H	ighway a	and	Haleakala	Highway	(signalized);
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- 2. Pukalani Bypass and Makawao Avenue (stop-controlled);
- 3. Pukalani Bypass/Kula Highway and Haleakala Highway <u>or</u> "Five Trees" (stop-controlled);
- 4. Kula Highway and Omaopio Road (stop-controlled);
- 5. Kula Highway and Kekaulike Avenue (stop-controlled);
- 6. Kula Highway and Project Access Road "A" (future stopcontrolled); and
- 7. Kula Highway and Project Access Road "B" (future stopcontrolled).

Under existing 1994 traffic conditions, three (3) of the five (5) analyzed intersections are currently operating at an undesirable level of service (LOS) (i.e., LOS "E" or "F") during the AM or PM peak hour, or both. LOS is a qualitative measure used to describe operational conditions within a traffic stream. In determining LOS, factors such as speed, delay safety, driver comfort, traffic interruptions, vehicle density, and freedom to maneuver are considered. LOS "A", "B", and "C", are considered satisfactory levels of service. LOS "D" is generally considered a "desirable minimum" operating level of service, while LOS "E" and LOS "F" are considered undesirable and unacceptable conditions, respectively.

Intersection improvements expected to be implemented by the Year 2005 include the signalization of the Pukalani Bypass/Makawao Avenue intersection and the Pukalani Bypass/Kula Highway/Haleakala Highway (a.k.a., "Five Trees") intersection.

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Under the Year 2005 Base without project conditions, only the Hana Highway/ Haleakala Highway intersection will be operating at LOS "F" during the AM peak hour. The remaining four (4) intersections will be operating at acceptable levels of service (i.e., LOS "D" or better).

Under the Year 2005 with project conditions, all of the intersections will be operating at acceptable levels of service (i.e., LOS "D" or better) except for the intersection of Hana Highway and Haleakala Highway. It should be noted that this intersection is currently operating at LOS "F" during the AM peak hour and will continue to operate at this level of service, with or without the development of the project.

As reflected in the TIAR, a connector road between the Upcountry and Kihei regions could mitigate this undesirable level of service by redistributing traffic and alleviating traffic congestion at the Hana Highway/Haleakala Highway intersection. In addition, upgrading either Omaopio Road or Pulehu Road could also reduce traffic congestion as well as provide an alternative route to West Maui. It should be noted that a development study for an Upcountry/Kihei Connector Road is currently underway.

The proposed project's 386 single-family residential units are anticipated to generate an average of 3,686 trips daily, with approximately 286 and 390 trips occurring during the AM and PM peak hours, respectively. The intersection of Kula Highway and the proposed project's access roads are anticipated to operate at LOS "B" during both the AM and PM peak hours. Based on the estimated traffic volume projections for the proposed project, no



roadway improvements to Kula Highway will be necessary in the vicinity of both project access roads. Based on the results of the TIAR, it has been concluded that the proposed project will not have any significant traffic impacts on any of the analyzed intersections.

#### 2. <u>Water</u>

The proposed water system will be constructed in accordance with standards established by the DWS and will be comprised of four (4) service zones. Refer to Appendix E. Service zone 1 will connect to the existing Upper Kula System, while service zone 2 will consist of a reservoir tank with a capacity of approximately 1.5 MG. Service zones 3 and 4 will feature reservoir tanks with capacities of approximately 0.2 MG and 0.1 MG, respectively. With the exception of service zone 1, the remaining services zones will utilize waterlines ranging in diameter from six (6) to twelve (12) inches.

Water from the existing Lower Kula System will flow into the approximately 0.2 MG tank proposed in service zone 3 via a new transmission line from Naalae Road. Consisting of approximately 9,000 linear feet of 18-inch ductile iron pipe, the new transmission line would connect to the existing 18-inch lower Kula waterline at Naalae Road and extend in a southwesterly direction toward the project site (Final Environmental Assessment for the Kula Water Transmission Main, Phase I, R.T. Tanaka Engineering, Inc., September 1995). The average daily demand for the proposed project is estimated to be approximately 305,000 gpd.

The proposed project will utilize applicable xeriscape principles and water conservation techniques for landscaping and irrigation. With

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the implementation of the proposed water system improvements, the proposed project is not anticipated to have an adverse effect on water sources, storage facilities, and distribution and transmission systems. In addition, the new transmission line is not anticipated to result in any significant short- or long-term environmental impacts (<u>Final Environmental Assessment for the Kula Water</u> <u>Transmission Main, Phase I</u>, R.T. Tanaka Engineering, Inc., September 1995).

#### 3. Drainage and Erosion Control

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The drainage plan for the proposed project will include roadway culverts, detention basins, a subsurface drainage system, diversion ditches and swales, grassed and paved swales along roadways, and the realignment of an existing gulch drainageway. Refer to Appendix E. The subsurface drainage system will consist of drain lines, inlets and manholes, as well as outlet structures.

In general, the Rational Method will be used to determine onsite storm runoff quantities. In addition to the subsurface drainage system, roadway and diversion swales will be designed for a 10 year storm recurrence interval of one (1) hour duration. Roadway culverts and detention basins will be designed for a 50 year storm recurrence interval of one (1) hour duration.

Using the method described in the <u>Erosion and Sediment Control</u> <u>Guide for Hawaii</u>, NRCS, March 1981, preliminary calculations of peak offsite storm runoff what flow through the project site have been completed. The peak flows for the existing culvert crossings at Kula Highway are reflected in Appendix E.



The proposed drainage system improvements will be designed to produce no adverse effect by storm runoff to downstream and adjacent properties. All drainage system improvements will conform to, and be coordinated with, applicable governmental standards and agencies.

Erosion control measures recommended during construction include the following:

- 1. Minimize the time of construction;
- 2. Retain existing ground cover as long as possible in order to complete construction;
- 3. Implement the early construction of drainage control features;
- 4. Use temporary area sprinklers in non-active construction areas when ground cover is removed;
- 5. Utilize onsite waterwagons for immediate sprinkling, as needed, in active construction areas;
- 6. Use temporary berms, cut-off ditches, or silt screen fencing, where needed, to control soil erosion;
- 7. Water graded areas thoroughly after construction activity has ceased for the day, as well as on weekends and holidays;
- 8. All cut and fill slopes shall be sodded or planted immediately after grading work has been completed;
- 9. Upon completion of finish grading, cover all exposed areas with grass or an appropriate cover material; and
- 10. Ensure that adequate measures are implemented to prevent sediment-laden runoff from leaving the project site.

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#### 4. <u>Wastewater</u>

The proposed project will utilize cesspools as individual wastewater systems for each lot. Refer to Appendix E. Since the proposed project will exceed the 50-lot limit established by the DOH, a variance will be sought in order to allow the project to be developed by utilizing cesspools as individual wastewater systems.

#### 5. <u>Electrical and Telephone Services</u>

Overhead lines for electrical, street lighting, telephone, and cable television services will be provided by the respective utility companies. The proposed project is not anticipated to adversely impact electrical and telephone services in the Upcountry region.

#### D. <u>CUMULATIVE AND SECONDARY IMPACTS</u>

Cumulative impacts are defined as impacts resulting from other past, present, and reasonably foreseeable future actions, while secondary impacts are impacts resulting from indirect actions. Cumulative impacts related to the development of the proposed subdivision include increases in traffic, as well as vehicle-generated noise and emissions.

Based on estimated traffic volume projections and an analysis of intersections in the region, traffic-related impacts are not anticipated to be adverse. Although, project-related traffic will generate noise and emissions, these impacts are not expected to significantly affect ambient air quality or result in any adverse noise conditions. It should be noted that the new water transmission line is anticipated to provide beneficial impacts by facilitating the development of the remainder of the Waiohuli parcel at such time any future development is programmed.

Secondary impacts associated with the development of the proposed subdivision and water transmission line include the effect of induced growth in the region, as well as additional requirements for infrastructure and public services. As previously noted, these long-term effects are not anticipated to result in any significant adverse impacts.

It should be noted that at the present time, DHHL has not programmed any commitments for any larger actions in the future.

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# Chapter IV

Summary of Unavoidable, Adverse Environmental Effects; Alternatives to the Proposed Action; and the Irreversible and Irretrievable Commitment of Resources

#### IV. SUMMARY OF UNAVOIDABLE, ADVERSE ENVIRONMENTAL EFFECTS; ALTERNATIVES TO THE PROPOSED ACTION; AND THE IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

#### A. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS

The proposed project will result in some construction-related impacts as described in Chapter III, Potential Impacts and Mitigation Measures.

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

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

#### B. ALTERNATIVES TO THE PROPOSED ACTION

#### 1. <u>No Action Alternative</u>

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As previously indicated, there was a total of nearly 5,000 Native Hawaiians on the waiting list for homestead lands on Maui. Of this total, approximately 2,400 Native Hawaiians are on the waiting list for residential lots. Pursuant to the HHCA, the "no action" alternative does not represent a responsible option toward addressing the entitlements and housing needs of Native Hawaiians.

Given the adequacy and cost of housing in Hawaii, and considering the very low, long-term lease rents associated with Hawaiian homestead lands, the proposed project will provide Native Hawaiians with the opportunity to become homeowners and



consequently, narrow the gap created by the shortage of affordable housing units in Hawaii.

#### C. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

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

In addition, the development of the proposed project will involve the *commitment of land for improvements which will preclude other land* options for the site. This commitment of land resources implements the mandate of the HHCA and is consistent with existing and future land uses in and around the project area.

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# Chapter V

## Findings and Conclusion

## V. FINDINGS AND CONCLUSION

The proposed project will involve the development of a residential subdivision and related infrastructure improvements. The project site and a portion of an adjoining parcel are currently undergoing consolidation and resubdivision. Upon completion of the subdivision process, the project site will encompass approximately 460 acres and will consist of 386 single-family lots ranging in size from one-half to one (1) acre. In addition, a 16-acre park site will be set aside for future development, as well as other parcels which will be used for utility sites and community-related needs. It should also be noted that a separate Environmental Assessment was prepared for the new water transmission line which will serve the needs of the proposed subdivision, as well as the kuleana parcels within the subdivision and the privately owned parcels along its alignment (Final Environmental Assessment for the Kula Water Transmission Main, Phase I, R.T. Tanaka Engineering, Inc., September 1995).

Since the proposed project involves State land and funding, this Environmental Assessment has been prepared pursuant to Chapter 343, HRS, and Chapter 200 of Title 11, Administrative Rules of the State Department of Health.

The development of the proposed project will involve short-term environmental effects typically associated with construction activities. To mitigate air quality and noise impacts, construction activities will be limited to daylight hours. Appropriate dust control measures such as revegetation, sprinkling, watering, and silt screen fencing, will be undertaken to minimize fugitive dust. Although ambient noise conditions may be temporarily affected by construction activities, no significant adverse effects are anticipated.

From a long-term perspective, the proposed project is not anticipated to result in any adverse environmental impacts. A botanical survey indicated that there are no rare, endangered, or threatened species of flora located within the project

site. Although a Hawaiian Hoary Bat was once observed foraging above the northeast corner of the project site, little is known about the life history of this endemic and endangered species. With the exception of this sighting, the avifauna and mammal survey revealed that none of the mammals observed are rare, endangered, or threatened species.

As a result of the current consolidation and resubdivision process, the SHPD was consulted concerning significance determinations, mitigation measures, and construction buffer zones for the 42 significant sites identified by the PHRI archaeological inventory survey. Coordination with the SHPD will be continued to ensure that buffer zones, mitigation measures, and data recovery and preservation plan requirements will be addressed.

With regard to short-term, socio-economic impacts, construction-related employment is anticipated to have a positive effect on the local economy. In addition, the proposed project is anticipated to fulfill an immediate for homesteading opportunities for Native Hawaiians. With the exception of Grades K to 5, the students generated by the proposed project are not expected to create a significant increase in facility requirements. Coordination with the DOE will be undertaken to discuss alternative measures for providing adequate education facilities for the additional students in Grades K to 5 generated as a result of the proposed project. The proposed project is not anticipated to create an immediate demand for new offsite recreational facilities.

Once fully developed and occupied, the subdivision's residents are anticipated to contribute to the long-term support of the regional economy through their purchases of goods and services from local merchants. The development of the project's 16-acre park site will expand the Upcountry region's network of recreational facilities, as well as accommodate the recreational needs of the community.

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Applicable infrastructure improvements will be implemented for the development of the project. With the exception of certain specified exemptions, the design of the infrastructure improvements will comply with applicable County design standards. It should be noted that, pursuant to Section 220 of the HHCA, Hawaiian homestead lands utilized by the Act are exempt from County regulatory requirements.

Based on an assessment of the proposed project, the development of the DHHL Kula Residential Lot, Unit 1 Subdivision is not anticipated to result in any significant environmental impacts.

## Chapter VI

Agencies Contacted in the Preparation of the Draft Environmental Assessment

## VI. AGENCIES CONTACTED IN THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT

- 1. County of Maui Department of Water Supply 200 South High Street Wailuku, Hawaii 96793
- County of Maui Department of Public Works and Waste Management Engineering Division
   200 South High Street Wailuku, Hawaii 96793
- County of Maui Department of Planning 250 South High Street Wailuku, Hawaii 96793
- 4. State of Hawaii Department of Health 54 South High Street Wailuku, Hawaii 96793

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- State of Hawaii
   Department of Transportation
   Highways Division
   650 Palapala Drive
   Kahului, Hawaii 96732
- State of Hawaii Department of Land and Natural Resources State Historic Preservation Division
   33 S. King Street, 6th Floor Honolulu, Hawaii 96813

# Chapter VII

Correspondence Received During the Public Comment Period and Responses to Substantive Comments

STATE OF HAWA! OFFICE OF ENVIRONMENTAL QUALITY CONTROL 220 SOUTH KING STREET FOURTH FLOOR HONOLULU, HAWAH PERIS TELEPHONE MAN 500-4105 FACTORIAL FROM 644-2462 September 26, 1995 Mr. Michael L. Crozier, Administrator Land Development Division State of Hawai'i, Department of Hawaiian Home Lands Old Federal Building 335 Merchant Street, Third Floor Honolulu, Hawai'i 96813 Dear Mr. Crozier: We are writing in response to your September 5, 1995, letter (MC:PY:0345B) submitting a Final Environmental Assessment/Negative Declaration for the Kula Water Transmission Main, Phase 1, and your September 12, 1995, letter, submitting a Draft Environmental Assessment for Kula Residence Lots, Unit 1. The Office of Environmental Quality Control (OEQC) must remind you that the law specifically disallows segmentation of a project into parts and submitting those parts, one at a time, to environmental review. We believe your Department has segmented a larger project into at least these two parts. For reasons set forth in the next section, we advise the Department of Hawaiian Home Lands (DHHL) to perform the following tasks in its assessment of significance in the Final Environmental Assessment/Notice of Determination for the Kula Residence Lots. Incorporate all information on water transmission from the Final Environmental 1) Assessment/Negative Declaration for the Kula Water Transmission Main into the Final Project Environmental Assessment for the Kula Residence Lots. Analyze and reassess the significance (under section 11-200-12, Hawaii Administrative Rules) of 2) the proposed Kula Residence Lots project considering the incorporated water transmission information above, especially with respect to the following: The two projects cited above have phase/unit number designations attached to the project A) title; the DHHL must consider every phase of a proposed action (or related group of

effects of the action.

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B) Describe whether the proposed action (or a group of related proposed actions such as the water transmission line and residence lots development) involve substantial secondary impacts. Population changes or effects on public facilities such as a water transmission line among other things should be considered secondary impacts.

actions), the expected consequences, and the cumulative as well as the short and long-term

C) Assess if and how the proposed action may have a cumulative effect upon the environment when past and future projects are considered.

JAN-22-96 MON 04:12 PM Off. of Env. Qual. Cntl. 708 586 4136

Mr. Michael L. Crozier, Administrator Land Development Division Department of Hawaiian Home Lands September 26, 1995 Page 2 of 2

D) Analyze if the proposed action involves any commitment for larger actions in the future.

#### BACKGROUND

We became concerned about project segmentation when, within a period of seven days, we received a final environmental assessment/negative declaration for the Kula Water Transmission Line, Phase I, and the draft environmental assessment/anticipated negative declaration for the Kula Residence Lots, Unit I project. Although the projects are obviously related to one another, we are unable to find explicit links between the two in any of their related documents.

While we recognize that different consultants prepared the environmental documents for the above projects, we believe that the DHHL has a responsibility to: 1) effectively coordinate/communicate with the consultant the status of pending projects for public disclosure in the environmental documents so that the public will be able to make informed comment on proposed actions; and 2) inform the Office/public of potential relationships between various proposed actions.

It is our duty to remind you that Section 11-200-7, Hawaii Administrative Rules, states in pertinent part that "[a] group of actions proposed by an agency ... shall be treated as a single action when ... (1) [t]he component actions are <u>phases or increments</u> of a larger total undertaking; (2) [a]n individual project is a <u>necessary precedent for a larger project</u>; (3) [a]n individual project represents a <u>commitment to a larger</u> <u>project</u>; or (4) [t]he actions in question are essentially identical and a single statement will adequately address the impacts of each individual action and those of the group of actions as a whole." [Underscoring supplied for emphasis].

An examination of our records failed to produce any environmental impact statement for proposed residence/infrastructure developments on Maui.

While we acknowledge DHHL's need to fulfill its constitutional mandate as set forth in the Hawaiian Homes Commission Act, we also believe that DHHL, as an agency of the State, must comply with the procedures for environmental review set forth in Chapter 343, Hawaii Revised Statutes. Accordingly, we echo Dr. John Harrison's concerns (see enclosed August 22, 1994, letter to your agency) concerning segmentation and remind you that in determining whether an action may have a significant effect on the environment, the Department <u>must</u> consider <u>every phase</u> of the proposed action, the expected consequences, both primary and secondary, and the cumulative as well as the short and long-term effects of the action.

If there are any questions, please call me or Mr. Leslie Segundo at 586-4185. Thank you for your cooperation.

Sincerely, GARY GILL Director

Enclosure

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BENJAMIN J. CAYETANO GOVERNOR STATE OF HAWAII



MAR 2 1 1996

KALI WATSON CHAIRMAN HAWAHAN HOMES COMMISSION.

JOBIE M. K. M. YAMAGUCHI DEPUTY TO THE CHAIRMAN

STATE OF HAWAII DEPARTMENT OF HAWAIIAN HOME LANDS P.O. BOX 1879 HONOLULL, HAWAII 96805

March 20,1996

Mr. Gary Gill, Director Office of Environmental Quality Control State of Hawaii 220 South King Street, 4th Floor Honolulu, Hawaii 96813

Dear Mr. Gill:

SUBJECT: Kula Residence Lots, Unit 1 Kula, Island of Maui

Thank you for providing the Department of Hawaiian Home Lands (DHHL) with your comments concerning the subject's Draft Environmental Assessment (EA). Pursuant to your September 26, 1995 letter, we would like to note that information contained in the Final EA for the Kula Water Transmission Main, Phase 1, (R.T. Tanaka Engineering, Inc., September 1995) has been included in the subject's Final EA.

In addition to the potential short- and long-term effects which were previously described, the subject's Final EA includes a description of cumulative and secondary impacts as well.

Please feel free to contact me should you require any additional information.

Sincerely,

Mike Crozier, Administrator Land Development Division

cc: Austin, Tsutsumi & Assoc. Munekiyo & Arakawa, Inc.



## University of Hawai'i at Mānoa

Environmental Center A Unit of Water Resources Research Center Crawford 317 • 2550 Campus Road • Honolulu, Hawai'i 96822 Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

> October 23, 1995 EA: 0134

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Mr. Kali Watson Department of Hawaiian Home Lands P.O. Box 1879 Honolulu, Hawaii 96805

Mr. Watson:

#### Draft Environmental Assessment (EA) Kula Residential Lot, Unit 1 Kula, Maui

The State of Hawaii, Department of Hawaiian Home Lands is proposing to develop a 386-lot residential subdivision on Hawaiian homestead lands in Kula, Maui. Pursuant to Section 204 of the Hawaiian Homes Commission Act (HHCA), the proposed project addresses the demand for developed homestead lots for Native Hawaiians by providing improved homesites for residential construction and occupancy by land awardees. The proposed project will encompass approximately 460 acres, comprised of homesites ranging in size from approximately 1/2 to one acre. In addition, the proposed project will involve construction of related roadway, wastewater, water and drainage system improvements.

This review was completed with the assistance of Kem Lowry, Urban and Regional Planning; Terry Hunt, Archaeology and Tom Hawley, Environmental Center.

This draft EA generally is well-prepared and addresses major environmental consequences of the proposed project. Our reviewers noted that the traffic section is especially thorough. However, we are concerned about the proposed use of cesspools in lieu of county-provided wastewater disposal. We note that the project will require an exemption from State Department of Health regulations which prohibit the use of cesspools in developments of larger than 50 lots. Any waiver, and particularly one seeking a six-fold exceedence of standards, should be accompanied by a more detailed and thorough discussion of possible consequences and proposed mitigative measures than occurs in this draft EA.

Mr. Kali Watson October 23, 1995 Page 2

Our reviewers generally concurred with the archaeological inventory survey and testing methodologies, but they noted that some of the research questions seemed naive. A more productive approach would be to incorporate results of future work in this project area to regional patterns of land use and chronology. We note that salvage archaeology must collect information for a broad range of people. If research questions imply a limited range of data acquisition (i.e. a deductive approach), then specifying them as a limiting factor is short-sighted. In short, salvage archaeology must be more than research archaeology. Because the sites will be forever buried under the proposed development, the archaeological report should include a wide range of preservation options and provide as many research resources for emerging archaeological questions as possible.

Furthermore, we note that this project and another DHHL project, the Kahikinui Kuleana project in Kahikinui, Maui are proceeding simultaneously. Given the relative proximity of the two projects, we suggest that the two draft EA's each should consider "overall and cumulative effects" of the other pursuant to Section 11-200-12, DOH Administrative Rules. Given potential significance to the Native Hawaiian community and to the wider East Maui area, we suggest that perhaps a full environmental impact statement would better cover the range of possible impacts these two projects entail.

Finally, we are concerned that the Department of Hawaiian Home Lands is both the proposing agency and the accepting authority for this project. This clearly represents a conflict of interest and effectively circumvents the spirit of the EIS process. Certainly the process of objective review is ill-served by such a situation. Public concerns regarding any project must be allowed a fair hearing in as neutral a forum as possible and must be given an honest chance to be addressed. The current situation compromises that possibility.

Thank you for the opportunity to comment.

Sincere

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John T. Harrison Environmental Coordinator

cc: OEQC Roger Fujioka Department of Hawaiian Home Lands Munekiyo and Arakawa, Inc. ✓ Kem Lowry Terry Hunt Tom Hawley BENJAMIN'J, CAYETANO 6033380398 NEXTERE INWAS



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STATE OF HAWAII DEPARTMENT OF HAWAIIAN HOME LANDS 100 IUN 3879 HONOLULU, HAWAII 96605

## April 2, 1996

University of Hawaii Environmental Center Crawford Hall, Room 317 2550 Campus Road Honolulu, Hawaii 96822

Attention: Mr. John T. Harrison, Coordinator

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Gentlemen:

SUBJECT: Draft Environmental Assessment, Kula Residence Lots, Unit 1 Kula, Island of Maui

Under the Department of Hawaiian Home Lands (DHHL) Acceleration Program of 1986, 308 of the 386 residential lots were awarded to native Hawaiian beneficiaries. The preliminary design for this area consisted of a roadway system, a drainage system, a water system, and an overhead electrical distribution system to service this Hawaiian Homes subdivision. All of the improvements were designed to meet minimum county standards. During this period, the use of cesspools for waste disposal was permitted and no alternative system was considered. During the award phase of this project, lessees were informed of the lack of Capital Improvement Program funds and the minimum improvements that would be constructed for this subdivision when funds became available from the legislature.

A Department of Health (DOH) Variance is being requested by the DHHL to utilize cesspools for waste disposal. The entire site is within an area designated not critical, and no existing sewer system is in the vicinity of the proposed project. The cost associated with an on-site sewage system would result in economic hardship to the DHHL as well as to its beneficiaries. A detailed report has been provided to the Department of Health, with whom the DHHL will work to address their comments and concerns. Mr. John T. Harrison Kula Residence Lots, Unit 1 Environmental Assessment Page 2

The concern you raised regarding the coordination and proximity of the DHHL's Kahikinui Kuleana project has been addressed in a letter to you dated October 27,1995. This letter explained that the projects were not related, and that both projects were planned independently and at different times. The letter also states that the only service which the DHHL will provide to the caretakers of this parcel is the surveying services. All additional infrastructure development will be initiated by caretakers of the kuleana program; without this arrangement, this area would not be inhabited for another fifty (50) or so years. The Kahikinui Kuleana Project is the first attempt by DHHL which allows settlement on "raw" lands using limited state assistance.

Thank you for your interest in this project. We apologize for the time taken to respond to your concerns. Should you have any questions, please feel free to contact Mr. Patrick Miyahira of Austin, Tsutsumi and Associates, Inc. at 244-8044.

Sincerely,

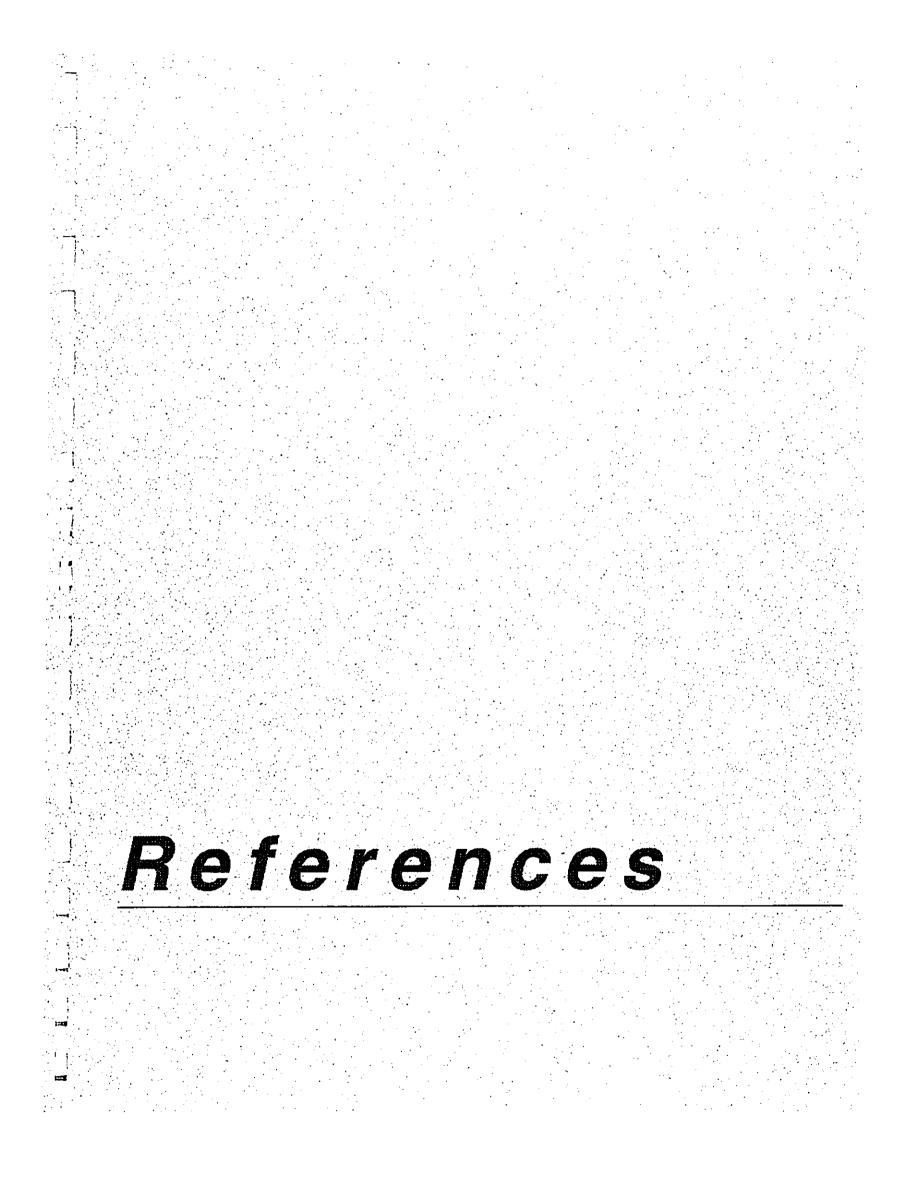
Mike Crozier, Administrator Land Development Division

cc: OEOC

ATA, Inc.

Tanaka Engineers, Inc.

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Maui Economic Development Board, Inc., Maui County Data Book, December 1993.

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Telephone conversation with Department of Hawaiian Home Lands employees, Joe Chu, September 1994 and Patrick Young, April 1996.

Telephone conversation with Kula Hospital employee, Natalie Kahoohanohano, September 1994.

Telephone conversations with Maui Fire Department employees, Deputy Chief Ron DeMello and Captain Charles Ledward, September 1994.

Telephone conversations with Department of Parks and Recreation employees, Leonard Costa and Pat Matsui, September 1994.

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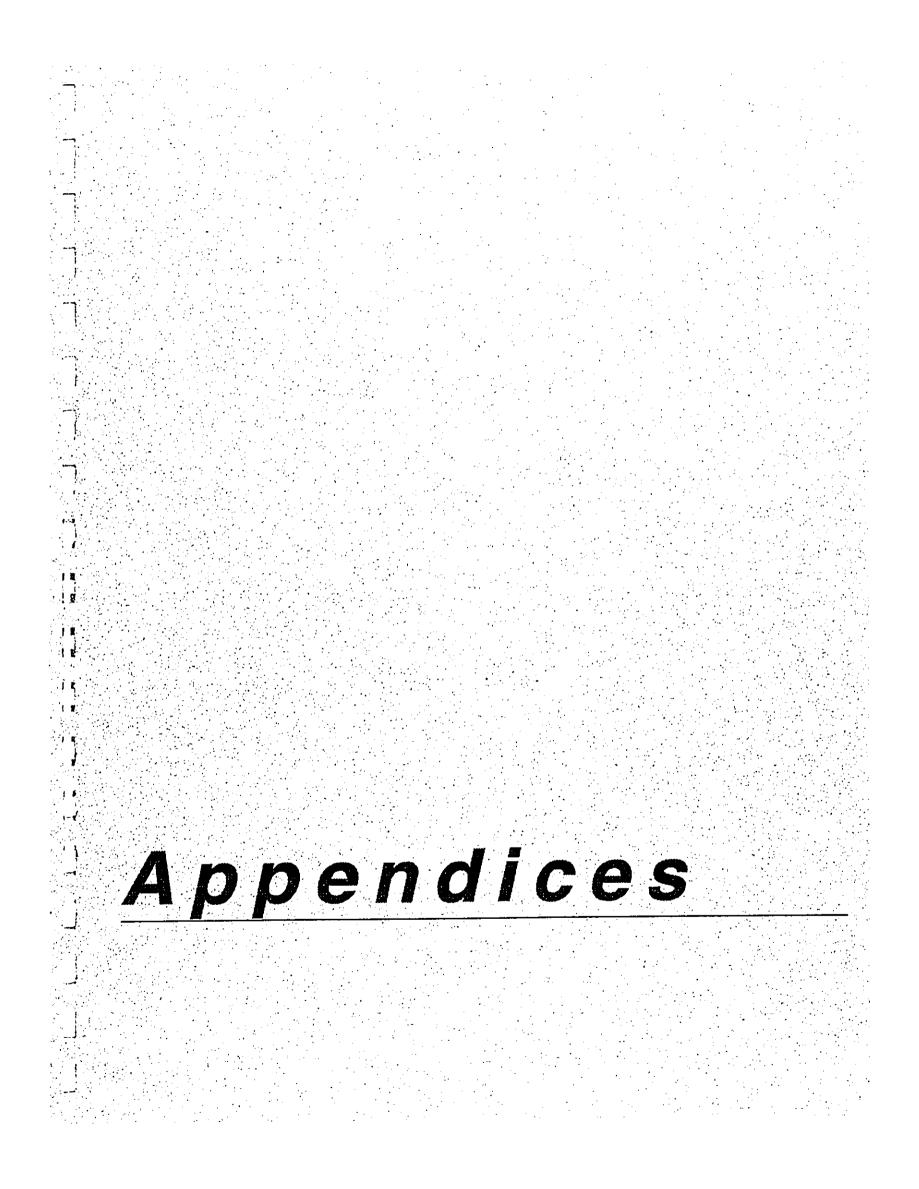
Wilson Okamoto and Associates, <u>Maui Community Plan Update Infrastructure</u> <u>Assessment</u>, September 1992.

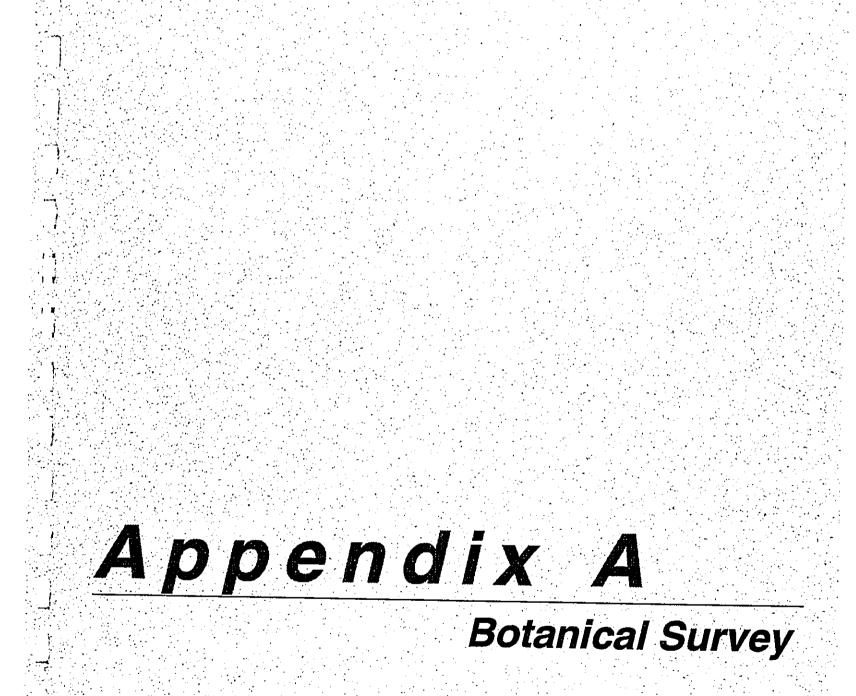
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BOTANICAL SURVEY DHHL KULA RESIDENTIAL LOT, UNIT 1 KULA, MAKAWAO DISTRICT, ISLAND OF MAUI

bу

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Prepared for: Munekiyo & Arakawa, Inc.

October 1994

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## BOTANICAL SURVEY DHHL KULA RESIDENTIAL LOT, UNIT 1 KULA, MAKAWAO DISTRICT, ISLAND OF MAUI

### INTRODUCTION

The  $\pm 655$ -acre Department of Hawaiian Home Lands (DHHL) project site, TMK: 2-2-02: 56, is found on the northwest slope of Haleakala, near Keokea. The property is bounded to the east by Kula Highway, and on the remaining three sides primarily by undeveloped lands used for pasture. Elevation on the property ranges from about 1,800 ft. along the lower, makai boundary to roughly 3,000 ft. along the upper, mauka boundary where it abuts the Kula Highway. Annual rainfall is about 15 inches on the lower one-quarter of the property, increasing gradually as one moves upslope to 30 inches per year on the upper section.

Only about two-thirds of the project site are planned for residential development. This upper portion of the property is the most suitable for the proposed land use. The climatic conditions are pleasant, with temperatures ranging from the low 60's to the mid-80's, rainfall from 20 to 30 inches annually, and the soil conditions favorable. The site offers spectacular views of the Maui isthmus and the West Maui mountains beyond (Woolsey, Miyabara & Associates 1983).

Field studies to assess the botanical resources found on the DHHL project site were conducted on 08 and 22 to 23 September 1994. The primary objectives of the field studies were to: 1) provide a description of the major vegetation types; 2) inventory the flora; 3) search for threatened and endangered species as well as rare and vulnerable plants; and 4) identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

#### SURVEY METHODS

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. Topographic maps and recent black and white aerial photographs were examined to determine vegetation cover patterns, terrain characteristics, access, boundaries, and reference points.

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Access was from the Kula Highway and then onto the main jeep road which runs the length of the property, following along the southern boundary near Waiohuli Gulch. From the main jeep road, a number of smaller side roads and bulldozer tracks can be accessed. A less well traveled jeep road on the northern portion of the property is found off of the dirt road which provides access to several privately-owned landlocked parcels.

A walk-through survey method was used. The less disturbed areas such as the larger gulches were more intensively surveyed as such areas are more likely to harbor native plant communities, and, perhaps, rare species. Notes were made on plant associations and distribution, substrate types, topography, exposure, grazing damage, drainage, etc. Plant identifications were made in the field; plants which could not be positively identified were collected for later determination in the harbarium, and for comparison with the most recent taxonomic literature.

The species recorded are indicative of the season ("rainy" vs. "dry") and the environmental conditions at the time of the survey. A survey taken at a different time of the year and under varying

environmental conditions would no doubt yield slight variations in the species list, especially of the weedy, annual plants.

## DESCRIPTION OF THE VEGETATION

An earlier archaeological survey (PHRI 1989) included a very short description of the vegetation observed on the project site, then identified as the Waiohuli parcel. Black wattle forests dominated the eastern half of the parcel, while lantana and prickly pear cactus were codominate on the lower western half. A recent botanical reconnaissance assessment (Char 1994) of the lands immediately north of the study site for a proposed waterline which will serve the residential lot also described similar vegetation types in more detail.

The black wattle forest occurs on the upper section of the project site from about the 2,350-foot elevation contour up to the highway. The forest is more or less confined to Kula cobbly loam, 12% to 20% slopes, identified as "KxaD" on the soil maps (Foote <u>et al.</u> 1972). These are well-drained, dark reddish-brown soils found on uplands and derived from ash over pahoehoe bedrock. The lantana-cactus scrub occurs on soils mapped as "KGKC", Kamaole very stony silt loam, 3% to 15% slopes; these are dark brown to dark reddish-brown soils derived from ash over fragmental 'a'a substratum, with 'a'a outcroppings sometimes common.

These two vegetation types along with the gulch vegetation are described in more detail below. A list of all the plant species inventoried on the project site during the field studies is presented at the end of the report.

#### Black Wattle Forest

Black wattle (<u>Acacia mearnsii</u>), a native of Australia, forms a somewhat dense forest cover on the cooler, wetter, upper sections of the property, from the highway at about 3,000 ft. elevation down to about the 2,350-foot contour. The forest occurs on deep, well-developed soils. In many places, the forest appears to have been bulldozed at one time, and large stands of black wattle trees have resprouted from root suckers. In these areas, the trees are about the same size and age; the trees are mostly 18 to 25 ft. tall with trunk diameters 3 to 6 inches. Scattered through this vegetation type are mounds or piles of boulders, rubble, and trunks of larger black wattle trees. Lantana shrubs (<u>Lantana</u> <u>camara</u>) are locally common on these bulldozed piles and also within the small, shallow gullies.

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Kikuyu grass (<u>Pennisetum clandestinum</u>), a native of Africa, forms somewhat low mats, about 6 inches tall, between the trees and in open areas. The cattle found throughout the property keep most of the grasses and other smaller species cropped low. Where the tree cover becomes denser, kikuyu grass may be replaced by two more shade-tolerant grass species; these are meadow ricegrass (<u>Ehrharta</u> <u>stipoides</u>) and a <u>Panicum</u> species. Other grasses found on this cooler upland section include a number of temperate species such as wild oat (<u>Avena fatua</u>), soft chess (<u>Bromus mollis</u>), ripgut grass (<u>Bromus rigidus</u>), and barley (<u>Hordeum leporinum</u>).

Seedlings of weedy, annual species and other grasses are common along the old bulldozer tracks which criss-cross the property and along the jeep roads. These include bristly foxtail grass (<u>Setaria</u> <u>verticillata</u>), peppergrass (<u>Lepidium virginicum</u>), keeled goosefoot (<u>Chenopodium carinatum</u>), Bermuda grass (<u>Cynodon dactylon</u>), hairy abutilon (<u>Abutilon grandifolium</u>), <u>Galinsoga parviflora</u>, owi (<u>Stachytarpheta dichotoma</u>), and bull thistle (<u>Cirsium vulgare</u>).

A few of the black wattle trees along the lower edges of the forest, where it interfaces the lantana-cactus scrub, have died back. The curled, brown leaves and seed pods still hang from the branches, suggesting, perhaps, that the trees died of drought stress.

#### Lantana-Cactus Scrub

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This vegetation type is found at about the 2,350-foot elevation and continues downslope to the project's boundary and beyond. Basically, it consists of dense patches of lantana, a thorny shrub 3 to 6 ft. tall, and clumps of prickly pear cactus or panini (<u>Opuntia ficus-indica</u>), 8 to 12 ft. tall. The lantanacactus cover is roughly 50 to 60%. A mixture of grasses and smaller, mostly weedy species fills in the matrix between the prickly scrub cover. Surveying can become difficult in the areas where the cactus plants are dense.

Two variants of the lantana-cactus scrub can be recognized in the field. The first variant is lantana-cactus scrub with scattered black wattle trees. This variant is found between the 2,350-foot elevation and the 2,000-foot elevation. Trees of black wattle are found as scattered stands among the lantana and cactus. The black wattle trees tend to occur in the shallow gullies and other low-lying areas where it may be somewhat moister. Pitted beardgrass (<u>Bothriochloa pertusa</u>), molasses grass (<u>Melinis minutiflora</u>), and Natal redtop (<u>Rhynchelytrum repens</u>) are the most abundant grasses. Kikuyu grass becomes uncommon, probably because of the drier conditions.

The black wattle trees thin out as one moves downslope and become uncommon at the 2,000-foot contour; rainfall below this elevation is about 15 inches per year. The second scrub variant, lantanacactus with kiawe (<u>Prosopis pallida</u>) trees is found from here on down. In places, the kiawe cover is 30 to 40%, but lantana and cactus are still abundant. The grass cover changes primarily to buffel grass (<u>Cenchrus ciliaris</u>) with smaller patches of pitted beardgrass. This lower section is drier and the vegetation more heavily grazed. Rocky outcroppings become common. The native wiliwili tree (<u>Erythrina sandwicensis</u>), with flower colors ranging from pale apple green to coral, is locally common in some areas along the lower boundary.

Smaller weedy herbaceous components commonly observed in the lantana-cactus scrub include hedge mustard (<u>Sisymbrium officinale</u>), peppergrass, hairy abutilon, cheeseweed (<u>Malva parviflora</u>) -which is more abundant during the wetter months, keeled goosefoot, and false mallow (<u>Malvastrum coromandelianum</u>).

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Among the smaller shrubs or subshrubs encountered are the native 'uhaloa (<u>Waltheria americana</u>) and 'ilima (<u>Sida fallax</u>). One 'ulei shrub (<u>Osteomeles anthyllidifolia</u>), about 7 ft. tall, is found at the interface between black wattle forest and lantanacactus scrub on a rocky outcropping. 'Ulei is an indigenous species belonging to the rose family. The hard wood was made into 'o'o or digging sticks, fish spears, and a musical instrument, the 'ukeke. The long slender flexible branches were bent into hoops for fish nets (Wagner et al. 1990).

#### Gulch Vegetation

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The project site includes a portion of the Waiohuli Gulch on its southern periphery. The gulch has been eroded down to bedrock in most places, and there are large boulder-strewn areas along the dry streambed. Also occasional are a few "dry fall" areas where the streambed plunges over a steep face or overhang.

This gulch and also some parts of the smaller unnamed gulch on

the northern portion of the property remain wetter during most of the year, and thus provide a moister habitat for plants. Gulch vegetation on the project site typically consists of dense clumps of Guinea grass (<u>Panicum maximum</u>), from 3 to 5 ft. tall, with scattered stands of Chinaberry trees (<u>Melia azedarach</u>). In places, lantana shrubs form dense, prickly patches. There are extensive groves of large wiliwili trees on the lower sections of Waiohuli Gulch.

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The steep gulch walls and "dry fall" sections of the streambed are damp and remain shaded during parts of the day. Thus, it is not uncommon to find small tussocks of mosses and light greencolored patches of <u>Dumotiera</u>, a thalloid liverwort, on the damp soil. Almost all the ferns found during the survey occur within the gulch areas. Other species observed only in these moister habitats include Mauritius hemp (<u>Furcraea foetida</u>), 'ape (<u>Alocasia</u> <u>macrorrhiza</u>), tarweed (<u>Cuphea cathagenensis</u>), four-o'clock (<u>Mirabilis jalapa</u>), 'ilihe'e (<u>Plumbago zeylanica</u>), and pamakani (<u>Ageratina riparia</u>).

Many of the plants found on the cooler upland portions of the property extend further downslope, following along the bottoms of the moist gulches. These include small patches of a very thorny blackberry species (<u>Rubus</u> sp.), honohono (<u>Commelina diffusa</u>), montbretia (<u>Crocosmia X crocosmiiflora</u>) -- an escaped ornamental member of the iris family, meadow ricegrass, jacaranda (<u>Jacaranda</u> mimosifolia), castor bean (Ricinus communis), etc.

## DISCUSSION AND RECOMMEDATIONS

The vegetation on the DHHL Kula Residential Lot, Unit 1, is dominated primarily by introduced or alien species. The property is presently used to graze cattle, so much of the vegetation has been browsed. There are also axis deer and feral pigs on the

property. In addition, parts of the site have been bulldozed in the past, probably to control black wattle, lantana, and prickly pear cactus, and to improve pasturage for the cattle. The upper three-quarters of the property where the proposed lots will be developed appear to be the most heavily disturbed.

Certain areas do support native species. These are the larger gulches which cross the property, especially Waiohuli Gulch, and the lower section of the property where there are stands of wiliwili trees. These areas were more intensively surveyed. Several rare native species are known to occur in the area around Pu'u o Kali, between 600 and 1,400 ft. elevation (Cuddihy and Stone 1990). .....

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Of a total of 112 plant species inventoried on the property, 95 (85%) are introduced or alien species, 2 (2%) are originally of Polynesian introduction, and 15 (13%) are native. Of the natives, 12 are indigenous, that is, they are native to the Hawaiian Islands and elsewhere, and 3 are endemic, that is, they are native only to the Hawaiian Islands. The endemic species are the kumu-niu fern (<u>Doryopteris decipiens</u>), wiliwili (<u>Erythrina</u> <u>sandwicensis</u>), and the native poppy or pua-kala (<u>Argemone glauca</u>).

None of the plants is a listed, proposed or candidate threatened and endangered species (U.S. Fish and Wildlife Service 1990, 1992, 1994). None of the plants is considered rare or vulnerable (Wagner <u>et al</u>. 1990). All of the plants can be found in similar environmental habitats throughout the Hawaiian Islands.

Given the findings above, the proposed development should not have a significant negative impact on the botanical resources. It is recommended, however, that areas disturbed by construction activities be revegetated as soon as possible to prevent soil

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loss and erosion gullying. Native species found on the site and nearby areas should be considered for landscaping. These species are adapted to the local conditions and would require less water. Some material recommended for landscaping include wiliwili, 'ulei, 'ilihe'e, and 'ilima. There are several interesting flower color forms of the wiliwili already on the project site.

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## PLANT SPECIES LIST -- DHHL Kula Residential Lot

A checklist of all those vascular plant species inventoried on the project site during the field studies is presented below. The species are arranged alphabetically by families within each of three groups: Ferns and Fern Allies, Monocots, and Dicots. The taxonomy of the Ferns and Fern Allies follow Lamoureux (1988), while the flowering plants, Monocots and Dicots, are in accordance with Wagner <u>et al</u>. (1990).

For each species, the following information is provided: 1. Scientific name with author citation.

- 2. Common English and/or Hawaiian name(s), when known.
- 3. Biogeographic status. The following symbols are used:
  - E = endemic = native only to the Hawaiian Islands.
  - I = indigenous = native to the Hawaiian Islands and also
     elsewhere throughout the Pacific.
  - P = Polynesian = plants originally of Polynesian introduction prior to Western contact (Cook's discovery of the islands in 1778); not native.

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- X = introduced or alien = all those plants brought to the islands by humans, intentionally or accidentally, after Western contact; not native.
- 4. Presence (+) or absence (-) of a particular species within each of three vegetation types recognized on the project site (see text for discussion):

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- bwf = Black Wattle Forest
- 1-c = Lantana-Cactus Scrub

g = Gulch Vegetation

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Scientific name	Comnon name	<u>Status</u>	Vegeta <u>bwf</u>	Vegetation type <u>bwf 1-c</u> g	type g
FERNS & FERN ALLIES					
ADIANTACEAE (Maidenhair Fern Family) Adiantum hispidulum Sw. Adiantum raddianum Presl	Australian maidenhair maidenhair fern	XX	11	1 1	+ +
BLECHNACEAE (Blechnum Family) Blechnum occidentale L.	blechnum	Х	ı	ı	+
HEMIONITIDACEAE (Gold Fern Family) Pityrogramma calomelanos (L.) Link	silver fern	X	ı	I	+
NEPHROLEPIDACEAE (Sword Fern Family) Nephrolepis multiflora (Roxb.) Jarrett ex Morton	hairy sword fern	X	I	t	+
L PSILOTACEAE (Whisk Fern Family) Psilotum nudum (L.) Beauv.	moa, pipi	I	1	I	+
SINOPTERIDACEAE (Cliffbrake Family) Doryopteris decipiens (Hook.) J. Sm.	kumu-niu, manawahua,	Ę	-		-
Pellaea ternifolia (Cav.) Link	ıwa ıwa kalamoho, lau-kahi	리머	<b>⊦</b> ı	1 1	⊦ +
THELYPTERIDACEAE (Woodfern Family) Christella parasitica (L.) Levl.	woodfern, oakfern	Х	ı	ı	+
FLOWERING PLANTS					
MONOCOTS					
AGAVACEAE (Sisal Family) Furcraea foetida (L.) Haw.	Mauritius hemp	X	I	I	+

Vegetation type

+ + + + +I. l + 1 1 1 + 1 L 1 ł + L + + + 60 + + + + <u>1-c</u> ++1 1 ł ÷ 1 L 1 + + ł 1+ 1 1 1 1 T 1 ł + + + + bwf + + + +++ + ++ + + + +1 Status ίI XXXXX xx × × xx \*\*\*\*\* × × × Ч bristly foxtail Indian dropseed, rattail Bermuda grass, manienie itchy crabgrass, kukaericegrass, mau'u laiki wiregrass, goosegrass barley, pale pitted beardgrass meadow ricegrass molasses grass Natal redtop kikuyu grass Guinea grass ripgut grass buffel grass McCoy grass Common name soft chess montbretia crabgrass wild oat grass pua'a honohono ape Setaria verticillata (L.) P. Beauv. Sporobolus indicus (L.) R. Br. IRIDACEAE (Iris Family) Crocosmia X crocosmiiflora (Lemaine ex E. Morr.) N.E. Brown Bothriochloa pertusa (L.) A. Camus COMMELINACEAE (Spiderwort Family) Commelina diffusa N.L. Burm. Alocasia macrorhizza (L.) Schott Paspalum scrobiculatum L. Pennisetum clandestinum Hochst. Cynodon dactylon (L.) Pers. Digitaria radicosa (Presl) Miq. Rhynchelytrum repens (Willd.) Melinis minutiflora P. Beauv. Ehrharta stipoides Labill. Eleusine indica (L.) Gaertn. CYPERACEAE (Sedge Family) Cyperus gracilis R. Br. Digitaria setigera Roth Hordeum leporinum Link POACEAE (Grass Family) Panicum maximum Jacq. (Aroid Family) Bromus rigidus Roth Cenchrus ciliaris L Bothriochloa sp. Bromus mollis L. Scientific name Avena fatua L. Panicum sp. ex Chiov. Hubb. ARACEAE

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<u>Scientific name</u>	Common name	Status	Vegeta <u>bwf</u>	Vegetation type <u>bwf 1-c g</u>	:ype <u>8</u>
DICOTS					
AMARANTHACEAE (Amaranthus Family) Amaranthus spinosus L.	spiny amaranth, pakai kuku	×	+	÷	ı
APIACEAE (Parsley Family) Anethum graveolens L.	di11	X	÷	I	ı
ASCLEPIADACEAE (Milkweed Family) Asclepias physocarpa (E. Mey.) Schlechter	balloon plant	Х	+	+	1
ASTERACEAE (Daisy Family) Ageratina riparia (Regel) R. King & H. Robinson Martemisia sp.	pamakani	××	1 -	ı	÷
Bidens cynapiifolia Kunth Bidens pilosa L.	West Indian beggar's tick Spanish needle, beggar's	<× :	- + ·	1 1	· +
Cirsium vulgare (Savi) Ten. Conyza bonariensis (L.) Cronq. Emilia fosbergii Nicolson Galinsoga parviflora Cav	сиск, кі, кі пепе bull thistle hairy horseweed, ilioha pualele	××××	+++	1111	+ + + + •
	שם	<××:	┝┿┿╵	<u>+</u> 1 1	+ 1 1 -
Truchea symputitutia (Mill) Ullis Sigesbeckia orientalis L. Sonchus oleraceus L. Tridax procumbens L. Zinnia peruviana (L.) L.	pucnea, sourbush small yellow crown-beard sow thistle, pua-lele coatbuttons wild zinnia	×××××	+ + + + 1		+ 1 + + +
BIGNONIACEAE (Bignonia Family) Jacaranda mimosifolia D. Don	jacaranda	Х	+	١	+

Scientific name	Conmon name	Status	Vegeta <u>bwf</u>	Vegetation type <u>bwf 1-c g</u>	g g
BRASSICACEAE (Mustard Family) Lepidium virginicum L. Sisymbrium officinale (L.) Scop.	peppergrass hedge mustard	××	+ +	+ +	+ 1
CACTACEAE (Cactus Family) Opuntia ficus-indica (L.) Mill.	prickly pear, paniní	X	+	+	+
CARYOPHYLLACEAE (Pink Family) Polycarpon tetraphyllum (L.) L. Silene gallica L.	allseed small-flowered catchfly	××	+ +	11	11
CHENOPODIACEAE (Goosefoot Family) Chenopodium carinatum R. Br.	keeled goosefoot	Х	+	+	ı
CONVOLVULACEAE (Morning-glory Family) Ipomoea alba L. Jpomoea indica (J. Burm.) Merr.	moonflower, koali pehu koali 'awa, koali 'awahia	Х	r +	ı +	+ +
CRASSULACEAE (Orpine Family) Kalanchoe pinnata (Lam.) Pers.	air plant	X	+	I	+
EUPHORBIACEAE (Spurge Family) Euphorbia heterophylla L. Ricinus communis L.	kaliko castor bean, koli	XX	ı +	11	+ +
FABACEAE (Pea Family) Acacia farnesiana (L.) Willd. Acacia mearnsii De Wild. Chamaecrista nictitans (L.) Moench Crotalaria pallida Aiton Desmodium sandwicense E. Mey. Erythrina sandwicensis Degener	klu black wattle partridge pea, lauki smooth rattlepod, pikakani Spanish clover, ka'imi wiliwili	XXXXX	ı + + I + I	++1:+	1+++1+
Glycine wightil (wight & Arnott) Verdc. Indigofera suffruticosa Mill.	glycine indigo, 'iniko	××	+ +	1 +	+ +

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			Vegetation		type
LILIC NAME	Common name	Status	<u>bwf</u>	<u>1-c</u>	60
Leucaena leucocephala (Lam.) de Wit Macroptilium lathyroides (L.) Urb. Medicago lupulina L. Medicago polymorpha L. Prosopis pallida (Humb. & Bonnl, ex	koa-haole wild bushbean, cowpea black medic bur clover	××××	· · + +	1 <del>1</del> 1 1	+ 1 1 1
	kiawe	Х	I	+	+
ld.) H. Irwin & Barneby		Х	+	1	+
LYTHRACEAE (Loosestrife Family) Cuphea carthagenensis (Jacq.) Macbr.	tarweed, Colombian cuphea	Х	ı	ı	+
MALVACEAE (Mallow Family) Abutilon grandifolium (Willd.) Sweet Malva parviflora L. Malvastrum coromandolion	hairy abutilon, mao cheese weed	XX	+ +	+ +	÷ 1
Garcke Sida fallax Walp. Sida rhombifolia L.	false mallow, hauuoi 'ilima Cuba jute	хтх	+++	++ 1	+ + I
MELLACEAE (Mahogany Family) Melia azedarach L.	Chinaberry, Pride of India, 'inia	х	ı	+	+
MENISPERMACEAE (Moonseed Family) Cocculus trilobus (Thunb.) DC.	huehue	I	+	I	· +
MYRTACEAE (Myrtle Family) Psidium guajava L.	guava, kuawa	Х	+	ı	· ı
NYCTAGINACEAE (Four-o'clock Family) Mirabilis jalapa L.	four-o'clock, naniahiahi	Х	ł	I	+
ONAGRACEAE (Evening Primrose Family) Oenothera stricta Ledeb. ex Link	evening primrose	X	+	I	· I

Vegetation type

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Scientific name	Common name	Status	bwf	<u>1-c</u>	60
OXALIDACEAE (Wood Sorrel Family) Oxalis corniculata L.	yellow wood sorrel, 'ihi	ŗ?	+	I	+
PAPAVERACEAE (Poppy Family) Argemone glauca (Nutt. ex Prain) Pope Bocconia frutescens L.	native poppy, pua-kala bocconia	ы×	+ I	+ 1	ı +
PASSIFLORACEAE (Passion Flower Family) Passiflora subpeltata Ort.	white passion flower	Х	+	÷	+
PHYTOLACCACEAE (Pokeweed Family) Phytolacca octandra L.	southern pokeberry	X	+	ı	t
PLANTAGINACEAE (Plantain Family) Plantago lanceolata L.	narrow-leaved plantain	x	+	+	ı
PLUMBAGINACEAE (Leadwort Family) Plumbago zeylanica L.	'ilihe'e, hilie'e	I	I	t	+
PORTULACACEAE (Purslane Family) Portulaca oleracea L. Portulaca pilosa L.	pigweed, common purslane	XX	ı +	+ י	+ י
PRIMULACEAE (Primrose Family) Anagallis arvensis L.	scarlet pimpernel	Х	+	ı	I
ROSACEAE (Rose Family) Eriobotrya japonica (Thunb.) Lindl. Osteomeles anthyllidifolia (Sm.) Lindl. Rubus sp.	loquat, biwa 'ulei, u'ulei	ХЦХ	· · +	1 <del>4</del> 1	+ + +
SAPINDACEAE (Soapberry Family) Dodonaea viscosa Jacq.	'a'ali'i	П	1	+	i

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Vegetation type <u>Status</u> <u>bwf</u> <u>1-c</u> <u>g</u>	popolo X X X 1? + + +	a, I? + +	+ + X	+ • • • + ++ X XX
<u>Common name</u>	apple of Sodom, popolo kikania tree tobacco poha popolo	'uhaloa, hi'aloa, kanakaloa	bur bush	lantana, lakana owi, oi weed verbena
<u>Scientific name</u>	SOLANACEAE (Tomato Family) Solanum linnaeanum Hepper & P. Jaeger Nicotiana glauca R.C. Graham Physalis peruviana L. Solanum americanum Mill.	STERCULIACEAE (Cacao Family) Waltheria indica L.	TILIACEAE (Linden Family) Triumfetta semitriloba Jacq.	<pre>VERBENACEAE (Verbena Family) Lantana camara L. Stachytarpheta dichotoma (Ruiz &amp;     Pav.) Vahl Verbena litoralis Kunth</pre>

# **Appendix B** Avifauna and Feral Mammals Survey

SURVEY OF THE AVIFAUNA AND FERAL MAMMALS AT DEPARTMENT OF HAWAIIAN HOMELANDS - KULA RESIDENTIAL LOTS, UNIT I, KULA, MAUI

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Prepared for Munekiyo and Arakawa, Inc. by

Phillip L. Bruner Assistant Professor of Biology Director, Museum of Natural History BYU-Hawaii Environmental Consultant Faunal (Bird & Mammal) Surveys

2 November 1994

# INTRODUCTION

The purpose of this report is to summarize the findings of a three day (29 August, 28, 29 October 1994) bird and mammal field survey of approximately 655 acres at Kula, Maui (Fig. 1). Also included are references to pertinent literature and unpublished reports.

The objectives of the field survey were to:

- 1- Document what bird and mammal species actually or potentially occur on the property.
- 2- Provide some baseline data on the relative abundance of each species.
- 3- Note the presence or likely occurrence of any native fauna particularly those that are listed as "Endangered" or "Threatened".
- 4- Determine if the property contains any special or unique resources that if lost or altered by development might result in a significant impact on the native fauna in this region of the island.

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# SITE DESCRIPTION

This long narrow property extends from 3,000 ft. elevation down to 1,800 ft. The 655 acres contain several habitat types. The higher sections are dominated by Black Wattle. The lower elevation contains Prickly Pear Cactus and Kiawe. Cleared areas along the existing ranch roads and fenceline are in pasture with Kikuyu grass. The topography of this property is steep. No wetland habitat was found on this site.

The weather during the survey was clear and cool. Winds were light. Visual and auditory observation conditions were excellent.

# STUDY METHODS

The property was surveyed on foot and by vehicle following existing roads and trails which traverse the property. Field observations were made with the aid of binoculars and by listening for vocalizations.

At scattered locations throughout the site, eight minute counts were made of all birds seen or heard. These data provide the basis for the relative abundance estimates given in Table One. Published reports of birds known from similar habitat on Maui were also consulted in order to acquire a better perspective of the

-2-

possible fauna that could occur in this region and their potential relative abundance (Pratt et al. 1987, Hawaii Audubon Society 1993). 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 of birds and mammals used in this report follow those given in Hawaii's Birds (Hawaii Audubon Society 1993); 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

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# Resident Endemic (Native) Birds:

The only endemic native landbird recorded on the survey was the Common Amakihi (<u>Hemignathus virens</u>). This species is not listed as endangered or threatened. They are the most abundant and widespread of the native landbirds. Common Amakihi will utilize habitat with second growth introduced plants as well as native forest. A total of ten Common Amakihi were tallied over the course of the field survey. The Short-eared Owl or Pueo (<u>Asio flammeus sandwichensis</u>) forage in agricultural fields and pastures as well as in forested upland habitats (Hawaii Audubon Society 1993). They are frequently seen in Kula and upcountry Maui. None were recorded on this survey, however, I have seen them in this region on past occasions. This species is listed by the State of Hawaii as endangered on the island of Oahu but not on Maui. No other native resident landbirds would be expected on this property.

# Migratory Indigenous (Native) Birds:

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Migratory shorebirds winter in Hawaii between the months of August through May. Some juveniles will stay over the summer months as well (Johnson et al. 1981, 1983, 1989). The most abundant shorebird species which winters in Hawaii is the Pacific Golden-Plover (<u>Pluvialis</u> <u>fulva</u>). Plover forage in open areas such as mud flats, lawns, pastures. plowed agricultural fields and roadsides. Plover are extremely site-faithful and most establish winter foraging territories which they defend vigorously. Such behavior makes it possible to accurately census the plover population in a particular area. These populations likewise remain relatively stable over many years (Johnson et al. 1989). A total 36 plover were recorded on the survey. These birds were seen along the ranch roads and in other open habitats on the site. The only other migrant which may occur in this area is the Ruddy Turnstone (Arenaria interpres). Neither the plover nor the turnstone are listed as endangered or threatened.

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# Resident Indigenous (Native) Seabirds:

No seabirds were recorded nor would any be expected at this location. Predators such as dogs, cats and the Small Indian Mongoose (<u>Herpestes auropunctatus</u>), along with human disturbance inhibit seabird nesting at all but a few isolated locations on the main Hawaiian Islands.

# Resident (Native) Waterbirds:

No wetland habitat was found on this property. No waterbirds would be expected at this site. The endangered Nene or Hawaiian Goose (<u>Neochen sandvicensis</u>) occurs at higher elevation in Haleakala National Park. It would be unusual to find them on this property. Nene have been introduced recently to Kauai were they utilize ranchlands and pastures. On Maui they are normally seen at higher elevation in more alpine and subalpine habitat.

# Exotic (Introduced) Birds:

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A total of 14 species of exotic birds were recorded during the field survey. Table One shows the relative abundance of each. In addition to these species other exotic birds which potentially could occur on the property include: Chukar (<u>Alectoris chukar</u>), Wild Turkey (<u>Meleagris gallopavo</u>), Cattle Egret (<u>Bubulcus ibis</u>), Barn Owl (<u>Tyto alba</u>), Red Avadavat (<u>Amandava amandava</u>) and Redcrested Cardinal (<u>Paroaria coronata</u>) (Pratt et al. 1987; Hawaii 6-4

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Audubon Society 1993).

# Feral Mammals:

Small Indian Mongoose were observed on the survey. Cat tracks were also seen. Axis Deer (Axis axis) were sighted throughout the property. Based on the number of sightings and the abundance of their tracks they must be fairly numerous in this region. Records of the endemic and endangered Hawaiian Hoary Bat (Lasiurus cinereus semotus) on Maui are limited (Tomich 1986; Kepler and Scott 1990). One bat was observed at 1800 hours on 28 October. The bat was foraging over the pasture near Highway 37 at the northeast edge of the property. This species is known to roost solitarily in trees and forages for flying insects using echolocation. They have been reported from a variety of habitats including native forest, alpine habitat, agricultural lands, second growth forest, ranchlands, ponds and bays as well as in urban areas. The life history of this species is not well known. Kepler and Scott (1990) suggest that bats occur on Maui only as a "migrant", probably from the Big Island". Others (Duvall and Duvall 1991), report evidence that would suggest there may be a resident breeding population of bats on Maui.

-6-

# CONCLUSION

A short field survey can only provide a limited view of the wildlife that may use the site. The number of species and their relative abundance may vary throughout the year due to resource (food, water) availability and reproductive success. Species which are migratory will only be an important part of the faunal picture 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 faunal community (Williams 1987; Moulton 1990). Thus only long term studies can provide a comprehensive view of the bird and mammal populations in a particular area. However, some general conclusions related to bird and mammal activity at this site can be made. Below is a summary of the findings of this survey.

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- 1- The site was surveyed by walking and driving the roads and trails which traverse the property. All habitat types found on the property were sampled. Census data on birds were obtained at random locations throughout the property and are reported in Table One.
  - 2- The migratory Pacific Golden-Plover was found on the open pasture lands and along roadsides. This is a typical wintering habitat for this species. Plover are not endangered or
  - threatened.

-7-

- 3- The only native resident bird found on the survey was the endemic Common Amakihi. This species is the most abundant and widespread of the native forest birds. They are not listed as endangered or threatened. The native owl (Pueo) occurs in this region but was not recorded on this survey. They are not endangered or threatened on Maui. The endangered Hawaiian Goose (Nene) occurs at higher elevation in Haleakala National Park. They would be unlikely to occur on this property.
- 4- The list of exotic birds recorded on the survey (Table 1) was typical for this region of Maui. No unexpected sightings were obtained. None of these species is listed as endangered or threatened.
- 5- Axis Deer, Small Indian Mongoose and cats were recorded at this site. The endangered Hawaiian Hoary Bat was seen foraging above the pasture lands at the NE edge of the property. The occurrence and abundance of this species on Maui has not been extensively studied.
- 6- This property has been significantly altered by introduced vegetation and ranching. Nevertheless, native birds and mammals were recorded. I did not find any unique or special resources on this site. Disturbed second growth forest/ranch land is common in this region of Maui.

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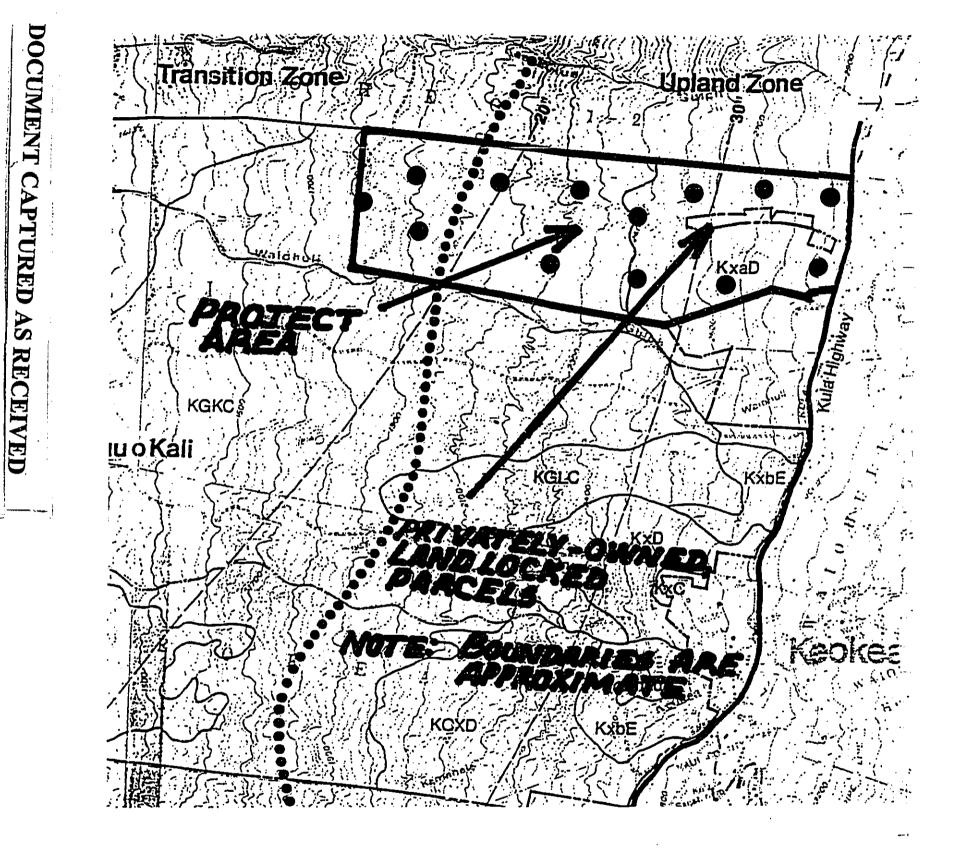


Fig. 1. Location of faunal (bird & mammal) survey with census stations marked as solid circles.

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TABLE 1

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Exotic species of birds recorded at the Department of Hawaiian Homelands, Kula Residential Lots, Units I, Kula, Maui.

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE*
Ring-necked Pheasant	<u>Phasianus colchicus</u>	R = 3
Black Francolin	Francolinus francolinus	R = 3
Gray Francolin	<u>Francolinus</u> pondicerianus	A =12
Spotted Dove	<u>Streptopelia chinensis</u>	C = 7
Zebra Dove	<u>Geopelia striata</u>	A =10
Eurasian Skylark	<u>Alauda</u> arvensis	A =13
Common Myna	<u>Acridotheres</u> tristis	6 = J
Leiothrix	Leiothrix lutea	C = 6
Northern Cardinal	<u>Cardinalis</u> cardinalis	C = 6
Northern Mockingbird	<u>Mimus polyglottus</u>	C = 7
Japanese White-eye	<u>Zosterops japonicus</u>	A =10
Nutmeg Mannikin	<u>Lonchura</u> punctulata	C = 6
Warbling Silverbill	<u>Lonchura</u> malabarica	U = 4
House Finch	<u>Carpodacus mexicanus</u>	A =11
*(see page 11 for key to symbols)	01s)	

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# KEY TO TABLE 1

Relative abundance =	Number of times observed during the frequency on eight minute counts in habitat.	e survey or n appropriate
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A = abundant (ave. 10+)

C = common (ave. 5-10)

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. . U = uncommon (less than 5)

R = recorded (seen or heard on one count only or at times other than on 8 min. counts. Number which follows is the total number of individuals seen or heard)

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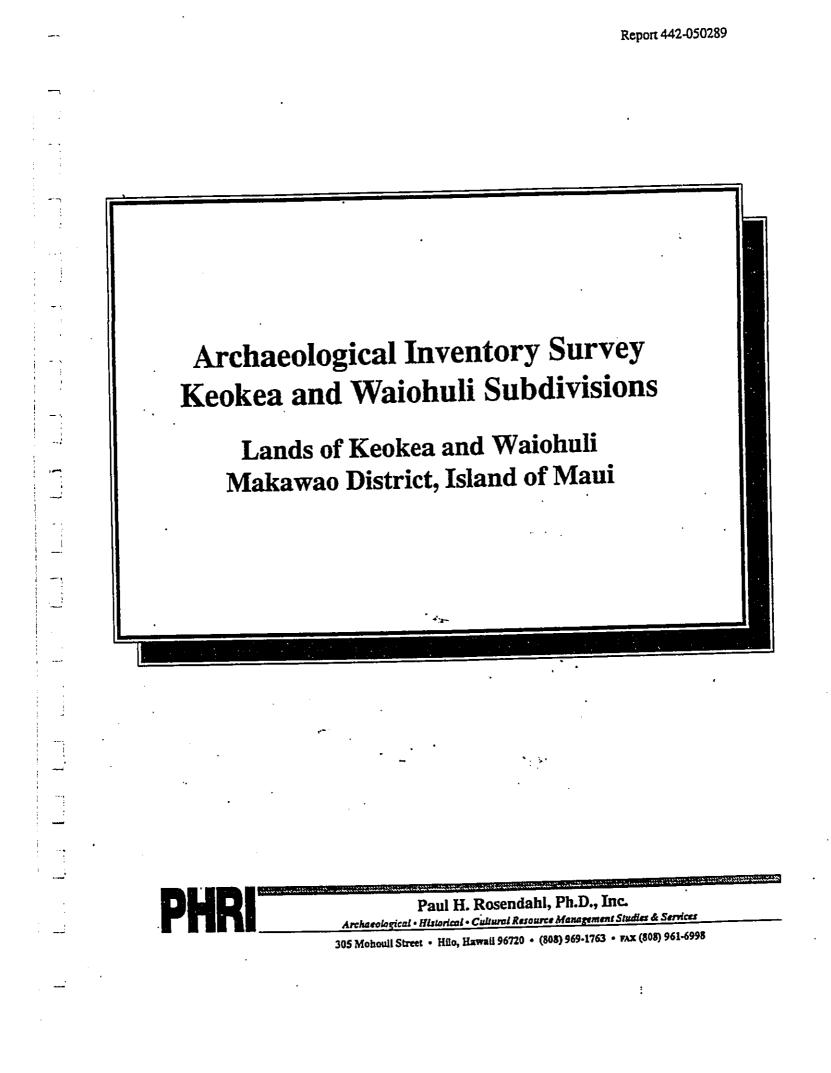
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# **Appendix C** Archaeological Inventory Survey



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# Archaeological Inventory Survey Keokea and Waiohuli Subdivisions

# Lands of Keokea and Waiohuli Makawao District, Island of Maui

(TMK:2-2-02:55,56)

by

Roderick S. Brown, M.A. Supervisory Archaeologist

### and

Alan E. Haun, Ph.D. Senior Archaeologist

with

Helen Wong Smith, B.A.

# Prepared for

Department of Hawaiian Home Lands P.O. Box 1879 Honolulu, Hawaii 96805

November 1989



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# SUMMARY

At the request of the Department of Hawaiian Home Lands (DHHL), Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted an archaeological inventory survey of Keokea and Waiohuli Subdivisions, situated in the Lands of Keokea and Waiohuli, Makawao (Kula) District, Island of Maui (TMK:2-2-02:55,56). The subdivisions are comprised of 1,025 acres (351 in Keokea and 674 in Waiohuli) and range in elevation from 1,800-3,000 feet AMSL (above mean sea level). The survey field work was conducted between January 17, 1989 and March 30, 1989. During the survey, 159 sites consisting of 274 features were formally designated. Sites consisted of both single and multiple features and included a wide range of formal and functional types. Minor agricultural features in the project areas—which number in the hundreds—were not designated nor documented in detail; they were, however, generally described, and their extents and spatial relationships were plotted.

Waiohuli Subdivision has undergone extensive bulldozing. As a result, sites in Waiohuli are in generally poorer condition than those in Keokea Subdivision. Sites in Keokea are, in most instances, intact, and the area contains excellent examples of extensive agricultural and habitation complexes. Significant resources present in the project areas include <u>heiau</u>, human burials, intact dryland agriculture field systems, and residential complexes. These resources could be adversely affected by the proposed development.

Of the total 159 sites identified during the present survey, 108 are in Keokea and 51 are in Waiohuli. Of the 108 Keokea sites, 94 are assessed as significant solely for information content. Eighty-nine of the 94 sites are recommended for further data collection, and five of the 94 sites are recommended for no further work. Four of the remaining 14 sites are assessed as significant for information content, as an excellent example of a site type, and for cultural value. Further data collection and preservation with interpretive development are recommended for these four sites. Three of the remaining 14 sites are assessed as significant for information content and as an excellent example of a site type. For these three sites, further data collection and preservation with interpretive development are recommended. Another three sites are assessed as significant for information content and for cultural value; these three sites are recommended for further data collection and preservation as is. Three other sites are assessed as significant for information content and are tentatively assessed as

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### SUMMARY

significant for cultural value. These three sites are recommended for further data collection and are provisionally recommended for preservation as is. The last site is assessed as significant for information content and as having cultural value. For this site, further data collection is recommended.

Of the 51 sites in Waiohuli Subdivision, 42 are assessed as significant solely for information content. Thirty-three of these 42 sites are recommended for further data collection, and nine of the 42 sites require no further work. Of the remaining nine sites, three are assessed as significant for information content, as excellent examples of a site type, and as culturally significant. Further data collection and preservation with interpretive development are recommended for these three sites. Two of the remaining six sites are assessed as significant for information content and are provisionally assessed as having cultural value. For these two sites, further data collection is recommended and preservation with interpretive development is provisionally recommended. The final four sites are assessed variously and require various recommended treatments (see Table 7 in Conclusions section for specific recommendations). ....

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# INTRODUCTION

### BACKGROUND

At the request of the Department of Hawaiian Home Lands (DHHL), Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted an archaeological inventory survey of Keokea and Waiohuli Subdivisions, situated in the Lands of Keokea and Waiohuli, Makawao (Kula) District, Island of Maui (TMK:2-2-02:55,56). The overall objective of the survey was to provide information appropriate to and sufficient for satisfying the requirements of Chapter 6E, Historic Preservation, Hawaii Revised Statutes, as amended. Field investigations were conducted between January 17, 1989 and March 30, 1989 under the supervision of PHRI Supervisory Archaeologist Roderick S. Brown, and under the overall direction of PHRI Senior Archaeologist Dr. Alan E. Haun.

### SCOPE OF WORK

The basic purpose of an inventory survey is to identify---to discover and locate on available maps-sites and features of potential archaeological significance present within a specified project area. Formerly called a reconnaissance survey and more recently referred to as an inventory survey, the survey comprises the initial level of archaeo- logical investigation. It is extensive rather than intensive in scope, and is conducted basically to determine the presence or absence of archaeological resources within a specified project area. It indicates both the general nature and variety of archaeological remains present, and the general distribution and density of such remains. Finally, it permits a general significance assessment of the archaeological resources, and facilitates formulation of realistic recommendations and estimates for such further work as might be necessary or appropriate. Such work could include intensive surveydata collection involving detailed recording of sites and features, and selected test excavations; and possibly subsequent mitigation-data recovery research excavations, construction monitoring, interpretive planning and development, and/or preservation of sites and features with significant scientific research, interpretive, and/or cultural values.

The significance of all archaeological remains identified within the project areas was to be assessed in terms of the National Register criteria contained in the Code of Federal Regulations (36 CFR Part 60.4). These criteria are used by Department of Land and Natural Resources - Historic Sites Section (DLNR-HSS) to evaluate eligibility for both the Hawaii State and National Register of Historic Places. The specific tasks for the current inventory survey were as follows:

- 1. Documentary Historical Research The specific purposes of this work were (a) to locate and summarize readily available relevant documentary resources (books, maps, journals, archival records, and other materials) relating to the <u>ahupuaa</u> and project areas; (b) to integrate and synthesize the findings of this research in order to define prehistoric, early historic, and later historic land use patterns; and (c) to assess the potential for any further research that might be appropriate in connection with subsequent mitigation work required for subdivision development.
- 2. Archaeological Background Research -The specific purposes of this work were: (a) to locate and review all prior archaeological research conducted within the project area <u>ahupuaa</u>; (b) to summarize the past research in terms of the extent and intensity of survey coverage and in terms of the age, function, and distribution of previously identified sites; and (c) to prepare a revised summary of past land use defined on the basis of historical documentary research.
- 3. Oral Historical Research The specific purposes of this work were: (a) to locate and interview knowledgeable local residents to determine their knowledge of past land use patterns and to elicit information concerning the age and function of specific sites; (b) to summarize and integrate the research findings with those from the historical documentary research and archaeological survey; and (c) to assess the potential for any further research that might be appropriate in connection with subsequent mitigation work required for subdivision development.
- 4. Inventory Survey Field Work Inventory survey field work was to consist of the following specific tasks: (a) conduct 100% coverage low-level (c. 30-50 ft altitude) aerial reconnaissance (helicopter) of the entire 1,000-acre project area, with special emphasis upon identifying all sites observed and plotting them on aerial photographs and/or maps, and identifying areas devoid of sites (e.g., mechanically altered lands); (b) conduct 100%

# INTRODUCTION

coverage, variable-intensity (30- to 90-ft intervals) ground reconnaissance of the entire project area, with relatively higher intensity coverage being given to undisturbed lands and relatively lower intensity coverage to mechanically altered lands; (c) record identified sites, including preparation of scaled sketch plan maps, completion of standardized PHRI site forms, and photographic recordation; and (d) conduct limited subsurface testing when necessary to accurately determine the extent (spatial and/or temporal) of site in order to assess its significance.

5. Data Analysis and Reports - Both Interim and Final reports were to be prepared. The Interim report was to summarize (a) the relevant project background, (b) field work completed and findings, (c) preliminary interpretation and evaluation of findings, (d) assessment of potential development impacts upon significant remains, and (e) specific recommendations for any further archaeological work that might be appropriate and/or required. The Final Report was to include (a) the full description of project findings, (b) interpretation and evaluation of these findings, and (c) specific recommendations and justifications for any subsequent mitigation work that might be necessary or appropriate.

# **PROJECT AREA DESCRIPTION**

Both proposed subdivisions are situated on the western slope of Mt. Haleakala, in Makawao (Kula) District, Island of Maui (Figure 1). The Keokea parcel consists of 351.41 acres (142.22 hectares), and the Waiohuli parcel consists of 673.99 acres (272.76 hectares). Combined, the two parcels total 1,025.40 acres (414.99 hectares). Each subdivision comprises the north-central portion of the <u>ahupuaa</u> which bears its name. The parcels are both bounded on the east by Highway 37. The northern and western boundaries of both parcels are fenced. Waiohuli Gulch more or less marks the southern boundary of the Waiohuli parcel. The southern boundary of the Keokea parcel is delineated by a high, stone cattle wall.

Both parcels are characterized by gentle to moderately steep west-facing dissected alluvial and volcanic slopes. Elevation in the Keokea parcel ranges from 2,225-2,850 ft AMSL, and in the Waiohuli parcel ranges from 1,800-3,000 ft AMSL. Drainages in the Keokea parcel are small and, for the most part, are poorly defined. Three large gulches extending east to west dissect the Waiohuli parcel; the gulches are fed by many smaller channels which drain the intervening slopes. Soils over all of the Keokea parcel and

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the eastern majority of the Waiohuli parcel are well-drained, with medium to moderately fine-textured subsoils of the Pu'u Pa-Kula Pane association. The eastern periphery of the Waiohuli parcel is overlaid with well-drained very stony soils and fine- to medium-textured subsoils of the Keawakapu-Makena association (Foote et al 1972). The soils in both parcels are derived from decomposed lava flows and ash of the Kula and Hana Volcanic Series which are, respectively, eight and four hundred thousand years old.

Both parcels are dominated by introduced vegetation including black wattle (Acacia decurrens Willd.), Christmasberry (Schinus terebinthifolius L.), lantana (Lantana camara L.), prickly pear or <u>panini</u> (Opuntia megacantha Salm-Dyck), <u>koa-haole</u> (Leucaena glauca L.), <u>kiawe</u> (Prosopis pallida L. Benth), grasses dominated by Kikuyu grass (Pennisetun clandestinum Hochst) and Chinaberry (Melia azedarach L.). Endemic vegetation includes abundant <u>ilima</u> (Sida spp.) and occasional <u>wiliwili</u> (Erythrina sandwicensis Degener).

Black wattle forests dominate the eastern halves of both parcels, probably as a result of the extensive and recurrent ground disturbance associated with recent habitation in higher elevations. Lantana is a dominant plant in the lower western portions of both parcels. Lantana is almost impenetrably dense in western Keokea where it is interspersed by occasional prickly pears. In western Waiohuli, lantana and prickly pear co-dominate and impair movement and visibility.

# PREVIOUS ARCHAEOLOGICAL WORK

The only early previous archaeological work conducted in the project area was by Thrum (1907) and Walker (1931). Thrum included Papakea, Kaumeheiwa, and Molohai <u>heiau</u> on a list of Maui <u>heiau</u> sites he compiled in the early decades of this century. Later, the three <u>heiau</u> were placed on the Hawaii Register of Historic Places. Walker listed and described 26 <u>heiau</u> in the Kula region.

In 1986, DHHL contracted B.P. Bishop Museum to monitor trailblazing for subdivision fences and to conduct an archaeological reconnaissance survey of both of the present proposed subdivisions (Riford 1987). This effort resulted in the discovery of 113 archaeological sites and "more than 252 archaeological features." During the study, the above-mentioned <u>heiau</u> and a diversity of prehistoric and historic agricultural, residential, and ceremonial sites were recorded. The survey focused on areas where residential lot awards are proposed. More than 410 acres of the total c. 1,025 acres comprising the project area were not examined during that survey. 4. 1

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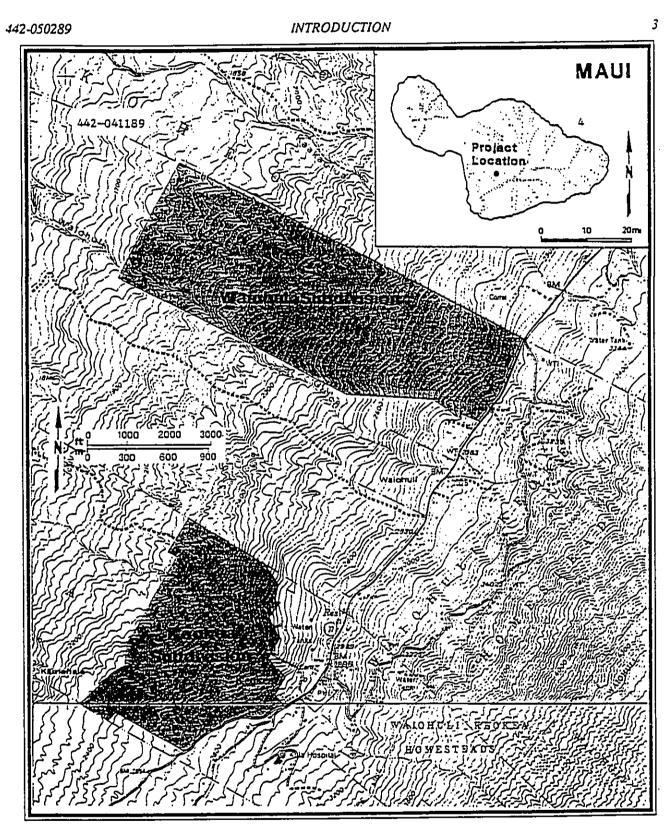


Figure 1. PROJECT AREA LOCATION MAP

Keokea and Waiohuli Subdivisions Lands of Keokea and Waiohuli, Makawao District, Island of Maui (TMK:2-2-02:55,56) PHRI Project No. 88-442 April 1989

# INTRODUCTION

442-050289

# SUMMARY OF LIMITED HISTORICAL DOCUMENTARY RESEARCH AND INFORMANT INTERVIEWS

The complete limited historical documentary research for the present project was conducted by PHRI Research Historian Helen Wong Smith, B.A.. Her report includes information obtained from the usual historical sources found in libraries, and information from other sources such as land and tax records, archaeological reports, maps, and various other manuscripts. The information in Wong's report is organized into five sections: Early Historical Accounts, Heiau in the Project Area, Land Commission Award (LCA) Information, Land Use and Tenure Information, and Informant Interviews.

Early accounts concerning the Makawao District generally either describe the area or relate early historical events. Ashdown (n.d.)' writes, "kula-o-ka-ma'o-ma'o or Land of Mirages, where lost souls wandered until they could find their way to rest. The rain of Makawao is described by Mrs. Miverva Kalama to Sterling (n.d.) in this way: "'ukiu rain = a soft drizzle (the ua Kama'aina of Makawao) when the kiu rain cloud from Makawao meets the Naulu rain cloud from Kula then the rain comes, the typical Makawao rain. Other early accounts, by Fornander and Kamakau, mention Makawao in relation to early historical events.

Three <u>heiau</u> are present in Keokea project area— Molohai, Papakea, and Kaumiumimua <u>heiau</u>. Ashdown (1971:46) mentions other <u>heiau</u> in Keokea and Waiohuli— Ho'ola and Ho'oula Ua <u>heiau</u> in Keokea and Kaimupeelua <u>heiau</u> in Waiohuli. Other <u>heiau</u> mentioned by historic writers in the Makawao district include Kailua <u>heiau</u> (Thrum 1909:44), and Pa'uhu, Mahea, Kaumuopahu (or Kaunuopahu), Po'onahoehoe and Mana <u>heiau</u>. The latter <u>heiau</u> is now part of a modern cemetery (Ashdown 1971:57).

Although there were many small parcels granted in Keokea and Waiohuli, the Indices states that Keokea was Crown Land from the beginning and that Waiohuli was approved as such in 1890 by Kalakaua. The numerous parcels may be a result of an experiment conducted by the Kamehameha III's administration prior the Great Mahele concerning trial fee ownership runs. In a report by Riford (1987), 11 Land Commission Awards (LCA) either within or bordering the Keokea parcel and eight LCAs within the Waiohuli parcel are listed. The bulk of the parcels are designated as <u>kula</u> land and houselots (1987).

Concerning land use and tenure, Kula has been used primarily for agriculture throughout history. C. Speakman, in his book entitled <u>MOWEE</u> mentions the fervor of cashcropping in Kula:

During the gold [potatoes] rush, hundreds of Hawaiians were going into business for themselves on Maui-growing potatoes and hauling them to the port where they were snapped up and shipped to San Francisco. The Maui fields were called Nu Caliponi, or New California; potatoes were gold, and a fortune could be dug out of the ground by one man (1978:116).

In addition to Irish potatoes, the Kula farmers planted corn, beans, onions, Chinese cabbage, round cabbage, sweet potatoes, wheat and other grains, and even cotton. In the early 1970s, 35% of Hawaii's vegetables were grown in Kula, including a large percentage of the state's head lettuce, dry onions, and tomatoes. Much of the remaining land was devoted to livestock breeding by about 20 full and part-time ranchers. Today the cash crops in Kula are vegetables other than corn and potatoes, and flowers.

Wong's report includes information on Kula Sanatorium, and also includes informant interviews. Kula Sanitorium was founded for the care of tuberculosis sufferers. Initially the sanitorium consisted of two tent-houses which accomodated 12 patients. The tent-houses, which included kitchen and dining facilities, was financed by the County and Territory and cost \$500.00. The first permanent ward was built by W.E. Foster, former patient and superintendent. Wong's informant interviews provide information primarily on Kaonoulu Ranch, for which the interviewees once worked.

According to Wong, during this century, the project area has been used primarily for cattle grazing, hence the many archaeological sites obscured by grasses and lantana. If further historical documentary research is conducted for the project area, Wong suggests that a check be made for awards given out during the Kingdom of Hawaii and that the following topics be addressed: prehistoric environment and occupation in the area, as evidenced by historical documents; and local and regional cultural and residential sequences.

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<sup>\*</sup> References in summary are listed in Appendix C.

# INTRODUCTION

# METHODS AND PROCEDURES

### **Field Work**

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The current field work was accomplished in five phases: preliminary field inspection, aerial (helicopter) survey, variable-intensity pedestrian survey, site recording, and limited surface collections and excavations.

**Preliminary Field Inspection** - PHRI Senior Archaeologist Dr. Alan E. Haun conducted a preliminary field inspection of portions of both Waiohuli and Keokea subdivisions in order to assess the project area terrain and vegetation with regard to logistical problems which might be faced by survey crews. In addition, Dr. Haun visited several previously recorded archaeological sites in each subdivision to evaluate the adequacy of existing archaeological records.

Helicopter Survey - On January 11, 1989, a lowlevel (30-50 ft. altitude) aerial reconnaissance survey was made of approximately 60% of both subdivisions. The areas surveyed included all portions of the project areas not obscured by black wattle forests (thus, eastern upslope portions were not examined aerially). Thirty-eight archaeological sites and/or features were identified from the air-34 in the Keokea parcel and four in the Waiohuli parcel. Each site/feature was flagged with weighted pink surveyor's tape, was labeled with a temporary aerial survey (AS) number, and was plotted on 1"=200' aerial photographs. A brief and very preliminary description of each site was recorded during the flight; these descriptions were upgraded during the subsequent variable-intensity 100% survey and recording phases of the field work.

Variable - Intensity 100% Coverage Ground Survey - The variable intensity ground survey began on January 17, 1989 and was completed on February 22, 1989. A crew of five archaeologists supervised by PHRI Supervisory Archaeologist Roderick S. Brown swept the entirety of both proposed subdivisions. Transects were spaced at 15-40 meter intervals. Transect spacing was determined exclusively by the surface integrity of the area being transected. In areas where no mechanical or erosional disturbance was evident, the survey interval was maintained at 15 meters. In disturbed areas the interval was increased to as wide as 40 meters. Surveyors were instructed to walk zigzag courses to search first for "islands" of undisturbed ground, and then to search within these "islands" for archaeological sites. The zigzagging resulted in an estimated maximum effective survey interval of 30 meters.

Locational control was maintained by plotting the course of each sweep on aerial photographs and/or 1"=200'scale topographic maps, and by marking each archaeologist's start and end points on each sweep with labeled surveyor's tape. As sites and features were encountered, each was marked with pink-and-blue surveyor's tape on which was labeled the project number (88-442), a temporary site number, and the date and name of the surveyor on whose transect the site was discovered. Each site was described in a field notebook at the time of discovery and was plotted on 1"=200 aerial photographs. Notation was made as to whether the site bore the (sometimes labeled) orange flagging with which some sites were marked by the Bishop Museum survey crew. Also noted were the direction and distance to nearby DHHL lot corner markers (where they existed) and the presence of aerial survey site markers.

Site Recording - Site recording began on February 22, 1989, immediately after the variable-intensity ground survey was completed. To facilitate the recording, two archaeologists were added to the field crew. The crew was divided into two teams of three persons each—one recorder, one mapper, and a rover, who measured, photographed, and described features and marked each site with an aluminum tag and flagging. Sites were recorded on standard PHRI site and feature forms. Scaled sketch maps were prepared of representative features and/or of the overall site configuration. Vegetation hampered visibility of, and even access to, some features, but the majority of features were adequately recorded.

During the pedestrian survey, sites and features were numbered as they were encountered. The numbering systems in each subdivision are independent. Temporary site numbers are prefixed by either "W-" (for Waiohuli) or "K-" (for Keokea). Site features were assigned letter designations (A,B,C,etc.).

During the pedestrian survey some sites of questionable nature were numbered. In some instances, subsequent examination of the questionable sites indicated they were natural or the result of recent ground disturbance; hence, the site was eliminated from site lists. Other sites were preliminarily recorded as separate entities and later were combined with other nearby sites and subsumed under a single site number. When sites were combined, the lowest site number was retained and other numbers were deleted; hence, the gaps in the numbering sequence. During the recording phase, many previously undiscovered sites were identified and were assigned numbers.

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# Data Management

Data management, cartography, and report production were computenzed. Preliminary site and feature data gathered during the ground survey were entered from the field notebooks into formatted dBASE IV files. Output from these preliminary files included formatted listings of site and feature information and direct electronic input of site location coordinates [easting (X), northing (Y) and elevation (Z)] to the computer-aided drafting program. Output of these data allowed recording crews to return to sites with printouts containing preliminary site descriptions and with contour maps illustrating the locations of the sites to be recorded.

Soon after the recording of each site and feature, the data were entered into dBASE IV files. These data files were formatted to allow direct output of revised site and feature location maps and the extraction of selected data in tabular format for inclusion in the Interim and Final reports. In addition, report-ready site survey records and site/feature descriptions were generated from the data files.

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# ARCHAEOLOGICAL SITES

During previous archaeological surveys of Waiohuli and Keokea subdivisions (Riford 1987), 113 sites consisting of 252 component features were identified. Three of the 113 sites, all <u>heiau</u>, were assigned SIHP<sup>\*</sup> site numbers—Papakea Heiau (50-50-10-1036), <u>Molohai Heiau</u> (50-50-10-1037) and <u>Kaumeheiwa Heiau</u> (50-50-10-1039). The remaining 110 sites were assigned temporary numbers. As part of the present work, the work on the earlier survey was consulted. It was found that records for 77 of the previously identified sites were incomplete. In addition, when an attempt was made to relocate the earlier sites in the field, definite field identifications were often impaired by unclear locational information in the report and by the lack of site markers in the field.

The present survey resulted in the formal identification of 159 sites consisting of 274 features. During the present survey, 53 previously identified sites were relocated. These sites were reassigned PHRI temporary numbers. Table 1 correlates previously identified sites with PHRI temporary site numbers. Figures 2 and 3 depict the locations of all identified sites. Appendices A and B summarize the sites and their component features. Appendices D and E provide detailed descriptions for each site and feature.

Appendices D and E include for each site:

- Site numbers either State Inventory of Historic Places (SIHP) numbers, Bishop Museum temporary numbers, if previously assigned, or PHRI temporary site numbers. PHRI temporary numbers are one, two, and three-digit numbers prefixed by "K-" or "W-";
- A site type designation provides formal feature type for sites consisting of a single feature, or designates the site as a complex if site includes more than one feature. Also lists total number of features present;

- A description of site topography a brief description of the terrain in the area of the site;
- A listing of site vegetation lists principal components of the vegetation within and in the vicinity of the site;
- 5. A statement of site condition overall state of preservation of the site (poor, fair, good, or excellent);
- An assessment of site integrity degree of historic modification by human agencies (unaltered, partially altered, and completely altered) and nature of modifications, if any;
- A probable age indicates probable/possible age of the site (i.e., historic or prehistoric);
- A functional interpretation probable or possible (\*) functions for each site; or, if function cannot be determined, assigns indeterminate function. For sites with multiple functions, functions separated by "/";
- Feature dimensions maximum length, width, and maximum area. Dimensions immediately followed by a description of feature construction, associated portable remains, and other descriptive information; and
- 10. A site description a brief overall description of the site listing types of constituent features, portable remains present, if any, and other site data.

Appendix F provides UTM coordinates, elevations, and proximity to water for all sites.

\* State Inventory of Historic Places (SIHP) site designation system: all four-digit site numbers prefixed by 50-50-10 or 50-50-14 (50=State of Hawaii, 50=Island of Maui, 10 or 14=USGS 7.5' series quad map ["Puu o Kali" or "Makena," respectively]).

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# FINDINGS

# Table 1.

# CORRELATION OF SITE NUMBERS

PHRI Temporary Number	BPBM Site Number (T-)	SIHP Site Number
W- 1		2344
W- 2	6	2345
* w-3	7	2039
W- 4	8	2346
W- 5	-	2347
W- 6	_	2348
W- 8	<del></del>	2349
W- 10		2350
W- 10 W- 11	5	2040
W- 12	_	2351
W- 12 W- 13	_	2352
W- 15 W- 14	_	2353
W- 15	_	2354
W- 15 W- 17	_	2355
W- 17 W- 18		2356
W- 20	_	2357
W-20 W-21		2358
	36	<b>T039</b> - 2
W-27	20	2042
W-28	110	2359
W- 30	110	2360
W-31	—	
W- 32		2361
W- 35	105	2362
W- 36		2043
W- 37	104	2363
W-42	75	2364
W-45	72	2044
<b>W-46</b>	71	2365
<b>W-47</b>	107	2366
W-48	108	2367
W-49		2368
W- 55		2369
W- 57	—	2370
W- 58	_	2371
W- 59	81	2372
<b>W-</b> 60	—	2373
<b>W-</b> 65	—	2374
W- 67		2375
<b>W-</b> 71	101	2376
<b>W-</b> 73	—	2377
<b>W-</b> 75	86-87	2378
<b>W-</b> 77		2379
W- 80	—	2380
W- 82	_	2381

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Table 1. (cont.)		
PHRI Temporary Number	BPBM Site Number (T-)	SIHP Site Number
W- 83		2382
W- 88		2383
W- 90		2384 ·
W- 96		2385
W- 97	_	2386
W- 98	69-70*	2387
W-101		2388
<b>K-</b> 1	15	2046
K- 2	16	2047
K- 3	14	2028
K- 4	19	2048
K- 5		2049
K- 6	_	2029
K- 7	22	2030
K- 8	_	2050
K- 9	38	2051
K- 10		2052
K- 11	39	2053
K- 12	_	2054
K- 13		2055
K- 14	<u> </u>	2056
K- 16		2057
K- 19		2058
K- 20		2059
K- 21	_	2060
K- 25	_	2061
K- 26	64	2062
K- 27	62	2063
K- 29	63	2064
K- 30	_	1037
K- 31	13	2065
K- 32		2066
К- 35		2067
K- 36	_	2032
K- 39		2068
K- 40		2069
K-41	—	2070
K- 42	—	2071
K- 44		2072
K- 45	60	2073
K- 46	60	2074
<b>K-48</b>	61-17-58	2033
K- 50		. 2075
K- 51	—	2076
K- 52	31	2077

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	Cable 1. (cont.)	· · · · · · · · · · · · · · · · · · ·
PHRI Temporary Number	BPBM Site Number (T-)	SIHP Site Number
K- 53		2078
K- 55 K- 54	30	2079
K- 55		2080
K- 57		2081
K- 59	_	2082
K- 60		2083
K- 62		2084
K- 63	_	2085
K- 64		2034
K- 65		2086
K- 69	37	2087
K- 70	27	2088
K- 71		2089
K- 76		2090
K- 78	_	2091
K- 79		2092
K- 80	46	2093
K- 81		1036
K- 84	55	2095
K- 85		2096
K- 87	25	2097
K- 89		2098
K- 90		2099
K- 95		2300
K- 96		2301
K- 90 K- 97		2302
K- 98		2303
K- 99	3	2304
K-100	_	2305
K-101	24	2306
K-102		2307
K-103	56	2308
K-105		2035
K-106		2310
K-107		2311
K-108		2312
K-109	49	2313
K-110	48	2314
K-111	—	2036
K-112	43	2315
K-115	42	2316
K-116	41	2317
K-118		2318
K-120	40	2319
K-124	<del></del>	2037
K-127	_	2320

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Table 1. (cont.)

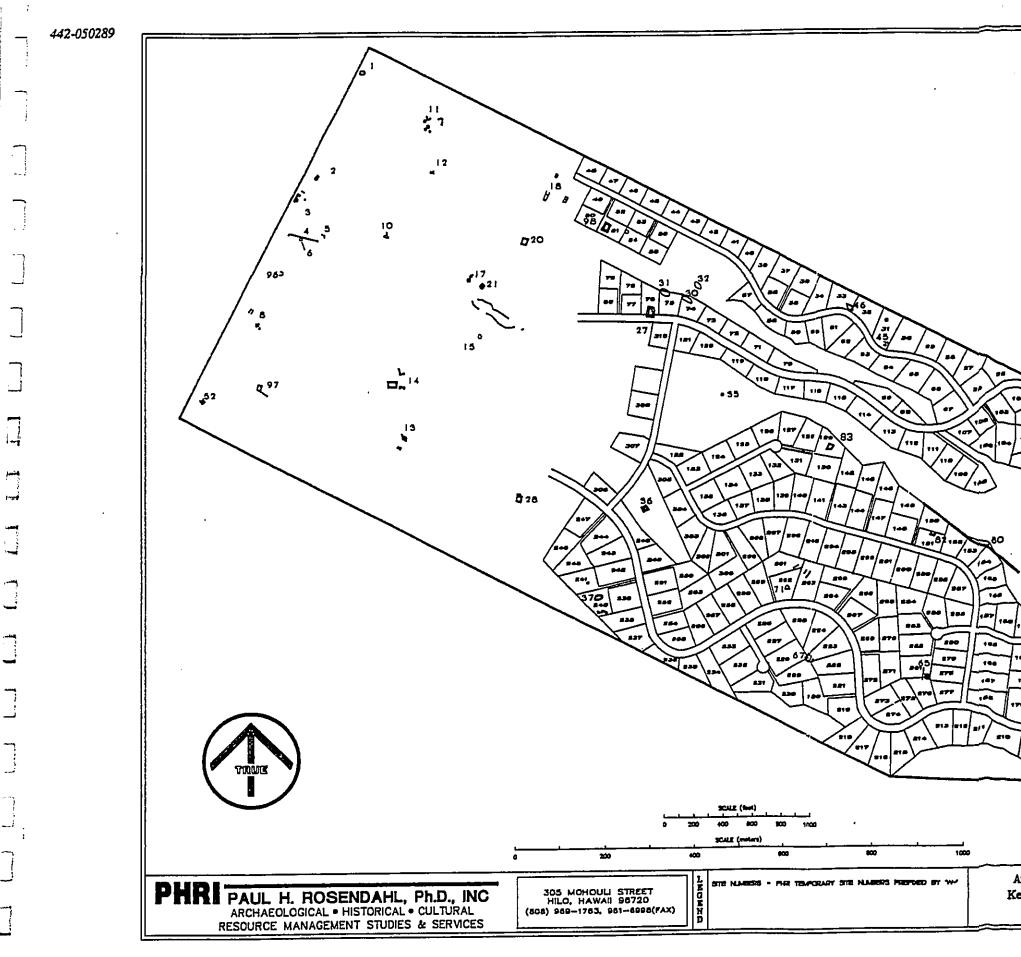
PHRI	<b>BPBM</b> Site	SIHP
Temporary Number	Number (T-)	Site Number
K-130		2038
K-131	_	2321
K-134	_	2322
K-135		2323
K-137	—	2324
K-140		2325
K-142	_	2326
K-143		2327
K-146	<del></del>	2328
K-148		2329
K-149	_	2330
K-152	<b></b>	2331
K-200		2332
K-201	_	2333
K-202	<del></del>	2334
K-203		2335
K-204	—	2336
K-205	_	2337
K-206	1	2338
K-207	45	2339
K-208		2340
K-209	_	2341
K-210		2342
K-211	—	2343

Of the 159 sites identified, 61 were complexes (sites consisting of more than one feature). In Waiohuli, nine complexes comprised of 21 features were identified, and in Keokea 52 complexes comprised of 156 features were identified. Ninety-eight of the identified sites consisted of single features (42 in Waiohuli and 56 in Keokea). Feature types present at sites include: wall, enclosure, terrace, mound, overhang, upright, wall, lithic scatter, alignment, cave, platform, bridge, and burial. Table 2 lists the frequencies of formal feature types recorded.

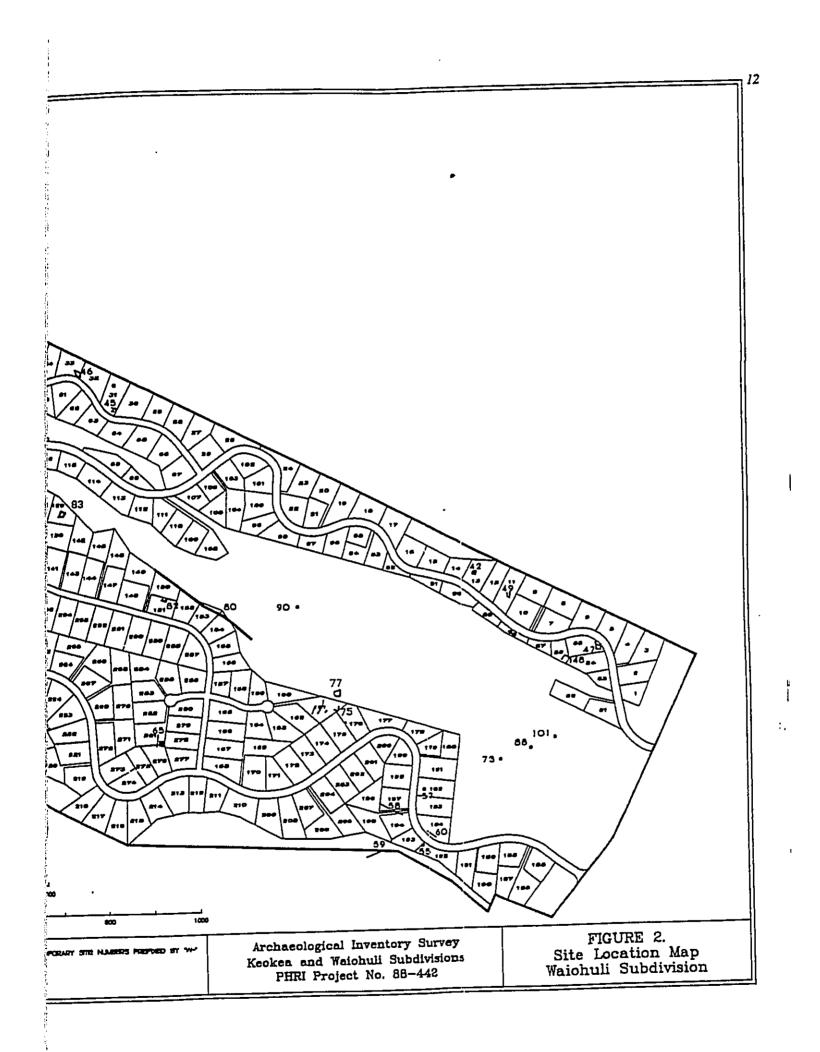
Probable functional interpretations were made for most sites. Site functions included: agricultural, habitation, religious, animal (cattle) control, burial, transportation, storage, roadway, lithic reduction, and indeterminate. The frequencies of functional site types are listed in Table 3.

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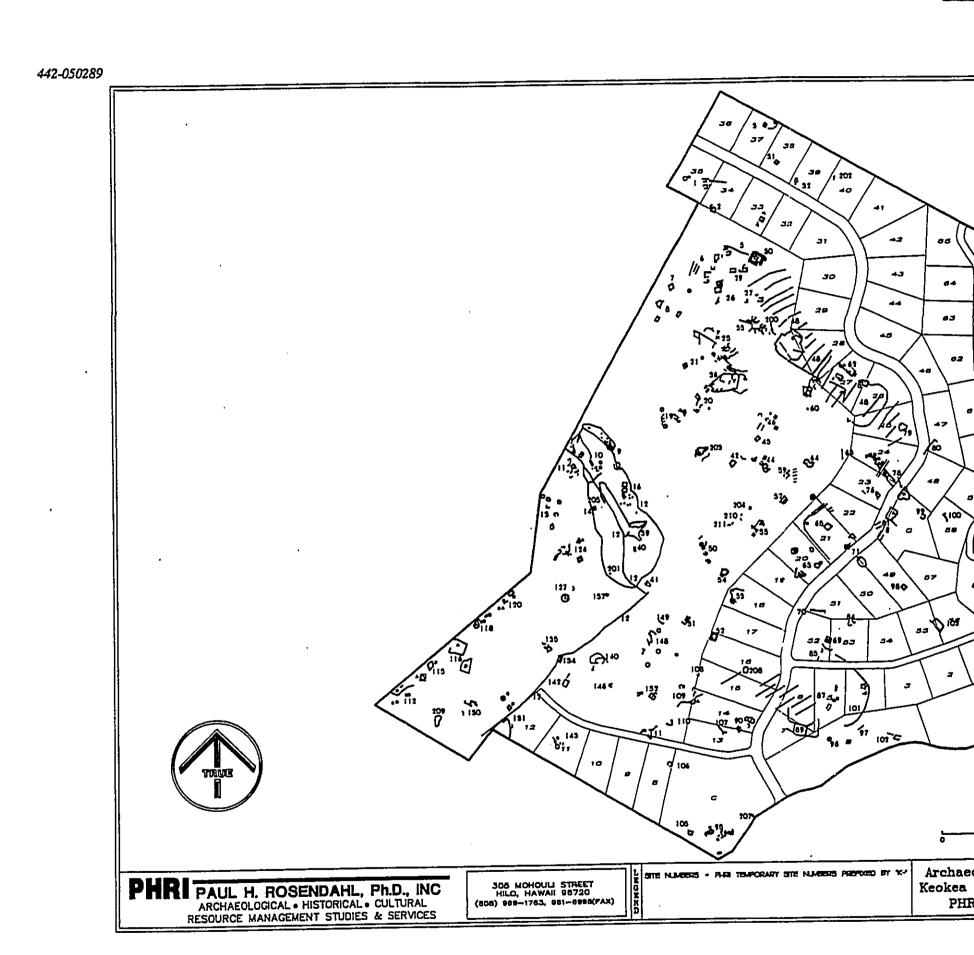
Sites were interpreted as habitation sites if they appeared to have been permanent or semi-permanent residences. Habitation sites are those which include archaeological features traditionally associated with dwellings. In the project area, habitation features include enclosures, platforms, terraces, and C-, L-, and U-shaped walls. No sites in the project area were interpreted as temporary habitation sites; however, several sites did include features traditionally associated with temporary habitation-such as C-, L-, and U-shaped walls and overhang shelters. Also, no habitation sites in the project area were "open" sites-habitation sites not associated with stone architecture. This was because such open sites, if they existed, would have been manifested by surface exposures of midden, artifact scatters, and soil discolorations-none of which were likely to have been seen through the dense vegetative cover which characterizes most of both subdivisions.



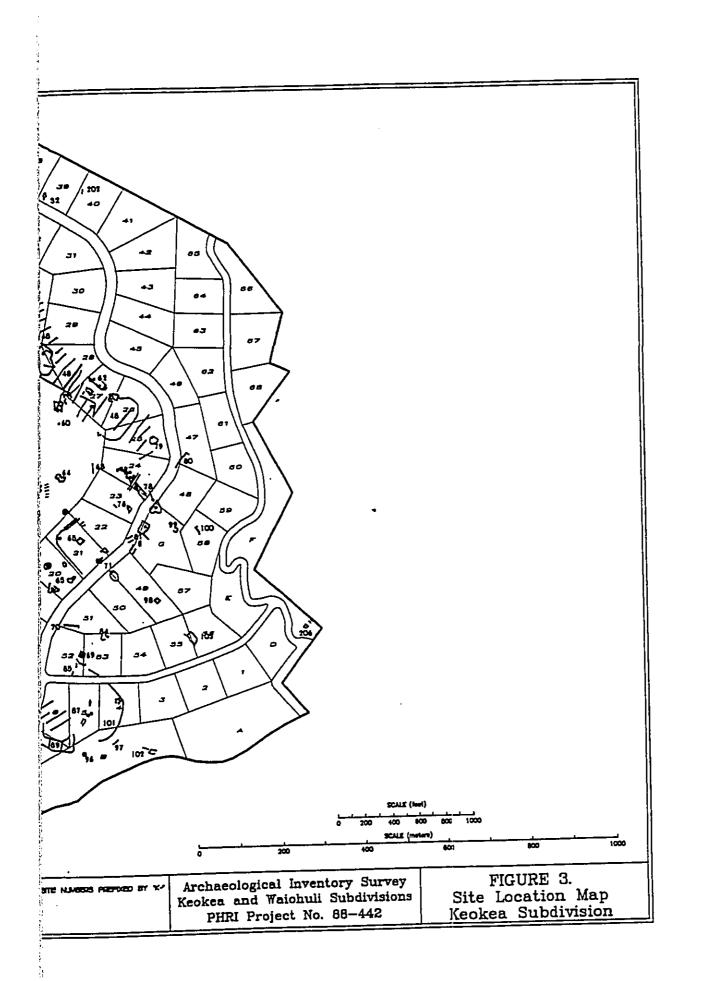
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### Table 2.

# FREQUENCIES OF FORMAL FEATURE TYPES

Formal Type	Number	Percent
	WAIOHULI	
Aliananant	1	1.59
Alignment	1	1.59
Bridge	1	1.59
Human Bone	1	1.59
Cave	30	47.62
Enclosure	1	1.59
Lithic Scatter	4	6.35
Mound	3	4.76
Overhang	1	1.59
Platform		7.94
Terrace	5 2	3.17
Upright	13	20.63
Wall		
WAIOHULI TOTAL:	63	100.00%
	KEOKEA	
Caim	1	0.47
Enclosure	139	65.88
Heiau	1	0.47
Lava Tube	2	0.95
Lava Tube Enclosure	1	0.47
Mound	3	1.42
Overhang	21	9.95
Paved Area	1	0.47
Platform	6	2.84
Sink	1	0.47
—	1	0.47
Stone	1	0.47
Structure	17	8.05
Terrace Wall	16	7.58
KEOKEA TOTAL:	211	100.00%

Nine sites were interpreted as religious or possibly religious, and 10 were interpreted as burials or potential burials. These include the previously recorded <u>heiau</u>, notchedrectangular enclosures, features with free-standing uprights and/or coral, large stepped and paved terraces, and features known or suspected to contain human remains. Several sites in the vicinity of Molohai Heiau in Keokea (a likely candidate for interpretation as an <u>ahupuaa</u>-level <u>heiau</u>) include a relatively high density of features tentatively assigned a religious function. Among these are Sites K-2, -3, -6, -29, and -48. In addition, many large and probably high-status residential features, densely clustered agricultural features, and other features were found proximate to the <u>heiau</u>. For example, nearby Site K-78 consists of a series of stepped, paved terraces extending for more than 120 meters; the site may be a <u>heiau</u> (ili level?). In addition, the land between K-78 and Molohai Heiau—very much like what persists throughout the Keokea subdivision and nearby surrounding lands—is regularly terraced and includes at least six large features.

### FINDINGS

# Table 3.

# FREQUENCIES OF FUNCTIONAL SITE TYPES

Formal Type	Number	Percent
	WAIOHULI	
Agriculture	8	1 <b>5.69</b>
Animal Control	5	9.80
Burial*/Ag.	1	1.96
Habitation/Ag.	23	45.10
Burial		3.92
Indeterminate	2 2	3.92
Lithic Reduction	1	1.96
Religious	1	1.96
Religious*	1	1.96
Religious*/Hab.	1 3 3 1	5.88
Transportation	3	5.88
Habitation	1	1.96
WAIHOULI TOTAL:	51	100.00%
	KEOKEA	
Agricultural	5	4.63
Animal Control		5.55
Animal Control/Ag.	6 3 3 1	2.78
Burial*/Hab./Ag.	3	2.78
Burial	1	0.93
Burial/Habitation	2	1.85
Burial/Ag.	1	0.93
Tool Manufacturing	1	0.93
Habitation	22	20.37
Habitation*/Ag.	1	0.93
Habitation/Ag.	48	44.44
Habitation*/An. Cont.	1	0.93
Habitation/Indeterminate		0.93
Habitation/Ag./An. Cont.		3.84
Indeterminate	2	1.85
Religious*/Ag.	ĩ	0.93
Religious/Hab./Ag.	î	0.93
Religious*/Hab./Ag.	1	0.93
Religious	1	0.93
Temp. Habitation	î	0.93
Temp. Hab./Ag.	1	0.93
Water Tank	î	0.93
KEOKEA TOTAL:	108	100.00%

\* Tentative Function

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#### FINDINGS

One hundred thirty-nine enclosures were identified in Keokea Subdivision of which 127 were tentatively assigned a habitation function. This is a density of one major habitation feature for every 2.76 acres. Walls were found throughout both subdivisions. These varied in thickness, height, and construction. The historical documentary research for the present project suggests that most walls were built within the last century. Indeed, the majority of the walls appear to have been constructed in historic times to control ranging cattle.

During the present project, two extensive wall complexes of probable historic origin were recorded (W-4 and K-12). Site W-4 consists of a series of walls and wall segments bordering both sides of the northernmost large gulch in Waiohuli; these walls and segments apparently served to keep cattle out of portions of the gulch. Site K-12 consists of a meandering series of long and substantial walls situated in the southwest portion of Keokea subdivision. K-12 includes the long straight wall which marks the southern boundary of the Keokea project area. Aside from barbed wire and occasional posts in and associated with Site W-4, no historic artifacts were found in association with the walls.

Extensively scattered throughout both subdivisions were hundreds of minor agricultural features (mounds and terraces) which were found associated with most of the recorded sites. Most of these features were not formally recorded; instead, their distributions were plotted (Figure 4) and they were referred to in the records of formally recorded sites as being present in the site area. Recorded sites not associated with minor agricultural features were exclusively those found in areas where mechanical ground alteration had almost certainly obliterated them. This is particularly true in Waiohuli where perhaps 50% of the surface of the subdivision has been bulldozed. In the Waiohuli parcel, major residential features may have been bulldozed; this would account for the low density of sites in that subdivision, however, it is clear that the bulldozer operator made occasional attempts to avoid them.

The spatial associations between the various formal and functional feature types in Waiohuli have been so thoroughly obscured by ground disturbance that, aside from focusing on a few small locales, any attempt to analyze site and feature distributions can be expected to yield very limited and unreliable results. This does not hold true in the Keokea subdivision where recent mechanical disturbance is primarily limited to areas along the eastern subdivision boundary and along the few roads which traverse the subdivision.

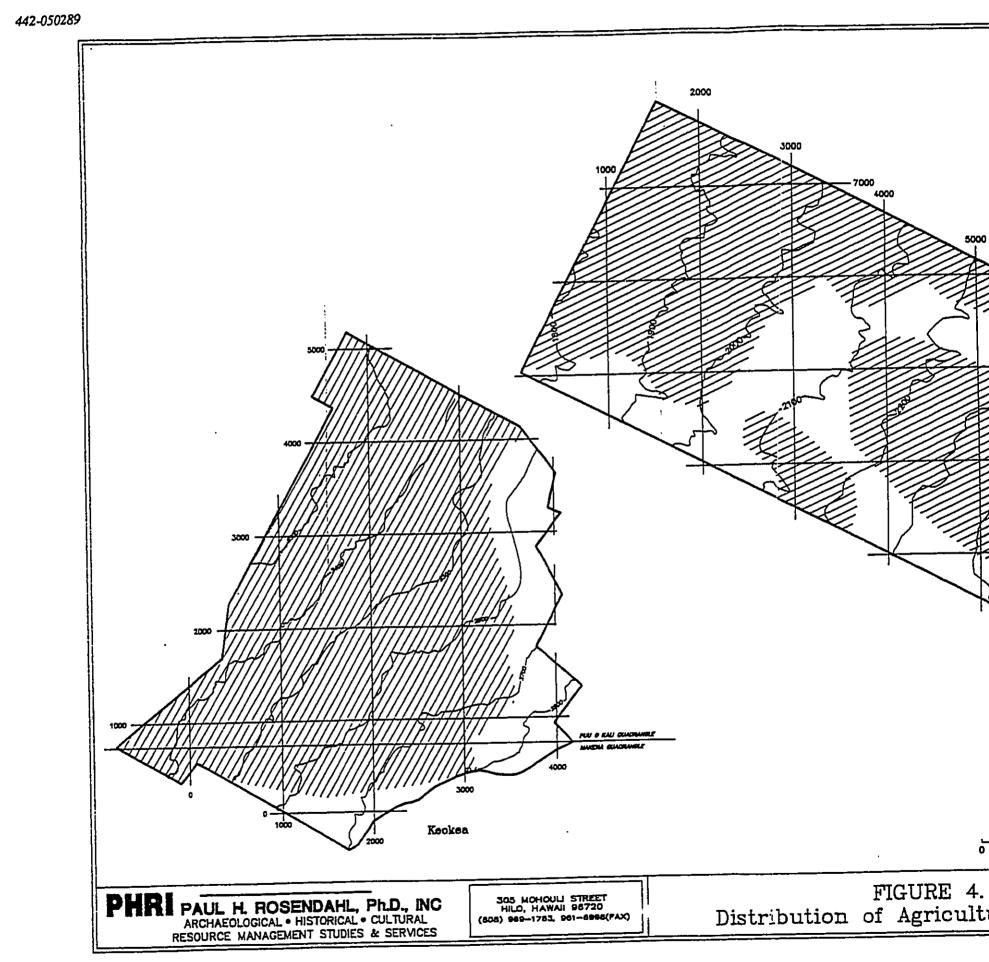
In Keokea, several of the residential features showed signs of having been disassembled in order to use their stones for building materials (Sites K-52 and K-90). In both Keokea (Site K-107) and Waiohuli (Site W-90), there was evidence that stone walls at the entrances to burial caves had been removed.

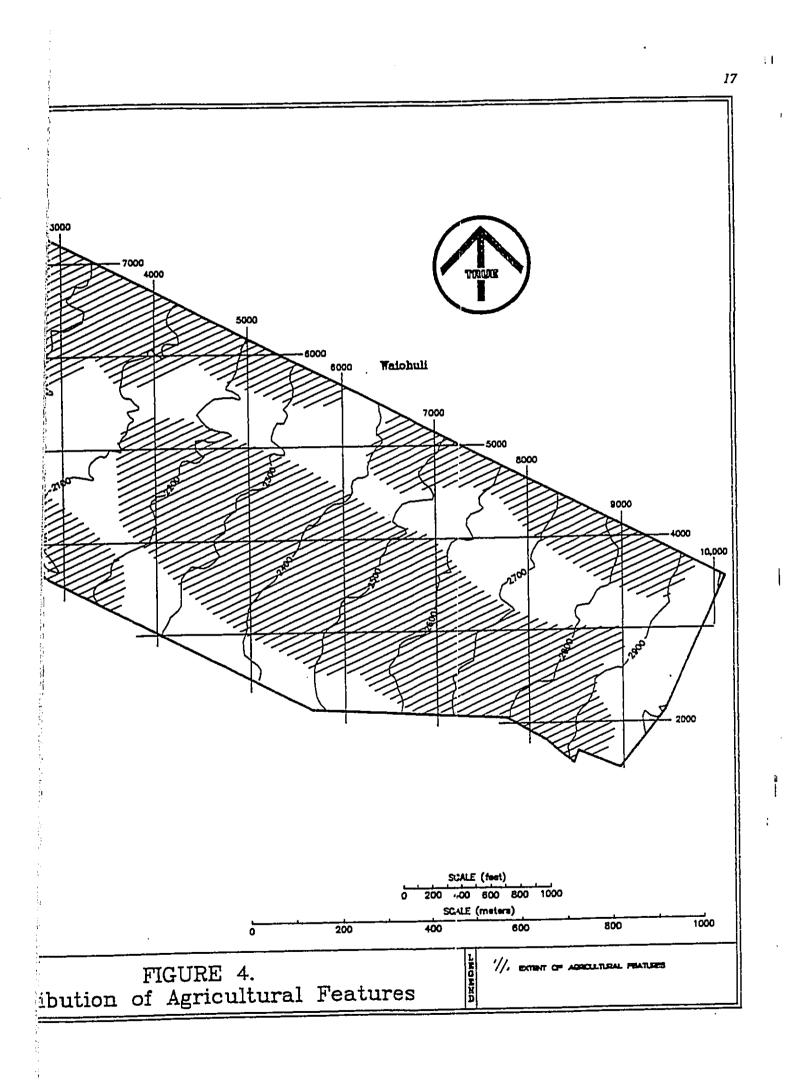
# LIMITED SURFACE COLLECTIONS

Surface collection was limited to the recovery of four artifacts considered threatened by either collection by amateurs or displacement by natural forces. The artifacts were all indigenous Hawaiian types—a small polished basalt adze, a retouched, utilized basalt core, a retouched basalt flake tool, and a scoria abrader.

#### LIMITED TEST EXCAVATIONS

Limited test excavations were undertaken to recover charcoal for radiocarbon dating and to assess the depth and constituents in cultural strata at selected features. The features excavated included a sample of the major formal feature types present. Nineteen test excavations (12 in Keokea and seven in Waiohuli) were conducted. Each excavation was taken down to a maximum depth of 50 cmbs (centimeters below surface) or to sterile soil. The test excavations yielded ecofactual material and 112 artifacts, including abraders, a flaked lithic tool, and flaked lithic debitage. The ecofactual materials included medium mammal, small mammal bone, fish bone, marine shell, kukui (Alewrites moluccana [L.] Willd.), gourd, and floral remains. Twelve of the excavation units (at 12 separate features) yielded marine faunal remains. Nine units yielded terrestrial faunal remains. The test units also yielded radiocarbon samples, of which 17 were submitted for dating analysis.





# DATA ANALYSES

#### CHRONOLOGY

Seventeen ash-charcoal samples from 15 sites were submitted to Beta Analytic Laboratories in Coral Gables, Florida for age determination analyses. The samples were collected from subsurface contexts within a number of feature types—including <u>heiau</u>, rectangular and circular enclosures, a paved platform, and a C-shaped wall—and from outside of an overhang shelter. Radiocarbon age determinations are summarized in Table 4 and are graphically illustrated in Figure 5.

One sample (from Site K-7, TP-1, 40-50 cmbs) contained insufficient carbon for dating. A sample from Site W-3 produced a modern (post AD 1950) date. The other 15 date ranges span 1,210 years (AD 680-AD 1890). Site K-7, Feature A, a rectangular enclosure tentatively assigned a permanent habitation function produced the earliest date (680-1060 AD). As insufficient carbon was recovered from the lowest level excavated at Site K-7, Feature A (40-50 cmbs), the dated sample (from 30-40 cmbs) does not represent the oldest strata in the feature. In addition, the lowest level excavated was not taken down to sterile strata. The early date for Feature A-which in structural form is similar to enclosures associated with much later dates-and other data suggests that the area of the feature has been inhabited on a fairly permanent basis for at least a millenium. Questions concerning intensity of occupation at the site and the evolution at the site of adaptive strategies over time will require further data collection and analysis and will require sound chronological determinations.

The remaining 14 date ranges span AD 1270-modern dates. Eight of these ranges were derived from samples taken from sites tentatively assigned religious functions. One of the eight ranges and three other ranges were from sites at which human remains are known to be present, or are suspected (from W-11, K-3, K-111, and K-130). The earliest of these ranges, AD 1270-1490, was derived from Feature A, Site W-11. Feature A is a C-shaped wall; however, it is unlike other C-shapes in that it opens toward the prevailing northeast winds—which indicates it most likely did not serve as a shelter. Feature A is associated with alignments and substantial mounds, some of which are tentatively interpreted as burials. Site K-3 is an enclosure and Sites K-111 and K-130 are overhang shelters.

An excavation at Site W-27 yielded two samples from separate, arbitrary strata (10cm) between 30 and 50 cmbs. The excavation was placed within the paved interior of the structure. Beneath the pavement was what appeared to be domestic midden, suggesting that the dates do not necessarily relate to the construction and use of the heiau itself but perhaps to pre-heiau occupation. This same observation pertains to the other substantial paved structures excavated and/or dated. In every case, once the paving was breached, apparent domestic deposits were encountered. One is led to deduce from this that the features tested were not as elaborate in construction early on; that the structures were either nonexistent during early occupation at their location or that they were less elaborate and were added to or rebuilt over time. The relationships between the dated samples and the form of the structures from which they were taken must await more detailed study.

#### PORTABLE REMAINS

One hundred twelve artifacts including abraders, a flaked lithic tool and flaked lithic debitage were recovered from 19 test excavations. Thirty-seven pieces of volcanic glass from nine sites and 60 pieces of flaked basalt from eight sites were recovered during excavations. Three sites yielded polished basalt flakes and one site yielded a shark tooth. Two pieces of coral were recovered from two sites (Table 5). Four artifacts—an abrader, an adze, a flaked lithic tool, and a utilized flake—were collected from the surface of four separate sites.

Marine ecofactual remains included Gastropoda, bivalves, fish, and Echinoidea (Table 6). Terrestrial faunal remains included remains of small, medium, and large mammals, and several pieces of unidentified remains. Floral remains included unidentified charcoal, gourd, and four kukui fragments. The excavated ecofactual remains do not constitute representative site or feature samples. They were collected as a by-product of excavations aimed primarily at collecting datable materials. They are, however, informative in that they demonstrate that a wide range of activities occurred throughout the project area over perhaps 1,200 years.

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### DATA ANALYSES

# Table 4.

# SUMMARY OF RADIOCARBON AGE DETERMINATIONS

PHRI Lab.No. RC-	Lab. No. BETA-	Provenience	C-14 Age Yrs. B.P. (one sigma)	C-13/ C-12 Ratio	C-13 Adjusted C-14 Age Yrs. B.P.	*Calendric Range Yrs. AD
KEOKEA						
K-3 513	30811	Fea. A, TU-1 Layer I/II 0-22 cmbs	180 <u>+</u> 50	-24.0	200 <u>+</u> 50	1640-1890 1910-1955#
K-6 514	30812	Fea. A, TT-1 Layer II, 17-48 cmbs	260 <u>+</u> 60	-24.1	270 <u>±</u> 60	1470-1680 1739-1805 1935-1955#
K-7 515	30813	Fea. A, TP-1 Layer I-4 30-40 cmbs	1020 <u>+</u> 100	-19.3	1110±100	680-1060 1077-1125 1135-1157
530		Fea. A, TP-1 Layer I-5 40-50 cmbs		_		Insufficient Carbon
K-48 518	30815	Fea. B, TP-2 Layer I-4 30-40 cmbs	30 <u>+</u> 70	-15.0	190 <u>+</u> 70	1518-1 <i>5</i> 91
K-64 517	30814	Fea. A, TP-1 Layer II/III 6-50 cmbs	330 <u>+</u> 80	-22.9	360 <u>+</u> 70	1420-1660
K-105 519	30816	Fea. A, TP-1 Layer III 20-40 cmbs	310±50	-26.3	290 <u>+</u> 50	1470-1670 1775-1793 1947-1953
K-111 520	30817	Fea. A, TP-1 Layer II 6-20 cmbs	110 <u>+</u> 70	-23.2	140 <u>+</u> 70	1640-1955#

\*Calibrated according to Stuiver and Pearson (1986). Range at two sigmas.

#Denotes influence of bomb C-14.

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K-130 522

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BETA-

30818

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# DATA ANALYSES

Table 4. (cont.)

C-14 Age C-13/ C-13 Adjusted Provenience Yrs. B.P. C-12 C-14 Age (one sigma) Ratio Yrs. B.P. Fea. A, TP-1 110<u>±</u>60 -21.7 160<u>+</u>60 Layer III 13-57 cmbs Fea. A, TP-1 100.2±0.7% -10.4 220<u>+</u>50 Layer II Modern 4-16 cmbs 1859-1861 1921-1955# 100.5<u>+</u>0.8% -24.3 100.4<u>+</u>0.8% Modem Modem 530<u>+</u>90 -24.5 540±90

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WAIOHULI W-3 523 30820 Fea. A, TP-1 Layer I-1 0-30 cmbs W-11 524 30821 Fea. A, TP-1 1270-1490 Layer I-1 0-35 cmbs W-27 525 30822 Fea. A, TP-1 430<u>+</u>70 -22.0 480<u>+</u>70 1305-1360 Layer I-4 30-40 cmbs 1380-1510 1598-1617 526 30823 Fea. A, TP-1 390<u>+</u>90 -21.4 450±90 1300-1365 Layer I-5 40-50 cmbs 1370-1650 W-28 527 . 30824 Fea. A, TP-1 430±90 -22.5 470<u>+</u>90 Layer I-2/3 1290-1640 10-30 cmbs W-36 528 30825 Fea. A, TP-1 450±50 -23.9 · 470<u>±</u>50 Layer I-5 1397-1482 40-50 cmbs W-45 529 30826 Fea. B, TP-1 100±50 -11.1 330<u>+</u>50 1450-1660 Layer II 18-30 cmbs

\*Calendric

Range

Yrs. AD

1640-1955#

1523-1566

1629-1696

1726-1818

9	513	515 518	517	615	520	521	522	523	524	525 526	527	528	529
1300 1400 1500 1600 1700 1800 1900 2000	XXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	680-1157					NIX I DIBITI DIVID NUM	Hadern		XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	XXIXXXXX	
PROVENTENCE 1200	2028, Fee. A. TU-1. 1/11. 0-22 cmbe 2029, Fee. A. TT-1. 11. 17-48 cmbe		2013, Fee. B. TP-2, I-4, 30-40 cabe 2014, Fee. A. TP-1, 11/111, 6-50 cabe	2035, Fea. A, TP-1, III, 20-40 cmbs	2036, Pes. A. TU-1, II. 6-20 cmbs	2037, Fea. A, TP-1, III, 13-57 cabs	2038, Fes. A. TP-1, II. 4-16 cabs	2039, Yea, A, TP-1, I-1, 0-30 cabs	2040, Yea. A. TF-1, I-1, 0-35 caba	2041, Fea. A. TP-1, I-4, 30-40 caba 2041, Fea. A. TP-1, I-5, 40-50 caba	2042, Fea. A. TP-1, I-2/3, 10-30 cmbs	2043, Fea. A, TP-1, I-5, 40-50 cmb#	2044, Fee. B. TP-1, II, 18-30 cabe

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Table 5.

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SUMMARY OF PORTABLE ARTIFACT TYPES (SUBSURFACE)

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	Fea.	TP∸1	<u>1</u> -3		m	7	S.		ı	ł	ı.	5
			I-2		'n	1	m		1	ŀ	1	e
K-6	<b>Fea.</b> A	TP-1	н		7	63	4		I	r	1	4
	A Total				10	1	11		2	I	2	13
K-3	<b>a.</b> A	TP-1			6	ł	6		Ļ	ı	-	10
	요  문	۶	H		-4	-	7		1	1 -	-	ę
	Material			INDIGENOUS FLAKED STONE	Bagalt	Volcanic Glass	SUBTOTAL FLAKED STONE	TOOLS Polischod hooolt	flakea	Shark tooth	SUBTOTAL TOOLS	TOTAL INDIGENOUS

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K-124	Fea. A	_	II			m	1	en l			ı	I	 · I	e
K-111	Fea. A	TP-1	H			1	υ	Ś			I	1	I	2
K-105	Fea. A	TP-1	II			t	t	t			1	i		1
K-64	Fea. A	TP-1	II			<del>, -</del> 4	I				I	I	1	1
	Material			INDIGENOUS	FLAKED STONE	Baselt	Volcanic Glass	SUBTOTAL FLAKED STONE	TOOLS	Polished besalt	flakes	Shark tooth	SUBTOTAL TOOLS	TOTAL INDIGENOUS

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Table 5. (Cont.)

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	K-3 Fea. A II I	1 I I I + 1 I I		+	+ 1 + 1 + +	1.1.1	REMAINS
	CATEGORY	MARING INVERTEBRATES GASTROPODA Strombug meculatue Cypraeidae Conidae Nerite picea	BIVALVIA Tellinidae	OTIIER Echinoidea	BONE Fish Mammel Large Medium Small Unidentified	VEGETAL REMAINS Charcoal Gourd Aleurites moluccana	NON-ECOFACTUAL REMA Coral

Table 6.

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# DATA ANALYSES

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Table 6. (Cont.)

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<u>K-105</u> Fea. A II II	1111	1	I	++1111	+ 1 +	l
<u>K-64</u> Fea. A III	1111	r	+	1 1 1 1 1 1	11	1
	MARINB INVERTEBRATES GASTROPODA <u>Strombus maculatus</u> Cypraeidae Conidae <u>Nerita picea</u>	BIVALVIA Tellinidae	OTHER Echinoidea	BONE Fish Mammel Large Medjum Smell Unidentified	VEGETAL REMAINS Charcoal Gourd Aleuritee moluccana	RON-ECOFACTUAL REMAINS Coral

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DATA ANALYSES

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# CONCLUSION

#### EVALUATION OF SURVEY METHODOLOGY

The archaeological inventory survey of Waiohuli and Keokea Subdivisions involved low-level aerial survey of approximately 60% of each subdivision and intensive (15-30 m interval) pedestrian survey of 100% of both subdivisions. During both aerial and pedestrian surveys, dense lantana, panini, wattle, ilima, and high grass consistently limited surface visibility to 10-20 percent of the ground surface, effectively eliminating the possibility of finding surface portable remains and minor agricultural features. As a result, the survey was focused on identifying substantial residential and agricultural features.

Even major, large-stacked boulder and cobble residential features were found to be thoroughly overgrown with <u>panini</u> and/or lantana, or were buried under wattle deadfalls. Because of this, the sites had to be considerably cleared and wall segments had to be probed for prior to preparing sketch maps. Nevertheless, excepting perhaps features in areas completely obscured by large, impenetrable <u>panini</u> thickets (areas totaling c. one acre), all major archaeological features in both subdivisions were identified during the survey.

#### DISCUSSION

The overall data suggests that Keokea Subdivision was intensively expoited in a variety of ways for at least two-thirds of the entirety of Hawaiian prehistory. There is evidence in the project area for change over time, spatial variety, functional (behavioral) variety, and interaction with peoples in other (coastal) areas.

The picture that the overall data for Waiohuli Subdivision presents is less clear due to the extensive historic disturbance in the area, especially in regard to the density of feature types and the temporal ranges of features. The feature types in the area (heiau to agricultural mounds) do, however, reflect a full range of activities. If the low site density in Waiohuli is not due to removal of sites by bulldozing, then prehistoric and historic occupation of the area was very different from nearby Keokea. For example, Kaumeheiwa Heiau in Waiohuli is not as densely surrounded by agricultural, habitation, and religious features as could be expected if it were in Keokea. It exists in relative isolation when compared with Molohai Heiau in Keokea. Agricultural features in Waiohuli are as widespread as those in Keokea, but they are not found in as high densities. The same goes for habitation and religous features in Waiohuli. There are other "nonarchaeological" differences between the two areas. For example, three major guiches and an extensive and welldeveloped contributary drainage system in Waiohuli may have transported surface water out of the immediate area before much could be absorbed. Keokea has no such drainage system. This could render the Waiohuli area effectively drier than Keokea and make the area less suited for agriculture. In turn, the limited productivity of the land might have substantially limited the population.

Even if the lower feature density in Waiohuli is a direct result of surface buildozing, it is still possible that subsurface remains are still present and are relatively intact. Unless the presense of subsurface remnants of features is demonstrated in Waiohuli, comparisons between the distributions of sites and features in Keokea and Waiohuli cannot be made with confidence, nor can the distributions within the Waiohuli Subdivision itself be addressed.

The historical documentary research suggests that the Kula region was intensively cultivated during the early historic period. Apparently, this was especially true during the gold rush years in California, when the influx of miners created a demand for food which the potato farmers in Kula in part filled. The historical documentation suggests that the farmers during this period did not make substantial modifications to the land (terraces, etc.) but instead "...followed the natural contour of the land..." Whether Keokea and Waiohuli subdivisions were under intensive cultivation during this period is open to question. The lack of historic period artifacts in association with residential and agricultural features suggests they were not.

# SUGGESTED RESEARCH QUESTIONS

Future research in the Kula area should address, at a minimum, the following questions.

- 1. When was the Kula area and each site and feature first occupied?
- 2. Were the occupations brief, intermittent, continuous, or long-term?
- 3. Which sites and features represent contemporaneous occupation and/or use?
- 4. Do some formal site/feature types appear earlier in the archaeological record than others?

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#### CONCLUSION

- 5. Are earlier sites functionally different from later sites?
- 6. How are the archaeological resources distributed with regard to environmental factors like elevation, distance from water, soil types, geomorphic features and vegetation communities?
- 7. How are archaeological resources distributed relative to each other? Do particular site and feature types tend to occur together?
- 8. What are the relationships between the archaeological resources in the Kula area and those elsewhere?
- 9. How do the distributions and densities of archaeological sites and features relate to the distribution and density of prehistoric people in the Kula area?
- 10. Can particular behaviors be associated with formal site and feature types—which behaviors with which formal types?
- 11. Do the archaeological data correlate well with the ethnographic and historic records?
- 12. Do the archaeological data from Kula support the interpretations made concerning similar sites and features in similar areas?

# GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED GENERAL TREATMENTS

To facilitate State and County review, general significance assessments and recommended general treatments for all identified sites are summarized in Table 1. Significance categories used in the site evaluation process are based on the National Register criteria for evaluation, outlined in the Code of Federal Regulations (36 CFR Part 60). The Hawaii State Historic Preservation Office (SHPO) uses these criteria for evaluating cultural resources. Sites determined to be potentially significant for information content (Category A, Table 1) 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" (36 CFR Sec. 60.4). Sites potentially significant as representative examples of site types (Category B, Table 1) 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." Sites with potential cultural significance (Category C) 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" (Draft Report, August 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).

Of the total 159 sites identified during the present survey, 108 are in Keokea and 51 are in Waiohuli. Of the 108 Keokea sites, 94 are assessed as significant solely for information content. Eighty-nine of the 94 sites are recommended for further data collection, and five of the 94 sites are recommended for no further work. Four of the remaining 14 sites are assessed as significant for information content, as an excellent example of a site type, and for cultural; value. Further data collection and preservation with interpretive development are recommended for these four sites. Three of the remaining 14 sites are assessed as significant for information content and as an excellent example of a site type. For these three sites, further data collection and preservation with interpretive development are recommended. Another three sites are assessed as significant for information content and for cultural value; these three sites are recommended for further data collection and preservation as is. Three other sites are assessed as significant for information content and are tentatively assessed as significant for cultural value. These three sites are recommended for further data collection and are provisionally recommended for preservation as is. The last site is assessed as significant for information content and as having cultural value. For this site, preservation "as is" is recommended.

Of the 51 sites in Waiohuli Subdivision, 42 are assessed as significant solely for information content. Thirty-three of these 42 sites are recommended for further data collection, and nine of the 42 sites require no further work. Of the remaining nine sites, three are assessed as significant for information content, as excellent examples of a site type, and as culturally significant. Further data collection and preservation with interpretive development are recommended for these three sites. Two of the remaining six sites are assessed as significant for information content and are provisionally assessed as having cultural value. For these two sites, further data collection is recommended and

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#### CONCLUSION

preservation with interpretive development is provisionally recommended. The final four sites are assessed variously and require various recommended treatments (see Table 7 for specific recommendations).

Table 8 lists lots which contain or appear to contain sites or portions of sites that are tentatively recommended for preservation. The uncertainty as to whether lots contain or do not contain sites is due to problems concerning lot boundaries. These problems are due to (a) possible inaccurate boundaries/locations on maps and aerial photographs provided by DHHL, (b) problems of determining precise boundaries and locations in the field due to vegetation and terrain changes that have occurred since preparation of the photographs and maps, and (c) missing DHHL lot corner markers. In all, 19 lots in Keokea and 5 lots in Waiohuli contain or appear to contain sites recommended for preservation. In order to accurately determine exactly which lots contain sites or portions of sites, the sites must first be individually staked out in the field. Following this, the DHHL will have to restake the boundaries in question.

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#### CONCLUSION

#### Table 7.

# SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED GENERAL TREATMENTS WAIOHULI PARCEL

Site or		gnificant	e Catego	ory	Rec	ommend	ed Tream	nent
Feature No.	A	x	В	C	FDC		PID	PAI
· W-1	+							
W-2	÷	-	-	_	7	-	-	-
W-3	+	-	_	-	- <del>-</del>	-	-	-
<b>W-5</b>	+	•	_	-	+	-	•	-
W-6	+	_	-	-	+	-	-	-
W-8	+	_	-	•	+	-	-	-
W-10	+	-	-	•	+	-	•	-
W-12	+	-	-	-	+	•	-	-
W-13	+	-	-	•	+	-	-	-
W-14	+-	-	-	•	+	-	-	-
W-15	+	-	-	-	+	-	-	-
W-17	+	-	-	-	+	-	-	-
W-18	+	-	-	-	+	-	-	-
W-20	+	-	-	-	+	•	-	•
W-21	+	-	-	-	+	-	-	-
W-31		-	-	-	+	•	-	-
11-21	+	•	-	-	+	-	-	-

**General Significance Categories:** 

- A = Important for information content, further data collection necessary (PHRI=research value);
- X = Important for information content, no further data collection necessary (PHRI=research value, SHPO=not significant);
- B = Excellent example of site type at local, region, island, State, or National level (PHRI=interpretive value); and
- C = Culturally significant (PHRI=cultural value).

**Recommended General Treatments:** 

- FDC = Further data collection necessary (further survey and testing, and possibly subsequent data recovery/mitigation excavations);
- NFW = No further work of any kind necessary, sufficient data collected, archaeological clearance recommended, no preservation potential (possible inclusion into landscaping suggested for consideration);
- PID = Preservation with some level of interpretive development recommended (including appropriate related data recovery work); and
- **PAI** = Preservation "as is," with no further work (and possible inclusion into landscaping), or minimal further data collection necessary.

\* Provisional assessment; definite assessment pending results of further data collection.

#### CONCLUSION

# Table 7. (cont.)

WAIOHULI PARCEL

Site or	<u>Si</u>	gnificant	e Catego	<u>ory</u>		ommende		
eature No.	A	Х	В	С	FDC	NFW	PID	PAI
W-37	+	-	•	-	+	-	-	-
W-42	+	-	-	-	+	-	-	-
W-46	+	-	-	-	+	-	-	-
W-48	+	-	-	-	+	-	-	-
W-49	- -	-	-	-	+	-	-	-
W-55	+	-	-	-	+	-	-	-
W-65	+	-	-	-	+	-	-	-
W-67	+	•	-	-	+	-	-	-
W-71	÷	-	-	-	+	-	-	-
W-73	+	-	-	-	+	-	-	-
W-75	+	-	-	-	+	•	-	-
W-77	+	-	-	-	+	-	-	-
W-82	+	-	-	-	+	-	-	-
W-83	+	-	-	-	+	•	-	-
W-96	+	-	-	-	+	-	-	-
W-97	+	-	-	-	+	-		-
W-98	+	-	-	-	+	-	-	-
Subtotal: 33	33	-	-	•	33	-	-	•
W-4	•	+	-	-	-	+	-	-
W-47	-	+	-	-	-	• +	-	-
W-57	-	+	-	-	-	+	-	-
W-58	-	+	<b>.</b> .	-	-	÷	-	-
W-59	-	+	-	•	-	+	-	-
W-60	-	+	-	-	-	+	-	-
W-80	-	+	-	-	-	+	-	-
W-88	-	+	-	-	-	÷	-	-
W-101	-	+	-	-	-	+	-	-
Subtotal: 9	•	9		•	-	9	•	-
<b>W-27</b>	+	-	+	+	+	-	+	-
W-28	+	-	+	+	+	-	+	-
W-36	+	-	+	+	+	- ·	+	-
Subtotal: 3	3	•	3	3	3	•	3	-
<b>W-45</b>	+		+	-	+	-	+	•
Subtotal: 1	1		1		1		1	-

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# CONCLUSION

# Table 7. (cont.)

# WAIOHULI PARCEL

Site or		<u>S</u>	ignifican	ce Categ	ory	Rec	ommend	ed Treat	ment
Feature No.		A	X	B	C	FDC	NFW	PID	PA
W-11		+	-	-	*		-		*
Subtotal:	1	1	-	-	1	1	-	-	1
W-30 W-32		+++	-	-	*	+ +		*	
Subtotal:	2	2	-	•	2	2		2	
W-90		+	-		+	+	•	•	
Subtotal:	1	1	-	-	1	1		-	1
<b>W-3</b> 5		+	-	-	+	+	-	-	
Subtotal:	1	1	-	•	1	1	-	•	
Waiohuli Total: 5	1	42	9	4	8	42	9	6	2

Site or	Si	gnifican	ce Catego	ory	Recommended Treatment				
Feature No.	<u>A</u>	X	В	С	FDC	NFW	PID	PAI	
K- 1	+	-	_						
K- 2	+	-	_	-	+	-	-	-	
K- 4	+	-	-	-		-	-	-	
K- 5	+	-	-	-	+	-	-	-	
K- 7	+	_	_	-	+	-	-	-	
K- 8	+	-	-	<b>-</b> .	+	-	-	-	
K- 10	+	_	-	-	+	-	-	-	
K- 11	, -	_	-	•	-4-	-	•	-	
K- 13	+	-	•	•	+	-	-		
K- 14	• +	-	-	-	+	-	-	-	
K- 16	+	_	-	-	+	-		-	
K- 19	+	-	-	-	+	-	-	-	
K- 21	+	-	-	•	+	•	-	-	
K- 20	+	-	-	-	+	-	-	-	
K- 25	+	-	-	•	+	-	-	-	
K- 26	•	-	-	•	+	-	-	-	
K- 27	+	-	-	•	+	-	-	•	
K- 31	+	-	-	-	+	-	-	-	
K- 32	+	-	-	-	+	-	-	-	
11- JZ	+	-	-	-	+	-	-	-	

# KEOKEA PARCEL

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## CONCLUSION

# Table 7. (cont.)

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# KEOKEA PARCEL

Site or	Si		e Catego		Rec	ommende	ed Treat	nent
eature No.	A	X	В	C	FDC	NFW	PID	PAI
K- 35	+	-	-	-	+		•	-
K- 42	+	-	-	-	+	-	-	-
K- 52	+	-	-	-	+	-	-	-
K- 53	+	-	-	•	+	<b>.</b> .	-	-
K-203	+	-	-	-	+	-	-	-
K- 9	+	-	-	-	+	-	-	•
K- 65	+	-	-	-	+	-	-	-
K- 76	+	-	-	-	+	-	-	•
K- 85	+	-	-	-	+	-	•	-
K-120	+	-	-	-	+	-	-	-
K-124	+	-	-	-	-+-	-	-	-
K-140	+	_	_			-	-	-
K-143	+	-	-	-	+	-	-	-
K- 36	+	-	-	-	+	-	-	-
K- 39	+	-	-	-	+	-	-	-
K- 41		-	-	-	+	_	-	-
K- 41 K- 44	+	-	-	-	+	_	-	-
K- 45	+	-	•	-	+	_	-	-
K- 46	+	-	-	•	+	_	-	-
	+	-	-	-	+	-	-	_
K- 50	+	-	-	•	+	-	-	-
K- 51	+	-	-	-	+	•	-	-
K- 54	+	-	-	-	+	•	-	-
K- 55	+	-	-	•	+	•	-	-
K- 57	+	-	-	-	+	-	•	-
K- 59	+	•	-	-	+	-	-	-
K- 64	+	-	-	-	+	-	•	-
K- 69	+	-	-	-	+	-	-	-
K- 70	÷	-	-	-	+	•	-	-
K- 79	+	•	-	-	+	-	-	•
K- 90	+	-	•	-	+	-	-	-
K- 81	÷	-	-	-	+	-	-	-
K- 84	+	-	-	-	+	-	-	-
K- 89	+	-	-	-	+	-	-	-
K- 95	+	-	-	-	+	-	-	-
K- 96	+	-	-	-	+	-	-	-
K- 97	+	•	-	-	+	-	-	-
K- 98	+	-	-	-	+	-	-	-
K- 99	+	-	-	-	+	-	-	-
K-101	+	-	-	-	+	-	-	-
K-102	+	-	-	-	+	-	-	
K-103	+	-	-	-	+	-	-	•
K-105	+	-	-	-	+	-	-	-
	• +		-	-	+	-	-	•
K-106	- <b>T</b>	-			•			

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# CONCLUSION

# Table 7. (cont.)

# KEOKEA PARCEL

Site or	<u></u> S	ignificar	ice Cate	ZOLA	Rec	ommend	ed Treat	ment
Feature No.	A	X	B	C	FDC	NFW	PID	PA
K-109	+							
K-110	+		_	-	+	-	•	-
K-111	+	-	-	-	+	-	-	-
K-112	+	-	_	-	+	-	-	-
K-116	+	-	_	-	+	-	-	-
K-118	+	-	-	_	+	-	-	-
K-127	+	-	-	-	+ +	-	-	-
K-130	+	-	-	-	+ +	-	-	-
K-131	+	-	-	-	+ +	-	-	-
K-135	+	-		-		-	-	•
K-137	+	_	_	-	+	-	•	-
K-142	+	-	_	-	+	-	-	•
K-146	+	-	-	-	+	-	-	-
K-148	+	-	-	-	+	-	-	-
K-149	• +	-	-	-	+	-	-	•
K-152	+	_	-	-	+	-	-	-
K-200	+	_	-	-	+	•	-	-
K-201	+	-	-	-	+	-	-	-
K-202	+	-	-	-	+	•	-	-
K-204	+	-	-	-	+	-	-	-
K-205	+	-	-	-	+	-	-	-
K-206	+		•	-	+	-	-	-
K-208	+		-	-	+	-	-	-
K-209	+	-	-	•	++	-	-	•
K-210	+	-	_	-			-	-
K-211	+	•	-	-	++	-	-	-
Subtotal: 89	89						•	
K- 30	1				····			
K- 62	+	•	+	+	+	-	+	-
K- 78	+	•	+	+	+	-	+	-
K-115	+ +	-	+	+	+	-	+	-
		-	+	+	+	•	+	-
Subtotal: 4	4	-	4	4	4	•	4	•
K- 12	•	+	-				·	
K- 60	-	÷	-	•	-	+	-	-
K- 63	-	÷	-	-	-	- <b>4</b> -	-	-
K- 80	-	+	-	-	-	- -	-	-
K-100	-	+	-	-	-	+	-	-
Subtotal: 5	0	5	<u> </u>			5		

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# CONCLUSION

# Table 7. (cont.)

# KEOKEA PARCEL

							-		
Site or	S	ignifican	ce Categ	OFY	Recommended Treatment				
eature No.	A	X	В	C	FDC	NFW	PID	PAI	
K- 29	+	-	+		+	-	+	•	
K- 40	+	-	+	-	+	-	+	-	
K- 48	+	•	+	-	+	-	+	-	
Subtotal: 3	3	-	3	•	3	-	3	-	
K- 87	÷	-	-	+	+	-	-	+	
K-107	+	-	-	+	+	-	-	+	
K-207	+	•	-	+	+	-	-	+	
Subtotal: 3	3	•	-	3	3	-	-	3	
K- 3	+		-	*		-	-	*	
K- 6	+	-	-	*	+	-	-		
K- 71	+	-	-	*	+	-	-	*	
Subtotal: 3	3	•	-	3	3	•	-	3	
K-134	+	-	•	÷	· -	-	-	+	
Subtotal: 1	1	•	-	1	-	-	-	1	
<i>Keokea</i> Total: 108	103	5	7	11	102	5	7	7	
	103			11	102				
Waiohuli				-		_			
Total: 51	51	9	4	8	42	9	6	2	
Grand									
Total: 159	154	14	11	19	144	14	13	9	

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CONCLUSION

#### Table 8.

# LOTS WHICH APPEAR TO CONTAIN SITES OR PORTIONS OF SITES RECOMMENDED FOR PRESERVATION\*

Keokea Su	bdivision	Waiohuli S	Subdivision	
 Lot No.	Site No.	Lot No.	Site No.	
5	87	30	45	
13	107	31	45	
14	107	74	30	
21	71	75	30	
22	71	76	27	
23	78			
24	48,78			
25	48			
26	48,62			
27	48,62			
28	48			
29	48			
37	3			
48	78			
49	71			
50	71			
58	78			
Α	78			
С	207			

\* See page 29 for explanation of uncertainty regarding boundaries of lots in relation to sites.

.

### CONCLUSION

# Table 9.

# **RESIDENCE LOTS CONTAINING SITES**

	ubdivision	<u>Waiohuli Subc</u>	livision
Lot No.	Site No.	Lot No.	Site No.
11	143 A	11	49
12	12, 131	13	42
12	131, 131 A-C	2-33	46
13-14	90, 107	51-54	98
14	109, 109 A	74	30
15	108	75	31
16	208	76	27
16-17	52, 52 A-B	84-85	47
18	53	84-85-86	48
9-20-21-22	65	129	83
20	65 D-G	149-150-152-153-154	80
21	65 C, 71 B	150-151	82
21-22	65 A-B, 71 A	161-175-176	75
1-49-50	71	182-183	57
3	76, 76 A-B	184	60
3-24	63, 78 A	192	55
3-24-48-49	78	192-196-197	58
4	78 B-E	222-223-224-228-229	58 67
5	79 79	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	07
6-27	48 C	240-241	37
7	48 D	262	
7-28	62, 62 A-C	276-277-278-281	71
9-28	48 A		65 45
9-28-27-26-25	48	31	40
3	4, 4 A-B		
4	2, 2 A-B		
4-35	1 B		
5	1 A		
	K-101		
-6-7	K-87, 89		
	K-106		
, )	K-71B		
\$ \$	K-48		
7	K-3		
3	K-31		
	K-32		
)	K-202		
, )	K-202 K-98		
	K-70		
	K-69, 85		
	K-69, 85		
,	N-U7, 04		

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# APPENDIX A

### SUMMARY OF IDENTIFIED SITES AND FEATURES - WAIOHULI

*Site/ Feature	Formal Site/Feature	Tentative Functional	,		M V le As		+F	ield W Tasks	
Number	Туре	Interpretation		R	I	C	DR	SC	EX
1	Enclosure	Habitation/Ag.		м	L	L	+	+	+
2	Enclosure	Habitation/Ag.		м	L	L	+	+	+
3	Теггасе	Habitation/Ag.		H	L	L	+	+	+
4	Wall	Animal Control	I	L	L	L	-	-	-
5	Overhang	Indeterminate		м	L	L	-	-	+
6	Lithic Scatter	Lithic Reduction	m	м	L	L	+	+	-
8	Enclosure	Habitation/Ag.		М	L	L	+	+	+
10	Тептасе	Agriculture		М	L	L	+	-	+
11 A B C D E F	Complex (6+) Wall Mound Mounds Mound Platform Mound	Burial**/Ag.		M/H	L	L/H	+	-	+
12	Terraces	Agriculture		м	L	L	+	-	+
13 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.		<b>M</b> .	L	L	+	-	+
	* PHRI temporar	y site numbers.							
	# Cultural Resour	ce Management -Va	alue Mode Ass	essme	nt				
•		Nature: R	= scientific res						
			= interpretive						
		Degree: H M	= cultural = high = moderate						
	+ Field Work Too		= low						

+ Field Work Tasks:

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DR = detailed recording (scaled drawings, photographs, and written descriptions)

SC = surface collections

EX = test excavations

\*\*Possible functional interpretation

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# APPENDIX A

A-2

# SUMMARY OF IDENTIFIED SITES AND FEATURES - WAIOHULI (cont.)

Site Featur	re Site/Feature	Tentative Functional		CRM V			Field V Tas	Work
Numb	er Type	Interpretation	R		C	DR		
14 A B C	Complex Enclosure Enclosure Wall,L-shaped	Habitation/Ag.	M	ΓĽ	L	+	-	+
15	Enclosure	Habitation/Ag.	М	L	L	+	-	÷
17 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	М	L	L.	÷	-	+
18 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	М	L	L	+	-	+
20	Enclosure	Habitation/Ag.	М	L	L	÷	+	+
21	Enclosure	Habitation/Ag.	М	L	L	+	•	+
· 27	Enclosure	Relig.( <u>Heiau</u> /Hab.)	н	н	н	÷	-	+
28	Enclosure	Religious**/Hab.	н	н	н	+	-	+
30	Alignment	Religious**	L/H	L/H	L/H	+	-	+
31	Overhang	Habitation/Ag.	М	L	L	+	-	+
32	Upright	Religious**	L/H	L/H	L/H	+	+	+
35	Human Bone	Burial	L	L	н	+	+	-
36	Enclosure	Religious**/Hab.	н	н	H	+	÷	+
37 A B	Complex (2) Enclosure Wall, U-shaped	Habitation/Ag.	М	Ľ	L	+	-	+
42	Enclosure	Habitation/Ag.	М	L	L	+	-	+
45 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	H	H	L	+	-	+
46	Enclosure	Habitation/Ag.	м	L	L	+	-	+

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# APPENDIX A

Site/	Formal	Tentative		RM Val		Fi	eld We	
eature umber	Site/Feature Type	Functional Interpretation	_ <u>Mo</u> R	<u>de Asse</u> I	<u>c</u>	DR	Tasks SC	EX
47	Enclosure	Animal Control	L	L	L	-	-	-
48	Wall	Agriculture	м	L	L	+	+	+
49	Terraces	Agriculture	М	L	L	+	-	+
55	Overhang	Temp. Habitation	М	L	L	+	+	+
57	Upright Slab	Indeterminate	L	L	L	-	-	-
58	Wails	Animal Control	L	L	L	-	-	-
59	Wall	Transportation	L	L	L	-	-	•
60	Wall	Animal Control	L	L	L	-	-	-
65	Enclosure	Habitation/Ag.	м	L	L	+	-	+
67 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	М	L	L	+	-	+
71	Enclosure	Agriculture	М	L	L	+	-	+
73	Walls	Agriculture	м	L	L	+	-	+
75	Wall	Habitation/Ag.	м	L	L	÷	+	+
77	Enclosure	Agriculture	М	L	L	+	-	+
80	Wall	Animal Control	L	L	L	-	-	-
82	Terrace	Habitation/Ag.	М	L	L	+	-	÷
83	Enclosure	Habitation/Ag.	М	L	L	+	-	÷
88	Wall	Transportation	L	L	L	-	-	-
90	Cave	Burial	н	L/H	н	÷	+	+
96	Wall	Agricultural	М	L	L	÷	+	+
97	Enclosure	Habitation/Ag.	М	L	L	+	+	+
98	Enclosure	Habitation/Ag.	М	L	L	+	+	+
101	Bridge	Transportation	L	L	L	-	-	-

# SUMMARY OF IDENTIFIED SITES AND FEATURES - WAIOHULI (cont.)

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# APPENDIX B

# SUMMARY OF IDENTIFIED SITES AND FEATURES ---- KEOKEA

*Site/ Feature Number	Formal Site/Feature	Tentative Functional			/alue ssess.	+F	ield V Task	
	Туре	Interpretation	R	I	C	DR	SC	EX
1 A B	Complex (2) Platform Terrace	Habitation/Ag	M	L,	L	+	-	+
2 A B	Complex (2) Enclosure Enclosure	Habitation/Ag	М	L	L	+	-	÷
3 A B	Complex (2) Enclosure Enclosure	Burial**/Hab./Ag	M/H	L	L/H	÷	-	+
4 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	М	L	L	+	-	÷
5 A B	Complex (2) Platform Enclosure	Temp. Habitation/ Agriculture	М	L	L	÷	-	+
6 A B C D	Complex (4) Enclosure Mound Enclosure Enclosure	Burial/Hab./Ag.	M/H	L	L/H	÷	-	+

\* PHRI temporary site numbers.

# Cultural Resource Management - Value Mode Assessment— Nature: R = scientific research

R = scientific research I = interpretive C = cultural

Η	= high
М	= moderate
L	= low

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Degree:

+ Field Work Tasks:

DR = detailed recording (scaled drawings, photographs, and written descriptions) SC = surface collections

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EX = test excavations

\*\*Possible functional interpretation

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### APPENDIX B

Site/ Feature	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value Mode Assess,			Field Work Tasks			
Number			R	I	C	DR	SC	EX	
7	Complex (2)	Habitation/Ag.	Н	L	L	+	-	+	
Α	Enclosure	B.		_	_				
В	Enclosure								
8	Complex (3)	Habitation/Ag.	М	L	L	+	_	+	
Ă	Enclosure	THOMADOWAS.	141	4	L	т	-	4	
	Enclosure								
B C									
C	Enclosure								
9	Complex (3)	Habitation/Ag.	М	L	L	+	-	+	
Α	Overhang								
В	Enclosure				•				
С	Enclosure								
10	Complex (7)	Habitation/Ag.	н	L	L	+	-	+	
Ă	Enclosure	THOMANOWAS.	11			Ŧ	-	1.	
В	Enclosure								
Ç	Enclosure								
D	Enclosure								
E	Enclosure				-				
F	Enclosure								
G	Platform								
11	Terrace	Habitation/Ag.	М	L	L	+	-	÷	
12	Wall	Animal Control	L	L	L	-	-	-	
13	Complex (6)	Habitation/Ag.	н	L	L	÷	-	÷	
Α	Enclosure								
В	Enclosure								
С	Enclosure								
D	Enclosure								
Ē	Enclosure								
F	Enclosure								
14	Enclosure	Habitation	М	L	L	+	-	÷	
16	Complex (3)	Habitation/Ag.	м	L	L	+	-	+	
A	Enclosure		748			٠		•	
B	Enclosure								
C	Enclosure								
L	Enclosure								
19	Complex (4)	Habitation/Ag.	н	L	L	+	+	+	
Α	Enclosure		-						
В	Enclosure		-						
С	Enclosure								

SUMMARY OF IDENTIFIED SITES AND FEATURES — KEOKEA (cont.)

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### APPENDIX B

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Site/	Formal Tentative					(cont.)					
Feature	Site/Feature	Tentative Functional		CRM Value Mode Assess.				Field Work			
Number	Туре	Interpretation	R		C	DR					
20 A B . C	Complex (3) Enclosure Terrace Enclosure	Habitation/Ag.	М	L	L	+	-	÷			
21 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	н	L	L	+	-	+			
25 A B C D E F	Complex (6) Enclosure Wall Enclosure Enclosure Enclosure Wall	Habitation/Ag./ Animal Control	н	L	L	+	-	+			
26 A B	Complex (2) Enclosure Platform	Habitation/Ag.	М	L	L	+	-	+			
27 A B	Complex (2) Overhang Enclosure	Habitation/Ag.	М	М	L	÷	-	÷			
29 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	н	М	м	+	-	+			
30	Heiau	Religious/Heiau	н	н	н	+	-	+			
31	Enclosure	Habitation	М	L	L	+	-	+			
32	Тепасе	Habitation	М	L	L	÷	-	+			
35 A B	Complex (2) Enclosure Overhang	Habitation/Ag.	н	L	L,	+	-	+			
36 A B C D E	Complex (5) Enclosure Enclosure Enclosure Enclosure Enclosures	Habitation/Ag.	н	L	L	+	-	÷			

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# APPENDIX B

Site/ Formal Feature Site/Feature		Tentative Functional		CRM Value Mode Assess.			Field Work Tasks		
Number	Туре	Interpretation	R	I	C	DR			
39	Overhang	Habitation	M	L	L	+	+	+	
40 A B	Complex (2) Enclosure Overhang	Habitation	Н	М	L	+	-	+	
41	Overhang	Temp. Habitation	М	L	L	+	-	+	
42	Enclosure	Habitation	н	L	L	+	-	+	
44 A B C D	Complex (4) Enclosure Enclosure Enclosure Enclosure	Habitation/Ag.	н	L	L	+	-	+	
45	Enclosure	Habitation/Ag.	М	L	L	+	-	+	
46 A B C D	Complex (4) Structure Enclosure Enclosure Enclosure	Habitation/Ag.	М	L	L	+	-	+	
48 A B C D	Complex (4) Enclosure Enclosure Enclosure	Habitation/Ag.	H	Н	н	+	•	+	
50 A B C	Complex (3) Enclosure Enclosure Enclosure	Habitation/Ag.	М	L	L	+	-	+	
51	Enclosure	Habitation/Ag.	м	L	L	+	-	+	
52 A B	Complex (2) Enclosure Paved Area	Habitation/Ag.	М	L	L	+	-	+	
53 A B	Complex (2) Enclosure Terrace	Habitation/Ag.	М	L	L	÷	-	+	
54	Enclosure	Habitation/Ag.	М	L.	L	+		+	

# SUMMARY OF IDENTIFIED SITES AND FEATURES ---- KEOKEA (cont.)

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## APPENDIX B

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Site/	Formal	Tentative	CRM Value				 Fi	eld Work		
Feature	Site/Feature	Functional	Mode Assess.					Task		
Number	Туре	Interpretation		R	I	C	DR	SC	EX	
55 A	Complex (3) Enclosure	Habitation/Ag.		н	L	L	+	-	+	
В	Overliang									
С	Enclosure									
57	Enclosure	Habitation/Ag.	i	М	L	L	+	-	÷	
59	Enclosure	Habitation/Ag.	· 1	М	L	L	+	-	÷	
60	Wall	Animal Control	I	<u>_</u>	L	L	~	-	-	
62 A B C	Complex (3) Enclosure Enclosure Enclosure	Relig./Habit. Ag./Burial	I	H	H	н	+	-	+	
•	2.10103010									
63	Wall	Animal Control	L		L	L	-	-	-	
<b>64</b>	Enclosure	Habitation/Ag.	N	Л	L	L	+	-	+	
65 A B C D E F G	Complex (7) Enclosure Walls Enclosure Enclosure Enclosure Enclosures Enclosure	Habitation/Ag.	F	I	L	L	+	-	+	
69	Enclosure	Water Tank	M	ſ	L	L	+	+	-	
70	Тептасе	Agricultural	М	ſ	L	L	+	+	+	
71 A B C	Complex (3) Enclosure Enclosure Mound	Burial**/Habit.	M/I	H	L	L/H	+	•	+	
76 A B	Complex (2) Terrace Wall	Habitation/Ag.	М	[	L	L	+	-	÷	

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# APPENDIX B

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Site/ Feature	Formal Site/Feature	Tentative Functional	-	M Val le Ass		Field Work Tasks			
Number	Туре	Interpretation	R	I	C	DR	SC	EX	
78	Complex (6)	Rel."/Hab./Ag.	Н	н	н	+	+	+	
A	Terraces	Kel. /Hau./Ag.	**	••	**	•	•	·	
B	Тепасе								
Ĉ	Platform								
D	Complex								
E	Enclosure								
F	Enclosure								
7 <del>9</del>	Enclosure	Agriculture	М	L	L	+	-	+	
80	Wall	Animal Control	L	L	L	-	-	-	
81	Complex (2)	An. Contr./Ag.	м	L	L	+	-	+	
A	Enclosure								
В	Enclosure								
84	Wall	Indeterminate	М	L	L	+	-	+	
85	Walls & Terraces	An. Contr./Ag.	M	L	L	+	-	+	
87 A	Complex (2) Platform	Burial	н	L	н	+	-	+	
В	Mound			_	-				
89	Тептасе	Habitation	М	L	L	+	-	+	
90	Enclosure	Habitation	н	L	L	+	-	+	
95 A B C	Complex (3) Enclosure Terrace Wali	Habit./Ag.	М	L	L	+	-	+	
96	Enclosure	Habitation	м	L	L	+	•	+	
97	Wall	Agricultural	м	L	L	÷	-	÷	
98	Enclosure	Habitation/Ag.	М	L	L	+	-	+	
<del>99</del>	Enclosure	Habitation	м	L	L	+	•	+	
100	Wall	Animal/Control	L	L	L	-	-	-	

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# APPENDIX B

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Site/ Feature	Formal Site/Feature	Tentative Functional		LM Va de Ass		Field Work Tasks			
Number	Туре	Interpretation	R	I	C	DR	SC	EX	
101	Mounds & Wall	An. Control/Ag.	М	L	L	+	-	+	
102	Terrace & Wall	Habitation/Ag.	м	L	L	÷	-	+	
103	Overhang	Habitation/Ag.	М	L	L	+	-	+	
105	Enclosure	Habitation/Ag.	н	L	L	÷	-	+	
106	Stone	Tool Manufac.	М	L	L	÷	÷	÷	
107	Overhang	Burial/Ag.	н	Ľ	н	+	+	+	
108	Enclosure	Habitation	М	L	L	+	-	+	
109 A B	Complex (2) Overhang Terrace	Agriculture	М	L	L	+	-	+	
110	Wall	Agricultural	М	L	L	+	-	+	
111 A B C	Complex (3) Overhang Terrace Overhang	Habitation	М	L	L	+	-	+	
112 A B C	Complex (3) Overhang Enclosure Wall	Habitation/Ag. Animal Control	М	L	L	÷	•	+	
115 A B	Complex (2) Enclosure Enclosure	Habitation	H	н	М	÷	-	÷	
116 A B	Complex (2) Enclosure Enclosure	Animal Control	М	L	L	+	-	÷	
118 A B C	Complex (3) Enclosure Enclosure Enclosure	Habitation/Ag. Animal Control	М	L	L	+	•	÷	

# SUMMARY OF IDENTIFIED SITES AND FEATURES — KEOKEA (cont.)

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# APPENDIX B

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Site/ Feature	Formal Site/Feature	Tentative Functional		M Va de As		Fi	eld Wo Tasks	
Number	Туре	Interpretation	R	I	<u>c</u>	DR	SC	EX
120 A B C	Complex Paved Terrace Lava Tube Enclosure	Habitation/Ag.	М	L	L	+	-	+
124 A B C	Complex (3) Enclosure Overhang Enclosure	Habitation/Ag.	М	L	L	+	-	+
127 A B	Complex (2) Enclosure Overhang	Habitation/Ag.	М	L	L	+	-	+
130	Enclosure	Habitation/Ag.	М	L	L	+	-	+
131 A B C	Complex (3) Overhang Enclosure Enclosure	Habitation/Ag. Animal Control	М	L	L	+	•	+
134	Enclosure	Religious"/ Habitation	H	L	М	+	-	÷
135 A B	Complex (2) Lava Tube Wall	Habitation/Ag.	М	L	L	+	-	÷
137	Enclosure	Habitation/Ag.	М	L	L	+	-	+
140 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	М	L	L	+	-	÷
142	Enclosure	Habitation/Ag.	н	L	L	+	-	+
143 A B	Complex (2) Enclosure Overhang	Habitation/Ag.	М	L	L	+	-	+
1 <b>46</b>	Enclosure	Habitation	М	L	L,	+	-	÷
148 A B C D	Complex (4) Enclosure Enclosure Enclosure Enclosure	Habitation/Ag.	М	Ļ	L	+	-	+

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# APPENDIX B

# SUMMARY OF IDENTIFIED SITES AND FEATURES — KEOKEA (cont.)

Site/ Feature	Formal Site/Feature	Tentative Functional	_	M Val le Ass			id Wo Tasks	5
Number	Турс	Interpretation	R	I	С	DR	SC	EX
149	Overhang	Habitation	М	L	L	+	-	+
152 A B	Complex (2) Platform Enclosure	Habitation/Ag.	н	L	L	+	-	÷
200	Overhang	Habitation	М	L	L	+	-	+
201	Enclosure	Habitation	М	L	L	+	-	+
202	Enclosure	Habitation	м	L	L	+	-	+
203	Enclosure	Habitation/Ag.	н	L	L	+	•	+
204	Enclosure	Habitation	м	L	L	÷	-	+
205	Overhang	Habitation	М	L	L	+	-	+
206	Lava Tube Enclosure	Habit.**/Ag.	М	L	L	+	-	+
207	Sink	Burial/Habitation	н	L	L	+	+	+
208	Enclosure	Habitation	М	L	L	+	-	+
209	Enclosure	Agricultural	м	L	L	+	-	+
210	Overhang	Habitation	м	L	L	+	-	÷
211	Тептасе	Habitation	М	L	L	+	-	+

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# APPENDIX C

# LIMITED HISTORICAL DOCUMENTARY RESEARCH KEOKEA AND WAIOHULI SUBDIVISIONS INVENTORY SURVEY by Helen Wong Smith, B.A.

Keokea and Waiohuli Subdivisions are situated in the ahupua'a of Keokea and Waiohuli, Makawao District (Kula), Island of Maui. Makawao can be translated: "Watchful eyes of Wa-o" (timeless or eternity). Sterling (n.d.) notes that "Makawao includes the ancient districts of Hamakualoa and Hamakauapoko..." For this reason, historical citations regarding Hamakuapoko and Hamakualoa are included within this report.

This report includes information obtained from the usual historical sources found in libraries, and information from other sources such as land and tax records, archaeological reports, maps, and various other manuscripts. Much information was obtained from the files of the Maui Historical Society, which houses the personal notes of E. Sterling and I. Ashdown. The information in this report is organized into five sections: Early Historical Accounts, <u>Heiau</u> in the Project Area, Land Commission Award (LCA) Information, Land Use and Tenure Information, and Informant Interviews.

# EARLY HISTORICAL ACCOUNTS

Early accounts concerning the Makawao District generally either describe the area or relate early historical events. Areal descriptions usually concern the atmosphere or weather. Ashdown (n.d.) writes, "kula-o-ka-ma'o-ma'o or Land of Mirages, where lost souls wandered until they could find their way to rest." The rain of Makawao is described by Mrs. Miverva Kalama to Sterling (n.d.) in this way: "'ukiu rain = a soft drizzle (the ua Kama'aina of Makawao) when the kiu rain cloud from Makawao meets the Naulu rain cloud from Kula then the rain comes, the typical Makawao rain."

A passage in Edward G. Beckwith's <u>Journal of a Tour</u> <u>on Maui</u>, also speaks of the unusual Makawao rain (Sterling n.d.):

We noticed a peculiar meteorological phenomen through the whole ride. The trade wind which blows from the ocean across the Northwestern slope of Haleakala, is highly charged with vapor, which is condensed by the cool mountian air, and falls in abundant rains over the region of Makawao. Along the west side of the mountains about half way to the summit, lay a long line of cumulo stratus clouds, and between this and the nimbus there was but little space. The former lay along side of the mountain, apparently immovable, while the latter would advance and recede, now coming very near and coquettishly scattering its shining rain-drops beneath the very head of immovable cumulus, and now retreating as though afraid of its more dignified companion. While mentioning this latter peculiarity to a gentleman this evening, he remarked that it was this feature of the clouds which gave the place its name - Makawao, Mako=to be afraid, wao=a cloud (HMCS June 5, 1854). [Sterling notes that this is incorrect, that "afraid translates <u>maka'u</u> and <u>ao</u> is cloud. Pukui et al (1974) indicates the literal translation of Makawao is "forest beginning."

The Sterling and Ashdown manuscripts also provide these two descriptions of Makawao. Sterling's description is somewhat poetic; Ashdown's description is curiously intermixed with what may be a legend:

"O native sons of those sections, the ones who watch for the dancing (haa) of the naked ones (olohe) on the plains of Kama'oma'o, where the iwa birds dwell in the ukiuku rain of Makawao..." S. W. Nailiili "E noho ana oe e oe ehoolono iki mai ana" Ke Au Okoa, Nov. 6, 1865, <u>Hamakuapoko and Hamakualoa</u> (Sterling n.d.).

In the area of Wahine'oma'o (now called the "Baseball Park" above the modern Poli-Policamp) and nearby Lua-ma-ma-ne, was a structure said to be for bird catching ceremonies because that region was full of birds. The 'Oma'o bird is known as the Hawaiian Thrush, and they were plentiful and provided green feathers. The Woman of 'Omao' dwelt at Mamane and she was called Mamao because she was of such very high rank. She was so sacred that others must keep their distance. A handsome lesser chief fell in love with her beauty and tried to win her. Of course this was kapu. Her heart was heavy with the knowledge that because he came near to her shadow he had to be punished. A high priest conducted ceremonies of purification at the temple there and revived happiness. Today the Mamane trees are stunted and soon the foreign s such as California Redwood, Norfolk Pine

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#### APPENDIX C

and others will be replacing the former green verdure (Ashdown 1971:46).

In 1873, Isabella Bird toured the Hawaiian Islands and wrote of her experiences to her sister back home in Edinburgh. These are her impressions of Makawao:

It is very pretty here, and I wish all invalids could revel in the sweet, changeless air. The name signifies "ripe bread-fruit of the gods." The plantation is 2000' above the sea, and is one of the finest on the islands; and owing to the slow maturity of the cane at so great a height, the yield is from 5 to 6 tons an acre. Water is very scarce; all that is used in the boiling-house and elsewhere has been carefully led into concrete tanks for storage, and even the walks in the proprietor's beautiful garden are laid with cement for the same purpose. He has planted many thousand Australian eucalyptus trees on the hillside in the hope of procuring a larger rainfall, so that the neighbourhood has quite an exotic appearance. Below, the coast is black and volcaniclooking jutting into the sea in naked lava promontories, which nature has done nothing to drape (Bird 1974:228).

Early accounts which mention Makawao in relation to early historical events include those by historians Kamakau and Fornander:

When Kekaulike heard that Alapa'i, the ruling chief of Hawaii was at Kohala on his way to war against Maui, he was afraid and fled to Wailuku in his double war cance named Ke-aka-milo. He sailed with his wives and children..., his officers, war leaders, chiefs, and fighting men, including warriors, spearmen, and counselors. Some went by cance and some overload, and the fleet landed at Kapa'ahu at the pit of 'Aihako'ko in Kula [old name for Makawao]. Here on the shore the chiefs prepared a litter for Kekaulike and bore him upland to Haleki'i in Kukahua (Kamakau 1961:69).

Ke-a-ulu-moku was another celebrated man of Kalaniopu'u's day. His father was the great chief Kau-ua-kahi-akua-nui, son of Lono-maka'ihonua and Kaha-po'ohiwi, but his mother belonged to Naohaku in Kohala. He was celebrated as a composer of war chants, chants of praise, love chants, prophetic chants, and genealogical chants. When he went back to Hawaii with Kalaniopu'u he was homesick for the two Hamakua districts of Maui [Hamakua is within Makawao District] here he had lived with Kamehameha-nui and Kahekili. His love for the place found expression in a chant he composed, of which the following is an excerpt:

Affectionate longing, ibid Aloha, Aloha Affection for my Aloha wale o'u (foster) parents, maku-a la my parents, e o'u makua, Affection for my Aloha wale o'u parents makua Who belong to Mai na 'aina Hamakua, Hamakua, The two districts of He mau 'aina Hamakua Hamakua elua, No'u mua kaikua'ana Where my elder brothers live. i naho ai. My hillside trails are theirs He ala pali na'u he

mau ali'i ia to rule (Kamakau 1961:112).

During the fleeing of Kekaulike, Kahekili was carrying on the war on Oahu and suppressing the revolt of the Oahu chiefs, (Kamakau dates this 1785) a serious disturbance on Maui had occurred which gave him much uneasiness. It appears that he had given the charge of his herds of hogs that were running in the Kula district and on the slopes of Haleakala to a petty chief named Kukeawe. This gentleman, not satisfied with whatever he could embezzle from his master's herds, made raids upon the farmers and country people of Kula, Honuaula, Kahikinui, and even as far as Kaupo, robbing them of their hogs, under pretext that they belonged to Kahekili. Indignant at this tyranny and oppression, the country people rose in arms and a civil war commenced. Kukeawe called the military forces left by Kahekili at Wailuku to his assistance; a series of battles were fought, and finally Kukeawe was killed at Kamaole-i-kai, near Palauea, and the revolted farmers remained masters of the situation (Fornander 1969:228).

This uprising of the country people was called the "Battle of the pig-earing Ku-keawe" ('Aipua'aa-Ku-keawe) (Kamakau 1961:142).

# HEAIU IN THE PROJECT AREA

Three <u>heiau</u> are present in Keokea project area— Molohai, Papakea, and Kaumiumimua <u>heiau</u>. Molohai <u>heiau</u>, situated at an elevation of 2,275 feet above sea level, was initially described by Walker (n.d.), who described 26 <u>heiau</u> in the Kula region of which Molohai is the fourth

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largest. Walker about 1930 listed Molohai heiau as being 65 by 90 ft and constructed of rough <u>a'a</u>. Walker surmised that the <u>heiau</u> was probably originally L-shaped; however, this could not be determined definitely, as the <u>heiau</u> had deteriorated and portions of it had been rebuilt as a modern wall. According to Walker, the front of the <u>heiau</u> was double terraced, and within it were a large court and a platform, set off by a low wall. In 1973, the Historic Sites office recorded the <u>heiau</u> as including narrow, terraced platform steps along the walls, three stone mounds, an alignment of stones, and a rectangular platform. Due to its size and good condition, Molohai <u>heiau</u> has been placed on the State Register of Historic Places.

Papakea <u>heiau</u> is situated <u>mauka</u> of Molohai at an elevation of 2,300 ft above sea level. Walker (1931) describes the <u>heiau</u> as "an open platform of a'a construction 45'x88'...the front double-terraced to a height of 4'...some coral seen but no pebbles." While surveying the <u>heiau</u> in 1973, a Historic Sites office archaeologist was told by a local informant that a house and cistern once stood on the site. The archaeologist and informant surmised that rocks from the <u>heiau</u> were utilized in constructing the cistern and that Walker's measurement of the <u>heiau</u> excluded the property line of the house. Ashdown (1971:46) cites this <u>heiau</u> as a fishing shrine.

Kaumiumimua <u>hejau</u>, according to M. Riford (1987), is situated <u>makai</u> of Papakea, on a large gully overlooking Ma'alaea Bay. In 1931, Walker commented that the <u>hejau</u> had been much disturbed and that the remains of a platform were present in the northern corner and near the entrance. A survey of the <u>hejau</u> by the Historic Sites office in 1973 indicated that the east and south walls evidence two and possibly three separate construction periods.

Ashdown (1971:46) mentions other <u>heiau</u> in Keokea and Waiohuli—Ho'ola and Ho'oula Ua <u>heiau</u> in Keokea and Kaimupeelua <u>heiau</u> in Waiohuli. Ho'ola <u>heiau</u> (Health temple) is situated just behind the Kula Sanatorium. Ashdown writes, "Ho'oula Ua <u>heiau</u>," a place for praying and offering gifts to bring rain." She also writes, "long before the forest was denuded...near Polipoli Spring area, there was farm where <u>'awa</u> was cultivated and there stood a temple to Lono." Kaimupeelua <u>heiau</u> is located in the Waiohuli project area. Although the <u>heiau</u> originally measured 17 by 25 meters, much of it has been reduced to rubble by cattle (Historic Sites Register 1973).

Other <u>heiau</u> mentioned by historic writers in the Makawao district include Kailua <u>heiau</u> (Thrum 1909:44), and Pa'uhu, Mahea, Kaumuopahu (or Kaunuopahu), Po'onahoehoe and Mana <u>heiau</u>. The latter <u>heiau</u> is now part of a modern cemetery (Ashdown 1971:57).

#### LAND COMMISSION AWARDS

Although there were many small parcels granted in Keokea and Waiohuli, the Indices states that Keokea was Crown Land from the beginning and that Waiohuli was approved as such in 1890 by Kalakaua. The numerous parcels may be a result of an experiment conducted by the Kamehameha III's administration prior the Greaty Mahele concerning trial fee ownership runs. Kuykendall (1968:283) recounts the reasons for such trial fee ownership runs:

It will be remembered that the year 1845, during which the new land law was written and in part enacted, was disturbed by an anti-foreign agitation, accompanied by a rather pointed suggestion that lands be given or sold to the common people and that the legislative committee, in its reply to the petitions of the people, approved the idea of selling land to Hawaiian subjects. This was directly in line with suggestions contained in Dr. Judd's report as minister of the interior, and there were frequent allusions to the subject in the proceedings of the legislature. The agitation among the people probably hastened the decision of the goverment to make an experimental beginning without waiting for the new law to go into operation. The places selected for the experiment were the Makawao district of Maui and Manoa valley on Oahu.

During the King's tour of Maui in December, 1845, and January 1846, the party visited Makawao and it was announced that the entire district, with the exception of McLane's plantation, was to be offered for sale to the people in fee simple. Rev. J.S. Green, pastor of the Hawaiian church at Makawao, undertook to manage the business of selling the land. In afterwards relating his experience in connection with the project, Green said he called the people together, showed them his instructions from the goverment, and explained the plan to them.

A few of them purchased at once, others had less confidence that lands thus purchased would be secure, but soon abandoned their scruples, while others still could not for a long time, be persuaded that there was not some catch about it—some design to enrich the chiefs at their expense. But nearly all of these were finally talked out of their suspicions & took up each a small piece of land.

\* Letter in Polynesian, July 14, 1849.

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Another missionary, Rev. Richard Armstrong, assisted the enterprise by making surveys. The land was sold at \$1 per acre, and nearly a 100 parcels were taken up, most of them ranging from 5 to 10 acres. Altogether about 900 acres were purchased by the people of the district.

In a report by Riford (1987), 11 Land Commission Awards (LCA) either within or bordering the Keokea parcel and eight LCAs within the Waiohuli parcel are listed. The bulk of the parcels is designated as kula land and houselots (1987). Kula land is described by Handy and Handy (1972:510) as "open country, or plain, as distinct from valley ... and has often been used as a term to distinguish between dry, or 'kula land' and 'wet-taro land'". As indicated in Kuykendall's account, kula plots were cultivated for personal use, but many tenants were involved in ranching and cash crops. A map of the project area showing LCA locations was obtained from the Tax Map Bureau in Honolulu (Figure A-1; "Portion of Kula, Makawao, Maui TMK 2-2-02"). The map shows nine LCAs within or abutting Keokea and Waiohuli. LCA 8452:19, in the ahupuaa of Koheo 1 and 2, abuts the Waiohuli project area on the northern side.

### LAND USE AND TENURE

In their discussion of Hawaiian sweet potato planting techniques, Handy and Handy (1972) mention the Kula area of Maui and describe it as "[w]here potatoes are planted in crumbling lava with humus, as on eastern Maui and in Kona, [in] Hawaii the soil is softened and heaped carelessly in little pockets and patches using favorable spots on slopes...[r]ocky lands in the olden days were walled up all around with the big and small stones of the patch until there was wall (kuaiwi) about 2' high" (Handy and Handy 1972:131).

Handy (1940:161) also mentions Kula in his early work entitled The Hawaiian Planter:

KULA was always an arid region, throughout its long, low seashore vast stony kula lands, and broad uplands. Both on the coast, where fishing was good, and on the lower westward slopes of Haleakala a considerable population existed. So far as I can learn Kula supported no Hawaiian taro, and the fisherman in this section must have depended for vegetable food mainly on poi brought from Waikapu and Wailuku across the plain to supplement their sweet potato staple diet.

Kuykendall (1968:313) writes of the time when Kula crops turned from subsistence crops to commodities:

...Before that time the whalers had created a limited market for fresh vegetables, fresh meat, and fruit; the great increase in the number of whaleships after 1840 caused a corresponding increase in the demand for such products of the soil. In bulk and value, potatoes (sweet and Irish) ranked first in this traffic. In the early days only sweet potatoes had been obtainable at the islands, but after 1830, if not sooner, cultivation of the Irish potato was taken up and during the 1840s and 1850s became of great importance. It was shortly before 1840 that Irish potatoes were first raised in the Kula district, which proved to be so well adapted to them that it soon came to be called the "potato district." Jarves describes the region as it appeared to him in July 1846:

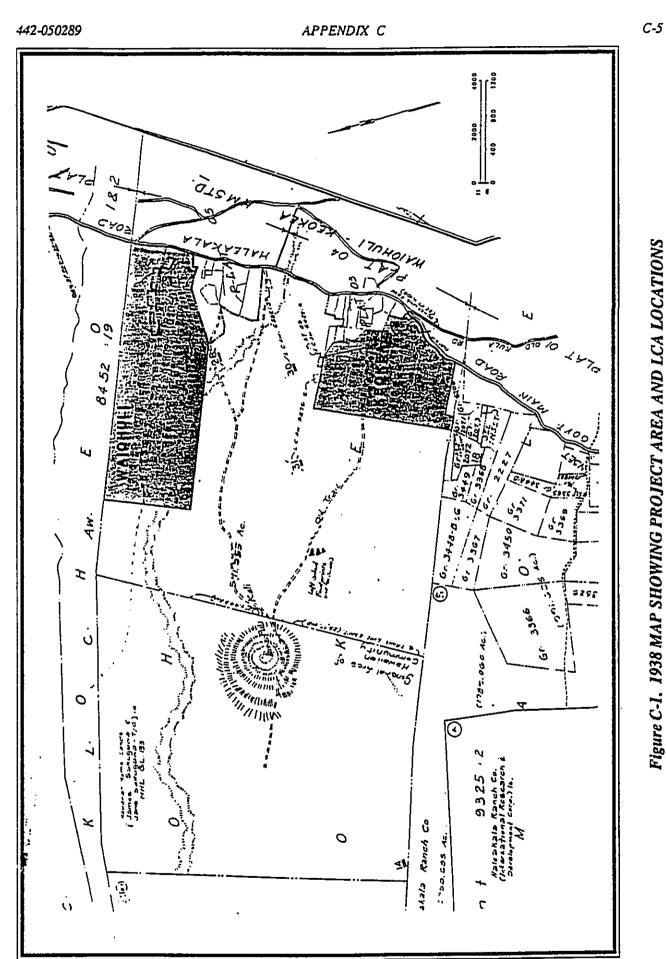
> It ranges along the mountain (Haleakala) between 2000 and 5000 feet elevation, for the distance of 12 miles. The forest is but partially cleared, and the seed put into the rich virgin soil. The crop now in the ground is immense. The fields being all in blossom have a fine appearance, spreading as they do, over the broad surface of the mountain.

From this upland region the potatoes were carried down to the shore and taken to Lahaina or were sold directly to ships which called at Kalepolepo. In the spring of 1847 it was estimated that the crop would amount to 20,000 barrels...In 1854, G.D. Gilman estimated that the local Hawaiian market, including whaleships, could be depended on to consume about 20,000 barrels of Irish potatoes.

The influx of gold seekers together with the comparative neglect of agriculture in California created a demand for potatoes and other vegetables, as well as for sugar, molasses, and coffee, which began to be felt strongly in 1847, but the potato "boom" commenced in the fall of 1849. At the beginning of November a correspondent wrote from Maui to the Polynesian:

The call for [potatoes] is loud and pressing, as some vessels bound for California have taken as many as 1,000 barrels each. The price is high, and the probablity is that the market can not be supplied this autumn. Kula, however, is full of people. Strangers from Wailuku, Hakamakua, and Lahaina are there

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preparing the ground and planting, so that if the demand from California shall be as urgent next spring as it is now the people will reap arich harvest...They often repeat the saying of a foreigner, who after visiting the mines of California, came back to Maui quite satisfied, and said to his neighbors at Waikapu, "California is yonder in Kula. There is the gold without the fatigue and sickness of the mining country."

The foreigner's remark caught the fancy of the Hawaiians and they were soon referring to Kula as "Kalifonia" or "Nu Kalifonia" and working with great diligence to extract the wealth from the rich pay dirt on the slopes of Haleakala. To encourage the spirit of enterprise which had been thus awakened among the native people, the privy council voted to have the government lands in Kula surveyed and divided into small lots of from 1 to 10 acres and offered for sale to the natives at a price of \$3/acre (see page 5 of this report) (1968:321).

C. Speakman, in his book entitled <u>MOWEE</u> also mentions the fervor of cash-cropping:

During the gold rush, hundreds of Hawaiians were going into business for themselves on Mauigrowing potatoes and hauling them to the port where they were snapped up and shipped to San Francisco. The Maui fields were called Nu Caliponi, or New California; potatoes were gold, and a fortune could be dug out of the ground by one man. The potato boom was short lived, and, when the prices dropped, the Hawaiians lost interest. Perhaps the problem was that Hawaiians did not share the white man's concept of time (1978:116).

The Chinese were among those who took advantage of this agricultural opportunity. During the 1840s, Chinese farmers leased lands in Kula. Their initial success motivated many Chinese to move to that region and lease land for farming. They moved from places such as Makawao, Paia, and Wailuku on Maui, Kohala on the Big Isle, and from Honolulu. Some went to Kula directly from China. The vast majority of Chinese, about 95%, were Hakkas from Kwangung Province. During the 1840s, most Kula Chinese acquired their farmland by lease or deed from the <u>haole</u> ranchers or Hawaiian homesteaders. Much of this land was owned by the Hawaiian govenment, which leased it to the ranchers, who in turn subleased it to the Chinese. In some cases, the farmers made their lease payments in farm produce, in lieu of monetary transaction. One family which leased land

from Ulupalakua Ranch paid five bags of corn for every acre of land they farmed (Interview, Willie Fong IN Mark 1975). Although by the mid-1850s, the demand for Kula potatoes had diminished, the Chinese population continued to grow. By between 1880 and 1910 approximately 80 Chinese families had moved to Kula; by 1900 there were some 700 Chinese living there. For a period of 30 to 40 years, Kula supported a thriving community which included Chinese and English schools, Christian churches, a Hung Men society, gambling joints and opium dens, general stores, and dozens of operating farms and cattle ranches (Mark 1975).

In addition to Irish potatoes, the Kula farmers planted corn, beans, onions, Chinese cabbage, round cabbage, sweet potatoes, wheat and other grains, and even cotton. When the Hawaiian market showed no demand for corn, the farmers used the corn to raise pigs, ducks and chickens, and marketed the animals instead. When the corn, potatoes, and other crops were harvested, they were packed and transported on mule teams or wagons to Kahului and Makena harbors, and were then shipped to Honolulu. Those who lived in the southern districts of Keokea and Kamaole usually brought their produce to the Makena landing. Most of Kula's produce, poultry, and beef was sent to two or three markets in Honolulu Chinatown, including Wing Hong Yuen and Sing Loy. The two stores, in turn, supplied Kula's general stores with Chinese dry goods and staples such as rice, flour, sugar, and canned milk (Mark 1975).

Early farming in Kula was adapted to the topography. In planting crops, rather than terracing the land, the farmers followed the natural contour of the land and depended on moist air and rainfall rather than irrigation. Until 1905, there was little water piped into the area, and during droughts which occurred every several years—the farmers had to pack barrels of water on mules from Polipoli Springs, or from the beach or Olinda, both about 8 miles away (Mark 1975). An article in newspaper <u>The Honolulu Advertiser</u> points out the changes in the topography in Kula and its affect on the water supply:

Before 1850 Kula was supplied with moisture naturally through the existence of a large forest. "That forest was cut down when land was cleared in Kula to open farm plots in 1850. This was in answer to the demand for food in California during the gold rush....by ranchers clearing for pasture." Secondary result of clearing forests was destruction of existing fresh water ponds in Kihei on the Maaloaea (sic) Bay coast below Kula. When forest was cleared, water was free to rush down the mountains carrying soil from Kula and filling with

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mud, the ponds for which Kihei was once famous. Meanwhile Kula is dependent on pipe from Waikamoi watershed (Korte 1962 A:15).

In 1905 the Kula Pipeline was built during perhaps the worst drought in Kula history. The water source for the pipeline was discovered in Olinda, northeast of Kula. The contractor who built the pipeline was a prominent Kula resident named Shim Mook, and labor was supplied by the men and women of the area (Mark 1975).

In 1911 the Hawaiian government released a large amount of public land, and it became possible for citizens to purchase property in Kula. The sale of the land was advertised in English and Hawaiian newspapers, but word was somehow not communicated to the Chinese, whose lives these land sales would most affect. According to the Hawaiian Church Chronicle (Oct. 1911:12), the Kula Chinese "were not aware of what was taking place until the land was sold and the Hawaiians came and told them that the property belonged to them. They (Chinese) had relied on the information which they had received that the disposal of the land would not take place for a considerable time." Faced with eviction, the Kula Chinese decided determinately to remain on the land and organize themselves. Ninety-eight young residents signed a petition expressing the desire of the Chinese to be allowed to reside on certain lots their families had farmed for many years. In a letter to the Commissioner of Public Lands dated September 27, 1911, Governor Frear suggested that leases be made to occupants of unsold lots for approximately 10 years, subject to withdrawal for homestead purposes. Then, as the older children of those families reached 18 years of age, they would be able to apply for the lots as homesteads. In October 1911 the Hawaiian Church Chronicle reported that the government had promised to do so under these terms. Chinese who applied for homesteads and were granted them were given three years to improve their lot ... after that period, they could apply for a "right of purchase" lease, and then buy the land outright from the government. Before this special arrangment was arrived at, however, a number of Kula farmers saw their land divided into homesteads and leased to others. These farmers, with the loss of their farmland, were forced to move out of Kula and change their livelihoods.

During the 1910s and 1920s many families left Kula for various reasons: severe drought which ruined crops and killed livestock, soil which was reaching depletion level after years of harvesting and tilling, lack of educational opportunities for children, and loss of land due to parceling homesteads. In 1918 another mass exodus occurred—some 40 families left Kula because the land they were leasing was sold to a man named Harold Rice, who intended to use the land for ranching. In the book <u>Mowee</u>, the author writes regarding the sale of farms to Rice: "The leases to the land had not expired, but the farmers were unaware of their right to challenge the eviction" (Speakman 1978:143). It is some of this land that Rice acquired from the farmers that made up Kaonoulu Ranch, in which the project area resides.

In the early 1970s, 35% of Hawaii's vegetables were grown in Kula, including a large percentage of the state's head lettuce, dry onions, and tomatoes. Much of the remaining land was devoted to livestock breeding by about 20 full and part-time ranchers (Project Measure Work Plan - Lower Kula Irrigation Project," Board of Water Supply, Maui County, Sept. 1971) The cash crops in Kula were no longer corn and potatoes, but a variety of vegetable and flowers produced by some 35 family-operated farms ranging in size from five to 50 acres. As of 1975, the agricultural yield of the irrigated soil was still very high (Mark 1975).

Sugar cultivation has played a major role in Honuaula and Makawao. In the spring of 1846 there were six establishments on the western slope of Mt. Haleakala manufacturing sugar and molasses (Kukendall 1968:316). Since the general vicinity of the present project area has been used historically for small farms and ranching, Kula sugar cultivation will not be discussed here.

A report on Kula would not be complete without some mention of Kula Sanatorium, founded for the care of tuberculosis sufferers. The sanitorium is located <u>mauka</u> of the project area at an elevation of 3,000 feet (<u>The Honolulu</u> <u>Advertiser</u> 9/20/85 B:3). Land for the sanatorium was requested by Bill Pogue in 1909. Initially the sanitorium consisted of two tent-houses which accomodated 12 patients. The tent-houses, which included kitchen and dining facilities, was financed by the County and Territory and cost \$500.00. The first permanent ward was built by W.E. Foster, former patient and Superintendent. Around 1932, the Hawaiian Homes Commission granted 100 acres to the sanitorium, and in 1937 a new sanatorium was constructed (Jones 1940).

The following general information relevant to Keokea and Waiohuli <u>ahupua'a</u> is from <u>The Maui News</u>:

3-26-04 - P. Cockett has been appointed manager of Waiohuli Cattle Ranch.

4-27-07 - On last Sunday morning, J.P. Inaina was installed pastor of the Keokea Hawaiian church in Kula. A large audience was present. Rev. I. D. Iaea preached the sermon and Rev. M. Lutero gave the right hand of fellowship. The charge to people and pastor was given by Rev. R.B. Dodge. Rev. D.N. Opunui offered the installing prayer.

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12-16-32 - Formal approval of the newly acquired land in Keokea which is now being turned into a baseball park for the people of Kula, was given by the Board of Supervisors on Thursday. A resolution requesting the Commissioner of Public Lands to effect the exchange of lands between the territory and the owner was adopted by the Board. Slightly over two acres are involved in the transaction.

#### INFORMANT INTERVIEWS

On April 20, 1989 the author, accompanied by Mr. Dan Auwai, Department of Hawaiian Homes Lands - Maui Manager, conducted oral history interviews with two former employees of Kaonoulu Ranch-William Poepoe and Henry Kekiwi. William Poepoe was employed by the ranch for some 46 years and retired in 1983. Mr. Poepoe was born on Ulapalakua Ranch and started working for Kaonoulu Ranch at the age of nine, at which age he planted molasses grass (scattering seeds) for the cattle to feed on. By age 11, he was working full-time for Kaonoulu Ranch. Mr. Poepoe said that Harold W. Rice, the founder of the ranch, owned, in addition to lands leased, over 18,000 acres. After Mr. Rice's death, his son, Oskie Rice, took over. Oskie Rick employed 15 full-time ranch hands. Mr. Poepoe said that the cattle raised on the ranch were taken to Makawao for slaughter. In addition to beef cattle, there were also dairy cattle.

Mr. Poepoe also provided additional information on the general Kula area. According to him, near Pu'u Kali (Red Hill) they grew corn, and within the caldera of Pu'u Kali is a fence that the Army erected during WWII for target practice. On the Kamaole-Keokea border there was once a Hawaiian settlement. Mr. Poepoe said there were paved sidewalks and gravesites there. He once took a tombstone from there, until the foreman asked where he got it and pointed out what it was. He then returned it.

Mr. Henry Kekiwi was the last foreman for Kanoulu Ranch (under Rice ownership). He presently lives in the Foreman's house, which the ranch provided along with five other houses for ranch hands. According to Mr. Kekiwi, when he retired after 42 years with the ranch, the ranch had 2,500 head of canle. Mr. Kekiwi provided general information on the area of the ranch. According to him, stone walls throughout the <u>ahupua'a</u> were built in the 1800s. On ranching practices, Mr. Kekiwi said that the cattle would graze in the lower lands near Pu'u Kali during the winter months, then around June, they would be taken <u>mauka</u>. Mr. Kekiwi noted that Hawaiian Homes Land wraps around the land of a Mr. George Tanji, who has lived on the land many

years growing cabbages and pigs. Mr. Kekiwi also noted that Rice sold <u>kuleana</u> land in the area to a Dupont and that Hawaiians and Chinese would move from Pu'u Kali area to further up Keokea during summer. Mr. Dan Auwai said the name Kaonoulu is derived from Cornwell who originally owned the land. A check with the Hawaii State Archives, however, shows Kaonoulu listed as an 'ili, so the name is most likely traditional.

Driving down the old Haleakala Road starting at Keokea gate, where the agricultural parcels that Hawaiian Homes is allocating are located, Mr. Kekiwi noted that the heiau from second gate left of Haleakala Road had ti leaves growing on its side, which indicates a fresh water supply in the area. He also pointed out many heiau in the general vicinity of Molohai and Papakea in Keokea, and in Waiohuli. He was not privy to the names of any of them nor was he aware of any stories about them. Mr. Kekiwi pointed out that when ranching, one is busy looking for caule, not for heiau. Along Haleakala Trail, which was used by Kaonoulu Ranch extensively during its ownership by the Rice family, he pointed out "footprints" imprinted in the lava rock. These footprints are outside the project area, on the way to Pu'u o Kali, also known as Red Hill (see Figure A-1 for location of footprints and locations of other sites mentioned in the interviews). The footprints numbered three, were of various sizes, and were all of the left foot. During an interview with William Poepoe, he said the right sides to the footprints were somewhere on Molokai. Mr. Kekiwi noted that before the ranch, the land was (probably) inhabited by Chinese; the Chinese used the walls but they were not necessarily built by them. Mr. Kekiwi said that the barbed wire fences along the walls were put up by the ranch hands, especially when parts of a wall would fall off, to prevent the cattle from crossing over. When asked by Mr. Auwai about a barbed wire fence that surrounded a small area outside the project area, Mr. Kekiwi said that it was probably put up by pakalolo growers and not the ranch hands.

#### CONCLUSION

During this century, the project area has been used primarily for cattle grazing, hence the many archaeological sites obscured by grasses and lantana. For the purposes of this report, a general overview of agricultural activities was given. If further historical documentary research is conducted for the project area, it is suggested that a check be made for awards given out during the Kingdom of Hawaii and that the following topics be addressed: prehistoric environment and occupation in the area, as evidenced by historical documents; local and regional cultural (including residential sequences.

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# **APPENDIX D**

# WAIOHULI SITE AND FEATURE DESCRIPTIONS

SITE NOS.: STATE: 2344 PHRI: W-1 BPBM:-FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 7.8 m long by 10.0 m wide; c. 78 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agriculture DESCRIPTION: This feature is a rectangular enclosure. Facing in places on both the inside and outside of the walls. Upright facing stones are present in the northeast and southwest corners. North wall is an alignment. All walls curve outwards. Walls range in height from 10 to 90 cm. Agricultural features, mounds and crude terraces surround the enclosure.

SITE NOS.: STATE: 2345 PHRI: W-2 BPBM: T-6 FORMAL TYPE: Enclosure **TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

**CONDITION:** Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 8.0 m long by 3.6 m wide; c. 29 sq m **PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: This is a long, narrow enclosure. The walls show no signs of having been faced. Near the center of the west wall a short wall segment extends westward for 1.5 meters. Scattered mounds, modified outcrops, and crude terraces surround the feature.

SITE NOS.: STATE: 2039 PHRI: W-3 BPBM: T-7 FORMAL TYPE: Terrace

**TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, kiawe and grasses CONDITION: Good

**INTEGRITY:** Unaitered

DIMENSIONS: 19.6 m long by 10 m wide; c. 196 sq m **PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: This is a complex, rectangular paved terrace with a 1.0 m high faced wall on the northwest. The west wall extends southward beyond the terrace and retains a lower earthen terrace. The paved surface of the terrace overlies 25 cm thick cultural deposit. Alignments border the south and east sides of the earthen terrace. Agricultural

features; crude terraces, mounds and modified outcrops are scattered around the site.

SITE NOS.: STATE: 2346 PHRI: W-4 BPBM: T-8 FORMAL TYPE: Wall TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses CONDITION: Good **INTEGRITY:** Unaltered

DIMENSIONS: 78.0 m long by 1.0 m wide; c. 78 sq m **PROBABLE AGE: Historic** 

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: This site is part of a complex of historic stone walls all of which are associated with a major eastwest drainage. The wall is constructed of stacked boulders and cobbies. It follows the bottom of a narrow drainage. A barbed wire fence begins at the east end of the wall.

SITE NOS.: STATE: 2347 PHRI: W-5 BPBM: ---FORMAL TYPE: Overhang TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, ganini, 'ilima, and grasses ' CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 3.0 m long by 3.8 m wide; c. 11 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Indeterminate DESCRIPTION: This overhang was possibly utilized.

The evidence for use consists of a single boulder which appears to have been placed on the dripline in the center of the entrance. The interior is 1.0 m high.

SITE NOS.: STATE: 2348 PHRI: W-6 BPBM: ---FORMAL TYPE: Lithic Scatter TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 7.3 m long by 2.8 m wide; c. 20 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Lithic Reduction DESCRIPTION: Basalt flakes are on a small bedrock outcrop. The bedrock has scars on it which suggest that a cobble was smashed against it. There are c. 12 flakes (5-10 cm) and numerous smaller flakes on the bedrock.

SITE NOS.: STATE: 2349 PHRI: W-8 BPBM: ----FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, kiawe, and grasses

#### APPENDIX D

**CONDITION:** Fair

INTEGRITY: Altered DIMENSIONS: 5.5 m long by 8.1 m wide; c. 45 sq m

**PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Semi-rectangular structure with some internal facing on the east wall. The walls of the enclosure are collapsed and have been altered both by cattle and bulldozer cuts on the south and SE sides. A wing wall extends SW 2.8 m from the SW corner. The structure walls are compiled of stacked boulders and cobbles up to 70 cm in height. Mounds and modified outcrops are present south of the site.

SITE NOS.: STATE: 2350 PHRI: W-10 BPBM: --FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, kiawe and grasses

**CONDITION:** Good

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INTEGRITY: Unaltered

DIMENSIONS: 6.6 m long by 5.3 m wide; c. 35 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agriculture

DESCRIPTION: T-shaped terrace; at the SW comer of the terrace is an outcrop. The terrace wall is composed of stacked boulders, cobbles and pebbles. It retains a c. 10 sq m area of soil.

#### SITE NOS .: STATE: 2040 PHRI: W-11 BPBM: T-5 FORMAL TYPE: Complex

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

**CONDITION:** Good **INTEGRITY:** Unaltered

DIMENSIONS: 23.0 m long by 18.0 m wide; c. 414 sq m **PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Burial\*/Agriculture DESCRIPTION: This complex includes a C-shaped enclosure, a wall, mounds, and a platform. Some mounds are possible burials; the largest (Feature E) is faced on one side. The C-shaped enclosure is unusual in that it opens to the northeast. Rough terraces, small mounds and modified outcrops, all probable agricultural features, surround the site.

#### FEATURE: A

FORMAL TYPE: C-shaped enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, kiawe and grasses **CONDITION:** Good

INTEGRITY: Unaltered

DIMENSIONS: 3.6 m long by by 2.4 m wide; c. 9 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: C-shaped enclosure open to the NE. Feature is comprised of stacked cobbles up to 40 cm high. A test pit in this feature produced only a few scattered pieces of charcoal, potentially indicating it is not a habitation feature as it's orientation also suggests. The charcoal produced a calendric age range of AD 1270-1490.

FEATURE: B

FORMAL TYPE: Mound TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses **CONDITION:** Good

**INTEGRITY:** Unaltered

DIMENSIONS: 2.0 m long by 1.2 m wide; c. 2 sq m

**PROBABLE AGE:** Prehistoric DESCRIPTION: Mound is roughly circular and rounded in profile. It is comprised of basalt cobbles and boulders stacked 40 cm high. The feature is more substantial than most of the agricultural mounds in the vicinity.

FEATURE: C

FORMAL TYPE: Mounds

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, panini, kiawe

**CONDITION:** Good

INTEGRITY: Unaltered

DIMENSIONS: 8.0 m long by 6.6 m wide; c. 53 sq m

PROBABLE AGE: Prehistoric DESCRIPTION: Four small mounds and one associated rubble wall. This portion of the site appears to be agricultural in nature. The mounds are too small for burials, and the wall appears to be a portion of a collapsed terrace situated along the edge of the drainage. The mounds average 6.5 cm in diameter and 40 cm in height.

FEATURE: D

FORMAL TYPE: Mound

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, panini, kiawe

**CONDITION:** Good

**INTEGRITY:** Unaltered

DIMENSIONS: 1.9 m long by 1.9 m wide; c. 4 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: This is a large mound comprised of stacked basalt cobbles and boulders. It is roughly rectangular in plan and rounded in profile. The mound is 60 cm in height. It is more substantial than most of the agricultural mounds in the vicinity.

#### APPENDIX D

FEATURE: E FORMAL TYPE: Platform TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, <u>panini</u>, 'ilima, and grasses CONDITION: Fair INTEGRITY: Unaltered DIMENSIONS: 3.0 m long by 3.0 m wide; c. 9 sq m PROBABLE AGE: Prehistoric DESCRIPTION: This feature appears to be a mostly collapsed platform which probably contains a burial. The 90 cm high structure is comprised of stacked boulders and cobbles. A c. 2 m long segment of the exterior facing remains intact along the west side. The remaining sides are collapsed. A small piece of decomposing coral is present on the surface of the feature.

FEATURE: F FORMAL TYPE: Mound **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Lantana, grasses, panini, kiawe **CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 1.8 m long by 1.4 m wide; c. 3 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: The is a large mound comprised of stacked basalt cobbles and boulders. It is roughly rectangular in plan and rounded in profile. The mound is 60 cm in height. It is more substantial than most agricultural mounds in the vicinity. SITE NOS.: STATE: 2351 PHRI: W-12 BPBM: --FORMAL TYPE: Terraces TOPOGRAPHY: Dissected alluvial slope VEGETATION: Panini, lantana and 'ilima

CONDITION: Fair INTEGRITY: Unaltered DIMENSIONS: 7.0 m long by 13.2 m wide; c. 92 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Agriculture DESCRIPTION: Three rock-retained terraces arranged in a stepped series. The terraces average 0.4 m in height, 7.0 m long by and 4.6 m wide. Terrace walls incorporate bedrock outcrops. Additional agricultural features, mostly mounds and modified outcrops are present to the southeast. SITE NOS.: STATE: 2352 PHRI: W-13 BPBM: — (Figure D-1)

FORMAL TYPE: Complex TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, <u>wiliwili</u>, 'ilima, <u>kiawe</u> and grasses CONDITION: Good INTEGRITY: Altered DIMENSIONS: 25.0 m long by 20.0 m wide; c. 500 sq m

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PROBABLE AGE: Prehistoric	
FUNCTIONAL INTERPRETATION: Habitation/	
Agriculture	
DESCRIPTION: Two enclosures; one square and the other	
trapezoidal. Associated agricultural mounds and terraces	
surround these features and extend c. 40 m to the northeast.	<b></b>
FEATURE: A (Figure D-1)	
FORMAL TYPE: Enclosure	
TOPOGRAPHY: Dissected alluvial slope	<b>4</b>
VEGETATION: Lantana, panini, 'ilima, and grasses	
CONDITION: Good	
INTEGRITY: Altered	ц.
DIMENSIONS: 8.0 m long by 6.0 m wide; c. 48 sq m	
PROBABLE AGE: Prehistoric	
DESCRIPTION: Trapezoidal enclosure; possible wall	۶
extension off NW corner. Small terrace at NW corner. Most	
of the west wall is collapsed. The SE corner is faced externally. The walls average 40 cm in height, are core-	
filled (filled portion is narrow), and are comprised of	4 -
stacked boulders and cobbles.	
FEATURE: B (Figure D-1)	,
FORMAL TYPE: Enclosure	
TOPOGRAPHY: Dissected alluvial slope	
VEGETATION: Lantana, panini, 'ilima, and grasses	- مو ق
CONDITION: Good	
INTEGRITY: Unaltered	
DIMENSIONS: 6.1 m long by 6.0 m wide; c. 37 sq m	•.
PROBABLE AGE: Prehistoric DESCRIPTION: Square enclosure with core-filled walls.	
The southwest wall consists of a ridge of bedrock. The walls	,
average 40 cm in height. The wall faces are comprised of	
stacked basalt cobbles and boulders. The core-fill is comprised	1.4°
of cobbles.	
SITE NOS.: STATE: 2353 PHRI: W-14 BPBM: —	••
FORMAL TYPE: Complex	•-
TOPOGRAPHY: Dissected alluvial slope	
VEGETATION: Lantana, panini, 'ilima, and grasses	
CONDITION: Fair	
INTEGRITY: Unaltered	
DIMENSIONS: 42.0 m long by 28.0 m wide; c. 1176 sq m PROBABLE AGE: Prehistoric	•
FUNCTIONAL INTERPRETATION: Habitation/	•~~*
Agriculture	
DESCRIPTION: This site includes two enclosures, an L-	
shaped wall, and associated agricultural features.	••
FEATURE: A	
FORMAL TYPE: Enclosure	<b>9</b>
TOPOGRAPHY: Dissected alluvial slope	

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses



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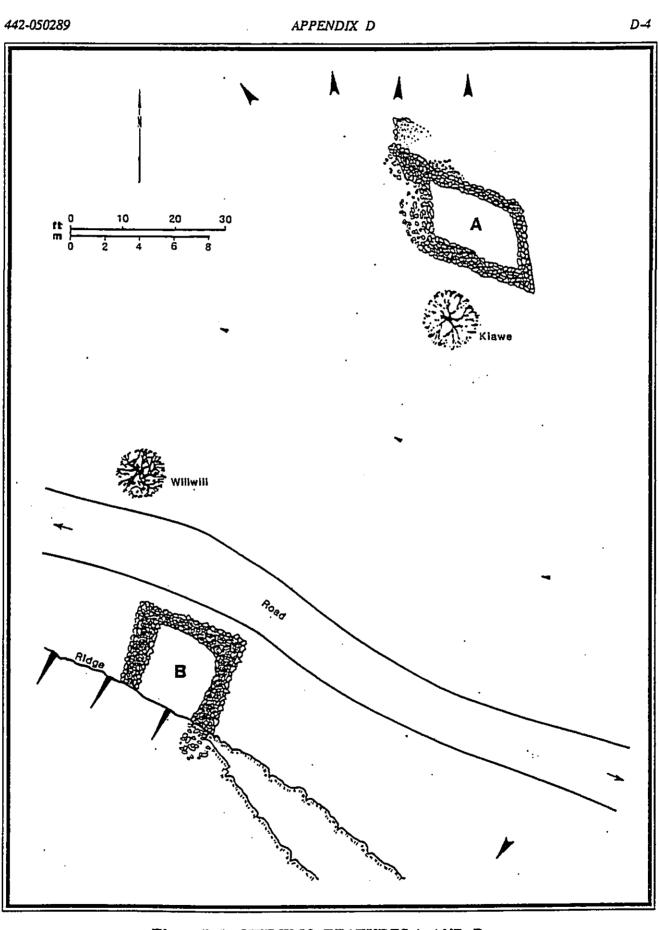


Figure D-1. SITE W-13, FEATURES A AND B.

#### APPENDIX D

**CONDITION:** Fair SI **INTEGRITY: Unaltered** F DIMENSIONS: 8.1 m long by 6.0 m wide; c. 49 sq m T **PROBABLE AGE:** Prehistoric VI DESCRIPTION: Rectangular enclosure with internal facing C on the NE corner. Two large flat slabs located atop walls of IN structure. Internal wall extends off south wall. The walls D range from 20 to 60 cm in height and are comprised of PI stacked basalt boulders and cobbles. FU A FEATURE: B DI FORMAL TYPE: Enclosure an **TOPOGRAPHY:** Dissected alluvial slope be VEGETATION: Lantana, panini, 'ilima, and grasses su **CONDITION:** Fair **INTEGRITY:** Unaltered FE DIMENSIONS: 3.0 m long by 2.5 m wide; c. 8 sq m FC **PROBABLE AGE:** Prehistoric TC DESCRIPTION: C-shaped; very crude. One end of the VE structure sits on bedrock. Feature is open to the south. It is CC comprised of basalt boulders and cobbles stacked/piled up IN to 50 cm in height. Feature probably is agricultural in DI function. PR DE FEATURE: C bec FORMAL TYPE: Wall ins TOPOGRAPHY: Dissected alluvial slope COI VEGETATION: Lantana, panini, 'ilima, and grasses fra **CONDITION:** Fair **INTEGRITY:** Unaltered FE DIMENSIONS: 10.0 m long by 9.0 m wide; c. 90 sq m FO **PROBABLE AGE:** Prehistoric TO DESCRIPTION: L-shaped; west portion of feature consists VE of an alignment of boulders and cobbles; south wall consists CO of stacked boulders and cobbles. The walls border a roughly IN rectangular area of level soil. DI PR SITE NOS.: STATE: 2354 PHRI: W-15 BPBM: ---DE FORMAL TYPE: Enclosure fac **TOPOGRAPHY:** Dissected alluvial slope ΠΟΓ VEGETATION: Lantana, panini, 'ilima, and grasses bas **CONDITION:** Poor **INTEGRITY:** Unaltered SIT DIMENSIONS: 5.0 m long by 4.8 m wide; c. 24 sq m FO **PROBABLE AGE:** Prehistoric то FUNCTIONAL INTERPRETATION: Habitation/ VE Agriculture CO DESCRIPTION: This is an oval enclosure constructed of INT large stones (averaging 60 cm in diameter). The inside of DIV the NE wall is faced. Agricultural features, mounds and C. modified outcrops, are present to the southeast. PR FU Agriculture

TE NOS.: STATE: 2355 PHRI: W-17 BPBM: —	
ORMAL TYPE: Complex	
OPOGRAPHY: Dissected alluvial slope	
EGETATION: Lantana, panini, 'ilima, and grasses	
ONDITION: Good	
TEGRITY: Unaitered	g
IMENSIONS: 13.0 m long by 9.0 m wide; c. 117 sq m	
ROBABLE AGE: Prehistoric	
UNCTIONAL INTERPRETATION: Habitation/	1
griculture	
ESCRIPTION: Consists of a two-chambered enclosure	
d an oval enclosure; both are small and incorporate	
drock in their construction. Scattered agricultural features	₿
rround the site.	l l
CATURE: A DRMAL TYPE: Enclosure	1,
DPOGRAPHY: Dissected alluvial slope	
EGETATION: Lantana, panini, 'ilima, and grasses	
DNDITION: Fair	ù
TEGRITY: Unaltered	:
MENSIONS: 6.0 m long by 4.0 m wide; c. 24 sq m	
ROBABLE AGE: Prehistoric	1-
ESCRIPTION: Two chambered enclosure; incorporates	
drock on south side. The north wall is faced on both the	• •
ide and the outside up to 60 cm in height. Walls are	\$.ee
mprised of stacked boulders and cobbles. A cowrie shell	
gment is present on the surface inside the feature.	
	•
ATURE: B	
DRMAL TYPE: Enclosure	*****
POGRAPHY: Dissected alluvial slope	
GETATION: Lantana, <u>panini</u> , ' <u>ilima</u> , and grasses	
TEGRITY: Unaltered	· .
MENSIONS: 4.2 m long by 4.2 m wide; c. 18 sq m	
OBABLE AGE: Prehistoric	••
SCRIPTION: Circular enclosure with the walls well	÷
ed on the inside. The southern wall is 1.0 m high and the	
th wall is 0.7 m high. The walls are comprised of stacked	
alt boulders and cobbles.	
TE NOS.: STATE: 2356 PHRI: W-18 BPBM:	
RMAL TYPE: Complex	
POGRAPHY: Dissected alluvial slope	1
GETATION: Lantana, panini, 'ilima, and grasses	
NDITION: Good	
TEGRITY: Unaltered	
MENSIONS: 100.0 m long by 80.0 m wide;	
8,000 sq m	
OBABLE AGE: Prehistoric	
NCTIONAL INTERPRETATION: Habitation/	

#### APPENDIX D

**DESCRIPTION:** This site includes one rectangular enclosure, one irregular enclosure, and numerous agricultural terraces and mounds.

FEATURE: A

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, <u>panini</u>, wattle, <u>kiawe</u>, and grasses CONDITION: Fair

INTEGRITY: Unaltered

DIMENSIONS: 6.3 m long by 5.4 m wide; c. 34 sq m PROBABLE AGE: Prehistoric

**DESCRIPTION:** Medium-sized rectangular enclosure which appears to have a doorway on the northwest corner. The walls are comprised of stacked basalt boulders and cobbles and range from 15 to 50 cm in height.

FEATURE: B

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FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good

INTEGRITY: Unaltered

**DIMENSIONS:** 12.0 m long by 11.0 m wide; c. 132 sq m **PROBABLE AGE:** Prehistoric

**DESCRIPTION:** Complex irregular enclosure. The larger (southern) enclosed area is large  $(9 \times 7.5 \text{ cm})$  and U-shaped. The northern enclosed area consists of an attached C-shape. The larger enclosed area opens to the west portion of the U-shaped area. The walls are comprised of stacked basalt boulders and cobbles. The walls range in height from 30 to 40 cm.

SITE NOS.: STATE: 2357 PHRI: W-20 BPBM: — FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 7.1 m long by 6.9 m wide; c. 49 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agriculture DESCRIPTION: Rectangular enclosure; upslope walls

retain a terrace. The west wall consists of an alignment on an outcrop. The walls are comprised of basalt boulders and cobbles stacked up to 70 cm in height. A probable hammerstone is present on the surface. Scattered agricultural features surround the site.

SITE NOS.: STATE: 2358 PHRI: W-21 BPBM: — (Figure D-2) FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses CONDITION: Good

INTEGRITY: Unaitered

DIMENSIONS: 9.9 m long by 9.2 m wide; c. 91 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: This is a rectangular enclosure open to the NW which is situated on a partially paved terrace. The walls of the enclosure are faced on both sides. The enclosure is 5 m long by 4.5 wide by 1.2 m high. Both the terrace and enclosure are comprised of stacked basalt cobble and boulders. Scattered agricultural features surround the site.

SITE NOS.: STATE: 2041 PHRI: W-27 BPBM: T-36 (Figures D-3, D-4)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 22.0 m long by 12.5 m wide; c. 275 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious/ Habitation

**DESCRIPTION:** May be Kaumeheiwa Heiau. L-shaped enclosure; includes an internal platform or wall segment, paving, and cupboard and step along the inner north wall. The northeast corner is notched. The south wall is paved with flat well-rounded boulders. The walls are well-faced and average 1.2 to 2 m in thickness and 90 cm in height. A test unit excavated in the interior of the enclosure revealed a subsurface cultural deposit containing charcoal, basalt and volcanic glass flakes, coral, marine shell and bone. A radiocarbon sample from the deposit yielded three possible age ranges between AD 1305 and 1617.

# SITE NOS.: STATE: 2042 PHRI: W-28 BPBM: ---

(Figure D-5)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses

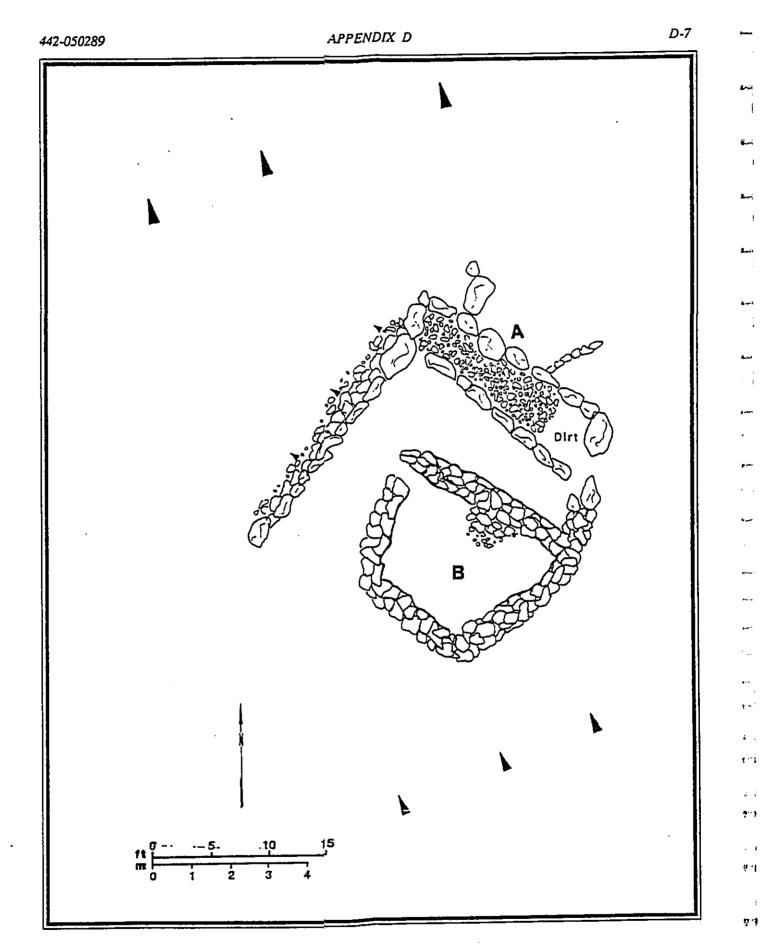
CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 12.1 m long by 11.1 m wide; c. 134 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious\* /Habitation

DESCRIPTION: This is a notched, paved enclosure. The paving lies over a rich cultural (habitation) layer. This feature may be a <u>heiau</u> or high status residence. Formally it resembles site 27. The walls average 2m in thickness and are up to 90 cm in height. The walls are faced on the interior and exterior. The walls are constructed of stacked boulders



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Figure D-2. SITE W-21

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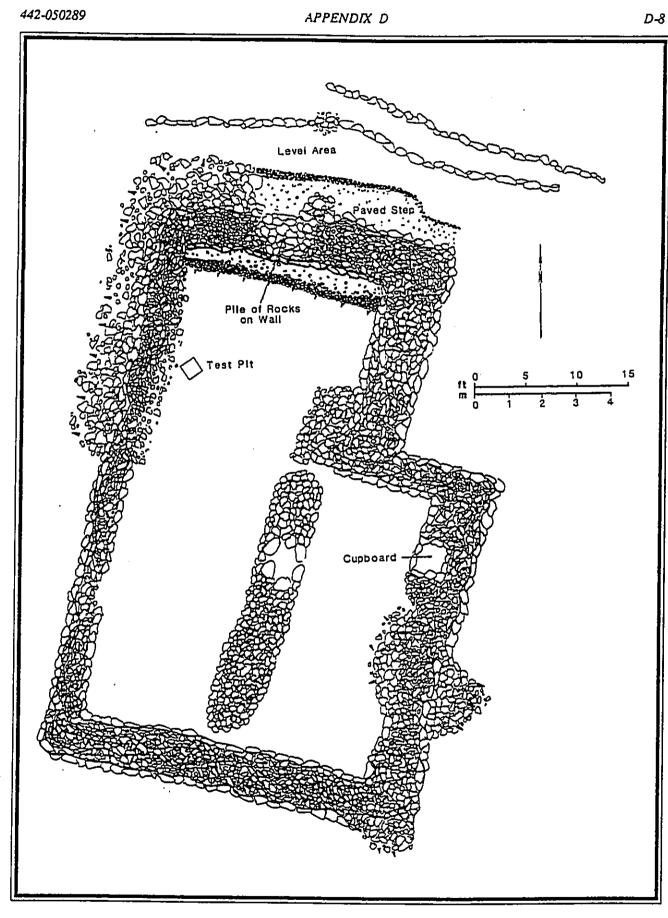


Figure D-3. SITE W-27

### APPENDIX D

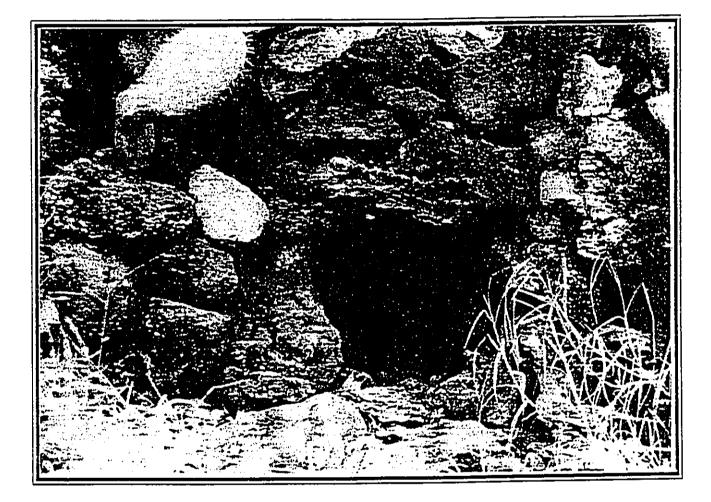


Figure D-4. SITE W-27, CUPBOARD. VIEW TO EAST-SOUTHEAST (PHRI Neg. 1143-3)

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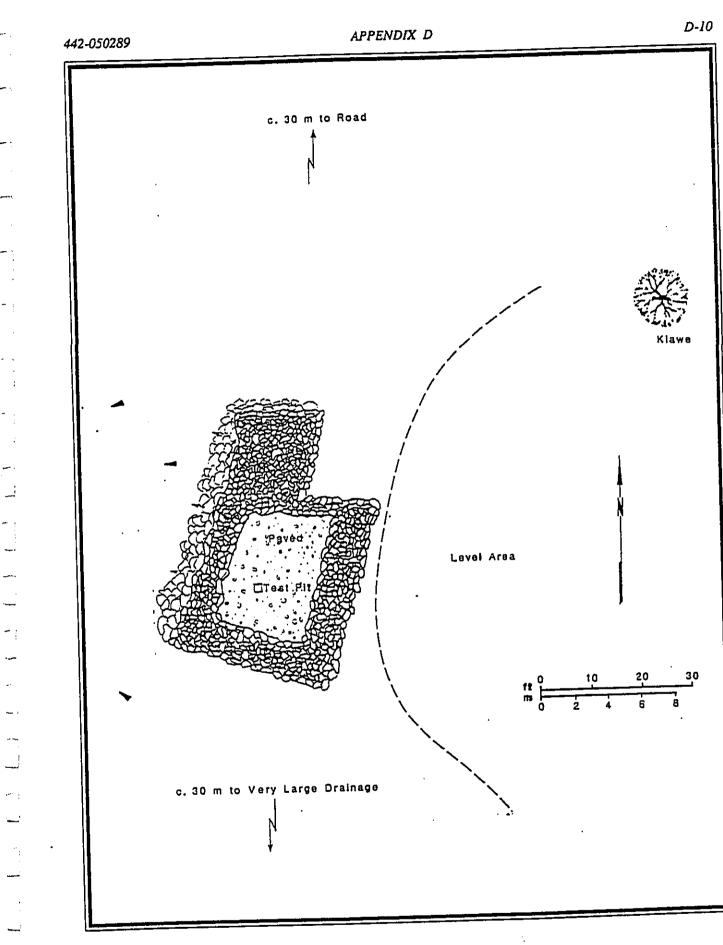


Figure D-5. SITE W-28

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#### APPENDIX D

and cobbles. A test unit in the interior of the enclosure revealed a subsurface cultural deposit containing coral, basalt and volcanic glass flakes, bone and charcoal. The deposit was capped by a pavement of basalt pebbles and cobbles. A radiocarbon sample obtained from the deposit yielded a age range of AD 1290-1640.

SITE NOS.: STATE: 2359 PHRI: W-30 BPBM: T-110 FORMAL TYPE: Alignment TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses **CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 23.0 m long by 1.0 m wide; c. 23 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Religious\* DESCRIPTION: Alignment of uprights and boulders situated on the edge of a basalt outcrop overlooking a gulch and another possible ceremonial site (W-32). Site W-27 lies c. 75.0 m to the southwest. The site's proximity to at least one religious/ceremonial site and its form suggest a possible religious function. SITE NOS.: STATE: 2360 PHRI: W-31 BPBM: ---FORMAL TYPE: Overhangs TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses **CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 13.0 m long by 3.0 m wide; c. 39 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ /Habitation Agriculture DESCRIPTION: Two overhangs; includes a bedrock outcrop and a free standing wall. The wall connects with the outcrop c. 5.5 m east of the easternmost overhang and extends west for about 7.0 m. The overhangs are each c. 1.0 m deep by 3.0 m wide by 2.0 m high. Agricultural features surround the site. SITE NOS.: STATE: 2361 PHRI: W-32 BPBM: ---(Figure D-6) FORMAL TYPE: Upright **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses **CONDITION:** Fair **INTEGRITY:** Unaltered DIMENSIONS: 6.2 m long by 6.0 m wide; c. 55 sq m **PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Religious\*

**DESCRIPTION:** Natural upright with orifice. The upright is part of an outcrop. The upright projects well above the outcrop and is 2m high measured from the surface of the

rough terrace. The orifice is .15 m in diameter and .55 m deep. Beneath the boulder wall is a crude terrace retained by a single-course of rocks. This unusual, and apparently modified natural upright is interpreted as a possible shrine; however, excavation of the terrace would be necessary to confirm this interpretation. SITE NOS.: STATE: 2362 PHRI: W-35 BPBM: T-105\*

FORMAL TYPE: Human bone TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, lantana, and 'ilima **CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 4.8 m long by 4.5 m wide; c. 22 sq m **PROBABLE AGE:** Unknown FUNCTIONAL INTERPRETATION: Burial DESCRIPTION: A slightly waterworn human skull fragment was discovered in the bottom of a gulch. Anterior portions of the occipital and both parietals were still articulated. The isolated fragment probably originated from an eroded burial situated somewhere upslope. SITE NOS.: STATE: 2043 PHRI: W-36 BPBM: ---(Figure D-7) FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 15.6 m long by 7.6 m wide; c. 119 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Religious\*

DESCRIPTION: A complex, paved rectangular enclosure with internal features. In the northeast corner is a slightly elevated paved platform. A fallen upright is present at the interior edge of the platform. One decomposing piece of coral is present near the platform. Overall the feature appears to be divided longitudinally into an upper paved half which has the platform and a lower half which has a soil covered surface. The wails of the feature are well-faced along much of their extent. The walls are comprised of basalt cobbles and boulders stacked up to 1.0 cm in height. The walls average 2 m in thickness. A test unit excavated in the lower soil-covered half of the feature revealed a pavement of large flat stones beneath which is a subsurface cultural deposit containing charcoal, coral, basalt flakes and numberous pebbles and cobbles, many of which are waterwon. A radiocarbon sample from the deposit yielded a calendric age range from AD 1397-1482.

SITE NOS.: STATE: 2363 PHRI: W-37 BPBM: T-104\* FORMAL TYPE: Complex

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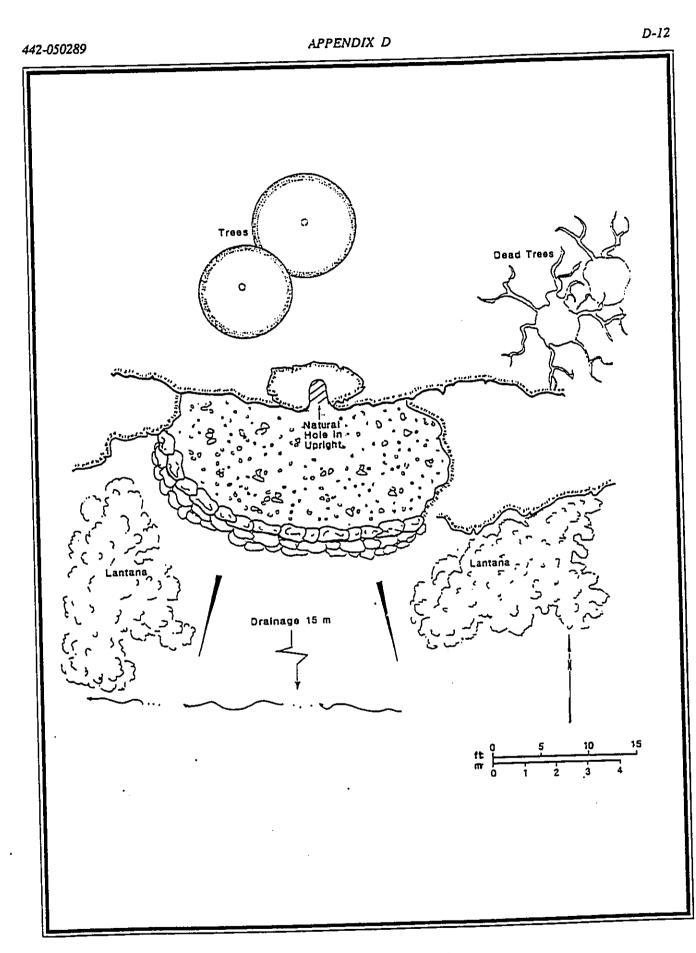


Figure D-6. SITE W-32

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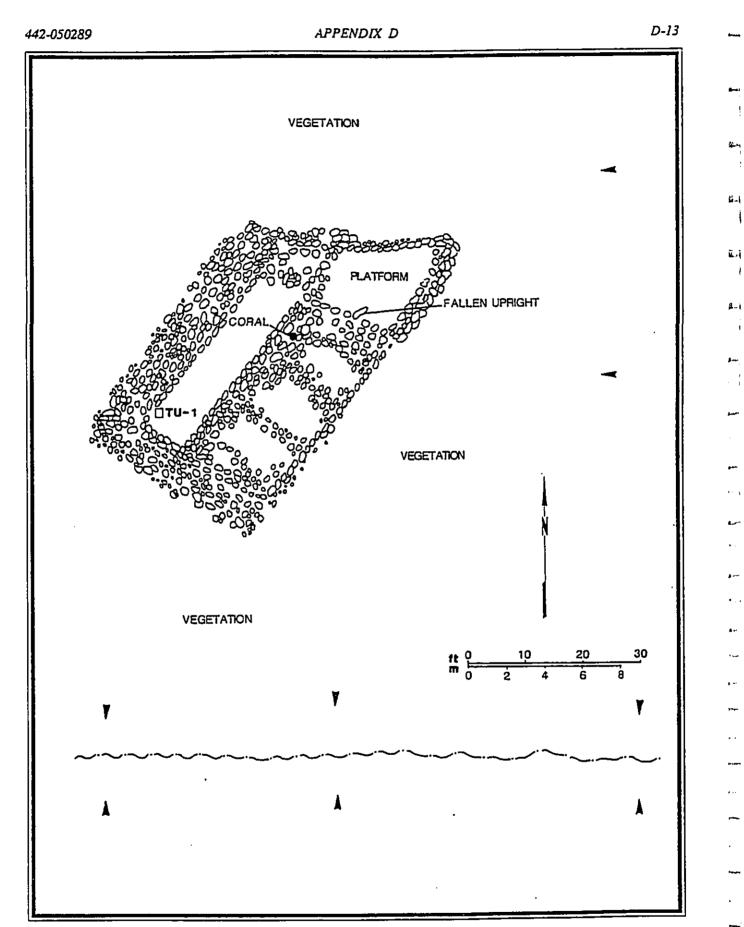


Figure D-7. SITE W-36

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#### APPENDIX D

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 5.0 m long by 4.0 m wide; c. 20 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agriculture DESCRIPTION: Circular enclosure with some facing on inside of NE wall, and a U-shaped enclosure. Agricultural features surround this site for distances exceeding 100.0 m. FEATURE: A FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, and 'ilima CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 5.0 m long by 4.0 m wide; c. 20 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: Circular enclosure c. 25 m north of Waiohuli Gulch. Enclosure is thoroughly obscured by lantana and panini. No signs of paving within enclosure. Walls average 75 cm in thickness and 30 cm in height. They are comprised of stacked basalt boulders and cobbles. FEATURE: B FORMAL TYPE: U-shaped wall **TOPOGRAPHY:** Dissected alluvial slope **VEGETATION:** Wattle Forest **CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 20.0 m long by 17.0 m wide; c. 340 sq m PROBABLE AGE: Unknown DESCRIPTION: Discontinuous U-shaped wall faces the south, perpendicular to the slope. The wall consists of one to two courses of large stacked cobbles and boulders. SITE NOS.: STATE: 2364 PHRI: W-42 BPBM: T-75\* FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, grasses, 'ilima **CONDITION:** Poor **INTEGRITY:** Unaitered DIMENSIONS: 5.5 m long by 5.2 m wide; c. 29 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agriculture DESCRIPTION: Oval enclosure and surrounding agricultural terraces. The highest density of terraces is to the east and the south of the enclosure. The enclosure is either poorly constructed or in poor condition. The walls are comprised of stacked basalt cobbles and boulders. Walls average 90 cm in thickness and 20-40 cm in height.

FORMAL TYPE: Complex **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses **CONDITION:** Fair **INTEGRITY:** Altered DIMENSIONS: 90.0 m long by 65.0 m wide; c. 5,850 sq m **PROBABLE AGE:** Prehistoric

SITE NOS.: STATE: 2044 PHRI: W-45 BPBM: T-72

(Figure D-8)

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: This complex includes a rectangular enclosure and an oval enclosure amidst extensive agricultural terraces and mounds.

FORMAL TYPE: Enclosure **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Panini, Lantana, 'ilima, and grasses **INTEGRITY:** Altered DIMENSIONS: 12.0 m long by 12.0 m wide; c. 144 sq m FEATURE: B FORMAL TYPE: Enclosure **TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses.

**CONDITION: Good** 

**INTEGRITY:** Altered

DIMENSIONS: 8.0 m long by 7.0 m wide; c. 56 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Oval enclosure with high, wide, faced walls. On the inside of the northwest wall there is a step-like feature which averages 1 m in width and is c. 30 cm above the interior surface. The walls of the structure range between 1 and 2 m in thickness and .50 to 1.40 in height. The walls are comprised of stacked boulders and cobbles. A test unit excavated in the interior of the feature revealed a subsurface cultural deposit containing charcoal, marine shell, basalt and volcanic glass flakes an kukui nut shell. A radiocarbon sample from the deposit yielded a calendric age range of AD 1450-1660.

SITE NOS.: STATE: 2365 PHRI: W-46 BPBM: T-71 FORMAL TYPE: Enclosure

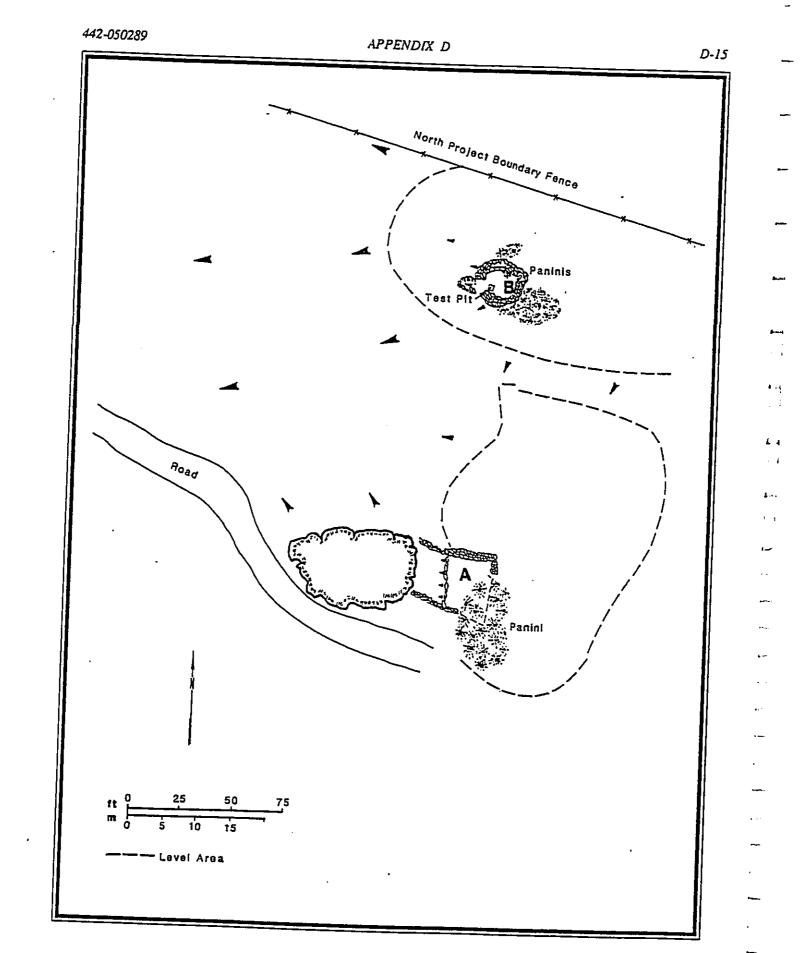
TOPOGRAPHY: Dissected alluvial slope

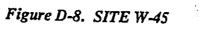
VEGETATION: Lantana, panini, wantle, 'ilima, and grasses

FEATURE: A **CONDITION:** Good

**PROBABLE AGE:** Prehistoric

**DESCRIPTION:** Rectangular enclosure with an adjoining western terrace. The western edge of the enclosure is defined by a large bedrock outcrop. Walls are comprised of basalt boulders and cobbles stacked to a maximum height of 40 cm.





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#### APPENDIX D

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SITE NOS.: STATE: 2369 PHRI: W-55 BPBM: ---**CONDITION:** Fair **INTEGRITY:** Unaltered DIMENSIONS: 14.5 m long by 9.5 m wide; c. 138 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agriculture DESCRIPTION: Trapezoidal enclosure surrounded by agricultural features. There is an opening in the northwest corner of the structure. The walls, comprised of stacked basalt boulders and cobble, average 1.0 m in thickness and 50 cm in height. SITE NOS.: STATE: 2366 PHRI: W-47 BPBM: T-107 FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, 'ilima and grasses **CONDITION:** Fair INTEGRITY: Unaltered DIMENSIONS: 39.0 m long by 25.0 m wide; c.975 sq m **PROBABLE AGE: Historic\*** FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Large rectangular enclosure. Wing walls extend off NE and NW corners. Some facing on the south and north sides and on the east wing wall. Walls are comprised of stacked boulders and cobbles. The walls average 80 cm in thickness and 1.0 m in height. SITE NOS.: STATE: 2367 PHRI: W-48 BPBM: T-108 FORMAL TYPE: Wall TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, 'ilima, and grasses CONDITION: Fair INTEGRITY: Alwred DIMENSIONS: 20.0 m long by 38.0 m wide; c. 760 sq m PROBABLE AGE: Prehistoric\* FUNCTIONAL INTERPRETATION: Agriculture DESCRIPTION: Large U-shaped wall; western wall retains a terrace. Wall is comprised of stacked basalt boulders and cobbles. Wall ranges in height from 40 to 100 cm. SITE NOS.: STATE: 2368 PHRI: W-49 BPBM: ---FORMAL TYPE: Terraces TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle and grasses CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 13.0 m long by 12.0 m wide; c. 156 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Agriculture DESCRIPTION: Alignment connecting two parallel agricultural terraces. Agricultural terraces are extensive in

FORMAL TYPE: Overhang **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Wattle, grasses, lantana, and Silky Oak CONDITION: Good **INTEGRITY:** Altered

DIMENSIONS: 4.0 m long by 3.5 m wide; c. 14 sq m **PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Temporary Habitation\*

DESCRIPTION: Site is an overhang with a wall in front partially blocking the entrance. The enclosed area measures 4.0 m wide by 3.5 m deep 2.0 m high. The wall covers 1.4 m of the entrance. The overhang is filled with historic trash. The wall is composed of stacked basalt boulders.

SITE NOS.: STATE: 2370 PHRI: W-57 BPBM: ---FORMAL TYPE: Upright slab **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Wattle, lantana, and grasses. CONDITION: Good **INTEGRITY:** Altered DIMENSIONS: 0.03 m long by 0.10 m wide; c. 300 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Indeterminate DESCRIPTION: Single upright slab with a few possibly associated boulders. Possible remnant of a wall or terrace because evidence of bulldozer disturbance surrounds. SITE NOS.: STATE: 2371 PHRI: W-58 BPBM: ---FORMAL TYPE: Walls TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, 'ilima, and grasses **CONDITION:** Fair **INTEGRITY:** Altered DIMENSIONS: 30.0 m long by 1.0 m wide; c. 30 sq m **PROBABLE AGE:** Historic FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Two wall segments which were probably connected before bulldozing of area. Walls run perpendicular to slope segments comprised of stacked basalt boulders and cobbles averaging 60 cm high. Probable remnant of cattle wall. SITE NOS.: STATE: 2372 PHRI: W-59 BPBM: T-81

FORMAL TYPE: Wall **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Wattle, 'ilima, grasses CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 24.0 m long by 1.0 m wide; c. 24 sq m this area, extending c. 150.0 m east to the edge of the project PROBABLE AGE: Historic FUNCTIONAL INTERPRETATION: Transportation

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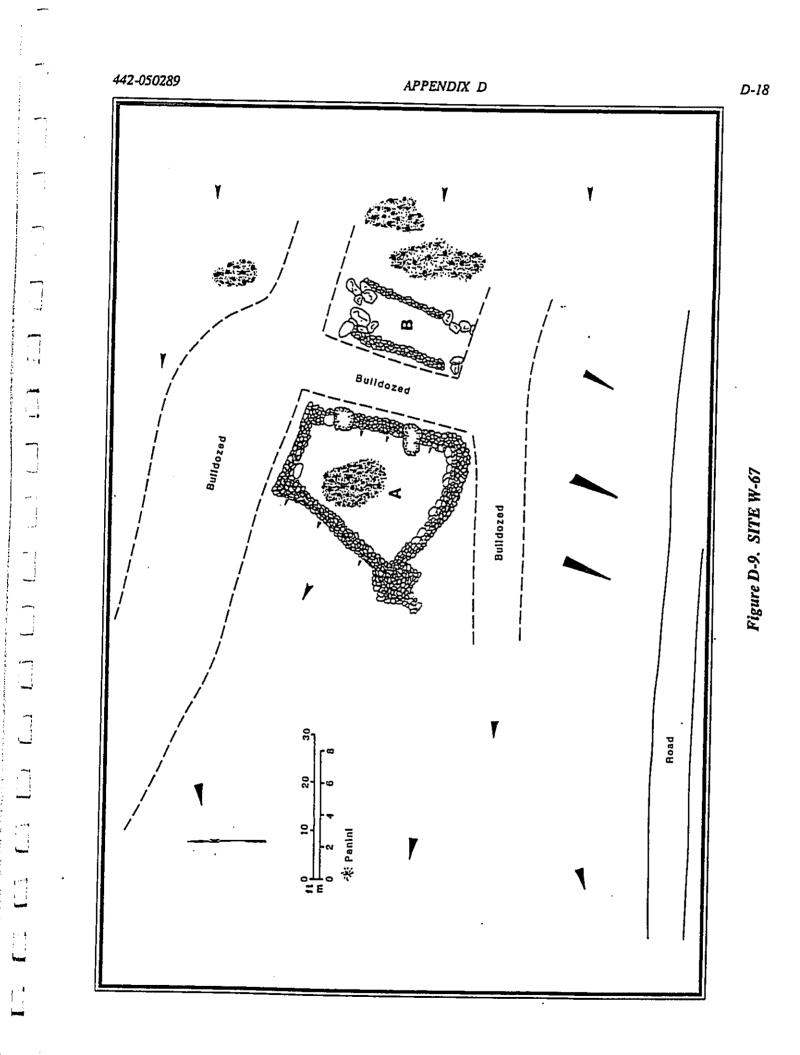
### APPENDIX D

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| DESCRIPTION: Historic road retaining wall. The wall is                           | FEATURE: A                                                      |             |
|----------------------------------------------------------------------------------|-----------------------------------------------------------------|-------------|
| in good condition and well-faced. It retains an abandoned                        | FORMAL TYPE: Enclosure                                          |             |
| road overlooking a drainage.                                                     | TOPOGRAPHY: Dissected alluvial slope                            | -بينغ       |
| iouu ovonooding a dimingo.                                                       | VEGETATION: Grasses, lantana, panini, 'ilima                    |             |
| SITE NOS.: STATE: 2373 PHRI: W-60 BPBM: —                                        | CONDITION: Good                                                 |             |
| FORMAL TYPE: Wall                                                                | INTEGRITY: Altered                                              |             |
| TOPOGRAPHY: Dissected alluvial slope                                             | DIMENSIONS: 12.0 m long by 11.0 m wide; c. 132 sq m             | \$++        |
| VEGETATION: Wattle and grasses                                                   | PROBABLE AGE: Prehistoric                                       |             |
| CONDITION: Poor                                                                  | DESCRIPTION: Trapezoidal enclosure. The east wall               |             |
| INTEGRITY: Altered                                                               | has been built around bedrock. The south wall is faced with     | B1          |
|                                                                                  | eight upright slabs. There are also upright slabs in the NE     |             |
| DIMENSIONS: 25.0 m long by 0.4 m wide; c. 10 sq m                                | and NW corners. A wing wall extends off the southwest           |             |
| PROBABLE AGE: Prehistoric                                                        | corner. The wall averages 40 cm in height and is composed       |             |
| FUNCTIONAL INTERPRETATION: Animal Control                                        | of stacked basalt boulders and cobbles.                         | <b>#</b> 1  |
| DESCRIPTION: Intermittent wall with some facing on                               | or stacked basait bounders and cooples.                         | 1           |
| the south side of the east end. The wall runs mauka-makai                        |                                                                 |             |
| perpendicular to slope. Wall id 25 m long, 40 cm thick, and                      | FEATURE: B                                                      | و، ھُ       |
| 1.0 m high. It is constructed of stacked basalt boulders and                     | FORMAL TYPE: Enclosure (?)                                      |             |
| cobbles. Probably part of some wall represented at site 58.                      | TOPOGRAPHY: Dissected alluvial slope                            |             |
|                                                                                  | VEGETATION: Grasses, lantana, panini, 'ilima                    |             |
| SITE NOS.: STATE: 2374 PHRI: W-65 BPBM:                                          | CONDITION: Fair                                                 | •(          |
| FORMAL TYPE: Enclosure                                                           | INTEGRITY: Altered                                              |             |
| TOPOGRAPHY: Dissected alluvial slope                                             | DIMENSIONS: 9.0 m long by 4.0 m wide; c. 36 sq m                |             |
| VEGETATION: Silky Oak, wattle, lantana, and grasses                              | PROBABLE AGE: Prehistoric                                       | ,           |
| CONDITION: Fair                                                                  | DESCRIPTION: Two parallel walls two meters apart                |             |
| INTEGRITY: Altered                                                               | extending for c. 7.8 m. Walls are joined at NW end by           |             |
| DIMENSIONS: 26.0 m long by 12.0 m wide; c. 312 sq m                              | relatively large rocks. The other end is partially enclosed by  |             |
| PROBABLE AGE: Prehistoric                                                        | larger rocks but they do not completely close off the           |             |
| FUNCTIONAL INTERPRETATION: Habitation/                                           | structure. Formally the walls resemble terraces; however'       |             |
| Agriculture                                                                      | it is likely they represent the disturbed remnants of a smaller |             |
| DESCRIPTION: Semi-rectangular enclosure and terraces.                            | enclosed rectangular terrace.                                   |             |
| The NE and NW walls of this enclosure consist of modified                        | -                                                               |             |
| bedrock. Facing is in the SE interior corner. A 10.0 m long                      | SITE NOS.: STATE: 2376 PHRI: W-71 BPBM: T-101                   |             |
| terrace alignment situated just upslope from the structure.                      | FORMAL TYPE: Enclosure                                          |             |
| Enclosed walls average 75 cm in thickness and 40 cm in                           | TOPOGRAPHY: Dissected alluvial slope                            |             |
| height. The enclosure is 8.4. m long and 5.6 m wide.                             | VEGETATION: Lantana, 'ilima, panini, wattle, and grasses        |             |
|                                                                                  | CONDITION: Fair                                                 |             |
| SITE NOS.: STATE: 2375 PHRI: W-67 BPBM:                                          | INTEGRITY: Altered                                              | • *         |
| (Figure D-9)                                                                     | DIMENSIONS: 22.0 m long by 18.0 m wide; c. 396 sq m             |             |
| FORMAL TYPE: Complex                                                             | PROBABLE AGE: Prehistoric                                       |             |
| TOPOGRAPHY: Dissected alluvial slope                                             | FUNCTIONAL INTERPRETATION: Agriculture                          |             |
| VEGETATION: Grasses, lantana, <u>panini</u> , <u>'ilima</u>                      | DESCRIPTION: Triangular enclosure with associated               |             |
| CONDITION: Good                                                                  | agricultural features. The structure has a small wall in the    | 4.1         |
| INTEGRITY: Altered                                                               | eastern end. Agricultural features extend west for c. 120.0 m   |             |
|                                                                                  | along the side of a hill. Enclosure walls average 25 cm in      | 5 F         |
| DIMENSIONS: 18.0 m long by 12.0 m wide; c. 216 sq m<br>PROBABLE AGE: Prehistoric | height and are comprised of stacked boulders and cobbles.       | <b>T</b> \$ |
| FUNCTIONAL INTERPRETATION: Habitation/                                           | height and are comprised of stacked bounders and boostes.       |             |
|                                                                                  | SITE NOS.: STATE: 2377 PHRI: W-73 BPBM:                         | 1           |
| Agriculture                                                                      |                                                                 |             |
| DESCRIPTION: Consists of one trapezoidal enclosure                               | FORMAL TYPE: Walls                                              | # 1         |
| and two close parallel walls. Walls may represent a collapsed                    | TOPOGRAPHY: Dissected alluvial slope                            |             |
| structure or two adjacent terraces. Several agricultural                         | VEGETATION: Wattle and grasses                                  | 1           |
| mounds noted in the vicinity.                                                    | CONDITION: Fair                                                 | 21 <b>)</b> |
|                                                                                  | INTEGRITY: Altered                                              |             |
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#### APPENDIX D

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|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|-------------|
| DREENSTONS 1700 - loss by 750 - wide                                                              | FUNCTIONAL INTERPRETATION: Animal Control                       | ,           |
| DIMENSIONS: 170.0 m long by 75.0 m wide;                                                          | DESCRIPTION: Long wall runs perpendicular to the slope.         |             |
| c. 12,750 sq m                                                                                    | The wall runs parallel to and close to the south side of a deep | <b>6</b> -4 |
| PROBABLE AGE: Prehistoric                                                                         | ravine and as such may be part of the system of walls at Site   |             |
| FUNCTIONAL INTERPRETATION: Agriculture<br>DESCRIPTION: Terraces and walls. In this area there are | W-4. Some segments of the wall are collapsed or have been       |             |
|                                                                                                   |                                                                 | 6.1         |
| two larger terraces and numerous smaller ones. The wall                                           | destroyed by cows and bulldozers.                               |             |
| runs perpendicular to the slope. Terraces are retained by                                         | SITE NOS.: STATE: 2381 PHRI: W-82 BPBM:                         | ļ           |
| either short retaining walls or alignments.                                                       |                                                                 |             |
|                                                                                                   | FORMAL TYPE: Terrace<br>TOPOGRAPHY: Dissected alluvial slope    | 61          |
| SITE NOS.: STATE: 2378 PHRI: W-75 BPBM: T-87-86                                                   |                                                                 | ;           |
| FORMAL TYPE: Wall                                                                                 | VEGETATION: Lantana, panini, 'ilima, and grasses                |             |
| TOPOGRAPHY: Dissected alluvial slope                                                              | CONDITION: Fair                                                 | 51          |
| VEGETATION: Wattle and grasses                                                                    | INTEGRITY: Altered                                              |             |
| CCNDITION: Good                                                                                   | DIMENSIONS: 9.3 m long by 5.5 m wide; c. 51 sq m                |             |
| INTEGRITY: Altered                                                                                | PROBABLE AGE: Prehistoric                                       |             |
| DIMENSIONS: 100.0 m long by 0.5 m wide; c. 50 sq m                                                | FUNCTIONAL INTERPRETATION: Habitation/                          |             |
| PROBABLE AGE: Prehistoric/Historic                                                                | Agriculture                                                     |             |
| FUNCTIONAL INTERPRETATION: Habitation/                                                            | DESCRIPTION: Possible rectangle habitation terrace in           |             |
| Agriculture                                                                                       | a large area of many scattered agricultural terraces. Consists  | .—          |
| DESCRIPTION: L-shaped wall, the north-south wall of                                               | of a U-shaped alignment of boulders and cobbles, the            |             |
| which retains a terrace. The east-west wall is short and free                                     | interior of which is relatively level compared to the adjacent  |             |
| standing. There are terraces in the area. There is also a                                         | slope.                                                          |             |
| water trough made from a cut half-boiler. The L-shaped                                            |                                                                 |             |
| wall appears to be the disturbed remnant of a rectangular                                         | SITE NOS.: STATE: 2382 PHRI: W-83 BPBM:                         |             |
| enclosure. The wall has a maximum height of 50 cm and is                                          | FORMAL TYPE: Enclosure                                          |             |
| composed of stacked basalt boulders and cobbles.                                                  | TOPOGRAPHY: Dissected alluvial slope                            | ×           |
|                                                                                                   | VEGETATION: Lantana, panini, 'ilima, and grasses                |             |
| SITE NOS.: STATE: 2379 PHRI: W-77 BPBM:                                                           | CONDITION: Fair                                                 |             |
| (Figures D-10, D-11)                                                                              | INTEGRITY: Altered                                              |             |
| FORMAL TYPE: Enclosure                                                                            | DIMENSIONS: 5.0 m long by 3.5 m wide; c. 18 sq m                |             |
| TOPOGRAPHY: Dissected alluvial slope                                                              | PROBABLE AGE: Prehistoric                                       |             |
| VEGETATION: Wattle, lantana, koa haole, 'ilima, and                                               | FUNCTIONAL INTERPRETATION: Habitation/                          |             |
| grasses                                                                                           | Agriculture                                                     | • •         |
| CONDITION: Good                                                                                   | DESCRIPTION: Small rectangular enclosure; NW corner             |             |
| INTEGRITY: Altered                                                                                | faced on interior and exterior; also facing on the interior of  |             |
| DIMENSIONS: 30.0 m long by 20.0 m wide; c. 600 sq m                                               | the SW corner. Walls have a maximum height of 30 cm and         | •           |
| PROBABLE AGE: Prehistoric*                                                                        | are composed of stacked cobbles and boulders. Agricultural      |             |
| FUNCTIONAL INTERPRETATION: Agriculture                                                            | features are present in the vicinity.                           | <b>.</b>    |
| DESCRIPTION: Irregular-shaped enclosure; uses a bedrock                                           | •                                                               |             |
| outcrop. Very low wall on NW side. The enclosure is                                               | SITE NOS.: STATE: 2383 PHRI: W-88 BPBM:                         | •           |
| situated in a swale. Wall is poorly preserved composed of                                         | FORMAL TYPE: Wall                                               | ¢~ [        |
| stacked basalt boulders and cobbles. A test unit of this                                          | TOPOGRAPHY: Dissected alluvial slope                            |             |
| feature did not reveal any cultural remains.                                                      | VEGETATION: Wattle and grasses                                  |             |
|                                                                                                   | CONDITION: Good                                                 | ÷.)         |
| SITE NOS.: STATE: 2380 PHRI: W-80 BPBM:                                                           | INTEGRITY: Unaltered                                            | 4.1         |
| FORMAL TYPE: Wall                                                                                 | DIMENSIONS: 15.0 m long by 1.1 m wide; c. 17 sq m               |             |
| TOPOGRAPHY: Dissected alluvial slope                                                              | PROBABLE AGE: Historic                                          | ł           |
| VEGETATION: Wattle, Silky Oak, lantana, 'ilima, panini,                                           | FUNCTIONAL INTERPRETATION: Transportation                       | t* * 1      |
| •                                                                                                 | DESCRIPTION: Road retaining wall. This wall is in               |             |
| grasses<br>CONDITION: Fair                                                                        | good condition and is faced. The wall holds up a bend in an     | i           |
|                                                                                                   | old road situated on the edge of a drainage. The road is        | 经上          |
| INTEGRITY: Unaltered                                                                              | almost certainly the same road that crosses the bridge (Site    |             |
| DIMENSIONS: 400.0 m long by 1.0 m wide; c. 400 sq m<br>PROBABLE AGE: Historic                     | W-101) just up stream.                                          |             |
| i rodadle age. filsung                                                                            | m-101) Jase ab su com.                                          |             |
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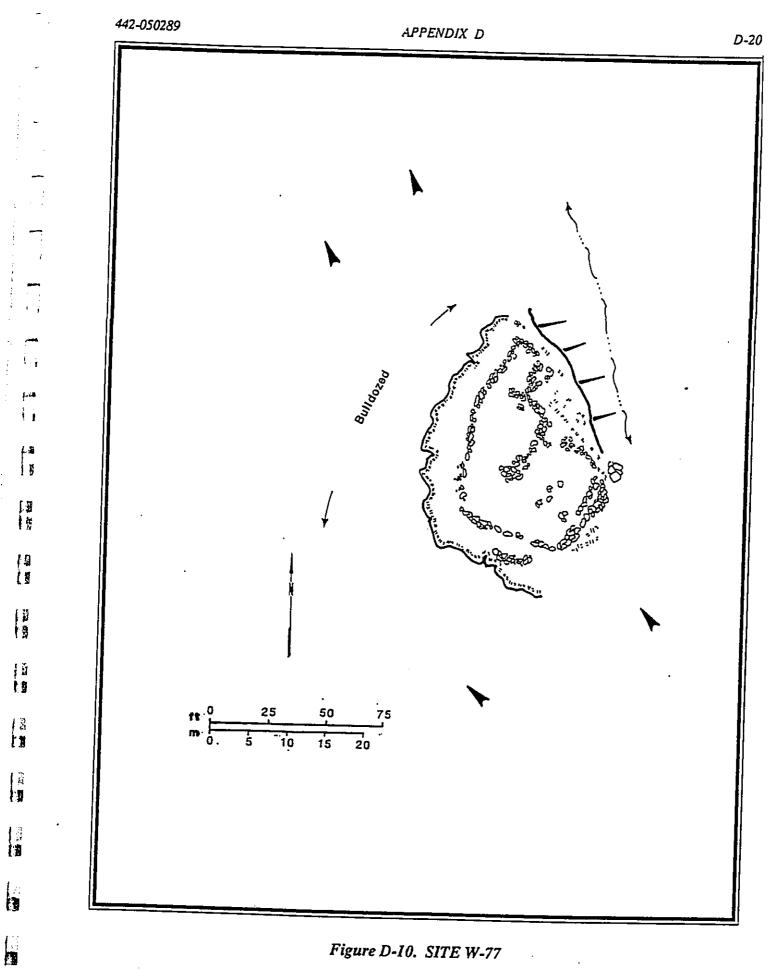


Figure D-10. SITE W-77

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APPENDIX D

Figure D-11. SITE W-77, WALL WITH UPRIGHTS. View to South. (PHRI Neg.1143-36) D-21

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## APPENDIX D

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FORMAL TYPE: Cave TOPOGRAPHY: Stream-cut basalt cliff VEGETATION: Wattle, lantana, 'ilima, and grasses **CONDITION:** Good **INTEGRITY:** Altered DIMENSIONS: 8.0 m long by 0.8 m wide; c. 6 sq m **PROBABLE AGE: Historic FUNCTIONAL INTERPRETATION: Burial** DESCRIPTION: Small lava tube which extends into the face of a tall cliff face; at least two burials present in tube. The tube extends inward for more than 8.0 m; bends slightly to left. Bones are scattered throughout the tube; a concentration of bones is situated c. 6.0 m from the opening. Entrance to tube is partially walled. Elements present include rib, long bones, possible skull fragment and other post-cranial remains. A glass bead and shell button noted among the bones.

SITE NOS.: STATE: 2385 PHRI: W-96 BPBM: — FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses CONDITION: Good

INTEGRITY: Unaltered

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DIMENSIONS: 10.0 m long by 9.2 m wide; c. 92 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agriculture DESCRIPTION: U-shaped wall with an internal mound. Site is simulated in a large agricultural area. The mound is c. 1.5 m in diameter and 0.5 m high. U-shape opens to the NW. Wall ranges from 35 to 60 cm in height and is comprised of stacked cobbles and boulders. Sub-surface probes indicate that no cultural remains are present in fill, thus probably the feature is agricultural in nature.

SITE NOS.: STATE: 2386 PHRI: W-97 BPBM: — FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, and grasses CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 12.0 m long by 10.0 m wide; c. 120 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture DESCRIPTION: Rectangular enclosure with short internal wall parallel to the east wall. The walls are very thick (c. 2 m). All walls have large flat boulders on top. There is a 15.0 m long wall extending northeast to the gulch. The 70 cm high enclosed wall is comprised of stacked basalt boulders and cobbles. Agricultural features are present in the vicinity.

SITE NOS.: STATE: 2387 PHRI: W-98 BPBM: T-69-70\*

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

**CONDITION:** Fair

**INTEGRITY:** Altered

DIMENSIONS: 7.7 m long by 5.0 m wide; c. 39 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Rectangular enclosure with associated agricultural features. The enclosure is higher on the west side to accommodate the slope. Walls are 1-2 m thick and range from 30-60 cm in height. Walls are composed of stacked basalt boulders and cobbles.

SITE NOS.: STATE: 2388 PHRI: W-101 BPBM: ---FORMAL TYPE: Bridge TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle CONDITION: Poor INTEGRITY: Unaltered DIMENSIONS: 9.0 m long by 4.0 m wide; c. 36 sq m PROBABLE AGE: Historic FUNCTIONAL INTERPRETATION: Transportation DESCRIPTION: Historic wooden bridge. The bridge is

DESCRIPTION: Historic wooden bridge. The bridge is collapsed. The south side still has some of the lower supports in place; "X" braces nailed to supports. Most of the cross members are missing. Supports consist of chemically treated piles.

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APPENDIX D

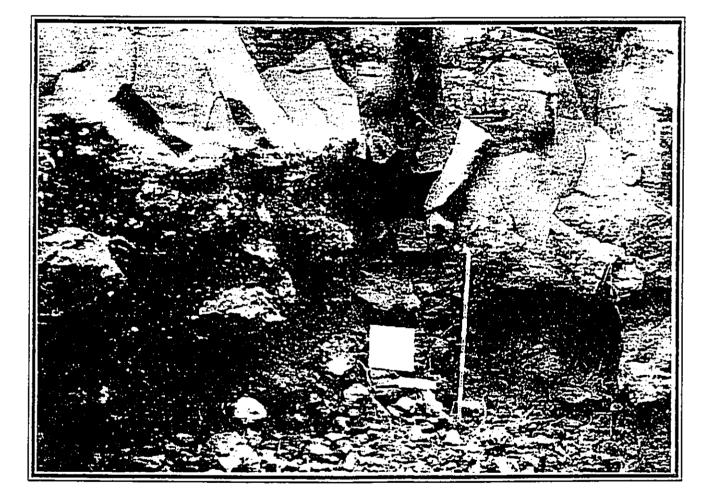


Figure D-12. SITE W-90, ENTRANCE TO HISTORIC BURIAL. VIEW TO SOUTHEAST. (PHRI Neg.1145-3) D-23



# **KEOKEA SITE AND FEATURE DESCRIPTIONS**

SITE NOS .: State: 2046 PHRI: K-1 BPBM: T-15 FORMAL TYPE: Complex (2 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, wattle, panini, and 'ilima

**CONDITION:** Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 80.0 m long by 40.0 m wide;

c. 3,200.0 sq m

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

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DESCRIPTION: Platform (Fea. A), terrace (Fea. B), mounds, paved areas, walls, and possible trails. There are a large number of agricultural features in this area including terraces, mounds, and modified outcrops .

FEATURE A: Platform

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, moming glory, 'ilima, Danini

**CONDITION:** Fair

INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 7.0 m wide; c. 49.0 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: An irregular paved platform with two possible bedrock cupboards on the north side. Feature is constructed aganist a bedrock outcropp. It is constructed of stacked cobbles and boulders. The upper surfeace is irregularly paved with cobbles. The north half of the feature is partially collapsed.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope

DIMENSIONS: 5.8 m long by 6.4 m wide; c. 37 sq m

VEGETATION: Lantana, grasses, morning glory, 'ilima, <u>panini</u>

**CONDITION:** Fair

**INTEGRITY:** Unaltered

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular terrace. The tops of the south and west walls are even with the inside ground surface. The east wall consists of modified bedrock. The

terrace wall has a maximum height of 50 cm and is composed of stacked basalt boulders and cobbles.

SITE NOS .: State: 2047 PHRI: K-2 BPBM: T-16 FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope

Tentative, temporary, or provisional

VEGETATION: 'Ilima, lantana, and grass CONDITION: Fair to Good **INTEGRITY:** Altered\* **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agriculture DESCRIPTION: Site consists of two adjacents enclosures.

There are a large number of agricultural features in this area including terraces, mounds, and modified outcrops.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Lantana and grass

**CONDITION:** Fair

**INTEGRITY:** Altered\*

DIMENSIONS: 12.0 m long by 10.0 m wide; c. 120.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with a 5.0m by 6.0 m paved platform in the southeast corner and a possible firepit inside. The northwest wall sits on the edge of a drop and consists of an alignment. The walls range from 1.0 to 2.0 m in thickness and average 50 cm in height. The walls

are constructed of stacked cobbles and boulders. The south corner of Fea. B abuts the north corner of Fea. A.

FEATURE B: Enclosure

**TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: lantana, grass, and 'ilima

**CONDITION:** Good

**INTEGRITY:** Unaltered

DIMENSIONS: 10.0 m long by 7.0 m wide; c. 70.0 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Irregular enclosure, the east wall of which consists of a bedrock outcrop. Facing present on both sides of the north and east walls. The south corner abuts the north corner of Fea. A. Walls are comprised of stacked basalt boulders and cobbles.

SITE NOS .: State: 2028 PHRI: K-3 BPBM: T-14 FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 120.0 m long by 100.0 m wide; c. 12,000.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Burial\*/ Habitation/Agriculture

### APPENDIX E

**DESCRIPTION:** Two rectangular enclosures with wide walls, one with an internal L-shaped wall. Agricultural terraces and mounds surround the enclosure.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: '<u>llima</u>, lantana, grasses CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 14.0 m long by 14.0 m wide; c. 196.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with wide walls, especially in the northwest corner. The west and south walls are faced externally and the east wall is faced internally. The walls average 80 cm in height and are copmrised of stacked boulders and cobbles. A curved, rock-retained terrace curves southward and then west away from the southeast corner of the enclosure. A test unit excavated in the interior of this feature revealed the presence of a subsurface deposit containing charcoal, marine shell, bone, and basalt flakes. The bone includes two phalanges from a child, potentiallyindicating and infant burial beneath the floor of the structure. A radiocarbon sample from the deposit yielded a calendric age range of AD 1640-1890.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 9.0 m long by 8.5 m wide; c. 76.5 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Rectangular enclosure with internal dividing wall. The internal wall forms a small room in the northwest corner of the enclosure. There is some interior and exterior facing on the south wall. The walls range between 40 and 60 cm in height and are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2049 PHRI: K-4 BPBM: FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, and 'ilima CONDITION: Good INTEGRITY: Altered DIMENSIONS: 27.0 m long by 10.0 m wide; c. 270.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation/

Agriculture DESCRIPTION: Complex consists of an irregular

enclosure and a rectangular enclosure. Possible firepit

present in Fea. A. Features fit pattern of typical residences situated along the edge of a terraced slope. Numerous agriculture terraces surround the site.

FEATURE A: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, and 'ilima CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 7.2 m long by 6.0 m wide; c. 43.2 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Irregular nearly C-shaped enclosure. Possible terrace in the north half; possible firepit in the center. Walls range from 100 cm to 10 cm in height and are comprised of stacked basalt boulders and cobbles. FEATURE B: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, kiawe, grasses CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 8.5 m long by 7.5 m wide; c. 63.8 sq m

**PROBABLE AGE:** Prehistoric **DESCRIPTION:** Rectangular enclosure with small room in the southeast corner. A c. 20.0 m long terrace wall extends off the southeast corner of the enclosure. A two track road runs through this terrace. Walls average 30 cm in height and are comprised of stacked boulders and cobbles.

SITE NOS .: State: 2048 PHRI: K-5 BPBM: T-19 FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, and grasses **CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 75.0 m long by 18.5 m wide; c. 1,387.5 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Temporary Habitation/Agriculture DESCRIPTION: Site consists of a C-shape, a platform, a modified outcrop wall, and surrounding terraces. The wall may have diverted water to a large earthen terrace system. FEATURE A: Platform TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle. CONDITION: Good INTEGRITY: Unaltered DIMENSIONS:5.0 m long by 3.0 m wide; c. 15.0 sq m

PROBABLE AGE: Prehistoric DESCRIPTION: Paved collapsed platform. Given its size and shape (triangular), the platform may have served an

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# APPENDIX E

agricultural function; however, testing is necessary to verify function. Feature is c. 30 cm high and is comprised of stacked basalt boulders and cobbles.

FEATURE B: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: lantana, grasses, 'ilima, wattle **CONDITION:** Good

**INTEGRITY:** Unaltered DIMENSIONS: 7.0 m long by 6.8 m wide; c. 47.6 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: C-shaped enclosure open to the

southwest. Possible midden within enclosure, as the soil inside is darker and finer than the surrounding soil. Position of surrounding features indicates the enclosure may be agricultural.

SITE NOS .: State: 2029 PHRI: K-6 BPBM: FORMAL TYPE: Complex (4 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 75.0 m long by 60.0 m wide; c. 4,500.0 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial/Habitation /Agriculture

DESCRIPTION: Complex consists of three enclosures, a mound, and agricultural features.

FEATURE A: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses, and wattle **CONDITION:** Good INTEGRITY: Unaltered DIMENSIONS: 13.0 m long by 11.8 m wide; \_ c. 153.4 sq m PROBABLE AGE: Prehistoric . . . DESCRIPTION: Notched rectangular enclosure with two internal platforms, an internal room, and an external platform. -----Internal platforms are in the northeast half of the enclosure and are connected by a step. The internal room is in the . . southwest portion of the enclosure near the notch. A test 1-1-1-1 unit excavated in side the internal room revealed a subsurface cultural deposit containing volcanic glass and basalt flakes, 4 1 sea urchin remains, coral fragments, marine shell, mammal and fish bone, charcoal, and kukui nut shell. A radiocarbon 1.1 sample from the deposit yielded two possible calendric age 1 \* ranges of AD 1470-1680 and AD 1739-1805. 174

FEATURE B: Mound

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle **CONDITION:** Good INTEGRITY: Unaltered DIMENSIONS: 2.0 m long by 1.0 m wide; c. 2.0 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Rectangular mound surrounded by bedrock outcrops. Facing on southwest side of this feature indicates that it may be a partially collapsed burial platform. The mound has a maximum height of 30 cm and is comprised of stacked basalt boulders and cobbles.

FEATURE C: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 7.0 m long by 7.0 m wide; c. 49.0 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Rectangular enclosure with high wellfaced walls, except for the east wall which is mostly collapsed. The enclosure is adjacent to a collapsed lava tube. The enclosure's external wall faces are higher than the internal ones (avr. 85 cm versus avr. 60 cm). Terraced level areas are adjacent to the north and south sides of the enclosure. FEATURE D: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle **CONDITION:** Fair/Poor INTEGRITY: Unaltered DIMENSIONS: 5.8 m long by 5.6 m wide; c. 32.5 sq m PROBABLE AGE: Prehistoric DESCRIPTION: C-shaped enclosure open to the west. The walls look very deflated, though there is no evidence of collapse. Rocks from the wall may have been removed and utilized for the construction of Fea. C.

SITE NOS.: State: 2030 PHRI: K-7 BPBM: T-22 (Figure E-1)

FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wiliwili, panini

CONDITION: Good

**INTEGRITY:** Unaltered DIMENSIONS: 110.0 m long by 70.0 m wide;

c. 7,700.0 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Complex consists of two enclosures, one rectangular and one oval. Surrounding the enclosures are numerous agriculture features.

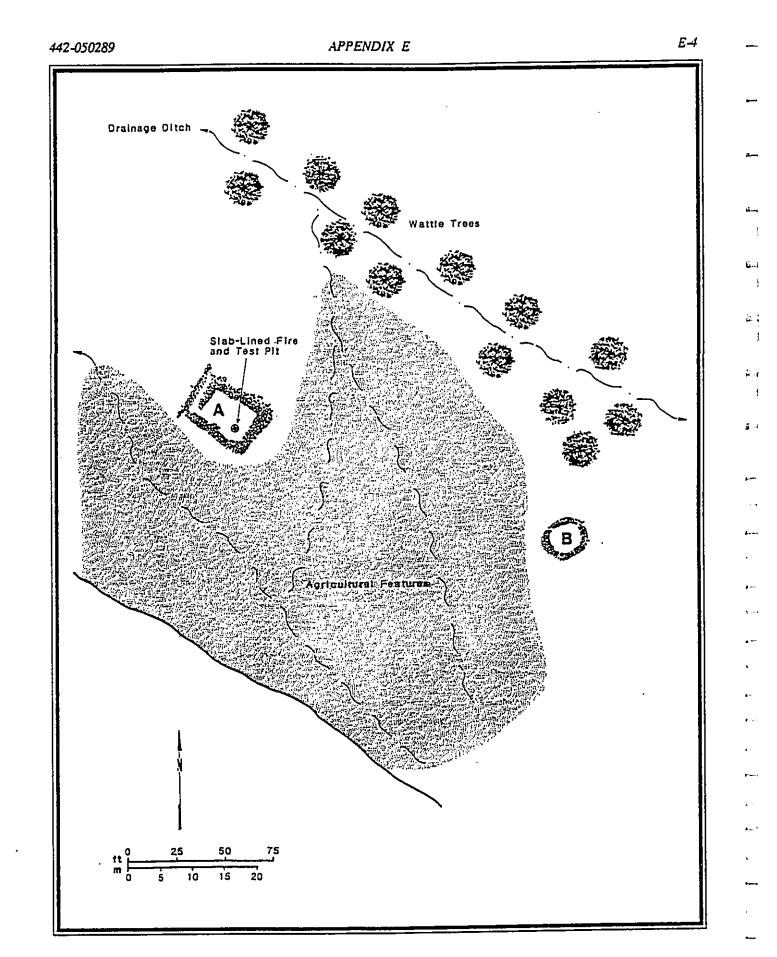


Figure E-1. SITE K-7, FEATURES A AND B.

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FEATURE A: Enclosure TOPOGRAPHY: Dissected alluvial slope c. 300.0 sq m VEGETATION: Grasses, lantana, 'ilima, wiliwili **CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 13.0 m long by 10.0 m wide; c. 130.0 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: Rectangular enclosure with a terrace attached to the northwest wall. A probable entryway opens onto the terrace near the west corner of the northwest wall. Facing is intermittent along the walls which are 65 cm to 75 cm high and comprised of stacked basalt boulders and cobbles. A slab-lined firepit is centrally located in the eastern half of the structure. A test unit was excavated which half-sectioned the firepit. The test unit revealed a subsurface cultural deposit containing marine shell, mammal bone, volcanic glass flakes, and charcoal. A radiocarbon sample collected from معد ر the deposit yielded three possible calendric age ranges: AD 680-1060, AD 1077-1125, and AD 1135-1157. FEATURE B: Enclosure 1 7 TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle 12 **CONDITION:** Good **INTEGRITY:** Unaltered 1 1 DIMENSIONS: 5.5 m long by 5.0 m wide; c. 27.5 sq m **CONDITION:** Fair **PROBABLE AGE:** Prehistoric 1.4 **INTEGRITY:** Unaltered DESCRIPTION: Oval enclosure; walls mostly faced, 1 🖞 some collapsed. The south part of the structure lies even with the ground surface. The walls average 80 cm in height 12 and are comprised of stacked basalt boulders and cobbles. 十時 SITE NOS .: State: 2050 PHRI: K-8 BPBM: ---FORMAL TYPE: Complex (3 Features) 1 8 TOPOGRAPHY: Dissected alluvial slope 十貫 VEGETATION: Grasses, lantana, 'ilima CONDITION: Good 1 **INTEGRITY:** Unaltered 1.3 DIMENSIONS: 50.0 m long by 45.0 m wide; c. 2,250.00sq m 1 : **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ ίŊ Agriculture DESCRIPTION: Complex consists of three rectangular c. 8,550.0 sq m enclosures, two rectangular and one irregular. Many 15 agriculture features are present in the general area. Agriculture FEATURE A: Enclosure 11 **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima **CONDITION:** Good

INTEGRITY: Unaltered

DIMENSIONS: 20.0 m long by 15.0 m wide;

**PROBABLE AGE:** Prehistoric

DESCRIPTION: Irregular in plan. South wall extends c. 4.0 m beyond the east wall. The southwest portion of the structure has wider walls and the exterior of these walls are collapsed. A short section of the south wall is faced. Maximum wall height is 1.0 m. Walls are comprised of stacked cobbles and boulders. A possible firepit is present in the north central portion of the enclosure.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima

**CONDITION:** Fair/Poor

INTEGRITY: Unaltered

DIMENSIONS: 13.0 m long by 6.0 m wide; c. 78.0 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure partially faced on the interior of the northeast corner. The outside of the east wall is partially covered by alluvium. The walls range in height from 30 cm to 40 cm and are comprised of stacked basalt boulders and cobbles.

FEATURE C: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses

DIMENSIONS: 12.0 m long by 8.0 m wide; c. 96.0 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with partial facing on the southeast exterior wall. The feature has been damaged by cattle to the extent that details of construction are difficult to ascertain. Maximum height of walls is 1.0 m and they average 1.5 m in width.

SITE NOS .: State: 2051 PHRI: K-9 BPBM: - T-38 FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima CONDITION: Good **INTEGRITY:** Unaitered DIMENSIONS: 95.0 m long by 90.0 m wide; PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ DESCRIPTION: Complex consists of two overhangs with associated walls, a rectangular enclosure, and a large

irregular enclosure. The irregular enclosure surrounds an area of agricultural features. Both enclosures are attached to the wall of Site K-12.

# APPENDIX E

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CONDITION: Good/Fair FEATURE A: Overhang INTEGRITY: Unaltered **TOPOGRAPHY:** Dissected alluvial slope DIMENSIONS: 80.0 m long by 60.0 m wide; VEGETATION: Lantana, grasses, 'ilima, honey suckle. **CONDITION:** Good c. 4,800.0 sq m PROBABLE AGE: Prehistoric **INTEGRITY:** Unaltered FUNCTIONAL INTERPRETATION: Habitation/ DIMENSIONS: 10.0 m long by 5.0 m wide; c. 50.00 sq m **PROBABLE AGE:** Prehistoric Agriculture DESCRIPTION: Complex consists of two square DESCRIPTION: Feature consists of two adjacent enclosures, two oval enclosures, one circular enclosure, one overhangs with associated walls on top of an outcrop. The U-shaped enclosure, a platform, and many surrounding \*\*\*\* south edge of the outcrop abuts the rock wall of Site K-12. agricultural features. The northern overhang is 3.0 m long, 2.5 m deep, and 1.5 m high. The southern overhang is 1.3 m long, 1.2 m deep, and FEATURE A: Enclosure ÷ ... 1.5 m high. Although no cultural remains noted on the TOPOGRAPHY: Dissected alluvial slope surface of the overhangs their association with Feature B VEGETATION: Lantana, 'ilima, grasses, panini and size indicate possible use as shelters. Testing would be CONDITION: Good/Fair necessary to verify prehistoric use. e . . INTEGRITY: Unaltered DIMENSIONS: 3,6 m long by 3.5 m wide; c. 12.6 sq m FEATURE B: Enclosure PROBABLE AGE: Prehistoric **TOPOGRAPHY:** Dissected alluvial slope DESCRIPTION: Small square enclosure; most of the a 4 VEGETATION: Lantana, grasses, wattle, Christmas-berry walls are faced internally and externally. A probable CONDITION: Good entryway is present in the western portion of the northeast INTEGRITY: Altered wall. The walls have a maximum thickness of 70 cm and a DIMENSIONS: 10.0 m long by 8.0 m wide; c. 80.0 sq m ÷ . maximum height of 1.3 m. Walls are comprised of stacked PROBABLE AGE: Prehistoric/Historic basalt boulders and cobbles. DESCRIPTION: Rectangular enclosure; paved area adjacent to east wall. The paved area measures c. 8.0 by 4.0 FEATURE B: Enclosure m; its exact dimensions are difficult to determine because TOPOGRAPHY: Dissected alluvial slope dense vegetation covers the feature. The walls have an VEGETATION: Lantana, grasses, panini, wattle average width of 80 cm and a maximum height of 80 cm. CONDITION: Good Walls are comprised of stacked basalt cobbles and boulders. INTEGRITY: Unaltered DIMENSIONS: 5,7 m long by 3.8 m wide; c. 21.7 sq m **FEATURE C: Enclosure** PROBABLE AGE: Prehistoric **TOPOGRAPHY:** Dissected alluvial slope DESCRIPTION: Oval enclosure with high walls. The VEGETATION: Lantana, grasses, 'ilima, Christmas-berry structure is built into a slope so that the northeast wall is CONDITION: Good almost at ground level; the wall opposite the northeast wall **INTEGRITY:** Altered is very high, 1.5 m. The interior walls of the enclosure are DIMENSIONS: 45.0 m long by 15.0 m wide; faced, and most of the exterior walls are faced. Walls have c. 675.0 sq m a maximum thickness of 1.0 m and are comprised of stacked PROBABLE AGE: Historic/Prehistoric\* basalt cobbles and boulders. **DESCRIPTION:** Very large irregular-shaped enclosure surrounding an area of agricultural features. Feature forms FEATURE C: Enclosure part of the walls of Site K-12 a complex of of historic cattle TOPOGRAPHY: Dissected alluvial slope control walls; however, the presence of a series of terraces VEGETATION: Lantana, grasses, panini, wattle and numerous mounds in the interior suggest the enclosure also functioned, potentailly prehistorically, as a garden CONDITION: Good/Fair INTEGRITY: Unaltered enclosure. The walls range from 1.0 to 1.8 m in height and DIMENSIONS: 6.5 m long by 5.0 m wide; c. 32.5 sq m average 80 cm in thickness. they are comprised of stacked PROBABLE AGE: Prehistoric basalt boulders and cobbles. •--DESCRIPTION: Oval enclosure; two internal cupboards present in east and south walls. The north wall is the highest SITE NOS .: State: 2052 PHRI: K-10 BPBM: --and is built into the slope. Internal facing on the southeast FORMAL TYPE: Complex (7 Features) ٠... and southwest comers. The walls have a maximum thickness **TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: Lantana, grasses, panini, wattle

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of 1.0 m and range from 10 to 30 cm in height. Walls are

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# APPENDIX E

comprised of stacked basalt cobbles and boulders and occasionally incorporate bedrock outcrops.

FEATURE D: Enclosure

**TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: Lantana, grasses, panini, wattle

CONDITION: Poor

INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 4.0 m wide; c. 16.0 sq m PROBABLE AGE: Prehistoric

**DESCRIPTION:** Small circular enclosure; some interior facing on the southwest side. Just south of the enclosure, at the foot of Site K-12, is a small natural cupboard in bedrock. Walls average 20 cm in height and 70 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders and occasionally incorporate bedrock outcrops.

### FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 4.3 m long by 5.3 m wide; c. 22.8 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Square enclosure; exteriors of the southwest and northeast walls and interiors of northeast, southeast, and northwest walls are faced. Possible cupboard present in north corner. The walls have a maximum thickness of 1.3 m and a maximum height of 80 cm. Walls are comprised of stacked basalt cobbles and boulders.

#### FEATURE F: Enclosure

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TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 4.5 m long by 7.6 m wide; c. 34.2 sq m -----**PROBABLE AGE:** Prehistoric DESCRIPTION: U-shaped enclosure open to the - 1 northeast. Both sides of southeast and southwest walls are 1---faced. The northwest wall is mostly collapsed. Walls average 20 cm in height and 70 cm in thickness. Walls are 1 A comprised of stacked basalt cobbles and boulders and occasionally incorporate bedrock outcrops. 1 09 FEATURE G: Platform/pavement ł . TOPOGRAPHY: Dissected alluvial slope 1.1 VEGETATION: Lantana, grasses, 'ilima **CONDITION:** Good 1 5 **INTEGRITY:** Unaltered t-st DIMENSIONS: 5.0 m long by 5.0 m wide; c. 25.0 sq m **PROBABLE AGE: Prehistoric** 

DESCRIPTION: Platform or partially elevated pavement built on and around bedrock. One meter north of the platform is a faced wall which extends north for 4.0 m. The feature has a maximum height of 50 cm and is comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2053 PHRI: K-11 BPBM: --- T-39 FORMAL TYPE: Terrace

**TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, panini, wattle, koa-haole

CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 6.0 m long by 4.0 m wide; c. 24.0 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

**DESCRIPTION:** Rectangular terrace; the east side and part of the west wall of the terrace consist of bedrock outcrops. Most of the west and north walls retain and rise slightly above a level area. Walls are unfaced. Many agricultural features in the general area.

SITE NOS .: State: 2054 PHRI: K-12 BPBM: ---

FORMAL TYPE: Wall

**TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: Lantana, grasses, wattle, 'ilima, wiliwili
 CONDITION: Good/Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 700.0 m long by 333.0 m wide;

c. 23,3100.0 sq m

**PROBABLE AGE:** Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Site consists of a complex of variable length cattle walls some of which form large enclosures in a collapsed lava tube. The walls extend beyond the project area's southwestern corner. The most prominent wall extends the distance and loops around to return to the project area's west boundary.

SITE NOS.: State: 2055 PHRI: K-13 BPBM: --

FORMAL TYPE: Complex (6 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, cilantro (Coriandrum sativum L., 'ilima, wattle, panini

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 100.0 m long by 45.0 m wide;

c. 4,500.0 sq m

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

**DESCRIPTION:** Four rectangular enclosures, one Dshaped enclosure, and one oval enclosure. Agriculture features, mounds and terraces, present in the area.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses CONDITION: Fair INTEGRITY: Unaltered DIMENSIONS: 3.5 m long by 3.0 m wide; c. 10.5 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Rectangular enclosure; internal

cupboard present on east wall; north-south wall extension off the east wall. Some of the inside of the north wall is faced; however, most walls are collapsed. Walls range from 30 cm to 60 cm in height and average 50 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, cilantro CONDITION: Fair INTEGRITY: Unaltered DIMENSIONS: 6.2 m long by 5.8 m wide; c. 36.0 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Sub-rectangular enclosure with collapsed walls; no facing or internal features present. Faced terrace nearby. Walls average 60 cm in height and 1.4 m in thickness. Walls are comprised of stacked basalt

cobbles and boulders. FEATURE C: Enclosure TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, and 'ilima CONDITION: Fair

INTEGRITY: Unaltered

**DIMENSIONS:** 5.7 m long by 5.3 m wide; c. 30.2 sq m **PROBABLE AGE:** Prehistoric

**DESCRIPTION:** Rectangular enclosure; north and northeast sides of the feature are built on bedrock. The walls are collapsed and the interior is filled with rubble. Walls average 60 cm in height and 1.4 m in thickness. Walls are comprised of stacked basalt cobbles and boulders and occasionally incorporate bedrock outcrops.

FEATURE D: Enclosure

**TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: Lantana, grasses, <u>panini</u>, wattle, forbs CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 5.0 m long by 5.0 m wide; c. 25.0 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure with unfaced walls.

Walls average 40 cm in height and 1.2 m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE E: Enclosure **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Lantana, morning glory, grasses, panini. 'ilima **CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 5.6 m long by 4.5 m wide; c. 25.2 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: D-shaped enclosure. North wall formed by an overhang and the remaining walls are comprised of stacked rock. The east wall and portions of the west wall are faced. Walls average 40 cm in height and 80 cm in thickness. Walls are comprised of stacked basalt cobbles e 1 and boulders. FEATURE F: Enclosure ù Ì TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Lantana CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 6.5 m long by 5.5 m wide; c. 35.8 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Sub-rectangular structure with no facing. Walls average 40 cm in height and 1.2 m in thickness. Walls are comprised of stacked basalt cobbles and boulders. SITE NOS .: State: 2056 PHRI: K-14 BPBM: ---FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, panini, grasses, forbs **CONDITION:** Fair **INTEGRITY:** Altered DIMENSIONS: 50.0 m long by 35.0 m wide; c. 1,750.0 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Complex consists of a U-shaped structure and associated agriculture features. The U-shape opens to southwest. The feature is 6.0 m long, 5.5 m wide, and has a maximum height of 70 cm. The walls average 2.0 m in thickness and appear mostly collapsed. A cattle wall (Site K-12) runs through the site. SITE NOS .: State: 2057 PHRI: K-16 BPBM: ---FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, honey suckle, wattle, <u>panini</u>

CONDITION: Fair INTEGRITY: Unaltered

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DIMENSIONS: 85.0 m long by 55.0 m wide; c. 4,675.0 sq m

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION --- Habitation DESCRIPTION: Complex consists of four habitation enclosures. A cattle wall, which is part of Site K-12, runs through the site. Minor agricultural features surround complex.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, panini, Christmas-berry **CONDITION:** Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 4.0 m long by 3.7 m wide; c. 14.8 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Double enclosure. The eastern enclosure is circular, the walls are collapsed and they incorporate bedrock. The western enclosure is square, and the walls are collapsed. Walls average 80 to 100 cm in height and 100 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

# FEATURE B: Enclosure

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TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, Christmas-berry, <u>panini</u>

**CONDITION:** Good

**INTEGRITY:** Unaltered

DIMENSIONS: 6.5 m long by 5.5 m wide; c. 35.8 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Rectangular enclosure; facing present on all of the exterior walls and on the interiors of the south and west walls. The stones used in construction are quite irregular so that the facing is not obvious. A break in the west wall is probably due to cattle, but may represent an entryway. Walls have a maximum height of 85 cm and and a maximum thickness of 80 cm.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, panini

CONDITION: Poor

**INTEGRITY:** Unaltered

DIMENSIONS: 8.5 m long by 7.5 m wide; c. 63.8 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Oval enclosure with collapsed walls. Walls average 10 cm in height and 60 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

SITE NOS .: State: 2058 PHRI: K-19 BPBM: ---FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, wattle **CONDITION:** Good **INTEGRITY:** Unaltered

DIMENSIONS: 60.0 m long by 45.0 m wide;

c. 2,700.0 sq m

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex of three habitation structures and numerous agriculture features. Many of the agriculture features are well-defined, are well-constructed, and incorporate bedrock.

**FEATURE A: Enclosure** 

**TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, wattle

**CONDITION:** Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 5.0 m long by 4.2 m wide; c. 21.0 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Small circular structure with some internal facing. Walls average 50 cm in height and 65 cm in thickness. Walls are comprised of stacked basalt pebbles, cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, wattle, panini **CONDITION:** Fair

INTEGRITY: Unaltered

DIMENSIONS: 4.2 m long by 3.5 m wide; c. 14.7 sq m

**PROBABLE AGE:** Prehistoric

DESCRIPTION: Small C-shaped enclosure. No facing observed. Walls average 55 cm in height and 70 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE C: Enclosure

**TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, panini **CONDITION:** Good

**INTEGRITY:** Unaltered

DIMENSIONS: 8.5 m long by 8.0 m wide; c. 68.0 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Oval enclosure with some facing in the northeast corner. North wall is the highest. Walls average 80 cm in height and 60 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2059 PHRI: K-20 BPBM: ---FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope

### APPENDIX E

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SITE NOS .: State: 2060 PHRI: K-21 BPBM: ---VEGETATION: Lantana, grasses, 'ilima, wattle, FORMAL TYPE: Complex (2 Features) Christmas-berry TOPOGRAPHY: Dissected alluvial slope CONDITION: Good VEGETATION: Lantana, 'ilima, grasses, wattle, panini **INTEGRITY:** Unaltered CONDITION: Good DIMENSIONS: 50.0 m long by 35.0 m wide; INTEGRITY: Unaltered c. 1,750.0 sq m DIMENSIONS: 55.0 m long by 25.0 m wide; **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ c. 1,375.0 sq m **PROBABLE AGE:** Prehistoric Agriculture A ...... FUNCTIONAL INTERPRETATION: Habitation/ DESCRIPTION: Complex consists of two enclosures, Agriculture one residential terrace, and many surrounding agriculture DESCRIPTION: Complex consists of a notched enclosure terraces. 8-4 and a badly collapsed circular enclosure. Within the notched enclosure is a small room. Agriculture features present in FEATURE A: Enclosure general area. **TOPOGRAPHY:** Dissected alluvial slope ii 1 VEGETATION: Lantana, grass, 'ilima, wattle, FEATURE A: Enclosure Christmas-berry TOPOGRAPHY: Dissected alluvial slope **CONDITION:** Fair VEGETATION: Lantana, grasses, 'ilima, wattle, panini **INTEGRITY:** Unaltered 51 **CONDITION:** Fair DIMENSIONS: 6.3 m long by 0.0 m wide; c. 0.00 sq m **INTEGRITY:** Unaltered **PROBABLE AGE:** Prehistoric DIMENSIONS: 5.5 m long by 5.5 m wide; c. 30.3 sq m DESCRIPTION: Square unfaced enclosure; possible step 2... PROBABLE AGE: Prehistoric on the interior of the east wall at a possible entryway. Walls DESCRIPTION: Circular enclosure bisected by a have a maximum height of 50 cm. and are comprised of modified bedrock wall. The walls are severely collapsed. stacked basalt pebbles, cobbles and boulders. Walls average 60 cm in height and 35 m in thickness. Walls are comprised of stacked basalt cobbles and boulders and FEATURE B: Terrace occasionally incorporate bedrock outcrops. TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle, panini FEATURE B: Enclosure CONDITION: Good TOPOGRAPHY: Dissected alluvial slope **INTEGRITY:** Unaltered VEGETATION: Lantana, grasses, 'ilima, Christmas-berry, DIMENSIONS: 6.0 m long by 5.0 m wide; c. 30.0 sq m <u>panini</u> **PROBABLE AGE:** Prehistoric **CONDITION:** Good **FUNCTIONAL INTERPRETATION: Habitation** DESCRIPTION: Rectangular level area with walls on **INTEGRITY:** Unaltered DIMENSIONS: 11.0 m long by 10.5 m wide; three sides. A wall, or what may be a wall, extends off the c. 115.5 sq m northwest corner of the terrace. Walls average 80 cm in **PROBABLE AGE:** Prehistoric height and 80 m in thickness. Walls are comprised of DESCRIPTION: Notched structure with thick, 2.0+ m stacked basalt cobbles and boulders and occasionally wide walls in the northeast corner and north end of the east incorporate bedrock outcrops. wall. A small internal room, c. 2.5 m by 1.5 m in size, **۲** extends from the north wall. Some facing is evident around FEATURE C: Enclosure the structure, as well as on the internal room. Walls average **TOPOGRAPHY:** Dissected alluvial slope 80 cm in height and 1.15 m in thickness. Walls are VEGETATION: Lantana, 'ilima, wattle, grasses comprised of stacked basalt cobbles and boulders. CONDITION: Good **INTEGRITY:** Unaltered SITE NOS.: State: 2061 PHRI: K-25 BPBM: ---DIMENSIONS: 2.0 m long by 2.0 m wide; c. 4.0 sq m 5-1 FORMAL TYPE: Complex (6 Features) **PROBABLE AGE:** Prehistoric TOPOGRAPHY: Dissected alluvial slope DESCRIPTION: This is a small circular enclosure. There VEGETATION: Lantana, grasses, 'ilima, wattle, panini is some facing on the walls. A possible entryway is present 4 . . . CONDITION: Good in the sutheast side. Walls average 70 cm in height and 50 INTEGRITY: Altered m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

# APPENDIX E

DIMENSIONS: 120.0 m long by 90.0 m wide; c. 10,800.0 sq m

PROBABLE AGE: Historic/Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture/Animal Control

**DESCRIPTION:** Complex consists of a circular enclosure, one irregular enclosure, two sub-rectangular enclosures, an L-shaped enclosure, one upslope-downslope wall, and many agriculture features. A series of well-faced, relatively high scallop-shaped terraces which frequently incorporate bedrock outcrops are present on the steeper slopes in the southeast portion of the site.

#### FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, grasses CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 4.0 m long by 3.5 m wide; c. 14.0 sq m PROBABLE AGE: Prehistoric DESCRIPTION: C-shaped enclosure with partially collapsed unfaced walls. Structure opens to the southwest.

Walls average 30 cm in height and 60 m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

### FEATURE B: Wall

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TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, grasses, wattle
CONDITION: Fair
INTEGRITY: Unaltered
DIMENSIONS: 9.4 m long by 5.3 m wide; c. 49.8 sq m
PROBABLE AGE: Prehistoric
DESCRIPTION: L-shaped enclosure with some facing on the interior and exterior of the south wall. Feature is open to the southeast. The west wall is entirely collapsed. An area of rubble indicates feature may have once had a north wall. Walls have a maximum height of 1.2 m and average 90 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders. There is a mound very close to the feature and a small C-shaped mound 2.0 m from the northwest corner.

FEATURE C: Enclosure TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, panini

- CONDITION: Good/Fair INTEGRITY: Unaltered DIMENSIONS: 12.0 m long by 9.0 m wide; c. 108.0 sq m PROBABLE AGE: Prehistoric
- DESCRIPTION:
   Enclosure is irregular in plan view.

   The southwest wall runs upslope-downslope into Site K-36.
   Enclosure contains an internal terrace wall in poor condition.

   Facing is present on the interior of the northeast corner and
   Facing is present on the interior of the northeast corner and

parts of the south wall. Walls average 45 cm in height and are comprised of stacked basalt cobbles and boulders.

# FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, 'ilima, lantana, wattle, panini CONDITION: Fair

INTEGRITY: Unaltered

DIMENSIONS: 20.5 m long by 15.0 m wide;

c. 307.5 sq m

PROBABLE AGE: Prehistoric/Historic

**DESCRIPTION:** Large rectangular enclosure; the east and west walls form terraces. The north and south walls are free standing. A wing wall extends off the southeast corner for c. 15 m. A long upslope-downslope probable ranch wall extends off the northeast corner, and a terrace extends off the east wall.

### FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 4.5 m long by 4.0 m wide; c. 18.0 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with some facing present on the exterior of the northeast corner. Walls average 60 cm in height and are comprised of stacked basalt cobbles and boulders.

### FEATURE F: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses

CONDITION: Good

INTEGRITY: Unaltered DIMENSIONS: 32.0 m long by 0.8 m wide; c. 25.6 sq m

PROBABLE AGE: Historic

DESCRIPTION: Upsole-downslope wall segment. West end of wall falls about 2.0 meters short of connecting with Fea. D. The east end of the wall is broken up into several walls and extends almost to a drainage. Walls average 60 cm in height and are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2062 PHRI: K-26 BPBM: — T-64 FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 40.0 m long by 20.0 m wide; c. 800.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Feature A is comprised of two rectangular rooms and a semicircular room. Feature B is a triangular platform. There are agricultural terraces throughout the general area.

FEATURE A: Enclosure

**TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 10.0 m long by 7.0 m wide; c. 70.0 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Three-roomed enclosure consisting of two rectangular enclosures which share a wall with a semicircular enclosure. Rectangular enclosures are situated just uphill from the semicircular enclosure. Wall of the semicircular enclosure is faced. Walls average 30 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE B: Platform

**TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wiliwili

**CONDITION:** Fair

**INTEGRITY:** Unaitered DIMENSIONS: 3.5 m long by 5.0 m wide; c. 17.5 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Triangular platform extends out from a gentle slope. The northwest wall is faced. The platform is 30 cm high and comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2063 PHRI: K-27 BPBM: - T-62 (Figure E-2)

FORMAL TYPE: Complex (2 Features)

**TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 30.0 m long by 30.0 m wide; c. 900.0 sq m

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Complex consists of a rock shelter with a curved wall in front of it, and a rectangular enclosure which makes extensive use of bedrock. Agriculture features surround the complex.

FEATURE A: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, wattle CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 6.0 m long by 4.0 m wide; c. 24.0 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: Two small chambers are present within the 50 cm high overhang. A wall fronting the overhang

forms a semicircular enclosure with the overhang. The wall averages 60 cm in height and is comprised of stacked basalt cobbles and boulders. Off the east wall of the enclosure there is a level area consisting of rubble (possible pavement).

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, wattle

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 10.0 m long by 5.8 m wide; c. 58.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: A rectangular enclosure. The north wall consists of the outcrop Feature A cuts into. There is some facing on the south and east walls. A 50 cm high step or bench runs the length of the interior of the east wall and possibly extends a little on the north and south walls. Walls average 60 cm in height and are comprised of stacked basalt cobbles and boulders.

| SITE NOS.: State: 2064 PHRI: K-29 BPBM: - T-63 |
|------------------------------------------------|
| FORMAL TYPE: Complex (2 Features)              |
| TOPOGRAPHY: Dissected alluvial slope           |
| VEGETATION: Lantana, grasses, 'ilima           |
| CONDITION: Good/Fair                           |
| INTEGRITY: Unaltered                           |
| DIMENSIONS: 50.0 m long by 50.0 m wide;        |
| c. 2,500.0 sq m                                |

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Feature A has walls extending from the northwest and southwest corners. Feature B has a possible platform in the southeast corner and a paved trail in the southwest corner. Agriculture features surround the complex. Some distance from the complex an isolated piece of coral was found. The substantial nature of Feature B and its close proximity to the heiau, Site K-30 suggest it may have functioned as a high status and/or priestly residence.

FEATURE A: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: lantana, 'ilima, grasses CONDITION: Good INTEGRITY: Unaltered

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# APPENDIX E



Figure E-2. SITE K-27, OVERHANG. VIEW TO WEST-NORTHWEST. (PHRI Neg. 1143-10a)

## APPENDIX E

E-14

DIMENSIONS: 12.0 m long by 10.0 m wide; c. 120.0 sq m FORMAL TYPE: Enclosure **PROBABLE AGE:** Prehistoric TOPOGRAPHY: Dissected alluvial slope DESCRIPTION: Rectangular enclosure with modified VEGETATION: Lantana, 'ilima, grasses bedrock walls extending off the northeast and southeast **CONDITION:** Fair corners. These walls run upslope, the longest for 15.0 m, the **INTEGRITY:** Unaltered other for 5.0 m. The north wall and the interior of the east DIMENSIONS: 10.0 m long by 9.0 m wide; c. 90.0 sq m **PROBABLE AGE: Prehistoric** wall are faced. Maximum wall height is 1.5 m. Walls are comprised of stacked cobbles and boulders. FUNCTIONAL INTERPRETATION: Habitation/ Agriculture FEATURE B: Enclosure DESCRIPTION: Sub-rectangular enclosure with very collapsed walls. Agricultural features surround this site. **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses Some facing is present on the inside of the east wall. **CONDITION:** Good Possible platform present in the northeast corner. The wall **INTEGRITY:** Unaitered ranges from 20 cm to 55 cm in height and averages 2.5 m in DIMENSIONS: 18.0 m long by 13.0 m wide; width. The wall is comprised of stacked basalt cobbles and 11 c. 234.0 sq m boulders. **PROBABLE AGE:** Prehistoric DESCRIPTION: Rectangular enclosure with a possible SITE NOS .: State: 2066 PHRI: K-32 BPBM: ---÷ 1 collapsed platform in the southeast corner. Portions of the FORMAL TYPE: Terrace north wall are paved with pebbles, especially the eastern **TOPOGRAPHY:** Dissected alluvial slope half of the north wall. The upper surface of the west wall is VEGETATION: Lantana, grasses, wattle nearly flush with the interior of the structure and thus, may **CONDITION:** Good have served as a porch. The walls are very substantially **INTEGRITY:** Unaltered constructed being nearly 2.0 m thick and up to 1.2 m high. DIMENSIONS: 6.0 m long by 5.5 m wide; c. 33.0 sq m Intact facing is present along most of the interior and **PROBABLE AGE:** Prehistoric exterior of the structure's walls. A paved walkway is **FUNCTIONAL INTERPRETATION: Habitation** present 0.5 m from the southwest corner of the enclosure; DESCRIPTION: Sub-rectangular terrace with walls on this walkway extends for 5.0 m to the west. the north, south, and west sides. The walls range from 50 cm to 60 cm in height and average 1.3 m in thickness. Walls are SITE NOS .: State: 2031 PHRI: K-30 BPBM: --comprised of stacked basalt cobbles and boulders. The east (Figure E-3) side is defined by a bedrock alignment. A short wall extends FORMAL TYPE: Enclosure off the south corner. TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, morning glory, SITE NOS.: State: 2067 PHRI: K-35 BPBM: -castor bean FORMAL TYPE: Complex (2 Features) CONDITION: Good **TOPOGRAPHY:** Dissected alluvial slope **INTEGRITY:** Unaltered VEGETATION: Lantana, 'ilima, wattle, grasses DIMENSIONS: 25.0 m long by 24.0 m wide; **CONDITION:** Fair c. 600.0 sq m **INTEGRITY:** Unaltered **PROBABLE AGE:** Prehistoric DIMENSIONS: 80.0 m long by 65.0 m wide; FUNCTIONAL INTERPRETATION: Religious c. 5,200.0 sq m DESCRIPTION: Molohai Heiau; a large and notched **PROBABLE AGE:** Prehistoric enclosure. Internal features include a long low wall, two FUNCTIONAL INTERPRETATION: Habitation/ mounds (one of which is faced), a triangular platform faced Agriculture on one side, a square platform in the north corner, a step or DESCRIPTION: Complex consists primarily of a bench around most of the inside wall, and a step or bench interconnected complex of agricultural terraces with an along outside of the north and west walls. A fragment of associated small enclosure and a small overhang. coral is present on the step on the inside of the south wall. A test unit was excavated near the triangular platform FEATURE A: Enclosure which revealed a subsurface cultural deposit containing TOPOGRAPHY: Dissected alluvial slope \*\*\* volcanic glass and basalt flakes, marine shell, mammal **VEGETATION:** Lantana, wattle, grasses bone, and charcoal. CONDITION: Fair

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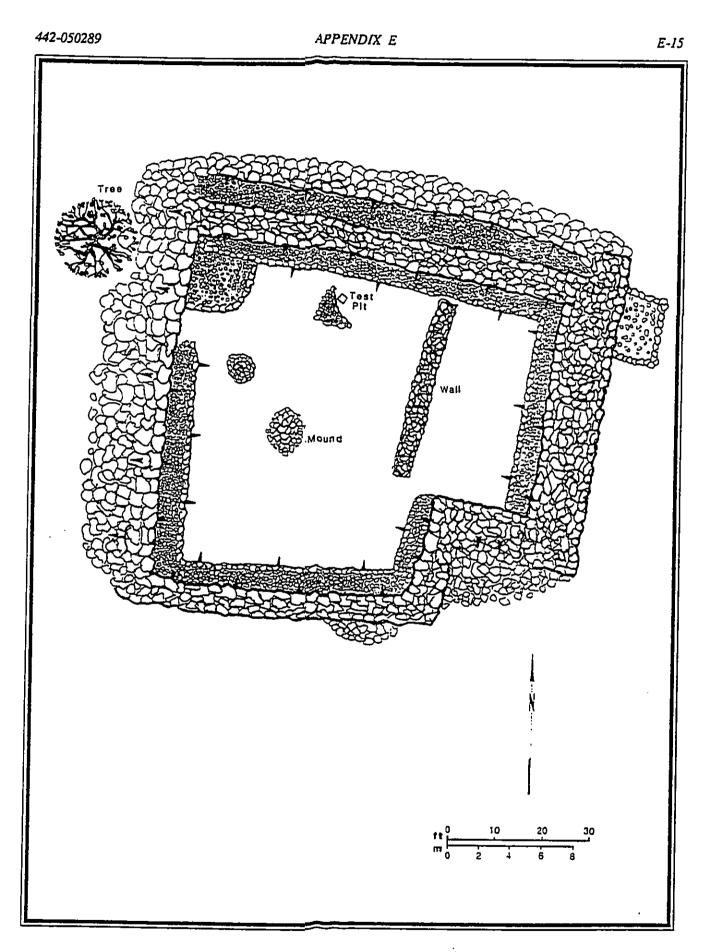


Figure E-3. SITE K-30.

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# APPENDIX E

### **INTEGRITY:** Unaltered

DIMENSIONS: 6.5 m long by 5.6 m wide; c. 36.4 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: D-shaped enclosure with two terrace walls curving off the northwest and southeast sides. The walls connect with a larger terrace 5.0 m to the south. Another wall may have once been connected to the east side of the enclosure; this wall is now separated from the enclosure by a cattle trail.

# FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, 'ilima, grasses, vines **CONDITION:** Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 4.7 m long by 3.1 m wide; c. 14.6 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Natural partially collapsed lava blister. The 50 cm high blister opening is partially blocked with a cobble wall. The wall is faced on the inside of its northwest end.

SITE NOS .: State: 3032 PHRI: K-36 BPBM: ---FORMAL TYPE: Complex (5 Features) **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses, wattle **CONDITION:** Excellent **INTEGRITY:** Unaltered

DIMENSIONS: 100.0 m long by 90.0 m wide; c. 9,000.0 sq m

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Complex consists of two rectangular enclosures, one trapezoidal enclosure, two attached circular enclosures, one very large rectangular enclosure, and numerous associated agriculture features.

**FEATURE A: Enclosure** 

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wattle, Christmas-berry, <u>'ilima</u>

CONDITION: Very Good

**INTEGRITY:** Unaltered

DIMENSIONS: 4.8 m long by 3.3 m wide; c. 15.8 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Rectangular enclosure with a cupboard and intact facing on interior of the southwest wall. The feature has very high walls, up to 2.0 m (exterior measurement). The walls average 1.0 m in thickness and are comprised of stacked basalt cobbles and boulders.

| FEATURE B: Enclosure<br>TOPOGRAPHY: Dissected alluvial slope                                                |          |
|-------------------------------------------------------------------------------------------------------------|----------|
| VEGETATION: Lantana, wattle, grasses, morning glory                                                         | • ~      |
| CONDITION: Excellent                                                                                        |          |
| INTEGRITY: Unaltered                                                                                        |          |
| DIMENSIONS: 5.9 m long by 5.4 m wide; c. 31.9 sq m                                                          | -        |
| PROBABLE AGE: Prehistoric                                                                                   |          |
| DESCRIPTION: All walls are faced on both sides. A                                                           |          |
| few small areas of the wall are collapsed. The walls average                                                | 3        |
| 80 cm in height and average 1.0 m in thickness. Walls are comprised of stacked basalt cobbles and boulders. |          |
| comprised of stacked basait coboles and bounders.                                                           |          |
| FEATURE C: Enclosure                                                                                        | Benet    |
| TOPOGRAPHY: Dissected alluvial slope                                                                        |          |
| VEGETATION: Lantana, 'ilima, Christmas-berry, grasses                                                       |          |
| CONDITION: Good                                                                                             | <b>E</b> |
| INTEGRITY: Unaltered                                                                                        |          |
| DIMENSIONS: 9.0 m long by 7.5 m wide; c. 67.5 sq m                                                          |          |
| PROBABLE AGE: Prehistoric<br>DESCRIPTION: Sub-trapezoidal enclosure. Inside of                              | ¥ (      |
| west wall is faced. Present on exterior of north wall is a                                                  | ,        |
| bedrock overhang (3.3 m long by 60 cm deep by 60 cm                                                         |          |
| high). All walls are partially collapsed. The walls have a                                                  | p -      |
| maximum height of 1.0 m and average 70 cm in thickness.                                                     | ,        |
| Walls are comprised of stacked basalt cobbles and boulders.                                                 |          |
| Feature is within and attached to Feature E.                                                                | <b>د</b> |
| FEATURE D: Enclosure                                                                                        |          |
| TOPOGRAPHY: Dissected alluvial slope                                                                        |          |
| VEGETATION: Lantana, grasses, wattle                                                                        | • •      |
| CONDITION: Good                                                                                             | • • •    |
| INTEGRITY: Unaltered                                                                                        |          |
| DIMENSIONS: 65.0 m long by 37.0 m wide;                                                                     | • •      |
| c. 2,405.0 sq m                                                                                             | ••••     |
| PROBABLE AGE: Prehistoric<br>DESCRIPTION: Feature C is within this very large                               |          |
| enclosure; a Feature E is attached to the outside of the                                                    | •        |
| enclosure. Terraces are present throughout the enclosure's                                                  |          |
| interior. The enclosure average 75 cm in height ane are                                                     |          |
| comprised of stacked basalt cobbles and boulders.                                                           |          |
|                                                                                                             | • • • •  |
| FEATURE E: Enclosure                                                                                        |          |
| TOPOGRAPHY: Dissected alluvial slope                                                                        |          |
| VEGETATION: Lantana, grasses, wattle<br>CONDITION: Fair                                                     | • •••    |
| INTEGRITY: Unaltered                                                                                        |          |
| DIMENSIONS: 10.0 m long by 5.0 m wide; c. 50.0 sq m                                                         |          |
| PROBABLE AGE: Prehistoric                                                                                   | 5° †     |
| DESCRIPTION: Double enclosure consisting of two                                                             |          |
| attached, roughly circular enclosures. The walls are very                                                   | i        |
| collapsed. North wall is formed by Feature D. Much of the                                                   | 5 I      |
| east wall is formed by an outcrop. The walls have a                                                         |          |
| maximum height of 90 cm and average 60 cm in thickness.                                                     | ł        |

Walls are comprised of stacked basalt cobbles and boulders.

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# APPENDIX E

SITE NOS .: State: 2068 PHRI: K-39 BPBM: ----FORMAL TYPE: Overhangs TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, Christmas-berry, grasses **CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 28.0 m long by 10.0 m wide; c. 280.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Consists of two shelters situated on the same side of a collapsed lava tube. The northern shelter is smaller than the southern one. The northern shelter is approximately 11 m long, 1.0m to 1.6 m deep, and 40 cm to 60 cm high. The southern shelter is approximately 8 m long, 1.6 m to 4.6 m deep, and 40 cm to 90 cm high. A terrace is fronts the southern shelter extending 5.0 m outside the shelter opening. The terrace has a maximum height of 2.0 m.

SITE NOS .: State: 2069 PHRI: K-40 BPBM: ---

(Figure E-4) FORMAL TYPE: Enclosure FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, grasses, wattle **CONDITION:** Good **INTEGRITY:** Unaltered **INTEGRITY:** Unaltered DIMENSIONS: 12.0 m long by 8.0 m wide; c. 96.0 sq m c. 900.0 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Complex consists of a rockshelter situated directly beneath a rectangular enclosure. FEATURE A: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, grasses **CONDITION:** Good INTEGRITY: Unaltered DIMENSIONS: 11.0 m long by 8.4 m wide; c. 92.4 sq m **PROBABLE AGE:** Prehistoric CONDITION: Good DESCRIPTION: Rectangular enclosure with a c. 1.0 mwide bench or step along the east wall. The northwest DIMENSIONS: 55.0 m long by 45.0 m wide; corner is comprised of bedrock, which extends over the top c. 2,475.0 sq m

of Feature B. The west and north walls, and the southeast corner of the enclosure are partially faced. The walls range from 30 to 70 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE B: Overhang TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses CONDITION: Good

**INTEGRITY: Unaltered** 

DIMENSIONS: 4.0 m long by 3.6 m wide; c. 14.4 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Natural rock shelter in partially collapsed blister. The shelter is 90 cm high. Two basalt flakes noted at the north end of the shelter.

SITE NOS .: State: 2070 PHRI: K-41 BPBM: ----

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, grasses, Christmas-berry **CONDITION:** Good

**INTEGRITY:** Unaltered

DIMENSIONS: 1.2 m long by 1.0 m wide; c. 1.20 sq m **PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Temporary

Habitation

DESCRIPTION: Very small rock shelter. Shelter is 60 cm high. Kukui nut fragment found inside.

SITE NOS .: State: 2071 PHRI: K-42 BPBM: ----

(Figure E-5)

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Very Good

DIMENSIONS: 50.0 m long by 18.0 m wide;

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Rectangular enclosure with core-fill walls. Walls average 90 cm in height. A piece of columnar basalt is present in the east wall. Sixteen meters away from the enclosure is a 26.0 m long wall.

SITE NOS .: State: 2072 PHRI: K-44 BPBM: ----FORMAL TYPE: Complex (4 Features) **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses **INTEGRITY:** Unaitered

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Complex consists of a rectangular structure, an irregular enclosure, two C-shape enclosures, and surrounding agriculture features.

FEATURE A: Enclosure **TOPOGRAPHY:** Dissected alluvial slope

# APPENDIX E

Figure E-4. SITE K-40, OVERHANG. VIEW TO SOUTHEAST. (PHRI Neg. 1157-10) E-18

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Figure E-5. SITE K-42, NE WALL OF FEATURE A. VIEW TO SOUTHWEST. (PHRI Neg.1151-1)

VEGETATION: Lantana, 'ilima, wattle, grasses CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 7.5 m long by 6.0 m wide; c. 45.0 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular structure with very thick (2-3.0 m) walls. Interior of the east and west walls are faced. North and west walls are somewhat collapsed. The walls range from 50 (interior) to 1.1 m (exterior) in height and are comprised of stacked basalt cobbles and boulders.

### FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 17.0 m long by 13.0 m wide:

c. 221.0 sa m

PROBABLE AGE: Prehistoric

DESCRIPTION: Double enclosure consisting of a roughly square and a roughly rectangular enclosure. The walls of the enclosure are very thick, up to 4.0 m thick on the southeast side. The south corner of the enclosure is faced. Near the south corner, on the southwest wall, is an opening. The walls range from 60 cm (interior) to 80 cm (exterior) in height and are comprised of stacked basalt cobbles and boulders occasionally incorporating bedrock outcrops.

### FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

# CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 9.0 m long by 8.5 m wide; c. 76.5 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Large C-shaped enclosure with walls faced on both sides. A short wall extends off the west corner of the enclosure. The southeast wall of the enclosure is collapsed. The walls average 55 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wantle, grasses

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 3.0 m long by 3.0 m wide; c. 9.0 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Small C-shaped enclosure open to the north. The back wall of the enclosure is built into an outcrop. On this same outcrop are several small terraces.

SITE NOS .: State: 2073 PHRI: K-45 BPBM: --- T-60 FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, panini, wattle, grasses **CONDITION:** Good

**INTEGRITY:** Unaltered

DIMENSIONS: 7.8 m long by 6.5 m wide; c. 50.7 sq m PROBABLE AGE: Prehistoric

# FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Rectangular enclosure with most of each wall faced. The northeast wall is built partially on bedrock. North of the feature is a long terrace which forms an arc; level areas are present above and below the terrace. The walls average 50 cm in height and are comprised of stacked basalt cobbles and boulders.

SITE NOS .: State: 2074 PHRI: K-46 BPBM: - T-60 FORMAL TYPE: Complex (4 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, panini, wattle, grasses

**CONDITION:** Good

INTEGRITY: Unaltered DIMENSIONS: 74.0 m long by 35.0 m wide;

c. 2590.0 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Complex consists of two rectangular enclosures, one C-shaped enclosure, one D-shaped enclosure, and numerous surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, 'ilima, grasses

**CONDITION:** Fair

INTEGRITY: Unaltered DIMENSIONS: 6.5 m long by 6.0 m wide; c. 39.0 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: The northwest side of this rectangularshaped feature is very collapsed. The northwest side incorporates a bedrock outcrop. Small portions of both sides of the walls are faced. The walls average 50 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE B: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 7.0 m long by 5.5 m wide; c. 38.5 sq m PROBABLE AGE: Prehistoric

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DESCRIPTION: C-shaped enclosure open to the southwest. The back of the C-shape is comprised of an outcrop. The outside of north wall is faced. A rock alignment runs across the front of the enclosure. The walls are comprised of stacked basalt cobbles and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good

**INTEGRITY:** Unaltered

**DIMENSIONS:** 7.5 m long by 5.5 m wide; c. 41.3 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Rectangular enclosure. Exteriors of all walls except east wall are faced. East wall is totally collapsed. The west wall incorporates some bedrock. The walls are comprised of stacked basalt cobbles and boulders.

FEATURE D: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 7.0 m long by 5.0 m wide; c. 35.0 sq m PROBABLE AGE: Prehistoric DESCRIPTION: D-shaped enclosure comprised of a bedrock outcrop and a wall. The outcrop forms the straight wall and part of the western portion of the D-shape. The walls are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2033 PHRI: K-48 BPBM: T-61-17-58 (Figure E-6)

FORMAL TYPE: Complex (4 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, wattle, 'ilima, Christmas-berry, grasses

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 145.0 m long by 75.0 m wide;

c. 10,875.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

**DESCRIPTION:** Very large complex consisting of a very large enclosure, a double enclosure, a small square enclosure, and an irregular enclosure. An extensive series of large contour terraces is situated along a broad ridge which extends through the central portion of the site.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle, Christmas-berry, grasses

CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 67.0 m long by 67.0 m wide;

c. 4,489.0 sq m

**PROBABLE AGE:** Prehistoric

DESCRIPTION: Large irregular-shaped enclosure with substantial walls, several of which incorporate large upright slabs as facing stones. Some of the walls are faced. Walls have a maximum thickness of 2.0 m and are up to 1.5 m in height. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE B: Enclosure

**TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: Lantana, wattle, vines, grasses

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 12.0 m long by 10.5 m wide;

c. 126.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Double enclosure in good condition. Lanai of porch present outside of the west wall. Situated just above the northeast corner of the enclosure is a curved paved terrace. Much facing present on interior walls. The walls have a maximum height of 1.1 m and maximum thickness of 2.0 m.

Two test units were excavated in the feature, one in each room. The units revealed a subsurface cultural deposit containing sea urchin remains, mammal and fish bone, a shark tooth, basalt and volcanic glass flakes, and charcoal. A radiocarbon sample collected from the deposit yielded a calendric age range of AD 1518-1591.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, wattle, Christmas-berry, grasses CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 17.0 m long by 17.0 m wide;

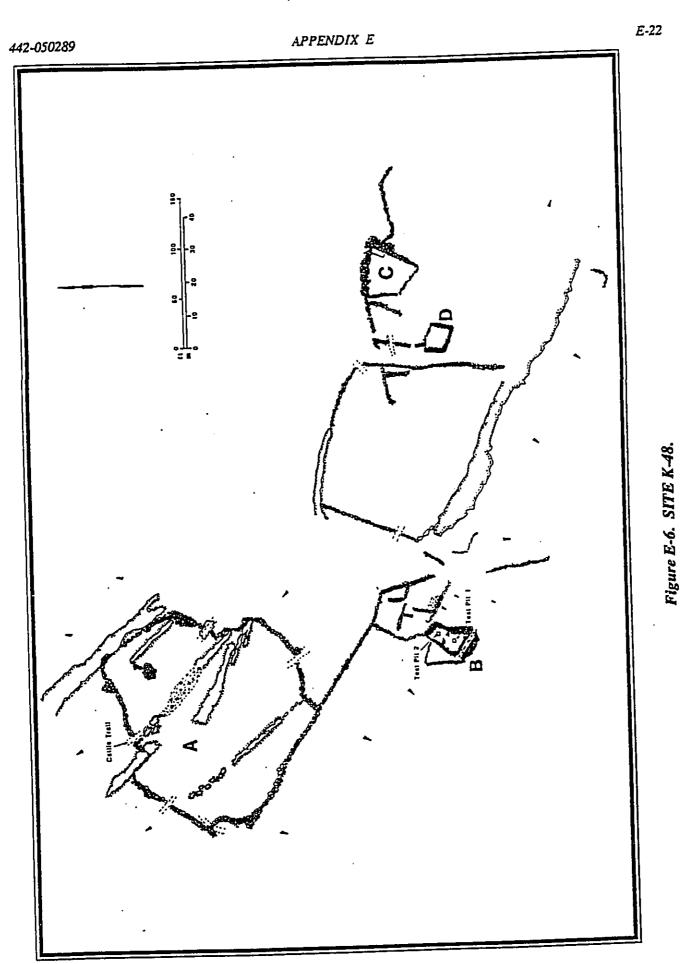
c. 289.0 sq m

PROBABLE AGE: Prehistoric

**DESCRIPTION:** Generally rectangular in plan view. The north and east walls are very thick, the west wall is thin, and the south wall is single-stacked, single-coursed. Present in the northeast corner is a platform.

FEATURE D: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, grasses, Christmas-berry CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 9.0 m wide; c. 81.0 sq m



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**PROBABLE AGE:** Prehistoric

DESCRIPTION: Feature has very low intact walls. Walls have a maximum thickness of 1.5 m and are up to 30 cm in height. Walls are comprised of stacked basalt boulders and cobbles.

# SITE NOS .: State: 2075 PHRI: K-50 BPBM: ----

(Figure E-7)

FORMAL TYPE: Complex (3 Features)

TOPOGRAPHY: Steep dissected alluvial slope

VEGETATION: Lantana, wattle, 'ilima, Christmas-berry, grasses

**CONDITION:** Good

**INTEGRITY:** Altered

DIMENSIONS: 40.0 m long by 35.0 m wide; c. 1,400.0 sq m

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Complex features are spread along a steep slope. At the top of the slope is a rectangular enclosure; further down the slope is an oval enclosure, and further down from the oval enclosure is a double enclosure. Numerous agricultural features, primarily terraces, are present

FEATURE A: Enclosure

in the area.

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, Christmas-berry, grasses **CONDITION:** Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 9.0 m long by 7.8 m wide; c. 70.2 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Rectangular enclosure; parts of the northwest corner and south wall are missing. The north and east walls are mostly bedrock. Walls have a maximum height of 80 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, Christmas-berry, grasses

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 7.2 m long by 7.0 m wide; c. 50.4 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Oval enclosure with well built and preserved walls. Internal walls are mostly faced. Opening present on northwest side. Walls have a maximum height of 90 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle, Christmas-berry, grasses

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 12.8 m long by 8.0 m wide; c. 102.4 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Two circular enclosures connected by a short wall. The southern enclosure is built almost entirely within a natural circle of bedrock. The northern enclosure is built on a flat area of bedrock; the southwest wall of the enclosure consists of modified bedrock. Walls have a maximum height of 70 cm. Walls are comprised of stacked basait boulders and cobbles.

SITE NOS .: State: 2076 PHRI: K-51 BPBM: ----

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, wattle, morning glory, panini

**CONDITION:** Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 12.0 m long by 5.5 m wide; c. 66.0 sq m **PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Sub-rectangular enclosure with an attached terrace. East wall has some internal facing; the rest of the walls are mostly collapsed. The northwest wall is totally collapsed. Maximum wall height is 42 cm. Walls average 75 cm in thickness and are copmrised of stacked basalt cobbles and boulders. Agricultural features surround the feature.

SITE NOS .: State: 2077 PHRI: K-52 BPBM: T-31 FORMAL TYPE: Complex (2 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wattle, Christmas-berry, <u>panini</u>

CONDITION: Fair/Good

**INTEGRITY:** Unaltered

DIMENSIONS: 42.0 m long by 35.0 m wide;

c. 1,470.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Complex consists of an irregular ovoid enclosure with an adjacent area of possible paving. Agricultural features surround the enclosure.

# APPENDIX E

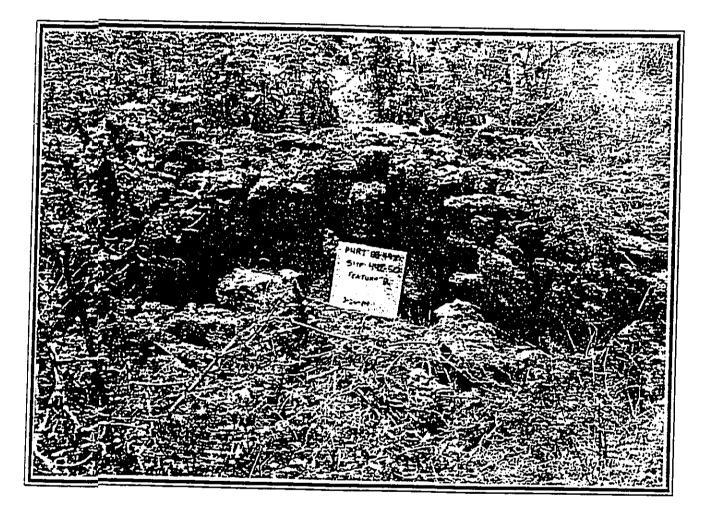


Figure E-7. SITE K-50, FEATURE B. VIEW TO SOUTHEAST. (PHRI Neg. 1155-6)

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FEATURE A: Enclosure

### APPENDIX E

**TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Wattle, lantana, 'ilima, grasses CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 24.0 m long by 18.0 m wide; c. 432.0 sq m **PROBABLE AGE:** Prehistoric **DESCRIPTION:** Western part of feature is built into a bedrock outcrop. There are two cupboards at the southwest end of the enclosure and a paved area at the south end. The walls of the enclosure have some facing. The walls include sections of multiple stacked and core-fill construction. Maximum wall height is 1.5 m. FEATURE B: Paved Area

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, grasses, honey suckle, panini **CONDITION:** Fair **INTEGRITY:** Unaltered DIMENSIONS: 15.0 m long by 15.0 m wide; c. 225.0 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: Feature consists of an irregularly-shaped area of paving adjacent to the west wall of the structure. SITE NOS.: State: 2078 PHRI: K-53 BPBM: ----

FORMAL TYPE: Complex (2 Features) **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Grasses, lantana, wattle, panini **CONDITION:** Good **INTEGRITY:** Altered DIMENSIONS: 42.0 m long by 40.0 m wide; c. 1,680.0 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agriculture DESCRIPTION: Complex consists of a group of connected agricultural and habitation features surrounded by a larger area of agricultural features. FEATURE A: Enclosure **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Grasses, lantana, wattle, panini **CONDITION:** Good **INTEGRITY:** Unaitered DIMENSIONS: 3.0 m long by 1.7 m wide; c. 5.1 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: C-shaped enclosure attached to Feature B. Feature opens to the south. Wall averages 30 cm in height and averages 75 cm in thickness. Wall is constructed of stacked basalt boulders and cobbles. Feature is either a VEGETATION: Lantana, 'ilima, wattle, grasses, planting windbreak or a temporary habitation structure.

FEATURE B: Terrace TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, panini **CONDITION:** Fair **INTEGRITY:** Altered DIMENSIONS: 20.0 m long by 15.0 m wide; c. 300.0 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: Raised terrace with three small planting features adjacent to the main wall. Wall averages 1.05 m in height and averages 40 cm in thickness. Wall is constructed of stacked basalt boulders and cobbles. SITE NOS .: State: 2079 PHRI: K-54 BPBM: T-30

(Figure E-8) FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, grasses CONDITION: Fair INTEGRITY: Unaltered DIMENSIONS: 14.0 m long by 11.0 m wide; c. 154.0 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agriculture DESCRIPTION: The feature is built on bedrock. It consists of an irregular-shaped enclosure with an internal

rectangular terrace at the south end. The east wall is basically a terrace. Portions of the northeast wall are faced on the inside. Wall averages 30 m in height and averages 1.5 m in thickness. Wall is constructed of stacked basalt boulders and cobbles occaissionally incorporating bedrock outcrops.

SITE NOS .: State: 2080 PHRI: K-55 BPBM: --FORMAL TYPE: Complex (3 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle, Christmas-berry, grasses

**CONDITION:** Fair

INTEGRITY: Unaltered

DIMENSIONS: 41.0 m long by 41.0 m wide;

c. 1,681.00 sq m

**PROBABLE AGE: Prehistoric** 

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Complex consists of two enclosures and an overhang. Numerous agricultural features surround the site.

### FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

Christmas-berry

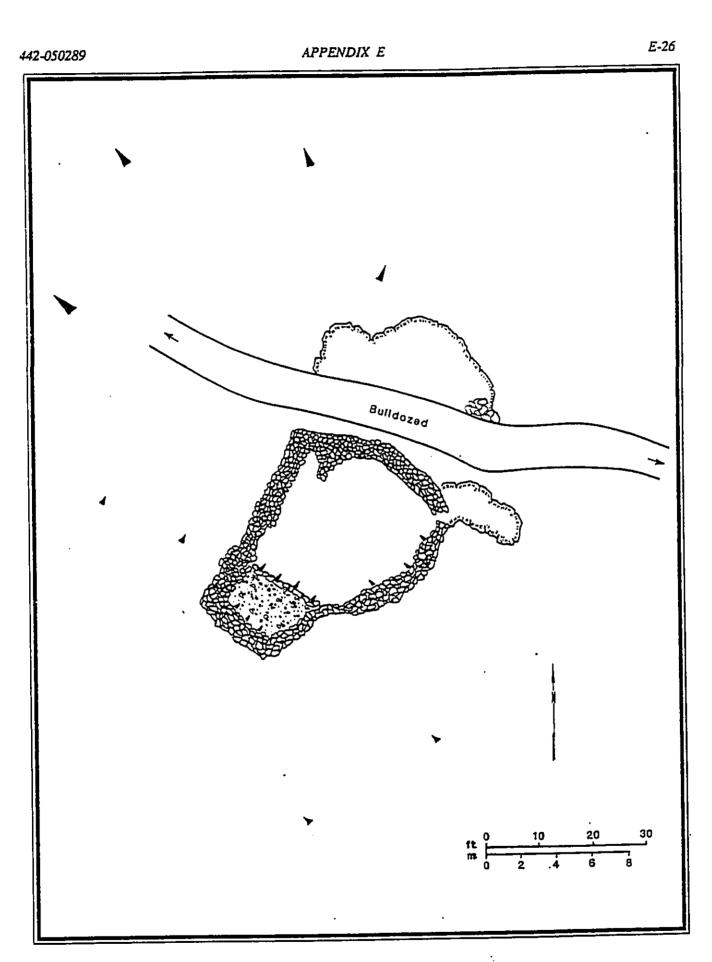


Figure E-8. SITE K-54.

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# APPENDIX E

**CONDITION:** Fair **INTEGRITY:** Unaltered DIMENSIONS: 7.0 m long by 5.0 m wide; c. 35.0 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: Rectangular enclosure with downslope wall also forming a terrace. A smaller enclosure or room is attached to the northeast side of the terrace. The terrace/

enclosure walls average 55 cm in height and are comprised of stackeed basalt boulders and cobbles.

FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wattle, Christmas-berry **CONDITION:** Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 5.0 m long by 3.0 m wide; c. 15.0 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: A low semicircular wall fronts the overhang. Ceiling of the shelter is 85 cm high.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle, grasses,

Christmas-berry

**CONDITION:** Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 16.0 m long by 7.5 m wide; c. 120.0 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Feature consists of two small enclosures connected by a wall of bedrock; the bedrock forms the northeast wall of both rooms. The lower room is triangular in plan, and its northwest wall forms a terrace. The upper room is square in plan. An upright slab is present on the wall of bedrock between the two rooms. The walls range from 55 cm to 90 cm in height and are comprised of stacked basalt boulders and cobbles.

SITE NOS .: State: 2081 PHRI: K-57 BPBM: ---FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, Christmas-berry, wattle,

Silky Oak

**CONDITION:** Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 30.0 m long by 24.0 m wide; c. 720.0 sq m

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Sub-rectangular enclosure built against an outcrop. The south and southeast walls incorporate bedrock. There is some facing on the enclosure's north

of stacked basalt boulders and cobbles. Many terraces present upslope and downslope of feature.

SITE NOS .: State: 2082 PHRI: K-59 BPBM: ---

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 36.0 m long by 28.0 m wide;

c. 1,008.0 sq m

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Rectangular enclosure with short walls extending from the southeast and northeast corners. Interior of southeast wall and the exterior of northwest wall are faced. Part of the southwest wall is collapsed. The wallis have a maximum thickness of 1.5 m and a maximum height of 1.1 m. Walls are comprised of stacked basalt boulders and cobbles. The enclosure, excluding the extending walls, measures 11.0 by 5.5 by 0.7 m. Numerous small terraces usualy incorporating bedrock outcrops are present to the east of the feature.

SITE NOS.: State: 2083 PHRI: K-60 BPBM: ---FORMAL TYPE: Wall TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle, 'ilima CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 5.5 m long by 1.1 m wide; c. 6.1 sq m **PROBABLE AGE: Historic** 

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Wall segment is bifaced and core-filled and runs upslope-downslope. Wall averages 50 cm in height and is composed of stacked basalt boulders and cobbles.

SITE NOS .: State: 2084 PHRI: K-62 BPBM: ---FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Wattle forest CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 45.0 m long by 35.0 m wide; c. 1,575.0 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Religious/Burial/

Habitation/Agriculture

DESCRIPTION: Complex consists of a rectangular enclosure with an internal probable burial platform, a corner. The walls average 80 cm in height and are comprised trapezoidal enclosure with an associated probable shrine/

### APPENDIX E

altar platform, a square enclosure and surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest

CONDITION: Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 12.0 m long by 5.5 m wide; c. 66.0 sq m PROBABLE AGE: Prehistoric

**DESCRIPTION:** Rectangular enclosure with a platform in the southeast end; platform is faced on the northwest and southeast sides. It is 55 cm high, roughly 2.0 m square, and has a relatively level upper surface. Cobble pavement surrounds the platform and on three sides extends to the enclosure walls. Not much of the northwest end of the enclosure remains. The enclosure wall average 1.2 m in thickness and have a maximum height of 50 cm. The walls and platform are comprised of stacked basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle forest CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 8.0 m long by 7.0 m wide; c. 56.0 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Enclosure's southwest wall is part of a

natural volcanic "sill". Facing is present on the interiors of the northeast, west, and southwest walls, and on the exterior of the southwest wall. The walls have a maximum thickness of 1.0 m and nmaximum height of 1.3. About 2.0 m east of the enclosure is a small platform faced on its northeast side. A large 1.2 m long fallen upright stone is present on the platform. A small cavity, centrally-located in the platform's upper surface, apparently once held the stone upright. Both the enclosure and platform are comprised of stacked basalt boulders and cobbles occasionally incorporating bedrock outcrops. A alignment extends from Feature B to Feature C.

#### FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle forest CONDITION: Fair INTEGRITY: Unaltered DIMENSIONS: 11.0 m long by 10.0 m wide; c. 110.0 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Large square enclosure with an internal mound or collapsed platform. The northeast and northwest walls of the enclosure consist of alignments; the southeast and southwest walls are wide, up-to 1.0 m in height, and are constructed primarily of boulders. The mound/platform

extends from the middle of the northwest wall of the enclosure.

SITE NOS.: State: 2085 PHRI: K-63 BPBM: --FORMAL TYPE: Wall TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, 'ilima, grasses, Christmas-berry **CONDITION:** Good INTEGRITY: Unaltered DIMENSIONS: 15.0 m long by 1.0 m wide; c. 15.0 sq m **PROBABLE AGE:** Historic FUNCTIONAL INTERPRETATION: Animal Control\* DESCRIPTION: Well-faced and well-built upslop¢downslope oriented wall segment. Wall is of multiplestacked construction, comprised of basalt boulders and cobbles. Wall averages 1.0 m in thickness and 1.1 m in height. SITE NOS .: State: 2034 PHRI: K-64 BPBM: ---FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 13.0 m long by 11.0 m wide;

c. 143.0 sq m

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agricultural

**DESCRIPTION:** Enclosure is attached to a terrace located c. 3.0 m downslope. Most of the area between the enclosure and the terrace is filled with rubble. Interior of the southeast wall of the enclosure is faced. Enclosure has an opening in the northwest wall. The walls range in height from 20 cm to 55 cm and are comprised of stacked basalt boulders and cobbles occassionally incorporating bedrock outcrops. Agricultural features surround the enclosure.

A test unit excavated outside the enclosure near the opening revealed a subsurface cultural deposit containing one basalt flake, sea urchin remains, and charcoal. A radiocarbon sample from the deposit yielded a calendric age range of AD 1420-1660.

SITE NOS.: State: 2086 PHRI: K-65 BPBM: ---FORMAL TYPE: Complex (7 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle forest CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 215.0 m long by 90.0 m wide; c. 19,350.0 sq m

PROBABLE AGE: Prehistoric

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### FUNCTIONAL INTERPRETATION: Habitation/ Agricultural

DESCRIPTION: Complex consists of enclosures and agricultural features close to each other. Six of the enclosures are habitation features, one is probably a field boundary.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

**CONDITION:** Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 8.2 m long by 6.2 m wide; c. 50.8 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Square enclosure with some facing on the interior of the northwest wall. A small cupboard-like overhang is present west of the southwest corner of the enclosure. Walls have a maximum height of 1.1 m and a maximum thickness of 60 cm. Walls are comprised of stacked basalt boulders and cobbles. A bedrock outcrop is incorporated into the southwest corner.

**FEATURE B:** Walls

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TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Wattle forest

**CONDITION:** Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 45.0 m long by 5.0 m wide; c. 225.0 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Two parallel walls on either side of a collapsed lava tube. The walls begin at the bottom of a short steep slope and extend to top of the slope, where they are joined together by a bedrock outcrop. The northwest wall ends at this point. The southeast wall continues through the site. Walls have a maximum height of 1.5 m and a maximum thickness of 1.0 m. Walls are comprised of stacked basalt boulders and cobbles occasionally incorporating bedrock outcrops.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 8.0 m long by 6.5 m wide; c. 52.0 sq m **PROBABLE AGE:** Prehistoric

DESCRIPTION: Square enclosure. The interior of the southwest wall is faced. The other walls are somewhat collapsed. Walls have a maximum height of 90 cm and a maximum thickness of 1.1 m. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE D: Enclosure TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Wattle forest CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 15.0 m long by 14.0 m wide; c. 210.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large D-shaped enclosure; the east wall consists of a bedrock outcrop. A few terraces are present within the enclosure. A 3.0 m long wall extends from the northwest portion of the enclosure generally toward the northwest. The northeast side of this wall is faced. Walls have a maximum height of 75 cm and a maximum thickness of 85 cm. Walls are comprised of stacked basalt boulders and cobbles occasionally incorporating bedrock outcrops.

FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Wantle forest **CONDITION:** Good

**INTEGRITY:** Unaltered DIMENSIONS: 5.0 m long by 3.7 m wide; c. 18.5 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Somewhat square in plan view. Part of the interior of the south wall is faced. Walls have a maximum height of 80 cm and a maximum thickness of 80 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE F: Enclosures

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wantle forest

**CONDITION:** Good

INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 7.5 m wide; c. 90.0 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Large oval enclosure with a slightly smaller enclosure attached to its northeast side. Most of the walls of both enclosures are collapsed. Walls have a maximum height of 65 cm and a maximum thickness of 90 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE G: Enclosure

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 8.0 m long by 7.4 m wide; c. 59.2 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Square enclosure; interior and exterior of north corner is faced. The west corner of the feature is collapsed. Walls have a maximum height of 60 cm and an

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# APPENDIX E

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| average thickness of 90 cm. Walls are comprised of stacked      | FEATURE A: Enclosure                                         |              |
|-----------------------------------------------------------------|--------------------------------------------------------------|--------------|
| basalt boulders and cobbles.                                    | TOPOGRAPHY: Dissected alluvial slope                         |              |
|                                                                 | VEGETATION: Lantana, panini, wattle, grasses                 | R.~*         |
| SITE NOS .: State: 2087 PHRI: K-69 BPBM: T-37                   | CONDITION: Fair                                              |              |
| (Figure E-9)                                                    | INTEGRITY: Unaltered                                         |              |
| FORMAL TYPE: Enclosure                                          | DIMENSIONS: 9.0 m long by 8.5 m wide; c. 76.5 sq m           | <u>.</u>     |
| TOPOGRAPHY: Dissected alluvial slope                            | PROBABLE AGE: Prehistoric                                    | _            |
|                                                                 | DESCRIPTION: Large square enclosure with low,                |              |
| VEGETATION: Lantana, grasses, panini, wattle<br>CONDITION: Good | collapsed walls. The north corner of the enclosure rises 1.5 |              |
|                                                                 |                                                              | <b>d</b>     |
| INTEGRITY: Unaltered                                            | m above the slope the enclosure is on. A terrace wall        |              |
| DIMENSIONS: 8.0 m long by 8.0 m wide; c. 64.0 sq m              | extends 5.0 m southwest off the southwest corner of the      |              |
| PROBABLE AGE: Prehistoric/Historic                              | enclosure. Walls are comprised of stacked basalt boulders    |              |
| FUNCTIONAL INTERPRETATION: Water Tank                           | and cobbles.                                                 |              |
| DESCRIPTION: Square enclosure faced on the southwest,           |                                                              | •            |
| northwest, and part of the northeast sides. The southeast and   | FEATURE B: Enclosure                                         |              |
| part of the northeast walls, which are lower than the rest of   | TOPOGRAPHY: Dissected alluvial slope                         | 5            |
| the structure, are constructed of generally larger stones than  | VEGETATION: Lantana, 'ilima, Christmas-berry, grasses        |              |
| those used in the other walls. Within the enclosure are the     | CONDITION: Fair                                              |              |
| remains of a wooden platform for a water tank, and metal        | INTEGRITY: Unaltered                                         | <b>a</b> - 4 |
| hoops used to bind boards of tank together.                     | DIMENSIONS: 7.0 m long by 7.0 m wide; c. 49.0 sq m           |              |
|                                                                 | PROBABLE AGE: Prehistoric                                    |              |
| STTE NOS .: State: 2088 PHRI: K-70 BPBM: T-27                   | DESCRIPTION: Enclosure consists of a square area of          |              |
| FORMAL TYPE: Tenace                                             | paving with a small sunken area in the middle of it. A wall  | ч.           |
| TOPOGRAPHY: Dissected alluvial slope                            | built on the paving forms the southwest and part of the      |              |
| VEGETATION: Lantana, 'ilima, wattle, grasses                    | northwest wall of the room. The interior of the sunken area  |              |
| CONDITION: Fair                                                 | and the wall are faced. Walls average 50 cm in height and    |              |
| INTEGRITY: Altered                                              | are comprised of stacked basalt boulders and cobbles.        |              |
|                                                                 | A terrace runs off the northeast wall.                       |              |
| DIMENSIONS: 35.0 m long by 12.0 m wide;                         | A lefface funs on the northeast wait.                        |              |
| c. 420.0 sq m                                                   |                                                              | ,            |
| PROBABLE AGE: Prehistoric                                       | FEATURE C: Paved Mound                                       |              |
| FUNCTIONAL INTERPRETATION: Agricultural                         | TOPOGRAPHY: Dissected alluvial slope                         | •            |
| DESCRIPTION: Terrace extends southward for 10.0 m               | VEGETATION: Lantana, 'ilima, grasses, wattle                 |              |
| from a upslope-downslope oriented wall. The junction of         | CONDITION: Fair                                              |              |
| the wall and the terrace abuts a basalt outcrop. The south      | INTEGRITY: Unaltered                                         | ÷.           |
| end of the wall curves to create a small terrace measuring      | DIMENSIONS: 10.0 m long by 5.0 m wide; c. 50.0 sq m          |              |
| 5.0 m in diameter.                                              | PROBABLE AGE: Prehistoric                                    | a (          |
|                                                                 | DESCRIPTION: Feature consists of a level area of rubble      |              |
| SITE NOS.: State: 2089 PHRI: K-71 BPBM:                         | fill with a wall on it. The feature is situated in front of  | • •          |
| FORMAL TYPE: Complex (3 Features)                               | collapsed lava tube. This tube may have an opening           |              |
| TOPOGRAPHY: Dissected alluvial slope                            | plugged up with rubble. Several aligned large upright slabs  | •            |
| VEGETATION: Lantana, panini, wattle, Christmas-berry,           | to the southeast and northwest appear to remnants of a       | er i         |
| grasses                                                         | terrace wall which would have retained the rubble fill.      |              |
| CONDITION: Fair                                                 |                                                              |              |
| INTEGRITY: Altered                                              | SITE NOS.: State: 2090 PHRI: K-76 BPBM:                      |              |
| DIMENSIONS: 60.0 m long by 50.0 m wide;                         | FORMAL TYPE: Complex (2 Features)                            | • •          |
| •••                                                             | TOPOGRAPHY: Dissected alluvial slope                         |              |
| c. 3,000.0 sq m                                                 |                                                              |              |
| PROBABLE AGE: Prehistoric                                       | VEGETATION: Grasses, lantana, 'ilima, wattle                 | H= 1         |
| FUNCTIONAL INTERPRETATION: Burial*/Habitation                   | CONDITION: Good                                              |              |
| DESCRIPTION: Complex consists of two enclosures                 | INTEGRITY: Unaltered                                         |              |
| with terraces between them, and connected to them. One          | DIMENSIONS: 55.0 m long by 18.0 m wide;                      |              |
| enclosure has unusually thick walls and a small interior.       | c. 990.0 sq m                                                | q1           |
| Southwest of this feature is a large rubble area which may be   | PROBABLE AGE: Prehistoric                                    |              |
| notural Feature C is a norsible love take buriel                |                                                              |              |

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APPENDIX E

Figure E-9. SITE K-69, WALL AND WATERTANK. VIEW TO WEST. (PHRI Neg#.1151-19).

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| FUNCTIONAL INTERPRETATION: Habitation/<br>Agricultural<br>DESCRIPTION: Complex consists of a U-shaped terrace<br>with some paving and a free standing upslope-downslope-<br>oriented wall segment.                                                                                                                                                                                                                            | VEGETATION: Grasses, lantana, 'ilima, wattle,<br>Christmas-berry<br>CONDITION: Good<br>INTEGRITY: Unaltered<br>DIMENSIONS: 25.0 m long by 10.0 m wide;                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| FEATURE A: Terrace<br>TOPOGRAPHY: Dissected alluvial slope<br>VEGETATION: Grasses, 'ilima, wattle, lantana<br>CONDITION: Fair/Poor<br>INTEGRITY: Altered<br>DIMENSIONS: 10.5 m long by 8.0 m wide; c. 84.0 sq m<br>PROBABLE AGE: Prehistoric<br>DESCRIPTION: U-shaped terrace with low walls. A<br>small paved area is present in the southeast portion of the<br>feature. Northwest of the terrace is a short terrace. Walls | c. 250.0 sq m<br><b>PROBABLE AGE:</b> Prehistoric<br><b>DESCRIPTION:</b> Three paved terraces oriented upslope-<br>downslope and connected to each other. Northeast boundary<br>of the terraces consists of a bedrock outcrop. The south and<br>west sides of the terraces are raised above the adjacent<br>slope. The northwest wall of the westernmost terrace is<br>faced. The eastern terrace measures 10 m by 7 m by 20 cm<br>high. The central terrace measures 8.5 m by 5.3 m by 75<br>cm high. |
| have a maximum height of 45 cm and an average thickness<br>of 1.2 m. Walls are comprised of stacked basalt boulders<br>and cobbles.                                                                                                                                                                                                                                                                                           | FEATURE B: Terrace<br>TOPOGRAPHY: Dissected alluvial slope<br>VEGETATION: Grasses, lantana, 'ilima, Christmas-berry,<br>wattle                                                                                                                                                                                                                                                                                                                                                                         |
| FEATURE B: Wall<br>TOPOGRAPHY: Dissected alluvial slope<br>VEGETATION: Grasses, 'ilima, lantana, wattle<br>CONDITION: Good<br>INTEGRITY: Unaltered<br>DIMENSIONS: 8.0 m long by 1.1 m wide; c. 8.8 sq m<br>PROBABLE AGE: Historic/Prehistoric*<br>DESCRIPTION: Core-filled wall segment oriented<br>upslope-downslope. The wall is faced on both sides and is                                                                 | CONDITION: Fair<br>INTEGRITY: Altered<br>DIMENSIONS: 10.0 m long by 8.0 m wide; c. 80.0 sq m<br>PROBABLE AGE: Prehistoric<br>DESCRIPTION: Probable residential terrace with a small<br>notch in the northwest corner. The inside of the east wall<br>and the outside of the south wall are faced. Interior of<br>terrace has possible paving.                                                                                                                                                          |
| collapsed in some areas. Wall has a maximum height of 1.1 m and an average thickness of 1.2 m. Wall is comprised of stacked basalt boulders and cobbles.                                                                                                                                                                                                                                                                      | FEATURE C: Platform/terrace<br>TOPOGRAPHY: Dissected alluvial slope<br>VEGETATION: Grasses, lantana, wattle, 'ilima,                                                                                                                                                                                                                                                                                                                                                                                   |
| SITE NOS.: State: 2091 PHRI: K-78 BPBM: —<br>FORMAL TYPE: Complex (6 Features)<br>TOPOGRAPHY: Dissected alluvial slope<br>VEGETATION: Grasses, lantana, ' <u>ilima</u> , wattle,<br>Christmas-berry<br>CONDITION: Good<br>INTEGRITY: Unaltered<br>DIMENSIONS: 115.0 m long by 70.0 m wide;<br>c. 8,050.0 sq m<br>PROBABLE AGE: Prehistoric                                                                                    | Christmas-berry<br>CONDITION: Fair<br>INTEGRITY: Unaltered<br>DIMENSIONS: 12.5 m long by 10.5 m wide; c. 131.3 sq m<br>PROBABLE AGE: Prehistoric<br>DESCRIPTION: Consists of a smaller paved platform<br>built on a larger one. The lower platform forms a paved area<br>which extends out c. 0.8 m beyond the limits of smaller<br>platform. Some facing is present on the west and south sides<br>of the platform.                                                                                   |
| FUNCTIONAL INTERPRETATION: Religious*/<br>Habitation/Agricultural<br>DESCRIPTION: Complex consists of two habitation<br>terrace complexes, one stepped and paved platform, one<br>rectangular enclosure, and one area of modified bedrock.<br>Agricultural terraces are present north of the main features.<br>FEATURE A: Terraces<br>TOPOGRAPHY: Dissected alluvial slope                                                    | FEATURE D: Complex<br>TOPOGRAPHY: Dissected alluvial slope<br>VEGETATION: Grasses, lantana, 'ilima, wattle,<br>Christmas-berry                                                                                                                                                                                                                                                                                                                                                                         |
| TA A AVIT IS VI DURANNE MIT WALA                                                                                                                                                                                                                                                                                                                                                                                              | PROBABLE AGE: Prehistoric                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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### APPENDIX E

**DESCRIPTION:** Complex is located on bedrock and is delineated by retaining walls. Modified bedrock outcrops and a possible walkway are present on the north wall. Within the walls are alignments/terraces and areas cleared of stones presumably for planting.

FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, wattle,

Christmas-berry

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 9.4 m long by 8.0 m wide; c. 75.2 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure; the east and south walls are built into a slope and are higher than the north and west walls. The interior of the east and south walls are faced, as are both sides of the west wall. A possible cupboard is present in the west wall. A possible firepit is present in the interior of the structure. Walls average 1 m in height and 1.2 m in width. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE F: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, wattle,

Christmas-berry

CONDITION: Good

INTEGRITY: Altered

DIMENSIONS: 22.5 m long by 22.5 m wide; c. 506.3 sq m

PROBABLE AGE: Prehistoric

enclosure or corral.

DESCRIPTION: Large irregular enclosure with the majority of its walls standing on the edge of a low cliff. The northwest wall consists of a single course of rocks. Wing walls extend off the southeast and southwest corners of the enclosure. Enclosure walls have a maximum height of 1.3 m and an average width of 60 cm. Walls are composed of stacked basalt boulders and cobbles occasionally incorporating bedrock outcrops. Feature appears to be either a agricultural

SITE NOS.: State: 2092 PHRI: K-79 BPBM: ---FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana, panini, 'ilima CONDITION: Fair INTEGRITY: Altered DIMENSIONS: 22.0 m long by 20.0 m wide; c. 440.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Agricultural DESCRIPTION: Large enclosure irregular in plan view. The south wall is constructed on a collapsed lava nube. The interior of the north wall is faced. The northeast wall consists of a loose alignment of rocks. Walls have a maximum height of 1.0 m and an average thickness of 60 cm. Walls are comprised of stacked basalt boulders and cobbles. Within the enclosure are several terraces.

SITE NOS.: State: 2093 PHRI: K-80 BPBM: T-46 FORMAL TYPE: Wall TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle forest CONDITION: Fair INTEGRITY: Altered DIMENSIONS: 50.0 m long by 1.5 m wide; c. 75.0 sq m PROBABLE AGE: Historic FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Unslope-downslope griented wall partie

**DESCRIPTION:** Upslope-downslope oriented wall partly with a fence along it. The wall ranges in height from 30 cm to 90 cm and is comprised of stacked basalt boulders and cobbles. At the north end the wall curves slightly to the west and connects with an outcrop situated above a drainage. Near the upslope portion of the wall is a terrace.

SITE NOS.: State: 2094 PHRI: K-81 BPBM: T-1036 FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle forest CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 80.0 m long by 40.0 m wide; c. 3,200.0 sq m PROBABLE AGE: Historic/Prehistoric FUNCTIONAL INTERPRETATION: Animal control/ Agricultural

**DESCRIPTION:** Complex consists of a large rectangular enclosure, a small circular enclosure, and numerous agricultural terraces. A wall extends off the southeast corner of the large enclosure.

FEATURE A: Enclosure

TOPOGRAPHY: Steep dissected alluvial slope VEGETATION: Wattle Forest CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 36.0 m long by 50.0 m wide;

c. 1,800.0 sq m

**PROBABLE AGE: Historic** 

DESCRIPTION: Large rectangular enclosure. The northern two-thirds of the west wall consists of a single course of rocks. Present in the southern half of the enclosure is an outcrop. A wall extends c. 25.0 m northeast off the southeast corner of the enclosure.

# APPENDIX E

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FEATURE B: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle forest CONDITION: Fair INTEGRITY: Unaltered DIMENSIONS: 4.0 m long by 3.5 m wide; c. 14.0 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Small circular enclosure built against a low outcrop. The walls of the enclosure are built with large rocks and are relatively high. The walls are not faced.

SITE NOS.: State: 2095 PHRI: K-84 BPBM: T-55 FORMAL TYPE: Wall TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle forest CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 4.5 m long by 3.5 m wide; c. 15.8 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Indeterminate DESCRIPTION: L-shaped wall open to the northeast. The northwest portion of the wall is collapsed. Wall has a maximum height of 1.2 m and is comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2096 PHRI: K-85 BPBM: — FORMAL TYPE: Wall and terrace complex TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle forest CONDITION: Fair INTEGRITY: Altered DIMENSIONS: 80.0 m long by 60.0 m wide; c. 4,800.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Animal Control/

Agricultural DESCRIPTION: Complex is largely built on and around bedrock. Site consists of an area of rough terrces and a long well-preserved wall segment. The long wall probably connects to a wall at Site K-101.

# SITE NOS.: State: 2097 PHRI: K-87 BPBM: T-25 (Figure E-10) FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle forest CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 28.0 m long by 8.0 m wide; c. 224.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Burial DESCRIPTION: The complex consists of a faced mound

and a faced platform. Both features are small. The platform

has a small wall around the top; the platform is probably a burial. The mound is a possible burial.

FEATURE A: Platform TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Wattle forest **CONDITION:** Excellent **INTEGRITY:** Unaltered DIMENSIONS: 3.8 m long by 2.1 m wide; c. 7.9 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: The sides and top of this feature are faced. A wall c. 20 cm high outlines the level upper surface of the platform. Platform has a maximum height of 1.2 m and is comprised of stacked basalt boulders and cobbles. FEATURE B: Mound/platform **TOPOGRAPHY:** Dissected alluvial slope **VEGETATION:** Wattle forest CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 2.0 m long by 2.0 m wide; c. 4.0 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: The east and west sides of the mound are faced; the north and south sides are somewhat collapsed. The feature is built on a L-shaped, rock-retained terrace. The feature has a maximum height of 1 m and is comprised of stacked basalt boulders and cobbles. SITE NOS .: State: 2098 PHRI: K-89 BPBM: ---FORMAL TYPE: Terrace TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Wattle forest CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 150.0 m long by 125.0 m wide; c. 18,750.0 sq m

PROBABLE AGE: Prehistoric/Historic\*

**DESCRIPTION:** Long terrace with a paved area. The terrace connects sides of a collapsed lava tube. Walls are built along the sides of the tube and intersect with the terrace and another large terrace downslope. There are many other small terraces to the north. The terraces appear to be largely agricultural in function, excepting the paved portion which may be a remnant of a habitation feature. For the most part, the walls appear to be ranch-related features. The site roughly resembles the map of Papakea Heiau contained in the SIHP Site Form No. 50-50-10-1036; however, the described location and coral offerings in the form do not match.

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FUNCTIONAL INTERPRETATION: Agricultural/ Habitation/Animal control

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APPENDIX E

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Figure E-10. SITE K-87, BURIAL PLATFORM. VIEW TO NORTHWEST. (PHRI Neg#.1151-36)

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#### APPENDIX E

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SITE NOS.: State: 2099 PHRI: K-90 BPBM: -FORMAL TYPE: Enclosure **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Grasses, lantana, wattle **CONDITION:** Fair **INTEGRITY:** Altered DIMENSIONS: 17.0 m long by 10.0 m wide; c. 170.0 sq m **PROBABLE AGE:** Prehistoric **FUNCTIONAL INTERPRETATION: Habitation** DESCRIPTION: Possibly notched enclosure which has been heavily disturbed. The enclosure has no northwest wall. The notch is in the south corner. Adjacent to the northwest side are two paved terraces or lanai. An internal wall subdivides the enclosure interior into upper and lower portions. The walls have a maximum height of 60 cm and are comprised of stacked basalt boulders and cobbles. SITE NOS.: State: 2300 PHRI: K-95 BPBM: -cobbles. FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana **CONDITION:** Fair **INTEGRITY:** Unaltered DIMENSIONS: 50.0 m long by 30.0 m wide; c. 1,500.0 sq m **PROBABLE AGE:** Prehistoric **FUNCTIONAL INTERPRETATION: Habitation/** Agricultural DESCRIPTION: Complex consists of an ovoid enclosure, a partially walled terrace, and a wall segment. There numerous agricultural terraces in the area. FEATURE A: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana **CONDITION:** Fair **INTEGRITY:** Unaitered DIMENSIONS: 7.0 m long by 6.0 m wide; c. 42.0 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: The west side and portions of the south wall of this enclosure are built into bedrock. The interiors of the east, west, and north walls, and the exterior of the west

and north walls are faced. The top of the east wall is even with the ground surface on the exterior, uphill side. Walls have a maximum height of 60 cm. Wall are comprised of stacked basalt boulders and cobbles and incorporate bedrock outcrops.

FEATURE B: Terrace TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Grasses, wattle, lantana **CONDITION:** Fair

**INTEGRITY:** Unaitered DIMENSIONS: 9.0 m long by 8.0 m wide; c. 72.0 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Terrace has east and south walls only; built on bedrock. Feature is eroded and heavily vegetated making it very difficult to determine its exact form and function. Feature may be agricultural in function. FEATURE C: Wall **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Grasses, wattle, lantana CONDITION: Fair/Poor **INTEGRITY:** Unaltered DIMENSIONS: 4.0 m long by 2.0 m wide; c. 8.0 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: Two course high wall faced on the .... west side but mostly collapsed. Maximum wall height is 20 cm. Walls are comprised of stacked basalt boulders and SITE NOS.: State: 2301 PHRI: K-96 BPBM: --FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana **CONDITION:** Fair **INTEGRITY:** Unaltered DIMENSIONS: 5.4 m long by 4.5 m wide; c. 24.3 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation\*/ Animal Control DESCRIPTION: Circular enclosure with unfaced walls. The southeast wall is built into a small outcrop of rock. Maximum wall height is 40 cm. Walls are comprised of stacked basalt boulders and cobbles. A small drainage is present c. 4.0 m west of the enclosure. SITE NOS.: State: 2302 PHRI: K-97 BPBM: --FORMAL TYPE: Wall TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Wattle forest **CONDITION:** Fair **INTEGRITY:** Unaltered DIMENSIONS: 7.0 m long by 0.6 m wide; c. 4.2 sq m **PROBABLE AGE: Prehistoric** 1 ---FUNCTIONAL INTERPRETATION: Agricultural DESCRIPTION: Modified bedrock wall c. 0.5 m high (maximum). Feature is probably agricultural. Small agricultural terraces present in the area. 5-SITE NOS.: State: 2303 PHRI: K-98 BPBM: -FORMAL TYPE: Enclosure \*--\* **TOPOGRAPHY:** Dissected alluvial slope **VEGETATION:** Wattle forest

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**CONDITION:** Fair INTEGRITY: Altered\*

DIMENSIONS: 9.5 m long by 8.5 m wide; c. 80.8 sq m **PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agricultural

DESCRIPTION: Rectangular enclosure with very low walls which look disturbed. There is some facing in the south corner of the enclosure. About 2.0 m southwest of the enclosure are two rock-retained terraces. Walls average 1.5 m in thickness and have a maximum height of 60 cm. Walls are comprised of stacked basalt boulders and cobbles.

SITE NOS .: State: 2304 PHRI: K-99 BPBM: T-3 FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Wattle forest **CONDITION:** Fair **INTEGRITY:** Unaltered DIMENSIONS: 7.0 m long by 5.5 m wide; c. 38.5 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Rectangular enclosure with openings in the south corner and northwest side. The southwest wall of the enclosure is built on a small bedrock outcrop. Possible slab-lined firepit in the center of enclosure. Walls have a maximum height of 70 cm and are comprised of stacked basalt boulders and cobbles.

A test unit excavated in the enclosure sectioning the possible firepit did not reveal any subsuface cultural remains indicating the feature is either not a habitation (i.e., an agricultural enclosure) or that the feature was little used.

SITE NOS .: State: 2305 PHRI: K-100 BPBM: ---FORMAL TYPE: Wall TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Wattle forest **CONDITION:** Poor **INTEGRITY:** Altered DIMENSIONS: 21.0 m long by 0.8 m wide; c. 16.8 sq m PROBABLE AGE: Historic FUNCTIONAL INTERPRETATION: Animal/Control DESCRIPTION: Cattle wall roughly faced on both sides. Wall has a maximum height of 60 cm; comprised of stacked basalt boulders and cobbles. SITE NOS .: State: 2306 PHRI: K-101 BPBM: T-24 FORMAL TYPE: Mounds and Wall

TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Wattle forest **CONDITION:** Good **INTEGRITY:** Altered

DIMENSIONS: 300.0 m long by 1.0 m wide;

c. 300.0 sq m

PROBABLE AGE: Historic/Prehistoric FUNCTIONAL INTERPRETATION: Animal Control/

Agricultural DESCRIPTION: Long cattle wall which curves to form a large are which opens downslope. In the northeast portion of this arc are several probable agricultural mounds. The wall is roughly faced on both sides. Wall has a maximum height of 60 cm; comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2307 PHRI: K-102 BPBM: ---FORMAL TYPE: Terrace and Wall TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle forest CONDITION: Fair INTEGRITY: Unaltered DIMENSIONS: 18.0 m long by 6.0 m wide; c. 108.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agricultural

DESCRIPTION: Rectangular terrace built on the top of a knoll. The wall is built across a small steep-sided drainage situated 6.0 m south of the terrace. The south and north walls of the terrace are situated on the edge of the knoll. An alignment extends 4.0 m north from the northwest corner of the terrace.

SITE NOS .: State: 2308 PHRI: K-103 BPBM: T-56 FORMAL TYPE: Overhang TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle forest **CONDITION:** Good INTEGRITY: Unaltered DIMENSIONS: 32.0 m long by 22.0 m wide; c. 704.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Feature includes large walled area in front of the 80 cm high overhang. The walls of the area run down a steep, short slope (from the cliff to the bottom of the drainage) where the northeast wall runs parallel to the drainage. A level area extends 5.0 m out from the dripline of the overhang.

SITE NOS .: State: 2035 PHRI: K-105 BPBM: --FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana CONDITION: Good INTEGRITY: Altered

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| c. 676.0 sq m<br>PROBABLE AGE: Prehistoric<br>FUNCTIONAL INTERPRETATION: Habitation/<br>Agricultural<br>DESCRIPTION: Rectangular enclosure. Outside of the<br>east wall and portions of the inside of the north and south<br>walls are faced. Walls are collapsed on the north and west<br>sides. In the northeast corner is a possible rock-filled pit.<br>Terraces are present north of the enclosure.<br>A test unit excavated inside the enclosure revealed a<br>subsurface cultural deposit containing fish and mammal<br>bone, kukui nut shell, and and charcoal. A radiocarbon<br>sample from the deposit yielded three posssible calendric<br>age ranges of AD 1470-1670, AD 1775-1793, and AD 1947-<br>1953. | <ul> <li>DIMENSIONS: 6.0 m long by 4.0 m wide; c. 24.0 sq m</li> <li>PROBABLE AGE: Prehistoric</li> <li>FUNCTIONAL INTERPRETATION: Habitation</li> <li>DESCRIPTION: C-shaped enclosure open to the northwest; interior of the southeast portion is faced. The southeast wall, which is the highest, abuts a slope. The wall averages 60 cm in thickness and has a maximum height of 90 cm. Wall is comprised of stacked basalt boulders and cobbles.</li> <li>SITE NOS.: State: 2313 PHRI: K-109 BPBM: T-49 FORMAL TYPE: Complex (2 Features)</li> <li>TOPOGRAPHY: Dissected alluvial slope</li> <li>VEGETATION: Grasses, lantana, 'jlima, wattle, panini</li> <li>CONDITION: Good</li> <li>INTEGRITY: Unaltered</li> <li>DIMENSIONS: 55.0 m long by 40.0 m wide;</li> </ul> | й<br>Ван<br>Ван<br>Ван |
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| SITE NOS.: State: 2310 PHRI: K-106 BPBM:<br>FORMAL TYPE: Stone<br>TOPOGRAPHY: Dissected alluvial slope<br>VEGETATION: Grasses, lantana<br>CONDITION: Good<br>INTEGRITY: Unaltered<br>DIMENSIONS: 2.0 m long by 2.0 m wide; c. 4.0 sq m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | c. 2,200.0 sq m<br>PROBABLE AGE: Prehistoric<br>FUNCTIONAL INTERPRETATION: Agricultural<br>DESCRIPTION: The complex consists of a C-shaped<br>terrace, and agricultural features. Several terraces extend<br>from an outcrop. Terraces situated downslope from C-<br>shape.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | •                      |
| <b>PROBABLE AGE:</b> Prehistoric<br><b>FUNCTIONAL INTERPRETATION:</b> Tool Manufacturing<br><b>DESCRIPTION:</b> Site consists of abraded depressions in<br>several pahochoe slabs at the bottom of a hill. The slabs<br>range in size from 20 cm to 90 cm in diameter.                                                                                                                                                                                                                                                                                                                                                                                                                                                | FEATURE A: Terraces<br>TOPOGRAPHY: Dissected alluvial slope<br>VEGETATION: Grasses, lantana, wattle, 'ilima, panini<br>CONDITION: Good<br>INTEGRITY: Altered<br>DIMENSIONS: 3-5 m long by 0.5-1.0 m wide by                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | р.н.<br>1 л.<br>1.     |
| SITE NOS.: State: 2311 PHRI: K-107 BPBM:<br>FORMAL TYPE: Overhang<br>TOPOGRAPHY: Dissected alluvial slope<br>VEGETATION: Grasses, Christmas-berry, wattle,<br>koa-haole<br>CONDITION: Good<br>INTEGRITY: Altered*                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0.3-0.5 m high<br><b>PROBABLE AGE:</b> Prehistoric<br><b>DESCRIPTION:</b> Small terraces scattered across slope.<br>Most incorporate bedrock outcrops and are roughy constructed.<br>They are opportunistically placed to utilized scattered pockets<br>of soil.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                        |
| DIMENSIONS: 14.0 m long by 6.0 m wide; c. 84.0 sq m<br>PROBABLE AGE: Prehistoric<br>FUNCTIONAL INTERPRETATION: Burial/Agricultural<br>DESCRIPTION: Consists of a burial in a lava blister<br>overhang. The blister is 0.3 m high and c. 4.0 m in diameter.<br>Bones (patella and rib) were observed inside. A wall<br>extends from the opening 9.0 m to the northwest. The                                                                                                                                                                                                                                                                                                                                            | TOPOGRAPHY: Dissected alluvial slope<br>VEGETATION: Lantana, grasses, wattle, Christmas-berry<br>CONDITION: Good<br>INTEGRITY: Unaltered<br>DIMENSIONS: 3.7 m long by 3.4 m wide; c. 12.6 sq m                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                        |
| entrance may have been plugged at one time, but is now<br>open. Agricultural features surround the site.<br>SITE NOS.: State: 2312 PHRI: K-108 BPBM: —<br>FORMAL TYPE: Enclosure<br>TOPOGRAPHY: Dissected alluvial slope                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <ul> <li>PROBABLE AGE: Itemseries</li> <li>DESCRIPTION: C-shaped terrace, probably agricultural<br/>in function. A slightly modified bedrock terrace is present<br/>immediately below the feature.</li> <li>SITE NOS.: State: 2314 PHRI: K-110 BPBM: T-48<br/>FORMAL TYPE: Wall</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>7</b> {             |
| VEGETATION: Grasses, lantana, 'ilima, wattle<br>CONDITION: Good<br>INTEGRITY: Unaltered                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | TOPOGRAPHY: Dissected alluvial slope<br>VEGETATION: Grasses, lantana, wattle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 9 F                    |

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CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 36.0 m long by 14.0 m wide; c. 504.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Agricultural DESCRIPTION: Large terrace forms a rough C-shape. Terrace is situated in the bottom and sides of a drainage. A wall extends upslope-downslope from the south end of the terrace and continues downslope.

SITE NOS.: State: 2036 PHRI: K-111 BPBM: — FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, Christmas-berry, wattle CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 40.0 m long by 20.0 m wide; c. 800.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Complex consists of a pair of adjoining overhangs, a paved terrace, and a small overhang with possible walls delineating a level area.

FEATURE A: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, Christmas-berry, wattle CONDITION: Good

**INTEGRITY:** Unaitered

DIMENSIONS: 12.0 m long by 11.0 m wide;

c. 132.0 sq m

PROBABLE AGE: Prehistoric

**DESCRIPTION:** Two adjoining overhangs with a possible wall in front of the western one. In front of the overhangs is a natural terrace area which extends 4.0 m to the west. Subsurface testing was conducted at the feature.

The test unit excavated near the dripline of the overhang revealed a subsurface cultural deposit containing volcanic glass flakes, marine shell, bone and charcoal. A radiocarbon sample from the deposit yielded a calendric age range of AD 1640-1955.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, Christmas-berry, wattle CONDITION: Good

**INTEGRITY:** Unaitered

DIMENSIONS: 10.0 m long by 7.5 m wide; c. 75.0 sq m PROBABLE AGE: Prehistoric

**DESCRIPTION:** This paved terrace is on a very steep slope and is built to extend the top of the ridge. About 1.5 m of the north wall is faced, and the other 1.5 m of the same wall is collapsed.

FEATURE C: Overhang TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, Christmas-berry, wattle CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 5.0 m long by 4.0 m wide; c. 20.0 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Overhang alone measures 1.4 m by 0.7 m; a level area fronts it. A possible modified bedrock wall is situated west of the overhang; this wall curves and connects with Feature B and encloses a level area.

SITE NOS.: State: 2315 PHRI: K-112 BPBM: T-43 FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, panini CONDITION: Good INTEGRITY: Altered DIMENSIONS: 60.0 m long by 50.0 m wide; c. 3,000.0 sq m PROBABLE AGE: Prehistoric/Historic FUNCTIONAL INTERPRETATION: Habitation/ Agricultural/Animal Control

DESCRIPTION: Complex consists of an overhang, an oval enclosure, and a cattle wall. Agricultural features surround the site.

FEATURE A: Overhang TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, panini CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 2.0 m deep by 1.8 m wide; c. 3.6 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Feanre consists of an 1 m high overhang with collapsed bedrock in front. Soil deposit present inside overhang.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses, <u>panini</u> CONDITION: Poor INTEGRITY: Unluered DIMENSIONS: 5.5 m long by 5.0 m wide; c. 27.5 sq m PROBABLE AGE: Prehistoric

**DESCRIPTION:** Mostly collapsed oval enclosure. alls have a maximum height of 30 cm and are comprised of stacked basalt boulders and cobbles. No facing remains and the walls are rounded in cross-section.

FEATURE C; Wall TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima. panini E-39

#### APPENDIX E

only wall which is easily discernible; the east wall is **CONDITION:** Good covered with lantana. The walls have a maximum height of **INTEGRITY:** Altered 80 cm and are comprised of stacked basalt boulders and DIMENSIONS: 60.0 m long by 0.75 m wide cobbles. PROBABLE AGE: Historic DESCRIPTION: Cattle wall which may be connected to SITE NOS .: State: 2317 PHRI: K-116 BPBM: T-41 the walls of Site K-12. Multiple-stacked wall comprised of FORMAL TYPE: Complex (2 Features) stacked basalt boulders and cobbles. Wall is 80 cm high and TOPOGRAPHY: Dissected alluvial slope 75 cm in thickness. VEGETATION: Lantana, 'ilima, grasses, kiawe SITE NOS .: State: 2316 PHRI: K-115 BPBM: T-42 **CONDITION:** Good **INTEGRITY:** Altered FORMAL TYPE: Complex (2 Features) DIMENSIONS: 75.0 m long by 55.0 m wide; TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, kiawe c. 4,125.0 sq m PROBABLE AGE: Historic CONDITION: Good FUNCTIONAL INTERPRETATION: Animal Control **INTEGRITY:** Unaltered DESCRIPTION: Complex consists of two large DIMENSIONS: 35.0 m long by 20.0 m wide; enclosures, one square and one trapezoidal. Both are c. 700.0 sq m probably historic corrals for cattle based on their size, PROBABLE AGE: Prehistoric location relative to other similar features, and construction. FUNCTIONAL INTERPRETATION: Habitation/ Agriculture FEATURE A: Enclosure DESCRIPTION: Complex consists of a square enclosure, TOPOGRAPHY: Dissected alluvial slope an enclosure irregular in plan, and agricultural terraces. VEGETATION: Lantana, grasses, 'ilima, panini CONDITION: Good FEATURE A: Enclosure **INTEGRITY:** Altered TOPOGRAPHY: Dissected alluvial slope DIMENSIONS: 30.0 m long by 22.0 m wide; VEGETATION: Lantana, grasses, 'ilima, kiawe c. 660.0 sq m **CONDITION:** Excellent PROBABLE AGE: Historic **INTEGRITY:** Unaltered DESCRIPTION: Large square enclosure with intermittent DIMENSIONS: 8.9 m long by 7.9 m wide; c. 70.3 sq m facing on the walls. Most of the west wall is missing due to PROBABLE AGE: Prehistoric buildozer activity during the building of a fence in the area. DESCRIPTION: Square enclosure with a 3.5 m square A upslope-downslope oriented wall segment extends for c. platform adjacent to the walls in the northeast quadrant of 5.0 m off the northeast corner. The walls average 75 cm to the structure's interior. The level upper surface of the 80 cm in thickness and have a maximum height of 1.0 m. platform is flush with the upper surfaces of the adjacent The walls are of multiple-stacked to core-filled construction walls which are also level. Both sides of all walls are welland are composed of stacked basalt cobble and boulders. faced. The south wall is massive, 1.9 m thick. The walls average 80 cm in height and average 1.5 m in thickness. A possible external cupboard is present on the outside of the FEATURE B: Enclosure TOPOGRAPHY: Dissected alluvial slope north wall near the northeast corner. The walls are comprised VEGETATION: Lantana, grasses, 'ilima, panini of stacked basalt boulders and cobbles. **CONDITION:** Fair INTEGRITY: Altered FEATURE B: Enclosure DIMENSIONS: 30.0 m long by 22.0 m wide; TOPOGRAPHY: Dissected alluvial slope c. 660.0 sq m VEGETATION: Lantana, grasses, 'ilima, kiawe **PROBABLE AGE:** Historic CONDITION: Poor DESCRIPTION: Large trapezoidal enclosure with only **INTEGRITY:** Unaltered the north and east walls intact. The other walls are linear DIMENSIONS: 30.0 m long by 20.0 m wide; piles of rubble having been probably destroyed by bulldozer c. 600.0 sq m activity. There is a depression in the northwest one-third of PROBABLE AGE: Prehistoric the enclosure. The walls average 80 cm in thickness and DESCRIPTION: Enclosure irregular in plan view have a maximum height of 1.3 m. The walls are of multiple-

stacked to core-filled construction and are composed of

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stacked basalt cobble and boulders.

DESCRIPTION: Enclosure irregular in plan view surrounding a small sink. The walls of the enclosure are poorly constructed and are low. The north wall may have been altered during fence building. The western wall is the

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#### APPENDIX E

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SITE NOS .: State: 2318 PHRI: K-118 BPBM: ----FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, panini, wattle CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 70.0 m long by 40.0 m wide; c. 2,800.0 sq m PROBABLE AGE: Prehistoric/Historic FUNCTIONAL INTERPRETATION: Habitation/ Agricultural/Animal Control DESCRIPTION: Complex consists of a large square enclosure, a circular enclosure, a sub-rectangular enclosure and associated agricultural features. The large enclosure is probably a historic cattle corral based on it's size, location relative to other similar features, and construction. FEATURE A: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, panini, wattle CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 35.0 m long by 30.0 m wide; c. 1,050.0 sq m PROBABLE AGE: Prehistoric/Historic DESCRIPTION: Large square enclosure. Most of the walls are faced, the west wall, however, is somewhat collapsed. The south wall is in the best condition. A collapsed terrace extends c. 5.0 m from the north corner, then extends 8.0 m to the northeast, then extends eastward and ends 5.0 m from Feature B. The enclosure walls average 70 cm in thickness and have a maximum height of 1.2 m. The walls are of multiple-stacked construction and are composed of stacked basalt cobble and boulders. FEATURE B: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, panini, wattle **CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 5.0 m long by 4.3 m wide; c. 21.5 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: Circular enclosure. The north half of the enclosure is collapsed, and the south half is in very good condition. Walls of the south half are faced on both sides. The enclosure walls average 70 cm in thickness and have a maximum height of 90 m. The walls are of multiple-stacked construction and are composed of stacked basalt cobble and boulders. FEATURE C: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, panini, wattle

**CONDITION:** Fair **INTEGRITY:** Unaltered DIMENSIONS: 9.0 m long by 4.5 m wide; c. 40.5 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: Sub-rectangular enclosure with very collapsed walls. Most of the south half of the east wall is missing.

SITE NOS .: State: 2319 PHRI: K-120 BPBM: T-40 FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, panini, morning glory **CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 60.0 m long by 25.0 m wide; c. 1,500.0 sq m **PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agricultural

DESCRIPTION: Complex consists of a paved terrace, a small lava tube, and a rectangular enclosure.

FEATURE A: Paved terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, panini, morning glory

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 7.0 m long by 4.5 m wide; c. 31.5 sq m **PROBABLE AGE: Prehistoric** 

DESCRIPTION: Feature consists of an outcrop of cobbles which has been modified into a terrace. A faced retaining wall is present on the southeast downslope side of the platform. The upper surface of the terrace is roughly paved.

FEATURE B: Lava Tube

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini,

morning glory

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 1.8 m long by 0.8 m wide; c. 1.4 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: A small lava tube open at both ends. Some possible stacking of cobbles at one opening, or the cobbles may represent collapse. Floor of tube has a soil deposit. internal height ranges from 35 cm to 55 cm.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini,

morning glory

#### APPENDIX E

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CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 6.2 m long by 3.7 m wide; c. 22.9 sq m PROBABLE AGE: Prehistoric

**DESCRIPTION:** Rectangular enclosure with all walls faced. There may be an opening in the south corner. Walls have a maximum height of 1.1 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2037 PHRI: K-124 BPBM: --

FORMAL TYPE: Complex (3 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, wattle

CONDITION: Good

INTEGRITY: Unaltered

**DIMENSIONS:** 65.0 m long by 60.0 m wide; c. 3,900.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agricultural

**DESCRIPTION:** Complex consists of an oval enclosure, an overhang wall, a rectangular enclosure, and surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 6.0 m wide; c. 42.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: An oval enclosure built into an natural collapsed lava tube depression. Portions of the interiors and exteriors of the walls are faced. The walls range from 60 cm to 80 cm in thickness and range from 1.2 m to 1.4 m in height. The walls are of multiple-stacked construction comprised of basalt boulders and cobbles. Just north of the enclosure is a small lava tube which extends to the northwest for an indeterminable length.

A test unit excavated inside the enclosure revealed a subsurface cultural deposit containingsmall and medium mammal bone, three basalt flakes, and charcoal. A radiocarbon sample from the deposit yielded a calendric age range of AD 1640-1955.

FEATURE B: Overhang TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, '<u>ilima</u>, wattle CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 3.4 m long by 2.5 m wide; c. 8.5 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Overhang with a small curved wall fronting it. The wall encloses a small area in front of the overhang and both ends of the wall connects to an outcrop equal in height to the wall. A few boulders are present on the outcrop, above the lip of the overhang. The walls have a maximum height of 1.0 m and a maximum thickness of 50 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE C: Enclosure TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses lantana, 'ilima, wattle CONDITION: Poor

INTEGRITY: Unaltered

**DIMENSIONS:** 8.0 m long by 6.0 m wide; c. 48.0 sq m **PROBABLE** AGE: Prehistoric

**DESCRIPTION:** Rectangular enclosure. The walls of the enclosure are quite collapsed making it difficult to determine their exact dimensions. The north wall, being on the side of a swale, is higher than the others. Part of the exterior of the west wall is faced. The walls have a maximum height of 1.0 m and a maximum thickness of 1.0 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS .: State: 2320 PHRI: K-127 BPBM: ---FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, panini, wattle **CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 65.0 m long by 35.0 m wide; c. 2275.0 sq m **PROBABLE AGE: Prehistoric** FUNCTIONAL INTERPRETATION: Habitation/ Agricultural DESCRIPTION: Complex consists of a circular enclosure, a small overhang with an associated wall, and many surrounding agricultural features. FEATURE A: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, 'ilima, lantana, panini, wattle **CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 9.0 m long by 8.2 m wide; c. 73.8 sq m

PROBABLE AGE: Prehistoric

**DESCRIPTION:** Circular enclosure; the interior of the south wall and the exterior of the north wall are faced. A possible cupboard is present in the south wall. The walls have a maximum height of 85 cm and a maximum thickness of 1.0 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

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#### APPENDIX E

FEATURE B: Overhang TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 1.8 m long by 0.4 m wide; c. 0.7 sq m PROBABLE AGE: Prehistoric

**DESCRIPTION:** A small shallow overhang in a lava blister. A 8.0 m long somewhat informal appearing wall extends north from the overhang. The wall measures 0.5 m wide; c. 0.5 m high. The overhang is 0.7 m high.

SITE NOS.: State: 2038 PHRI: K-130 BPBM: — FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, panini

CONDITION: Good

**INTEGRITY:** Unaltered

**DIMENSIONS:** 40.0 m long by 40.0 m wide; c. 1,600.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agricultural

**DESCRIPTION:** Rectangular enclosure with a small associated overhang containing a pig mandible. Most of the interior walls are faced. The walls have a maximum height of 1.3 m and a maximum thickness of 80 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles. The overhang is 1.4 m high, 1.4 m wide, and 50 cm deep. There are many agricultural features in the area.

A test unit excavated inside the enclosure revealed a subsurface cultural deposit containing small mammal bone, marine shell, three basalt flakes, and charcoal. A radiocarbon sample from the deposit yielded five possible calendric age ranges: AD 1523-1566, AD 1629-1696, AD 1726-1818, AD 1859-1861, and AD 1921-1955.

SITE NOS.: State: 2321 PHRI: K-131 BPBM: — FORMAL TYPE: Complex (3 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, morning glory,

panini CONDITION: Good

INTEGRITY: Altered

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**DIMENSIONS:** 80.0 m long by 50.0 m wide; c. 4,000.0 sq m

PROBABLE AGE: Prehistoric/Historic

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture/Animal Control

**DESCRIPTION:** Complex consists of a square enclosure, an oval enclosure, an overhang and a wall, and associated agricultural features. A wall of Site K-12 bisects the site.

FEATURE A: Overhang

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, morning glory, panini

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 3.0 m long by 0.4 m wide; c. 1.2 sq m PROBABLE AGE: Prehistoric

**DESCRIPTION:** Very shallow, 50 cm high overhang with a possible deposit on the floor. A nearby wall is probably not associated with the overhang, as it appears to be a cattle wall. The wall is 50+m long, 70 cm thick, and 50 cm high. There is also a probable road between this wall and the wall of Site K-12.

**FEATURE B: Enclosure** 

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, morning glory, panini

**CONDITION:** Fair/Poor

**INTEGRITY:** Unaltered

DIMENSIONS: 5.0 m long by 5.0 m wide; c. 25.00 sq m PROBABLE AGE: Prehistoric

**DESCRIPTION:** Square enclosure with collapsed walls and rock mounds possibly associated with the enclosure. The walls have a maximum height of 30 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, morning glory, panini

CONDITION: Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 6.0 m long by 5.0 m wide; c. 30.0 sq m PROBABLE AGE: Prehistoric

**DESCRIPTION:** Circular enclosure with collapsed walls. No facing was present on any of the walls. The walls have a maximum height of 50. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini

**CONDITION:** Fair-Poor

INTEGRITY: Altered

DIMENSIONS: 18.5 m long by 13.2 m wide;

c. 244.2 sq m

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Religious\*/ Habitation

#### APPENDIX E

DESCRIPTION: Large substantial rectangular enclosure with wide walls and internal features. The east wall is intermittently faced on both sides. There is a possible internal step, or bench along the south half of the east wall. A natural step in the bedrock floor separates the higher north one-quarter of the floor from the lower south three-quarters. The later portion of the interior may have been futher subdivided by a wall which is now completely collapsed. A cattle wall has been constructed along the west wall of the feature. Stones from the remaining walls, especially the north and south ones, have been removed to construct the cattle wall. The walls average 70 cm in height and have a maximum thickness of up-to 2.0 m. Walls are comprised of stacked basalt boulders and cobbles. The feature commands a broad view of the surrounding terrain. The enclosure is one of the largest within the project area and probably represents a small heiau, a men's house, or high status residence based on its size, construction, and location.

SITE NOS .: State: 2323 PHRI: K-135 BPBM: ---FORMAL TYPE: Complex (2 Features) **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, panini, morning glory **CONDITION: Good INTEGRITY:** Unaltered DIMENSIONS: 35.0 m long by 15.0 m wide; c. 525.0 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agricultural DESCRIPTION: Complex consists of an enclosed portion of a collapsed lava tube, and an L-shaped wall within a collapsed lava tube. Along the tube, throughout the site, there are small associated features. A long wall, which may be part of Site K-112 or Site K-12, is situated nearby. FEATURE A: Lava Tube **TOPOGRAPHY:** Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, morning glory, fems **CONDITION:** Good

**INTEGRITY:** Unaltered

DIMENSIONS: 12.0 m long by 12.0 m wide; c. 144.0 sq m

**PROBABLE AGE:** Prehistoric

DESCRIPTION: An enclosure built within a collapsed lava tube; the northeast and southwest walls have been built on the sides of the tube. The walls have a maximum height of 1.5 m and a maximum thickness of 85 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

FEATURE B: Wall TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, morning glory, fems **CONDITION:** Good **INTEGRITY:** Unaltered -DIMENSIONS: 7.0 m long by 6.0 m wide; c. 42.0 sq m PROBABLE AGE: Prehistoric DESCRIPTION: L-shaped wall built within a collapsed lava tube. One leg of the L-shape is on the top of the tube and the other crosses the tube. The northeast side of the tube is steep enough to act as a wall-which creates an over all U-shape open to the northwest. The walls have a maximum height of 1.5 m and a maximum thickness of 80 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles. SITE NOS .: State: 2324 PHRI: K-137 BPBM: ---FORMAL TYPE: Enclosure **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Grasses, lantana, Christmas-berry **CONDITION:** Fair INTEGRITY: Unaltered DIMENSIONS: 4.0 m long by 3.6 m wide; c. 14.4 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agricultural DESCRIPTION: Sub-rectangular enclosure with some facing on the east wall. Northeast side of structure is built into an outcrop. The walls have a maximum height of 70 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles. Agicultural features, mounds, terraces, and modified outcrops, surround site. SITE NOS .: State: 2325 PHRI: K-140 BPBM: ---FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, vines CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 50.0 m long by 40.0 m wide; • - . . c. 2,000.0 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Indeterminate .... DESCRIPTION: Complex consists of a large ovoid enclosure, and a C-shaped enclosure. Associated with these features are two small overhangs. •---FEATURE A: Enclosure TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Grasses, Lantana, vines **CONDITION:** Good

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**INTEGRITY:** Unaltered DIMENSIONS: 30.0 m long by 16.0 m wide; c. 480.0 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: Large ovoid enclosure situated in a depression/sink. Much of the south wall consists of a small cliff. The other walls are high and are intermittently faced. Wall average 1.0 m in height. Walls are multiple-stacked comprised of basalt cobbles and boulders and frequently incorporate bedrock outcrops. Interior is thickly vegetated possibly indicating feature served as an garden enclosure. FEATURE B: Enclosure **TOPOGRAPHY:** Dissected alluvial slope VEGETATION: Grasses, lantana, vines **CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 4.8 m long by 3.8 m wide; c. 18.2 sq m PROBABLE AGE: Prehistoric DESCRIPTION: C-shaped enclosure open to the west. The walls are low and are not faced. The walls have an average height of 20 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles. SITE NOS.: State: 2326 PHRI: K-142 BPBM: ----FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, vines **CONDITION:** Fair **INTEGRITY:** Unaltered DIMENSIONS: 7.8 m long by 6.0 m wide; c. 46.8 sq m **PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agricultural DESCRIPTION: Rectangular enclosure with intermittent facing on all sides. Terraces are present north and south of the west wall. The terraces form the edge of a level area which runs to the base of a ridge situated to the east and north. The walls have an average height of 40 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles. A test unit excavated in the enclosure sectioning the possible firepit did not reveal any subsuface cultural remains indicating the feature is either not a habitation (i.e., an agricultural enclosure) or that the feature was little used. SITE NOS.: State: 2327 PHRI: K-143 BPBM: ----FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, Christmas-berry, panini **CONDITION:** Good **INTEGRITY:** Unaltered

DIMENSIONS: 50.0 m long by 25.0 m wide;

c. 1,250.00 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agricultural

DESCRIPTION: Complex consists of an irregular enclosure, an overhang, and surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, Christmas-berry, panini

CONDITION: Good

**INTEGRITY:** Unaltered

DIMENSIONS: 8.0 m long by 7.0 m wide; c. 56.0 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Enclosure is irregular in plan view. Walls are infrequently faced on the north and west sides. In the southwest corner is a possible small platform. In the northwest corner is a low area defined by a terrace connected to the possible platform and north wall. The walls have an maximum height of 80 cm and a maximum thickness of 80 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, Christmas-berry, panini

CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 2.5 m long by 1.5 m wide; c. 3.8 sq m

**PROBABLE AGE:** Prehistoric

**DESCRIPTION:** A 80 cm overhang with short walls of modified bedrock on either side of the entrance. Present in the vicinity of the overhang are numerous agricultural terraces.

SITE NOS.: State: 2328 PHRI: K-146 BPBM: --

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, Christmas-berry, wattle CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 6.0 m wide; c. 42.0 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: U-shaped enclosure open to the southeast. Northwest side of enclosure is built into a small outcrop. A level area is present on the other side of the outcrop. The walls have a maximum height of 70 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

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**INTEGRITY:** Unaltered

#### APPENDIX E

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t + ... SITE NOS .: State: 2329 PHRI: K-148 BPBM: ---DIMENSIONS: 7.5 m long by 7.0 m wide; c. 52.5 sq m (Figure E-11) **PROBABLE AGE:** Prehistoric FORMAL TYPE: Complex (5 Features) DESCRIPTION: Circular enclosure with unfaced walls TOPOGRAPHY: Dissected alluvial slope quite collapsed. The walls have a maximum height of 35 VEGETATION: Grasses, lantana, 'ilima, wattle, cm. Walls are of multiple-stacked construction comprised Christmas-berry of basalt boulders and cobbles. **CONDITION:** Fair **INTEGRITY:** Unaltered FEATURE D: Enclosure DIMENSIONS: 90.0 m long by 60.0 m wide; TOPOGRAPHY: Dissected alluvial slope c. 5,400.0 sq m VEGETATION: Grasses, lantana, 'ilima, Christmas-berry, ε. PROBABLE AGE: Prehistoric wattle CONDITION: Poor FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Site consists of three circular enclosures, **INTEGRITY:** Unaltered n 1 one U-shaped enclosure, one rectangular enclosure, and DIMENSIONS: 5.4 m long by 5.2 m wide; c. 28.1 sq m surrounding agricultural features. **PROBABLE AGE:** Prehistoric DESCRIPTION: Rectangular enclosure with very FEATURE A: Enclosure collapsed walls. The only portions of the enclosure above 3.14 TOPOGRAPHY: Dissected alluvial slope ground level are the south wall, the southeast corner, and a VEGETATION: Grasses, lantana, 'ilima, wattle, small bit of the east wall. A wall extends c. 4.0 m south from Christmas-berry the southwest corner of the enclosure. The walls have a £ .\* **CONDITION:** Fair maximum height of 30 cm. Walls are of multiple-stacked **INTEGRITY:** Unaltered construction comprised of basait boulders and cobbles. DIMENSIONS: 6.5 m long by 6.5 m wide; c. 42.3 sq m **PROBABLE AGE:** Prehistoric DESCRIPTION: Circular enclosure with low, unfaced SITE NOS .: State: 2330 PHRI: K-149 BPBM: ---walls. The walls have a maximum height of 25 cm. Walls FORMAL TYPE: Overhang are of multiple-stacked construction comprised of basalt **TOPOGRAPHY:** Dissected alluvial slope boulders and cobbles. VEGETATION: lantana, 'ilima, wattle, grasses, panini **CONDITION:** Fair FEATURE B: Enclosure **INTEGRITY:** Unaltered TOPOGRAPHY: Dissected alluvial slope DIMENSIONS: 8.0 m long by 3.5 m wide; c. 28.0 sq m VEGETATION: Grasses, lantana, 'ilima, Christmas-berry, **PROBABLE AGE:** Prehistoric wattle **FUNCTIONAL INTERPRETATION: Habitation CONDITION:** Fair DESCRIPTION: Overhang is enclosed; it is small and **INTEGRITY:** Unaltered low, and a wall seals off one-quarter of the entrance. DIMENSIONS: 10.0 m long by 7.5 m wide; c. 75.0 sq m Fronting the overhang is a fairly level area which is terraced. PROBABLE AGE: Prehistoric The overhang measures 2.9 by 1.1 by 0.5 m. DESCRIPTION: U-shaped enclosure open to the northeast, with associated walls. Small portion of southwest SITE NOS .: State: 2331 PHRI: K-152 BPBM: --wall is faced. Present within the enclosure is a small wall FORMAL TYPE: Complex (2 Features) which extends 2.0 m northeast off the enclosure's southwest **TOPOGRAPHY:** Dissected alluvial slope wall. The walls have a maximum height of 80 cm. Walls are VEGETATION: Lantana, 'ilima, grasses, wattle of multiple-stacked construction comprised of basalt boulders **CONDITION:** Good and cobbles and occasionally incorporating bedrock outcrops. **INTEGRITY:** Unaltered Three meters east of the enclosure is what appears to be a DIMENSIONS: 40.0 m long by 40.0 m wide; very collapsed U-shape. c. 1,600.0 sq m **PROBABLE AGE:** Prehistoric FEATURE C: Enclosure FUNCTIONAL INTERPRETATION: Habitation/ TOPOGRAPHY: Dissected alluvial slope Agricultural VEGETATION: Grasses, lantana, 'ilima, Christmas-berry, DESCRIPTION: Complex consists of a double terrace, a wattle U-shaped enclosure, and surrounding agricultural features. **CONDITION:** Fair 3-44-

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## APPENDIX E

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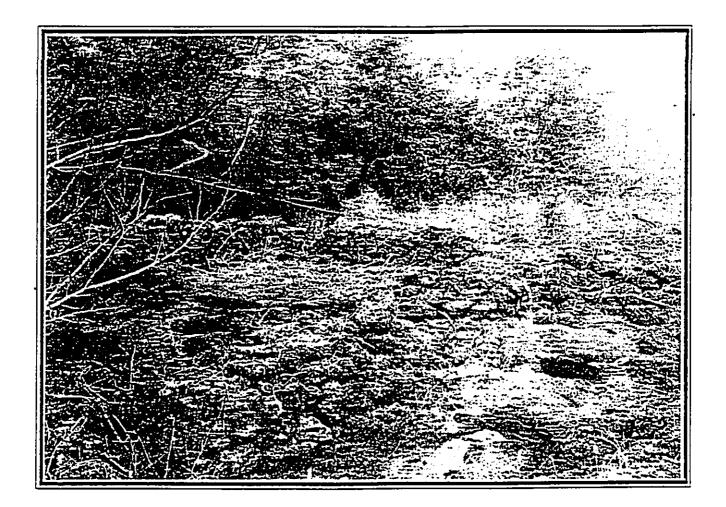


Figure E-11. SITE K-148, FEATURE B. VIEW TO SOUTHWEST. (PHRI Neg.# 1154-20)

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## APPENDIX E

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| FEATURE A: Double terrace                                    | possible entryway is present in the southwest wall. The         |                  |
| TOPOGRAPHY: Dissected alluvial slope                         | walls have a maximum height of 30 cm. Walls are of              |                  |
| VEGETATION: Grasses, wattle, 'ilima, lantana                 | multiple-stacked construction comprised of basalt boulders      | <b>1</b> 4-1-    |
| CONDITION: Good                                              | and cobbles. Five meters south of the enclosure is a wall of    |                  |
| INTEGRITY: Unaltered                                         | Site K-12.                                                      |                  |
| DIMENSIONS: 5.9 m long by 5.8 m wide; c. 34.2 sq m           |                                                                 |                  |
| PROBABLE AGE: Prehistoric                                    | SITE NOS.: State: 2334 PHRI: K-202 BPBM:                        | <b>ta</b> . I    |
| DESCRIPTION: Feature consists of two attached paved          | FORMAL TYPE: Enclosure                                          |                  |
| terraces. The downslope and northwest side of each level     | TOPOGRAPHY: Dissected alluvial slope                            |                  |
| area is well faced. The upper terrace surface is 80 cm above | VEGETATION: Grasses, lantana, wattle                            | ۰.               |
| the lower one. The southeast corner of each terrace is level | CONDITION: Poor                                                 | <b>-</b> ,       |
| with the slope of the hill. The lower terrace is 70 cm high. | INTEGRITY: Unaltered                                            | 1                |
| what are stope of the find. The fower whate is 70 cm mgh.    | DIMENSIONS: 4.0 m long by 3.0 m wide; c. 12.0 sq m              |                  |
| FEATURE B: Enclosure                                         | PROBABLE AGE: Prehistoric                                       | <b>4</b> 1       |
| TOPOGRAPHY: Dissected alluvial slope                         | FUNCTIONAL INTERPRETATION: Habitation                           | Ļ                |
|                                                              | DESCRIPTION: A small rectangular enclosure with a               |                  |
| VEGETATION: Grasses, lantana, ' <u>ilima</u> , wattle        | modified bedrock terrace extending 10.0 m off the southwest     | ē.,              |
| CONDITION: Good                                              | modified bedrock tetrace extending 10.011 of the solutivest     |                  |
| INTEGRITY: Unaitered                                         | corner. The walls have a maximum height of 70 cm. Walls         |                  |
| DIMENSIONS: 5.7 m long by 5.0 m wide; c. 28.5 sq m           | are of multiple-stacked construction comprised of basalt        |                  |
| PROBABLE AGE: Prehistoric                                    | boulders and cobbles occasionally incorporating bedrock         | ¥                |
| DESCRIPTION: U-shaped enclosure open to the southwest.       | outcrops.                                                       |                  |
| The walls of the enclosure are faced. The back wall of the   |                                                                 |                  |
| U-shape, the northeast side, is collapsed. The walls have a  | SITE NOS.: State: 2335 PHRI: K-203 BPBM:                        |                  |
| maximum height of 40 cm. Walls are of multiple-stacked       | FORMAL TYPE: Enclosure                                          |                  |
| construction comprised of basalt boulders and cobbles.       | TOPOGRAPHY: Dissected alluvial slope                            |                  |
|                                                              | VEGETATION: Lantana, grasses, 'ilima, wattle                    |                  |
| SITE NOS.: State: 2332 PHRI: K-200 BPBM:                     | CONDITION: Good                                                 | ▲ 1.41           |
| FORMAL TYPE: Overhang                                        | INTEGRITY: Unaltered                                            |                  |
| TOPOGRAPHY: Dissected alluvial slope                         | DIMENSIONS: 45.0 m long by 22.0 m wide;                         |                  |
| VEGETATION: Lantana, nanini, wattle, Christmas-berry,        | c. 990.0 sq m                                                   | . * **           |
| grasses                                                      | PROBABLE AGE: Prehistoric                                       |                  |
| CONDITION: Good                                              | FUNCTIONAL INTERPRETATION: Habitation/                          | •                |
| INTEGRITY: Unaltered                                         | Agricultural                                                    |                  |
| DIMENSIONS: 10.7 m long by 3.0 m wide; c. 32.1 sq m          | DESCRIPTION: Large inegular-shaped enclosure with               |                  |
| PROBABLE AGE: Prehistoric                                    | two rooms on the southwest side. Probable agricultural          | -                |
| FUNCTIONAL INTERPRETATION: Habitation                        | features within enclosure including modified outcrops and       |                  |
| DESCRIPTION: Site consists of an 1.1 m high overhang         | terraces. The walls have a maximum height of 1.5 m. Walls       |                  |
| with a partially walled entrance. One wall is on the         | are of multiple-stacked to core-fill construction. Walls are    |                  |
| southeast side of the entrance. The wall has a faced corner. | comprised of basalt boulders and cobbles occasionally           |                  |
| The wall on the other side is collapsed. Inside the overhang | incorporating bedrock outcrops.                                 |                  |
| is a small oval-shaped level terraced area.                  | meorporating bounder duscrops.                                  |                  |
| is a sinal oval-snaped level terraced alea.                  | SITE NOS .: State: 2336 PHRI: K-204 BPBM:                       | 1                |
| SITE NOS.: State: 2333 PHRI: K-201 BPBM:                     | FORMAL TYPE: Enclosure                                          |                  |
| FORMAL TYPE: Enclosure                                       | TOPOGRAPHY: Dissected alluvial slope                            | ,                |
|                                                              |                                                                 |                  |
| TOPOGRAPHY: Dissected alluvial slope                         | VEGETATION: grasses, lantana, 'ilima, wattle,                   | • •              |
| VEGETATION: Grasses, lantana                                 | Christmas-berry                                                 |                  |
| CONDITION: Fair                                              | CONDITION: Fair                                                 |                  |
| INTEGRITY: Unaltered                                         | INTEGRITY: Unaltered                                            | *                |
| DIMENSIONS: 3.3 m long by 2.8 m wide; c. 9.3 sq m            | DIMENSIONS: 6.2 m long by 5.0 m wide; c. 31.0 sq m              |                  |
| PROBABLE AGE: Prehistoric                                    | PROBABLE AGE: Prehistoric                                       |                  |
| FUNCTIONAL INTERPRETATION: Habitation                        | FUNCTIONAL INTERPRETATION: Habitation                           |                  |
| DESCRIPTION: Small square enclosure with collapsed           | DESCRIPTION: Circular enclosure with collapsed walls.           | *****            |
| walls. There is a bit of facing on the southwest corner. A   | The interior of the southwest wall is partially faced. Possible |                  |
|                                                              |                                                                 |                  |

in height.

### APPENDIX E

opening present in a section of the west wall. The walls have a maximum height of 55 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles.

SITE NOS .: State: 2337 PHRI: K-205 BPBM: ---FORMAL TYPE: Overhang TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, Christmas-berry, panini CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 18.0 m long by 5.0 m wide; c. 90.0 sq m **PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Overhang with a terraced area in front of it. Overhang has two deep recesses at either end; recesses differ in elevation and are separated by a collapsed modified bedrock wall. Overhang ceiling ranges from 50 cm to 90 cm

SITE NOS .: State: 2338 PHRI: K-206 BPBM: T-1 FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, 'ilima, lantana CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 6.6 m long by 5.5 m wide; c. 36.30 sq m

**PROBABLE AGE:** Prehistoric FUNCTIONAL INTERPRETATION: Habitation\*/ Agricultural

DESCRIPTION: The northwest and southeast walls of this enclosure are formed by a collapsed lava tube. Possible cupboard present in the middle of the northeast wall. Within the tube, 6.0 m upslope of the enclosure, is a terrace. The walls have a maximum height of 90 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles.

SITE NOS .: State: 2339 PHRI: K-207 BPBM: T-45 FORMAL TYPE: Sink, Burial

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, Christmas-berry, panini **CONDITION: Good** 

**INTEGRITY:** Unaltered

DIMENSIONS: 36.0 m long by 5.0 m wide;

c. 180.00 sa m

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Burial/Habitation DESCRIPTION: Very deep sink with a small circular alignment in lava tube at the bottom. A lava tube extends to the west. Human bone noted on surface in tube. Sink is filled with trash and dead animals. Areas of charcoal-stain noted on floor of tube.

SITE NOS .: State: 2340 PHRI: K-208 BPBM: ---FORMAL TYPE: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, Christmas-berry

**CONDITION:** Fair

**INTEGRITY:** Unaltered

DIMENSIONS: 5.0 m long by 4.3 m wide; c. 21.5 sq m **PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Sub-rectangular enclosure built on a bedrock outcrop. Interiors and exteriors of walls are faced. The walls have a maximum height of 90 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles. Many agricultural terraces present nonhwest of the enclosure.

SITE NOS .: State: 2341 PHRI: K-209 BPBM: ----

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, morning glory, kiawe **CONDITION:** Good

**INTEGRITY:** Unaltered

DIMENSIONS: 30.0 m long by 15.0 m wide;

c. 450.0 sq m

**PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Indeterminate

DESCRIPTION: Large oval enclosure encircling a sink. Aside from the east wall, which is built on a slope and which utilizes bedrock, all walls are faced on both sides. The walls have a maximum height of 1.4 m and a maximum thickness of 90 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles. Agricultural terraces surround the enclosure.

SITE NOS .: State: 2342 PHRI: K-210 BPBM: --FORMAL TYPE: Overhang TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle CONDITION: Good **INTEGRITY:** Unaltered

DIMENSIONS: 4.1 m long by 2.9 m wide; c. 11.9 sq m **PROBABLE AGE:** Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Overhang with irregular enclosure in front. Two sides of the enclosure consist of bedrock; one of the bedrock sides has a small overhang. The interior portion of the northwest wall is faced; all other walls are collapsed. The walls have a maximum height of 90 cm and a maximum thickness of 60 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles.

## APPENDIX E

cobbles.

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SITE NOS .: State: 2343 PHRI: K-211 BPBM: ---FORMAL TYPE: Terrace TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle, lilikoi CONDITION: Good **INTEGRITY:** Unaltered DIMENSIONS: 13.0 m long by 6.5 m wide; c. 84.50 sq m PROBABLE AGE: Prehistoric

## FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Probable residential terrace with modified bedrock walls present on the south and west sides. The other walls were vaguely defined. Terrace is situated on the end of a ridge. The walls have a maximum height of 80 cm and a maximum thickness of 1.1 m. Walls are of multiple-stacked and are comprised of basalt boulders and

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APPENDIX F

FULL UTM COORDINATES, ELEVATION AND PROXIMITY TO WATER FOR IDENTIFIED SITES

| TEMP.      | COOR     | COORDINATES | (ft. above | DISTANCE AND<br>DIRECT, TO WATER + | TEMP.   | LE COO  | FULL UTM<br>COORDINATES | ELEVATION                | DISTANCE AND                        |
|------------|----------|-------------|------------|------------------------------------|---------|---------|-------------------------|--------------------------|-------------------------------------|
| Vanino     | nulleva  | NUKTHING    | sea leve)  | (A.) (approx.)                     | NUMBER  | EASTING | NORTHING                | (II. RDUYE<br>sea level) | DIRECT. TO WATER<br>(ft.) (approx.) |
| IVA IOHULI |          |             |            |                                    | W-57    | 776,250 | 2.294.650               | 2780                     | 550 (AD                             |
|            |          |             |            |                                    | W-58    | 776.200 | 2.294 600               | 0150                     | (N) ncr                             |
|            | 0(4,4)   | 2,296,100   | 1820       | 625 (S)                            | W-59    | 776.150 | 2.294 500               | 2760                     |                                     |
| M-2        | 7/4,350  | 2,295,850   | 1820       | 175 (N)                            | W-60    | 176 250 | 0 004 550               | 0000                     | (N) nnnt                            |
| W-3        | 774,300  | 2,295,800   | 1820       | 375(N/NF) 450(S)                   | N. KS   | 077021  | 000, 402,2              | 7870                     | 800 (N)                             |
| W-4        | 774,300  | 2,295,700   | 1820       | 175 (SW)                           | CO-M    | 007 322 | 2,294,750               | 2500                     | 1000 (S)                            |
| W-5        | 774,350  | 2.295.700   | 1840       | (110) 511                          | 10-M    | 006,077 | 2,294,800               | 2400                     | (MS/S) 575                          |
| W-6        | 774.300  | 2.295 700   | 0001       | (MC) (77                           | 1/-M    | 004,677 | 2,294,950               | 2340                     | 1000 (S)                            |
| W-8        | 774 200  | 0 205 550   | 1820       | (MC/C) 0C1                         | 61-W    | 1/6,400 | 2,294,700               | 2800                     | (N) 5L                              |
| W-10       | 774,500  | 2 295 750   | 1990       | (MC) 000                           | W-75    | 776,050 | 2,294,800               | 2640                     | 225 (N)                             |
| W-11       | 774 600  | 0.000 900 0 |            | (c) c/c '(N) c/c                   | //-M    | 776,050 | 2,294,850               | 2640                     | 125 (N)                             |
| W-12       |          | 0,005,000   | 0061       | (s) onc                            | W-80    | 775,750 | 2,295,050               | 2400-2540                | 225 (N)                             |
|            |          | 006'F67'7   | 0061       | (\$) 001                           | W-82    | 775,700 | 2,295,050               | 2440                     | 325 (N)                             |
|            |          | 007,042,2   | 1961       | 250 (S)                            | W-83    | 775,450 | 2.295.250               | 2300                     |                                     |
| N-14       | 000, 4/1 | 2,295,400   | 1940       | 625 (S), 575 (N)                   | W-88    | 776,450 | 2.294.750               | 2840                     |                                     |
| CI-W       | 1/4,700  | 2,295,500   | 1980       | 50 (N)                             | 06-W    | 775 950 | 0 205 050               | 0102                     |                                     |
| W-17       | 774,700  | 2,295,650   | 1940       | 300 (S)                            | 96-W    | 774 250 | 000 200 6               | 0401                     | (3) (7)                             |
| W-18       | 774,850  | 2,295,850   | 1980       | 375 (SW)                           | W-97    | 000 722 |                         | 1000                     | (N) 001                             |
| W-20       | 774,800  | 2,295,700   | 1980       | 125 (N)                            | W-98    |         | 0.04,02,2               | 1820                     | 125 (S)                             |
| W-21       | 774,700  | 2,295,600   | 1960       | 275 (S)                            | W_101   |         | 054 106 6               | 7070                     | 200 (S)                             |
| W-27       | 775,050  | 2,295,550   | 2100       | 300 (N). 300 (S)                   |         | mr'nz   | UC1,4%2,2               | 7860                     | 200 (S)                             |
| W-28       | 774,800  | 2,295,150   | 2100       | 375 (SW)                           | KENKE4  |         |                         |                          |                                     |
| W-30       | 775,150  | 2,295,600   | 2100       | 225 (N)                            | Valloat |         |                         |                          |                                     |
| W-31       | 775,100  | 2,295,600   | 2100       | 150 (N)                            | K-1     | 174 150 | 1 103 AEA               |                          |                                     |
| W-32       | 775,200  | 2,295,600   | 2100       | 125 (N)                            | κ.,     |         | 004 206 6               | 0977-0777                | ł                                   |
| W-35       | 774,950  | 2,294,900   | 2200       | 175 (N)                            | K. 3    | 007 411 | 005,000,000             | 2240                     | •                                   |
| W-36       | 775,050  | 2,295,100   | 2180       | 875 (W/SW)                         | K. d    |         | 0.00,642,2              | 2300-2320                | •                                   |
| W-37       | 774,950  | 2,294,950   | 2200       | 250 (W/SW)                         | × ×     | 000,411 | UCC'C67'7               | 2280                     | •                                   |
| W-42       | 776,350  | 2,295,100   |            | 575 (S)                            | 2       |         | 000°°C/2°7              | 0052-0877                | •                                   |
| W-45       | 775,600  | 2,295,500   |            | 775 (5)                            | 0-4     | 001,4/1 | 2,293,250               | 2260-2280                | •                                   |
| W-46       | 775,500  | 2,295,550   |            | 475 (SW)                           |         | 771,050 | 2,293,200               | 2250-2280                | •                                   |
| W-47       | 776,650  | 2,294,950   |            | 250 (S)                            | 0-4     | 000 222 | 2,293,150               | 2260-2280                | •                                   |
| W-48       | 776,550  | 2.294.900   |            |                                    | 01 A    | 000 222 | 002,242,2               | 2280-2320                | •                                   |
| W-49       | 776,450  | 2.295.050   |            |                                    | 01-V    | 006,677 | C)()R'767'7             | 2320-2340                |                                     |
| W-55       | 776.250  | 005 706 6   |            |                                    | U-11-V  | 0000111 | 2,292,750               | 2300-2320                | •                                   |
| }          |          | 00011/11-   | -          |                                    | K-12    | 773,900 | 2,292,400               | 2380-2480                | ,                                   |

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APPENDIX F

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| Restrict         Notifilities         Level of T14,00         2.292,600         2340         Rest         T4,400         2.292,500         2340         Rest         T4,400         2.292,500         2340         Rest         T4,400         2.292,500         2340         Rest         T4,400         2.292,500         2360         2680         2680         2680         2680         2680         2680         2680         2680         2680         2680         2680         2680         2680         2580         2680         2580         2680         2580         2680         2580         2680         2580         2680         2580         2680         2580         2580         2680         2580         2680         2580         2680         2580         2680         2580         2680         2580         2680         2580         2680         2580         2680         2580         2680         2580         2680         2580         2680         2580         2680         2780         2680         2580         2680         2580         2680         2580         2680         2780         2680         2780         2680         2780         2680         2780         2680         2780         2780         2780 <th>PHRI<br/>TEMP</th> <th>FUL<br/>FUL</th> <th>FULL UTM</th> <th>ELEVATION<br/>(ft. above</th> <th>DISTANCE AND<br/>DIRECT. TO WATER</th> <th>PHRI<br/>TEMP</th> <th>FULL UTM<br/>COORDINATI</th> <th>UTM<br/>INATES</th> <th>ELEVATION<br/>(ft. abave</th> <th>DISTANCE AND<br/>DIRECT. TO WATER</th>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | PHRI<br>TEMP                                 | FUL<br>FUL | FULL UTM    | ELEVATION<br>(ft. above | DISTANCE AND<br>DIRECT. TO WATER | PHRI<br>TEMP  | FULL UTM<br>COORDINATI | UTM<br>INATES | ELEVATION<br>(ft. abave | DISTANCE AND<br>DIRECT. TO WATER |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------|-------------|-------------------------|----------------------------------|---------------|------------------------|---------------|-------------------------|----------------------------------|
| T13.800         2.292,630         2320-2360         K-64         T/4,400         2.292,600           T14,100         2.292,900         2360         K-65         T/4,400         2.292,500           T14,100         2.292,900         2360         K-65         T/4,400         2.292,500           T14,100         2.292,900         2360         K-70         T/4,400         2.292,500           T14,100         2.293,000         2320         2360         K-71         T/4,400         2.292,500           T14,100         2.293,000         2330         K-71         T/4,400         2.292,500           T14,100         2.293,100         2330         K-71         T/4,400         2.292,500           T14,200         2.293,100         2330         K-71         T/4,450         2.292,500           T14,200         2.293,100         2330         K-71         T/4,450         2.292,500           T14,200         2.293,100         2320,3140         K-81         T/4,450         2.292,500           T14,200         2.293,100         2320,3140         K-81         T/4,450         2.292,500           T14,200         2.292,600         240         240         2.292,500         2292,500                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | BER                                          | EASTING    | NORTHING    | sca levd)               | (h.) (approx.)                   | NUMBER        | EASTING                | NORTHING      |                         | (A.) (approx.)                   |
| 713,900         2.292,700         2360         K-69         774,100         2.292,500           774,100         2.293,000         2330         K-70         774,400         2.292,500           774,100         2.293,000         2330         K-70         774,500         2.292,500           774,100         2.293,200         2360         K-70         774,500         2.293,200           774,100         2.293,200         2360         K-70         774,500         2.293,200           774,200         2.293,200         2300         K-70         774,500         2.293,200           774,200         2.293,300         2300         K-70         774,500         2.293,100           774,200         2.293,400         K-70         774,500         2.293,100           774,300         2.293,400         K-81         774,500         2.292,400           774,300         2.293,400         K-81         774,500         2.292,100           774,300         2.293,400         K-81         774,500         2.292,100           774,300         2.293,400         K-81         774,500         2.292,100           774,200         2.293,400         K-81         774,500         2.292,100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | .13                                          | 773,800    | 2,292,650   | 2320-236(               | ,                                |               |                        |               | 0070                    |                                  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 14                                           | 000.577    | 2.292.700   | 2360                    | ſ                                | K-04          | 1/4,400                | 7,292,800     | 2480                    | •                                |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | : 1                                          |            |             | 2360                    | 1                                | K-65          | 774,400                | 2,292,600     | 2540-260                |                                  |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 2 9                                          |            | 000,000,000 |                         |                                  | K-69          | 774,450                | 2,292,350     | 2680                    | •                                |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <u>,                                    </u> | //4,100    | 006'767'7   | 0922                    | •                                | K-70          | 774.450                | 2.292.400     | 2640                    | ı                                |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 50                                           | 774,150    | 2,292,900   | 2360                    | •                                | K-71          | 774 500                | 2 292 550     | 2580-260                | '<br>S                           |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 21                                           | 774,100    | 2,293,000   | 2320                    | 1                                | УL Л          | 055 744                |               | 2540.256                |                                  |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 25                                           | 774,200    | 2,293,100   | 2320-238(               | •                                | 01-11         |                        | 001 2/2/2     | 0750                    | 2                                |
| 714,300 $2,293,200$ $2340$ $K-19$ $714,500$ $2,292,800$ $714,500$ $2,292,800$ $714,500$ $2,292,400$ $714,500$ $2,292,400$ $2302,400$ $714,500$ $2,293,400$ $2302,400$ $2302,400$ $2302,400$ $2322,500$ $714,500$ $2,293,400$ $2292,400$ $2322,200$ $K=81$ $714,500$ $2,292,400$ $2322,200$ $K=87$ $714,600$ $2,292,500$ $2322,200$ $K=87$ $714,600$ $2,292,500$ $2322,200$ $714,600$ $2,292,100$ $714,600$ $2,292,100$ $714,600$ $2,292,100$ $714,600$ $2,292,100$ $714,600$ $2,292,100$ $714,600$ $2,292,100$ $714,600$ $2,292,100$ $714,600$ $2,292,100$ $714,600$ $2,292,100$ $714,600$ $2,292,100$ $714,600$ $2,292,100$ $714,700$ $2,292,100$ $714,700$ $2,292,100$ $714,700$ $2,292,100$ $714,700$ $2,292,100$ $714,700$ $2,292,100$ $714,700$ $2,292,100$ $714,700$ $2,292,100$ $714,700$ $2,292,200$ <t< td=""><td>26</td><td>774.200</td><td>2,293,200</td><td>2300</td><td>•</td><td>0/-4</td><td>010,411</td><td>2,474,100</td><td>0017</td><td>•</td></t<>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 26                                           | 774.200    | 2,293,200   | 2300                    | •                                | 0/-4          | 010,411                | 2,474,100     | 0017                    | •                                |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 27                                           | 774,300    | 2,293,200   | 2340                    | •                                | 61-N          | 000,411                | UC0'767'7     | 0007                    | •                                |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                              | 050 722    | 0 203 250   | 2300                    | •                                | K-80          | 774,700                | 2,292,800     | 2560                    | ·                                |
| $ \begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                              |            | 000 200 0   | 2007                    |                                  | K-81          | 774,600                | 2,292,650     | 2580-260                | 8                                |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 9.8                                          | 000,471    | 005,642,2   | 0000                    | 1                                | K-84          | 774,500                | 2,292,400     | 2660                    | ł                                |
| 774,400       2,293,400       2320-2340       2322-230         774,250       2,293,100       2260-2280 $K$ -89       774,450       2,292,150         774,250       2,292,600       2340-2420 $K$ -95       774,450       2,292,150         774,000       2,292,600       2340-2420 $K$ -95       774,450       2,292,100         774,000       2,292,600       2340-2440 $K$ -96       774,450       2,292,100         774,000       2,292,800       2440 $K$ -96       774,450       2,292,100         774,300       2,292,800       2440 $K$ -96       774,450       2,292,600         774,300       2,292,800       2440 $K$ -96       774,450       2,292,600         774,300       2,292,800       2440 $K$ -99       774,600       2,292,600         774,300       2,292,600       2440 $K$ -100       774,500       2,292,100         774,300       2,292,600       2480-2520 $K$ -100       774,600       2,292,100         774,400       2,292,400       774,100       2,292,400       774,100       2,292,100         774,200       2,292,400       774,100       2,292,400       774,100       2,292,100                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <u>-</u>                                     | 7/4,300    | 0000,862,2  | 2300                    | ı                                | K-85          | 774.450                | 2,292,300     | 2680                    | •                                |
| 774,250       2,293,100       2320,2340 $K$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 5<br>F                                       | 774,400    | 2,293,450   | 2320                    | •                                | K-87          | 774.450                | 2 292 200     | 2720                    | ı                                |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 35                                           | 774,250    | 2,293,100   | 2320-234                | •                                | K-89          | 774.400                | 2.292.150     | 2700-275                |                                  |
| 774,000 $2,292,600$ $2340.2420$ $K.95$ $774,200$ $2,292,100$ 774,000 $2,292,500$ $2420$ $K.95$ $774,550$ $2,292,500$ 774,000 $2,292,500$ $2440$ $K.97$ $774,550$ $2,292,500$ 774,550 $2,292,500$ $2440$ $K.97$ $774,550$ $2,292,500$ 774,300 $2,292,800$ $2440$ $K100$ $774,550$ $2,292,500$ 774,300 $2,292,900$ $2440$ $K-100$ $774,550$ $2,292,500$ 774,300 $2,292,600$ $2320-2520$ $2,292,600$ $2,292,600$ $2,292,600$ 774,400 $2,292,600$ $2480-2450$ $K-100$ $774,700$ $2,292,600$ 774,100 $2,292,600$ $2540$ $K-102$ $774,100$ $2,292,100$ 774,100 $2,292,400$ $774,100$ $2,292,100$ $774,100$ $2,292,100$ 774,200 $2,292,400$ $774,100$ $2,292,100$ $774,100$ $2,292,100$ 774,200 $2,292,$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 36                                           | 774,200    | 2,293,000   | 2260-228                | •                                | K-90          | 774 250                | 2.292.150     | 2660                    | F                                |
| 774,000       2,292,600       2420         774,000       2,292,500       2560-2480 $K-97$ 774,550       2,292,500         774,1550       2,292,800       2440 $K-97$ 774,550       2,292,500         774,300       2,292,800       2440 $K-97$ 774,550       2,292,500         774,300       2,292,800       2440 $K-99$ 774,550       2,292,500         774,300       2,292,900       2440 $K-100$ 774,550       2,292,500         774,300       2,292,900       2420-2440 $K-100$ 774,750       2,292,500         774,300       2,292,600       2480-2520 $K-100$ 774,700       2,292,600         774,100       2,292,400       2,292,400 $K-102$ 774,100       2,292,100         774,100       2,292,400       2,592,600       2,490 $K-105$ 774,100       2,292,100         774,200       2,292,400       2,890 $K-102$ $774,100$ 2,292,100 $774,100$ 2,292,300         774,200       2,292,400 $K-105$ $774,100$ 2,292,300 $774,100$ 2,292,300         774,200       2,292,400 $K-105$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ŝ                                            | 774,000    | 2,292,600   | 2340-242                |                                  | K-95          | 774 200                | 006 166 6     | 2202                    | ı                                |
| 774,050       2,292,500       2560-2480 $K-97$ 774,550       2,292,100         774,250       2,292,800       2440 $K-99$ 774,550       2,292,650         774,300       2,292,800       2440 $K-99$ 774,550       2,292,650         774,300       2,292,800       2440 $K-99$ 774,760       2,292,650         774,300       2,292,900       2420-2440 $K-100$ 774,750       2,292,600         774,300       2,292,600       2480-2520 $K-100$ 774,750       2,292,200         774,100       2,292,600       2380-2560 $K-103$ 774,700       2,292,100         774,100       2,292,400       2540 $K-103$ 774,100       2,292,300         774,100       2,292,400       2560 $K-103$ 774,100       2,292,300         774,200       2,292,500 $K-103$ 774,100       2,292,300       774,100       2,292,300         774,200       2,292,500 $K-103$ 774,100       2,292,300       774,100       2,292,300       774,100       2,292,300       774,100       2,292,300       774,100       2,292,300       774,400       2,292,200       774,400       2,292,70                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <del>4</del> 0                               | 774,000    | 2,292,600   | 2420                    | •                                | 20-24<br>K-06 | 774 450                | 001 606 6     | UPLC                    | •                                |
| 774,250       2,292,800       2440 $K-91$ 774,550       2,292,650         774,300       2,292,800       2440-2460 $K-98$ 774,550       2,292,650         774,300       2,292,800       2440 $K-99$ 774,700       2,292,650         774,300       2,292,800       2440 $K-100$ 774,700       2,292,650       2,292,650         774,300       2,292,600       2480-2520 $K-101$ 774,550       2,292,650       2,292,600         774,100       2,292,600       2480-2520 $K-101$ 774,700       2,292,400       2,292,400         774,100       2,292,400       2,540 $K-102$ 774,100       2,292,400         774,100       2,292,400 $K-102$ 774,100       2,292,400         774,100       2,292,400 $K-102$ 774,100       2,292,400         774,200       2,292,400 $K-102$ 774,100       2,292,400         774,200       2,292,500 $K-103$ 774,100       2,292,400         774,200       2,292,500 $K-103$ 774,100       2,292,150         774,300       2,292,500 $K-103$ 774,100       2,292,150                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ł                                            | 774,050    | 2,292,500   | 2560-248                | •                                | K-07          | 055 722                | 2 202 100     | 0926                    | I                                |
| 774,300       2,292,800       2440-2460       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       -       - </td <td>42</td> <td>774,250</td> <td>2,292,800</td> <td>2440</td> <td>•</td> <td>16-Y</td> <td>0007 464</td> <td>2002 500 5</td> <td>0017</td> <td>ŧ</td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 42                                           | 774,250    | 2,292,800   | 2440                    | •                                | 16-Y          | 0007 464               | 2002 500 5    | 0017                    | ŧ                                |
| 774,300 $2,292,850$ $2440$ $K-99$ $114,100$ $2,292,650$ $2,292,650$ 774,300 $2,292,600$ $2320-2520$ $K-100$ $774,550$ $2,292,650$ $2,292,200$ 774,300 $2,292,600$ $2340-2520$ $K-101$ $774,550$ $2,292,600$ $2,292,600$ $2,292,400$ $2,292,400$ $2,292,400$ $2,292,400$ $2,292,400$ $2,292,400$ $2,292,400$ $2,292,400$ $2,292,400$ $2,292,400$ $2,292,400$ $2,292,400$ $2,292,400$ $2,292,400$ $2,292,400$ $7,4,100$ $2,292,400$ $7,4,100$ $2,292,400$ $7,4,100$ $2,292,400$ $7,4,100$ $2,292,400$ $7,4,100$ $2,292,400$ $7,4,100$ $2,292,400$ $7,4,100$ $2,292,150$ $7,4,100$ $2,292,150$ $7,4,100$ $2,292,150$ $7,4,100$ $2,292,150$ $7,4,100$ $2,292,150$ $7,4,1,100$ $2,292,150$ $7,4,100$ $2,292,150$ $7,4,100$ $2,292,150$ $7,4,100$ $2,292,150$ $7,4,100$ $2,292,150$ $7,4,100$ $2,292,150$ $7,4,14,100$ $2,292,150$ $7,4,14,100$ $2,292,150$ $7,4,14,100$ $2,292,150$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 44                                           | 774.300    | 2,292,800   | 2440-246                | • 0                              | 06-2          | 000-1-20               | 000°767'7     | 0407                    | •                                |
| 774,300       2,292,900       2420-2440 $K-100$ 774,500       2,292,200         774,400       2,292,600       2380-2520 $K-101$ 774,500       2,292,100         774,100       2,292,400       2540 $K-103$ 774,700       2,292,400         774,100       2,292,400       2560 $K-103$ 774,700       2,292,400         774,100       2,292,460       2560 $K-103$ 774,700       2,292,400         774,200       2,292,460       2560 $K-105$ 774,100       2,292,450         774,200       2,292,460       2560 $K-106$ 774,100       2,292,150         774,200       2,292,500       2540 $K-106$ 774,100       2,292,150         774,200       2,292,500 $K-106$ 774,100       2,292,150 $774,100$ 2,292,150         774,300       2,292,600       2520 $K-106$ 774,100       2,292,150 $774,100$ 2,292,150         774,300       2,292,150 $K-106$ 774,100       2,292,150 $774,100$ 2,292,150         774,350       2,292,050 $K-106$ 774,100       2,292,150 $774,100$ 2,292,150 <td>45</td> <td>774.300</td> <td>2,292,850</td> <td>2440</td> <td>ı</td> <td>66-N</td> <td>1/4,/00</td> <td>000,242,2</td> <td>2000</td> <td>,<br/>,</td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 45                                           | 774.300    | 2,292,850   | 2440                    | ı                                | 66-N          | 1/4,/00                | 000,242,2     | 2000                    | ,<br>,                           |
| 774,400       2,293,000       2320-2520 $K-101$ 774,500       2,292,600       2480-2520 $K-101$ 774,500       2,292,400       2,292,400         774,100       2,292,400       2540 $K-103$ 774,100       2,292,400       2,292,400         774,100       2,292,400       2560 $K-103$ 774,100       2,292,400       2,292,400         774,200       2,292,450       2560 $K-105$ 774,100       2,292,150 $K-105$ 774,100       2,292,150         774,200       2,292,500       2540 $K-107$ 774,100       2,292,150 $K-107$ 774,100       2,292,150 $K-103$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 46                                           | 774.300    | 2,292,900   | 2420-244                | · 0                              | MI-X          | 001,411                | 000,242,2     | 107-M07                 |                                  |
| 774,200       2,292,600       2480-2520       K-102       774,600       2,292,400       2,292,400         774,100       2,292,400       2540       K-103       774,700       2,292,400         774,200       2,292,400       2560       K-105       774,100       2,292,400         774,200       2,292,400       2560       K-106       774,100       2,292,150         774,200       2,292,500       2540       K-107       774,100       2,292,150         774,300       2,292,600       2540       K-107       774,100       2,292,150         774,300       2,292,600       2520       K-107       774,100       2,292,150         774,300       2,292,600       2520       K-103       774,100       2,292,150         774,350       2,292,700       2520       K-110       774,100       2,292,150         774,350       2,292,700       K-111       774,100       2,292,150         774,350       2,292,750       K-110       774,100       2,292,150         774,500       2,292,750       K-111       774,100       2,292,150         774,500       2,292,750       K-111       774,000       2,292,150         774,500       2,292,150 <td>48</td> <td>774.400</td> <td>2.293.000</td> <td>2320-252</td> <td>- 0</td> <td>N-101-X</td> <td>002,122</td> <td>2,292,200</td> <td>-17-0017</td> <td>-</td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 48                                           | 774.400    | 2.293.000   | 2320-252                | - 0                              | N-101-X       | 002,122                | 2,292,200     | -17-0017                | -                                |
| 774,100 $2,292,400$ $2540$ $K-103$ 774,100 $2,292,400$ $2,292,400$ 774,100 $2,292,400$ $2560$ $K-105$ 774,100 $2,292,050$ $774,100$ $2,292,050$ $774,100$ $2,292,050$ $774,100$ $2,292,050$ $774,100$ $2,292,050$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,150$ $774,100$ $2,292,100$ $774,100$ $2,292,100$ $774,100$ $2,292,100$ $774,100$ $2,292,100$ $774,100$ $2,292,100$ $774,100$ $774,100$ $774,000$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | : Ç                                          | 774,200    | 2.292.600   | 2480-252                | •                                | K-102         | 7/4,600                | 2,292,100     | 2/80                    | •                                |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2                                            | 001 712    | 0 292 400   | 2540                    | •                                | K-103         | 774,700                | 2,292,400     | 72-080-27               |                                  |
| 774,100       2,292,450       2560       K-106       774,100       2,292,050         774,200       2,292,500       2540       K-107       774,200       2,292,150         774,300       2,292,500       2520       K-109       774,150       2,292,300         774,350       2,292,700       2520       K-109       774,160       2,292,300         774,350       2,292,750       2480       K-110       774,100       2,292,150         774,450       2,292,750       2480       K-111       774,100       2,292,150         774,500       2,292,950       2440       K-111       774,100       2,292,150         774,500       2,292,950       2440       K-111       774,100       2,292,150         774,500       2,292,950       2440       K-111       774,000       2,292,150         774,500       2,292,950       K-111       774,100       2,292,150         774,500       2,292,950       K-111       774,100       2,292,100         774,500       2,292,900       K-111       774,100       2,292,100         774,500       2,292,900       K-111       774,100       2,292,300         774,500       2,292,300       K-112 <t< td=""><td>5 8</td><td>000 724</td><td>2 202 400</td><td>2560</td><td>•</td><td>× K-105</td><td>774,100</td><td></td><td>1</td><td>ı</td></t<>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 5 8                                          | 000 724    | 2 202 400   | 2560                    | •                                | × K-105       | 774,100                |               | 1                       | ı                                |
| 774,200       2,292,500       2540       K-107       774,200       2,292,150         774,200       2,292,500       2540       K-108       774,150       2,292,300         774,300       2,292,700       2520       K-109       774,160       2,292,300         774,350       2,292,700       2500       K-109       774,100       2,292,150         774,350       2,292,750       2480       K-111       774,100       2,292,150         774,400       2,292,950       2440       K-111       774,000       2,292,100         774,500       2,292,950       2440       K-111       774,000       2,292,300         774,500       2,292,950       2440       K-1115       773,400       2,292,300         774,500       2,292,900       K-115       773,400       2,292,300         774,500       2,292,300       K-115       773,400       2,292,300         774,500       2,2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | រុះ                                          |            |             | 0550                    |                                  | K-106         | 774,100 (+             |               |                         | •                                |
| 774,200       2,292,500       2522,300         774,300       2,292,600       2520       2,292,300         774,300       2,292,700       2520       2,292,150         774,350       2,292,750       2480       8         774,500       2,292,150       8         774,500       2,292,150       8         774,500       2,292,150       8         774,500       2,292,150       8         774,500       2,292,150       8         774,500       2,292,150       8         774,500       2,292,160       8         774,500       2,292,160       8         774,500       2,292,100       2,292,100         774,500       2,292,300       2,292,300         774,500       2,292,300       2,292,300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 9 J                                          | 007 4/1    | 0.4,242,2   | 0077                    | •                                | K-107         | 774,200                | 2,292,150     | 1 2640                  | •                                |
| 774,300       2,2292,600       2520         774,350       2,292,700       2500         774,350       2,292,750       2480         774,400       2,292,950       2440         774,500       2,292,950       2440         774,500       2,292,950       2440         774,500       2,292,950       2440         774,500       2,292,950       2440         774,500       2,292,950       2440         774,500       2,292,900       2,292,300         774,500       2,292,300       2,292,300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 4 ¦                                          | 1/4,200    | NUC,242,2   | 0620                    | •                                | K-108         | 774,150                | 2,292,300     | . 2580                  | ı                                |
| 774,350 2,292,700 2500 - K-110 774,100 2,222,150 774,350 2,292,750 2480 - K-111 774,000 2,292,150 774,400 2,292,950 2440 - K-112 773,400 2,292,200 774,500 2,293,000 2440-2460 - K-115 773,500 2,292,300 774,500 2,292,300 774,500 7,203,000 7480,3500 7,202,300 774,500 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7,202,300 7 | 55                                           | 774,300    | 2,292,600   | 07.57                   |                                  | K-109         | 774,100                | 2.292.200     | 2580-260                | •                                |
| 774,350 2,292,750 2480 - K-111 774,000 2,292,100 774,400 2,292,950 2440 - K-112 774,000 2,292,200 774,500 2,293,000 2440-2460 - K-115 773,500 2,292,300 774,500 2,292,300 7480,3500 2,292,300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -51                                          | 774,350    | 2,292,700   | 2500                    | •                                | K-110         | 774,1000               | 2.292.150     | 2600                    | ,                                |
| 774,500 2,292,950 2440 - K-112 773,400 2,292,200 774,500 2,293,000 2440-2460 - K-115 773,500 2,292,300 774,500 2,292,300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <u>6</u>                                     | 774,350    | 2,292,750   | 2480                    | •                                | K-111         | UUU PLL                | 001 666 6     | 2600                    | I                                |
| 774,500 2,293,000 2440-2460 - K-115 773,500 2,292,300                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ŝ                                            | 774,400    | 2,292,950   | 2440                    | •                                | K_113         |                        | 2 202 200     | 0007<br>0360            |                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -62                                          | 774,500    | 2,293,000   | 2440-246                | •                                | 711-VI        |                        | 002'7/7'7     | 00007                   | ı                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | К.63                                         | 774.500    | 2 292 800   | 2480-2500               |                                  |               |                        | WIC,242,2     | 0007                    | •                                |

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APPENDIX F

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FULL UTM COORDINATES, ELEVATION AND PROXIMITY TO WATER FOR IDENTIFIED SITES (cont.)

:

| TEMP.<br>TEMP.<br>NUMBER | FUI<br>COOF<br>EASTING | FULL UTM<br>COORDINATES<br>ING NORTHING | ELEVATION<br>(fl. above<br>sca level) | DISTANCE AND<br>DIRECT. TO WATER<br>(ft.) (approx.) |
|--------------------------|------------------------|-----------------------------------------|---------------------------------------|-----------------------------------------------------|
| K-118                    | 773,600                | 2.292.400                               | 2380                                  |                                                     |
| K-120                    | 007,677                | 2,292,450                               | 2380                                  | •                                                   |
| K-124                    | 773,850                | 2,292,600                               | 2380                                  | ı                                                   |
| K-127                    | 773,800                | 2,292,450                               | 2400                                  |                                                     |
| K-130                    | 773,600                | 2,292,200                               | 2400-2420                             | •                                                   |
| K-131                    | 773,700                | 2,292,150                               | 2460-2480                             | •                                                   |
| K-134                    | 773,800                | 2,292,300                               | 2460                                  | •                                                   |
| K-135                    | 773,800                | 2,292,350                               | 2440                                  |                                                     |
| K-137                    | 773,950                | 2,292,400                               | 2440                                  | ,                                                   |
| K-140                    | 773,900                | 2,292,300                               | 2480-2500                             | •                                                   |
| K-142                    | 773,800                | 2,292,250                               | 2480                                  |                                                     |
| K-143                    | 773,800                | 2,292,100                               | 2500                                  | •                                                   |
| K-146                    | 773,950                | 2,292,250                               | 2520                                  | •                                                   |
| K-148                    | 774,050                | 2,292,350                               | 2520                                  | •                                                   |
| K-149                    | 774,050                | 2,292,400                               | 2500-2520                             | •                                                   |
| K-152                    | 774,000                | 2,292,200                               | 2560                                  |                                                     |
| K-200                    | 774,300                | 2,293,100                               | 2360-2380                             |                                                     |
| K-201                    | 773,950                | 2,202,500                               | 2420                                  | •                                                   |
| K-202                    | 774,500                | 2,293,450                               | 2360                                  |                                                     |
| K-203                    | 774,150                | 2,292,800                               | 2400                                  |                                                     |
| K-204                    | 774,250                | 2,292,700                               | 2500                                  | •                                                   |
| K-205                    | 773,900                | 2,292,700                               | 2360                                  | •                                                   |
| K-206                    | 775,000                | 2,292,400                               | 2800                                  |                                                     |
| K-207                    | 774,250                | 2,291,950                               | 2700                                  | •                                                   |
| K-208                    | 774,250                | 2,292,300                               | 2600                                  | •                                                   |
| K-209                    | 773,500                | 2,292,150                               | 2380                                  |                                                     |
| K-210                    | 774,250                | 2,292,650                               | 2500                                  |                                                     |
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APPENDIX F

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# Appendix C-1

Correspondence dated July 24, 1995

State Historic Preservation Division

E NJAMIN J. CAYETAND UOVERNOR OF HAWAI



#### STATE OF HAWAII

### DEPARTMENT OF LAND AND NATURAL RESOURCES

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

July 24, 1995

Ms, Gwen Ohashi Acting Director Land Use & Codes Administration Department of Public Works County of Maui 200 South High Street Wailuku, Hawaii 96793

Dear Ms. Ohashi:

SUBJECT: DHHL Kula Residential Lots, Unit 1 – Subdivision of Lot A Waiohuli, Kula, Maui <u>TMK: 2-2-02: 56</u>

Thank you for the opportunity to respond to the subdivision. Our office has been working with the Department of Hawaiian Home Lands (DHHL) and with their planner (Munekiyo & Arakawa) to adequately handle historic preservation concerns for this subdivision.

42 significant sites are present within Lot A. For those 42, two different kinds of mitigation approches have been agreed upon. However, all sites are to be protected for the time being, with different sized buffer zones. We are recommending two conditions to cover the protection of these sites. These are fairly standard conditions, with some additional wording to cover the fact that parcels will be awarded out to individuals by DHHL.

33 sites are significant solely for their information content. These sites can be archaeologically data recovered and then destroyed, or they can be preserved, or they can be temporarily preserved until data recovery is done. DHHL may decide to have these sites data recovered before awarding, or they might have these decisions be made by the individual awardees based on how they plan to use their lots. Currently, they must be considered to be slated for preservation until data recovery occurs. At this point, we have recommended that 15 foot buffers be placed around these sites. They need only small buffer zones around their edges; to protect the site's information. For these 33 sites, we recommend the following condition, to ensure their protection:

1. 33 sites have archaeological data recovery as the agreed upon mitigation measure. These sites must be protected until data recovery occurs. Prior to any data recovery work, an archaeological data recovery plan (scope of work) must be approved by the State Historic Preservation Division. The successful execution of this plan must be verified in writing by that Division to the Department of Hawaiian Home Lands. Until these sites are data

JUL D I 1995 MICHAEL D. WILSON, CHARLEDIN

BOARD OF LAND AND HATURAL RESOURCES

OLDUTY GLEERT COLOMA-AGARAN

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AQUACULTURE DEVELOPMENT

AQUATIC RESOURCES CONSERVATION AND ENVIRONMENTAL AFFAIRS CONSERVATION AND RESOURCES ENFORCEMENT CONVEYANCES FORESTRY AND WADUFE HISTORIC PRESERVATION DAVISION LAND MANAGDMENT STATE PARKS WATER AND LAND DEVELOPMENT

LOG NO: 15140 / DOC NO: 9507RC41 Ms. Gwen Ohashi Page 2

> recovered, 15 foot buffers shall be placed around these sites -- as interim protection measures. Awardees shall be notified by DHHL of the presence of any of these sites that have not yet been data recovered that are on their plots, and the mitigation concerns shall be explained to them. Prior to any land altering construction, the buffers shall be marked -with an archaeologist verifying the markers are correctly placed.

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9 sites are recommended for preservation, some intended for interpretation. The sites consist of house sites, shrines, burials, and one heiau. These sites need larger buffer zones to allow the inclusion of some of the surrounding terrain to preserve the visual and physical context of the site. And they will eventually need long-range preservation plans, with interpretive elements in some cases. Buffer zones still need to be fixed for 6 of these sites, and we are working with the planners on alternatives. Awardees also need to be aware of these sites, if they are on their land, and interim protection measures are needed. Eventually, interpretative/preservation plans will be needed, and our Division will probably assist DHHL in preparing these plans. At this time, we recommend the following condition to ensure protection of these sites:

2. 9 sites shall be preserved (W-11,-27, -28, -30, -32, -35, -36, -45, -90 as identified in the PHRI archaeological survey) some for interpretive purposes. DHHL shall establish buffers around these sites which are acceptable to the State Historic Preservation Division. Preservation plans for these sites shall be developed, and the plans must be approved by the State Historic Preservation Division prior to their implementation. Awardees shall be notified by DHHL of the presence of any of these sites that are on their plots, and the preservation concerns shall be explained to them. Prior to any land altering construction in the vicinity of any of these sites, the buffers shall be marked -- with an archaeologist verifying the markers are correctly placed.

If your department or DHHL finds some of the above wording to have problems, please let us know, and acceptable alternatives can easily be worked out. The above conditions however, should ensure that the subdivision will have "no adverse effect" on the significant historic sites.

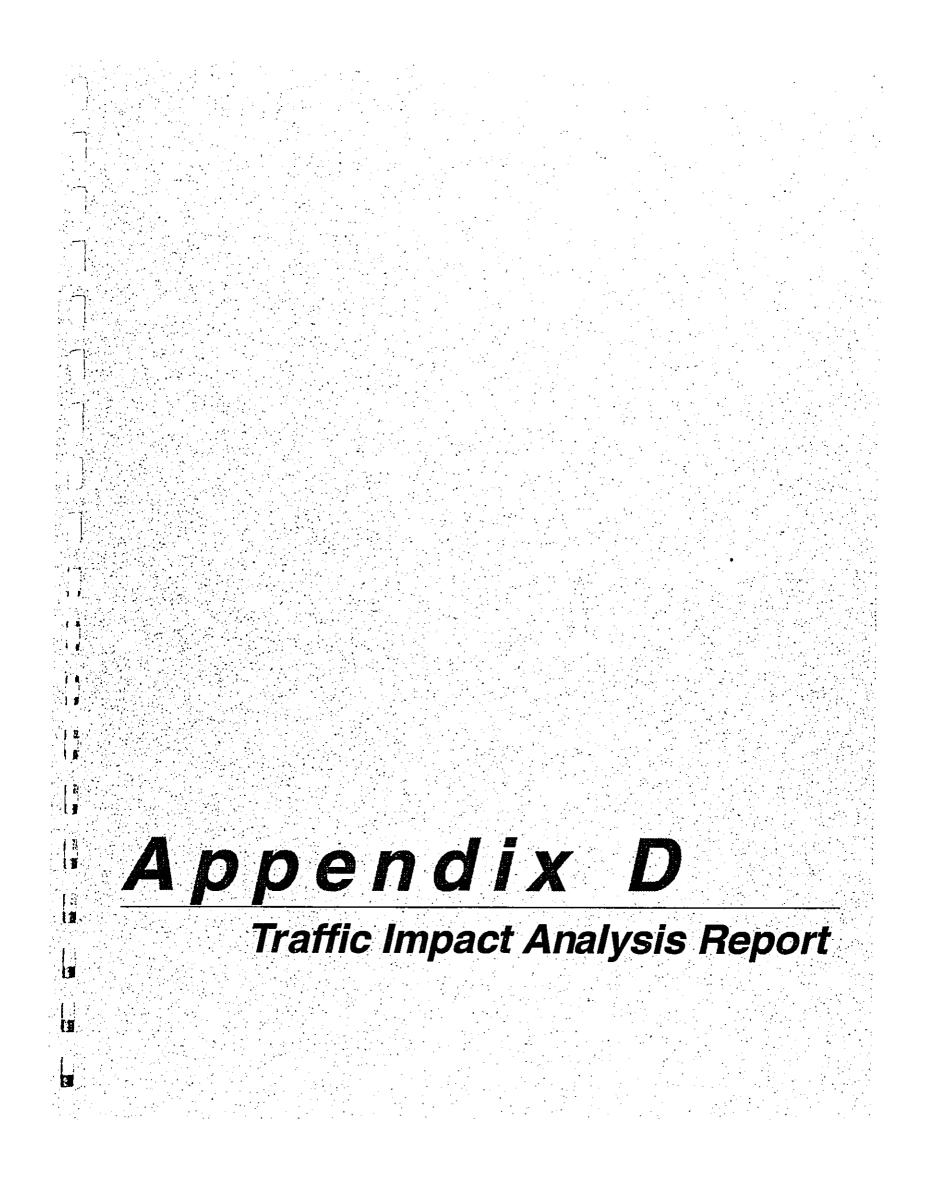
Please contact Dr. Sara Collins (587-0013) if you have any questions.

Aloha,

Don Hibbard, Administrator

RC:jen

c: Planning Office, Department of Hawaiian Home Lands Glenn Tadaki, Munekiyo & Arakawa, Inc.



# TRAFFIC IMPACT ANALYSIS REPORT

KULA RESIDENCE LOTS UNIT 1 KULA, MAUI, HAWAII

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**AUGUST 1995** 

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**Prepared** for

STATE OF HAWAII DEPARTMENT OF HAWAIIAN HOME LANDS

Prepared by



AUSTIN, TSUTSUMI & ASSOCIATES, INC. ENGINEERS • SURVEYORS

## TRAFFIC IMPACT ANALYSIS REPORT

## FOR THE

## **KULA RESIDENCE LOTS - UNIT 1**

## ISLAND OF MAUL

Prepared for

## STATE OF HAWAII DEPARTMENT OF HAWAIIAN HOME LANDS

Prepared By

AUSTIN, TSUTSUMI & ASSOCIATES, INC. Engineers • Surveyors Honolulu • Wailuku • Hilo, Hawaii

August, 1995

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CIVIL ENGINEERS - SURVEYORS

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ATA AUSTIN, TSUTSUMI & ASSOCIATES, INC.

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AUSTIN, TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS . SURVEYORS

TED S KAWAHIGASHI, PE. KENNETH K KUROKAWA, PE. IVAN K, NAKATSUKA, PE. LAMBERT J. YAMASHITA, PE. HOWARD H.W. MAU, PE

## TRAFFIC IMPACT ANALYSIS REPORT

## FOR THE

## **KULA RESIDENCE LOTS - UNIT 1**

## **ISLAND OF MAUI**

## I. INTRODUCTION

This report documents the findings of the traffic study conducted by Austin, Tsutsumi & Associates, Inc. (ATA) to evaluate the potential traffic impacts and circulation needs of Kula Residence Lots - Unit 1 Development.

## A. Project Description

The Project is located in Kula, on the island of Maui. Figure 1 shows the Project's general location. The Department of Hawaiian Home Lands propose to develop 386 residential lots on 668 acres of land (TMK 2-2-02:56). Single family dwelling units are to be constructed on the lots by the individual owners. Access to the Project site is provided off Kula Highway.

## B. Purpose and Scope

The purpose of the study is to analyze potential traffic impacts on the roadway system within the study area. Proposed roadway improvements, which are required to allow the street system to accommodate the future traffic volumes after the completion of the Project, are identified in this study. The following traffic scenarios are analyzed in the study:

Existing Conditions - The analysis of existing traffic conditions is intended to provide a basis for the remainder of the study. The existing conditions

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AEPLY TO: 501 SUMNER STREET, SUITE 521 • HONOLULU, HAWAII 98817•5031 PHONE (808) 533•3646 • FAX (808) 526•1267 OFFICES IN: HONOLULU, HAWAII WAILUKU, MAUI, HAWAII • HILO, HAWAII

## AUSTIN, TSUTBUM: & ASSOCIATES, INC.

ATA

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analysis includes an assessment of land use, streets and highways, traffic volumes, and current operating conditions.

- Year 2005 Base (Without Project) Conditions This is an analysis of future traffic conditions for the study area in the Year 2005. The objective of this phase of the study is to forecast future traffic conditions for the study area in the Year 2005 without the Project, to serve as a basis against which Project impacts can be measured.
- Year 2005 With Project Conditions This is an analysis of future traffic conditions with traffic expected to be generated by the proposed Project in the Year 2005 added to Year 2005 Base traffic forecasts, in order to identify impacts of the proposed Project on future traffic operating conditions.

A total of five existing intersections and two future intersections have been identified within the study area which are to be analyzed during the AM and PM peak traffic hour of traffic for each of the traffic scenarios described above. The seven intersections are as follows:

- 1. Hana Highway and Haleakala Highway (signalized)
- 2. Pukalani Bypass and Makawao Avenue (stop-controlled)
- 3. Pukalani Bypass/Kula Highway and Haleakala Highway <u>or</u> "Five Trees" (stop-controlled)
- 4. Kula Highway and Omaopio Road (stop-controlled)
- 5. Kula Highway and Kekaulike Avenue (stop-controlled)
- 6. Kula Highway and Project Access Road "A" (future stop-controlled)
- 7. Kula Highway and Project Access Road "B" (future stop-controlled)

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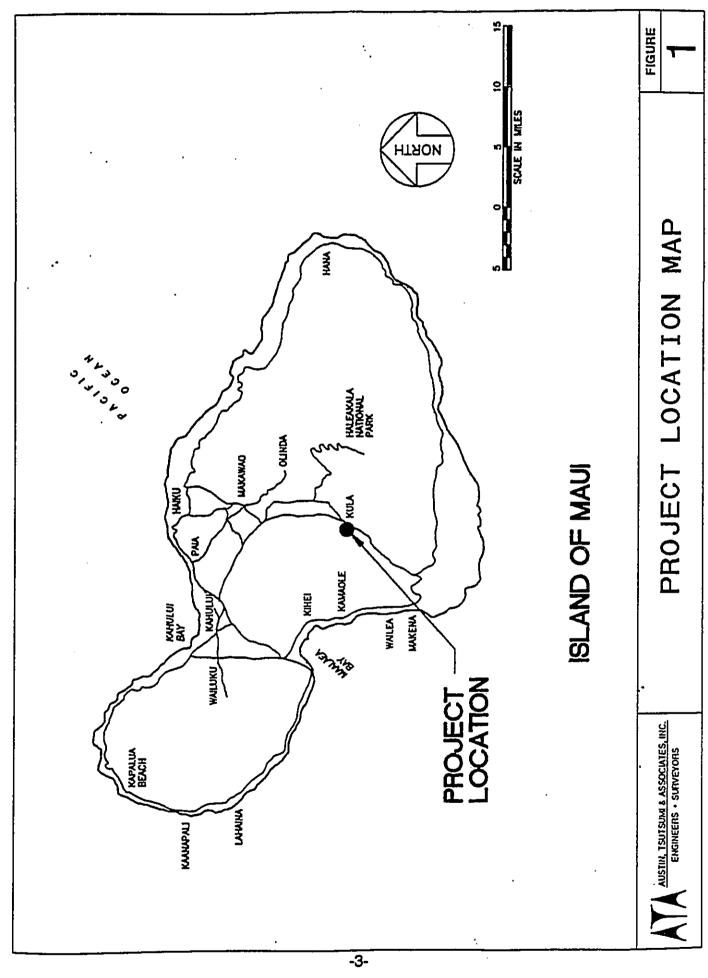
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Figure 2 illustrates the study area and locations of the seven study intersections.

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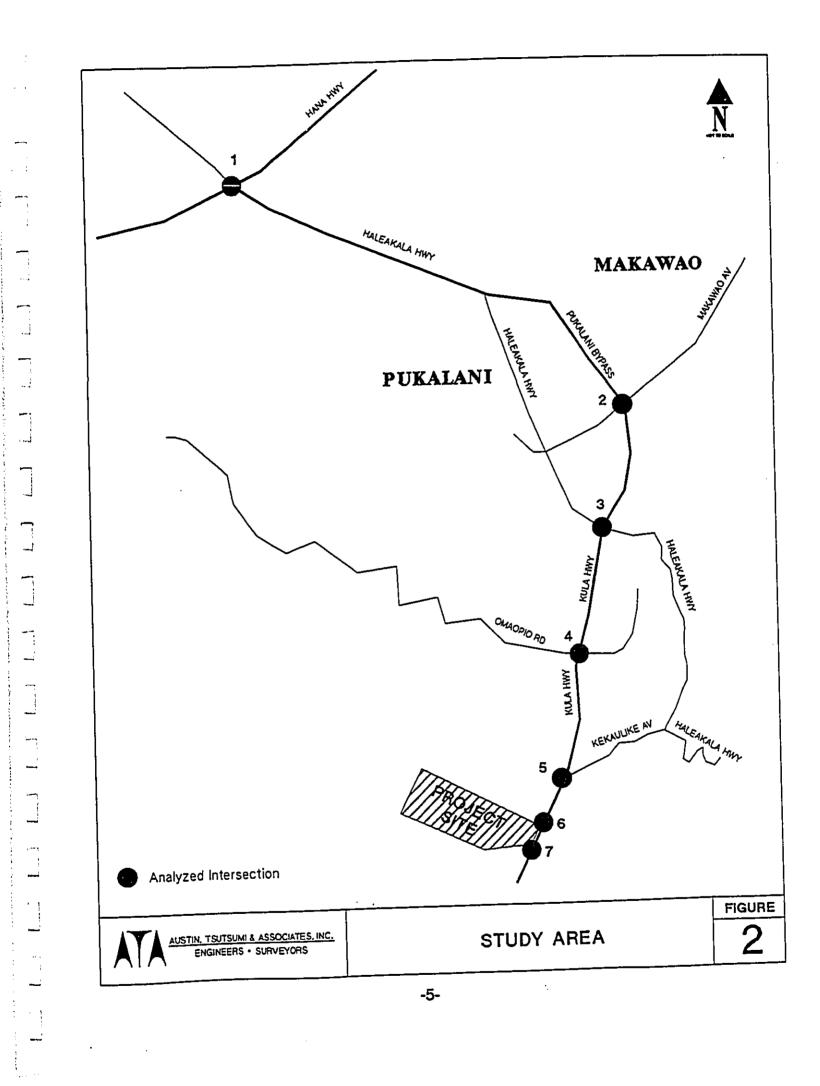
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## ATA AUSTIN, TSUTSUMI & ASSOCIATES. INC.

## II. EXISTING CONDITIONS

An extensive field investigation was undertaken to develop an accurate and detailed description of existing conditions and infrastructure within the study area. Information relevant to the study includes land use, an inventory of streets, traffic volumes, and current operating conditions on the street system.

## A. Existing Roadway System

This section describes the existing circulation system serving the study area, including number of travel lanes, street classifications, and traffic control devices.

Brief descriptions of major facilities within the study area follow:

- <u>Hana Highway</u> Hana Highway is a major State highway providing access from Kahului to Hana. West of Haleakala Highway, Hana Highway is a four-lane, divided highway with channelization at major intersections. East of Haleakala Highway, Hana Highway reduces to a two-lane Highway.
- Haleakala Highway Haleakala Highway is a major arterial between Hana Highway and Pukalani town. Between Hana Highway and the Pukalani Bypass, Haleakala Highway provides two lanes in the southbound (mauka) direction and one lane in the northbound (makai) direction. During the morning peak period, Haleakala Highway is conned from the Pukalani Bypass (Pukalani Junction) to Hana Highway for contra-flow with two lanes in the northbound directions and one lane in the southbound direction. Between the Pukalani Bypass and Kula Highway (Five-Trees), Haleakala Highway is a two-lane road serving the town of Pukalani. From Kula Highway (Five-Trees), Haleakala Highway continues east as a two-lane road to Haleakala Crater.

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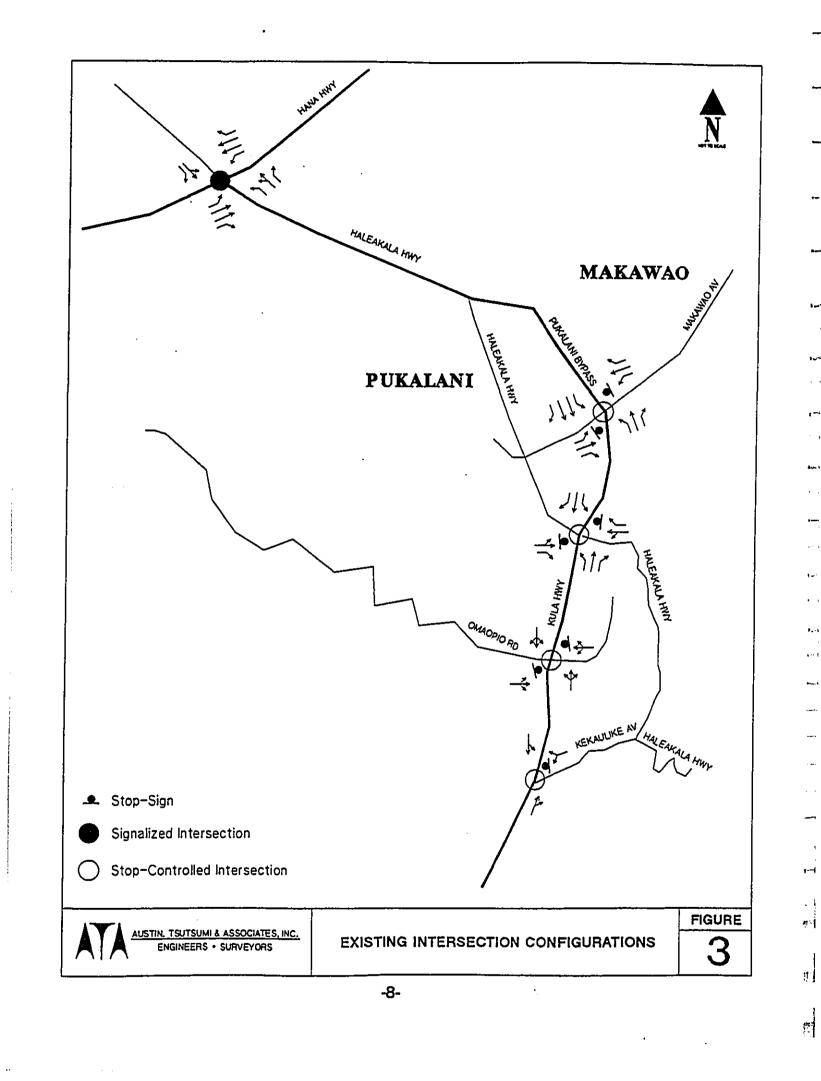
## ATA AUSTIN, TSUTSUMI & ASSOCIATES, INC.

- <u>Pukalani Bypass</u> The Pukalani Bypass travels between Haleakala Highway at Pukalani Junction and Kula/Haleakala Highway (Five-Trees). Between Haleakala Highway (Pukalani Junction) and Makawao Avenue, the Bypass Highway provides two-lanes in the southbound direction and one lane in the northbound direction. South of Makawao Avenue the Bypass Highway reduces to one lane in the southbound direction toward Kula/Haleakala Highway (Five-Trees).
- <u>Kula Highway</u> Kula Highway is a two-lane highway serving the Upcountry area from "Five-Trees" to the Kula area. From Five-Trees, Kula Highway is a north-south arterial serving mainly residential/ agricultural uses.
- Makawao Avenue Within the study area, Makawao Avenue is a two-lane road serving the towns of Pukalani and Makawao. Makawao Avenue originates within Pukalani, at its intersection with Haleakala Highway, and extends north-east through Makawao Town. At the intersection with Baldwin Avenue, Makawao Avenue continue as Kaupakulua Road, which extends northeast and eventually connects with Hana Highway in the vicinity of Ulumalu. Baldwin Avenue extends northwest and connects with Hana Highway in Paia Town.
- <u>Omaopio Road</u> Omaopio Road is a two-lane, rural, curving roadway originating at Kula Highway and extending north-west toward Kahului Town. Within the study area, Omaopio Road serves mainly residential/ agricultural uses.
- <u>Kekaulike Avenue</u> Kekaulike Avenue is a two-lane, collector roadway originating at Kula Highway and extends north, where it terminates at Haleakala Highway. Kekaulike Avenue serve mainly residential uses in the Upcountry area.

Existing intersection configurations are illustrated in Figure 3.

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#### ALISTIN, TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS + SURVEYORS

## B. Existing Traffic Operations

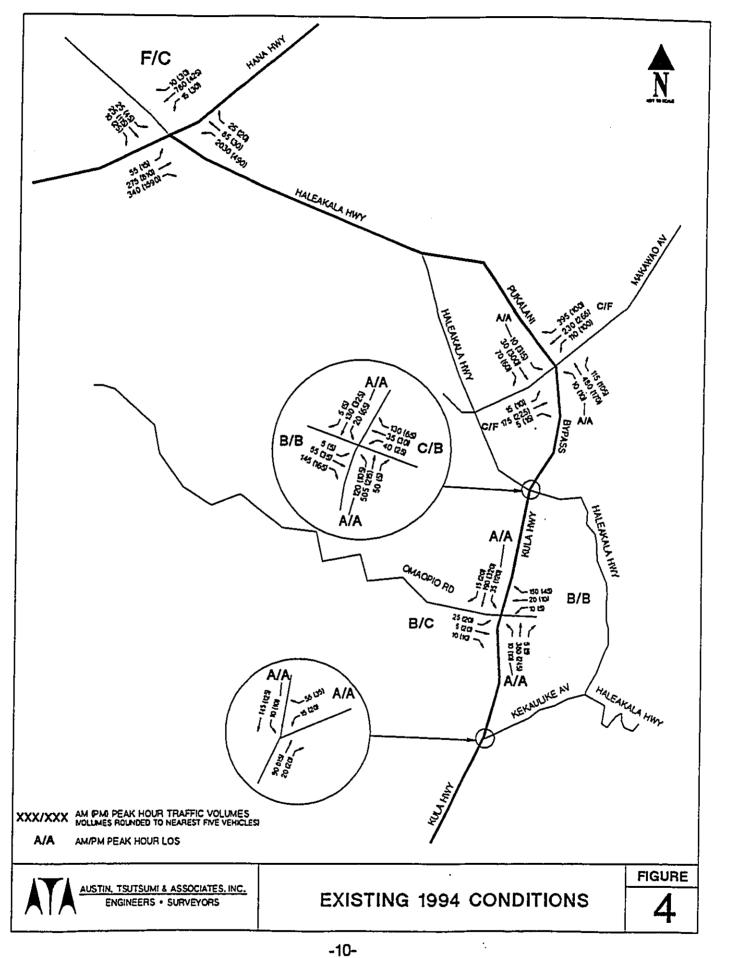
The following sections present the existing intersection peak hour traffic volumes, a description of the methodology utilized to analyze the intersection traffic conditions, and the resulting level of service conditions at each of the five analyzed intersections under existing conditions.

## 1. Existing Traffic Volumes

Weekday AM and PM peak period counts were obtained by ATA as part of this study at each of the five existing intersections. The results of the traffic counts are provided in Appendix A. Manual turning movement counts were obtained for the morning and evening peak period of traffic on September 28 and 29, 1994 at the five analyzed intersections. Figure 4 illustrates the existing peak hour traffic volumes within the study area.

Existing morning traffic level varies within the study area from the Upcountry area to Hana Highway. On Kula Highway near the intersections of Kekaulike Avenue and Omaopio Road, traffic is generally light with no noticeable traffic delay. In the Pukalani/Makawao area, makai-bound traffic on Pukalani Bypass is significantly heavier, with noticeable delays on the minor street approaches at the intersections at Five-Trees, and at Makawao Avenue, while Kula-bound traffic is relatively light. At the intersection of Hana Highway and Haleakala Highway, approximately 2.030 peak hour left-turning vehicles from Haleakala Highway to Hana Highway were observed.

Existing evening traffic in the study area also varies from Hana Highway to the Upcountry area. At the intersection of Hana Highway and Haleakala Highway, traffic is moderately heavy with approximately 1600 vehicles turning right from Hana Highway to Haleakala Highway. At the intersection of Pukalani Bypass and Makawao Avenue, noticeable



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delay was observed on Makawao Avenue. Near the Kula area, traffic is generally light with little or no vehicular delay observed.

## 2. Level Of Service Methodology

Level of service (LOS) is a qualitative measure used to describe the condition of traffic flow, ranging from free-flow conditions at LOS A to congested conditions at LOS F. This section describes the current levels of service of the five existing intersections.

The 1994 <u>Highway Capacity Manual-Special Report 209</u> "Operational" (Transportation Research Board, 1985) method of intersection volume to capacity (V/C) ratio, average stopped delay/vehicle and corresponding level of service was applied to each of the signalized intersections to be analyzed in this study. Intersections controlled by stop signs on minor street approach(es), the "Two-Way Stop Control" method described in the <u>Highway Capacity Manual</u> (Transportation Research Board, 1994) was employed to determine the available reserve capacity and corresponding level of service for each of the constrained movements (approaches from minor streets and left-turn movements from major streets) at the intersection.

Levels of service definitions for both signalized and unsignalized intersections are included in Tables 1 and 2, respectively.

#### 3. Existing Level Of Service

Two of the five existing intersections are currently operating at an undesirable level of service (i.e. LOS E or F) during either the AM or PM peak hour, or both. The following describes the intersections that are operating at LOS E or F.

 Hana Highway & Haleakala Highway - The intersection is currently operating at LOS F during the AM peak hour of traffic. The heavy

| LEVEL OF SERVICE | DELAY<br>(SECONDS/VEHICLE) | DESCRIPTION                  |
|------------------|----------------------------|------------------------------|
| A                | 0.0 - 5.0                  | Little or no delay           |
| В                | 5.1 - 15.0                 | Short traffic delay          |
| с                | 15.1 - 25.0                | Moderate traffic delay       |
| D                | 25.1 - 40.0                | Long traffic delay           |
| Ε                | 40.1 - 60.0                | Very long traffic delay      |
| F                | > 60.0                     | Failure – extreme congestion |

TABLE 1 LEVEL OF SERVICE DEFINITIONS FOR SIGNALIZED INTERSECTION **.....**,

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SOURCE: "Highway Capacity Manual", Transportation Research Board, 1894.

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| LEVEL OF SERVICE | DELAY<br>(SECONDS/VEHICLE) | DESCRIPTION                  |
|------------------|----------------------------|------------------------------|
| A                | 0.0 - 5.0                  | Little or no delay           |
| В                | 5.1 - 10.0                 | Short traffic delay          |
| c                | 10.1 - 20.0                | Moderate traffic delay       |
| D                | 20.1 - 30.0                | Long traffic delay           |
| E                | 30.1 - 45.0                | Very long traffic delay      |
| F                | > 45.0                     | Failure - extreme congestion |

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#### TABLE 2 LEVEL OF SERVICE DEFINITIONS FOR UN-SIGNALIZED INTERSECTION

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SOURCE: "Highway Capacity Manual", Transportation Research Board, 1994.

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northbound left-turn traffic (2,030 vehicles) from Haleakala Highway to Hana Highway experiences long delays. Field observation reveals that, during the AM peak hour of traffic, the queue on Haleakala Highway is approximately 1 mile. -

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Pukalani Bypass & Makawao Avenue - Both the eastbound and westbound approaches are operating at LOS F during the PM peak hour of traffic. Poor level of service is due to the relatively high traffic travelling on Pukalani Bypass. from field observation, it was also apparent that the left-turn and through vehicles on Makawao Avenue often hesitate, not sure as to who has the right-of-way, when there are gaps in traffic on the Bypass Highway.

Figure 4 also summarizes the existing level of service at each of the five analyzed intersections.

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#### **III. FUTURE TRAFFIC PROJECTIONS**

In order to properly evaluate the potential impact of the Project on local traffic conditions, it is necessary to develop forecasts of future traffic volumes in the study area under conditions both with and without the proposed Project traffic. The methodologies and key assumptions used to develop these forecasts are described below.

#### A. Project Traffic Volumes

The development of traffic Projections for the proposed Project involves traffic generation, trip distribution, and traffic assignment. A description of each process follows:

#### 1. Project Traffic Generation

Trip generation estimates for the development were developed by applying appropriate trip generation rates to the 386 dwelling units. This method provides an indication of the volume of traffic expected to be generated by the project.

The traffic expected to be generated by the Project was estimated by applying the trip generation rates for "Single Family Detached Housing", (ITE code 210), which are as follows:

- Average Daily: 9.55 vehicles per dwelling unit with 50% entering and exiting the Project site.
- AM Peak Hour: 0.74 vehicles per dwelling unit with 26% entering and 74% exiting the Project site.
- PM Peak Hour: 1.01 vehicles per dwelling unit with 65% entering and 35% exiting the Project site.

These trip generation rates were based upon data from "Trip Generation" 5th Edition, Institute of Transportation Engineers (ITE), 1991. The

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application of these rates provides an estimate of the total increases in future traffic expected to be generated by the project. It is estimated that the Project will generate approximately 3,686 daily vehicle trips; 286 AM peak hour trips (with 74 trips entering and 212 trips exiting the Project site) and 390 PM peak hour trips (with 253 trips entering and 137 trips exiting the Project site).

#### 2. Project Traffic Distribution

The directional distribution pattern developed for the Project site was based on the existing traffic distribution pattern. The general distribution pattern used to distribute future Project traffic is illustrated in Figure 5. A ....

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## 3. Project Traffic Assignment

The trip distribution pattern identified in Figure 5 was used to assign the project-generated traffic to the local street network. The assignment to specific streets and intersections was based on the available access into and out of the site and the availability of local routes to access the regional highway system. The resulting estimated Project generated peak hour traffic volumes, at each of the five analyzed intersections, are illustrated in Figure 6.

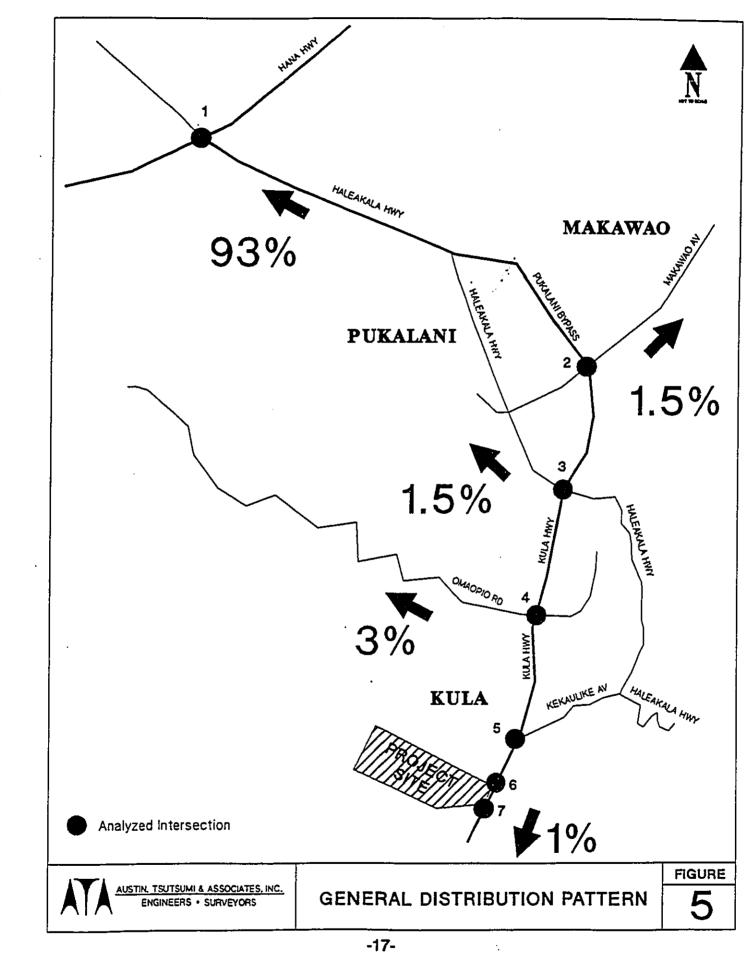
#### B. Year 2005 Traffic Projections

The following sections describe Year 2005 Base (without project) and Year 2005 With Project traffic projections.

# 1. Year 2005 Base (Without Project) Traffic Volumes

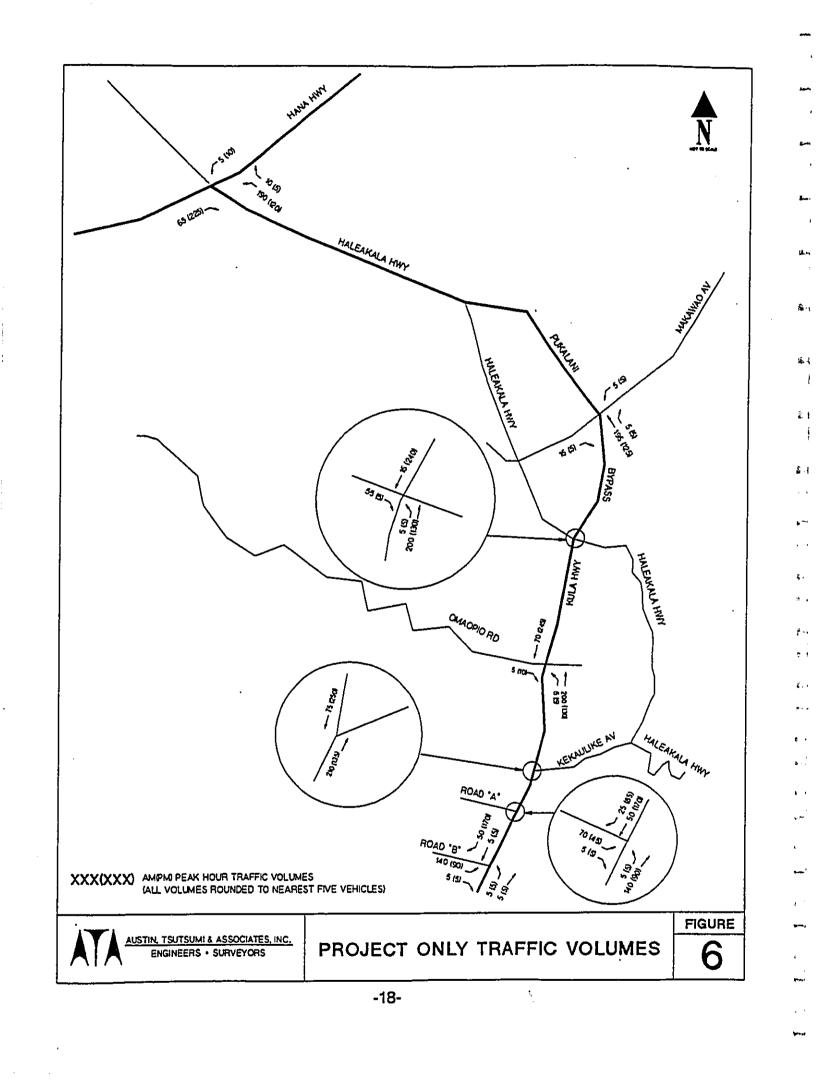
The forecasts for Year 2005 Base traffic without the proposed Project are based on yearly growth of existing traffic volumes and proposed related development projects expected to be completed by the

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Year 2005 which could contribute traffic to the street system within the study area.

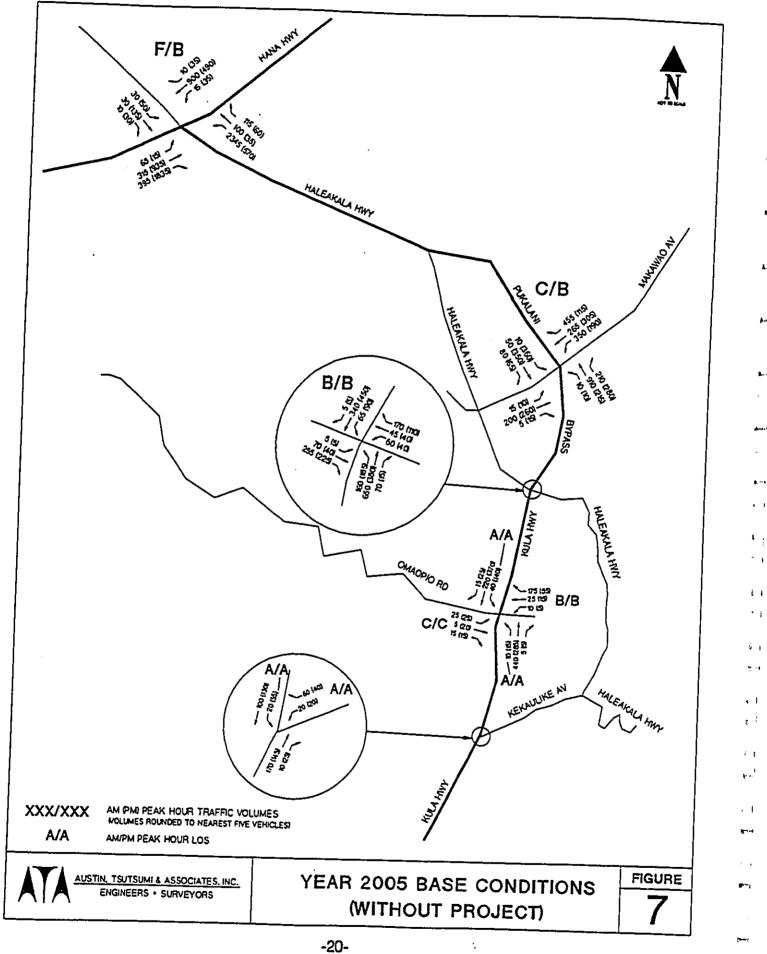
The background growth rate, which was applied to existing traffic volumes to estimate Year 2005 Base conditions, is based on the May 1991 "Maui Long Range Highway Planning Study (Island-Wide Plan)" prepared by ATA and historical traffic counts obtained from the State Department of Transportation.

The average annual traffic growth rate of approximately 1.3 percent per year in the Upcountry area was utilized to forecast the Year 2005 Base traffic conditions.

Traffic generated by the Upcountry Maui High School is included in this study. The trip generation and distribution of the high school were obtained from the November 1992 "Final Report Traffic Impact Study -Upcountry Maui High School", prepared by Parsons Brinckerhoff Quade & Douglas (PBQ&D), Inc.. Figure 7 illustrates Year 2005 Base traffic volumes.

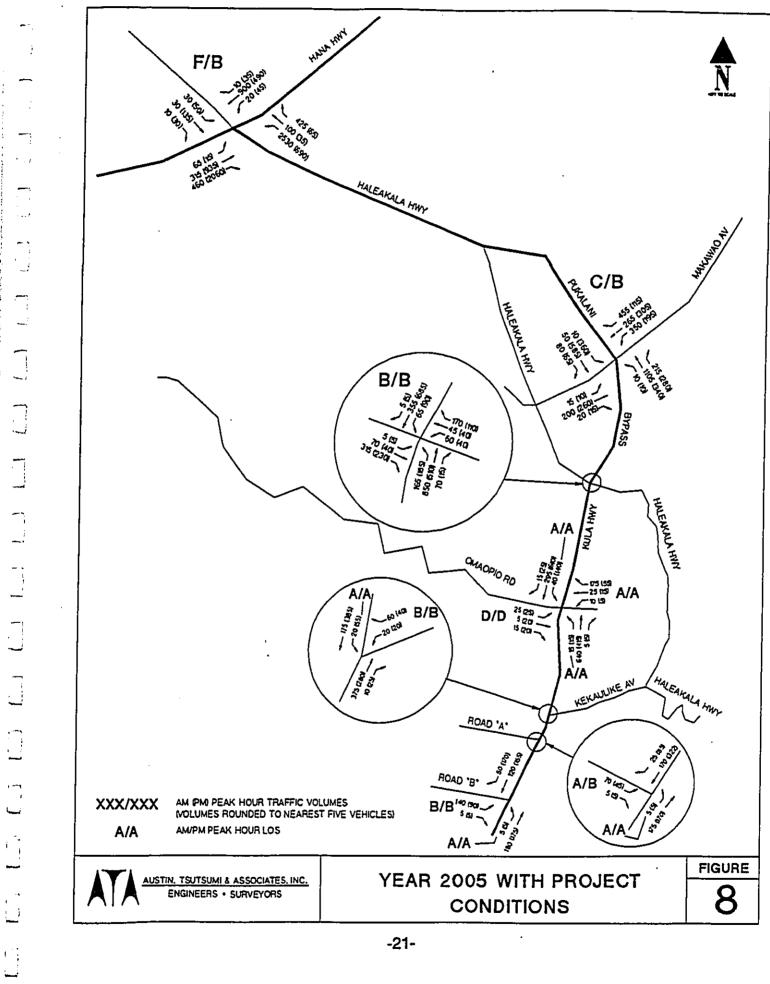
2. Year 2005 With Project Traffic Volumes

The proposed development generated traffic volumes were then added to Year 2005 Base traffic volumes. The resulting Year 2005 With Project intersection traffic volumes are illustrated on Figure 8.



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## IV. TRAFFIC IMPACT ANALYSIS

This section provides the results of the traffic impact analysis conducted to assess the potential Project impacts on the Year 2005 traffic conditions, based on the traffic forecasts developed in the previous section. The traffic impact analysis includes an assessment of projected Year 2005 conditions both without and with the Project for each of the analyzed intersections.

Potential roadway improvements and mitigation to alleviate traffic impacts within the study area will also be discussed.

#### Year 2005 Planned Improvements Α.

By the Year 2005, the following roadway improvements are expected to be completed:

- Signalization of the intersection of Pukalani Bypass and Makawao Avenue. The design and installation of a traffic signal is currently underway and it is expected to be in operation in the near future.
- Signalization of the intersection of Pukalani Bypass/Kula Highway and Haleakala Highway (Five-Trees). This improvement is based on the recommendation contained in the November 1992 Maui High School traffic report prepared by PBQ&D, Inc.. The study indicates that, by the Year 1995, traffic volumes at the intersection will warrant a traffic signal. With the addition of the High School traffic, the traffic study recommends a traffic signal to accommodate future traffic demand at the intersection.
- Between Hana Highway and Pukalani Junction, Haleakala Highway will be widen from it current three lanes to four lanes.

The following analyses (Year 2005 Base and Year 2005 With Project scenarios) assume the improvements described above are implemented.

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## B. Year 2005 Base (Without Project) Traffic Impact Analysis

Figure 7 also summarizes the Year 2005 Base, level of service at each of the five analyzed intersections. Analysis indicates that, under base conditions, only the intersection of Hana Highway and Haleakala Highway will be operating at LOS F during the AM peak hour of traffic. The other four intersections will be operating at acceptable levels of service (i.e. LOS D or better).

Although traffic is expected to grow within the study area, the installation of traffic signals at the intersections of Pukalani Bypass/Makawao Avenue and at "Five Trees" will accommodate Year 2005 traffic demand. The intersection of Hana Highway and Haleakala Highway is currently operating at LOS F during the AM peak hour of traffic and it will continue to operate at LOS F.

#### C. Year 2005 With Project Traffic Impact Analysis

The Year 2005 With Project scenario was analyzed to determine the potential effect of the proposed development on the roadway system. Figure 8 also summarized the Year 2005 With Project level of service at each of the seven analyzed intersections (two additional intersections at Kula Highway and Project Access Road "A" and Road "B"). The results indicate that only the intersection of Hana Highway at Haleakala Highway will be operating at LOS F during the AM peak hour. The other six intersections will be operating at acceptable levels of service (i.e. LOS D or better). Table 3 summarizes the level of service at each of the analyzed intersections.

As discussed earlier, under the Year 2005 Base conditions, the overall growth in the study area will increase, but with the installation of traffic signals at Pukalani Bypass/Makawao Avenue and at "Five Trees", only the intersection of Hana Highway and Haleakala Highway will be operating at LOS F. The remaining four intersections will be operating at LOS D or better. With the

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# TABLE 3 SUMMARY OF LEVEL OF SERVICE

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| PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         PM         AM         AM<                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | лгини чил чил чил чил чил чил чил чил чил чи |    | ž  | EXISTING                                     |       |     |                |      | BA    | BASE |             |     |       |            | HPRC       | + PROJECT |           |     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|----|----|----------------------------------------------|-------|-----|----------------|------|-------|------|-------------|-----|-------|------------|------------|-----------|-----------|-----|
| VIC         ELA         LOS         V/C         ELA         LOS         ISS         C         ISS         C         ELA         LOS         ISS         C         LOS         ISS         C         DELAV         LOS         V/C         DELAV         LOS         V/C         DELAV         LOS         V/C         DELAV         LOS         V/C         DELAV         LOS         LOS </th <th>иганит а</th> <th></th> <th></th> <th></th> <th>M</th> <th></th> <th></th> <th>₹</th> <th>ſ</th> <th></th> <th>M</th> <th></th> <th></th> <th>₹</th> <th></th> <th></th> <th>M</th> <th></th>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | иганит а                                     |    |    |                                              | M     |     |                | ₹    | ſ     |      | M           |     |       | ₹          |            |           | M         |     |
| ULAHWY 128 * F 0.62 15.5 C 1.28 * F(a) 0.58 12.8 B(a) 1.46 * 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4.4 Å = 4                                                                                                                                                                                                                                                                                                                                                                                                                    | иганиу а                                     | ł  |    |                                              |       | 108 | ş              | E    | LOS   |      | <b>VIII</b> | LOS | ş     | DELAY      | <b>F03</b> | ŝ         | DELAY LOS | ŝ   |
| Interesting       -       2.4       A       -       3.3       A       -       3.3       A       -       2.4       B       0.27       7.6       B       0.27       2.6       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2       2 <t< td=""><td>ULA HWY &amp;</td><td></td><td>Ľ.</td><td>0.62</td><td></td><td>o</td><td>1.28</td><td>•</td><td>F [a]</td><td>0.58</td><td>12.8</td><td></td><td>_</td><td>•</td><td>u.</td><td>0.68</td><td>13.0</td><td>8</td></t<>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | ULA HWY &                                    |    | Ľ. | 0.62                                         |       | o   | 1.28           | •    | F [a] | 0.58 | 12.8        |     | _     | •          | u.         | 0.68      | 13.0      | 8   |
| 7.1       2.4       A       1       2.4       A       1         7.4       A       1       13.4       C       1       4.8       A         7.4       A       1       13.4       C       1       13.4       C       1         7.4       A       1       12.5       C       1       12.5.6       F         12.5.6       F       1       3.3       A       12.5.6       F         12.5.5       C       1       12.5       C       1       12.5       C         12.5       C       1       2.8       A       A       B       0.41       B       B       0.33       A       T       T       T       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <del></del>                                  |    |    | <u>.                                    </u> |       |     | 0.68           |      | C     | 0.37 | 7.6         | ß   | 0.70  | 23.9       | o          | 0.55      | 11.3      | ۵   |
| 2.4       1       2.4       1       3.3       A         1.1       1.4       A       1       3.3       A         1.1       1.1       1.2       C       1.25       C       1.25       C         1.1       1.2       C       1.25       C       1.25       C       1.25       C         1.1       1.2       2.8       A       1.2       2.8       A       1.2       1.25       C         1.1       2.8       B       1.1       2.8       A       1.2       2.8       A       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1       1.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                              |    |    |                                              |       |     |                |      |       |      |             |     |       |            |            |           |           |     |
| 4.4       A       -       4.4       A       -       4.4       A       -       4.6       A       -       13.4       C       -       12.5       C       -       125.6       F       -       12.5       C       -       125.6       F       -       12.5       C       -       10.1       C       10.1       C       10.1       C       10.1       C       10.1       C       10.1       C       10.1       10.1       C       10.1       10.1       C       10.1       10.1       10.1       10.1       10.1       10.2       10.2       10.2       10.3       10.3       10.3       10.3       10.3       10.3       10.1       10.1       10.1       10.1       10.1       10.1       10.1       10.1       10.1       10.1       10.1       10.1       10.1       10.1       10.1       10.1       10.1       10.1       10.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                              | N  |    | 1                                            | 3.3   | <   |                |      |       |      |             |     |       |            |            | <u> </u>  |           |     |
| - 134 C - 1258 F<br>- 1356 C - 1256 F<br>- 1255 C - 1256 F<br>- 1255 C - 1255 F<br>- 1255 C - 1255 F<br>- 1255 C - 1255 B<br>- 1255 C - 1255 B<br>- 1255 B<br>- 125 B<br>- 125 B<br>- 127 C - 127 C<br>- 127 |                                              | 4  |    | I                                            | 4.0   | <   |                |      |       |      |             |     |       |            |            | -         |           |     |
| -       12.5       C       -       12.5       C       -       12.5       C       -       12.5       C       -       12.5       C       -       12.5       C       -       12.5       C       -       12.5       C       -       12.5       C       -       12.5       C       -       12.5       C       -       12.4       B       0.05       B       1       -       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1 <td></td> <td>13</td> <td></td> <td>1</td> <td>125,8</td> <td>ц.</td> <td></td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                              | 13 |    | 1                                            | 125,8 | ц.  |                |      |       |      |             |     |       |            |            |           |           |     |
| NA       NA       NA       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 3. PUKALANI BYPASSIKULA HWY &                | 12 |    | 1                                            | 868.0 | u.  |                |      |       |      |             |     |       |            |            |           |           |     |
| 1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                              |    |    |                                              |       |     |                |      |       |      |             |     |       |            |            |           |           |     |
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| N       N       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ICH                                          | ŝ  |    | 1                                            | 5.0   | 8   |                |      |       |      |             |     |       |            |            |           |           |     |
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| X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X       X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | I. KULA HWY & OMAOPIO RD                     |    |    |                                              |       |     |                |      |       |      |             |     |       |            |            |           |           |     |
| 33       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                              | ŝ  |    | 1                                            | 3.1   | <   | t              | 2.7  |       | •    | 3.3         |     | 1     | 2.9        | <          | I         | 4.2       | <   |
| NA     A     25     63     B       NA     A     25     63     B       NA     A     25     63     B       NA     A     25     63     B       NA     A     25     63     B       NA     A     25     63     03       NA     A     A     1     1       NA     A     25     63     0       NA     A     A     1     1       NA     A     1     1     1       N     <                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                              | 9  |    | 1                                            | 3.2   |     | ۱<br>          | 3.8  |       | ŀ    | 3.4         |     | •     | 4.6        | <          | 1         | 4.1       | <   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                              | 8  |    | .'                                           | 10.2  | C   | ł              | 12.7 |       | ŀ    | 13.0        |     | 1     | 20.9       | ۵          | ł         | 25.6      | ٥   |
| I I I I I I I I I I I I I I I I I I I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                              | Ð  |    | •                                            | 5.8   |     | 1              | 2.5  |       | 1    | 8.7         |     | 1     | 11.5       | υ          | 1         | 10.8      | O   |
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| 1 1 1 1<br>1 1 1 1<br>1 1 1 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                              | N  |    |                                              | 2.5   |     | 1              | 2.6  |       | 1    | 2.6         |     | ۱<br> | 3.3        | <          | 1         | 3.1       | <   |
| NA AN AN AN AN AN AN AN AN AN AN AN AN A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                              |    |    | 1                                            | 3.9   |     | t              | 4    |       | 1    | 4.          |     | 1     | 5.5        |            | ۱<br>     | 6.5       | ۵   |
| V V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 6. KULA HWY & ACCESS RD "A"                  | z  | ۲  |                                              | NA    |     |                | ٧N   |       |      | ٧N          |     |       |            |            |           |           |     |
| NA AN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | NB LEFT                                      |    |    |                                              |       |     |                |      |       |      |             |     | ł     | 2.6        |            | 1         | 3.3       | <   |
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|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 7. KULA HWY & ACCESS RD "B"                  | z  | <  |                                              | NA    |     | . <del>.</del> | NA   |       |      | M           |     |       | 1          |            |           | 1         |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | NB LEFT                                      |    |    | •                                            |       |     |                |      |       | _    |             |     | 1     | 0 (<br>N ( | < (        | t         | 0.0       | < 1 |

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Volume to capacity ratio exceeds 1.00, calculation of delay no foasible, LOS F based on v/c.
 (a) Optimized signal timing improves intersection LOS from Existing to Base.
 (b) Stop-controlled intersection is signalized under future scenatios.

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addition of the Project traffic, the intersection of Hana Highway and Haleakala Highway will continue operating at LOS F during the AM peak hour while the remaining intersections will be operating at LOS D or better. The intersections at Kula Highway and the Project Access Road "A" and Road "B" are expected to operate at LOS B during both the AM and PM peak hours of traffic.

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#### V. CONCLUSIONS AND RECOMMENDATIONS

This study was undertaken to analyze the potential traffic impacts of the Kula Residence Lots - Unit 1. The following summarizes the conclusions and recommendations of the study. منغ

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#### A. Conclusions

- Under existing 1994 traffic conditions, three of the five analyzed intersections are currently operating at an undesirable level of service (i.e. LOS E or F) during either the AM or PM peak hour, or both.
- The Project's 386 single-family dwelling units is expected to generate an average of 3,686 daily trips; 286 AM peak hour trips and 390 PM peak hour trips.
- Intersection improvements expected to be implemented by the Year 2005 include the signalization of the Pukalani Bypass/Makawao Avenue intersection and at the "Five Trees" intersection.
- Under the Year 2005 Base (without project) conditions, only the intersection of Hana Highway and Haleakala Highway will be operating at LOS F (AM peak hour). The other four intersections will be operating at acceptable levels of service (i.e. LOS D or better). The intersection of Hana Highway and Haleakala Highway is currently operating at LOS F during the AM peak hour of traffic.
- Under the Year 2005 With Project conditions, all of the intersections will be operating at acceptable levels of service (i.e. LOS D or better) except for the intersection of Hana Highway and Haleakala Highway, which is currently operating at LOS F during the AM peak hour and will continue to operating at LOS F, with or without the development of the Project.

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- The intersection of Kula Highway and Project Access Road "A" and Road "B" will be operating at LOS B during both the AM and PM peak hours of traffic.
- Based on the results of the analysis, it is concluded that the Kula Residence Lots - Unit 1, will not have any significant traffic impact on any of the analyzed intersections.
- Based on the estimated traffic volume projection of the proposed Kula Residence Lots project, no roadway improvements to Kula Highway will be necessary in the vicinity of Project Access Roads "A" and "B".

#### **B.** Recommendations

- As concluded previously, the only intersection that will be operating at an undesirable level of service (i.e. LOS E or F) is the intersection of Hana Highway at Haleakala Highway. The intersection is currently operating at LOS F during the AM peak hour of traffic and will continue to operate at this level regardless whether the Kula Residential Lots is developed. One potential mitigation that will help alleviate the heavy demand at the intersection is the construction of a connector road between the Upcountry area and the Kihei area. The construction of this road will certainly redistribute traffic and help relieve some of the heavy demand at Hana Highway. A route study of the Upcountry-Kihei Connector Road is currently underway.
- Another potential regional mitigation to the congestion at Hana Highway and Haleakala Highway is to offer an alternative route to West Maui in addition to Haleakala Highway. Currently, Omaopio Road and Pulehu Road both can be used as an alternative to Haleakala Highway, but because both are rural, winding and relatively under-developed roads, they are not attractive to commuters. If one of the roads can be

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upgraded, it can potentially relieve some of the demand at the Haleakala Highway/Hana Highway intersection. -----

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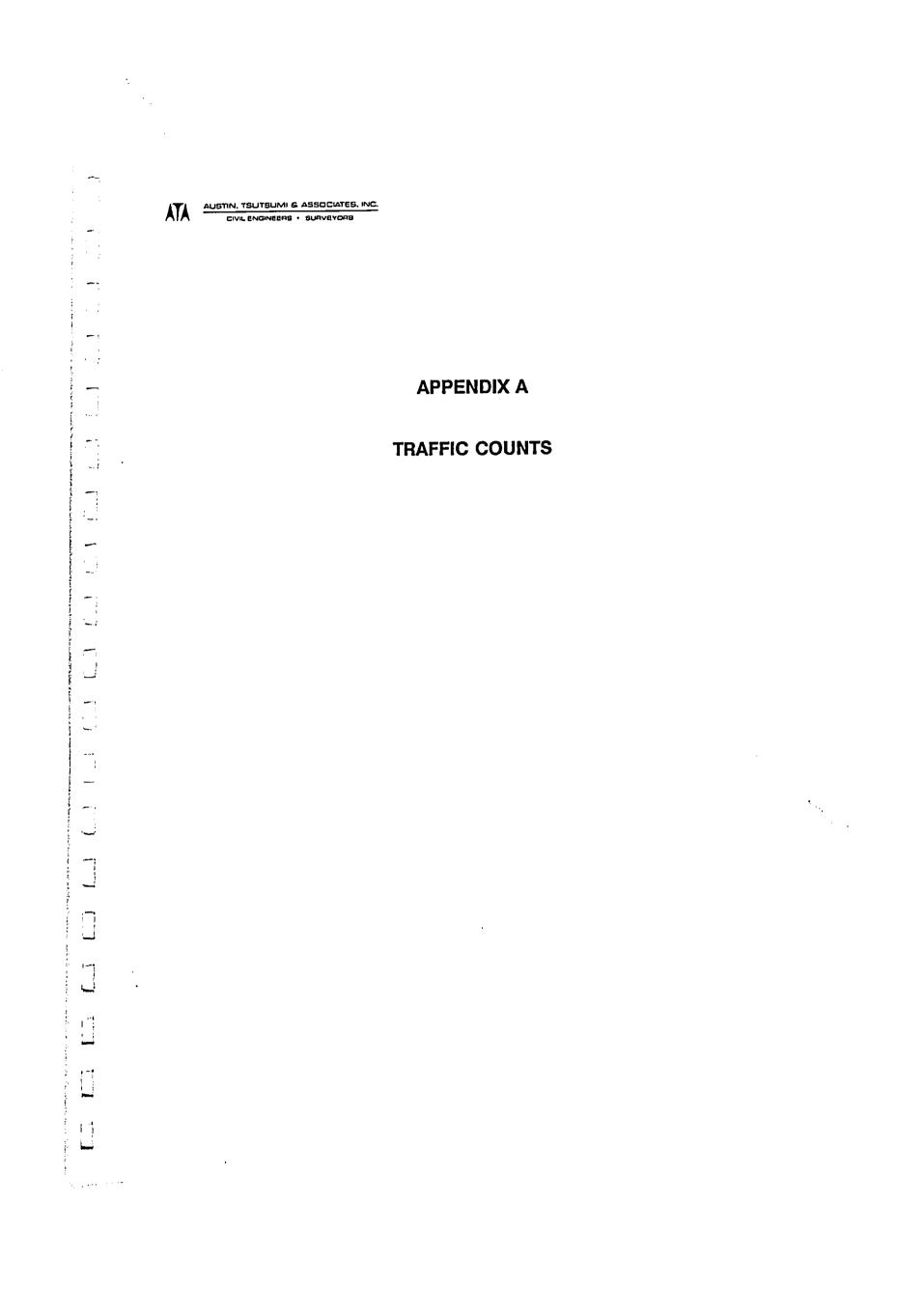
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|   | 7:30          | 1         | 202             | 4        | 0        | 15             | 556        | 81          | 67             | 10       | ō        | 4              | 5       | 955              |
|   | 7:45          | 3         | 217             | 4        | Ō        | 30             | 471        | 90          | 94             | 14       | 1        | 7              | 7       | 938              |
|   | HR TOTAL      | 9         | 782             | 15       | l        | 87             | 2031       | 342         | 274            | 57       | - 9      | 26             | 25      | 3658             |
|   | 8:00 AM       | 3         | 131             | 3        | 1        | 17             | 398        | 103         | 85             | :8       | 2        | 5              | 9       | 775              |
|   | 8:15          | 5         | 122             | 0        | 6        | 18             | 321        | 98          | \$2            | 11       | 1        | 6              | 10      | 680              |
|   |               |           |                 |          |          |                |            | •••••       |                |          |          |                |         |                  |
|   | DAY TOTAL     | 22        | 1357            | 27       | 10       | 176            | 3595       | 727         | 536            | 107      | 13       | 45             | 54      | 6569             |

PEAK PERIOD ANALYSIS FOR THE PERIOD: 6:30 AM - 8:30 AM

| DIRECTION | START     | PEAK HR | •••••    | va     | DLUMES . |       | 8     | PERCENT | rs   |
|-----------|-----------|---------|----------|--------|----------|-------|-------|---------|------|
| FROM      | PEAK HOUR | FACTOR  | Right    | Thru   | ı Left   | Total | Right | Thru    | Left |
| North     | 7:00 AM   | 0.90    | 9        | 782    | 15       | 806   | 1     | 97      | 2    |
| East      | 6:45 AM   | 0.92    | 2        | 86     | 2042     | 2130  | 0     | 4       | 96   |
| South     | 7:30 AM   | 0.91    | 372      | 328    | 53       | 753   | 49    | 44      | 7    |
| West      | 7:00 AM   | 0.75    | 9        | 26     | 25       | 60    | 15    | 43      | 42   |
|           |           |         | Entire 1 | Inters | ection   |       |       |         |      |
| North     | 7:00 AM   | 0.90    | 9        | 782    | 15       | 806   | 1     | 97      | 2    |
| East      |           | 0.91    | 1        | 87     | 2031     | 2119  | 0     | 4       | 9ó   |
| South     |           | 0.85    | 342      | 274    | 57       | 673   | 51    | 41      | 3    |
| West      |           | 0.75    | 9        | 26     | 25       | 50    | 15    | 43      | 42   |

| : 0800       | AKALA HWY |                 |          | P        | rimary         | Novements | : Vehicles |                 |          |          |                 |         | DATE: 9/28/94    |  |
|--------------|-----------|-----------------|----------|----------|----------------|-----------|------------|-----------------|----------|----------|-----------------|---------|------------------|--|
| me<br>gin    | Fr<br>RT  | om Nort<br>TKRU | :h<br>LT | Fr<br>RT | on Eas<br>THRU | t<br>LT   | Fr<br>RT   | om Sout<br>Thru | th<br>LT | Fr<br>RT | on West<br>Thru | :<br>LT | Vehicle<br>Total |  |
| :00 PM       |           | 86              | 2        | 2        | 5              | 151       | 328        | 181             | 2        | 2        | 29              | 8       | 797              |  |
| :15          | 2         | 89              | Ģ        | 0        | 8              | 176       | 365        | 219             | 2        | 4        | 41              | 15      | 930              |  |
| :30          | 5         | 97              | â        | 0        | 3              | 147       | 377        | 172             | 4        | 5        | 38              | 15      | 871              |  |
| :45          | 10        | 101             | 4        | 0        | 9              | 127       | 404        | 219             | 5        | 9        | 32              | 9       | 929              |  |
| TOTAL        | 18        | 373             | 23       | 2        | 25             | 601       | 1474       | 791             | 13       | 20       | 140             | 47      | 3527             |  |
| :00 PM       | 4         | 84              | 8        | 0        | 3              | 107       | 402        | 215             | 2        | 9        | 15              | 10      | 364              |  |
| :15          | 10        | 141             | 12       | 0        | 11             | 111       | 405        | 203             | 2        | 2        | 31              | 10      | 938              |  |
| :30          | 10        | 102             | 6        | 5        | 11             | 139       | 339        | 129             | 3        | 3        | 44              | 14      | 799              |  |
|              | 5         | 132             | 10       | 0        | 4              | 122       | 294        | 146             | 2        | 1        | 19              | 11      | 74ċ              |  |
| :45<br>Total | 23        | 459             | 36       | š        | 34             | 479       | 1440       | ó93             | -<br>?   | 15       | 109             | 45      | 3347             |  |
| TOTAL        | 20        | 437             |          | •        | • ·            |           | - · · ·    |                 |          |          |                 |         |                  |  |
| :00 PM       | 3         | 6               | 1        | 2        | 1              | 28        | 51         | 27              | ð        | 0        | 4               | 0       | 123              |  |
|              |           |                 |          |          |                |           |            |                 |          |          |                 |         |                  |  |
| Y TOTAL      | 44        | 838             | 60       | 9        | 60             | 1108      | 2965       | 1511            | 22       | 35       | 253             | 92      | 5997             |  |

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PEAK PERIOD ANALYSIS FOR THE PERIOD: 4:00 PM - 6:15 PM

| DIRECTION | START     | PEAK HR |        | vol     | UMES . |       | P     | ERCENT | s    |
|-----------|-----------|---------|--------|---------|--------|-------|-------|--------|------|
| FROM      | PEAK HOUR | FACTOR  | Right  |         | Left   | Total | Right | Thru   | Left |
| North     | 5:00 PM   | 0.79    | 23     | 459     | 36     | 518   | 4     | 89     | 7    |
| East      | 4:00 PM   | 0.85    | 2      | 25      | 601    | 628   | 0     | 4      | 96   |
| South     | 4:30 PH   | 0.96    | 1588   | 809     | 13     | 2410  | 66    | 34     | 1    |
| West      | 4:00 PM   | 0.86    | 20     | 140     | 47     | 207   | 10    | 68     | 23   |
|           |           |         | Entire | Interse | ection |       |       |        |      |
| North     | 4:30 PM   | 0.74    | 29     | 423     | 32     | 484   | 6     | 57     | 7    |
| East      |           | 0.87    | 0      | 31      | 492    | 523   | 0     | 6      | 94   |
| South     |           | 0.96    | 1588   | 809     | 13     | 2410  | 66    | 34     | 1    |
| West      |           | 0,80    | 25     | 116     | 44     | 185   | 14    | 63     | 24   |

|           | : : 4<br>: Haleakala Hi<br>: Makawao Av | WY                         |                |                              |                |                         |                                   |                               |                          |               |                     |                      |                    |          | PAGE: 1<br>FILE: HALMAKA |
|-----------|-----------------------------------------|----------------------------|----------------|------------------------------|----------------|-------------------------|-----------------------------------|-------------------------------|--------------------------|---------------|---------------------|----------------------|--------------------|----------|--------------------------|
| ***       | :                                       |                            |                |                              | Primary<br>    | Nov                     | ements                            | : Vehicl                      | es<br>                   |               |                     |                      |                    |          | DATE: 9/29/94            |
| Time      |                                         | rom Nor                    |                |                              | roa Eas        |                         |                                   |                               | From So                  |               |                     | EI                   | rom Wes            | t        | Vehicle                  |
| Begin<br> | KI                                      | THRU                       | Lĭ             | RT                           | THRU           | LT                      |                                   | RT                            | THRU                     | LT            |                     | RT                   | THRU               | LT       | Total                    |
| 6:24      | 67                                      | 33                         | 6              | 8                            | 57             | 0                       |                                   | 0                             | 22                       |               |                     |                      | 3                  |          |                          |
| 6:39      | 98                                      | 38                         | 20             | 24                           | 130            | 0                       |                                   | ō                             |                          | 5             |                     | i                    | 4                  | 4        | 201                      |
| 6:54      | 108                                     | 48                         | 15             | 23                           | 114            | Ő                       |                                   | Ő                             |                          | 4             |                     | 1                    | 8                  | 10       | 367                      |
| 7:09      | 142                                     | 55                         | 30             | 31                           | 152            | 1                       |                                   | 3                             | 35                       | 3             |                     | Ō                    | 8                  | 10       | 381                      |
| 7:24      | 74                                      | 58                         | 38             | 30                           | 104            | 5                       |                                   |                               | . 38                     | 3             |                     | 3                    | 10                 | 25       | 479<br>389               |
| 7:39      | 72                                      | 67                         | 29             | 29                           | 111            | 2                       |                                   | ĩ                             | 52                       | 4             |                     | 5                    | 4                  | 23<br>16 | 372                      |
| 7:54      | 63                                      | 57                         | 17             |                              | 73             | 1                       |                                   | 4                             | 43                       | 2             |                     | 4                    | 8                  | 11       | 314                      |
| 8:09      | 45                                      | 43                         | 16             | 19                           | 85             | 2                       |                                   | 1                             | 47                       | 2             |                     | i                    | 3                  | 5        | 269                      |
| DAY TOTAL | 669                                     | 399                        | 171<br>PEAN    | 195<br>K PERIOD ANALY        | 826<br>SIS FOR | 11<br>The               |                                   | 10<br>): 6:24                 |                          | 24<br>8·24 AM | I                   | 15                   | 48                 | 101      | 2792                     |
|           |                                         |                            |                |                              |                |                         | rento                             | . 0.24                        | MA -                     | 0:24 MA       |                     |                      |                    |          |                          |
|           | DIRECTION                               | STAR                       |                | PEAK HR                      |                | • • • • •               | VOI                               | .UMES                         |                          |               | :                   | PERCENT              | s                  |          |                          |
|           | FROM                                    | PEAK H                     | DUR            | FACTOR                       | 8              | ight                    | Thru                              | Left                          | Total                    |               |                     | Thru                 | Left               |          |                          |
|           |                                         |                            |                |                              |                |                         |                                   |                               |                          | ******        | <br>54              | 31                   | 15                 |          |                          |
|           | North                                   | 6:54 /                     | AM             | 0.81                         |                | 396                     | 228                               | 112                           | 736                      |               |                     |                      |                    |          |                          |
|           | East                                    | 6:54 /<br>6:39 /           |                | 0.81<br>0.83                 |                | 396<br>108              | 228<br>500                        | 112<br>6                      | 736<br>614               |               |                     |                      |                    |          |                          |
|           | East<br>South                           | 6:39 4<br>7:24 4           | am<br>Am       | 0.83<br>0.87                 | 1              |                         |                                   |                               | 736<br>614<br>198        |               | 18                  | 81                   | 1                  |          |                          |
|           | East                                    | 6:39 6                     | am<br>Am       | 0.83                         | :              | 801                     | 500                               | 6                             | 614                      |               |                     |                      |                    |          |                          |
|           | East<br>South                           | 6:39 4<br>7:24 4           | am<br>Am       | 0.83<br>0.87                 | 1              | 108<br>7<br>12          | 500<br>180                        | 6<br>11<br>71                 | 614<br>198               |               | 18<br>4             | 81<br>91             | 1<br>6             |          |                          |
|           | East<br>South<br>West                   | 6:39 4<br>7:24 4<br>7:09 4 | ам<br>ам<br>ан | 0.83<br>0.87<br>0.74         | Enti           | 108<br>7<br>12<br>.re I | 500<br>180<br>30<br>nterse        | 6<br>11<br>71<br>ctian        | 614<br>198<br>113        |               | 18<br>4<br>11       | 81<br>91<br>27       | 1<br>6<br>63       |          |                          |
|           | East<br>South<br>West<br>North          | 6:39 4<br>7:24 4           | ам<br>ам<br>ан | 0.83<br>0.87<br>0.74<br>0.81 | Enti<br>3      | 108<br>7<br>12<br>(re I | 500<br>180<br>30<br>nterse<br>228 | 6<br>11<br>71<br>ction<br>112 | 614<br>198<br>113<br>736 |               | 18<br>4<br>11<br>54 | 81<br>91<br>27<br>31 | 1<br>6<br>63<br>15 |          |                          |
|           | East<br>South<br>West                   | 6:39 4<br>7:24 4<br>7:09 4 | ам<br>ам<br>ан | 0.83<br>0.87<br>0.74         | Enti<br>3      | 108<br>7<br>12<br>.re I | 500<br>180<br>30<br>nterse        | 6<br>11<br>71<br>ctian        | 614<br>198<br>113        |               | 18<br>4<br>11       | 81<br>91<br>27       | 1<br>6<br>63       |          |                          |

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| :        | MAKAWAO AV        |             |        | p                 | rimary  | Moven | ents: \      | /ehicles     | 5      |         |            |               |            | 0   | ATE: 9/28/94 |   |
|----------|-------------------|-------------|--------|-------------------|---------|-------|--------------|--------------|--------|---------|------------|---------------|------------|-----|--------------|---|
| 'ime     | Fr                | om Nori     | <br>th | Fr                | on Eas  | t.    |              | Fr           | oa Sou | th      |            | Fr            | om West    |     | Vehicle      |   |
| legin    | RT                | THRU        | LT     | RT                | THRU    | LT    |              | RT           | THRU   | LT      |            | RT            | THRU<br>   | LT  | Total        |   |
| 4:00 PM  | 22                | 49          | 18     | 28                | 69      | 1     |              | 1            | 52     | 1       |            | 17            | 49         | 48  | 355          |   |
| 4:15     | 25                | 48          | 19     | 27                | 58      | 0     |              | 4            | 60     | 1       |            | ó             | 49         | 71  | 368          |   |
| 4:30     | 41                | 57          | 26     | 22                | 40      | 6     |              | 1            | 46     | 1       |            | 9             | 63         | 78  | 390          |   |
| 4:45     | 27                | 56          | 23     | 41                | 41      | 1     |              | 6            | 53     | 2       |            | 17            | 87         | 87  | 441          |   |
| IR TOTAL | 115               | 210         | 86     | 118               | 208     | 3     |              | 12           | 211    | 5       |            | 49            | 248        | 294 | 1534         |   |
| 5:00 PM  | 20                | 74          | 20     | 19                | 48      | 3     |              | 3            | 52     | 2       |            | 10            | 63         | 31  | 398          |   |
| 5:15     | 30                | 75          | 24     | 25                | 41      | 3     |              | 3            | 62     | ì       |            | 15            | 70         | 75  | 424          |   |
| 5:30     | 23                | 61          | 31     | 22                | 42      | 1     |              | 2            | 57     | 5       |            | i7            | 79         | 63  | 408          |   |
| 5:45     | 31                | 88          | 18     | 23                | 22      | 4     |              | 2            | 58     | 3       |            | 10            | 56         | ó7  | 382          |   |
| IR TOTAL | 104               | 298         | 93     | 89                | 153     | 11    |              | 10           | 229    | 11      |            | 52            | 268        | 294 | 1512         |   |
|          |                   |             |        |                   |         |       |              |              |        |         |            |               |            |     |              | • |
| AY TOTAL | 219               | 508         | 179    | 207               | 361     | 19    |              | 22           | 440    | 16      |            | 101           | 516        | 579 | 3156         |   |
|          |                   |             | PEAK   | PERIOD ANALY      | ISIS FO | R THE | PERIOD       | : 4:00       | PM -   | 6:00 PM |            |               |            |     |              |   |
|          | DIRECTION<br>FROM | STA<br>Peak |        | PEAK HR<br>Factor |         |       | VOLI<br>Thru | JMES<br>Left | Total  |         | P<br>Right | ERCEN<br>Thru | TS<br>Left |     |              |   |
|          | ********          |             |        |                   |         |       |              | •••••        |        |         | ••••••     |               |            |     |              |   |
|          | North             | 5:00        |        | 0.90              |         | 104   | 298          | 93           | 495    |         | 21         | 60            | 19<br>2    |     |              |   |
|          | East              | 4:00        | PM     | 0.85              |         | 118   | 208          | 8            | 334    |         | 35         | 62<br>92      | 2          |     |              |   |

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| Lasi  | 4:00 PH | 0.03 | 110    | 200    | 0         | 004 |    |             | -  |  |
|-------|---------|------|--------|--------|-----------|-----|----|-------------|----|--|
| South | 5:00 PM | 0.95 | 10     | 229    | 11        | 250 | 4  | 92          | 4  |  |
| West  | 4:45 PM | 0.88 | 59     | 299    | 314       | 672 | 9  | 44          | 47 |  |
|       |         |      | Entire | Inters | ection    |     |    |             |    |  |
| North | 4:45 PM | 0.90 | 100    | 266    | <b>98</b> | 164 | 22 | 57          | 21 |  |
| East  |         | 0.86 | 107    | 172    | 8         | 237 | 37 | <u> 5</u> 0 | 3  |  |
| South |         | 0.94 | 14     | 224    | 10        | 248 | 6  | 90          | 4  |  |
| Nest  |         | 0.88 | 59     | 299    | 314       | 672 | 9  | 44          | 47 |  |
|       |         |      |        |        |           |     |    |             |    |  |

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## INTERSECTION TURNING MOVEMENT MANUAL COUNT REDUCTION WORKSHEET TURNING MOVEMENT SUMMARY

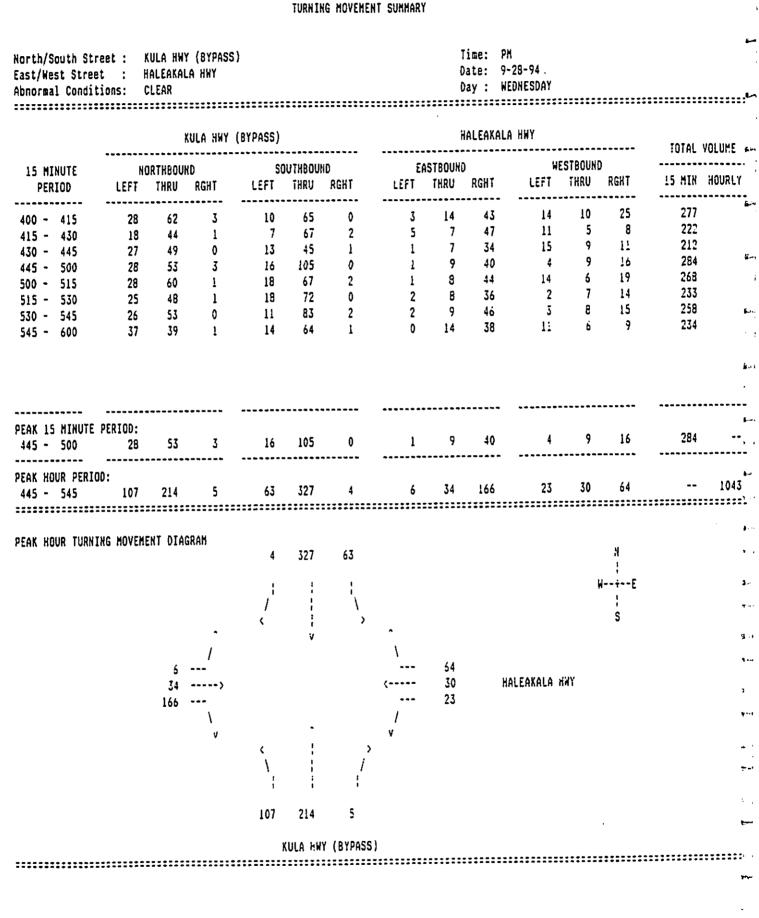
|                               |         |         | KULA HW      | Y (BYPAS | S)              |          |      |                  | HALEAKAL   | A HUV        |                 |            |            |        |
|-------------------------------|---------|---------|--------------|----------|-----------------|----------|------|------------------|------------|--------------|-----------------|------------|------------|--------|
| 15 MINUTE                     |         | ORTHBOU |              |          |                 |          |      |                  |            |              |                 |            | TOTAL      | VOLUME |
| PERIOD                        | LEFT    |         | RGHT         | LEFI     | SOUTHBO<br>Thru |          | LEFT | EASTBOUN<br>Thru | ID<br>RGHT | W<br>Left    | ESTBOUN<br>Thru | ID<br>RGHT | 15 MIN     |        |
| 630 - 645                     | 32      | 148     | 4            | 2        | 32              | ••••••   |      | •                |            |              |                 |            | 15 /11/    | HUUKL  |
| 545 - 700                     | 28      | 117     | 1            | 4        |                 | 0<br>0   | 1    | 16<br>12         | 55<br>36   | 4            | 9               | 23         | 326        |        |
| 700 - 715                     | 21      | 135     | 6            | 5        |                 | ŏ        | ő    | 2                | 30<br>29   | 1<br>ç       | 2<br>5          | 25         | 250        |        |
| 15 - 730                      | 19      | 111     | 32           | 5        | 40              | Ó        | Ő    | 15               | 37         | 7<br>9       | 26              | 26<br>33   | 267        |        |
| 730 - 745                     | 44      | 140     | 9            | 6<br>3   | 43              | 2        | 3    | 19               | 42         | 20           | 3               | 48         | 327        |        |
| 45 - 800                      | 21      | 55      | 1            | 3        | 19              | 0        | 0    | 9                | 31         | 2            | 3               |            | 379<br>155 |        |
| 00 - 815<br>15 - 830          | 19      | 77      | 5            | 3        |                 | 0        | 0    | 18               | 41         | 3            | 5               | 15         | 199        |        |
| 13 - 030                      | 22      | 41      | 5            | 0        | 29              | 0        | 0    | 13               | 38         | 6            | 9               | 29         | 192        |        |
| K 15 MINUTE PE<br>0 - 745<br> | 44      | 140     | 9            | 6        | 43              | 2        | 3    | 19               | 42         | 20           | 3               | 48         | 379        |        |
|                               |         | 503     | 48<br>====== | 20       | 128             | 2        | 3    | 55<br>======     | 144        | 39<br>====== | 37<br>======    | 132        |            | 1223   |
| K HOUR TURNING                | MOVEMEN | T DIAGR | AM           | -        | 145             |          |      |                  |            |              |                 |            |            |        |
|                               |         |         |              | 2        | 128             | 20       |      |                  |            |              |                 | 8          |            |        |
|                               |         |         |              | 1        | . :             | :        |      |                  |            |              |                 | ! _        |            |        |
|                               |         |         |              | , i      |                 | 1        |      |                  |            |              | H               | -+፤        |            |        |
|                               |         |         |              | <        | 1               | `>       |      |                  |            |              |                 | ։<br>Տ     |            |        |
|                               |         |         |              |          | v               |          | .*   |                  |            |              |                 | 5          |            |        |
|                               |         | 7       | 1            |          |                 |          | ١    |                  |            |              |                 |            |            |        |
|                               |         | 5       | -            |          |                 |          |      | 132              |            |              |                 |            |            |        |
|                               |         | 144     | ,            |          |                 |          | <    | 37               | HALE       | AKALA EWY    |                 |            |            |        |
|                               |         | • • •   | ١            |          |                 |          |      | 39               |            |              |                 |            |            |        |
|                               |         |         | v            |          |                 |          | 1    |                  |            |              |                 |            |            |        |
|                               |         |         | •            | ç        | 1               | 、        | v    |                  |            |              |                 |            |            |        |
|                               |         |         |              | Ì        | į               | í        |      |                  |            |              |                 |            |            |        |
|                               |         |         |              |          | j.              | <u>'</u> |      |                  |            |              |                 |            |            |        |
|                               |         |         |              | •        | ,               | ſ        |      |                  |            |              |                 |            |            |        |
|                               |         |         |              | 112      | 503             | 48       |      |                  |            |              |                 |            |            |        |
|                               |         |         |              |          |                 |          |      |                  |            |              |                 |            |            |        |

KULA HWY (BYPASS)

29-Sep-94

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INTERSECTION TURNING MOVEMENT MANUAL COUNT REDUCTION WORKSHEET

ATA

. \_ 29-Sep-94

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| -              | Weather<br>Counter<br>Counted                                                                   | · :                                                                 |                                          |                             |                          |                                                              | Tr                          | JAP<br>affic C<br>203          | AR Techn<br>ounting<br>I Stout<br>Ivyland<br>Vehicl | Equipme<br>Drive,                                              | nt & Su<br>Suite 4<br>974                | pplies                |                       | ON<br>PN                                                    | ー:-<br>1 A 07<br>人      | Sit<br>Sta             | 2 D<br>te Code :<br>art Date:<br>.e I.D. :<br>ye : | 09/28/9                                |
|----------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|------------------------------------------|-----------------------------|--------------------------|--------------------------------------------------------------|-----------------------------|--------------------------------|-----------------------------------------------------|----------------------------------------------------------------|------------------------------------------|-----------------------|-----------------------|-------------------------------------------------------------|-------------------------|------------------------|----------------------------------------------------|----------------------------------------|
| ·<br>·         |                                                                                                 | Southb                                                              | ound                                     |                             |                          | ¦<br>¦Westbou                                                | <br>1nd                     |                                |                                                     | Northbo                                                        |                                          |                       |                       | ¦<br>¦Eastbou                                               |                         |                        |                                                    |                                        |
| · .<br>:       | Date 09/                                                                                        | Left<br>/28/94 -                                                    | Thru                                     | Right                       | Other                    | <br>Left                                                     | Thru                        | Right                          |                                                     |                                                                |                                          | Right                 | Other                 |                                                             |                         | Right                  | <u>Other</u>                                       | ĩctal                                  |
|                | 16:07<br>16:22<br>16:37<br><u>16:52</u><br>Hr Total<br>17:07<br>17:22                           | 18<br>34<br>36<br><u>34</u><br>122<br>26                            | 67<br>86<br>70<br><u>96</u><br>319<br>61 | 7<br>4<br>5<br>4<br>20<br>5 | 0 :<br>0 :<br>0 :<br>0 : | 2<br>0<br>0<br>2<br>4                                        | 8<br>2<br>0<br>2<br>12<br>4 | 7<br>9<br>17<br>13<br>46<br>11 | 0 ;<br>0 ;<br>0 ;<br>0 ;                            | 1<br>5<br>3<br>2<br>11<br>3                                    | 53<br>60<br>78<br><u>54</u><br>245<br>47 | 2<br>0<br>0<br>1<br>3 | 0<br>0<br>0<br>0<br>0 | 3<br>4<br>9<br>4<br>20                                      | 14<br>2<br>3<br>0<br>19 | 2<br>2<br>4<br>12<br>3 | C  <br>0  <br>0  <br>0  <br>0                      | 134<br>208<br>225<br><u>216</u><br>833 |
| <b></b>        | 17:22<br>17:37<br><u>17:52</u>                                                                  | 32<br>39<br>17                                                      | 77<br>69<br>29                           | 6<br>4<br>4                 | 0                        | 0<br>1<br>0                                                  | 2                           | 10<br>11<br>7                  | 0 ¦<br>0 !<br>0 !                                   | 7<br>1                                                         | 61<br>54                                 | 3<br>0                | 0 :<br>0              | 1<br>7                                                      | 2<br>2                  | 4<br>5                 | 0  <br>0                                           | 205<br>195                             |
|                | Hr Total                                                                                        | 114<br>* 8RE                                                        | 236                                      | 19                          | 0 ;                      | 2                                                            | 9                           | 39                             | _ ب                                                 | • 12                                                           | <u>26</u><br>188                         | <u>1</u> 5            | 0 :                   |                                                             | 15                      | <u>2</u>               | 0 ;                                                | <u>90</u><br>654                       |
|                |                                                                                                 | - + OKC                                                             | :нл +                                    |                             | *******                  | ******                                                       |                             | *****                          |                                                     |                                                                |                                          |                       |                       | *******                                                     |                         |                        |                                                    |                                        |
| _              | <b>≠</b> TOTAL <b>¥</b>                                                                         | 236                                                                 | 555                                      | 39                          | 0 ;                      | 6                                                            | 21                          | 85                             | 0 ;                                                 | 23                                                             | 433                                      | 8                     | 0                     | 31                                                          | 24                      | 26                     | 0                                                  | 1487                                   |
|                | Peak Hour<br>Peak star<br>Volume<br>Percent<br>Pk total<br>Highest<br>Volume<br>Hi total<br>PHF | Hnalys<br>t 16:07<br>122<br>264<br>461<br>16:52<br>34<br>134<br>.86 | 319<br>69 <b>%</b>                       | 20<br>4 <b>1</b><br>4       | 0  <br>0  <br>0  <br>0   | ion for<br>16:07<br>4<br>6%<br>62<br>16:07<br>2<br>17<br>.91 | the Per<br>12<br>193<br>8   | riod: 14<br>46<br>74%<br>7     | 0  <br>0  <br>0  <br>0  <br>0                       | 8:22 or<br>16:07<br>11<br>4%<br>259<br>16:37<br>3<br>81<br>.30 | 09/28,<br>245<br>95%<br>73               | 3<br>15<br>0          | 0<br>04               | 16:07<br>20<br>39 <b>%</b><br>51<br>16:07<br>3<br>19<br>.57 | 19<br>37 <b>5</b><br>14 | 12<br>24 <b>5</b><br>2 | 0<br>2<br>0                                        |                                        |
|                |                                                                                                 |                                                                     |                                          |                             |                          |                                                              |                             |                                |                                                     |                                                                |                                          |                       |                       |                                                             |                         |                        |                                                    |                                        |
| <b>k</b> = = 1 |                                                                                                 |                                                                     |                                          |                             |                          |                                                              |                             |                                |                                                     |                                                                |                                          |                       |                       |                                                             |                         |                        |                                                    |                                        |

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| Weather<br>Counter<br>Counted I | :<br>:<br>by: |          |        | -             |         | Tra   | JAH/<br>affic Co<br>2031 | AR Techni<br>Dunting I<br>Stout I<br>Ivyland<br>Vehicli | Equipmen<br>Drive, S | t & Sup<br>uite 4<br>74 | oplies |       |         |      | Stai  | e Code :<br>rt Date:<br>e I.D. :<br>e : | 09/29/ |
|---------------------------------|---------------|----------|--------|---------------|---------|-------|--------------------------|---------------------------------------------------------|----------------------|-------------------------|--------|-------|---------|------|-------|-----------------------------------------|--------|
| ç                               | Southbou      | ind      |        |               | Westbou | nd    |                          |                                                         | Northbo              | und                     |        |       | Eastbou | nd   | •     |                                         | <br>   |
| Date 09/2                       | Left          |          | Right  | Other         |         |       | Right                    | Other                                                   |                      |                         | Right  | Other | Left    | Thru | Right | Other ;                                 | Tot    |
| 06:30                           | 3             | 28       | 3      | . 0           | 1       | 1     | 31                       | 0 ;                                                     | 2                    | 96                      | 2      | 0 :   | 3       | 0    | 0     | 0 ;                                     | 1      |
| 06:45                           | 2             | 27       | 5      | 0             |         | 2     | 46                       | 0                                                       | 1                    | 58                      | - 1    | 0     |         | Ō    | 5     | 0                                       | 1      |
| 07:00                           | 2             | 40       | 3      | 0             |         | 12    | 48                       | 0                                                       | 2                    | 93                      | 1      | 0     |         | 1    | 3     | 0                                       | 2      |
| 07:15                           | - 9           | 55       | 3      | 0             |         | 1     | 39                       | 0 1                                                     | -                    | 101                     | Ŭ      | 0     | 7       | 0    | 3     | 0                                       | 2      |
| Hr Total                        | 16            | 150      | 14     | 0 ;           |         | 16    | 164                      | 0;                                                      |                      | 378                     | 4      | 0 ;   | 19      | 1    | 9     | 3 ;                                     |        |
| 07:30                           | 13            | 54       | 5      | 0 f           | 0       | 4     | 36                       | 0 (                                                     | 5                    | 90                      | 3      | 0 ;   | 7       | 0    | 3     | 0 ;                                     | 2      |
| 07:45                           | 9             | 43       | 4      | Ó             | 3       | 5     | 27                       | 0                                                       | 2                    | 96                      | 2      | 0 ;   | 5       | 1    | 2     | 0 ;                                     | 1      |
| 08:00                           | 16            | 44       | 1      | 0             |         | 1     | 19                       | 0                                                       | 3                    | 66                      | 2      | 0     | 4       | 2    | 3     | 0                                       | 1      |
| 08:15                           | 8             | 46       | 2      | 0 :           | l       | 0     | 21                       | 0                                                       | 4                    | 63                      | 0      | 0     | 4       | 2    | 3_    | 0;                                      | !      |
| Hr Total                        | 46            | 187      | 12     | 0             | 6       | 10    | 103                      | 0 :                                                     | 12                   | 315                     | 7      | 0 }   | 20      | 5    | 11    | 0 ;                                     | 7.     |
|                                 | - * BRE       | AX = -   |        |               |         | ••••• | •                        |                                                         |                      | _/                      |        |       |         |      |       |                                         | ****** |
| *TOTAL*                         | 62            | 337      | 26     | 0 {           | 12      | 26    | 267                      | 0 ;                                                     | 18                   | 693                     | 11     | 0 ;   | 39      | ó    | 20    | 0;                                      | 15     |
| Annak Vour                      |               | <br>     |        | <br>T-b       | <br>+:  | ••••• |                          |                                                         |                      |                         |        |       |         |      |       |                                         | •      |
| Peak Hour<br>Peak star          |               | 15 0 9 1 | CHUITE | Intersec<br>1 | 07:00   |       | eriod: (                 | 10:30 10                                                | 07:00                |                         | 477    | :     | 07:00   |      |       | :                                       |        |
| Volume                          |               | 192      | 15     | 0 !           |         |       | 150                      | 0                                                       |                      | 380                     | 6      | 0     | 23      |      | 11    | 0                                       |        |
| Percent                         | 14\$          | 803      | 63     | 01            | 45      | 121   | 834                      | 01                                                      | 21                   | 96\$                    | 25     | 0=    | 64%     | ó-   | 314   | 01                                      |        |
| Pk total                        | 240           |          |        |               | 180     | •     | *                        |                                                         | 394                  | •                       |        | ļ     | 36      |      |       | I<br>I                                  |        |
| Highest                         | 07:30         |          |        | i             | 07:00   |       |                          | ļ                                                       | 07:15                |                         |        | ł     | 07:15   |      |       | 1                                       |        |
| Volume                          | 13            | 54       | 5      | 0             | 1       | 12    | 48                       | 0                                                       | 1                    | 101                     | Û      | 0     | 7       | 0    | 3     | 0                                       |        |
| Hi total                        | 72            |          |        | :             | 61      |       |                          | ł                                                       | 102                  |                         |        | 1     | 10      |      |       | 1                                       |        |
| PHF                             | .83           |          |        | ;             | .74     |       |                          | 1                                                       | .97                  |                         |        | 1     | .90     |      |       | }                                       |        |
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<th>09/29/94<br/>0353<br/>035<u>4</u><br/>013113</th> <th>21<br/>9<br/>23<br/>19</th> <th>0</th> <th></th> <th></th> <th>Theu</th> <th>Right</th> <th>ilther</th> <th>1</th> <th></th> <th>Piaht</th> <th>Other</th> <th></th> <th></th> <th>Dicht</th> <th>Othen 1</th> <th>;<br/>;<br/>;</th>                                                                                                           | 09/29/94<br>0353<br>035 <u>4</u><br>013113                                                                                        | 21<br>9<br>23<br>19                                                                                                                                              | 0                                                                                                                                                                                                               |                                                                                                     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                                                                                                                                                                                                                                                                                                                                                                 | o Hernitset - Heenitse                                                                                                            | tal 20<br>tal 20<br>iour Analy<br>start 07:0<br>19<br>18<br>107<br>107:3<br>7<br>al 36<br>0ur Analy<br>tart 07:0<br>19<br>t 18<br>al 107<br>t 07:3<br>7<br>al 36 | tal 20 86<br>L* 33 158<br>Nour Analysis 8y 1<br>start 07:00<br>2 19 88<br>107<br>1 07:30<br>7 29<br>al 36<br>.74<br>our Analysis 8y E<br>tart 07:00<br>19 88<br>t 18% 82%<br>al 107<br>t 07:30<br>7 29<br>al 36 | tal 20 86 0<br>L* 33 158 0<br>Nour Analysis By Individu<br>start 07:00<br>9 19 88 0<br>101 18% 82% 0%<br>107<br>107<br>107:30<br>17 29 0<br>al 36<br>.74<br>Our Analysis By Entire I<br>tart 07:00<br>19 88 0<br>t 18% 82% 0%<br>al 107<br>t 07:30<br>7 29 0<br>al 36 | tal 20 86 0 0<br>L* 33 158 0 0<br>Hour Analysis By Individual Appristant 07:00<br>9 19 88 0 0<br>10 18% 82% 0% 0%<br>10 18% 82% 0% 0%<br>10 107<br>10 7 29 0 0<br>13 36<br>107<br>107 10<br>107 10 | tal       20       86       0       20         L*       33       158       0       32         Hour Analysis By Individual Approach for<br>start 07:00       06:30         e       19       88       0       12         etal       107       79       04       15%         tal       107       79       0       3         tal       36       26       .74       .76         our Analysis By Entire Intersection for<br>tart 07:00       07:10       07:00         19       88       0       17         t       18%       82%       0%       0%         our Analysis By Entire Intersection for<br>tart 07:00       07:00       07:00         19       88       0       17       17         t       18%       82%       0%       0%       24%         al       107       70       70       3       36         al       36       26       3       3       36 | tal       20       86       0       20       0         L*       33       158       0       32       0         Hour Analysis By Individual Approach for the Perstart 07:00       06:30       06:30         L*       19       88       0       12       0         Nour Analysis By Individual Approach for the Perstart 07:00       06:30       0       06:30         L*       19       88       0       12       0         L*       18%       32%       0%       0%       15%       0%         L*       107       79       0       3       0       07:15         L       7       29       0       0       3       0         al       36       26       .74       .76         Our Analysis By Entire Intersection for the Perstart 07:00       07:00       17       0         t       18%       82%       0%       0%       24%       0%         al       107       70       70       70       70       70         t       07:30       07:15       7       29       0       3       0         al       107       36       26 | tal       20       86       0       0       20       0       37         L*       33       158       0       0       32       0       104         Hour Analysis By Individual Approach for the Period: 0       06:30       06:30       0       12       0       67         Start 07:00       06:30       0       12       0       67       0       05       01       05       05       05       05       05       05       05       05       05       05       05       05       05       05       05       05       05       05       05       07       10       07       10       07       10       07       0       07       0       07       0       03       0       23       01       07       0       03       0       07       0       03       0       07       0       03       0       10       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0 | tal       20       86       0       20 $\overline{37}$ 0         L*       33       158       0       132       0       104       0         Hour Analysis By Individual Approach for the Period:       06:30       0       06:30       0       12       0       67       0         It IB\$       82\$       0\$       0\$       15\$       0\$       85\$       0\$       1         It IB\$       82\$       0\$       0\$       12       0       67       0       1         It IB\$       82\$       0\$       0\$       15\$       0\$       85\$       0\$       1         It IB\$       82\$       0\$       0\$       15\$       0\$       85\$       0\$       1         It ID7       79       15\$       07:15       15       15       15       15       16         It IB\$       82\$       0\$       0\$       17       0       53       0\$       16         Our Analysis By Entire Intersection for the Period:       06:30       17       0       53       0\$       15         It IB\$       82\$       0\$       0\$       17       0       53       0\$       14 | tal       20       86       0       20       0       37       0       0         L*       33       158       0       0       32       0       104       0       0         Hour Analysis By Individual Approach for the Period:       06:30       07:00       06:30       07:00         Hour Analysis By Individual Approach for the Period:       06:30       07:00       07:00         Ist       98       0       12       0       67       0       0         Ist       82%       0%       0%       15%       0%       85%       0%       0%         Ist       07:30       07:15       07:15       07:15       07:15       07:15         Ist       07:30       26       47       .76       .81         Our Analysis By Entire Intersection for the Period:       06:30 to 08:30 of       07:00       07:00       07:00         Ist       82%       0%       0%       17       0       53       0%       0%         Ist       82%       0%       0%       17       0       53       0%       0%         Ist       82%       0%       0%       17       0       53       0% </td <td>tal       20       86       0       20       0       37       0       0       109         L*       33       158       0       32       0       104       0       0       251         Hour Analysis 8y Individual Approach for the Period: 06:30 to 08:30 on 09/25         tart 07:00       06:30       07:00         2       19       88       0       12       0       67       0       146         th       18%       82%       0%       0%       15%       0%       85%       0%       0%       95%         tal       107       79       153       107:15       07:15       07:15         t       729       0       3       0       23       0       0       45         al       36       26       47       .881       0       0       17       0       53       0       0       146         t       18%       82%       0%       0%       17       0       53       0       0       146         our Analysis By Entire Intersection for the Period: 06:30 to 08:30 on 09/29       0       153       0       0       146         &lt;</td> <td>tal       20       86       0       0       20       0       37       0       0       109       12         L*       33       158       0       0       32       0       104       0       0       251       23         Hour Analysis 8y Individual Approach for the Period: 06:30 to 08:30 on 09/29/94         Attract 07:00         0       12       0       67       0       0       146       7         19       88       0       12       0       67       0       0       146       7         107       19       88       0       12       0       67       0       0       146       7         107       79       153       153       07:15       07:15       07:15       153       147       153         1       07:30       07:15       07:00       07:00       07:00       07:00       146       7         13       36       0       17       0       53       0       0       146       7         136       126       17       0       53       0       0       146       7         19</td> <td>tal       20       86       0       20       0       37       0       0       109       12       0         tal       33       158       0       32       0       104       0       0       251       23       0         tour Analysis By Individual Approach for the Period:       06:30       07:00       07:00       0       146       7       0         turt 07:00       06:30       07:00       0       046       7       0       0       146       7       0         tut 18%       82%       0%       0%       15%       0%       85%       0%       0%       95%       5%       0%       0%       95%       5%       0%       0%       95%       5%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       16%       16%       16%       0%       16%       0%</td> <td>tal       20       86       0       0       20       0       37       0       0       109       12       0       0         Lx       33       158       0       0       32       0       104       0       0       251       23       0       0         Hour Analysis 8y Individual Approach for the Period:       06:30       107:00       107:00       107:30       107:30       107:00       107:30         Hour Analysis 8y Individual Approach for the Period:       06:30       107:00       126       0       107       0       0         Hour Analysis 8y Individual Approach for the Period:       06:30       107:00       126       0       126       0       0         H 18       52%       0%       0%       15%       0%       0%       95%       5%       0%       0%         H 18%       52%       0%       0       30       23       0       0       45       0       0         H 20       0       3       0       23       0       0       47       0       0       0         H 20       0       3       0       23       0       0       166       7</td> <td>tal       20       86       0       20       0       37       0       0       109       12       0       0       0       0         Lx       33       158       0       ;       32       0       104       0       0       251       23       0       0       0         Lx       33       158       0       ;       32       0       104       0       0       251       23       0       0       0         Iour Analysis By Individual Approach for the Period: 06:30 to 08:30 on 09/29/94       0       0       0       0       0         itart 07:00       :       06:30       :       07:00       :       C7:30         ital       107       :       155       05       05       05       05         ital       107       :       79       :       153       0       0       0         ital       107       :       79       :       153       0       0       0         ital       07:15       :       07:15       :       06:30       0       0       0         ital       107       :       :       :       0</td> <td>tal       20       86       0       20       0       37       0       0       10       10       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       <th0< td=""><td>tal       20       86       0       20       0       37       0       0       10       12       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       <th0< td=""></th0<></td></th0<></td> | tal       20       86       0       20       0       37       0       0       109         L*       33       158       0       32       0       104       0       0       251         Hour Analysis 8y Individual Approach for the Period: 06:30 to 08:30 on 09/25         tart 07:00       06:30       07:00         2       19       88       0       12       0       67       0       146         th       18%       82%       0%       0%       15%       0%       85%       0%       0%       95%         tal       107       79       153       107:15       07:15       07:15         t       729       0       3       0       23       0       0       45         al       36       26       47       .881       0       0       17       0       53       0       0       146         t       18%       82%       0%       0%       17       0       53       0       0       146         our Analysis By Entire Intersection for the Period: 06:30 to 08:30 on 09/29       0       153       0       0       146         < | tal       20       86       0       0       20       0       37       0       0       109       12         L*       33       158       0       0       32       0       104       0       0       251       23         Hour Analysis 8y Individual Approach for the Period: 06:30 to 08:30 on 09/29/94         Attract 07:00         0       12       0       67       0       0       146       7         19       88       0       12       0       67       0       0       146       7         107       19       88       0       12       0       67       0       0       146       7         107       79       153       153       07:15       07:15       07:15       153       147       153         1       07:30       07:15       07:00       07:00       07:00       07:00       146       7         13       36       0       17       0       53       0       0       146       7         136       126       17       0       53       0       0       146       7         19 | tal       20       86       0       20       0       37       0       0       109       12       0         tal       33       158       0       32       0       104       0       0       251       23       0         tour Analysis By Individual Approach for the Period:       06:30       07:00       07:00       0       146       7       0         turt 07:00       06:30       07:00       0       046       7       0       0       146       7       0         tut 18%       82%       0%       0%       15%       0%       85%       0%       0%       95%       5%       0%       0%       95%       5%       0%       0%       95%       5%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       15%       0%       16%       16%       16%       0%       16%       0% | tal       20       86       0       0       20       0       37       0       0       109       12       0       0         Lx       33       158       0       0       32       0       104       0       0       251       23       0       0         Hour Analysis 8y Individual Approach for the Period:       06:30       107:00       107:00       107:30       107:30       107:00       107:30         Hour Analysis 8y Individual Approach for the Period:       06:30       107:00       126       0       107       0       0         Hour Analysis 8y Individual Approach for the Period:       06:30       107:00       126       0       126       0       0         H 18       52%       0%       0%       15%       0%       0%       95%       5%       0%       0%         H 18%       52%       0%       0       30       23       0       0       45       0       0         H 20       0       3       0       23       0       0       47       0       0       0         H 20       0       3       0       23       0       0       166       7 | tal       20       86       0       20       0       37       0       0       109       12       0       0       0       0         Lx       33       158       0       ;       32       0       104       0       0       251       23       0       0       0         Lx       33       158       0       ;       32       0       104       0       0       251       23       0       0       0         Iour Analysis By Individual Approach for the Period: 06:30 to 08:30 on 09/29/94       0       0       0       0       0         itart 07:00       :       06:30       :       07:00       :       C7:30         ital       107       :       155       05       05       05       05         ital       107       :       79       :       153       0       0       0         ital       107       :       79       :       153       0       0       0         ital       07:15       :       07:15       :       06:30       0       0       0         ital       107       :       :       :       0 | tal       20       86       0       20       0       37       0       0       10       10       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0 <th0< td=""><td>tal       20       86       0       20       0       37       0       0       10       12       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       <th0< td=""></th0<></td></th0<> | tal       20       86       0       20       0       37       0       0       10       12       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0 <th0< td=""></th0<> |

| leather<br>ounter<br>counted by | :<br>:<br>/: |          |        |         |                      | Tra      |        | ounting<br>1 Stout (<br>Ivyland | clogies,<br>Equipmen<br>Drive, Su<br>, PA 1897<br>e group 1 | : & Sup<br>ite 4<br>4 | oplies |       | KELAN<br>PM | /L/¥E | Sit<br>Stai | e Code :<br>t Date:<br>e I.D. : |          |
|---------------------------------|--------------|----------|--------|---------|----------------------|----------|--------|---------------------------------|-------------------------------------------------------------|-----------------------|--------|-------|-------------|-------|-------------|---------------------------------|----------|
|                                 | uthbou       |          |        |         | <br> Westboun        | d.       |        |                                 | :<br> Northbou                                              | nri                   |        |       | Eastbour    | nd    |             |                                 |          |
| 51                              |              |          |        |         | +                    |          |        |                                 |                                                             |                       |        |       |             |       | _           |                                 |          |
| ate 09/28                       | Left<br>3/94 | Thru<br> | Right  | Other   | ¦ Left               | Thru<br> | Right  | Other                           | ¦ Left                                                      | Thru                  | Rignt  | Other | ¦ Left      | Thru  | Right       | Other ¦                         | Total    |
| 6:00                            | 12           | 37       | 0      | 0       | : 8                  | 0        | 14     | 0                               | ! 0                                                         | 26                    | 7      | 0     | : 0         | 0     | 0           | 0 !                             | 104      |
| 6:15                            | 12           | 26       | õ      | ŏ       |                      | ŏ        |        | ŏ                               | •                                                           | 37                    | 7      | 0     | 0           | 0     | Ō           | Ó                               | 95       |
| 6:30                            | 12           | 31       | ŏ      |         | 2                    | Ő        | 2      |                                 | 0                                                           | 36                    | 5      | Ő     | Ō           | 0     | Ő           | Ő                               |          |
| 6:45                            | 13           | 20       | ō      | 0       | • -                  | 0        | 9      | 0                               | . 0                                                         | 27                    | 4      | Ċ     | 0           | 0     | 0           | 0                               |          |
| r Total                         | 49           | 114      | 0      | 0       |                      | 0        | 33     | 0                               | : 0                                                         | 126                   | 23     | 0     | 0           | 0     | 0           | 0 ;                             |          |
| 7:00                            | 17           | 30       | 0      | 0       | ; 7                  | 0        | 7      | 0                               | : 0                                                         | 23                    | 1      | 0     | 0           | 0     | 0           | 0 ;                             | 90 =     |
| 7:15                            | 16           | 18       | 0      | 0       | 2                    | 0        | 11     | 0                               | 0                                                           | 52                    | 7      | 0     | 0           | 0     | 0           | 0                               | 96       |
| 7:30                            | 13           | 29       | 0      |         | 0                    | 1        | 3      | 0                               | 0                                                           | 51                    | 3      | 0     | 0           | 0     | 0           | 0 ;                             | 80       |
| 7:45                            | 8            | 34       | 0      | 0       | 2                    | 0        | 9      | 0                               | 0                                                           | 25_                   | 5_     | 00    |             | 0     | 0           | 0                               | 81       |
| r Total                         | 54           | 111      | Û      | C       | 11                   | 1        | 30     | 0                               | : 0                                                         | 116                   | 14     | 0     | 0           | 0     | 0           | 0 ;                             | 337      |
| TOTAL*                          | 103          | 225      | Û      | 0       | ; 30                 | 1        | 63     | 0                               | ; 0                                                         | 242                   | 37     | 0     | ; 0         | 0     | 0           | 0 !                             | 701 **   |
| eak Hour<br>eak start           |              | is Øy    | Entire | Interse | ction for<br>{ 16:00 | the P    | eriod: | 16:00 t                         | o 18:00 o<br>  16:00                                        |                       | 8/94   |       | ; 16:00     | )     |             |                                 | <b>.</b> |
| olume .                         | 49           | 114      | 0      | 0       | 19                   | 0        | 33     | 0                               | 0                                                           | 126                   | 23     | 0     | 0           | 0     | 0           | 0 }                             | ,        |
| ercent                          | 30%          | 70\$     | 03     | 01      | 37\$                 | 0*       | 63     | 05                              | 01                                                          | 85≒                   | 15\$   | 05    | 0\$         | 03    | 0\$         | 0\$                             | E.       |
| k total                         | 163          |          |        |         | 52                   |          |        |                                 | 149                                                         |                       |        |       | 0           |       |             | ł                               |          |
| ighest                          | 16:00        |          |        |         | 16:00                |          |        | :                               | 16:15                                                       |                       |        |       | 16:00       |       |             | ł                               | • ·      |
| olume                           | 12           | 37       | 0      | 0       | 8                    | 0        | 14     | 0                               | 0                                                           | 37                    | 7      | 0     | 0           | 0     | 0           | 0 [                             |          |
| i total                         | 49           |          |        |         | 22                   |          |        | 1                               | 44                                                          |                       |        |       | ; O         |       |             | 1                               | ¢        |
| HF                              | .83          |          |        |         | .59                  |          |        | 1                               | .35                                                         |                       |        |       | .0          |       |             |                                 |          |

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• . • AUSTIN, TAUTSUMI & ASSOCIATES, INC.

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## APPENDIX B

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## LEVEL OF SERVICE CALCULATIONS

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# **EXISTING 1994 LOS CALCULATIONS**

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KULA RESIDENT LOTS EXISTING 1994 AH

02/27/95 10:04:08

# SIGNAL94/TEAPAC[V1 L1.0] - Summary of Parameter Values

Intersection Parameters for Int # 1 - HANA HWY & HALEAKALA HWY

METROAREA NONCOD LOSTTIME 2.0 LEVELOFSERVICE C S NODELOCATION . 0 0

Approach Parameters

| APPLABELS       | SB   | WB   | NB   | EB   |
|-----------------|------|------|------|------|
| GRADES          | .0   | .0   | .0   | .0   |
| PEDLEVELS       | LOW  | LOW  | LOW  | LOW  |
| PARKINGSIDES    | NONE | None | HONE | None |
| PARKVOLUMES     | 20   | 20   | 20   | 20   |
| BUSVOLUMES      | 0    | 0    | 0    | 0    |
| RIGHTTURNONREDS | 0    | 0    | 0    | 0    |

Movement Parameters

| MOVLABELS       | RT T      | H LT | RT     | тн     | LT   | RT   | . TH | I LT |      |        |      |
|-----------------|-----------|------|--------|--------|------|------|------|------|------|--------|------|
| VOLUMES         | 9 78      |      | 1      | 87     | 2031 |      |      |      | RT   | TH     |      |
| WIDTHS          | 12.0 22.0 |      | 12.0   |        |      | 342  |      |      | 9    | 26     | 25   |
| LANES           |           | 2 1  | 12.0   | 11.0   | 11.0 | 12.0 |      |      | 12.0 | 11.0   | .0   |
| UTILIZATIONS    |           | •    | 1      | 1      | 1    | 1    | 2    | 1    | 1    | 1      | 0    |
|                 | 1.00 1.00 |      | 1.00   | 1.00   | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00   | 1.00 |
| TRUCKPERCENTS   | 1.0 2.0   |      | 2.0    | 2.0    | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0    | 2.0  |
| PEAKHOURFACTORS | 1.00 1.00 | 1.00 | 1.00   | 1.00   | 1.00 | 1.00 | 1.00 | 1.00 |      | 1.00   | 00.1 |
| ARRIVALTYPES    | 33        | 3    | 3      | 3      | 3    | 3    | 3    | 3    | 3    | 3      |      |
| ACTUATIONS      | NO NO     | YES  | NO     | YES    | YES  | Ю    | КО   | YES  | -    | -      | 3    |
| REQCLEARANCES   | 4.0 4.0   | 4.0  | 4.0    | 4.0    | 4.0  |      |      |      | NO   | YES    | YES  |
| MININUMS        | 5.0 5.0   |      | 5.0    |        |      | 4.0  | 4.0  | 4.0  | 4.0  | 4.0    | 4.0  |
| IDEALSATFLOWS   |           |      |        | 5.0    | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0    | 5.0  |
| FACTORS         |           | 1900 |        |        | 1900 | 1900 | 1900 | 1900 | 1900 | 1900   | 1900 |
|                 | 1.00 1.00 |      | 1.00 1 | 1.00 1 | i.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00   | 1.00 |
| DELAYFACTORS    | 1.00 1.00 |      | 1.00 1 | .00 1  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |        |      |
| NSTOPFACTORS    | 1.00 1.00 | 1.00 | 1.00 1 | .00 1  | .00  | 1.00 | 1.00 | 1.00 |      | 1.00   |      |
| GROUPTYPES      | FFLW NORM | NORM | FFLW N | ORM D  | OPT  |      |      | NORM |      | IORM I |      |
| SATURATIONFLOWS | 0 3601    | 1711 |        | 721 1  |      |      |      | 1711 |      |        |      |
|                 |           |      | ••     |        |      | • •  | 0001 | .,   | 0    | 724    | 0    |

Phasing Parameters

| SEQUENCES<br>PERMISSIVES<br>OVERLAPS<br>CYCLES<br>GREENTIMES<br>YELLOWTIMES<br>CRITICALS<br>EXCESS | 67<br>YES<br>60<br>5.42<br>4.00<br>9<br>0 | YES<br>YES<br>180<br>.00<br>.00<br>0 | YES<br>YES<br>10<br>11.95<br>4.00<br>2 | YES<br>YES<br>21.21<br>4.00<br>6 | 5.42<br>4.00<br>11 | LEADLAGS<br>OFFSET<br>PEDTIME | NONE<br>.00<br>.0 | NONE<br>1<br>0 |  |
|----------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------------------|----------------------------------------|----------------------------------|--------------------|-------------------------------|-------------------|----------------|--|
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انسقل KULA RESIDENT LOTS 02/27/95 **EXISTING 1994** 10:04:14 AM 4.41 . SIGHAL94/TEAPAC[V1 L1.0] - Capacity Analysis Summary ومسكل Intersection Averages for Int # 1 - HANA HWY & HALEAKALA HWY Degree of Saturation (v/c) 1.29 Vehicle Delay 33.6 Level of Service D din. Sq 67 ¦ Phase 1 | Phase 2 | Phase 3 | Phase 4 | Phase 5 | \*\*/\*\* ------8-i-i ! 1 -| \* + + 1 \* + + /:\ \* +> | +> <++++; \*\*\*\* اسلا v \_ ł y |\*\*\*\* North ζ# **(+ + <+ +** 1####> \* -+ + + + 5.1×1 ++ ; \* ++ } | G/C= .090 | G/C= .000 | G/C= .199 | G/C= .353 | G/C= .090 -G= 5.4" | G= .0" | G= 12.0" | G= 21.2" | G= 5.4" } Y+R= 4.0" ; Y+R= .0" ; Y+R= 4.0" ; Y+R= 4.0" ; Y+R= 4.0" ; OFF= -.0% ; OFF=15.7% ; OFF=15.7% ; OFF=42.3% ; OFF=84.3% ; ------C= 60 sec G= 44.0 sec = 73.3% Y=16.0 sec = 26.7% Ped= .0 sec = .0% • • \$ -1 {Lane {Width/{ g/C { Service Rate; Adj } { KCM { L }90% Max} 5.4 ; Group | Lanes; Reqd Used | &C (vph) &E ;Volume; v/c | Delay | S | Queue ; a ---S8 Approach τ. 29.2 D+ TH | 22/2 | .243 | .233 | 744 | 838 | 782 | .933 | 29.6 | +D+; 253 ft 6.1 LT | 11/1 | .000 | .124 | 352 | 397 | 15 | .038 | 8.1 | B+; 25 ft; **1** - 1 N8 Approach 13.5 8 **7** -- 1 ..... TH 22/2 | .103 | .233 | 744 | 838 | 274 | .327 | 14.6 | B | 89 ft ι. LT | 11/1 | .000 | .124 | 290 | 331 | 57 | .172 | 8.3 |\*B+| 42 ft ¥\*\* 1 ۱. WB Approach 38.7 D r~-TH | 11/1-| .639 | .387 | 617 | 666 | 1086 |1.631 | 38.7 | 0 | 562 ft LT | 11/1+| .614 | .387 | 613 | 662 | 1032 |1.559 | 38.8 |\*D | 534 ft I ----E8 Approach 22.1 C з, LT+TH | 11/1 | .114 | .124 | 56 | 80 | 51 | .573 | 22.1 |\*C | 38 ft t----

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KULA RESIDENT LOTS Existing 1994 PM 02/27/95 10:06:45

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#### SIGNAL94/TEAPAC[VI L1.0] - Summary of Parameter Values

Intersection Parameters for Int # 1 - HANA HWY & HALEAKALA HWY

| METROAREA      | NO | ICBD |
|----------------|----|------|
| LOSTTIME       |    | 2.0  |
| LEVELOFSERVICE | C  | S    |
| NODELOCATION   | 0  | 0    |

Approach Parameters

| APPLABELS       | SB   | WB   | NB   | EB   |
|-----------------|------|------|------|------|
| GRADES          | .0   | .0   | .0   | .0   |
| PEDLEVELS       | LOW  | LOW  | LOW  | LOW  |
| PARKINGSIDES    | NONE | NONE | NONE | NONE |
| PARKVOLUMES     | 20   | 20   | 20   | 20   |
| BUSVOLUNES      | 0    | 0    | 0    | 0    |
| RIGHTTURNONREDS | 0    | 0    | 0    | 0    |

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Movement Parameters

| MOVLABELS       | RT          | TH   | LT   | RT   | TH   | LT   | RT   | TH   | LT   | RT   | TH   | ĻT   |  |
|-----------------|-------------|------|------|------|------|------|------|------|------|------|------|------|--|
| VOLUMES         | 29          | 423  | 32   | 100  | 31   | 492  | 1588 | 809  | 13   | 25   | 116  | 44   |  |
| WIDTHS          | 12.0        | 22.0 | 11.0 | 12.0 | 11.0 | 11.0 | 12.0 | 22.0 | 11.0 | 12.0 | 11.0 | .0   |  |
| LANES           | 1           | 2    | 1    | 1    | 1    | 1    | 1    | 2    | 1    | 1    | 1    | 0    |  |
| UTILIZATIONS    | 1.00        | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| TRUCKPERCENTS   | 1.0         | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  |  |
| PEAKHOURFACTORS | 1.00        | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| ARRIVALTYPES    | 3           | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |
| ACTUATIONS      | NO          | NO   | YES  | NO   | YES  | YES  | 98   | NO   | YES  | NO   | YES  | YES  |  |
| REQCLEARANCES   | 4.0         | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  |  |
| MININUMS        | 5.0         | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  |  |
| IDEALSATFLOWS   | 1900        | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |  |
| FACTORS         | 1.00        | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| DELAYFACTORS    | 1.00        | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| NSTOPFACTORS    | 1.00        | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| GROUPTYPES -    | <b>FFLW</b> | NORM | NORM | FFLW | NORM | DOPT | FFLW | NORM | NORM | FFLW | NORM | NORM |  |
| SATURATIONFLOWS | 0           | 3601 | 1711 | 0    | 1724 | 1711 | 0    | 3601 | 1711 | 0    | 1316 | 0    |  |

Phasing Parameters

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| SEQUENCES   | 57   |     |       |       |      |          |      |      |
|-------------|------|-----|-------|-------|------|----------|------|------|
| PERMISSIVES | YES  | YES | YES   | YES   |      | LEADLAGS | NONE | NONE |
| OVERLAPS    | YES  | YES | YES   | YES   |      | OFFSET   | .00  | 1    |
| CYCLES      | 60   | 180 | 10    |       |      | PEDTINE  | .0   | 0    |
| GREENTIMES  | 6.44 | .00 | 16.08 | 11.78 | 9.70 |          |      |      |
| YELLOWTINES | 4.00 | .00 | 4.00  | 4.00  | 4.00 |          |      |      |
| CRITICALS   | 3    | 0   | 8     | 5     | 11   |          |      |      |
| EXCESS      | 0    |     |       |       |      |          |      |      |

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KULA RESIDENT LOTS 02/27/95 EXISTING 1994 10:07:17 PH SIGHAL94/TEAPAC(V1 L1.0) - Capacity Analysis Summary Intersection Averages for Int # 1 - HANA HWY & HALEAKALA HWY Degree of Saturation (v/c) .62 Vehicle Delay 15.5 Level of Service C+ Sq 57 | Phase 1 | Phase 2 | Phase 3 | Phase 4 | Phase 5 | \*\*/\*\* ------ 
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 //\ ++++ v ¦ssss († ¥ North ! **(†** 122223 ł ŧ ÷ \* + + \* - | - 1 ; G/C= .107 ; G/C= .000 ; G/C= .268 ; G/C= .196 ; G/C= .162 ; G= 6.4" | G= .0" | G= 16.1" | G= 11.8" | G= 9.7" Jacob Barriel | Y+R= 4.0" | Y+R= .0" | Y+R= 4.0" | Y+R= 4.0" | Y+R= 4.0" | OFF= -.0% | OFF=17.4% | OFF=17.4% | OFF=50.9% | OFF=77.2% | ·---C= 60 sec G= 44.0 sec = 73.3% Y=16.0 sec = 26.7% Ped= .0 sec = .0% ..... Group ! Lanes | Reqd Used | @C (vph) @E |Volume | v/c | Delay | S | Queue | ..... SB Approach 12.3 8 ..... ; TH | 22/2 | .146 | .301 | 1005 | 1085 | 423 | .390 | 12.7 | 8 | 125 ft; LT | 11/1 | .000 | .141 | 325 | 361 | 32 | .089 | 6.3 |\*8+ 25 ft ..... ۰. **1** - 1 NB Approach 16.2 C+ TH | 22/2 | .250 | .301 | 1005 | 1085 | 809 | .746 | 16.4 |\*C+; 238 ft; LT | 11/1 | .000 | .141 | 375 | 412 | 13 | .032 | 6.2 | B+; 25 ft; ۰. W8 Approach 16.5 C+ ۶. } TH { 11/1-} .191 } .230 } 336 } 396 } 268 } .677 } 16.8 }\*C+} 174 ft 1..... LT | 11/1+ .184 | .230 | 333 | 393 | 255 | .649 | 16.1 | C+ 166 ft 2.1 EB Approach 17.5 Cł LT+TH | 11/1 | .161 | .195 | 203 | 257 | 160 | .623 | 17.5 |\*C+| 109 ft| **r**~ 

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| Major Street: PUKALAINI<br>Minor Street: MAKAWAO AV<br>Scenario: EXISTING<br>Peak Hour: AM |              |         |               |      |       |      |              |       |         |           | Inte       |            | - •    | 23-Feb-<br>BC<br>BYPMAK- |
|--------------------------------------------------------------------------------------------|--------------|---------|---------------|------|-------|------|--------------|-------|---------|-----------|------------|------------|--------|--------------------------|
| Peak Hour Factor:                                                                          | 1.00         |         |               |      | ¥12   |      | V11          |       | V1C     | )         |            |            |        |                          |
| HAJOR STREET                                                                               |              |         |               |      | 396   | 5    | 228          |       | 112     | 2         |            | <          | NOR    | TH                       |
| Rum of Lanes - V2:                                                                         | 2            |         |               |      | ļ     | i    | i            |       | į       |           |            |            |        |                          |
| Excl LT - V1 (Y/N):                                                                        | Ŷ            |         |               |      | /     |      |              |       | í,      |           |            |            |        |                          |
| Excl RT - V3 (Y/H):                                                                        | Ý            |         |               |      | ć     |      | l<br>V       |       | ۱       | >         |            |            |        |                          |
| Stop/Yield - V3 (Y/H):                                                                     | Ň            |         |               |      | •     |      | •            |       |         | ·         |            |            |        |                          |
| Grade - V1, V2, V3:                                                                        | 2            |         |               | ^    |       |      |              |       |         |           | •          |            |        |                          |
|                                                                                            |              |         |               | 1    |       |      |              |       |         |           | ١          |            |        |                          |
| Num of Lanes - VS:                                                                         | 1            | V1 (    | ;             |      |       |      |              |       |         |           | ·          | - 11       | 3 V6   |                          |
| Excl LT - V4 (Y/N):                                                                        | Y            |         |               |      |       |      |              |       |         |           |            |            | - ••   |                          |
| Excl RT - V6 (Y/H):                                                                        | Y            | V2 30   | )             | >    |       |      |              |       |         |           | (          | - 48       | 1 V5   |                          |
| Stop/Yield - V6 (Y/N):                                                                     | 8            |         |               |      |       |      |              |       |         |           |            |            |        |                          |
| Grade - V4,V5,V6:                                                                          | -2           | V3 70   |               | ·- , |       |      |              |       |         |           |            | • 1        | B V4   |                          |
| MINOR STREET                                                                               |              |         |               | 1    |       |      |              |       |         |           | 1          |            |        | _                        |
| Num of Lanes - V8:                                                                         | ;<br>1       |         |               | v    |       |      |              |       |         |           |            | MAJOR      |        |                          |
| Grade - V7,V8,V9:                                                                          |              |         |               |      | ,     |      | •            |       |         |           |            | PUKALA     | AINI B | YPASS                    |
| Shared Lane-V7,8,9:                                                                        | 0            |         |               |      | ì     |      | 1            |       | ,       |           |            |            |        |                          |
| (0=N,1=LT,2=TR,3=LTR)                                                                      |              |         |               |      | `!    |      |              |       | /       |           |            |            |        |                          |
| (                                                                                          |              |         |               |      |       |      | !            |       |         |           |            |            |        |                          |
| Num of Lanes - V11:                                                                        | 1            |         |               |      | 14    |      | 175          |       | 5       |           |            |            |        |                          |
| Grade - V10,V11,V12:                                                                       | 0            |         |               |      |       |      |              |       | -       |           |            |            |        |                          |
| Shared Lane-Vi0,11,12:                                                                     | 0            |         |               |      | ٧7    |      | ٧8           |       | ٧9      |           |            |            |        |                          |
| (0=N,1=LT,2=TR,3=LTR)                                                                      | }            |         |               |      |       |      |              |       |         |           |            |            |        |                          |
|                                                                                            | ł            |         |               |      | MINOR | STR  | EET - P      | IAKAW | AD AV   |           |            |            |        |                          |
| /DLUME ADJUSTMENTS                                                                         | !            | •••     |               | ;    |       |      |              |       |         |           |            |            |        |                          |
| MOVEMENT NO.                                                                               | j            | 1       | 2             | 3    | 4     | 5    | 6            | 7     | 8       | 9         | 10         | 11         | 12     | )                        |
| HOURLY FLOW RATE, V(vph)                                                                   | j            | 9       | 30            | 70   | 8     |      | 113          |       | 175     |           | 112        | 228        |        |                          |
| VOLUME, v (pcph)                                                                           | i            | 13      | 30            | 70   | 8     | 481  |              |       | 193     | 6         | 123        | 251        | 436    |                          |
|                                                                                            | <b></b>      |         | ••            |      |       |      |              |       |         |           |            |            |        |                          |
| TEP 1: RT FROM MINOR STREET                                                                | •            | 9 = 1/2 | UT 1          |      | -     |      |              |       |         |           |            |            |        |                          |
| Conflicting Flows:<br>Potential Capacity:                                                  |              |         | <b>1</b> 3 T  | 42 - |       |      | vhp          |       | Vc12 =  | •         | V6 +       | V5 :       |        | vhp                      |
| Novement Capacity:                                                                         | ¦Cp,         | 9=CP,9  | -             |      |       |      | pcph<br>Doob |       | Cp,12   |           | <b>.</b> _ |            |        | pcph                     |
| Prb. of Queu-free State:                                                                   |              | 9=1-19  |               | -    |       | .00  | pcph         |       | Cm, 12= |           |            | <b>^</b> _ |        | pcph                     |
|                                                                                            | ; <b>,</b> , |         |               |      | ۰<br> |      |              | i<br> | po,12=  | 1-A19<br> | (/UE,1)    | 2=         | 0.45   |                          |
| EP 2: LT FROM MAJOR STREET                                                                 | ł            |         |               |      |       |      |              | !     |         |           |            |            |        |                          |
| Conflicting Flows:                                                                         | ۷c,          | 4 = V2  | + V3          | :    |       | 100  | vhp          | 1     | Vc,1 =  | V5 ÷      | + V6 =     |            | 594    | vhp                      |
| Potential Capacity:                                                                        | Cp,          | 4 =     |               |      |       |      | pcph         |       | Cp,1 =  | -         | -          |            |        | pcph                     |
| Movement Capacity:                                                                         | ¦Cm,         | 4=CP,4  |               |      |       |      | pcph         |       | Cm,1=C; | o,1=      |            |            |        | poph                     |
| Prb. of Queu-free State:                                                                   | ¦pa,         | 4=1*V4/ | C <b>n</b> 4= |      |       | . 99 |              |       | 00,1=1- |           |            |            | 0.98   | •                        |
| Major Left Shared Lane                                                                     | ł            |         |               |      |       |      |              | 1     |         | •         |            |            |        |                          |
| Prob. of Queue-free State                                                                  |              |         |               |      |       |      |              |       |         |           |            |            |        |                          |

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| Major Street: PUKALAINI BYPA<br>Minor Street: MAKAWAO AV<br>Scenario: EXISTING<br>Peak Hour: AM                       | 155     |                         |              | I           | ntesection       | Analy<br>File Na | ine: BYPMAK-A    |
|-----------------------------------------------------------------------------------------------------------------------|---------|-------------------------|--------------|-------------|------------------|------------------|------------------|
| STEP J: TH FROM MINOR STREET                                                                                          | }       |                         |              | 1           |                  |                  |                  |
| Conflicting Flows:                                                                                                    | Yc.,8   | = 1/2V3+V2              | +V1+V6+V5+V4 | 4           | Vc.,11 = 1       | /2¥6+¥5+¥4+      | V3+V2+V1         |
|                                                                                                                       |         |                         | 528          | vph         | :                |                  | 528 vph          |
| Potential Capacity:<br>Capacity Adi Sactor                                                                            | ιτρ,8 = | 4100 1 -                | 536          | pcph        | Cp,11 =          | Tao 1 -          | 536 pcph         |
| Movement Canacity:                                                                                                    |         | /,4*pa,1 =<br>^n 0±fa = | V.98<br>534  | i<br>nonh l | TII = p0,4       | *pa,1 =          | 0.90<br>534 pach |
| Conflicting Flows:<br>Potential Capacity:<br>Capacity Adj Factor:<br>Movement Capacity:<br>Prob. of Queue-free State: | ;po,8 = | 1-v8/Cm,8               | = 0.63       | popii i     | po,11 = 1-       | vil/Cm,li =      | 0.52             |
| STEP 4: LT FROM MINOR STREET                                                                                          | <br>!   |                         |              | ·<br>!      |                  |                  | ***********      |
| Conflicting Flows:                                                                                                    | Vc,7 =  | 1/2V3+V2+               | V1+1/2V6+V5+ | V4+         | Vc,10 = 1/       | 2V6+V5+V4+1,     | /2V3+V2+V1+      |
| -                                                                                                                     |         |                         | 12) = 840    | vph         | 1/2              | (V8+V9) =        |                  |
| Potential Capacity:<br>Major Left, Minor Through                                                                      | Cp7 =   |                         | 307          | pcph [      | Cp10 =           |                  | 428 pcph         |
| Impedance Factor:                                                                                                     | P''7=po | ,11*f11 =               | 0.51         | i           | P''10=po,8       | *f8 =            | 0.62             |
| Major Left, Hinor Through                                                                                             | 1       |                         |              | ł           |                  |                  |                  |
| Adjusted Impedance Factor:<br>Capacity Adjustment Factor:                                                             | p 7 =   |                         | 0.62         | ļ           | p'10 =           | _                | 0.70             |
| Capacity Adjustment Factor:                                                                                           | f7 = p' | 7*po,12 =               | 0.28         |             | $f10 = p'10^{3}$ | *po,9 =          | 0.70             |
| Movement Capacity:                                                                                                    |         |                         | <b>C</b> 0   | pepn (      | UN, 10 - 110     |                  | 279 pcpn         |
| DELAY AND LEVEL OF SERVICE SUMM                                                                                       | IARY    |                         |              | AVG         |                  | ł                |                  |
| MOVENENT                                                                                                              |         |                         | csh(pcph)    |             | LOS              |                  |                  |
| MINOR LEFT TURN (7)                                                                                                   |         | 85                      | NA           | <br>51.4    | <br>F            | LEVEL OF         | SERVICE CRITERI  |
| MINOR THROUGH (8)                                                                                                     | 193     |                         | NA           |             | C                | -                |                  |
| MINOR RIGHT TURN (9)                                                                                                  | 6       | 1361                    | NA           | 2.7         | A                | LEVEL            | AVG<br>Total     |
| MINOR LEFT TURN (10)                                                                                                  | 123     | 299                     | NA           | 20.1        | D                | OF               | DELAY            |
| MINOR THROUGH (11)                                                                                                    | 251     | 524                     | HA           | 13.0        |                  | SERVICE          | (SEC/VEH         |
| MINOR RIGHT TURN (12)                                                                                                 | 436     | 790                     | NA           | 10.0        | 8                |                  | <br><=5          |
| MAJOR LEFT (1)                                                                                                        | 13      | 823                     | HA           | 4.4         | A                | 1 R              | >5&<=10          |
| MAJOR LEFT (4)                                                                                                        | 8       | 1515                    | NA           | 2.4         |                  | : C              | >10&<=20         |
|                                                                                                                       | •       |                         |              |             |                  | D                | >20&<=30         |
| MINOR APPROACH (7)(8)(9)                                                                                              | -       | -                       | -            | 13.4        | C                | E                | >30&<=45         |
| NINOR APPROACH (10)(11)(12)                                                                                           | -       | -                       | •            | 12.5        |                  | F                | >45              |
| MAJOR APPROACH (1)(2)(3)                                                                                              | •       | -                       | -            | 0.5         | A                | i<br>1<br>1      |                  |
| MAJOR APPROACH (4)(5)(6)                                                                                              | -       | -                       | •            | 0.0         |                  | 1                |                  |
|                                                                                                                       |         |                         |              |             |                  |                  |                  |

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| Sce                  | Street: MAKAWAD A<br>mario: EXISTING<br>Hour: PM | BYPAS<br>V |                                         |         |              |          |          |            |        | In     |        |           | 23-Feb-95<br>BC<br>BYPMAK-P<br>2 |
|----------------------|--------------------------------------------------|------------|-----------------------------------------|---------|--------------|----------|----------|------------|--------|--------|--------|-----------|----------------------------------|
| Pe                   | ak Hour Factor:                                  | 1.00       | :                                       |         |              | V12      | VI.      | 1          | V10    | •••••• |        |           |                                  |
|                      |                                                  |            | i                                       |         |              | 100      | 266      | 5          | 98     |        | (      | NORTH     |                                  |
|                      | HAJOR STREET                                     |            | 1                                       |         |              | 1        | 1        |            | 1      |        | •      |           |                                  |
|                      | of Lanes - V2:                                   | 2          |                                         |         |              | ł        | Ì        |            | i      |        |        |           |                                  |
|                      | LT - V1 (Y/N):                                   | Y          | 1                                       |         |              | 1        | 1        |            | 1      |        |        |           |                                  |
|                      | RT - V3 (Y/N):                                   | Y          |                                         |         |              | <        | v        |            | >      |        |        |           |                                  |
| 5000/116             | eld - V3 (Y/N):                                  | H          |                                         |         |              |          |          |            |        |        |        |           |                                  |
| Gra                  | ade - V1,V2,V3:                                  | 2          | ł                                       |         | î            |          |          |            |        | ^      |        |           |                                  |
| ¥                    | - <b>*</b> 1                                     |            | 1                                       |         | 1            |          |          |            |        | 1      |        |           |                                  |
|                      | of Lanes - V5:                                   | 1          | VI 3                                    | 14      |              |          |          |            |        |        | 10     | 7 V6      |                                  |
|                      | LT - V4 (Y/N):                                   | Y          | ł                                       |         |              |          |          |            |        |        |        |           |                                  |
|                      | RT - V6 (Y/H):                                   | Y          | V2 2                                    | 99      | >            |          |          |            |        | <      | - 172  | 2 V5      |                                  |
|                      | ld - V6 (Y/N):                                   | K          |                                         |         |              |          |          |            |        |        |        |           |                                  |
| 613                  | de - V4,V5,V6:                                   | -2         | V3 .                                    | 59      | ••           |          |          |            |        |        | - 8    | B V4      |                                  |
|                      |                                                  |            |                                         |         | 1            |          |          |            |        | 1      |        |           |                                  |
|                      | -MINOR STREET                                    |            |                                         |         | ۷            |          |          |            |        | v      | MAJOR  | STREET    |                                  |
|                      | of Lanes - V8:                                   | 1          |                                         |         |              |          |          |            |        |        | PUKALA | ANI BYPAS | <b>SS</b>                        |
| 6rac                 | de - V7,V8,V9:                                   | 0          |                                         |         |              | ٢.       | ^        |            | >      |        |        |           |                                  |
|                      | d Lane-V7,8,9:                                   | 0          |                                         |         |              | A.       |          |            | 1      |        |        |           |                                  |
| (v=n,1=C)            | [,2=TR,3=LTR)                                    |            |                                         |         |              |          | 1        |            | ;      |        |        |           |                                  |
| Hun of               |                                                  |            |                                         |         |              | 1        | 1        |            | 1      |        |        |           |                                  |
|                      | Lanes - VII:                                     | 1          |                                         |         |              | 10       | 224      | 1          | 14     |        |        |           |                                  |
| Grade -<br>Shanad La | · V10,V11,V12:                                   | 0          |                                         |         |              |          |          |            |        |        |        |           |                                  |
| SHALED LA            | ne-V10,11,12:                                    | 0          |                                         |         |              | V7       | ¥8       | ۷9         | )      |        |        |           |                                  |
| (v-a,1-L)            | ,2=TR,3=LTR)                                     | į          |                                         |         |              |          |          |            |        |        |        |           |                                  |
|                      |                                                  | i          |                                         |         | l            | MINOR ST | REET - I | NAKAWAD AV | 1      |        |        |           |                                  |
| VOLUME AD            | THETWENTE                                        | ·          |                                         |         |              | *******  |          |            |        |        |        |           |                                  |
| MOVENEI              |                                                  | i          |                                         |         | -            |          |          | _          |        |        |        |           |                                  |
|                      | FLOW RATE, V(vph)                                | Ì          |                                         | 1 2     | 3            |          | 5 6      |            | 89     | 10     | 11     | 12        |                                  |
| VOLUME               | , v (pcph)                                       | i          | 31-                                     |         | 59           | 8 17     |          |            | 4 14   | 98     | 266    | 100       |                                  |
|                      | , v (popii)                                      | i          | 44(                                     | 299     | 59           | 8 17     | 2 107    | 11 24      | 6 15   | 108    | 293    | 110       |                                  |
| STEP 1. RT           | FROM HINOR STREET                                | r 1        |                                         |         |              |          |          | ·          |        |        |        |           |                                  |
|                      | cting Flows:                                     |            | -0 - 1                                  |         | <b>110</b> - |          | •        |            |        |        |        |           |                                  |
|                      | ial Capacity:                                    |            | c9 = 1/                                 | 2 43 4  | • ¥Z =       |          | 0 vhp    |            |        | 2 76 + | V5 =   | 172 vh    |                                  |
|                      | nt Capacity:                                     |            | p,9 =                                   | o       |              |          | 3 pcph   | Cp,1       |        |        |        | 1133 pc   |                                  |
|                      | Queu-free State:                                 |            | ∎,9=Cp,                                 |         | _            |          | 3 pcph   |            | 12=Cp, |        |        | 1133 рс   | ph                               |
|                      |                                                  | iP         | 0,9=1-v                                 | 9/UM,9  | <b>.</b>     | 0.99     | 9        | ; po,1     | 12=1-v | 12/Cm, | 12=    | 0.90      |                                  |
| STEP 2: IT           | FROM MAJOR STREET                                |            |                                         |         |              |          |          | *********  |        |        |        |           | *******                          |
|                      | ting Flows:                                      |            |                                         | 3 1 117 | -            |          |          |            |        |        |        |           |                                  |
|                      | al Capacity:                                     |            | c,4 = V                                 | 2 7 83  | -            |          | 3 vhp    |            |        | + V6 : |        | 279 vh    |                                  |
|                      | t Capacity:                                      |            | 0,4 =                                   | 4-      |              |          | pcph     | Cp,1       |        |        |        | 1214 pc   |                                  |
|                      | Queu-free State:                                 |            | ∎,4=Cp,                                 |         |              |          | pcph     |            | =Cp,1= |        |        | 1214 pc   | ph                               |
|                      |                                                  |            | ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,, | 4/Cm4=  |              | 0.99     |          | ; po,1     | =1-v1/ | Cm1=   |        | 0.64      |                                  |
|                      |                                                  | i i        | •                                       |         |              |          |          |            | •      |        |        |           |                                  |
| Major L              | eft Shared Lane<br>of Queue-free State           | ł          | ·o,4=                                   |         |              | KA       |          | p≭o,.      | -      |        |        | NA        |                                  |

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| Major Street: PUKALANI BYPASS<br>Minor Street: MAKAWAO AV<br>Scenario: EXISTING<br>Peak Hour: PM |              |                  | In             | tesection # | DATE:<br>Analyst:<br>File Name:<br>Intesection #: | BC<br>BYPMAK-P  |
|--------------------------------------------------------------------------------------------------|--------------|------------------|----------------|-------------|---------------------------------------------------|-----------------|
| STEP 3: TH FROM MINOR STREET                                                                     |              |                  | 1              |             |                                                   |                 |
|                                                                                                  |              | V3+V2+V1+V6+V5+V | •              |             | /286+85+84+83+                                    |                 |
|                                                                                                  | =            |                  | vph            |             |                                                   | 793 vph         |
| Potential Capacity:<br>Capacity Adj Factor:                                                      | Cp,8 =       |                  |                |             |                                                   |                 |
| Hovement Capacity:                                                                               |              |                  |                | f11 = po,4  |                                                   | .63<br>277 perb |
| Prob. of Queue-free State:                                                                       | po,8 = 1-v8  | /Cm,8 = 0.01     |                |             | /11/Cm,11 = 0                                     |                 |
| STEP 4: LT FROM MINOR STREET                                                                     |              |                  | <br>!          |             |                                                   |                 |
|                                                                                                  | Vc,7 = 1/2V  | 3+V2+V1+1/2V6+V5 | +V4+           | Vc,10 = 1/2 | 2V6+V5+V4+1/2V                                    | 3+V2+V1+        |
| _                                                                                                | 1/2(1        | V11+V12) = 976   |                |             | (V8+V9) =                                         |                 |
| Potential Capacity:                                                                              | Cp7 =        |                  | pcph           | Cp10 =      |                                                   | 279 pcph        |
| Major Left, Minor Through                                                                        |              | ·                |                | -           |                                                   |                 |
|                                                                                                  | P''7=po,11*  | f11 = 0.01       | ł              | P''10=po,84 | if8 = 0.                                          | .01             |
| Hajor Left, Hinor Through                                                                        |              |                  |                | •           |                                                   |                 |
| Adjusted Impedance Factor:                                                                       | p'7 =        | 0.05             |                | p'10 =      |                                                   | .05             |
| Capacity Adjustment Factor:                                                                      |              | 12 = 0.04        |                | f10 = p'10* | po,9 = 0.                                         | .05             |
| Novement Capacity: •                                                                             | CB,/ = T/#Cp | >,/ = 11         | poph ;         | Cm,10 = f10 | *Cp,10 =                                          | 14 pcph         |
| DELAY AND LEVEL OF SERVICE SUMMA                                                                 | RY           |                  | AVG            |             | 1                                                 |                 |
| HOVEMENT                                                                                         | v(pcph) cm(  | pcph) csh(pcph)  | TOTAL<br>DELAY | LOS         |                                                   |                 |
| HINDR LEFT TURH (7)                                                                              | 11 1         | 1NA              | 686.0          |             | LEVEL OF SER                                      | VICE CRITERIA   |
| MINOR THROUGH (8)                                                                                | 246 23       | 7NA              | 108.0          | F           | 1                                                 |                 |
| MINOR RIGHT TURN (9)                                                                             | 15 116       | 3NA              | 3.1            | A           |                                                   | AVG             |
|                                                                                                  |              |                  |                |             | LEVEL                                             | TOTAL           |
|                                                                                                  |              | 4NA              | 3631.1         | F           | OF                                                | DELAY           |
|                                                                                                  |              | 7NA              | 174.0          | F           | SERVICE                                           | (SEC/VEH)       |
| MINOR RIGHT TURN (12)                                                                            | 110 113      | 3NA              | 3.5            | A           | <br>А.                                            | <=5             |
| MAJOR LEFT (1)                                                                                   | 40 121       | 4NA              | 4.6            | A           | 8                                                 | >5&<=10         |
| NAJOR LEFT (4)                                                                                   | 8 110        |                  | 3.3            | A           | C                                                 | >10&<=20        |
|                                                                                                  |              |                  | -              |             | D                                                 | >20&<=30        |
| MINOR APPROACH (7)(8)(9)                                                                         |              |                  | 125.6          | F           | Ε                                                 | >30&<=45        |
| HINOR APPROACH (10)(11)(12)                                                                      |              | -                | 868.0          | F           | F                                                 | >45             |
| MAJOR APPROACH (1)(2)(3)                                                                         |              | -                | 2.6            | A           |                                                   |                 |
|                                                                                                  |              | -                | 0.1            | A           |                                                   |                 |
| MAJOR APPROACH (4)(5)(6)                                                                         |              |                  |                |             |                                                   |                 |

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| ajor Street: KULA HWY<br>inor Street: HALEAKALA HWY<br>Scenario: EXISTING<br>Peak Hour: AM |                      |               |      |          |          |              | Fil         | DATE:<br>Analyst:<br>Le Name:<br>ction #: | 23-Feb<br>BC<br>Halku |     |
|--------------------------------------------------------------------------------------------|----------------------|---------------|------|----------|----------|--------------|-------------|-------------------------------------------|-----------------------|-----|
|                                                                                            |                      |               | V12  |          | v11      | V10          |             |                                           |                       |     |
| Peak Hour Factor: 1.00                                                                     |                      |               | 132  |          | 37       | 39           |             | < NOI                                     | RTH                   |     |
| MAJOR STREET                                                                               |                      |               | i    |          | 1        | t i          |             |                                           |                       |     |
| Rum of Lanes - V2: 1                                                                       |                      |               | ļ    |          | 1        | <u>اً</u>    |             |                                           |                       |     |
| Excl LT - V1 (Y/N): Y                                                                      |                      |               | . !  |          | ŧ        | Ś            |             |                                           |                       |     |
| Excl RT - V3 (Y/H): Y                                                                      |                      |               | <    |          | v        |              |             |                                           |                       |     |
| Stop/Yield - V3 (Y/H): H                                                                   |                      | •             |      |          |          |              | •           |                                           |                       |     |
| Grade - V1,V2,V3: 2 ;                                                                      |                      |               |      |          |          |              | ١           |                                           |                       |     |
|                                                                                            |                      | 1             |      |          |          |              | ۱           | 48 V6                                     |                       |     |
| Num of Lanes - V5: 1                                                                       | V1 20 -              |               |      |          |          |              |             | 70 70                                     |                       |     |
| Excl LT - V4 (Y/N): Y                                                                      |                      |               |      |          |          |              |             | 5A7 VC                                    |                       |     |
|                                                                                            | V2 128 -             | >             | •    |          |          |              | (           | 503 VS                                    | ł                     |     |
|                                                                                            |                      |               |      |          |          |              |             | 100 11                                    | 1                     |     |
|                                                                                            |                      |               |      |          |          |              |             | 122 V4                                    | )                     |     |
| Grade - ¥4,¥5,¥6: -2                                                                       |                      | ١             |      |          |          |              | 1           |                                           |                       |     |
|                                                                                            |                      | ,<br>v        |      |          |          |              |             | AJOR STR                                  | (EE I                 |     |
| HINOR STREET                                                                               |                      |               |      |          |          |              |             | KULA HWY                                  |                       |     |
| Num of Lanes - V8: 1                                                                       |                      |               | <    |          | •        |              | >           |                                           |                       |     |
| Grade - V7, V8, V9: 0                                                                      | l<br>L               |               | ۱    |          | 1        | 1            |             |                                           |                       |     |
| Shared Lane-V7,8,9: 1                                                                      | 8                    |               | ì    |          | ļ        | ļ            |             |                                           |                       |     |
| (0=N,1=LT,2=TR,3=LTR)                                                                      | į                    |               |      |          | ļ        |              |             |                                           |                       |     |
|                                                                                            |                      |               | 1    | 3        | 55       | 144          |             |                                           |                       |     |
| Num of Lanes - V11: 1                                                                      |                      |               |      | 3        |          | • • •        |             |                                           |                       |     |
| Grade - V10,V11,V12: 0                                                                     | 1                    |               |      |          | 20       | ٧9           |             |                                           |                       |     |
| Shared Lane-V10,11,12: 1                                                                   | L<br>1               |               | ۷7   |          | 84       | 17           |             |                                           |                       |     |
| (0=N,1=LT,2=TR,3=LTR)                                                                      | <br> <br> <br>       |               | HIH  | IOR STRE | ET - H   | ALEAKALA HI  | iY<br>      |                                           |                       |     |
| VOLUME ADJUSTMENTS                                                                         | L<br>1               | _             | _    | . r      | ,        | 7 8          | 9 10        | 11                                        | 12                    |     |
| MOVEMENT NO.                                                                               | 1                    | 2             | 3    | 4 5      | 6        |              | 144 39      | 37                                        | 132                   |     |
| HOURLY FLOW RATE, V(vph)                                                                   |                      |               | 2 1  | 22 503   | 48       |              | 158 43      | 41                                        | 145                   |     |
| VOLUME, v (pcph)                                                                           | 28                   | 128           | 2 1  | 22 503   | 48       | 3 61         |             |                                           |                       | •-• |
|                                                                                            | <br>I                |               |      |          |          | 1            |             |                                           | '                     |     |
| STEP 1: RT FROM MINOR STREET                                                               | Vc9 = 1/2            | ) V3 + 1      | V2 = | 128      | vhp      | Vc12         | = 1/2 V6 ·  | + V5 =                                    | 503 vhp               |     |
| Conflicting Flows:                                                                         |                      |               |      |          | pcph     | . Cp.1       | 2 =         |                                           | 770 pcph              |     |
| Potential Capacity:                                                                        | Cp,9 =<br> Cm,9=Cp,9 | 3-            |      |          | pcph     | Cm.1         | 2=Cp,12=    |                                           | 770 pcph              | i - |
| Hovement Capacity:                                                                         | po,9=1-v             | /-<br>)/rm 0- |      | 0.87     |          | po.1         | 2=1-v12/Cm  | ,12=                                      | 0.81                  |     |
| Prb. of Queu-free State:                                                                   |                      | ·····         |      |          |          |              |             |                                           |                       |     |
| STEP 2: LT FROM MAJOR STREET                                                               | ł                    |               |      |          |          |              | - 116 1 114 | -                                         | 551 vhp               |     |
| Conflicting Flows:                                                                         | Vc,4 = V             | 2 + V3        | :    |          | vhp      | • •          | = VS + V6   | •                                         | 937 pcpt              |     |
| Potential Capacity:                                                                        | Cp,4 =               |               |      |          | pcph     | <b>C</b> p,1 |             |                                           | 937 pcpt              |     |
|                                                                                            | C∎,4=Cp,             | 4:            |      | 1486     | pcph     | Ca.          | L=Cp,1=     |                                           |                       | •   |
| Movement Capacity:                                                                         | po,4=1-v             | 4/Cm4=        |      | 0.92     | 1        | ¦ pο,        | 1=1-v1/Cm1= |                                           | 0.97                  |     |
| Prb. of Queu-free State:                                                                   | 16-11-24             | •             |      |          |          |              |             |                                           | цА                    |     |
| Major Left Shared Lane                                                                     | ¦p≭o,4=              |               |      | NA       | <b>`</b> | † p*0        | .1=         |                                           | NA                    |     |

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| Major Street: KULA HWY<br>Minor Street: HALEAKALA HWY<br>Scenario: EXISTING<br>Peak Hour: AM |                             |                                        | T            | A             | Analys<br>File Nam                      | e: HALKUL-A         |
|----------------------------------------------------------------------------------------------|-----------------------------|----------------------------------------|--------------|---------------|-----------------------------------------|---------------------|
|                                                                                              |                             |                                        |              | Lesection #   | Intesection                             | <b>#:</b> 3         |
| STEP 3: TH FROM MINOR STREET<br>Conflicting Flows:                                           | <br> Yc.,8 = 1/2V3+V        | 19 1 11 1 11 1 11 1 11 1 1 1 1 1 1 1 1 | ł            | V. 11 .       |                                         |                     |
| controoting troub.                                                                           | : :                         | 773 vp                                 | і<br>Ь І     | VC.,11 =<br>= | 1/2V6+V5+V4+V                           |                     |
| Potential Capacity:                                                                          | Cp.8 =                      |                                        |              | Cp,11 =       |                                         | 773 vph<br>429 pcph |
| Capacity Adj Factor:                                                                         |                             |                                        | •            | • •           | t≭po,1 =                                |                     |
| Movement Capacity:                                                                           | Cm.8 = Cp 8*f8              | = 382 pcp                              | h !          |               | ,11×f11 =                               |                     |
| Prob. of Queue-free State:                                                                   | <pre>;po,8 = 1-v8/C#,</pre> | 8 = 0.84                               |              |               | v11/Cm,11 =                             |                     |
| STEP 4: LT FROM MINOR STREET                                                                 | !                           |                                        | <br>I        |               |                                         |                     |
| Conflicting Flows:                                                                           | Vc,7 = 1/2V3+V2             | +V1+1/2V6+V5+V4+                       | 1            | Vc.10 = 1/    | 2V6+V5+V4+1/                            | 2V3+V2+V1+          |
|                                                                                              | 1/2(V11+V                   | (12) = 858 vpi                         |              |               |                                         | 873 vph             |
| Potential Capacity:                                                                          | Cp7 =                       | 338 pcp                                |              | Cp10 =        | , ,                                     | 331 pcph            |
| Major Left, Minor Through                                                                    |                             |                                        | İ            | -             |                                         | ··· • • · · ·       |
| Impedance Factor:                                                                            | P"7=po,11*f11 :             | • 0.79                                 | Ì            | P''10=po,8    | *f8 =                                   | 0.75                |
| Major Left, Minor Through                                                                    |                             |                                        | ŧ            |               |                                         |                     |
| Adjusted Impedance Factor:                                                                   |                             | 0.84                                   | 1            | p'10 =        |                                         | 0.81                |
| Capacity Adjustment Factor:                                                                  |                             |                                        |              | f10 = p'10    |                                         | 0.70                |
| Movement Capacity:                                                                           | ¦Cm,7 = f7≭Cp,7 =           | 231 pcpł                               |              | Cm, 10 = f1   | 0≭Cp,10 =                               | 231 pcph            |
| DELAY AND LEVEL OF SERVICE SUM                                                               | (ADY                        |                                        |              |               | · • • • • • • • • • • • • • • • • • • • |                     |
| Sent and Level of Service Som                                                                |                             |                                        | AVG<br>Total |               | i                                       |                     |
| MOVEMENT                                                                                     | v(pcph) c∎(pcph             | ) csh(pcph)                            | DELAY        |               |                                         |                     |
|                                                                                              |                             |                                        |              |               |                                         |                     |
| MINOR LEFT TURN (7)                                                                          | 3 231                       | SHRD                                   | SHRD         |               | LEVEL OF S                              | ERVICE CRITERIA     |
| MINOR THROUGH (8)                                                                            | 61 382                      | 370                                    | 11.7         |               |                                         |                     |
| MINOR RIGHT TURN (9)                                                                         | 158 1193                    | NA                                     | 3.5          | Â             | į                                       | AVG                 |
|                                                                                              |                             |                                        |              |               | LEVEL                                   | TOTAL               |
| HINOR LEFT TURN (10)                                                                         | 43 231                      | SHRD                                   | SHRD         | ••            | OF                                      | DELAY               |
| MINOR THROUGH (11)                                                                           | 41 382                      | 286                                    | 17.7         | C             | SERVICE                                 | (SEC/VEH)           |
| MINOR RIGHT TURN (12)                                                                        | 145 770                     | NA                                     | 5.8          | 8             |                                         | ******              |
|                                                                                              |                             |                                        |              |               | A                                       | <=5                 |
| MAJOR LEFT (1)                                                                               | 28 937                      | NA                                     | 4.0          | A             | 8                                       | >5&<=10             |
| MAJOR LEFT (4)                                                                               | 122 1486                    | NA                                     | 2.6          | A             | C                                       | >10&<=20            |
| MINOR APPROACH (7)(8)(9)                                                                     | _                           |                                        |              | _             | 0                                       | >20&<=30            |
| MINOR APPROACH (10)(11)(12)                                                                  |                             | •                                      | 5.9          | 8             | Ε                                       | >30&<=45            |
| NTHOR HELMONDE (10)(11)(12)                                                                  | - •                         | -                                      | 10.1         | C             | i t                                     | >45                 |
| MAJOR APPROACH (1)(2)(3)                                                                     |                             | •                                      | 0.7          | A             | 1                                       |                     |
| HAJOR APPROACH (4)(5)(6)                                                                     |                             | -                                      | 0.5          | Â             | i<br>I                                  |                     |
| · · · · · · · · · · · · · · · · · · ·                                                        |                             |                                        | ~            | n             |                                         |                     |
| TOTAL INTERSECTION (1-12)                                                                    |                             |                                        | 3.3          | A             |                                         |                     |

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| Major Street: KULA HWY<br>Minor Street: HALEAKALA HWY<br>Scenario: EXISTING<br>Peak Hour: PM |         |        |        |     |       |      |        |        |        |             | F<br>Intes | ile  | DAT<br>alys<br>Nam<br>ion | t:<br>e: | 23-Feb-95<br>BC<br>Halkul-P<br>3 |
|----------------------------------------------------------------------------------------------|---------|--------|--------|-----|-------|------|--------|--------|--------|-------------|------------|------|---------------------------|----------|----------------------------------|
|                                                                                              | <br>!   |        |        |     | V12   |      | ٧11    |        | V10    |             |            |      |                           |          |                                  |
| Peak Hour Factor: 1.0                                                                        |         |        |        |     |       | ,    |        |        |        |             |            |      |                           |          |                                  |
|                                                                                              | ł       |        |        |     | 64    |      | 30     |        | 23     |             |            | ٢.   |                           | NORTH    |                                  |
| MAJOR STREET                                                                                 |         |        |        |     |       |      | į      |        | i      |             |            |      |                           |          |                                  |
| Num of Lanes - V2:                                                                           |         |        |        |     | ,i    |      | i      |        | i,     |             |            |      |                           |          |                                  |
|                                                                                              |         |        |        |     | 1     |      | i      |        | 1      |             |            |      |                           |          |                                  |
|                                                                                              |         |        |        |     | <     |      | v      |        |        | >           |            |      |                           |          |                                  |
|                                                                                              | f       |        |        | •   |       |      |        |        |        |             | ,          |      |                           |          |                                  |
| Grade - V1,V2,V3:                                                                            | 2       |        |        |     |       |      |        |        |        |             | ,          |      |                           |          |                                  |
|                                                                                              |         |        | 1      |     |       |      |        |        |        |             | 1          |      | e i                       | 12       |                                  |
|                                                                                              | V1      | 63 ·   |        |     |       |      |        |        |        |             |            |      | 5 '                       | 0        |                                  |
|                                                                                              |         |        |        |     |       |      |        |        |        |             |            |      |                           |          |                                  |
| Excl RT - V6 (Y/H):                                                                          | (   V2  | 327 ·  |        | ••> |       |      |        |        |        |             | <          | , i  | 214                       | 15       |                                  |
| Stop/Yield - V6 (Y/N):                                                                       |         |        |        |     |       |      |        |        |        |             |            |      |                           |          |                                  |
| Grade - V4,V5,V6: -                                                                          | 2   V3  | 4 ·    |        |     |       |      |        |        |        |             | ,          |      | 107                       | 4        |                                  |
|                                                                                              |         |        | 1      | ١   |       |      |        |        |        |             | 1          |      |                           |          |                                  |
| HINOR STREET                                                                                 |         |        |        | ۷   |       |      |        |        |        | ۷           |            |      |                           | REET     |                                  |
| Num of Lanes - V8:                                                                           |         |        |        |     |       |      |        |        |        |             |            | KULS | ¢ K₩.                     | ſ        |                                  |
| Grade - V7,V8,V9:                                                                            |         |        |        |     | <     |      |        |        |        | ?           |            |      |                           |          |                                  |
| Shared Lane-V7,8,9:                                                                          |         |        |        |     | ۱,    |      |        |        |        | /           |            |      |                           |          |                                  |
| (0=N,1=LT,2=TR,3=LTR)                                                                        | :       |        |        |     |       |      |        |        | 1      |             |            |      |                           |          |                                  |
|                                                                                              | 1       |        |        |     |       |      | 1      |        |        |             |            |      |                           |          |                                  |
| Num of Lanes - V11:                                                                          |         |        |        |     | 6     |      | 34     |        | 166    |             |            |      |                           |          |                                  |
| Grade - V10,V11,V12:                                                                         |         |        |        |     |       |      |        |        |        |             |            |      |                           |          |                                  |
| Shared Lane-V10,11,12:                                                                       |         |        |        |     | V7    |      | ¥8     |        | ٧9     |             |            |      |                           |          |                                  |
| (0=N,1=LT,2=TR,3=LTR)                                                                        | 1       |        |        |     |       |      |        |        |        |             |            |      |                           |          |                                  |
|                                                                                              | ;       |        |        |     | MINOR | STRE | ET - I | IALEAK | KALA K | WY<br>      |            |      |                           |          |                                  |
| YOLUME ADJUSTMENTS                                                                           | 1       |        |        |     |       |      |        |        |        |             |            |      |                           |          |                                  |
| HOVEHENT NO.                                                                                 | i       | 1      | 2      | 3   | 4     | 5    | 6      | 7      | 8      | 9           | 10         |      | 11                        | 12       |                                  |
| HOURLY FLOW RATE, V(vph)                                                                     | i       | 63     | 327    | 4   | 107   | 214  | 5      | 6      | 5 34   | 166         | 23         |      | 30                        | 64       |                                  |
| VOLUME, v (pcph)                                                                             | i       |        | 327    | 4   | 107   |      |        | 7      | 37     | 183         | 25         |      | 33                        | 70       |                                  |
|                                                                                              |         |        |        |     |       |      |        |        |        |             |            | ••   |                           |          |                                  |
| STEP 1: RT FROM MINOR STREET                                                                 | 1       |        |        |     |       |      |        |        |        |             |            |      |                           |          |                                  |
| Conflicting Flows:                                                                           | Vc9     | = 1/2  | V3 +   | ¥2  | :     |      | vhp    | 1      |        | = 1/2       | ¥6 +       | ¥5   | :                         |          | vhp                              |
| Potential Capacity:                                                                          | Cp,9    | :      |        |     |       |      | pcph   |        | Cp,i   |             |            |      |                           |          | pcph                             |
| Movement Capacity:                                                                           | Cm,9    | =Cp,9  | :      |     |       | 945  | pcph   | 1      |        | 2=Cp,1      |            |      |                           |          | pcph                             |
| Prb. of Queu-free State:                                                                     | ¦p0,9   | =1-v9, | /Cm,9: | :   |       | 0.81 |        |        | po,1   | 2=1-v1      | 2/Cm,      | 12=  |                           | 0.94     |                                  |
|                                                                                              | <br>I   |        | **     |     |       |      |        | ·      |        |             |            |      |                           |          |                                  |
| STEP 2: LT FROM MAJOR STREET                                                                 | i<br>19 |        | 1 117  | •   |       | 771  |        | i<br>i | V. 1   | = ¥5        | t VX       | -    |                           | 210      | vhp                              |
| Conflicting Flows:                                                                           |         | = V2   | T ¥J   | •   |       |      | vhp    | Ì      |        |             | 1 10       | -    |                           |          | pcph                             |
| Potential Capacity:                                                                          | Cp,4    |        | -      |     |       |      | pcph   | Î<br>I | Cp,1   | -<br>=Cp,1= |            |      |                           |          | poph                             |
| Hovement Capacity:                                                                           |         | =Cp,4  |        |     |       |      | pcph   | ļ.     | •      |             |            |      |                           | 0.93     |                                  |
| Prb. of Queu-free State:                                                                     | ;p0,4   | =1-v4, | /し商4≦  |     |       | 0.91 |        | i      | ha't   | =1-v1/      | UH1-       |      |                           | v. 73    |                                  |
| Hajor Left Shared Lane                                                                       | 1       | 4-     |        |     |       |      |        | i      |        | 1           |            |      |                           | NA       |                                  |
| Prob. of Queue-free State                                                                    | :D¥O.   | 4 =    |        |     |       | NA   |        | :      | p*0,   | 1-          |            |      |                           | nH       |                                  |

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| Major Street: KULA HWY<br>Minor Street: HALEAKALA HWY<br>Scenario: EXISTING<br>Peak Hour: PM |                                       |                                       | Int            | esection # I                                                                            | DATE<br>Analyst<br>File Name<br>ntesection # | BC<br>Halkul-P      |
|----------------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------|----------------|-----------------------------------------------------------------------------------------|----------------------------------------------|---------------------|
| STEP 3: TH FROM MINOR STREET                                                                 |                                       |                                       | l              |                                                                                         |                                              |                     |
| · · · · · · · · · · · · · · · · · · ·                                                        |                                       | +V2+V1+V6+V5+V4                       |                |                                                                                         | 2V6+V5+V4+V3                                 |                     |
|                                                                                              | :                                     | 711 vp                                |                | =<br>Cp,11 =                                                                            |                                              | 711 vph<br>462 pcph |
|                                                                                              | Cp,8 =<br>f8 = po,4*po,               |                                       |                | f11 = po,4*                                                                             |                                              | 402 popul           |
|                                                                                              |                                       | 8 = 393 pcp                           | •              |                                                                                         | 11*f11 =                                     |                     |
| Prob. of Queue-free State:                                                                   |                                       |                                       | 1<br>1<br>1    |                                                                                         | 11/Cm,11 = (                                 |                     |
| STEP 4: LT FROM MINOR STREET                                                                 | , , , , , , , , , , , , , , , , , , , | • • • • • • • • • • • • • • • • • • • |                |                                                                                         |                                              |                     |
| Conflicting Flows:                                                                           |                                       | V2+V1+1/2V6+V5+V4+                    |                |                                                                                         | V6+V5+V4+1/2V                                |                     |
|                                                                                              |                                       | 1+V12) = 758 vp                       |                | 1/2(<br>Cpi0 =                                                                          | •                                            | 811 vph<br>359 pcph |
|                                                                                              | Cp7 =                                 | 385 pcp                               | 411 î<br>L     | ohio -                                                                                  |                                              | ant hahu            |
| Major Left, Hinor Through<br>Impedance Factor:                                               | ₽''7=po,11≭f1                         | 1 = 0.78                              | !              | P''10=po,8≭                                                                             | f8 = 0                                       | .77                 |
| Hajor Left, Minor Through                                                                    | i i−pojis is                          |                                       | ł              | <b>-</b> - <b>-</b> - <b>-</b> - <b>-</b> - <b>-</b> - <b>-</b> - <b>-</b> - <b>- -</b> |                                              |                     |
| Adjusted Impedance Factor:                                                                   | p'7 =                                 | 0.83                                  |                | p'10 =                                                                                  |                                              | .82                 |
| Capacity Adjustment Factor:                                                                  | f7 = p'7*po,1                         | 2 = 0.78                              | •              | f10 = p'10*                                                                             |                                              | .66                 |
| Hovement Capacity:                                                                           | Cm,7 = f7*Cp,                         | 7 =     299 pcp                       | ih :           | Cm,10 = f10                                                                             | *Cp,10 =                                     | 238 pCph            |
| DELAY AND LEVEL OF SERVICE SUMMA                                                             | IRY                                   |                                       | AVG            |                                                                                         | <br>                                         |                     |
| HOVEMENT                                                                                     | v(pcph) cm(pd                         | cph) csh(pcph)                        | TOTAL<br>DELAY | LOS                                                                                     | 1<br> <br> <br>1                             |                     |
|                                                                                              | 7 299                                 | SHRD                                  | SHRD           |                                                                                         | I<br>1 EVEL OF SE                            | RVICE CRITERI       |
| MINOR LEFT TURN (7)<br>MINOR THROUGH (8)                                                     | 37 393                                |                                       | 30KU<br>10.9   |                                                                                         | l reien af Ar<br>1                           |                     |
|                                                                                              | 183 945                               |                                       | 4.7            |                                                                                         | ,<br> <br>1                                  | AVG                 |
|                                                                                              |                                       |                                       |                |                                                                                         | LEVEL                                        | TOTAL               |
| HINOR LEFT TURN (10)                                                                         | 25 238                                | SHRD                                  | SHRD           |                                                                                         | OF                                           | DELAY               |
| MINOR THROUGH (11)                                                                           | 33 393                                | 307                                   | 14.4           |                                                                                         | SERVICE                                      | (SEC/VEH            |
| MINOR RIGHT TURH (12)                                                                        | 70 1079                               | NA                                    | 3.6            | A                                                                                       | • • • • • • • •                              |                     |
|                                                                                              |                                       |                                       |                |                                                                                         | i R<br>I D                                   | <=5<br>>5&<=10      |
| MAJOR LEFT (1)                                                                               | 88 1348                               |                                       | 2.9            |                                                                                         | 1 C                                          | >10&<=20            |
| MAJOR LEFT (4)                                                                               | 107 1192                              | NA                                    | 3.3            | н                                                                                       | , U<br>! N                                   | >20&<=30            |
| MINOR APPROACH (7)(8)(9)                                                                     |                                       | •                                     | 5.9            | . B                                                                                     | E E                                          | >30&<=45            |
| MINOR APPROACH (10)(11)(12)                                                                  |                                       | -                                     | 8.5            |                                                                                         | F                                            | >45                 |
|                                                                                              |                                       |                                       |                |                                                                                         | -<br> <br>                                   |                     |
| HAJOR APPROACH (1)(2)(3)                                                                     |                                       | -                                     | 0.6            | A                                                                                       |                                              |                     |
| MAJOR APPROACH (4)(5)(6)                                                                     |                                       | •                                     | 1.1            | A                                                                                       |                                              |                     |
|                                                                                              |                                       |                                       |                |                                                                                         |                                              |                     |

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| Major Street: KULA HWY<br>Minor Street: OHADPIO H<br>Scenario: EXISTING<br>Peak Hour: AM | RD      |        |        |      |      |            |        |          |            | In        | Fil  | DATE:<br>DATE:<br>nalyst:<br>e Name:<br>tion #: |      |  |
|------------------------------------------------------------------------------------------|---------|--------|--------|------|------|------------|--------|----------|------------|-----------|------|-------------------------------------------------|------|--|
| Peak Hour Factor:                                                                        | 1.00    |        |        |      | V1   | 2          | ٧1     | .1       | V10        |           |      |                                                 |      |  |
|                                                                                          |         |        |        |      | 15   | 0          | 2      | 2        | 8          |           |      |                                                 |      |  |
| HAJOR STREET                                                                             |         |        |        |      |      | -          | Ī      | -        |            |           | (    | NOR                                             | 18   |  |
| Num of Lanes - V2:                                                                       | 1       |        |        |      |      | j –        | i      |          |            |           |      |                                                 |      |  |
| Excl LT - V1 (Y/N):                                                                      | N I     |        |        |      | 1    |            | i      |          | <u>`</u> ۱ |           |      |                                                 |      |  |
| Excl RT - V3 (Y/H):                                                                      | н ¦     |        |        |      | <    |            | v      |          | ,<br>,     |           |      |                                                 |      |  |
| Stop/Yield - V3 (Y/N):                                                                   | N ;     |        |        |      |      |            |        |          |            |           |      |                                                 |      |  |
| Grade - V1, V2, V3:                                                                      | 2       |        |        | ^    |      |            |        |          |            | ~         |      |                                                 |      |  |
|                                                                                          | ł       |        |        | 1    |      |            |        |          |            | ١         |      |                                                 |      |  |
| Num of Lanes - V5:                                                                       |         | 1 3    | 3      | •    |      |            |        |          |            |           | -    | 6 110                                           |      |  |
| Excl LT - V4 (Y/N):                                                                      | H ;     |        |        |      |      |            |        |          |            |           | -    | 6 V6                                            |      |  |
| Excl RT - V6 (Y/H):                                                                      | NIV     | 2 193  | 2      | >    |      |            |        |          |            | /         |      | 00.00                                           |      |  |
| Stop/Yield - V6 (Y/N):                                                                   | H I     |        |        |      |      |            |        |          |            | (         | - 3  | 80 V5                                           |      |  |
| Grade - V4,V5,V6:                                                                        | -2   V  | 3 15   | 5      | -    |      |            |        |          |            |           | -    | 8 V4                                            |      |  |
| HINOR STREET                                                                             | [       |        |        | v    |      |            |        |          |            | 1         |      |                                                 |      |  |
| Num of Lanes - V8:                                                                       | 1       |        |        | •    |      |            |        |          |            | v         |      | R STREET                                        | ſ    |  |
| Grade - V7, V8, V9:                                                                      | 0       |        |        |      | ,    |            | •      |          |            |           | KULA | HWY                                             |      |  |
| Shared Lane-V7,8,9:                                                                      | 3       |        |        |      | ``   |            |        |          | >          |           |      |                                                 |      |  |
| (0=N,1=LT,2=TR,3=LTR)                                                                    |         |        |        |      | 1    |            | 1      |          | 1          |           |      |                                                 |      |  |
|                                                                                          |         |        |        |      | į.   |            | í      |          |            |           |      |                                                 |      |  |
| Num of Lanes - V11:                                                                      | 1       |        |        |      | i    |            | ł      |          | ł          |           |      |                                                 |      |  |
| Grade - V10, V11, V12:                                                                   | 0       |        |        |      | 23   |            | 2      |          | 11         |           |      |                                                 |      |  |
| Shared Lane-VIO,11,12:                                                                   | 3 !     |        |        |      |      |            |        |          |            |           |      |                                                 |      |  |
| (0=H,1=LT,2=TR,3=LTR)                                                                    |         |        |        |      | ٧7   |            | V8     |          | ٧9         |           |      |                                                 |      |  |
|                                                                                          | ł       |        |        | H    | INOR | STRE       | ET - 0 | HAOP     | IO RD      |           |      |                                                 |      |  |
| VOLUHE ADJUSTMENTS                                                                       | ••••••• |        |        |      |      |            |        |          |            |           |      |                                                 |      |  |
| MOVEMENT NO.                                                                             | 1       |        | •      |      |      | _          |        |          |            |           |      |                                                 |      |  |
| HOURLY FLOW RATE, V(vph)                                                                 | 1       | 1 77   |        | 3    | 4    | 5          | 6      | 7        | 8 9        |           | 11   | 12                                              |      |  |
| VOLUME, v (pcph)                                                                         | 1       |        | 192    |      |      | 380        | 6      | 23       | 2 11       | -         | 22   |                                                 |      |  |
|                                                                                          | 1<br>   | 40<br> | 192    | 13   | 8    | 380        | 6      | 25       | 2 12       | 9         | 24   | 165                                             |      |  |
| TEP 1: RT FROM MINOR STREET                                                              | !       |        |        |      |      |            |        |          |            |           |      |                                                 |      |  |
| Conflicting Flows:                                                                       | Vc9     | : 1/2  | V3 + 1 | 12 - |      | 200        |        | i        | u-1        |           |      |                                                 |      |  |
| Potential Capacity:                                                                      | Cp,9    |        |        |      |      | 200        |        |          |            | /2 16 + 1 | /5 = | 383 v                                           |      |  |
| Movement Capacity:                                                                       | Cm,9:   |        |        |      |      | 97 p       |        |          | Cp,12 =    |           |      | 886 p                                           |      |  |
| Prb. of Queu-free State:                                                                 | po,9=   |        |        |      |      | 97 p<br>99 | chu    | 1        | Cm,12=Cp   | ,12=      |      | 886 p                                           | cph. |  |
|                                                                                          | ******* |        |        |      |      | 17<br>     |        | i        | 0,12=1-\   | /12/Cm,12 | =    | 0.81                                            |      |  |
| EP 2: LT FROM MAJOR STREET                                                               | ł       |        |        |      |      |            |        | <br>1    |            |           |      |                                                 |      |  |
| Conflicting Flows:                                                                       | Yc,4    | = V2 + | + ¥3 = |      | 2    | 07 v       | the    | ł<br>1 1 | la t       |           |      | _                                               |      |  |
| Potential Capacity:                                                                      | Cp.4    |        |        |      |      | 56 pc      |        |          | 'c,I = V5  | ) + V6 =  |      | · 386 vl                                        |      |  |
| Movement Capacity:                                                                       | Cm,4=   |        |        |      |      |            |        |          | p,1 =      |           |      | 1122 pc                                         |      |  |
| Prb. of Queu-free State:                                                                 | po,4=)  |        |        |      | 0.9  | 66 pc      | ן ווקי |          | #,1=Cp,1   |           |      | 1122 pc                                         | :ph  |  |
| Major Left Shared Lane                                                                   | 1       |        |        |      | v.9  | 7          | i      | P        | 0,1=I-VI,  | /Cm1=     |      | 0.96                                            |      |  |
| Prob. of Queue-free State                                                                | ¦p≭o,4: |        |        |      | 0.9  |            | ;      |          |            |           |      |                                                 |      |  |

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| Major Street: KULA HWY<br>Minor Street: DMAOPIO RD<br>Scenario: EXISTING<br>Peak Hour: AM |           |                    |             |                 | In             | tesection               | Analys<br>File Nam |                  |
|-------------------------------------------------------------------------------------------|-----------|--------------------|-------------|-----------------|----------------|-------------------------|--------------------|------------------|
| STEP 3: TH FROM MINOR STREET                                                              |           |                    |             | *               | ļ              | W2 11 - 1               | 1007 107 107 1     | 17 1 10 1 11 1   |
| Conflicting Flows:                                                                        |           |                    |             | 5t¥4<br>697 unh |                | Vć.,11 = 1,<br>=        |                    |                  |
| Potential Capacity:                                                                       |           |                    |             |                 |                |                         |                    |                  |
| Capacity Adj Factor:                                                                      | f8 = po   | .4*po.1 :          | : 0         | .95             |                | f1i = po,4 <sup>2</sup> | ⊧po,1 =            | 0.95             |
| Novement Capacity:                                                                        | Cm,8 =    | Cp,8≭f8 :          | :           | 484 pcph        |                | Cm,11 = Cp              | ,11*f11 =          | 482 pcph         |
| Prob. of Queue-free State:                                                                | ;po,8 =   | 1-v8/C∎,8          | 3: 1        | .00             |                | po,11 = 1-1             | /11/Cm,11 =        | 0.95             |
| STEP 4: LT FROM MINOR STREET                                                              |           |                    |             |                 | ł              |                         |                    |                  |
| Conflicting Flows:                                                                        |           |                    |             | +¥5+¥4+         |                |                         | 276+72+74+1/       |                  |
|                                                                                           |           |                    |             | 710 vph         |                | • •                     | (48+46) =          |                  |
| Potential Capacity:<br>Major Left, Minor Through                                          | icp/ =    |                    |             | 411 pcph        | i<br>!         | Cp10 =                  |                    | 457 pcph         |
| Impedance Factor:                                                                         | ¦₽''7=po, | ,11 <b>*</b> f11 = | : 0         | .90             |                | P''10=po,84             | *f8 =              | 0.94             |
| Major Left, Minor Through                                                                 | !         |                    |             |                 | Ì              |                         |                    |                  |
| Adjusted Impedance Factor:                                                                | [p'7 =    |                    | 0           | .92             | 1              | p'10 =                  | _                  | 0.96             |
| Adjusted Impedance Factor:<br>Capacity Adjustment Factor:<br>Movement Capacity:           | (17 = p') | /≭po,12 =          | . 0         | .75<br>709 acab | ł              | f10 = p104              | 90,9 =             | 0.95<br>432 ocob |
|                                                                                           |           |                    |             |                 | <br>           | ····                    |                    |                  |
| DELAY AND LEVEL OF SERVICE SUMM                                                           | ARY       |                    |             |                 | AVG            |                         |                    |                  |
| MOVENENT                                                                                  | v(pcph)   | cm(poph            | ) csh(pc    |                 | TOTAL<br>Delay |                         | i<br>1<br>1        |                  |
|                                                                                           |           |                    |             |                 |                |                         |                    |                  |
|                                                                                           | 25<br>2   | 309<br>484         | SHRÐ<br>406 |                 | SHRD<br>9.8    |                         | LEVEL UP           | SERVICE CRITERIA |
| MINOR RIGHT TURN (9)                                                                      | 12        | 1097               | SHRD        |                 | SHRD           |                         | 1<br> <br>         | AVG              |
|                                                                                           |           |                    |             |                 |                |                         | LEVEL              | TOTAL            |
| MINOR LEFT TURN (10)                                                                      | 9         | 432                | SHRD        |                 | SKRD           |                         | OF                 |                  |
| MINOR THROUGH (11)                                                                        | 24        | 482                | 771<br>SUDD |                 | 6.3<br>euon    | B                       | SERVICE            | (SEC/VEH)        |
| MINOR RIGHT TURN (12)                                                                     | 165       | 886                | SHRD        |                 | SHRD           | ••                      | ι<br>! Δ           | <:5              |
| MAJOR LEFT (1)                                                                            | 46        | 1122               | NA          |                 | 3.3            | A                       | B                  | >5&<=10          |
| MAJOR LEFT (4)                                                                            | 8         | 1366               | NA          |                 | 2.7            |                         | Ċ                  | >10&<=20         |
|                                                                                           |           |                    |             |                 |                |                         | D                  | >201<=30         |
| MINOR APPROACH (7)(8)(9)                                                                  | -         | •                  | -           |                 | 9.8            |                         | Ε .                | >30&<=45         |
| MINOR APPROACH (10)(11)(12)                                                               | -         | -                  | -           |                 | 6.3            | B                       | F                  | >45              |
| MAJOR APPROACH (1)(2)(3)                                                                  | •         | •                  | •           |                 | 0.6            | A                       | 1                  |                  |
| MAJOR APPROACH (4)(5)(6)                                                                  | -         | -                  | -           |                 | 0.1            |                         | 1                  |                  |
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| Num of Lanes - V8:       1         Grade - V7,V8,V9:       0         Shared Lane-V7,8,9:       3         Num of Lanes - V11:       1         Rum of Lanes - V11:       1         Rum of Lanes - V11:       1         Shared Lane-V7,8,9:       3         Num of Lanes - V11:       1         Shared Lane-V10,V11,V12:       0         Shared Lane-V10,11,12:       3         V0(0=N,1=LT,2=TR,3=LTR)       V7         WINOR STREET - OMAOPIO RD         VOLUME ADJUSTMENTS         MOVEMENT NO.       1         1       2         Y0LUME, v (pcph)       1222         122       319         Y0LUME, v (pcph)       1222         171       319         Y0LUME, v (pcph)       171         Y17       Y8         Y2       Y2         Y2       322         Y1       319         Y2       Y2         Y2 <th>&lt;</th> <th></th> <th></th> <th>A-P<br/>4</th>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <           |       |            | A-P<br>4 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------|------------|----------|
| HAJOR STREET       46       12       4         Hum of Lanes - V2:       1       /       /       /         Excl LT - V1 (Y/N):       N       /       /       /         Stop/Yield - V3 (Y/N):       N       /       /       /         Excl LT - V4 (Y/N):       N       /       /       /         Excl LT - V4 (Y/N):       N       /       /       /         Excl LT - V4 (Y/N):       N       /       /       /         Stop/Yield - V6 (Y/N):       N       Y2 319>       /       /         Stop/Yield - V6 (Y/N):       N       Y2 319>       /       /         Grade - V1,V2,V3:       2       /       /       /       /         Grade - V4,V5,V6:       -2       V3 20       /       /       /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>&lt;</b> |       |            |          |
| Hus of Lanes - V2:       1         Excl LT - V1 (Y/N):       N         Mus of Lanes - V3:       1         Grade - V1,V2,V3:       2         Hus of Lanes - V5:       1         V1       122         Excl LT - V4 (Y/N):       N         Kus of Lanes - V5:       1         V1       122         Excl RT - V6 (Y/N):       N         Excl RT - V6 (Y/N):       N         V2       319         Stop/Yield - V6 (Y/N):       N         Grade - V4, V5, V6:       -2         V3       20         Shared Lanes - V8:       1         Grade - V7, V8, V9:       0         Shared Lanes - V8:       1         Grade - V10, V11, V12:       0         Shared Lanes - V11:       1         20       19         12       3         31       1         V1       12         31       1         12       3         12       3       4         12       3       4         12       3       5       7         12       3       4       5         13                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             | - NOR | тн         |          |
| Excl LT - V1 (Y/M):       H       /         Excl RT - V3 (Y/M):       H       /         Stop/Yield - V3 (Y/M):       H       /         Grade - V1,V2,V3:       2       /         Hum of Lanes - V5:       1       V1 122         Excl RT - V6 (Y/M):       H       V2 319>         Stop/Yield - V6 (Y/M):       H       V2 319>         Excl RT - V6 (Y/M):       H       V2 319>         Stop/Yield - V6 (Y/M):       H       V2 319>         Grade - V4,V5,V6:       -2       V3 20        MINOR STREET       V       V         Mum of Lanes - V8:       1          Grade - V1,V2,V9:       0          Shared Lane-V7,8,9:       3          Mum of Lanes - V11:       1       20       19         Grade - V10,V11,V12:       0           Shared Lane-V10,11,12:       3       V7       V8       V9         OC-M, 1=LT, 2=TR, 3=LTR)       HINOR STREET - OHAOPIO RD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |             |       |            |          |
| Excl RT - V3 (Y/N): N<br>Stop/Yield - V3 (Y/N): N<br>Grade - V1,V2,V3: 2<br>Num of Lanes - V5: 1 V1 122<br>Excl LT - V4 (Y/N): N<br>Excl RT - V6 (Y/N): N<br>Grade - V4,V5,V6: -2 V3 20<br>Num of Lanes - V8: 1<br>Grade - V7,V8,V9: 0 C<br>Shared Lane-V7,8,9: 3 V<br>(0=N,1=LT,Z=TR,3=LTR)<br>Num of Lanes - V11: 1 20 19 12<br>Grade - V10,V11,V12: 0<br>Shared Lane-V10,11,12: 3 V7 V8 V9<br>(0=N,1=LT,Z=TR,3=LTR)<br>NUMOVEMENT HO. 1 2 3 4 5 6 7 8 9 10<br>HUMOR STREET - OMAOPIO RD<br><br>OLUME ADJUSTMENTS<br>MOVEMENT HO. 1 2 3 4 5 6 7 8 9 10<br>HUMOR STREET - OMAOPIO RD<br><br>TEP 1: RT FROM MINOR STREET<br>Conflicting Flows: VGp 9 1/2 V3 + V2 = 329 vhp<br>Potential Capacity: CD,9 = 943 pcph<br>Capacity: CD,9 = 943 pcph<br>Capacity: CD,9 = 0.99 V<br>POL21-V12/Cm,12<br>FEP 2: LT FROM MAOR STREET<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |             |       |            |          |
| Stop/Yield - V3 (Y/H):       H         Grade - V1,V2,V3:       2         Hum of Lanes - V5:       1         Excl LT - V4 (Y/N):       H         Excl RT - V6 (Y/H):       H         W1 02 319       Y         Stop/Yield - V6 (Y/N):       H         Grade - V4,V5,V6:       -2         Y3 20       Y         Hum of Lanes - V8:       1         Grade - V7,V8,V9:       0         Grade - V7,V8,V9:       0         Grade - V7,V8,V9:       1         Grade - V10,V11,V12:       1         Num of Lanes - V11:       1         20       19         12       12         Shared Lane-V10,11,12:       3         Y7       Y8         Y9       12         Grade - V10,V11,V12:       1         W1HOR STREET - OMAOPIO RD         Y0LUME ADJUSTMENTS       1         MOVEMENT NO.       1       2       3       4       5       6       7       8       9       10         Y0LUME, V (pcph)       122       319       20       11       245       3       20       19       12         Y1       Y2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |             |       |            |          |
| Grade - V1, V2, V3:       2       /       /         Hum of Lanes - V5:       1       V1       122       /         Excl LT - V4 (Y/N):       H       V2       319       /       /         Stop/Yield - V6 (Y/N):       H       V2       319       /       /         Mum of Lanes - V8:       1       V       /       /       /         Grade - V4, V5, V6:       -2       V3       20       /       /       /         Mum of Lanes - V8:       1       V       /       /       /       /       /         Grade - V7, V8, V9:       0       C       >       /       /       /       /         Mum of Lanes - V11:       1       20       19       12       /       /       /         Grade - V10, V11, V12:       0       //       /       /       /       /       /         Shared Lane-V10, 11, 12:       3       V7       V8       V9       /       /       /         OCLUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10         MOVEMENT NO.       1       1       2       3       4 </td <td></td> <td></td> <td></td> <td></td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |             |       |            |          |
| Hum of Lanes - V5:       1       V1       122           Excl IT - V4 (Y/N):       N       V2       319           Stop/Yield - V6 (Y/N):       N       V2       319           Stop/Yield - V6 (Y/N):       N       V2       319                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |             |       |            |          |
| Excl LT - V4 (Y/N):       N       V       V       V       V         Excl RT - V6 (Y/N):       N       V2 319>       V       V       V         Stop/Yield - V6 (Y/N):       N       V       V       V       V       V         Mue of Lanes - V8:       1       V       V       V       V       V       V         Shared Lane-V7,8,9:       3       V       I       I       V       V       V         Nue of Lanes - V11:       1       20       19       12       I       I       V       V       V         Shared Lane-V10,V11,V12:       0       V7       V8       V9       V9       V0       V7       V8       V9       V9       V0       V0       V1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |             |       |            |          |
| Excl LT - V4 (Y/N): H<br>Excl RT - V6 (Y/N): H<br>Stop/Yield - V6 (Y/N): H<br>Grade - V4,V5,V6: -2 V3 20<br>Num of Lanes - V8: 1<br>Grade - V7,V8,V9: 0<br>Shared Lane-V7,8,9: 3<br>(0=N,1=LT,2=TR,3=LTR)<br>Mum of Lanes - V11: 1<br>Grade - V10,V11,V12: 0<br>Shared Lane-V10,11,12: 3<br>MUNOR STREET - OMAOPIO RD<br>MINOR STREET - OMAOPIO RD<br>MINOR STREET - OMAOPIO RD<br>MINOR STREET - OMAOPIO RD<br>MUNDEL ADJUSTMENTS<br>MOVEMENT NO. 1 2 3 4 5 6 7 8 9 10<br>MUNDE ADJUSTMENTS<br>MOVEMENT NO. 1 2 3 4 5 6 7 8 9 10<br>MOUNTY FLOW RATE, V(vph)<br>122 319 20 11 245 3 20 19 12 4<br>VOLUME, v (pcph)<br>171 319 20 11 245 3 22 21 13 4<br>TEP 1: RT FROM MINOR STREET<br>Conflicting Flows: Vc9 = 1/2 V3 + V2 = 329 vhp<br>Potential Capacity: Cp,9 = 943 pcph<br>Cm,1=2:cp,12=<br>Movement Capacity: Cp,9 = 943 pcph<br>Cm,1=2:cp,12=<br>Prb. of Queu-free State: p0,9=1-v9/Cm,9= 0.99<br>Po.12=1-v12/Cm,12<br>PTEP 2: LT FROM MAJOR STREET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |       |            |          |
| Excl RT - V6 (Y/N):       H       V2 319>       (>         Stop/Yield - V6 (Y/N):       H       Grade - V4, V5, V6:       -2       V3 20          Num of Lanes - V8:       1       V       V       V       V         Shared Lane-V7, V8, V9:       0       C       >       Shared Lane-V7, V8, V9:       0         Grade - V7, V8, V9:       0       C       >       >       /         Hum of Lanes - V8:       1       20       19       12         Grade - V10, V11, V12:       0       Shared Lane-V10, 11, 12:       3       V7       V8       V9         OShared Lane-V10, 11, 12:       3       V7       V8       V9       V9       V7       V8       V9         OLUME ADJUSTMENTS       1       2       3       4       5       6       7       8       10         MOVEMENT NO.       1       1       2       3       4       5       20       19       12       4         VOLUME, V (pcph)       122       319       20       11       245       3       22       11       3         TEP 1: RT FROM MINOR STREET       171       319       20       11       245 <td>ა</td> <td>5 V6</td> <td></td> <td></td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ა           | 5 V6  |            |          |
| Stop/Yield - V6 (Y/N):       H         Grade - V4,V5,V6:       -2       V3       20          Hum of Lanes - V8:       1       V       V       V         Grade - V7,V8,V9:       0        V       V       V         Shared Lane-V7,8,9:       3        /       /       /         Num of Lanes - V11:       1       20       19       12         Grade - V10,V11,V12:       0        V       V       V         Shared Lane-V10,11,12:       3       V7       V8       V9         (0=H, 1=LT, 2=TR, 3=LTR)       MINOR STREET - OMAOPIO RD       122       319       20       11       245       3       20       19       12         VOLUME ADJUSTMENTS       122       319       20       11       245       3       20       19       12         VOLUME, V (pcph)       122       319       20       11       245       3       22       11       3         VOLUME, V (pcph)       171       319       20       11       245       3       22       11       4         VOLUME, V (pcph)       171       319       20       11       2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |             |       |            |          |
| Grade - V4, V5, V6:       -2       V3       20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 245         | i V5  |            |          |
| MINOR STREET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 11          | ٧4    |            |          |
| Num of Lanes - V8:       1         Grade - V7, V8, V9:       0         Shared Lane-V7, 8, 9:       3         (0=N, 1=LT, 2=TR, 3=LTR)       /         Hum of Lanes - V11:       1         20       19         Grade - V10, V11, V12:       0         Shared Lane-V10, 11, 12:       3         V0LUME ADJUSTMENTS       1         MOVEMENT NO.       1         122       319         201       11         245       3         201       12         VOLUME ADJUSTMENTS         MOVEMENT NO.       1         122       319         201       1245         320       19         121       319         201       1245         320       19         121       319         2011       245         V0LUME, v (pcph)       171         319       20         1245       3         22       13         4         VOLUME, v (pcph)       171         121       24         V010HE, v (pcph)       171         319       20                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 11          |       |            |          |
| Num of Lanes - V8:       1         Grade - V7, V8, V9:       0         Shared Lane-V7, 8, 9:       3         (0=N, 1=LT, 2=TR, 3=LTR)       1         Hum of Lanes - V11:       1         Grade - V10, V11, V12:       0         Shared Lane-V10, 11, 12:       3         Shared Lane-V10, 11, 12:       3         V7       V8         V9       0         Oshared Lane-V10, 11, 12:       3         V10LUME ADJUSTMENTS         MOVEMENT NO.       1         HOVEMENT NO.         HOURLY FLOW RATE, V(vph)         V122       319         V0LUME, v (pcph)         171       319         20       11         245       3         22       13         4         VOLUME, v (pcph)       171         319       20         1245       3         22       13         4       1         V0LUME, v (pcph)       171         319       20         1245       3         22       13         4       1         VC12 = 1/2 V6 + V         Potential Capacity:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | AJOR        | STREE | T          |          |
| Grade - V7,V8,V9:       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0       0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ULA H       |       | • •        |          |
| (0=N,1=LT,2=TR,3=LTR)       Num of Lanes - V11: 1       20       19       12         Grade - V10,V11,V12: 0       Shared Lane-V10,11,12: 3       V7       V8       V9         Shared Lane-V10,11,12: 3       V7       V8       V9         (0=N,1=LT,2=TR,3=LTR)       MINOR STREET - OMAOPIO RD         VOLUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10         MOVEMENT NO.       1       2       3       4       5       6       7       8       9       10         MOURLY FLOW RATE, V(vph)       122       319       20       11       245       3       20       19       12         VOLUME, v (pcph)       171       319       20       11       245       3       22       21       13       4         TEP 1: RT FROM MINOR STREET         Conflicting Flows:       VC9 = 1/2 V3 + V2 =       329       vhp       Vc12 = 1/2 V6 + V         Potential Capacity:       Cp,9 =       943       pcph       Cp,12 =       0.99       po,12=i-v12/Cm,12=         Prb. of Queu-free State:       ipo,9=1-v9/Cm,9=       0.99       ipo,12=i-v12/Cm,12       ipo,12=i-v12/Cm,12       ipo,12=i-v12/Cm,12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |             |       |            |          |
| Num of Lanes - V11:       1       20       19       12         Grade - V10,V11,V12:       0       0       0       0       0       0       0         Shared Lane-V10,11,12:       3       V7       V8       V9         (0=N,1=LT,2=TR,3=LTR)       NINOR STREET - OMAOPIO RD         /OLUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10         /OLUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10         //OLUME ADJUSTMENTS       1       12       3       4       5       6       7       8       9       10         //OLUME ADJUSTMENTS       1       12       3       4       5       6       7       8       9       10         //OLUME, v (pcph)       122       319       20       11       245       3       22       21       13       4         TEP 1: RT FROM MINOR STREET       171       319       20       11       245       3       22       11       24       4         YOLUME, v (pcph)       171       319       20       11       245                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |             |       |            |          |
| Grade - V10,V11,V12:       0         Shared Lane-V10,11,12:       3         V7       V8         V9         (0=N,1=LT,2=TR,3=LTR)         HINOR STREET - OMAOPIO RD         VOLUME ADJUSTMENTS         MDVEMENT NO.         HOVEMENT V(vph)         HOVEMENT NO.         HOVEMENT VO.         HOVEMEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |       |            |          |
| Grade - V10,V11,V12:       0         Shared Lane-V10,11,12:       3         V7       V8         V9         (0=N,1=LT,2=TR,3=LTR)         HINOR STREET - OMAOPIO RD         VOLUME ADJUSTMENTS         MDVEMENT NO.         HOVEMENT V(vph)         HOVEMENT NO.         HOVEMENT VO.         HOVEMEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |       |            |          |
| Grade - V10,V11,V12:       0         Shared Lane-V10,11,12:       3         V0:0=N,1=LT,2=TR,3=LTR)       MINOR STREET - OMAOPIO RD         VOLUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10         VOLUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10         VOLUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10         MOVEMENT NO.       1       2       3       4       5       3       20       19       12       4         VOLUME, v (pcph)       122       319       20       11       245       3       22       21       13       4         TEP 1: RT FROM MINOR STREET       1       171       319       20       11       245       3       22       21       13       4         TEP 1: RT FROM MINOR STREET       1       171       319       20       11       245       3       22       11       3       4         TEP 1: RT FROM MINOR STREET       100,9 = 1/2       V3       pcph       Cp,12 =                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |             |       |            |          |
| (0=N,1=LT,2=TR,3=LTR)       MINOR STREET - OMAOPIO RD         /OLUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10         /OLUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10         MOVEMENT NO.       1       1       2       3       4       5       6       7       8       9       10         HOURLY FLOW RATE, V(vph)       122       319       20       11       245       3       20       19       12       4         VOLUME, v (pcph)       171       319       20       11       245       3       22       21       13       4         TEP 1: RT FROM MINOR STREET       1       171       319       20       11       245       3       22       21       13       4         TEP 1: RT FROM MINOR STREET       1       171       319       20       11       245       3       22       11       3       4         Movement Capacity:       ICp,9 =       943       pcph       Cp,12 =       Cm,12:Cp,12 =       po,12:i-v12/Cm,12       po,12:i-v12/Cm,12       po,12:i-v12/Cm,12       <                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |             |       |            |          |
| (0=N,1=LT,2=TR,3=LTR)       HINOR STREET - OMAOPIO RD         /OLUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10         /OLUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10         HOVEMENT NO.       1       2       3       4       5       6       7       8       9       10         HOURLY FLOW RATE, V(vph)       122       319       20       11       245       3       20       19       12       4         VOLUME, v (pcph)       171       319       20       11       245       3       22       21       13       4         TEP 1: RT FROM MINOR STREET       171       319       20       11       245       3       22       21       13       4         TEP 1: RT FROM MINOR STREET       VC9 = 1/2       V3 + V2 =       329       vhp       Vc12 = 1/2       V6 + V         Potential Capacity:       ICp,9 =       943       pcph       Cp,12 =       Cm,12:Cp,12=         Prb. of Queu-free State:       Ipo,9=1-v9/Cm,9=       0.99       po,12=1-v12/Cm,12       P       12       12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |             |       |            |          |
| VOLUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10         HOVEMENT NO.       1       2       3       4       5       6       7       8       9       10         HOURLY FLOW RATE, V(vph)       122       319       20       11       245       3       20       19       12       4         VOLUME, v (pcph)       171       319       20       11       245       3       22       21       13       4         TEP 1: RT FROM MINOR STREET       Image: Conflicting Flows:       Vc9 = 1/2       V3 + V2 =       329       vhp       Vc12 = 1/2       V6 + V         Potential Capacity:       Image: Cp, 9 =       943       pcph       Cp, 12 =       0       0       12:cp, 12=         Prb. of Queu-free State:       Image: Po, 9=:1-v9/Cm, 9=       0.99       po, 12:i-v12/Cm, 12       0       12:i-v12/Cm, 12         TEP 2: LT FROM MAJOR STREET       Image: Po, 12:i-v12/Cm, 12       Image: Po, 12:i-v12/Cm, 12       12:i-v12/Cm, 12       12:i-v12/Cm, 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |             |       |            |          |
| HOVEMENT NO.       1       2       3       4       5       6       7       8       9       10         HOURLY FLOW RATE, V(vph)       122       319       20       11       245       3       20       19       12       4         VOLUME, v (pcph)       171       319       20       11       245       3       22       21       13       4         TEP 1: RT FROM MINOR STREET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |             |       |            |          |
| HOVEMENT NO.       1       2       3       4       5       6       7       8       9       10         HOURLY FLOW RATE, V(vph)       122       319       20       11       245       3       20       19       12       4         VOLUME, v (pcph)       171       319       20       11       245       3       22       21       13       4         TEP 1: RT FROM MINOR STREET       Image: Conflicting Flows:       Vc9 = 1/2       V3 + V2 =       329       vhp       Vc12 = 1/2       V6 + V         Potential Capacity:       Image: Cp, 9 =       943       pcph       Cp, 12 =       Cm, 12=Cp, 12=         Movement Capacity:       Image: Cm, 9=Cp, 9=       943       pcph       Cm, 12=Cp, 12=       po, 12=i-v12/Cm, 12         Prb. of Queu-free State:       Image: Image: Po, 9=1-v9/Cm, 9=       0.99       po, 12=i-v12/Cm, 12       Image: Po, 12=i-v12/Cm, 12         TEP 2: LT FROM MAJOR STREET       Image: Po, 12=i-v12/Cm, 12       Image: Po, 12=i-v12/Cm, 12       Image: Po, 12=i-v12/Cm, 12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             |       | •••••••••• | • •      |
| HOURLY FLOW RATE, V(vph)       122 319 20 11 245 3 20 19 12 4         VOLUME, v (pcph)       171 319 20 11 245 3 22 21 13 4         TEP 1: RT FROM MINOR STREET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |       |            |          |
| VOLUME, v (pcph)       171 319 20 11 245 3 22 21 13 4         TEP 1: RT FROM MINOR STREET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 11          | 12    |            |          |
| TEP 1: RT FROM MINOR STREET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 12          | 46    |            |          |
| Conflicting Flows:       Vc9 = 1/2 V3 + V2 = 329 vhp       Vc12 = 1/2 V6 + V         Potential Capacity:       Cp,9 = 943 pcph       Cp,12 =         Movement Capacity:       Cm,9=Cp,9= 943 pcph       Cm,12=Cp,12=         Prb. of Queu-free State:       !po,9=1-v9/Cm,9=       0.99       po,12=i-v12/Cm,12         IEP 2: LT FROM MAJOR STREET       !       .       .       .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 13          | 51    |            |          |
| Potential Capacity:         Cp,9 =         943 pcph         Cp,12 =           Movement Capacity:         Cm,9=Cp,9=         943 pcph         Cm,12=Cp,12=           Prb. of Queu-free State:         po,9=1-v9/Cm,9=         0.99         po,12=i-v12/Cm,12           TEP 2: LT FROM MAJOR STREET         Image: Complexity of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of th                                                                                                                                                                                                |             |       |            |          |
| Potential Capacity:         'Cp,9 =         943 pcph         Cp,12 =           Hovement Capacity:         'Cm,9=Cp,9=         943 pcph         Cm,12=Cp,12=           Prb. of Queu-free State:         'po,9=1-v9/Cm,9=         0.99         'po,12=i-v12/Cm,12           TEP 2:         LT FROM MAJOR STREET         '         '                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 5 =         | 247   | vhp        |          |
| Hovement Capacity:         'Cm,9=Cp,9=         943 pcph         Cm,12=Cp,12=           Prb. of Queu-free State:         'po,9=1-v9/Cm,9=         0.99         'po,12=i-v12/Cm,12           TEP 2:         LT FROM MAJOR STREET         '         '                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |       | pcph       |          |
| Prb. of Queu-free State: {po,9=1-v9/Cm,9= 0.99 } po,12=1-v12/Cm,12                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |             |       | pcph       |          |
| CP 2: LI FRUM MHJUR SIREEI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | :           | 0.95  | · ·        |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |       |            | -        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             | 040   | when       |          |
| Detection According 10 10 10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |             | 248   |            |          |
| Havenach Generality in the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second sec |             |       | pcph       |          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             |       | pcph       |          |
| PrD. of Queu-free State: ;po,4=1-v4/Cm4= 0.99 ; po,1=1-v1/Cm1=<br>Major Left Shared Lane ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |             | 0.87  |            |          |
| Prob. of Queue-free State  p*0,4= 0.99   p*0,1=                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |             | 0.84  |            |          |

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| ajor Street: KULA HWY<br>inor Street: OMAOPIO RD<br>Scenario: EXISTING<br>Peak Hour: PM |                  |                         |              | I          | ntesection               | Anal<br>File N            | yst: 8C<br>ame: KU |        |
|-----------------------------------------------------------------------------------------|------------------|-------------------------|--------------|------------|--------------------------|---------------------------|--------------------|--------|
| TEP 3: TH FROM MINOR STREET                                                             |                  |                         |              | <br>;<br>; |                          |                           |                    |        |
| Conflicting Flows:                                                                      | Vc.,8            | -                       | ***1+*6+*5+* | •          | Vc.,11 = 1               | /286+85+84                | V3+V2+V1           |        |
|                                                                                         |                  |                         | 710          |            | :                        |                           | 719 vp!            | )      |
| Potential Capacity:                                                                     | Cp,8 =           |                         | 463          | pcph       | Cp,11 =                  |                           | 458 pcp            | h      |
| Novement Canadity                                                                       | 10 - 0 -         | ),4*p0,1 =<br>^- 0*f0 - | 0.83         |            | f11 = po,4               | *po,1 =                   | 0.83               |        |
| Capacity Adj Factor:<br>Movement Capacity:<br>Prob. of Queue-free State:                | po,8 =           | 1-v8/Cm,8               | = 0.95       | popn ;     | Cm,11 = Cp<br>po.11 = 1- | ),11∓†11 =<br>v11/Cm,11 = | 380 pcp<br>0,97    | h      |
| EP 4: LT FRON MINOR STREET                                                              |                  |                         |              |            |                          |                           |                    |        |
| Conflicting Flows:                                                                      | i<br>Vc.7 =      | 1/243+42+               | V1+1/2V6+V5  | 1941 t     | Vo 10 - 1/               | 9W/1WE1W/11               | /01/711/01101      |        |
|                                                                                         |                  |                         | 12) = 738    |            | Vc,10 = 1/               | 2V6+V5+V4+1<br>(V8+V9) =  |                    |        |
| Potential Capacity:                                                                     | Cp7 =            |                         | 396          |            |                          | (*0**7) -                 |                    |        |
| Major Left, Minor Through                                                               | 1                |                         |              |            |                          |                           | to pup             | U      |
| Impedance Factor:                                                                       | P''7=po          | ,11*f11 =               | 0.80         |            | P**10=po.8               | *f8 =                     | 0.79               |        |
| Major Left, Minor Through                                                               | 1                |                         |              | i          |                          |                           |                    |        |
| Adjusted Impedance Factor:<br>Capacity Adjustment Factor:<br>Movement Capacity:         | ¦p'7 =           |                         | 0.85         |            | p'10 =                   |                           | 0.83               |        |
| Capacity Adjustment Factor:                                                             | f7 = p"          | 7*po,12 =               | 0.81         | i          | f10 = p'104              | po,9 =                    | 0.82               |        |
| Movement Capacity:                                                                      | <b>¦C∎,7 =</b> 1 | f7*Cp,7 =               | 319          | pcph       | Cm, 10 = fic             | )*Cp,10 =                 | 332 pcp/           | ı      |
| AY AND LEVEL OF SERVICE SUMM                                                            | ARY              |                         | *********    | AVG        |                          | ······                    |                    |        |
| •••••                                                                                   |                  |                         |              | TOTAL      |                          |                           |                    |        |
| HOVEMENT                                                                                |                  |                         | csh(pcph)    | DELAY      | LOS                      | 1                         |                    |        |
| MINOR LEFT TURN (7)                                                                     | 22               | 319                     | SHRD         | 690D       |                          |                           |                    |        |
| MINOR THROUGH (8)                                                                       | 21               |                         | 408          | 10.2       |                          | I LEVEL UP                | SERVICE CR         | TIFKIU |
| MINOR RIGHT TURN (9)                                                                    | 13               | 943                     | SHRD         |            |                          | t<br>J                    | ٨                  | VG     |
|                                                                                         |                  |                         |              | VIIIV      |                          | LEVEL                     |                    | TAL    |
| MINOR LEFT TURN (10)                                                                    | 4                | 332                     | SHRD         | SHRD       |                          |                           |                    | LAY    |
| MINOR THROUGH (11)                                                                      | 13               | 380                     | 713          | 5.6        | 8                        | SERVICE                   |                    | C/VEH) |
| KINOR RIGHT TURN (12)                                                                   | 51               | 1039                    | SHRD         | SHRD       |                          | ]                         |                    |        |
|                                                                                         |                  |                         |              |            |                          | A                         | <=5                |        |
| NAJOR LEFT (1)                                                                          | 171              | 1306                    | NA           | 3.2        | A                        | 8                         | >5&<:              | =10    |
| NAJOR LEFT (4)                                                                          | 11               | 1182                    | NA           | 3.1        | A                        | C                         | >10&               | <=20   |
|                                                                                         |                  |                         |              |            | _                        | D                         | >20&               |        |
| MINOR APPROACH (7)(8)(9)                                                                | -                | -                       | -            | 10.2       | C                        | E                         | >30&               | (=45   |
| HINOR APPROACH (10)(11)(12)                                                             | •                | -                       | -            | 5.6        | В                        | F                         | >45                |        |
| MAJOR APPROACH (1)(2)(3)                                                                | -                | -                       | -            | 1.1        | A                        |                           |                    |        |
|                                                                                         | •                | -                       | -            | 0.1        | A                        |                           |                    |        |
| MAJOR APPROACH (4)(5)(6)                                                                |                  |                         |              |            | •                        |                           |                    |        |

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| Peak Hour: AM<br>Scenario: EXISTING                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                           |                                                                                                                                      |                                   |                           |                                                                              | Date:<br>alyst:<br>Name:<br>tion:   | 27-Jun<br>BC<br>KULKEK-A<br>S         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|---------------------------|------------------------------------------------------------------------------|-------------------------------------|---------------------------------------|
| Peak Hour Factor: 1.00                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                           |                                                                                                                                      |                                   |                           |                                                                              |                                     |                                       |
| MAJOR STREET                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                           | 88                                                                                                                                   | ->                                | <                         | 146                                                                          | ۷5                                  |                                       |
| Hum of Lanes - V2: 1<br>Excl RT - V3 (Y/H): H                                                                                                                                                                                                                                                                                                                                                                                                     | V3                                                                                                                                                                                                                        | 20                                                                                                                                   |                                   |                           |                                                                              |                                     |                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1 13                                                                                                                                                                                                                      | 20                                                                                                                                   | •                                 |                           | 11                                                                           | ٧4                                  |                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                           | `v                                                                                                                                   |                                   | v                         | /<br>/ MAJOR ST<br>Kula Hwy                                                  |                                     |                                       |
| Num of Lanes - V5: 1                                                                                                                                                                                                                                                                                                                                                                                                                              | ł                                                                                                                                                                                                                         |                                                                                                                                      | ,<br>(                            | >                         |                                                                              |                                     |                                       |
| Excl LT - V4 (Y/N): H                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                           |                                                                                                                                      | ۱.                                | 1                         |                                                                              |                                     |                                       |
| \$ Grade - V4,V5: -2                                                                                                                                                                                                                                                                                                                                                                                                                              | i                                                                                                                                                                                                                         |                                                                                                                                      |                                   |                           |                                                                              |                                     |                                       |
| HINOR STREET                                                                                                                                                                                                                                                                                                                                                                                                                                      | ł                                                                                                                                                                                                                         |                                                                                                                                      | 17                                | 53                        |                                                                              | N007                                | •                                     |
| Num of Lanes - V7, V9: 1                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                           |                                                                                                                                      | 1                                 | 55                        |                                                                              | NORTH                               | 1>                                    |
| Shared Lane (Y/N): y                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                           |                                                                                                                                      | ٧7                                | V9                        |                                                                              |                                     |                                       |
| \$ Grade - V7&V9: -2                                                                                                                                                                                                                                                                                                                                                                                                                              | 1                                                                                                                                                                                                                         | NINOR                                                                                                                                | STREET: KEKAU                     | LIKE AV                   |                                                                              |                                     |                                       |
| VOLUNE ADJUSTMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                           |                                                                                                                                      |                                   |                           |                                                                              |                                     |                                       |
| MOVEMENT NO.                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2                                                                                                                                                                                                                         | 3                                                                                                                                    | 4                                 |                           | 5 7                                                                          | 9                                   |                                       |
| VOLUME, V (vph)                                                                                                                                                                                                                                                                                                                                                                                                                                   | 88                                                                                                                                                                                                                        |                                                                                                                                      | 11                                |                           | 5 17                                                                         | 53                                  |                                       |
| VOLUME, v (pcph)                                                                                                                                                                                                                                                                                                                                                                                                                                  | 88                                                                                                                                                                                                                        | 20                                                                                                                                   | 11                                | 146                       | 5 17                                                                         | 53                                  |                                       |
| Potential Capacity:   (                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                           | 0 -                                                                                                                                  |                                   | 88                        | 123                                                                          | 8 vph<br>5 pcph                     |                                       |
| Novement Capacity: ; (                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                           | 7 •<br>••••••••••••••••••                                                                                                            |                                   |                           |                                                                              | 5 pcph                              |                                       |
| STEP 2: LT FROM MAJOR STREET                                                                                                                                                                                                                                                                                                                                                                                                                      | - ¥4                                                                                                                                                                                                                      | **                                                                                                                                   |                                   |                           |                                                                              |                                     |                                       |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:                                                                                                                                                                                                                                                                                                                                                                                                | - ¥4<br>  ¥                                                                                                                                                                                                               | c,4 = V3+V2 =                                                                                                                        | 20                                | + 88                      | = 101                                                                        | } vph                               |                                       |
| STEP 2: LT FROM MAJOR STREET                                                                                                                                                                                                                                                                                                                                                                                                                      | - V4<br>  V<br>  C                                                                                                                                                                                                        | c,4 = V3+V2 =<br>p,4 =                                                                                                               | 20                                | + 88                      | = 101<br>152                                                                 | yph<br>pcph                         |                                       |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:                                                                                                                                                                                                                                                                                                                     | - V4<br>  V<br>  C                                                                                                                                                                                                        | c,4 = V3+V2 =                                                                                                                        |                                   | + 88                      | = 101<br>152:<br>152:                                                        | ) vph<br>S pcph<br>S pcph           |                                       |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane                                                                                                                                                                                                                                                                                           | - V4<br>  V<br>  C<br>  C<br>  D                                                                                                                                                                                          | c,4 = V3+V2 =<br>p,4 =<br>m,4 = Cp,4 =<br>p,4 = 1-v4/Cm,4                                                                            |                                   | + 88                      | = 101<br>152                                                                 | ) vph<br>S pcph<br>S pcph           |                                       |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:                                                                                                                                                                                                                                                                                                                     | - V4<br>  V<br>  C<br>  C<br>  D                                                                                                                                                                                          | c,4 = V3+V2 =<br>p,4 =<br>m,4 = Cp,4 =<br>p,4 = 1-v4/Cm,4                                                                            | :                                 |                           | = 101<br>152<br>152<br>0.99                                                  | 3 vph<br>5 pcph<br>5 pcph           |                                       |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET                                                                                                                                                                                                                             | - V4<br>  V<br>  C<br>  C<br>  D<br> <br>  P                                                                                                                                                                              | c,4 = V3+V2 =<br>p,4 =<br>m,4 = Cp,4 =<br>p,4 = 1-v4/Cm,4                                                                            |                                   |                           | = 101<br>152<br>152<br>0.99                                                  | 3 vph<br>5 pcph<br>5 pcph           |                                       |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:                                                                                                                                                                                                       | - V4<br>  V<br>  C<br>  C<br>  p<br> <br>  p <sup>1</sup><br>  v <sup>2</sup>                                                                                                                                             | c,4 = V3+V2 =<br>p,4 =<br>m,4 = Cp,4 =<br>p,4 = 1-v4/Cm,4<br>to,4 =<br>:,7 = 1/2V3+V2+V.                                             | :                                 |                           | = 100<br>152<br>152<br>0.99<br>0.99                                          | 3 vph<br>5 pcph<br>5 pcph           |                                       |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:                                                                                                                                                                                | - V4<br>  V<br>  C<br>  C<br>  p<br> <br>  p <sup>1</sup><br>  v <sup>2</sup>                                                                                                                                             | c,4 = V3+V2 =<br>p,4 =<br>m,4 = Cp,4 =<br>p,4 = 1-v4/Cm,4                                                                            | :                                 |                           | = 101<br>152:<br>152:<br>0.99<br>0.99                                        | 8 vph<br>5 pcph<br>6 pcph           |                                       |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor                                                                                                                                                  | - V4<br>  V<br>  C<br>  C<br>  D<br>  p<br> <br>p <sup>1</sup><br>  p <sup>2</sup><br>  VC                                                                                                                                | c,4 = V3+V2 =<br>p,4 =<br>m,4 = Cp,4 =<br>p,4 = 1-v4/Cm,4<br>%o,4 =<br>c,7 = 1/2V3+V2+V<br>p,7 =                                     | :                                 |                           | = 101<br>152:<br>152:<br>0.99<br>0.99<br>255<br>754                          | yph<br>pcph<br>pcph<br>pcph<br>ycph |                                       |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:                                                                                                                                                                                | - V4<br>V<br>C<br>C<br>C<br>C<br>P<br>P<br>P<br>P<br>P<br>P                                                                                                                                                               | c,4 = V3+V2 =<br>p,4 =<br>m,4 = Cp,4 =<br>p,4 = 1-v4/Cm,4<br>to,4 =<br>;,7 = 1/2V3+V2+V<br>p,7 =<br>=po,4=                           | :                                 |                           | = 101<br>152<br>152<br>0.99<br>0.99<br>255<br>754<br>0.99                    | yph<br>pcph<br>pcph<br>pcph<br>pcph |                                       |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:                                                                                              | - V4<br>  V<br>  C<br>  C<br>  D<br>  D<br>  D<br>  D<br>  D<br>  D<br>  D<br>  C<br>  D<br>  C<br>  D<br>  C<br>  C<br>  C<br>  C<br>  C<br>  C<br>  C<br>  C<br>  C<br>  C                                              | c,4 = V3+V2 =<br>p,4 =<br>m,4 = Cp,4 =<br>p,4 = 1-v4/Cm,4<br>%o,4 =<br>c,7 = 1/2V3+V2+V<br>p,7 =                                     | :                                 |                           | = 101<br>152<br>152<br>0.99<br>0.99<br>255<br>754<br>0.99                    | yph<br>pcph<br>pcph<br>pcph<br>ycph |                                       |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>DELAY AND LEVEL OF SERVICE SUM                                                            | - V4<br>  V<br>  C<br>  C<br>  D<br>  P<br>  P<br>  P<br>  P<br>  C<br>  C<br>  T<br>  C<br>  C<br>  I<br>  I<br>  A<br>  Y<br>  I<br>  I<br>  I<br>  I<br>  I<br>  I<br>  I<br>  I<br>  I<br>  I                         | c,4 = V3+V2 =<br>p,4 =<br>m,4 = Cp,4 =<br>c,4 = 1-v4/Cm,4<br>co,4 =<br>c,7 = 1/2V3+V2+V<br>c,7 =<br>=po,4=<br>c,7 = Cp,7 =           | :<br>5+V4 :<br>csh                | AVG TOTA                  | = 101<br>152<br>152<br>0.99<br>0.99<br>255<br>754<br>0.99<br>748             | yph<br>pcph<br>pcph<br>pcph<br>pcph |                                       |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:                                                                                              | - V4<br>V<br>C<br>C<br>C<br>D<br>P<br>P<br>P<br>P<br>V7<br>V7<br>V7<br>C<br>F7<br>C<br>MARY<br>V(vcph)                                                                                                                    | c,4 = V3+V2 =<br>p,4 =<br>m,4 = Cp,4 =<br>p,4 = 1-v4/Cm,4<br>to,4 =<br>c,7 = 1/2V3+V2+V<br>f,7 =<br>=po,4=<br>cm(pcph)               | =<br>5+V4 =<br>                   | AVG TOTA<br>DELAY         | = 101<br>152:<br>152:<br>0.99<br>0.99<br>255<br>754<br>0.99<br>748<br>L      | yph<br>pcph<br>pcph<br>pcph<br>pcph |                                       |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>DELAY AND LEVEL OF SERVICE SUP                                                            | - V4<br>V<br>C<br>C<br>C<br>D<br>D<br>D<br>D<br>D<br>D<br>D<br>D<br>D<br>D<br>D<br>D<br>D<br>D<br>D<br>D                                                                                                                  | c,4 = V3+V2 =<br>p,4 =<br>m,4 = Cp,4 =<br>p,4 = 1-v4/Cm,4<br>to,4 =<br>c,7 = 1/2V3+V2+V<br>p,7 =<br>=po,4=<br>cm(pcph)               | =<br>5+V4 =<br>(pcph)             | AVG TOTA<br>DELAY         | = 101<br>152<br>152<br>0.99<br>0.99<br>255<br>754<br>0.99<br>748<br>L<br>LOS | yph<br>pcph<br>pcph<br>pcph<br>pcph | ·····                                 |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>DELAY AND LEVEL OF SERVICE SUM<br>Movement<br>MINOR LEFT TURN (7)<br>MINOR RIGHT TURN (9) | - V4<br>  V<br>  C<br>  C<br>  D<br>  p<br>  p<br>  p<br>  p<br>  c<br>  c<br>  f7<br>  C<br>  C<br>  f7<br>  C<br>  C<br>  I<br>  I<br>  f7<br>  C<br>  S<br>  S<br>  S<br>  S<br>  S<br>  S<br>  S<br>  S<br>  S<br>  S | c,4 = V3+V2 =<br>p,4 =<br>a,4 = Cp,4 =<br>c,4 = 1-v4/Cm,4<br>c,4 =<br>c,7 = 1/2V3+V2+V<br>c,7 =<br>=p0,4=<br>cm(pcph)<br>748<br>1235 | =<br>5+V4 =<br>(pcph)<br><br>SHRD | AVG TOTA<br>DELAY         | = 101<br>152:<br>152:<br>0.99<br>0.99<br>255<br>754<br>0.99<br>748<br>L      | yph<br>pcph<br>pcph<br>pcph<br>pcph | · · · · · · · · · · · · · · · · · · · |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>ELAY AND LEVEL OF SERVICE SUM<br>Movement<br>MINOR LEFT TURN (7)                          | - V4<br>  V<br>  C<br>  C<br>  D<br>  p<br>  p<br>  p<br>  p<br>  c<br>  c<br>  f7<br>  C<br>  C<br>  f7<br>  C<br>  C<br>  I<br>  I<br>  f7<br>  C<br>  S<br>  S<br>  S<br>  S<br>  S<br>  S<br>  S<br>  S<br>  S<br>  S | c,4 = V3+V2 =<br>p,4 =<br>a,4 = Cp,4 =<br>c,4 = 1-v4/Cm,4<br>c,4 =<br>c,7 = 1/2V3+V2+V<br>c,7 =<br>=p0,4=<br>cm(pcph)<br>748<br>1235 | =<br>5+V4 =<br>(pcph)<br><br>SHRD | AVG TOTA<br>DELAY<br>SHRD | = 100<br>152<br>152<br>0.99<br>0.99<br>255<br>754<br>0.99<br>748<br>         | yph<br>pcph<br>pcph<br>pcph<br>pcph | ·                                     |

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| Minor Street: KEKAULIKE AV<br>Peak Hour: PM<br>Scenario: EXISTING                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                         |                                                                                                             |                                          |                                          | Ana                                                                                    | Date:<br>lyst:<br>Name:                    | 27-Jun<br>BC<br>KULKEK-P<br>5         |                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------|----------------|
| Peak Hour Factor: 1.00                                                                                                                                                                                                                                                                                                                                                                                                                            | •                                                                                                                                                       | ••••••                                                                                                      |                                          |                                          |                                                                                        |                                            |                                       |                |
| Num of Land and                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                         | ,,                                                                                                          |                                          | ζ                                        | 126                                                                                    | ۷5                                         |                                       |                |
| Excl RT - V3 (Y/N): N                                                                                                                                                                                                                                                                                                                                                                                                                             | V3 20                                                                                                                                                   | )                                                                                                           |                                          |                                          | 11                                                                                     | ¥4                                         |                                       |                |
| Stop/Yield - V3 (Y/N): A                                                                                                                                                                                                                                                                                                                                                                                                                          | !                                                                                                                                                       | ١                                                                                                           |                                          | 1                                        |                                                                                        |                                            |                                       |                |
| \$ Grade - V2,V3: 2                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                         | ۷                                                                                                           |                                          | v                                        | MAJOR STR                                                                              | EET:                                       |                                       |                |
| Num of Lanes - V5: 1                                                                                                                                                                                                                                                                                                                                                                                                                              | i<br>!                                                                                                                                                  |                                                                                                             | ,                                        |                                          | KULA HWY                                                                               |                                            |                                       |                |
| Excl LT - V4 (Y/N): N                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                         |                                                                                                             | ì                                        | ,                                        |                                                                                        |                                            |                                       |                |
| \$ Grade - V4,V5: -2                                                                                                                                                                                                                                                                                                                                                                                                                              | i                                                                                                                                                       |                                                                                                             |                                          | (                                        |                                                                                        |                                            |                                       |                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ł                                                                                                                                                       |                                                                                                             |                                          |                                          |                                                                                        |                                            |                                       |                |
| Num of Lanes - V7,V9: 1                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                         |                                                                                                             | 19                                       | 33                                       |                                                                                        | NORTH                                      | >                                     |                |
| Shared Lane (Y/N): y                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                         |                                                                                                             | ¥7                                       | 100                                      |                                                                                        |                                            |                                       |                |
| \$ Grade - ¥7&¥9: -2                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                         | MINOR ST                                                                                                    | REET: KEKAU                              | V9<br>ILTKE AV                           |                                                                                        |                                            |                                       |                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                         |                                                                                                             |                                          |                                          |                                                                                        |                                            |                                       |                |
| VOLUME ADJUSTMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                | _                                                                                                                                                       |                                                                                                             |                                          |                                          |                                                                                        |                                            |                                       | :              |
| MOVEMENT NO.<br>Volume, V (vph)                                                                                                                                                                                                                                                                                                                                                                                                                   | 2                                                                                                                                                       | 3                                                                                                           | 4                                        | 5                                        | 7                                                                                      | 9                                          |                                       |                |
| VOLUME, v (pcph)                                                                                                                                                                                                                                                                                                                                                                                                                                  | 114<br>114                                                                                                                                              | 20<br>20                                                                                                    | 11<br>11                                 | 126                                      | 19                                                                                     | 33                                         |                                       |                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                         |                                                                                                             | 11<br>                                   | 126                                      | 19                                                                                     | 33                                         |                                       |                |
| STEP 1: RT FROM MINOR STREET                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                         |                                                                                                             |                                          |                                          |                                                                                        |                                            |                                       |                |
| Conflicting Flows:                                                                                                                                                                                                                                                                                                                                                                                                                                | /c,9 = 1/2*V3+                                                                                                                                          | V2 =                                                                                                        | 10 +                                     | 114                                      | = 124                                                                                  | vph                                        |                                       |                |
| Potential Capacity:<br>Movement Capacity:                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                         |                                                                                                             |                                          |                                          |                                                                                        | pcph                                       |                                       | •              |
| nuvement capacity:                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>m,p = Cp,9 =</b>                                                                                                                                     |                                                                                                             |                                          |                                          |                                                                                        | pcph                                       |                                       |                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                         |                                                                                                             |                                          |                                          |                                                                                        | • •                                        |                                       |                |
| ***************************************                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                         |                                                                                                             | ••••••••••                               |                                          |                                                                                        |                                            |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:                                                                                                                                                                                                                                                                                                                                                                                                | - ¥4                                                                                                                                                    | <br>= V3+V2 =                                                                                               | 20                                       | + 114                                    |                                                                                        |                                            |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:                                                                                                                                                                                                                                                                                                                                                                         | - V4<br>  Vc,4                                                                                                                                          |                                                                                                             | 20                                       | + 114                                    | = 134                                                                                  | vph                                        |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:                                                                                                                                                                                                                                                                                                                                                   | - V4<br>  Vc,4<br>  Cp,4<br>  Cm,4                                                                                                                      | =<br>= Cp,4 =                                                                                               | 20                                       | + 114                                    | = 134<br>1480                                                                          | vph<br>pcph                                |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:                                                                                                                                                                                                                                                                                                                     | - V4<br>  Vc,4<br>  Cp,4<br>  Cm,4                                                                                                                      | :                                                                                                           | 20                                       | + 114                                    | = 134<br>1480<br>1480                                                                  | vph                                        |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane                                                                                                                                                                                                                                                                                           | - V4<br>  Vc,4<br>  Cp,4<br>  Cm,4<br>  po,4                                                                                                            | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =                                                                              | 20                                       | + 114                                    | = 134<br>1480                                                                          | vph<br>pcph                                |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:                                                                                                                                                                                                                                                                                                                     | - V4<br>Vc,4<br>Cp,4<br>Cm,4<br>po,4                                                                                                                    | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =<br>=                                                                         |                                          |                                          | = 134<br>1480<br>1480<br>0.99                                                          | vph<br>pcph                                |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:                                                                                                                                                                                                                                                             | - V4<br>  Vc,4<br>  Cp,4<br>  Cm,4<br>  po,4<br>  p <sup>*</sup> 0,4                                                                                    | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =<br>=                                                                         |                                          | + 114                                    | = 134<br>1480<br>1480<br>0.99                                                          | vph<br>pcph                                |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:                                                                                                                                                                                                       | - V4<br>Vc,4<br>Cp,4<br>Cm,4<br>po,4<br>po,4<br>p <sup>2</sup> o,4<br>- V7                                                                              | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =<br>=                                                                         |                                          |                                          | = 134<br>1480<br>1480<br>0.99<br>0.99                                                  | vph<br>pcph<br>pcph                        |                                       | . <del></del>  |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:                                                                                                                                                                                | - V4<br>Vc,4<br>Cp,4<br>Cm,4<br>po,4<br>po,4<br>p <sup>2</sup> o,4<br>- V7                                                                              | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =<br>=<br>1/2V3+V2+V5+V                                                        |                                          |                                          | = 134<br>1480<br>1480<br>0.99<br>0.99<br>261                                           | vph<br>pcph<br>pcph<br>pcph                |                                       | . <del>.</del> |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor                                                                                                                                                  | - V4<br>  Vc,4<br>  Cp,4<br>  Cm,4<br>  po,4<br>  p <sup>2</sup> 0,4<br>  V7<br>  Vc,7 =                                                                | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =<br>=<br>1/2V3+V2+V5+V                                                        |                                          |                                          | = 134<br>1480<br>1480<br>0.99<br>0.99<br>261                                           | vph<br>pcph<br>pcph                        |                                       | . <del>.</del> |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:                                                                                                                    | - V4<br>  Vc,4<br>  Cp,4<br>  Cm,4<br>  po,4<br>  p <sup>2</sup> 0,4<br>  V7<br>  Vc,7 =                                                                | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =<br>=<br>1/2V3+V2+V5+V                                                        |                                          |                                          | = 134<br>1480<br>1480<br>0.99<br>0.99<br>261<br>748                                    | vph<br>pcph<br>pcph<br>pcph                |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor                                                                                                                                                  | - V4<br>Vc,4<br>Cp,4<br>Cm,4<br>po,4<br>p <sup>2</sup> o,4<br>V7<br>Vc,7 =<br>Cp,7 =<br>f7=po,                                                          | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =<br>=<br>1/2V3+V2+V5+V                                                        |                                          |                                          | = 134<br>1480<br>1480<br>0.99<br>0.99<br>261<br>748<br>0.99                            | vph<br>pcph<br>pcph<br>pcph                |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:                                                                                              | - V4<br>Vc,4<br>Cp,4<br>Cm,4<br>po,4<br>p <sup>2</sup> o,4<br>VC,7 =<br>Cp,7 =<br>f7=po,<br>Cm,7 =                                                      | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =<br>=<br>1/2V3+V2+V5+V<br>4=                                                  |                                          |                                          | = 134<br>1480<br>1480<br>0.99<br>0.99<br>261<br>748<br>0.99                            | vph<br>pcph<br>pcph<br>pcph<br>vph<br>pcph |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>DELAY AND LEVEL OF SERVICE SUM                                                            | - V4<br>Vc,4<br>Cp,4<br>Cm,4<br>po,4<br>po,4<br>p <sup>2</sup> 0,4<br>V7<br>Vc,7 =<br>Cp,7 =<br>f7=po,<br>Cm,7 =                                        | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =<br>=<br>1/2V3+V2+V5+V<br>4=<br>Cp,7 =                                        | <br>/4 =<br>csh                          | AVG TOTAL                                | = 134<br>1480<br>1480<br>0.99<br>0.99<br>261<br>748<br>0.99<br>742                     | vph<br>pcph<br>pcph<br>pcph<br>vph<br>pcph |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:                                                                                              | - V4<br>Vc,4<br>Cp,4<br>Cm,4<br>po,4<br>p <sup>2</sup> o,4<br>VC,7 =<br>Cp,7 =<br>f7=po,<br>Cm,7 =                                                      | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =<br>=<br>1/2V3+V2+V5+V<br>4=                                                  |                                          | AVG TOTAL<br>DELAY                       | = 134<br>1480<br>1480<br>0.99<br>0.99<br>261<br>748<br>0.99<br>742<br>LOS              | vph<br>pcph<br>pcph<br>pcph<br>vph<br>pcph |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>DELAY AND LEVEL OF SERVICE SUN<br>Movement                                                | - V4<br>Vc,4<br>Cp,4<br>Cm,4<br>po,4<br>p <sup>2</sup> o,4<br>V7<br>Vc,7 =<br>Cp,7 =<br>f7=po,<br>Cm,7 =<br>MARY<br>v(vcph)                             | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =<br>=<br>1/2V3+V2+V5+V<br>4=<br>Cp,7 =<br>cm(pcph)                            | /4 =<br>csh<br>(pcph)                    | AVG TOTAL<br>DELAY                       | = 134<br>1480<br>1480<br>0.99<br>0.99<br>261<br>748<br>0.99<br>742<br>LOS              | vph<br>pcph<br>pcph<br>pcph<br>vph<br>pcph |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>DELAY AND LEVEL OF SERVICE SUN<br>Movement<br>MINOR LEFT TURN (7)<br>MINOR RIGHT TURN (9) | - V4<br>Vc,4<br>Cp,4<br>Cm,4<br>po,4<br>po,4<br>p <sup>2</sup> o,4<br>V7<br>Vc,7 =<br>Cp,7 =<br>f7=po,<br>Cm,7 =<br>HARY<br>v(vcph)                     | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =<br>=<br>1/2V3+V2+V5+V<br>4=<br>Cp,7 =<br><u>cm(pcph)</u>                     | /4 =<br>csh<br>(pcph)                    | AVG TOTAL<br>DELAY                       | = 134<br>1480<br>1480<br>0.99<br>0.99<br>261<br>748<br>0.99<br>742<br>LOS              | vph<br>pcph<br>pcph<br>pcph<br>vph<br>pcph |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>DELAY AND LEVEL OF SERVICE SUN<br>Movement<br>Movement                                    | - V4<br>Vc,4<br>Cp,4<br>Cp,4<br>Cm,4<br>po,4<br>po,4<br>p <sup>2</sup> o,4<br>VC,7 =<br>Cp,7 =<br>f7=po,<br>Cm,7 =<br>HARY<br>v(vcph)<br>19             | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =<br>=<br>1/2V3+V2+V5+V<br>4=<br>Cp,7 =<br><u>cm(pcph)</u><br><br>742          | /4 =<br>csh<br>(pcph)<br><br>SHRD        | AVG TOTAL<br>DELAY<br>SHRD               | = 134<br>1480<br>1480<br>0.99<br>0.99<br>261<br>748<br>0.99<br>742<br>LOS<br>SHRD      | vph<br>pcph<br>pcph<br>pcph<br>vph<br>pcph |                                       |                |
| STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>STEP 3: LT FROM MINOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>DELAY AND LEVEL OF SERVICE SUN<br>Movement<br>MINOR LEFT TURN (7)<br>MINOR RIGHT TURN (9) | - V4<br>Vc,4<br>Cp,4<br>Cm,4<br>po,4<br>po,4<br>p <sup>2</sup> o,4<br>- V7<br>Vc,7 =<br>Cp,7 =<br>f7=po,<br>Cm,7 =<br>MARY<br>v(vcph)<br>19<br>33<br>11 | =<br>= Cp,4 =<br>= 1-v4/Cm,4 =<br>=<br>1/2V3+V2+V5+V<br>4=<br>Cp,7 =<br>Cm(pcph)<br><br>742<br>1198<br>1480 | /4 =<br>csh<br>(pcph)<br><br>SHRD<br>978 | AVG TOTAL<br>DELAY<br>SHRD<br>3.9<br>2.5 | = 134<br>1480<br>1480<br>0.99<br>0.99<br>261<br>748<br>0.99<br>742<br>LOS<br>SHRD<br>A | vph<br>pcph<br>pcph<br>pcph<br>vph<br>pcph | · · · · · · · · · · · · · · · · · · · |                |

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# YEAR 2005 BASE LOS CALCULATIONS

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### SIGNAL94/TEAPAC[V1 L1.0] - Summary of Parameter Values

Intersection Parameters for Int # 1 - HANA HWY & HALEAKALA HWY

| METROAREA      | NONCBD |     |  |  |
|----------------|--------|-----|--|--|
| LOSTTIME       |        | 2.0 |  |  |
| LEVELOFSERVICE | 3      | S   |  |  |
| NODELOCATION   | 0      | 0   |  |  |

Approach Parameters

| APPLABELS       | 58   | WB   | NB   | EB          |
|-----------------|------|------|------|-------------|
| GRADES          | .0   | .0   | .0   | .0          |
| PEDLEVELS       | LOW  | LOW  | LOW  | LOW         |
| PARKINGSIDES    | NONE | NONE | NONE | NONE        |
| PARKVOLUMES     | 20   | 20   | 20   | 20 <i>'</i> |
| BUSVOLUMES      | · 0  | 0    | 0    | 0           |
| RIGHTTURNONREDS | 0    | 0    | 0    | 0           |

#### Movement Parameters

| MOVLABELS       | RT   | тя   | LT   | RT   | <b>T</b> 8 | LT   | RT   | TH   | LT   | RT   | TH   | LT   |
|-----------------|------|------|------|------|------------|------|------|------|------|------|------|------|
| VOLUMES         | 10   | 902  | - 17 | 115  | 100        | 2344 | 395  | 316  | 66   | 10   | 30   | 29   |
| WIDTHS          | 12.0 | 22.0 | 11.0 | 12.0 | 11.0       | 11.0 | 12.0 | 22.0 | 11.0 | 12.0 | 11.0 | .0   |
| LANES           | 1    | 2    | 1    | 1    | 1          | 1    | 1    | 2    | 1    | 1    | 1    | 0    |
| UTILIZATIONS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00       | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| TRUCKPERCENTS   | 2.0  | 2.0  | 2.0  | 2.0  | 2.0        | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  |
| PEAKHOURFACTORS | 1.00 | 1.00 | 1.00 | 1.00 | 1.00       | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| ARRIVALTYPES    | 3    | 3    | 3    | 3    | 3          | 3    | 3    | 3    | 3    | 3    | 3    | 3    |
| ACTUATIONS      | NO   | NO   | YES  | NO   | YES        | YES  | ND   | NO   | YES  | Ю    | YES  | YES  |
| REQCLEARANCES   | 4.0  | 4.0  | 4.0  | 4.0  | 4.0        | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  |
| MINIMUMS        | 5.0  | 5.0  | 5.0  | 5.0  | 5.0        | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  |
| IDEALSATFLOWS   | 1900 | 1900 | 1900 | 1900 | 1900       | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| FACTORS         | 1.00 | 1.00 | 1.00 | 1.00 | 1.00       | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| DELAYFACTORS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00       | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| NSTOPFACTORS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00       | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| GROUPTYPES      | FFLW | NORM | NORM | FFLW | NORM       | DOPT | FFLW | NORM | NORM | EFLW | NORK | NORM |
| SATURATIONFLOWS | 0    | 3601 | 763  | 0    | 1721       | 1711 | 0    | 3601 | 390  | 0    | 624  | 0    |

#### Phasing Parameters

| SEQUENCES   | 17    | ALL   |      |     |          |      |      |
|-------------|-------|-------|------|-----|----------|------|------|
| PERMISSIVES | YES   | YES   | YES  | YES | LEADLAGS | NONE | NONE |
| OVERLAPS    | YES   | YES   | YES  | YES | OFFSET   | .00  | 1    |
| CYCLES      | 60    | 180   | 10   |     | PEDTIME  | .0   | 0    |
| GREENTIMES  | 16.48 | 24.92 | 6.60 |     |          |      |      |
| YELLOWTINES | 4.00  | 4.00  | 4.00 |     |          |      |      |
| CRITICALS   | 2     | 6     | 11   |     |          |      |      |
| EXCESS      | 0     |       |      |     |          |      |      |

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KULA RESIDENT LOTS YEAR 2005 BASE AM PEAK HOUR

SIGHAL94/TEAPAC[V1 L1.0] - Capacity Analysis Summary
Intersection Averages for Int # 1 - HAHA HWY & HALEAKALA HWY

Degree of Saturation (v/c) 1.26 Vehicle Delay 28.8 Level of Service D+

| 7 ¦ Phase<br>* | e 1   | Phase 2          | Phase 3   |
|----------------|-------|------------------|-----------|
| *              |       |                  | 1         |
| + * +          | 1     |                  |           |
| # +>           |       | <b>&lt;</b> ++++ | İ         |
| l v            | Ì     | ****             | 1         |
|                | ^ į   | v                | ****      |
| h   (+         | +     |                  | ****>     |
| +              | + 1   |                  |           |
| +              | +     |                  | 1         |
| . ! G/C= .     | 275 ! | G/C= .415        | G/C= .110 |
|                |       |                  | G= 6.6"   |
|                | •     |                  | Y+R= 4.0" |
| •              | •     |                  | OFF=82.3% |

C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0%

| Group | Lanes | Read Used | İ | Service Rate¦<br>@C (vph) @E ¦V | olume¦ v | /c | Delay | S | Queue ; |
|-------|-------|-----------|---|---------------------------------|----------|----|-------|---|---------|
|       |       |           |   |                                 |          |    |       |   |         |

 SB Approach
 17.7
 C+

 I
 TH
 22/2
 .274
 .308
 1031
 1109
 902
 .813
 17.9
 \*C+
 263
 ft;

 I
 TH
 22/2
 .274
 .308
 1031
 1109
 902
 .813
 17.9
 \*C+
 263
 ft;

 LT
 11/1
 .000
 .308
 191
 235
 17
 .072
 9.5
 8+
 25
 ft;

 NB Approach
 12.5
 B

 I
 TH
 22/2
 .116
 .308
 1031
 1109
 316
 .285
 12.0
 8
 92
 ft;

 I
 TH
 22/2
 .116
 .308
 1031
 1109
 316
 .285
 12.0
 8
 92
 ft;

 I
 TH
 11/1
 .000
 .308
 8B
 114
 66
 .550
 15.1
 C+;
 39
 ft;

 WB Approach
 35.6
 0
 35.6
 0
 .583
 ft;

 I
 TH
 11/1-;
 .722
 .449
 730
 772
 1253
 1.623
 35.6
 0
 583
 ft;

 I
 T
 11/1+;
 .699
 .449
 725
 767
 1191
 1.553
 35.7
 #D
 554
 ft;

 EB Approach
 26.1
 D+
 26.1
 D+
 26.1
 D+

LT+TH | 11/1 | .147 | .143 | 58 | 81 | 59 | .656 | 26.1 |\*D+; 43 ft

KULA RESIDENT LOTS YEAR 2005 BASE PM PEAK HOUR

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#### SIGNAL94/TEAPAC[V1 L1.0] - Summary of Parameter Values

Intersection Parameters for Int # 1 - HANA HWY & HALEAKALA HWY

| METROAREA      | HONCBE |     |  |
|----------------|--------|-----|--|
| LOSTTINE       |        | 2.0 |  |
| LEVELOFSERVICE | C      | S   |  |
| NODELOCATION   | 0      | 0   |  |

Approach Parameters

| APPLABELS       | S8   | WB   | Ю    | EB   |
|-----------------|------|------|------|------|
| GRADES          | .0   | .0   | .0   | .0   |
| PEDLEVELS       | LOW  | LOW  | LOW  | LOW  |
| PARKINGSIDES    | NONE | NONE | NONE | NONE |
| PARKVOLUHES     | 20   | 20   | 20   | 20   |
| BUSVOLUMES      | 0    | 0    | 0    | 0    |
| RIGHTTURNONREDS | 0    | 0    | 0    | 0    |

#### **Novement** Parameters

| MOVLABELS       | RT     | TH   | LT   | RT   | . TH | LT   | RT   | TH   | LT   | Rĭ   | TH   | LT   |
|-----------------|--------|------|------|------|------|------|------|------|------|------|------|------|
| VOLUMES         | 33     | 488  | 37   | 58   | 36   | 568  | 1833 | 934  | 15   | 29   | 134  | 51   |
| WIDTHS          | 12.0 2 | 22.0 | 11.0 | 12.0 | 11.0 | 11.0 | 12.0 | 22.0 | 11.0 | 12.0 | 11.0 | .0   |
| LANES           | 1      | 2    | 1    | 1    | 1    | 1    | 1    | 2    | 1    | 1    | 1    | 0    |
| UTILIZATIONS    | 1.00 1 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| TRUCKPERCENTS   | 2.0    | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  |
| PEAKHOURFACTORS | 1.00 1 | l.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| ARRIVALTYPES    | 3      | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |
| ACTUATIONS      | NO     | NO   | YES  | Ю    | YES  | YES  | NO   | NO   | YES  | NO   | YES  | YES  |
| REDCLEARANCES   | 4.0    | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  |
| MINIHUMS        | 5.0    | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  |
| IDEALSATFLOWS   | 1900 1 | 900  | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| FACTORS         | 1.00 1 | .00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| DELAYFACTORS    | 1.00 1 | .00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| NSTOPFACTORS    | 1.00 1 | .00  | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| GROUPTYPES      | FFLW N | IORM | NORM | FFLW | NORM | DOPT | FFLW | NORM | HORN | FFLW | NORM | NORM |
| SATURATIONFLOWS | 03     | 601  | 320  | 0    | 1724 | 1711 | 0    | 3601 | 509  | 0    | 1258 | 0    |

Phasing Parameters

| SEQUENCES   | 17    | ALL   |       |     |          |      |      |
|-------------|-------|-------|-------|-----|----------|------|------|
| PERMISSIVES | YES   | YES   | YES   | YES | LEADLAGS | NONE | NONE |
| OVERLAPS    | YES   | YES   | YES   | YES | OFFSET   | .00  | 1    |
| CYCLES      | 60    | 180   | 10    |     | PEDTIME  | .0   | 0    |
| GREENTIMES  | 20.54 | 15.17 | 12.30 |     |          |      |      |
| YELLOWTINES | 4.00  | 4.00  | 4.00  |     |          |      |      |
| CRITICALS   | 8     | 5     | 11    |     |          |      |      |
| EXCESS      | 0     |       |       |     |          |      |      |

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| KULA RESIDENT LOTS<br>YEAR 2005 BASE<br>PM PEAK HOUR                                                                                                             | 02/27/95<br>10:15:28                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| SIGNAL94/TEAPAC[V1 L1.0] - Capacity Analys                                                                                                                       | is Summary                                                |
| Intersection Averages for Int ¥ 1 - HANA<br>Degree of Saturation (v/c) .58 Veh                                                                                   | XWY & HALEAKALA HWY<br>icle Delay 12.8 Level of Service 8 |
| Sq 17 ¦ Phase 1 ¦ Phase 2 ¦ Phase 3<br>**/**                                                                                                                     | -                                                         |
| + +       / \ + +>       v       +++       v       +++       v       +++       North       + *                                                                   |                                                           |
| + *  <br>  G/C= .342   G/C= .253   G/C= .205<br>  G= 20.5"   G= 15.2"   G= 12.3"<br>  Y+R= 4.0"   Y+R= 4.0"   Y+R= 4.0"<br>  DFF= .0\$   OFF=40.9\$   OFF=72.8\$ |                                                           |
| C= 60 sec G= 48.0 sec = 80.0% Y=1                                                                                                                                | -<br>2.0 sec = 20.0%                                      |
| ¦ Lane ¦Width/¦ g/C ¦ Service Rat<br>¦ Group ¦ Lanes¦ Reqd Used ¦ @C (vph) @                                                                                     |                                                           |
| S8 Approach                                                                                                                                                      | 10.3 B                                                    |
| TH   22/2   .164   .376   1293   1353<br>  LT   11/1   .000   .376   90   114                                                                                    |                                                           |
| NB Approach                                                                                                                                                      | 13.0 8                                                    |
| TH   22/2   .283   .376   1293   1353<br>  LT   11/1   .000   .376   154   190                                                                                   | ¦ 934 ¦ .690 ¦ 13.1 ¦≭B ¦ 246 ft¦                         |
| WB Approach                                                                                                                                                      | 13.6 B                                                    |
|                                                                                                                                                                  |                                                           |
| TH   11/1-  .215   .286   435   493<br>  LT   11/1+  .207   .286   431   489                                                                                     |                                                           |
|                                                                                                                                                                  |                                                           |

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KULA RESIDENT LOTS YEAR 2005 BASE AM PEAK HOUR

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02/27/95 10:35:48

#### SIGNAL94/TEAPAC[VI L1.0] - Summary of Parameter Values

Intersection Parameters for Int # 2 - PUKALAHI BYPASS & MAKAWAO AV

| METROAREA      | NON | ICBD |
|----------------|-----|------|
| LOSTTINE       |     | 2.0  |
| LEVELOFSERVICE | C   | S    |
| NODELOCATION   | 0   | 0    |

#### Approach Parameters

| APPLABELS         | SB   | WB   | NB   | EB   |
|-------------------|------|------|------|------|
| GRADES            | 2.0  | .0   | -2.0 | .0   |
| PEDLEVELS         | LOW  | LOW  | LOW  | LOW  |
| PARKINGSIDES      | NONE | NONE | NONE | NONE |
| PARKVOLUHES       | 20   | 20   | 20   | 20   |
| <b>BUSVOLUMES</b> | 0    | 0    | 0    | 0    |
| RIGHTTURNONREDS   | 10   | 45   | 20   | 5    |

#### Movement Parameters

| MOVLABELS       | RT   | TH   | LT   | RT   | TH   | LT   | RT   | TH   | LΤ   | RT   | TH   | LT   |  |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|--|
| VOLUMES         | 81   | 52   | 10   | 457  | 263  | 349  | 210  | 909  | 9    | 6    | 202  | 16   |  |
| WIDTHS          | 12.0 | 24.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |  |
| LANES           | 1    | 2    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |  |
| UTILIZATIONS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| TRUCKPERCENTS   | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  |  |
| PEAKHOURFACTORS | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| ARRIVALTYPES    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |
| ACTUATIONS      | NO   | NO   | YES  | YES  | YES  | YES  | NO   | NO   | YES  | YES  | YES  | YES  |  |
| REQCLEARANCES   | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  |  |
| MINIHUMS        | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  |  |
| IDEALSATFLOWS   | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |  |
| FACTORS         | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| DELAYFACTORS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| NSTOPFACTORS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| GROUPTYPES      | NORM | NORM | NORM | NORM | NORM | NORM | NORM | NORM | NORM | NORM | NORM | NORM |  |
| SATURATIONFLOWS | 1524 | 3688 | 237  | 1539 | 1863 | 1770 | 1554 | 1881 | 1543 | 1539 | 1863 | 863  |  |

#### Phasing Parameters

| SEQUENCES   | 12    | ALL   |      |     |          |      |      |
|-------------|-------|-------|------|-----|----------|------|------|
| PERMISSIVES | NO    | NO    | NO   | NO  | LEADLAGS | NONE | NONE |
| OVERLAPS    | YES   | YES   | YES  | YES | OFFSET   | .00  | 1    |
| CYCLES      | 60    | 120   | 30   |     | PEDTIME  | .0   | 0    |
| GREENTIMES  | 29.10 | 12.27 | 6.63 |     |          |      |      |
| YELLOWTIMES | 4.00  | 4.00  | 4.00 |     |          |      |      |
| CRITICALS   | 8     | 6     | 11   |     |          |      |      |
| EXCESS      | 0     |       |      |     |          |      |      |

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|   | KULA RESIDENT LOTS 02/27/95<br>Year 2005 Base 10:35:58<br>Am Peak Hour                                                                                                                                                                                                                                                                                                 |            |
|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
|   | SIGKAL94/TEAPAC(V1 L1.0) - Capacity Analysis Summary                                                                                                                                                                                                                                                                                                                   |            |
|   | Intersection Averages for Int # 2 ~ PUKALANI BYPASS & MAKAWAG AV<br>Degree of Saturation (v/c) .68 Vehicle Delay 16.0 Level of Service C4                                                                                                                                                                                                                              | ł          |
|   | Sq 12 ¦ Phase 1 ¦ Phase 2 ¦ Phase 3 ¦<br>**/**                                                                                                                                                                                                                                                                                                                         |            |
|   | $+ + +$ $+ + +$ $+ + +$ $+ + + +$ $+ + +$ $+ + + +$ $/   \setminus  $ $(+ + +)$ $\vee$ $+ + + +$ North $(+ + +)$ $+ + +$ $+ + + + +$                                                                                                                                                                                                                                   |            |
|   | ; + ≠ + ; + ; v ;<br>; G/C= .485 ; G/C= .204 ; G/C= .111 ;                                                                                                                                                                                                                                                                                                             |            |
|   | G= 29.1 G= 12.3 G= 6.6<br>Y+R= 4.0 Y+R= 4.0 Y+R= 4.0<br>DFF= .03 OFF=55.23 OFF=82.33                                                                                                                                                                                                                                                                                   |            |
|   | C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0                                                                                                                                                                                                                                                                                                      | \$         |
|   | Lane  Width/  g/C   Service Rate  Adj     HCM   L  90% Max<br>  Group   Lanes  Reqd Used   &C (vph) &E  Volume  v/c   Delay   S   Queue                                                                                                                                                                                                                                | -<br> <br> |
|   | SB Approach 5.4 Bt                                                                                                                                                                                                                                                                                                                                                     |            |
|   | RT       12/1       .080       .518       748       790       71       .090       5.5       8+       29       ft         TH       24/2       .028       .518       1896       1912       52       .027       5.4       8+       25       ft         LT       12/1       .000       .518       96       119       10       .081       4.7       A       25       ft     | 4          |
|   | NB Approach 17.7 C+                                                                                                                                                                                                                                                                                                                                                    |            |
| · | RT       12/1       .166       .789       1227       1227       190       .155       1.2       A       34       fl         TH       12/1       .506       .518       936       975       909       .932       21.3       *C       369       fl         LT       12/1       .000       .518       766       800       9       .011       4.5       A       25       fl  | 61         |
|   | WB Approach 14.1 B                                                                                                                                                                                                                                                                                                                                                     |            |
|   | RT       12/1       .304       .415       593       639       412       .645       10.6       B       203       f         TH       12/1       .175       .415       728       773       263       .340       7.8       B+       130       f         LT       12/1       .232       .238       360       421       349       .829       23.0       #C       224       f | 41         |
|   | EB Approach 23.0 C                                                                                                                                                                                                                                                                                                                                                     |            |
|   | RT       12/1       .002       .144       167       219       1       .005       14.2       8       25 f         TH       12/1       .140       .144       208       268       202       .754       23.7       *C       146 f         LT       12/1       .000       .144       85       116       16       .129       14.5       8       25 f                         | •          |

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KULA RESIDENT LOTS YEAR 2005 BASE PM PEAK HOUR

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### SIGNAL94/TEAPAC[VI L1.0] - Summary of Parameter Values

Intersection Parameters for Int # 2 - PUKALAHI BYPASS & MAKAWAO AV

METROAREA LOSTTINE LEVELOFSERVICE NODELOCATION NONCBD 2.0 S Ĉ 0 0

Approach Parameters

| APPLABELS       | SB   | WB   | NB   | E8   |
|-----------------|------|------|------|------|
| GRADES          | 2.0  | .0   | -2.0 | .0   |
| PEDLEVELS       | LOW  | LOW  | LOW  | LOW  |
| PARKINGSIDES    | NONE | NONE | NONE | NONE |
| PARKVOLUMES     | 20   | 20   | 20   | 20   |
| BUSVOLUMES      | 0    | 0    | 0    | 0    |
| RIGHTTURNONREDS | 5    | 10   | 30   | 5    |

Hovement Parameters

| NOVLABELS       | RT   | TH   | LĨ   | RT   | TH   | LT   | RT   | TH   | LT   | RT   | TH   | LT   |  |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|--|
| VOLUKES         | 67   | 351  | 362  | 115  | 307  | 192  | 279  | 213  | 9    | 16   | 258  | 12   |  |
| WIDTHS          | 12.0 | 24.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | i2.0 | 12.0 | 12.0 |  |
| LANES           | 1    | 2    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |  |
| UTILIZATIONS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| TRUCKPERCENTS   | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  |  |
| PEAKHOURFACTORS | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| ARRIVALTYPES    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |  |
| ACTUATIONS      | KO   | NO   | YES  | YES  | YES  | YES  | NO   | NO   | YES  | YES  | YES  | YES  |  |
| REQCLEARANCES   | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  |  |
| MINIKUNS        | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  |  |
| IDEALSATFLOWS   | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |  |
| FACTORS         | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| DELAYFACTORS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| NSTOPFACTORS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |  |
| GROUPTYPES      | NORN | NORM | NORM | HORM | NORM | NORM | NORM | NORM | NORM | NORM | NORM | NORM |  |
| SATURATIONFLOWS | 1524 | 3688 | 993  | 1539 | 1863 | 788  | 1554 | 1881 | 888  | 1539 | 1863 | 658  |  |

Phasing Parameters

| SEQUENCES   | 11    | ALL   |     |     |          |      |      |
|-------------|-------|-------|-----|-----|----------|------|------|
| PERMISSIVES | NO    | NO    | NO  | NO  | LEADLAGS | NONE | NONE |
| OVERLAPS    | YES   | YES   | YES | YES | OFFSET   | .00  | 1    |
| CYCLES      | 60    | 120   | 30  |     | PEDTIME  | .0   | 0    |
| GREENTIMES  | 30.23 | 21.77 |     |     |          |      |      |
| YELLOWTINES | 4.00  | 4.00  |     | •   |          |      |      |
| CRITICALS   | 3     | 6     |     |     |          |      |      |
| EXCESS      | 0     |       |     |     |          |      |      |

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| YEA              | A RESIDENT LOTS<br>IR 2005 BASE<br>PEAK HOUR                                                                                                      | 02/27/95<br>10:46:42                                                                                                                                                                                                                      |             |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| SIG              | NAL94/TEAPAC[V1 L1.0] - Capaci                                                                                                                    | ty Analysis Summary                                                                                                                                                                                                                       |             |
| In               | tersection Averages for Int <b>#</b><br>Degree of Saturation (v/c)                                                                                | 2 - PUKALANI BYPASS & MAKAWAD AV<br>.37 Vehicle Delay 7.6 Level of Service B+                                                                                                                                                             |             |
|                  | 11 ¦ Phase 1 ¦ Phase 2 ¦<br>/**                                                                                                                   |                                                                                                                                                                                                                                           |             |
| 1                | + + *         ^           + + *         ++++           (+ + *)         <++++                                                                      |                                                                                                                                                                                                                                           |             |
|                  | rth <+ ++)++++>                                                                                                                                   |                                                                                                                                                                                                                                           |             |
|                  | } + + + + ++++<br>+ + + + V                                                                                                                       |                                                                                                                                                                                                                                           |             |
|                  | G/C= .504   G/C= .363  <br>G= 30.2"   G= 21.8"  <br>Y+R= 4.0"   Y+R= 4.0"                                                                         |                                                                                                                                                                                                                                           |             |
|                  | OFF= .0%   OFF=57.1%                                                                                                                              | 86.7% Y= 8.0 sec = 13.3% Ped= _0 sec = _0%                                                                                                                                                                                                |             |
|                  |                                                                                                                                                   |                                                                                                                                                                                                                                           |             |
| 6<br>1<br>1<br>2 | Lane ¦Width/¦ g/C ¦<br>Group¦Lanes¦Reqd Used                                                                                                      | Service Rate¦ Adj ¦   HCM   L  90% Hax <br>eC (vph) eE ¦Volume¦ v/c ¦ Delay ¦ S ¦ Queue ¦                                                                                                                                                 |             |
| S                | B Approach                                                                                                                                        | 7.0 8+                                                                                                                                                                                                                                    |             |
| =                | RT   12/1   .073   .537                                                                                                                           | 778       818       62       .076       5.1       B+       25 ft         1971       1981       351       .177       5.4       B+       68 ft         496       533       362       .679       9.0       *B+       141 ft                  |             |
| -                | IB Approach                                                                                                                                       | 5.7 B+                                                                                                                                                                                                                                    |             |
| -                | RT   12/1   .206   .537<br>TH   12/1   .153   .537                                                                                                | 796       835       249       .298       5.9       8+       97 ft         975       1011       213       .211       5.5       8+       83 ft         440       477       9       .019       4.2       A       25 ft                       |             |
| •                |                                                                                                                                                   | 9.5 B†                                                                                                                                                                                                                                    |             |
|                  | RT   12/1   .099   .396                                                                                                                           | 562       610       105       .172       7.6       B+       53       ft         690       738       307       .416       8.7       B+       156       ft         269       312       192       .615       11.9       *8       98       ft |             |
|                  |                                                                                                                                                   | 8.2 Bł                                                                                                                                                                                                                                    | •           |
|                  | EB Approach<br>====================================                                                                                               | r(n   (10   11   018 ! 7.1   8+ 25 ft                                                                                                                                                                                                     |             |
|                  | RI         12/1         .007         1372           TH         12/1         .172         .396           LT         12/1         .000         .396 | 562       610       11       100       11       100         690       738       258       .350       8.3       8+       131       ft         220       261       12       .046       7.2       8+       25       ft                       | 6<br>1<br>6 |

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SIGNAL94/TEAPAC[VI L1.0] - Summary of Parameter Values

Intersection Parameters for Int # 3 - BYPASS/KULA HWY & HALEAKALA

HETROAREA NONCED LOSTTIME 2.0 LEVELOFSERVICE C S NODELOCATION 0 0

Approach Parameters

| APPLABELS       | SB   | WB   | NB   | EB   |
|-----------------|------|------|------|------|
| GRADES          | 2.0  | .0   | -2.0 | .0   |
| PEDLEVELS       | LOW  | LOW  | Low  | LOW  |
| PARKINGSIDES    | NONE | NONE | None | None |
| PARKVOLUMES     | 20   | 20   | 20   | 20   |
| BUSVOLUMES      | 0    | 0    | 0    | 0    |
| RIGHTTURNONREDS | 0    | 15   | 5    | 25   |

Movement Parameters

| MOVLABELS<br>VOLUMES<br>WIDTHS<br>LANES<br>UTILIZATIONS<br>TRUCKPERCENTS<br>PEAKHOURFACTORS<br>ARRIVALTYPES<br>ACTUATIONS<br>REQCLEARANCES<br>MINIMUMS<br>IDEALSATFLOWS<br>FACTORS<br>DELAYFACTORS | RT TH L<br>2 342 6<br>12.0 12.0 12.4<br>1 1<br>1.00 1.00 1.00<br>2.0 2.0 2.0<br>1.00 1.00 1.00<br>3 3 3<br>NO NO NO<br>4.0 4.0 4.0<br>5.0 5.0 5.0<br>1900 1900 1900<br>1.00 1.00 1.00<br>1.00 1.00 1.00<br>1.00 1.00 1.00 | 6 171 46 60<br>0 12.0 12.0 .0<br>1 1 1 0<br>0 1.00 1.00 1.00<br>0 2.0 2.0 2.0<br>1.00 1.00 1.00<br>0 3 3 3<br>NO NO NO<br>4.0 4.0 4.0<br>5.0 5.0 5.0<br>1900 1900 1900<br>1.00 1.00 1.00<br>1.00 1.00 1.00 | 71       649       160         12.0       12.0       12.0         1       1       1         1.00       1.00       1.00         2.0       2.0       2.0         1.00       1.00       1.00         3       3       3         NO       NO       NO         4.0       4.0       4.0         5.0       5.0       5.0         1900       1900       1900         1.00       1.00       1.00 | 12.0 12.0 .0<br>1 1 0<br>1.00 1.00 1.00<br>2.0 2.0 2.0<br>1.00 1.00 1.00<br>3 3 3<br>ND HO HO<br>4.0 4.0 4.0<br>5.0 5.0 5.0<br>1900 1900 1900<br>1.00 1.00 1.00<br>1.00 1.00 1.00 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DELAYFACTORS                                                                                                                                                                                       | 1.00 1.00 1.00                                                                                                                                                                                                            | 1.00 1.00 1.00                                                                                                                                                                                             | 1.00 1.00 1.00<br>1.00 1.00 1.00<br>NORM NORM NORM                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                   |

Phasing Parameters

| SEQUENCES<br>PERMISSIVES<br>OVERLAPS<br>CYCLES<br>GREENTIMES<br>YELLOWTIMES<br>CRITICALS<br>EXCESS | 31<br>HO<br>YES<br>60<br>11.87<br>4.00<br>9<br>0 | ALL<br>NO<br>YES<br>120<br>22.51<br>4.00<br>2 | NO<br>YES<br>30<br>13.62<br>4.00<br>4 | NO<br>YES | LEADLAGS<br>OFFSET<br>PEDTIME | KONE<br>.00<br>.0 | NONE<br>1<br>0 |  |
|----------------------------------------------------------------------------------------------------|--------------------------------------------------|-----------------------------------------------|---------------------------------------|-----------|-------------------------------|-------------------|----------------|--|
|----------------------------------------------------------------------------------------------------|--------------------------------------------------|-----------------------------------------------|---------------------------------------|-----------|-------------------------------|-------------------|----------------|--|

P

| YEAR 2005 BASE<br>Am peak hour                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | OTS                                                                                                                                                                                                                                                                                                                                                                                                                                | 02/27/95<br>11:09:59                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| SIGNAL94/TEAPAC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | [V1 LI.O] - Capacity Analysis Su <b>am</b> a                                                                                                                                                                                                                                                                                                                                                                                       | ry                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
| Intersection Ave<br>Degree of                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | erages for Int # 3 - 8YPASS/KULA #<br>Saturation (v/c) .41 Vehicle Dela                                                                                                                                                                                                                                                                                                                                                            | WY & HALEAKALA<br>Wy 8.4 Level of Service B+                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |
| Sq 31 ¦ Phase 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Phase 2 { Phase 3 {                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| **/**<br>!                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | + + + +                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| /ix                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | + * + xxxx<br><+ * +> <++++                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | V ^ ++++                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| North   <* + +<br>   ++++ * + +                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | +>  + +> ++++>                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| v * + +                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| 6/C= .198                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3   G/C= .375   G/C= .227                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| ; Y+R= 4.0"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | G= 22.5" G= 13.6"<br>Y+R= 4.0" Y+R= 4.0"                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | OFF=26.5% OFF=70.6%                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| C= 60 sec                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | G= 48.0 sec = 80.0% Y=12.0 sec = 1                                                                                                                                                                                                                                                                                                                                                                                                 | 20.0\$ Ped= .0 sec = .0\$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| Lane  Width/!                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | a/C ! Service Rate! Adi !                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |
| Lane  Width/ <br>Group   Lanes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | g/C ¦ Service Rate¦ Adj ¦<br>Reqd Used ¦ &C (vph) &E ¦Volume;                                                                                                                                                                                                                                                                                                                                                                      | HCM   L  90% Max <br>v/c   Delay   S   Queue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |
| ¦ Group ¦ Lanes¦                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                    | HCM   L  90% Max <br>v/c   Delay   S   Queue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |
| ¦ Group ¦ Lanes¦<br>SB Approach                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Read Used   eC (vph) eE  Volume                                                                                                                                                                                                                                                                                                                                                                                                    | HCM   L  90% Max <br>v/c   Delay   S   Queue  <br>10.7 B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |
| ¦ Group ¦ Lanes¦<br>SB Approach<br>RT ¦ 12/1 ¦                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Read Used   @C (vph) @E  Volume;<br>.006   .409   565   622   2                                                                                                                                                                                                                                                                                                                                                                    | <pre>v/c ; Delay ; S ; Queue ; 10.7 8 .003 ; 8.0 ; 8+; 25 ft;</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| Group { Lanes {<br>SB Approach<br>RT   12/1  <br>TH   12/1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Read Used   eC (vph) eE  Volume;<br>.006   .409   565   622   2  <br>.227   .409   695   753   342                                                                                                                                                                                                                                                                                                                                 | v/c ¦ Delay ¦ S ¦ Queue ¦<br>10.7 B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |
| Group { Lanes }<br>SB Approach<br>RT   12/1  <br>TH   12/1  <br>LT   12/1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Read Used   eC (vph) eE  Volume;<br>.006   .409   565   622   2  <br>.227   .409   695   753   342                                                                                                                                                                                                                                                                                                                                 | <pre>v/c : Delay : S : Queue :<br/>10.7 B<br/>.003 : 8.0 : 8+: 25 ft;<br/>.454 : 10.1 :*8 : 171 ft;</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |
| Group { Lanes {<br>SB Approach<br>RT   12/1  <br>TH   12/1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Read Used   eC (vph) eE  Volume;<br>.006   .409   565   622   2  <br>.227   .409   695   753   342                                                                                                                                                                                                                                                                                                                                 | <pre>v/c ! Delay ! S ! Queue ; 10.7 B .003 ! 8.0 ! 8+! 25 ft; .454 ! 10.1 !*B ! 171 ft; .537 ! 13.7 ! 8 ! 33 ft; 5.9 8+</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| <pre>Group { Lanes {     SB Approach     RT   12/1       TH   12/1       LT   12/1       HB Approach     RT   12/1   </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Reqd Used   &C (vph) &E  Volume;<br>.006   .409   565   622   2  <br>.227   .409   695   753   342  <br>.053   .409   91   117   66                                                                                                                                                                                                                                                                                                | <pre>v/c : Delay : S : Queue :<br/>10.7 B<br/>.003 : B.0 : B+: 25 ft;<br/>.454 : 10.1 : *B : 171 ft;<br/>.537 : 13.7 : B : 33 ft;<br/>5.9 B+<br/>.063 : 2.5 : A : 25 ft;</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |
| <pre>Group { Lanes {     SB Approach     RT   12/1       TH   12/1       LT   12/1       LT   12/1       HB Approach     RT   12/1       TH   12/1   </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Reqd Used   @C (vph) @E  Volume<br>.006   .409   565   622   2  <br>.227   .409   695   753   342  <br>.053   .409   91   117   66  <br>.075   .673   1028   1046   66  <br>.378   .673   1256   1266   649                                                                                                                                                                                                                        | <pre>v/c : Delay : S : Queue :<br/>10.7 B<br/>.003 : B.0 : B+: 25 ft;<br/>.454 : 10.1 :*B : 171 ft;<br/>.537 : 13.7 : B : 33 ft;<br/>5.9 B+<br/>.063 : 2.5 : A : 25 ft;<br/>.513 : 4.0 : A : 179 ft;</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |
| <pre>Group { Lanes {     SB Approach     RT   12/1       TH   12/1       LT   12/1       LT   12/1       HB Approach     RT   12/1       TH   12/1   </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Reqd Used   &C (vph) &E  Volume;<br>.006   .409   565   622   2  <br>.227   .409   695   753   342  <br>.053   .409   91   117   66                                                                                                                                                                                                                                                                                                | <pre>v/c : Delay : S : Queue :<br/>10.7 B<br/>.003 : B.0 : B+: 25 ft;<br/>.454 : 10.1 :*B : 171 ft;<br/>.537 : 13.7 : B : 33 ft;<br/>5.9 B+<br/>.063 : 2.5 : A : 25 ft;<br/>.513 : 4.0 : A : 179 ft;</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |
| <pre>Group { Lanes {     SB Approach     RT   12/1       TH   12/1       LT   12/1       LT   12/1       HB Approach     RT   12/1       TH   12/1   </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Reqd Used   @C (vph) @E  Volume<br>.006   .409   565   622   2  <br>.227   .409   695   753   342  <br>.053   .409   91   117   66  <br>.075   .673   1028   1046   66  <br>.378   .673   1256   1266   649                                                                                                                                                                                                                        | <pre>v/c : Delay : S : Queue :<br/>10.7 B<br/>.003 : B.0 : B+: 25 ft;<br/>.454 : 10.1 : *B : 171 ft;<br/>.537 : 13.7 : B : 33 ft;<br/>5.9 B+<br/>.063 : 2.5 : A : 25 ft;<br/>.513 : 4.0 : A : 179 ft;<br/>.387 : 15.1 : *C+: 104 ft;</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |
| <pre>     Group { Lanes;     SB Approach     RT   12/1       TH   12/1       LT   12/1       LT   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       LT   12/1       WB Approach </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Reqd       Used       @C (vph) @E Volume;         .006       .409       565       622       2         .227       .409       695       753       342         .053       .409       91       117       66         .075       .673       1028       1046       66         .378       .673       1256       1266       649         .128       .231       338       413       160                                                       | <pre>10.7 B<br/>10.7 B<br/>.003   8.0   8+! 25 ft!<br/>.454   10.1  *B   171 ft!<br/>.537   13.7   8   33 ft!<br/>5.9 B+<br/>.063 ! 2.5   A   25 ft!<br/>.513   4.0   A   179 ft!<br/>.387   15.1  *C+! 104 ft!<br/>13.9 B</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
| <pre>     Group { Lanes;     SB Approach     RT   12/1       TH   12/1       LT   12/1       LT   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       LT   12/1       RT   12/1   </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Reqd       Used       @C (vph) @E Volume;         .006       .409       565       622       2         .227       .409       695       753       342         .053       .409       91       117       66         .075       .673       1028       1046       66         .378       .673       1256       1266       649         .128       .231       338       413       160         .145       .260       332       401       156 | <pre>10.7 B<br/>10.7 B<br/>.003   8.0   8+  25 ft;<br/>.454   10.1  *B   171 ft;<br/>.537   13.7   8   33 ft;<br/>.063   2.5   A   25 ft;<br/>.513   4.0   A   179 ft;<br/>.387   15.1  *C+  104 ft;<br/>13.9 B<br/></pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |
| <pre>     Group { Lanes;     SB Approach     RT   12/1       TH   12/1       LT   12/1       LT   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       LT   12/1       RT   12/1   </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Reqd       Used       @C (vph) @E Volume;         .006       .409       565       622       2         .227       .409       695       753       342         .053       .409       91       117       66         .075       .673       1028       1046       66         .378       .673       1256       1266       649         .128       .231       338       413       160                                                       | <pre>10.7 B<br/>10.7 B<br/>.003   8.0   8+  25 ft;<br/>.454   10.1  *B   171 ft;<br/>.537   13.7   8   33 ft;<br/>.063   2.5   A   25 ft;<br/>.513   4.0   A   179 ft;<br/>.387   15.1  *C+  104 ft;<br/>13.9 B<br/></pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |
| <pre>     Group { Lanes;     SB Approach     RT   12/1       TH   12/1       LT   12/1       LT   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       TH   12/1       LT   12/1       RT   12/1   </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Reqd       Used       @C (vph) @E Volume;         .006       .409       565       622       2         .227       .409       695       753       342         .053       .409       91       117       66         .075       .673       1028       1046       66         .378       .673       1256       1266       649         .128       .231       338       413       160         .145       .260       332       401       156 | <pre>10.7 B<br/>10.7 B<br/>.003   8.0   8+  25 ft;<br/>.454   10.1  *B   171 ft;<br/>.537   13.7   8   33 ft;<br/>.063   2.5   A   25 ft;<br/>.513   4.0   A   179 ft;<br/>.387   15.1  *C+  104 ft;<br/>13.9 B<br/></pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |
| <pre>     Group { Lanes;     S8 Approach     RT   12/1       TH   12/1       TH   12/1       LT   12/1       TH   12/1       TH   12/1       TH   12/1       LT   12/1       LT   12/1       LT   12/1       EB Approach     E</pre> | Reqd       Used       @C (vph) @E Volume;         .006       .409       565       622       2         .227       .409       695       753       342         .053       .409       91       117       66         .075       .673       1028       1046       66         .378       .673       1256       1266       649         .128       .231       338       413       160         .145       .260       332       401       156 | 10.7       B         10.7       B         .003       B.0       B+!       25         .454       10.1       *B       171         .537       13.7       B       33         .54       10.1       *B       171         .537       13.7       B       33         .57       B+       33       Ft         .063       2.5       A       25       ft         .537       13.7       B       33       ft         .063       2.5       A       25       ft         .387       15.1       *C+       104       ft         .387       15.1       *C+       104       ft         .389       14.2       *B       97       ft         .262       13.5       B       66       ft         .7.8       B+ |  |

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### SIGNAL94/TEAPAC[V1 L1.0] - Summary of Parameter Values

Intersection Parameters for Int # 3 - BYPASS/KULA HWY & HALEAKALA

METROAREANONCBDLOSTTINE2.0LEVELOFSERVICECNODELOCATION0

Approach Parameters.

| APPLABELS       | SB   | WB   | NB   | EB   |
|-----------------|------|------|------|------|
| GRADES          | 2.0  | .0   | -2.0 | .0   |
| PEDLEVELS       | LOW  | LOW  | LOW  | LOW  |
| PARKINGSIDES    | NONE | NONE | NONE | NONE |
| PARKVOLUNES     | 20   | 20   | 20   | 20   |
| BUSVOLUMES      | 0    | 0    | 0    | 0    |
| RIGHTTURNONREDS | 0    | 10   | 5    | 25   |

Movement Parameters

| MOVLABELS       | RT   | TH   | LT   | RT   | TH   | LT   | RT   | TH   | LT   | RT   | TH   | LT   |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|
| VOLUMES         | 5    | 447  | 88   | 111  | 41   | 42   | 17   | 381  | 184  | 225  | 42   | 7    |
| WIDTHS          | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | .0   | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | .0   |
| LANES           | 1    | 1    | 1    | 1    | 1    | 0    | 1    | 1    | 1    | 1    | 1    | 0    |
| UTILIZATIONS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| TRUCKPERCENTS   | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  |
| PEAKHOURFACTORS | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| ARRIVALTYPES    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |
| ACTUATIONS      | NO   | NO   | NO   | NO   | NO   | NO   | ND   | Ю    | Ю    | Ю    | Ю    | NO   |
| REQCLEARANCES   | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  |
| MINIMUNS        | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  |
| IDEALSATFLOWS   | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| FACTORS         | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| DELAYFACTORS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| NSTOPFACTORS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| GROUPTYPES      | NORM | NORM | NORM | NORM | NORM | NORM | NORM | NORM | NORM | NORM | NORM | NORM |
| SATURATIONFLOWS | 1524 | 1844 | 584  | 1539 | 1661 | 0    | 1554 | 1881 | 1787 | 1539 |      | 0    |

Phasing Parameters

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| SEQUENCES   |       |       |      |     |          |      |      |
|-------------|-------|-------|------|-----|----------|------|------|
| SEQUENCES   | 31    | ALL   |      |     |          |      |      |
| PERMISSIVES | NO    | NO    | NO   | NO  | LEADLAGS | NONE | NONE |
| OVERLAPS    | YES   | YES   | YES  | YES | OFFSET   | .00  | 1    |
| CYCLES      | 60    | 120   | 30   |     | PEDTIME  | .0   | Ō    |
| GREENTIMES  | 12.25 | 26.12 | 9.62 |     |          |      |      |
| YELLOWTIMES | 4.00  | 4.00  | 4.00 |     |          |      |      |
| CRITICALS   | 9     | 2     | 5    |     |          |      |      |
| EXCESS      | 0     |       |      |     |          |      |      |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <u>د</u> ند                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| ILA RESIDENT LOTS<br>FAR 2005 BASE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 02/27/95<br>11:12:53                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                  |
| I PEAK HOUR                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | f -                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                  |
| [GKAL94/TEAPAC[V1 L1.0] - Capacity Analysis Su                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ппагу                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <u>E</u> .c                                                                      |
| ntersection Averages for Int # 3 - BYPASS/KU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | JLA HNY & HALEAKALA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                  |
| Degree of Saturation (v/c) .36 Vehicle                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Delay B.7 Level of Service B+                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | £                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                  |
| q 31 ¦ Phase 1 ¦ Phase 2 ¦ Phase 3 ;<br>*/**                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>6</b>                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                  |
| /// (+ * +> (****                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>L</b>                                                                         |
| v * ****                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                  |
| arth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                  |
| orth   <* + +>; + +>; ++++><br>   ++++ * + +   + +  ++++                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | £                                                                                |
| { v <b>x</b> + + } + +   v {                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                  |
| G/C= .204   G/C= .435   G/C= .160                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 6                                                                                |
| G= 12.3"   G= 26.1"   G= 9.6"  <br>Y+R= 4.0"   Y+R= 4.0"   Y+R= 4.0"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                  |
| OFF= .0%   OFF=27.1%   OFF=77.3%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1-1                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | sec = 20 0% Ped: _0 sec = _0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                  |
| C= 60 sec                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>4</b>                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                  |
| . Introduction and a Compion Date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 645 ! ! HCH ! L !90% Max!                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | •                                                                                |
| Lane {Width/} g/C { Service Rate}<br>Group { Lanes; Regd Used { @C (vph) @E {V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Adj ¦ ¦ HCM ¦ L ¦90% Max¦<br>/olume¦ v/c ¦ Delay ¦ S ¦ Queue ¦                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                  |
| Lane ¦Width/¦ g/C ¦ Service Rate;<br>Group ¦ Lanes¦ Reqd Used ¦ &C (vph) &E ¦V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Adj     HCM   L  90% Max;<br>/olume¦ v/c   Delay   S   Queue                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | £.                                                                               |
| Group ¦ Lanes; Reqd Used ¦ &C (vph) &E ¦V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | olume; v/c ; Delay ; S ; Queue ;<br>8.7 B+                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                  |
| Group ¦ Lanes¦ Reqd Used ¦ &C (vph) &E ¦V<br>SB Approach                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | volume; v/c ; Delay ; S ; Queue ;<br>8.7 B+                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | £.                                                                               |
| Group   Lanes; Reqd Used   CC (vph) EE  V<br>SB Approach<br>RT   12/1   .011   .469   665   714  <br>TH   12/1   .282   .469   816   864                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 8.7 B+<br>5 : .007 : 6.5 : B+; 25 ft;<br>447 : .517 : 9.0 :*B+; 200 ft;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>₽</b> +<br>₹ -                                                                |
| Group   Lanes   Reqd Used   CC (vph) EE  V<br>SB Approach<br>RT   12/1   .011   .469   665   714  <br>TH   12/1   .282   .469   816   864  <br>IT   12/1   .272   .469   232   274                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 8.7       B+         5       .007       6.5       B+       25       ft         447       .517       9.0       #B+       200       ft         88       .321       7.8       B+       39       ft                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ۴.<br>۲۰                                                                         |
| Group   Lanes   Reqd Used   CC (vph) EE  V<br>SB Approach<br>RT   12/1   .011   .469   665   714  <br>TH   12/1   .282   .469   816   864  <br>IT   12/1   .272   .469   232   274                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 8.7       B+         8.7       B+         5       .007       6.5       B+       25       ft         447       .517       9.0       *B+       200       ft         88       .321       7.8       B+       39       ft                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ц.,<br>Т.,<br>4.,                                                                |
| Group   Lanes; Reqd Used   @C (vph) @E  V<br>SB Approach<br>RT   12/1   .011   .469   665   714  <br>TH   12/1   .282   .469   816   864  <br>LT   12/1   .222   .469   232   274                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 8.7       B+         8.7       B+         5       .007       6.5       B+       25       ft         447       .517       9.0       *B+       200       ft         88       .321       7.8       B+       39       ft         6.2       B+       39       ft       39       ft                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | ۵.<br>۲۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰                                     |
| Group   Lanes; Reqd Used   C (vph) EE  V<br>SB Approach<br>RT   12/1   .011   .469   665   714  <br>TH   12/1   .282   .469   816   864  <br>LT   12/1   .222   .469   232   274  <br>NB Approach                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 8.7       B+         8.7       B+         5       .007       6.5       B+       25       ft         447       .517       9.0       *B+       200       ft         88       .321       7.8       B+       39       ft         6.2       B+       12       .010       1.6       A       25       ft                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ۵.<br>۲۰<br>۱۰<br>۱۰<br>۱۰                                                       |
| Group   Lanes; Reqd Used   C (vph) E  V<br>SB Approach<br>RT   12/1   .011   .469   665   714  <br>TH   12/1   .282   .469   816   864  <br>LT   12/1   .222   .469   232   274  <br>NB Approach<br>RT   12/1   .021   .740   1144   1150  <br>TH   12/1   .021   .740   1144   1150  <br>TH   12/1   .021   .740   1144   1150                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 8.7       B+         8.7       B+         5       .007       6.5       B+       25       ft         447       .517       9.0       *B+       200       ft         88       .321       7.8       B+       39       ft         6.2       B+         12       .010       1.6       A       25       ft         381       .274       2.0       A       84       ft                                                                                                                                                                                                                                                                                                                                                                                                     | ۵.<br>۲۰<br>۱۰<br>۱۰<br>۱۰                                                       |
| Group       Lanes       Reqd       Used       @C (vph) @E  V         SB Approach         RT       12/1       .011       .469       665       714         TH       12/1       .282       .469       816       864         LT       12/1       .222       .469       232       274         NB Approach                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 8.7       B+         8.7       B+         5       .007       6.5       B+       25       ft         447       .517       9.0       *B+       200       ft         88       .321       7.8       B+       39       ft         6.2       B+         12       .010       1.6       A       25       ft         381       .274       2.0       A       84       ft                                                                                                                                                                                                                                                                                                                                                                                                     | ۵۰<br>۲۰<br>۵۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰                                     |
| Group       Lanes       Reqd       Used       EC (vph) EE [V]         SB Approach         I       RT       12/1       .011       .469       665       714         I       TH       12/1       .282       .469       816       864         LT       12/1       .222       .469       232       274         NB Approach         RT       12/1       .021       .740       1144       1150         TH       12/1       .243       .740       1391       1391         LT       12/1       .143       .238       350       425                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 8.7       B+         8.7       B+         5       .007       6.5       B+       25       ft         447       .517       9.0       *B+       200       ft         88       .321       7.8       B+       39       ft         6.2       B+         12       .010       1.6       A       25       ft         381       .274       2.0       A       84       ft         184       .433       15.2       *C+       118       ft                                                                                                                                                                                                                                                                                                                                      | ۵۰<br>۲۰<br>۵۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰                                     |
| Group       Lanes; Reqd       Used; EC (vph) EE ; V         SB Approach         I       RT       12/1; .011; .469; 665; 714;         TH       12/1; .282; .469; 816; 864;         LT       12/1; .222; .469; 232; 274;         NB Approach         I       RT       12/1; .222; .469; 232; 274;         NB Approach         I       TH       12/1; .243; .740; 1144; 1150;         I       TH       12/1; .243; .740; 1391; 1391;         LT       12/1; .143; .238; 350; 425;         WB Approach                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 8.7       B+         8.7       B+         5       .007       6.5       B+       25       ft         447       .517       9.0       *B+       200       ft         88       .321       7.8       B+       39       ft         6.2       B+         12       .010       1.6       A       25       ft         381       .274       2.0       A       84       ft         184       .433       15.2       *C+       118       ft                                                                                                                                                                                                                                                                                                                                      | ۵۰<br>۲۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰                   |
| Group       Lanes; Reqd       Used; @C (vph) @E !V         SB Approach         RT       12/1       .011       .469       665; 714         TH       12/1       .282       .469       816       864         LT       12/1       .282       .469       816       864         LT       12/1       .222       .469       232       274         NB Approach                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 8.7       B+         8.7       B+         5       .007       6.5       B+       25       ft         447       .517       9.0       *B+       200       ft         88       .321       7.8       B+       39       ft         6.2       B+         12       .010       1.6       A       25       ft         381       .274       2.0       A       84       ft         184       .433       15.2       *C+       118       ft         101       .339       16.1       C+       69       ft                                                                                                                                                                                                                                                                         | ۵۰<br>۲۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰                   |
| Group       Lanes; Reqd       Used; C(vph) EE; V         SB Approach       RT       12/1; .011; .469; 665; 714; .714; .714; .714; .282; .469; 816; 864; .714; .714; .222; .469; 232; 274; .714; .714; .12/1; .222; .469; 232; 274; .714; .714; .724; .740; .714; .715; .714; .714; .715; .714; .714; .715; .714; .714; .715; .714; .714; .715; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714; .714 | 8.7       B+         8.7       B+         5       .007       6.5       B+       25       ft         447       .517       9.0       *B+       200       ft         88       .321       7.8       B+       39       ft         6.2       B+         12       .010       1.6       A       25       ft         381       .274       2.0       A       84       ft         184       .433       15.2       *C+       118       ft         101       .339       16.1       C+       69       ft                                                                                                                                                                                                                                                                         | ۵.<br>۲۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰                   |
| Group       Lanes; Reqd       Used; C(vph) EE; V         SB Approach         I       RT       12/1; .011; .469; 665; 714;         TH       12/1; .282; .469; 816; 864;         LT       12/1; .222; .469; 232; 274;         NB Approach         I       RT         I       12/1; .222; .469; 232; 274;         NB Approach         I       TH; 12/1; .243; .740; 1144; 1150;         I       TH; 12/1; .243; .740; 1391; 1391;         I       LT; 12/1; .143; .238; 350; 425;         WB Approach         I       RT; 12/1; .104; .194; .228; 298;         I       12/1; .083; .194; .250; .322;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 8.7       B+         8.7       B+         5       .007       6.5       B+       25       ft         447       .517       9.0       *B+       200       ft         88       .321       7.8       B+       39       ft         6.2       B+         6.2       B+         12       .010       1.6       A       25       ft         381       .321       7.8       B+       39       ft         12       .010       1.6       A       25       ft         381       .274       2.0       A       84       ft         184       .433       15.2       *C+       118       ft         15.9       C+         15.7       *C+       69       ft         83       .258       15.7       *C+       56       ft                                                               | ۵.<br>۲۰<br>۲۰<br>۲۰<br>۲۰<br>۲۰<br>۲۰<br>۲۰<br>۲۰<br>۲۰<br>۲۰                   |
| Group       Lanes; Reqd       Used; @C (vph) @E !V         SB Approach         RT       12/1       .011       .469       665; 714         TH       12/1       .282       .469       816       864         LT       12/1       .282       .469       816       864         LT       12/1       .222       .469       232       274         NB Approach         I       RT       12/1       .021       .740       1144       1150         I       H       12/1       .021       .740       1391       1391         LT       12/1       .024       .740       1391       1391         LT       12/1       .143       .238       350       425         WB Approach                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 8.7       B+         5       .007       6.5       B+       25       ft         447       .517       9.0       *B+       200       ft         88       .321       7.8       B+       39       ft         6.2       B+         12       .010       1.6       A       25       ft         381       .321       7.8       B+       39       ft         12 / .010       1.6       A       25       ft         381       .321       7.8       B+       39       ft         12 / .010       1.6       A       25       ft         381       .274       2.0       A       84       ft         184       .433       15.2       *C+       118       ft         15.9       C+         9.1       B+         9.1       B+       9.1       B+                                    | ۵۰<br>۲۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰<br>۱۰ |
| Group       Lanes       Reqd       Used       @C (vph) @E [V]         SB Approach         ITH       12/1       .011       .469       665       714         TH       12/1       .282       .469       816       864         LT       12/1       .282       .469       816       864         LT       12/1       .222       .469       232       274         NB Approach                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 8.7       B+         8.7       B+         5       .007       6.5       B+       25       ft         447       .517       9.0       *B+       200       ft         88       .321       7.8       B+       39       ft         6.2       B+         12       .010       1.6       A   25       ft         381       .321       7.8       B+       39       ft         12 : .010   1.6   A   25       ft         381       .274       2.0   A   84       ft         184       .433       15.2       *C+       118       ft         15.9       C+         101       .339       16.1       C+       69       ft         83       .258       15.7       *C+       56       ft         9.1       B+         9.1       B+         200 ! .280 ; 7.6 ! B+!       90       ft | ۵۰<br>۲۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰<br>۹۰                   |

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| Major Street: KULA HWY<br>Minor Street: OMAOPIO RD<br>Scenario: YEAR 2005 BASE<br>Peak Hour: AM |                          |        |              |         |           |        |         |         | An:<br>File<br>sect: |       | ::    | 27-Jun-95<br>BC<br>KULOMA-A<br>4 |
|-------------------------------------------------------------------------------------------------|--------------------------|--------|--------------|---------|-----------|--------|---------|---------|----------------------|-------|-------|----------------------------------|
|                                                                                                 | 1                        |        | V.           | 12      | V11       |        | V10     |         |                      |       |       |                                  |
| Peak Hour Factor: 1.00                                                                          | 1<br>1                   |        | 1            | 73      | 25        |        | 9       |         | ٢.                   | ł     | IORTH |                                  |
| HAJOR STREET                                                                                    |                          |        | -            | }       | ł         |        | 1       |         |                      |       |       |                                  |
| Num of Lanes - V2: 1                                                                            |                          |        |              | f       | ;         |        | ł       |         |                      |       |       |                                  |
| Excl LT - V1 (Y/N): N                                                                           | 1                        |        |              | 1       | :         |        | ١       |         |                      |       |       |                                  |
| Excl RT - V3 (Y/H): H                                                                           |                          |        | <            |         | ٧         |        | >       |         |                      |       |       |                                  |
| Stop/Yield - V3 (Y/N): N                                                                        |                          |        |              |         |           |        |         |         |                      |       |       |                                  |
| Grade - V1, V2, V3: 2                                                                           | 1                        | -      | •            |         |           |        |         | ^       |                      |       |       |                                  |
|                                                                                                 |                          | 1      |              |         |           |        |         | 1       |                      |       | •     |                                  |
| Num of Lanes - V5: 1                                                                            | ¥1 38                    |        |              |         |           |        |         |         | -                    | 7 \   | /6    |                                  |
| Excl LT - V4 (Y/N): N                                                                           | •                        |        |              |         |           |        |         |         |                      |       |       |                                  |
| Excl RT - V6 (Y/N): N                                                                           | V2 222                   |        | >            |         |           |        |         | <       | - (                  | 439 \ | 15    |                                  |
| Stop/Yield - V6 (Y/H): N                                                                        | •                        |        |              |         |           |        |         |         |                      |       |       |                                  |
| Grade - V4,V5,V6: -2                                                                            | V3 17                    |        |              |         |           |        |         | ,       | -                    | 9 ۱   | 14    |                                  |
|                                                                                                 |                          | ۱.     |              |         |           |        |         | .,      | MA TI                | וס פו | REET  |                                  |
| MINOR STREET                                                                                    | i                        | N      |              |         |           |        |         | v       |                      | A HNY |       |                                  |
| Num of Lanes - V8: 1                                                                            | i                        |        | ,            |         | •         |        | 、       |         | NOP                  |       |       |                                  |
| Grade - V7,V8,V9: 0                                                                             | i.                       |        | ι,           |         | ı         |        | í       |         |                      |       |       |                                  |
| Shared Lane-Y7,8,9: 3                                                                           | í<br>1                   |        | 1            | ı       |           |        | '       |         |                      |       |       |                                  |
| (0=N,1=LT,2=TR,3=LTR)                                                                           | 1                        |        |              |         |           |        |         |         |                      |       |       |                                  |
| Num of Lanes - VII: 1                                                                           | 1                        |        |              | 27      | 2         |        | 13      |         |                      |       |       |                                  |
| Grade - V10,V11,V12: 0                                                                          | 1                        |        |              |         | -         |        |         |         |                      |       |       |                                  |
| Shared Lane-V10,11,12: 3                                                                        | 1                        |        | V.           | 7       | V8        |        | V9      |         |                      |       |       |                                  |
| (0=N,1=LT,2=TR,3=LTR)                                                                           | •                        |        |              |         |           |        |         |         |                      |       |       |                                  |
| (****)*=***/*=***;* ****/                                                                       | 1<br> <br>               |        | HI           | NOR STR | EET - (   | DHADPI | O RD    |         |                      |       |       |                                  |
| VOLUNE ADJUSTMENTS                                                                              | <br>!                    |        |              |         |           | •••••  |         |         |                      |       |       |                                  |
| MOVEMENT NO.                                                                                    | 1                        | 2      | 3            | 4 5     | 6         | 7      | 8       | 9 10    |                      | 11    | 12    |                                  |
| HOURLY FLOW RATE, V(vph)                                                                        | 38                       |        |              | 9 439   |           |        |         |         |                      | 25    | 173   |                                  |
| VOLUME, v (pcph)                                                                                | 53                       | 222 1  | 7            | 9 439   | 7         | 30     | 2 1     | 4 10    |                      | 28    | 190   |                                  |
|                                                                                                 | <b>-</b>                 |        |              |         |           |        |         |         |                      |       |       |                                  |
| STEP 1: RT FROM MINOR STREET                                                                    | <br> Yc9 = 1/2           | V7 1 1 | 1 <b>7</b> - | 231     | whe       | 1      | Vc12 =  | 1/2 44  | + V5                 | :     | 443   | vhp                              |
|                                                                                                 | •                        | TUTI   |              |         | pcph      | •      | Cp,12 = | •       |                      |       |       | pcph                             |
|                                                                                                 | Cp,9 =<br> Cm,9=Cp,9     | -      |              |         | pcph      | •      | Ca,12=C |         |                      |       |       | pcph                             |
|                                                                                                 | po,9=1-v9                |        |              | 0.99    |           |        | po,12=1 |         |                      |       | 0.77  |                                  |
| Prb. of Queu-free State:                                                                        |                          |        |              |         |           |        |         |         |                      |       |       |                                  |
| STEP 2: LT FRON MAJOR STREET                                                                    | ;                        |        |              |         |           | 1      |         |         |                      |       |       |                                  |
|                                                                                                 | Vc,4 = V2                | + Y3 : | :            | 239     | vhp       | •      | Vc,i =  | V5 + V6 | :                    |       | 446   |                                  |
|                                                                                                 | Cp,4 =                   |        |              | 1319    | pcph      | -      | Cp,1 =  |         |                      |       |       | pcph                             |
|                                                                                                 |                          | _      |              | 1319    | pcph      | 1      | Cm,1=Cp | ,1=     |                      |       | 1051  | pcph                             |
| Potential Capacity:                                                                             | {Cm,4=Cp,4               | -      |              |         | F * F * * | •      |         |         |                      |       |       |                                  |
| Potential Capacity:<br>Movement Capacity:                                                       | ¦C∎,4=Cp,4<br>¦po,4=1-v4 |        |              | 0.99    |           | •      | po,1=1- |         |                      |       | 0.95  |                                  |
| Potential Capacity:<br>Movement Capacity:                                                       | • • • • •                |        |              |         |           | •      |         |         |                      |       | 0.95  |                                  |

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| jor Street: XULA HWY<br>Hor Street: OMAOPIO RD<br>Scenario: YEAR 2005 BASE<br>Peak Hour: AM |           |                      |                 | In           | tesection In           | Analys<br>File Nam | e: KULOMA-A      |
|---------------------------------------------------------------------------------------------|-----------|----------------------|-----------------|--------------|------------------------|--------------------|------------------|
| EP 3: TH FROM MINOR STREET                                                                  | :         |                      |                 | 1            |                        |                    |                  |
|                                                                                             | Vc.,8 =   | 1/2V3+V2+            | V1+V6+V5+V4     |              | Vc.,11 = 1/2           |                    |                  |
| -                                                                                           | :         |                      | 724 vp          | h i          | =<br>Cp,11 =           |                    | 729 vph          |
| Potential Capacity:                                                                         | Cp,8 =    |                      | 455 pCp         | h            | Cp,11 =                |                    | 452 pcph         |
| Capacity Adj Factor:                                                                        | f8 = po,  | 4*po,1 =             | 0.93            | . !          | f11 = po,4*p           | 0,1 =              | 0.93             |
| Movement Capacity:                                                                          | Cm, B = C | p,8*18 =             | 425 pcp         | n;           | cm, II = cp, I         | 1/Cm 11 -          | 422 pcpn         |
| Prob. of Queue-free State:                                                                  | ;po,8 = 1 | -v8/cm,8 :           | - 1.00          | i<br>        | po,11 = 1-v1           | .1/UM;II -         | U.73<br>         |
| EP 4: LT FROM MINOR STREET                                                                  | ;         |                      |                 | -            |                        |                    |                  |
|                                                                                             | Vc.7 = 1  | /243+42+4            | 1+1/2V6+V5+V4+  | i            | Vc,10 = 1/2V           |                    |                  |
|                                                                                             |           |                      | 2) = 819 vp     |              | 1/2(V                  |                    |                  |
|                                                                                             |           |                      | 355 pcp         |              | Cp10 =                 |                    | 401 pcph         |
| Major Left, Minor Through                                                                   |           |                      |                 |              | -11.4                  | -                  |                  |
|                                                                                             | P''7=p0,  | 11*f11 =             | 0.87            |              | P''10=po,8*f           | 8 =                | 0.93             |
| Major Left, Minor Through                                                                   |           |                      |                 |              | -110 -                 |                    | 0.05             |
| Adjusted Impedance Factor:<br>Capacity Adjustment Factor:                                   | ;p'7 =    | * 17 -               | 0.90            | i            | p'10 =<br>fin = n'inte | o 9 -              | V.75<br>A 93     |
| Capacity Adjustment Factor: Adjustment Factor: A                                            | (T/ = p'/ | *00,12 =<br>7*Cp 7 * | V.07<br>747 oct | i<br>h i     | Cm 10 = f10*p          | Cn.10 =            | 375 pcph         |
| nuvembni lapavily:                                                                          | ·····     |                      |                 | ·· 1         |                        |                    |                  |
| LAY AND LEVEL OF SERVICE SUMM                                                               | ARY       |                      |                 | AVG          | ł                      |                    |                  |
|                                                                                             |           |                      |                 | TOTAL        | •                      |                    |                  |
| NOVENENT                                                                                    |           |                      | csh(pcph)       | DELAY        | LOS                    |                    |                  |
|                                                                                             |           |                      |                 |              | T                      |                    |                  |
| MINOR LEFT TURN (7)                                                                         | 30        | 247                  | SHRD            | SHRD         | <br>C                  | LEYEL UP 3         | SERVICE CRITERIA |
| MINOR THROUGH (8)<br>MINOR RIGHT TURN (9)                                                   | 2         | 425                  | 33V<br>6400     | 12./<br>SNDU | !                      |                    | AVG              |
| NTNOK KIGHT TORM (9)                                                                        | 14        | 1020                 | JAKU            | SUKN         | I<br>I                 | LEVEL              |                  |
| MINOR LEFT TURN (10)                                                                        | 10        | 375                  | SHRD            | SHRD         | !                      | OF                 | DELAY            |
| MINOR THROUGH (11)                                                                          | 28        |                      | 706             | 7.5          | •                      | SERVICE            |                  |
| MINOR RIGHT TURN (12)                                                                       | 190       | 826                  | SHRD            | SHRD         |                        |                    |                  |
| venen neens senn (ee)                                                                       |           |                      |                 |              |                        | A                  | <=5              |
| MAJOR LEFT (1)                                                                              | 53        | 1051                 | NA              | 3.6          | A                      | 8                  | >5&<=10          |
| MAJOR LEFT (4)                                                                              | 9         | 1319                 | NA              | 2.7          |                        | C                  | >10&<=20         |
| • •                                                                                         |           |                      |                 |              | 1                      | D                  | >20&<=30         |
| MINOR APPROACH (7)(8)(9)                                                                    | -         | -                    | -               | 12.7         |                        | E                  | >304<=45         |
| MINOR APPROACH (10)(11)(12)                                                                 | -         | -                    | -               | 7.5          | B                      | F                  | >45              |
|                                                                                             |           |                      |                 |              |                        |                    |                  |
| MAJOR APPROACH (1)(2)(3)                                                                    | -         | -                    | -               | 0.7          |                        |                    |                  |
| MAJOR APPROACH (4)(5)(6)                                                                    | -         | -                    | -               | 0.1          | A                      |                    |                  |
|                                                                                             |           |                      |                 | 2.6          | A                      |                    |                  |

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| Major Street: KULA HWY<br>Minor Street: OHAOPIO RD<br>Scenario: YEAR 2005 BASE<br>Peak Hour: PM |       |             |            |       |     |      |         |        |                |          |         | DA<br>Analy<br>ile Na<br>ectior | ne:   | 27-Jun<br>8C<br>KULOH/ |
|-------------------------------------------------------------------------------------------------|-------|-------------|------------|-------|-----|------|---------|--------|----------------|----------|---------|---------------------------------|-------|------------------------|
|                                                                                                 | !     |             |            |       | V12 |      | ¥11     |        | V10            |          |         |                                 |       |                        |
| Peak Hour Factor: 1.00                                                                          | ł     |             |            |       | 53  |      | 14      |        | 5              |          |         | <i>(</i>                        | NORTI | 4                      |
| HAJOR STREET                                                                                    | 1     |             |            |       | 1   |      | 17      |        | !              |          |         | •                               | NORT  | •                      |
| Num of Lanes - V2: 1                                                                            | 1     |             |            |       | i   |      |         |        |                |          |         |                                 |       |                        |
| Excl LT - V1 (Y/N): N                                                                           | i     |             |            |       | ' i |      | 1       |        | · '\           |          |         |                                 |       |                        |
| Excl RT - V3 (Y/N): N                                                                           | •     |             |            |       | ć   |      | v       |        |                | >        |         |                                 |       |                        |
| Stop/Yield - V3 (Y/N): N                                                                        | -     |             |            |       | •   |      |         |        |                |          |         |                                 |       |                        |
| Grade - V1,V2,V3: 2                                                                             |       |             |            | •     |     |      |         |        |                |          | •       |                                 |       |                        |
|                                                                                                 | 1     |             |            | 1     |     |      |         |        |                |          | ١       | _                               |       |                        |
| Num of Lanes - V5: 1                                                                            | •     | 141         |            | •     |     |      |         |        |                |          |         | 3                               | ٧6    |                        |
| Excl LT - V4 (Y/N): N                                                                           | •     |             |            |       |     |      |         |        |                |          |         |                                 |       |                        |
|                                                                                                 | ¥2    | 368         |            | ·>    |     |      |         |        |                |          | <       | 283                             | V5    |                        |
| Stop/Yield - V6 (Y/N): N                                                                        | •     |             |            |       |     |      |         |        |                |          |         |                                 |       |                        |
| Grade - V4,V5,V6: -2                                                                            | V3    | 23          |            |       |     |      |         |        |                |          |         | 13                              | ٧4    |                        |
|                                                                                                 | 1     |             |            | 1     |     |      |         |        |                |          | 1       |                                 |       |                        |
| HINOR STREET                                                                                    | 1     |             |            | v     |     |      |         |        |                |          |         | IAJOR                           |       |                        |
| Num of Lanes - V8: 1                                                                            | į.    |             |            |       |     |      | •       |        |                |          |         | KULA H                          | NT    |                        |
| Grade - V7,V8,V9: 0                                                                             | i     |             |            |       | <,  |      |         |        |                | <b>`</b> |         |                                 |       |                        |
| Shared Lane-V7,8,9: 3                                                                           | 1     |             |            |       | ١.  |      | i       |        | /              |          |         |                                 |       |                        |
| (O=N,1=LT,2=TR,3=LTR)                                                                           | i     |             |            |       | i   |      | i       |        | - i            |          |         |                                 |       |                        |
|                                                                                                 | i.    |             |            |       | i   |      | i       |        |                |          |         |                                 |       |                        |
| Num of Lanes - VII: 1                                                                           | 1     |             |            |       | 23  |      | 22      |        | 14             |          |         |                                 |       |                        |
| Grade - V10,V11,V12: 0                                                                          | i     |             |            |       |     |      |         |        |                |          |         |                                 |       |                        |
| Shared Lane-V10,11,12: 3                                                                        | i i   |             |            |       | ٧7  |      | V8      |        | ٧9             |          |         |                                 |       |                        |
| (0=N,1=LT,2=TR,3=LTR)                                                                           | i     |             |            |       |     | 6795 | EET - O | -      | 0 00           |          |         |                                 |       |                        |
|                                                                                                 | 1<br> |             |            | ,<br> |     |      |         |        |                |          |         |                                 |       |                        |
| VOLUME ADJUSTMENTS                                                                              | 1     |             |            |       |     |      |         |        |                |          |         |                                 |       |                        |
| MOVEMENT NO.                                                                                    | 1     | 1           |            | 3     | 4   | 5    | 6       | 7      | 8              | 9        | 10      | 11                              | 12    |                        |
| HOURLY FLOW RATE, V(vph)                                                                        | 1     |             | 368        |       |     | 283  |         | 23     |                | 14       | 5       | 14                              | 53    |                        |
| VOLUME, v (pcph)                                                                                | ł     | 197         | 368        | 23    | 13  | 283  | 3       | 25     | 24             | 15       | 6       | 15                              | 58    |                        |
| STEP 1: RT FROM MINOR STREET                                                                    | 1     |             |            |       |     |      |         | !      |                |          |         |                                 |       |                        |
| Conflicting Flows:                                                                              | Vc9   | : 1/2       | 2 V3 +     | V2 =  | :   | 380  | vhp     | i      | Vc12           | : 1/:    | 2 V6 +  | V5 =                            | 285   | vhp                    |
| Potential Capacity:                                                                             | {Cp,9 |             |            |       |     |      | pcph    |        | Cp,12          |          |         |                                 |       | pcph                   |
| Movement Capacity:                                                                              |       | -<br>1=Cp,9 | 12         |       |     |      | pcph    | •      | Cm,12          |          | 12=     |                                 |       | pcph                   |
| Prb. of Queu-free State:                                                                        |       |             | -<br>/Cm,9 | :     | 1   | 0.98 | P+1     | •      | •              |          | 12/C∎,1 | 2=                              | 0.94  |                        |
| ···· ·· ·· ··· ··· ··· ··· ··· ··· ···                                                          |       |             |            |       |     |      |         |        |                |          |         |                                 |       |                        |
| STEP 2: LT FROM MAJOR STREET                                                                    | 1     |             |            |       |     |      |         | ļ      |                |          |         |                                 | • ~ ~ |                        |
| Conflicting Flows:                                                                              |       |             | + V3       | 2     |     |      | vhp     |        | •              |          | + V6 =  |                                 |       | vhp                    |
| Potential Capacity:                                                                             | Cp,4  |             |            |       |     |      | pcph    |        | Cp,1           |          |         |                                 |       | pcph                   |
| Novement Capacity:                                                                              |       | =Cp,4       |            |       |     |      | pcph    |        | Cm,1=          |          |         |                                 |       | pcph                   |
| Prb. of Queu-free State:                                                                        | po,4  | =1-v4       | /Cm4=      |       |     | 0.99 |         |        | p <b>0,1</b> = | 1-v1/    | (Cm1=   |                                 | 0.84  |                        |
| Major Left Shared Lane                                                                          | ;     |             |            |       |     |      |         | 1<br>t |                |          |         |                                 |       |                        |
| Prob. of Queue-free State                                                                       | ¦o≭o. | 4=          |            |       | (   | 0.99 |         | 1      | o≭o,1:         |          |         |                                 | 0.80  |                        |

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| Minor Street: OMAOPIO RD<br>Scenario: YEAR 2005 BASE                                                                                                                                                                                        |                                                                                                                                               |                           |                                                 |                            | DAT<br>Analys<br>File Nam    | t: 8C                                                           |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------------------------|----------------------------|------------------------------|-----------------------------------------------------------------|--|
| Peak Hour: PM                                                                                                                                                                                                                               |                                                                                                                                               |                           | Intes                                           | section                    | Intesection                  | <b>f:</b> 4                                                     |  |
| STEP 3: TH FROM MINOR STREET                                                                                                                                                                                                                | 1                                                                                                                                             |                           | <br>I                                           |                            | ***********                  |                                                                 |  |
| Conflicting Flows:                                                                                                                                                                                                                          | Yc8 = 1/2V3                                                                                                                                   | +V2+V1+V6+V5+V4           | l Ve                                            | c                          | /286+85+84+8                 | 3+42+41                                                         |  |
|                                                                                                                                                                                                                                             | ;<br>;                                                                                                                                        | 820 v                     | •                                               | :                          | /=                           | 830 vph                                                         |  |
|                                                                                                                                                                                                                                             | Cp,8 =                                                                                                                                        |                           |                                                 | 5,11 =                     |                              | 400 pcph                                                        |  |
|                                                                                                                                                                                                                                             | f8 = po,4≭po,                                                                                                                                 | 1 = 0.79                  | f1                                              | L1 = po,4                  |                              | 0.79                                                            |  |
| Novement Capacity:                                                                                                                                                                                                                          | Cm,8 = Cp,8*f                                                                                                                                 | 3 = 320 pcj               | ih ¦ C∎                                         | ∎,11 = Cp                  | ,11*f11 =                    | 316 pcph                                                        |  |
| Prob. of Queue-free State:                                                                                                                                                                                                                  | ;po,8 = 1-v8/C                                                                                                                                | 1,8 = 0.92                | ¦ po                                            | ),11 = 1-1                 | v11/Cm,11 =                  | 0.95                                                            |  |
| STEP 4: LT FROM MINOR STREET                                                                                                                                                                                                                | !                                                                                                                                             |                           | <br>I                                           |                            |                              | **************                                                  |  |
|                                                                                                                                                                                                                                             | $\frac{1}{2}$                                                                                                                                 | 2+V1+1/2V6+V5+V4+         | l<br>Ve                                         | 10 <del>-</del> 1/2        | 2V6+V5+V4+1/2                | UZ1U91U11                                                       |  |
|                                                                                                                                                                                                                                             |                                                                                                                                               | +V12) = 852 vp            |                                                 |                            | (V8+V9) :                    |                                                                 |  |
| Potential Capacity:                                                                                                                                                                                                                         | Cp7 =                                                                                                                                         | 340 pcp                   |                                                 | 10 =                       |                              | 347 pcph                                                        |  |
| Major Left, Minor Through                                                                                                                                                                                                                   | 1                                                                                                                                             | · · · · · · ·             | }                                               |                            |                              | • · · · <b>p</b> •p                                             |  |
|                                                                                                                                                                                                                                             | ¦P''7≈po,11≭f11                                                                                                                               | = 0.75                    | j p'                                            | '10=po,84                  | 4f8 =                        | 0.73                                                            |  |
| Hajor Left, Hinor Through                                                                                                                                                                                                                   |                                                                                                                                               |                           | ł                                               |                            |                              |                                                                 |  |
| Adjusted Impedance Factor:                                                                                                                                                                                                                  |                                                                                                                                               | 0.81                      |                                                 | 10 =                       |                              | 0.79                                                            |  |
| Capacity Adjustment Factor:                                                                                                                                                                                                                 |                                                                                                                                               |                           |                                                 |                            | po,9 = (                     |                                                                 |  |
| Movement Capacity:                                                                                                                                                                                                                          | jum,/ = T/+Up,/                                                                                                                               | = 259 pcp                 | n ; (m.                                         | ,10 = T10                  | *Cp,10 =                     | 270 pcph                                                        |  |
| DELAY AND LEVEL OF SERVICE SUMMA                                                                                                                                                                                                            | ARY                                                                                                                                           |                           | AVG                                             |                            | !                            |                                                                 |  |
|                                                                                                                                                                                                                                             |                                                                                                                                               |                           | TOTAL                                           |                            | <br> <br>                    |                                                                 |  |
| MOVEHENT                                                                                                                                                                                                                                    | v(pcph) cm(pc                                                                                                                                 | ph) csh(pcph)             | DELAY                                           | LOS                        |                              |                                                                 |  |
|                                                                                                                                                                                                                                             |                                                                                                                                               |                           |                                                 |                            | 1                            |                                                                 |  |
| MINOR LEFT TURH (7)                                                                                                                                                                                                                         | 25 259                                                                                                                                        | SHRD                      | SHRD                                            |                            | LEVEL OF SE                  | ERVICE CRITERIA                                                 |  |
|                                                                                                                                                                                                                                             | 24 320                                                                                                                                        | 340<br>Shrd               | 13.0                                            | C                          | ;                            | 4110                                                            |  |
| NINOR THROUGH (8)                                                                                                                                                                                                                           |                                                                                                                                               | STIMU                     | SHRD                                            |                            | i<br>I I CVCI                | AVG                                                             |  |
|                                                                                                                                                                                                                                             | 15 889                                                                                                                                        | enne                      |                                                 |                            |                              | TOTAL                                                           |  |
| MINOR THROUGH (8)<br>Minor Right Turn (9)                                                                                                                                                                                                   | 15 889                                                                                                                                        |                           | SHRD                                            |                            |                              | DELOY                                                           |  |
| MINOR THROUGH (8)<br>Minor Right Turn (9)<br>Minor Left Turn (10)                                                                                                                                                                           | 15 889<br>6 270                                                                                                                               | SHRD                      | SHRD                                            | <br>B                      | OF                           | DELAY<br>(SEC/VEH)                                              |  |
| MINOR THROUGH (8)<br>Minor Right Turn (9)                                                                                                                                                                                                   | 15 889                                                                                                                                        |                           | 6.7                                             | в<br>                      |                              | DELAY<br>(SEC/VEH)                                              |  |
| MINOR THROUGH (8)<br>MINOR RIGHT TURN (9)<br>MINOR LEFT TURN (10)<br>MINOR THROUGH (11)                                                                                                                                                     | 15 889<br>6 270<br>15 316                                                                                                                     | SHRD<br>617               |                                                 | B                          | OF                           |                                                                 |  |
| MINOR THROUGH (8)<br>MINOR RIGHT TURN (9)<br>MINOR LEFT TURN (10)<br>MINOR THROUGH (11)<br>MINOR RIGHT TURN (12)<br>MAJOR LEFT (1)                                                                                                          | 15 889<br>6 270<br>15 316                                                                                                                     | SHRD<br>617               | 6.7                                             | B                          | OF<br>SERVICE                | (SEC/VEH)                                                       |  |
| MINOR THROUGH (8)<br>MINOR RIGHT TURN (9)<br>MINOR LEFT TURN (10)<br>MINOR THROUGH (11)<br>MINOR RIGHT TURN (12)                                                                                                                            | 15 889<br>6 270<br>15 316<br>58 994                                                                                                           | SHRD<br>617<br>Shrd       | 6.7<br>Shrd                                     | B<br>                      | OF<br>Service<br>A           | (SEC/VEH)<br><br>>5&<=10<br>>10&<=20                            |  |
| MINOR THROUGH (8)<br>MINOR RIGHT TURN (9)<br>MINOR LEFT TURN (10)<br>MINOR THROUGH (11)<br>MINOR RIGHT TURN (12)<br>MAJOR LEFT (1)<br>MAJOR LEFT (4)                                                                                        | 15         889           6         270           15         316           58         994           197         1253                           | SHRD<br>617<br>SHRD<br>NA | 6.7<br>SHRD<br>3.4<br>3.3                       | B<br><br>A<br>A            | OF<br>Service<br>A<br>B      | (SEC/VEH)<br><=5<br>>5&<=10<br>>10&<=20<br>>20&<=30             |  |
| MINOR THROUGH (8)<br>MINOR RIGHT TURN (9)<br>MINOR LEFT TURN (10)<br>MINOR THROUGH (11)<br>MINOR RIGHT TURN (12)<br>MAJOR LEFT (1)<br>MAJOR LEFT (4)<br>MINOR APPROACH (7)(8)(9)                                                            | 15         889           6         270           15         316           58         994           197         1253           13         1116 | SHRD<br>617<br>SHRD<br>NA | 6.7<br>SHRD<br>3.4<br>3.3<br>13.0               | B<br><br>A<br>A<br>C       | OF<br>SERVICE<br>A<br>B<br>C | (SEC/VEH)<br><=5<br>>5&<=10<br>>10&<=20<br>>20&<=30<br>>30&<=45 |  |
| MINOR THROUGH (8)<br>MINOR RIGHT TURN (9)<br>MINOR LEFT TURN (10)<br>MINOR THROUGH (11)<br>MINOR RIGHT TURN (12)<br>MAJOR LEFT (1)<br>MAJOR LEFT (4)                                                                                        | 15         889           6         270           15         316           58         994           197         1253                           | SHRD<br>617<br>SHRD<br>NA | 6.7<br>SHRD<br>3.4<br>3.3                       | B<br><br>A<br>A            | OF<br>SERVICE<br>A<br>B<br>C | (SEC/VEH)<br><=5<br>>5&<=10<br>>10&<=20<br>>20&<=30             |  |
| MINOR THROUGH (8)<br>MINOR RIGHT TURN (9)<br>MINOR LEFT TURN (10)<br>MINOR THROUGH (11)<br>MINOR RIGHT TURN (12)<br>MAJOR LEFT (1)<br>MAJOR LEFT (4)<br>MINOR APPROACH (7)(8)(9)<br>MINOR APPROACH (10)(11)(12)                             | 15         889           6         270           15         316           58         994           197         1253           13         1116 | SHRD<br>617<br>SHRD<br>NA | 6.7<br>SHRD<br>3.4<br>3.3<br>13.0<br>6.7        | B<br>A<br>A<br>C<br>B      | OF<br>SERVICE<br>A<br>B<br>C | (SEC/VEH)<br><=5<br>>5&<=10<br>>10&<=20<br>>20&<=30<br>>30&<=45 |  |
| MINOR THROUGH (8)<br>MINOR RIGHT TURN (9)<br>MINOR LEFT TURN (10)<br>MINOR THROUGH (11)<br>MINOR RIGHT TURN (12)<br>MAJOR LEFT (1)<br>MAJOR LEFT (4)<br>MINOR APPROACH (7)(8)(9)<br>MINOR APPROACH (10)(11)(12)<br>MAJOR APPROACH (1)(2)(3) | 15         889           6         270           15         316           58         994           197         1253           13         1116 | SHRD<br>617<br>SHRD<br>NA | 6.7<br>SHRD<br>3.4<br>3.3<br>13.0<br>6.7<br>1.1 | B<br>A<br>A<br>C<br>B<br>A | OF<br>SERVICE<br>A<br>B<br>C | (SEC/VEH)<br><=5<br>>5&<=10<br>>10&<=20<br>>20&<=30<br>>30&<=45 |  |
| MINOR THROUGH (8)<br>MINOR RIGHT TURN (9)<br>MINOR LEFT TURN (10)<br>MINOR THROUGH (11)<br>MINOR RIGHT TURN (12)<br>MAJOR LEFT (1)<br>MAJOR LEFT (4)<br>MINOR APPROACH (7)(8)(9)<br>MINOR APPROACH (10)(11)(12)                             | 15         889           6         270           15         316           58         994           197         1253           13         1116 | SHRD<br>617<br>SHRD<br>NA | 6.7<br>SHRD<br>3.4<br>3.3<br>13.0<br>6.7        | B<br>A<br>A<br>C<br>B      | OF<br>SERVICE<br>A<br>B<br>C | (SEC/VEH)<br><=5<br>>5&<=10<br>>10&<=20<br>>20&<=30<br>>30&<=45 |  |

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| Minor Street: KEKAULIKE AV<br>Peak Hour: AM<br>Scenario: YEAR 2005 BAS                                                                                                                                                                     | E                                                            |                           |             |              | Fil                                     | Date: 27-Jun<br>Analyst: BC<br>e Hame: KULKEK-<br>section: 5 |   |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|---------------------------|-------------|--------------|-----------------------------------------|--------------------------------------------------------------|---|
| Peak Hour Factor: 1.00                                                                                                                                                                                                                     |                                                              |                           |             |              |                                         |                                                              |   |
| HAJOR STREET                                                                                                                                                                                                                               | -   V2  61                                                   | 3>                        |             | <b>&lt;-</b> | 102                                     | V5                                                           |   |
| Hum of Lanes - V2: 1                                                                                                                                                                                                                       | •                                                            |                           |             |              |                                         |                                                              |   |
|                                                                                                                                                                                                                                            | V3 8                                                         | 3                         |             |              | 22                                      | ٧4                                                           |   |
| Stop/Yield - V3 (Y/N): N                                                                                                                                                                                                                   |                                                              | ١                         |             |              | 1                                       |                                                              |   |
| \$ Grade - V2,V3: 2                                                                                                                                                                                                                        |                                                              | v                         |             | ,            | V MAJOR S<br>Kula hi                    |                                                              |   |
| Num of Lanes - V5: 1                                                                                                                                                                                                                       | ł                                                            |                           | ۲           | >            |                                         |                                                              |   |
| Excl LT - V4 (Y/H): H                                                                                                                                                                                                                      | 1                                                            |                           | 1           | 1            |                                         |                                                              |   |
| <b>t</b> Grade - V4,V5: -2                                                                                                                                                                                                                 |                                                              |                           | 4<br>1<br>1 |              |                                         |                                                              |   |
| HINOR STREET                                                                                                                                                                                                                               | 1                                                            |                           | 20          | 61           |                                         | NORTH>                                                       |   |
| Num of Lanes - V7, V9: 1                                                                                                                                                                                                                   |                                                              |                           |             |              |                                         |                                                              |   |
| Shared Lane (Y/N): Y                                                                                                                                                                                                                       |                                                              |                           | ٧7          | ٧9           |                                         |                                                              |   |
| \$ Grade - V7&V9 -2                                                                                                                                                                                                                        | ;<br>                                                        | MINUR ST                  | REET: KEKA  | ULIXE AV     |                                         |                                                              |   |
| VOLUNE ADJUSTMENTS                                                                                                                                                                                                                         |                                                              |                           |             |              |                                         | 9992 W = = 99 W ± # 99 8 B ± 9                               |   |
| HOVEMENT NO.                                                                                                                                                                                                                               | 2                                                            | 3                         | 4           |              | 5 7                                     | 9                                                            |   |
| VOLUME, V (vph)                                                                                                                                                                                                                            | 168                                                          | 8                         | 22          | 10           | -                                       | 61                                                           |   |
| VOLUME, v (pcph)                                                                                                                                                                                                                           | 168                                                          | 8                         | 22          | 102          |                                         | 61                                                           |   |
| Potential Capacity:   C<br>Movement Capacity:   C<br>STEP 2: LT FROM MAJOR STREET<br>Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State: | m,p = Cp,9 =<br>- V4<br>  Vc,4<br>  Cp,4<br>  Cm,4<br>  po,4 | = Cp,4 =<br>= 1-v4/Cm,4 = | 8           | + 168        | 11<br>= 1<br>14                         |                                                              |   |
|                                                                                                                                                                                                                                            |                                                              |                           |             |              | ••••••••••••••••••••••••••••••••••••••• |                                                              | - |
| TEP 3: LT FROM MINOR STREET -<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:                                                                                                     | Vc,7 =<br>Cp,7 =                                             |                           | /4 =        |              | 71                                      | 96 vph<br>14 pcph                                            |   |
| Movement Capacity:                                                                                                                                                                                                                         | Cm.7 =                                                       |                           |             |              | 0.9<br>70                               | va<br>)2 pcph                                                |   |
|                                                                                                                                                                                                                                            |                                                              |                           |             |              |                                         |                                                              | - |
|                                                                                                                                                                                                                                            |                                                              | ce(pcph)                  |             |              | LOS                                     |                                                              |   |
| ELAY AND LEVEL OF SERVICE SUN<br>Movement                                                                                                                                                                                                  | •(vcpii)                                                     |                           |             |              |                                         |                                                              |   |
| ELAY AND LEVEL OF SERVICE SUN<br>Hovement<br>MINOR LEFT TURN (7)                                                                                                                                                                           |                                                              | 702                       |             |              |                                         |                                                              |   |
| ELAY AND LEVEL OF SERVICE SUN<br>Hovement<br>MINOR LEFT TURN (7)                                                                                                                                                                           | 20                                                           |                           | SHRD        |              | SHRD                                    |                                                              |   |

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|                                                                                                                                                                                                                                                                                                                                                                   | CONTROLLED                                                                                           | T-INTERSECTION                                                                                             | LEVEL OF SER                          | VICE ANALYS                              | IS                                                                                     | 1994 HC                             | M. a                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|---------------------------------------|------------------------------------------|----------------------------------------------------------------------------------------|-------------------------------------|-----------------------------------------------------------------------------|
| lajor Street: KULA HWY                                                                                                                                                                                                                                                                                                                                            |                                                                                                      |                                                                                                            |                                       |                                          | :::::::::::::::::::::::::::::::::::::::                                                | )ate: 27-Jun                        | ==                                                                          |
| linor Street: KEKAULIKE AV                                                                                                                                                                                                                                                                                                                                        |                                                                                                      |                                                                                                            |                                       |                                          |                                                                                        | yst: BC                             |                                                                             |
| Peak Hour: PM                                                                                                                                                                                                                                                                                                                                                     |                                                                                                      |                                                                                                            |                                       |                                          | File h                                                                                 |                                     | اس≢<br>ا                                                                    |
| Scenario: YEAR 2005 BASE                                                                                                                                                                                                                                                                                                                                          |                                                                                                      |                                                                                                            |                                       |                                          | Intersect                                                                              |                                     |                                                                             |
| Peak Hour Factor: 1.00                                                                                                                                                                                                                                                                                                                                            | t<br>!                                                                                               |                                                                                                            |                                       | 4                                        |                                                                                        |                                     | 4.1                                                                         |
| HAJOR STREET                                                                                                                                                                                                                                                                                                                                                      | V2 1                                                                                                 | 45>                                                                                                        |                                       | <                                        | 132                                                                                    | ٧5                                  |                                                                             |
| Num of Lanes - V2: 1                                                                                                                                                                                                                                                                                                                                              | 1                                                                                                    |                                                                                                            |                                       |                                          |                                                                                        |                                     |                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                   | 1 13                                                                                                 | 27                                                                                                         |                                       |                                          | 57                                                                                     | ٧4                                  | [mil                                                                        |
| Stop/Yield - V3 (Y/N): N                                                                                                                                                                                                                                                                                                                                          | }                                                                                                    | 1                                                                                                          |                                       | 1                                        |                                                                                        |                                     | 1                                                                           |
| <b>\$</b> Grade - V2,V3: 2                                                                                                                                                                                                                                                                                                                                        |                                                                                                      | v                                                                                                          |                                       | v                                        | MAJOR STR<br>Kula hwy                                                                  | EET:                                | ·                                                                           |
| Num of Lanes - V5: 1                                                                                                                                                                                                                                                                                                                                              | · ·                                                                                                  |                                                                                                            | <b>(</b>                              | >                                        |                                                                                        |                                     | <b>L</b>                                                                    |
| Excl LT - V4 (Y/H): N                                                                                                                                                                                                                                                                                                                                             | 1                                                                                                    |                                                                                                            | ١                                     | 1                                        |                                                                                        |                                     | 1                                                                           |
| <b>%</b> Grade - V4,V5: -2                                                                                                                                                                                                                                                                                                                                        |                                                                                                      |                                                                                                            | t                                     | - F                                      |                                                                                        |                                     |                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                   | 1                                                                                                    |                                                                                                            | ;                                     | ;                                        |                                                                                        |                                     | استق                                                                        |
| NINOR STREET                                                                                                                                                                                                                                                                                                                                                      | 1                                                                                                    |                                                                                                            | 22                                    | 38                                       |                                                                                        | NORTH>                              |                                                                             |
| Hum of Lanes - V7,V9: 1                                                                                                                                                                                                                                                                                                                                           | i                                                                                                    |                                                                                                            |                                       |                                          |                                                                                        |                                     |                                                                             |
| Shared Lane (Y/N): Y                                                                                                                                                                                                                                                                                                                                              | i                                                                                                    |                                                                                                            | V7<br>V7                              | V9                                       |                                                                                        |                                     | E-11                                                                        |
| \$ Grade - V7&V9: -2                                                                                                                                                                                                                                                                                                                                              | i<br>                                                                                                | MINOR SI                                                                                                   | TREET: KEKAUL                         | .IKE AV                                  |                                                                                        |                                     |                                                                             |
| OLUNE ADJUSTHENTS                                                                                                                                                                                                                                                                                                                                                 |                                                                                                      |                                                                                                            |                                       |                                          |                                                                                        |                                     |                                                                             |
| HOVEMENT NO.                                                                                                                                                                                                                                                                                                                                                      | 2                                                                                                    | 3                                                                                                          | 4                                     | 5                                        | 7                                                                                      | 9                                   | #+ 1                                                                        |
| VOLUME, V (vph)                                                                                                                                                                                                                                                                                                                                                   | 145                                                                                                  | 27                                                                                                         | 57                                    | 132                                      | 22                                                                                     | 38                                  | ۰ <b>.</b>                                                                  |
| VOLUME, v (pcph)                                                                                                                                                                                                                                                                                                                                                  | 145                                                                                                  | 27                                                                                                         | 57                                    | 132                                      | 22                                                                                     | 38                                  |                                                                             |
| TEP 1: RT FROM MINOR STREET                                                                                                                                                                                                                                                                                                                                       | - V9                                                                                                 |                                                                                                            |                                       |                                          |                                                                                        |                                     |                                                                             |
| Conflicting Flows: V                                                                                                                                                                                                                                                                                                                                              | c,9 = 1/2 <b>*</b> V                                                                                 | /3+V2 =                                                                                                    | 14 +                                  | 145                                      | = 159                                                                                  | vph                                 | • 1                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                   | p,9 =                                                                                                |                                                                                                            |                                       |                                          | 1151                                                                                   | pcph                                | 🛔 crant                                                                     |
| Movement Capacity:   C                                                                                                                                                                                                                                                                                                                                            | ∎,p = Cp,9                                                                                           | :                                                                                                          |                                       |                                          | 1151                                                                                   | pcph                                | •                                                                           |
| TEP 2: LT FROM MAJOR STREET                                                                                                                                                                                                                                                                                                                                       | - V4                                                                                                 |                                                                                                            |                                       | *-*                                      |                                                                                        |                                     | •                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                   | ••                                                                                                   | 4 - 47100 -                                                                                                | 27                                    |                                          |                                                                                        |                                     | # * · · ·                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                   | ł Vc.                                                                                                | 4 = VSTVZ =                                                                                                | 21                                    | + 145                                    | : 172                                                                                  | VOD                                 | <b>*</b> ~                                                                  |
| Conflicting Flows:<br>Potential Capacity:                                                                                                                                                                                                                                                                                                                         | ! Co.                                                                                                | 4 = V3+V2 =<br>4 =                                                                                         | 27                                    | + 145                                    |                                                                                        |                                     |                                                                             |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:                                                                                                                                                                                                                                                                                                   | ¦ Ср,<br>; С <b>м</b> ,                                                                              |                                                                                                            | 21                                    | + 145                                    |                                                                                        | pcph                                |                                                                             |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:                                                                                                                                                                                                                                                                     | ¦ Cp,<br>¦ Cm,                                                                                       | 4 =                                                                                                        |                                       | + 145                                    | 1419                                                                                   | pcph<br>pcph                        | <b>á</b> - s                                                                |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane                                                                                                                                                                                                                                           | Ср,<br>См,<br>ро,                                                                                    | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =                                                                       |                                       | + 145                                    | 1419<br>1419                                                                           | pcph<br>pcph                        | <b>a</b> - •                                                                |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:                                                                                                                                                                                                                                                                     | Ср,<br>См,<br>ро,                                                                                    | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =<br>,4 =                                                               |                                       |                                          | 1419<br>1419<br>0.96<br>0.96                                                           | pcph<br>pcph                        |                                                                             |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:                                                                                                                                                                                                             | Ср,<br>См,<br>ро,<br>р*о                                                                             | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =<br>,4 =                                                               |                                       |                                          | 1419<br>1419<br>0.96                                                                   | pcph<br>pcph                        | <b>å</b> -•                                                                 |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>TEP 3: LT FROM MINOR STREET -                                                                                                                                                                            | Cp,<br>Cm,<br>po,<br>p*o                                                                             | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =<br>,4 =                                                               |                                       |                                          | 1419<br>1419<br>0.96                                                                   | pcph<br>pcph                        | \$                                                                          |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>TEP 3: LT FROM MINOR STREET -<br>Conflicting Flows:                                                                                                                                                      | Cp,<br>Cm,<br>po,<br>p*o                                                                             | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =<br>,4 =<br>7 = 1/2V3+V2+V5                                            |                                       |                                          | 1419<br>1419<br>0.96<br>                                                               | pcph<br>pcph<br>vph                 | به ک<br>۲۰۰۰                                                                |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>EP 3: LT FROM MINOR STREET -<br>Conflicting Flows:<br>Potential Capacity:                                                                                                                                | Cp,<br>Cm,<br>Cm,<br>po,<br>p*o<br>V7<br>V7<br>VC,<br>Cp,                                            | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =<br>,4 =<br>7 = 1/2V3+V2+V5                                            |                                       |                                          | 1419<br>1419<br>0.96<br>                                                               | pcph<br>pcph                        | به ک<br>۲۰۰۰                                                                |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>                                                                                                                                                                                                         | Cp,<br>Cm,<br>po,<br>p*o<br>V7<br>V7<br>VC,<br>Cp,<br>f7=                                            | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =<br>,4 =<br>7 = 1/2V3+V2+V5+<br>7 =<br>po,4=                           |                                       |                                          | 1419<br>1419<br>0.96<br>                                                               | pcph<br>pcph<br>vph                 | ی - در<br>ج-سه<br>تو                                                        |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>EP 3: LT FROM MINOR STREET -<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:                                                                    | Cp,<br>Cm,<br>po,<br>p*o<br>V7<br>V7<br>VC,<br>Cp,<br>f7=                                            | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =<br>,4 =<br>7 = 1/2V3+V2+V5+<br>7 =                                    |                                       |                                          | 1419<br>1419<br>0.96<br>                                                               | pcph<br>pcph<br>vph                 | ية - م<br>19 - مربع<br>19 - م<br>14 - م                                     |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>EP 3: LT FROM MINOR STREET -<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:                                              | Cp,<br>Cm,<br>po,<br>p*o<br>V7<br>V7<br>VC,<br>Cp,<br>f7=<br>Cm,                                     | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =<br>,4 =<br>7 = 1/2V3+V2+V5+<br>7 =<br>po,4=                           | +V4 =                                 |                                          | 1419<br>1419<br>0.96<br>                                                               | pcph<br>pcph<br>vph<br>pcph         | ية - م<br>19 - مربع<br>19 - م<br>14 - م                                     |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>EP 3: LT FROM MINOR STREET -<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>LAY AND LEVEL OF SERVICE SUM              | Cp,<br>Cm,<br>po,<br>p*o<br>V7<br>V7<br>VC,<br>Cp,<br>f7=<br>Cm,<br>MARY                             | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =<br>,4 =<br>7 = 1/2V3+V2+V5+<br>7 =<br>00,4=<br>7 = Cp,7 =             | +V4 =<br>csh                          | AVG TOTAL                                | 1419<br>1419<br>0.96<br>                                                               | pcph<br>pcph<br>vph<br>pcph         | de ex<br>Remote<br>de<br>Remote<br>de exe<br>Remote                         |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>EP 3: LT FROM MINOR STREET -<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>LAY AND LEVEL OF SERVICE SUM<br>Movement  | Cp,<br>Cm,<br>po,<br>v7<br>V7<br>V7<br>Cp,<br>f7=<br>cm,<br>MARY<br>v(vcph)                          | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =<br>,4 =<br>7 = 1/2V3+V2+V5+<br>7 =<br>00,4=<br>7 = Cp,7 =<br>cm(pcph) | +V4 =<br>csh<br>(pcph)                | AVG TOTAL<br>DELAY                       | 1419<br>1419<br>0.96<br>                                                               | pcph<br>pcph<br>vph<br>pcph         | ی - بر<br>۱۳۸۰ ه<br>۱۳۹۰ ه<br>۱۳۹۲ ه<br>۱۳۹۲ ه<br>۱۳۹۲ ه                    |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>TEP 3: LT FROM MINOR STREET -<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>LAY AND LEVEL OF SERVICE SUM<br>Movement | Cp,<br>Cm,<br>po,<br>v7<br>V7<br>V7<br>Cp,<br>f7=<br>cm,<br>MARY<br>v(vcph)                          | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =<br>,4 =<br>7 = 1/2V3+V2+V5+<br>7 =<br>00,4=<br>7 = Cp,7 =<br><br>637  | +V4 =<br>csh<br>(pcph)<br><br>SHRD    | AVG TOTAL<br>DELAY                       | 1419<br>1419<br>0.96<br>0.96<br>348<br>666<br>0.96<br>637<br>LOS                       | pcph<br>pcph<br>vph<br>pcph         | ی - بر<br>۱۳۸۰ ه<br>۱۳۹۰ ه<br>۱۳۹۲ ه<br>۱۳۹۲ ه<br>۱۳۹۲ ه                    |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>TEP 3: LT FROM MINOR STREET -<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>LAY AND LEVEL OF SERVICE SUM<br>Movement | Cp,<br>Cm,<br>po,<br>v7<br>V7<br>V7<br>Cp,<br>f7=<br>cm,<br>MARY<br>v(vcph)                          | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =<br>,4 =<br>7 = 1/2V3+V2+V5+<br>7 =<br>00,4=<br>7 = Cp,7 =<br><br>637  | +V4 =<br>csh<br>(pcph)<br><br>SHRD    | AVG TOTAL<br>DELAY<br>SHRD               | 1419<br>1419<br>0.96<br>0.96<br>348<br>666<br>0.96<br>637<br>LOS                       | pcph<br>pcph<br>vph<br>pcph         | δ                                                                           |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>EP 3: LT FROM MINOR STREET -<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>LAY AND LEVEL OF SERVICE SUM<br>Movement  | Cp,<br>Cm,<br>po,<br>v7<br>V7<br>V7<br>Cp,<br>f7=<br>cm,<br>MARY<br>v(vcph)                          | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =<br>,4 =<br>7 = 1/2V3+V2+V5+<br>7 =<br>00,4=<br>7 = Cp,7 =<br><br>637  | +V4 =<br>csh<br>(pcph)<br><br>SHRD    | AVG TOTAL<br>DELAY<br>SHRD               | 1419<br>1419<br>0.96<br>0.96<br>348<br>666<br>0.96<br>637<br>LOS<br>                   | pcph<br>pcph<br>vph<br>pcph         | ی - د<br>۲ میرو<br>۲ مربع<br>۲ مربع<br>۲ مربع<br>۲ مربع<br>۲ مربع<br>۲ مربع |
| Conflicting Flows:<br>Potential Capacity:<br>Movement Capacity:<br>Prob. of Queue-free State:<br>Major Left Shared Lane<br>Prob. of Queue-free State:<br>EP 3: LT FROM MINOR STREET -<br>Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>LAY AND LEVEL OF SERVICE SUM<br>Movement  | Cp,<br>Cm,<br>po,<br>p*o<br>V7<br>V7<br>V7<br>Cp,<br>f7=<br>Cm,<br>MARY<br>v(vcph)<br>22<br>38<br>57 | 4 =<br>4 = Cp,4 =<br>4 = 1-v4/Cm,4 =<br>,4 =<br>7 = 1/2V3+V2+V5+<br>7 =<br>00,4=<br>7 = Cp,7 =<br>         | +V4 =<br>csh<br>(pcph)<br>SHRD<br>888 | AVG TOTAL<br>DELAY<br>SHRD<br>4.3<br>2.6 | 1419<br>1419<br>0.96<br>0.96<br>348<br>666<br>0.96<br>637<br>LOS<br><br>SHRD<br>A<br>A | pcph<br>pcph<br>vph<br>pcph<br>pcph | de ex<br>Renise<br>De se<br>Renis<br>La sa<br>Renis<br>De se<br>Renis       |

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ATA AUSTIN, TEUTELIMI & ASSOCIATES, INC.

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YEAR 2005 WITH PROJECT LOS CALCULATIONS

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KULA RESIDENT LOTS (386) YEAR 2005 + PROJECT AM PEAK HOUR 06/27/95 10:44:21

## SIGNAL94/TEAPAC(V1 L1.2) - Summary of Parameter Values

Intersection Parameters for Int # 1 - HANA HWY & KALEAKALA HWY

NETROAREANONCBDLOSTTIME2.0LEVELOFSERVICECNODELOCATION0

Approach Parameters

| APPLABELS       | 58   | <b>H</b> 8 | НÐ   | EB   |
|-----------------|------|------------|------|------|
| GRADES          | .0   | .0         | .0   | .0   |
| PEDLEVELS       | LOW  | LOW        | LOW  | LOW  |
| PARKINGSIDES    | HONE | HONE       | NONE | NONE |
| PARKYOLUMES     | 20   | 20         | 20   | 20   |
| BUSVOLUMES      | 0    | 0          | 0    | 0    |
| RIGHTTURNONREDS | Ó    | 0          | 0    | 0    |

#### Novement Parameters

| NOVLABELS       | RT   | TH   | LT   | RT   | TH   | LT   | RT   | TH   | ١ĭ   | RT   | TH   | LT   |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|
| VOLUKES         | 10   | 902  | 20   | 123  | 100  | 2532 | 461  | 316  | 66   | 10   | - 30 | 29   |
| WIDTHS          | 12.0 | 22.0 | 11.0 | 12.0 | 11.0 | 11.0 | 12.0 | 22.0 | 11.0 | 12.0 | 11.0 | .0   |
| LANES           | 1    | 2    | 1    | 1    | 1    | 1    | 1    | 2    | 1    | 1    | 1    | 0    |
| UTILIZATIONS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| TRUCKPERCENTS   | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  |
| PEAKHOURFACTORS | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  |
| ARRIVALTYPES    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |
| ACTUATIONS      | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  |
| REQCLEARANCES   | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  |
| MININUMS        | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  |
| IDEALSATFLOWS   | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| FACTORS         | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| DELAYFACTORS    | 1.00 |      |      | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| NSTOPFACTORS    | 1.00 |      |      | 1.00 |      | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| GROUPTYPES      | FFLM |      |      | FFLN |      | DOPT | FFLN | NORM | NORM | FFLW | NORM | NORM |
| SATURATIONFLOWS | 0    | 3601 | 689  | 0    |      | 1711 | 0    | 3601 | 478  | 0    | 545  | 0    |

Phasing Parameters

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| SEQUENCES<br>PERMISSIVES<br>OVERLAPS<br>CYCLES<br>GREENTIMES<br>YELLOWTIMES | 17<br>YES<br>YES<br>60<br>13.07<br>4.00 | ALL<br>YES<br>YES<br>180<br>25.07<br>4.00 | YES<br>YES<br>10<br>9.87<br>4.00 | YES<br>YES | LEADLAGS<br>OFFSET<br>PEDTIME | НОНЕ<br>00.<br>0. | NONE<br>1<br>0 |
|-----------------------------------------------------------------------------|-----------------------------------------|-------------------------------------------|----------------------------------|------------|-------------------------------|-------------------|----------------|
| CRITICALS                                                                   | 2                                       | 6                                         | 11                               |            |                               |                   | •              |

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KULA RESIDENT LOTS (386) YEAR 2005 + PROJECT AN PEAK HOUR

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### SIGHAL94/TEAPAC[V1 L1.2] - Capacity Analysis Summary

### Intersection Averages for Int # 1 - HAWA HWY & KALEAKALA HWY Degree of Saturation (v/c) 1.46 Vehicle Delay 46.7 Level of Service E+

.

| **/** | ; <b>*</b> +  | 1             | !        | <br>!        |        |       |        |      |          |       |
|-------|---------------|---------------|----------|--------------|--------|-------|--------|------|----------|-------|
| •     | *+            | }             | 1        | i            |        |       |        |      |          |       |
| 11    | + +>          | <++++         | ł        |              |        |       |        |      |          |       |
|       | V             | ****          | 2        | 1            |        |       |        |      |          |       |
|       | 1             | ۲ (           | ; tt t t | 1            |        |       |        |      |          |       |
| rth . | :             |               | ****>    | 1            |        |       |        |      |          |       |
|       | ++            |               |          |              |        |       |        |      |          |       |
|       | { + +         | 1             | }        | 1            |        |       |        |      |          |       |
|       |               | G/C= .418     |          |              |        |       |        |      |          |       |
|       |               | 6= 25.1       |          |              |        |       |        |      |          |       |
|       |               | Y+R= 4.0"     |          |              |        |       |        |      |          |       |
|       | OFF= .0\$     | 0FF=28.4%     | OFF=76.  | 91           |        |       |        |      |          |       |
|       | <br>C= 60 sec | G= 48.0 sec = | 80.01    | <br>Y=12 0   | 580 3  | 20 05 | 0ed:   | 0 co |          | 09    |
|       |               |               |          |              | 300 -  | 20.04 | F60-   |      | <i>,</i> | . • • |
|       |               |               |          |              | ****** |       |        |      |          |       |
| .ane  | Width/        | g/C           | Servica  | Rate!        | Adi !  | !     | ! RCM  | 11   | 901 Ha   | Y.    |
| Grou  | ID ! Lanes!   | Read Used ;   | AC (yoh  | ) <u>e</u> f | Volume | vle   | 1 Dala |      | Quana    | 1     |

| SB Appr | <br>  |      |   |      |   |      |   |     |   |     |   |     |       |   | 50.8 E                              |
|---------|-------|------|---|------|---|------|---|-----|---|-----|---|-----|-------|---|-------------------------------------|
| ¦ TH    | <br>ł | 22/2 | ; | .281 | 1 | .251 | 1 | 837 | ! | 904 | ! | 949 | 1.050 | : | 51.7  *E   300 f<br>11.2   B   25 f |

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13.0 B

### NB Approach

| ==    | =====:<br>TH | ===<br> <br> | ==<br>2 | ===<br>2/2   | ==<br>!   | <br>114. | ==<br>  | .251 | ===      | 837 | :::     | 904 | ::: | 333  | ==:        | . 368 | === | 12.1         | :::  | ===<br>B | ====<br>105 | ===:<br>ft¦ |
|-------|--------------|--------------|---------|--------------|-----------|----------|---------|------|----------|-----|---------|-----|-----|------|------------|-------|-----|--------------|------|----------|-------------|-------------|
| ;<br> | LT<br>       | ;            | 1       | 1/1          | ;         | .000     | ¦<br>   | .251 |          | 86  |         | 113 | ;   | 69   |            | .575  | !   | 17.4         |      | C+¦      | 44          | ft          |
| N8    | Appro        | ac           | h       |              |           |          |         |      |          |     |         |     |     |      |            |       |     | 50.7         |      |          |             |             |
|       |              |              |         |              |           |          |         |      |          |     |         |     |     |      |            |       |     | JV./         |      | -        |             |             |
| :::   |              | ==:          | ==      | ===:<br>1/1· | ==:<br>-¦ | .816     | :=:<br> | .451 | :==<br>¦ | 735 | :==<br> | 776 | :== | 1421 | ::::<br> } |       | ::: | 50.7<br>50.7 | :::: | :::      | <br>658     | titi<br>ft: |

|                                                              | • |
|--------------------------------------------------------------|---|
| ***************************************                      |   |
| LT+TH   11/1   .175   .198   74   100   63   .583   19.6  *C |   |
|                                                              |   |

XULA RESIDENT LOTS (386) YEAR 2005 + PROJECT PM PEAK HOUR

06/27/95 10:54:44

### SIGHAL94/TEAPAC[V1 L1.2] - Summary of Parameter Values

Intersection Parameters for Int # 1 - HANA HWY & KALEAKALA HWY

METROAREANONC8DLOSTTIME2.0LEVELOFSERVICECNODELOCATION0

Approach Parameters

| APPLABELS       | SB   | WB   | NB   | 58   |
|-----------------|------|------|------|------|
| GRADES          | .0   | .0   | .0   | .0   |
| PEDLEVELS       | LOW  | LOW  | LOW  | LOW  |
| PARKINGSIDES    | NONE | NONE | NONE | NONE |
| PARKVOLUNES     | 20   | 20   | 20   | 20   |
| BUSVOLUMES      | 0    | 0    | 0    | 0    |
| RIGHTTURNONREDS | 0    | 0    | 0    | 0    |

**Movement Parameters** 

| MOVLABELS       | RT   | TH   | LT   | RT   | TH   | LT   | RT   | TH   | LT   | RT   | r th | ٤T   |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|
| VOLUMES         | 33   | 488  | 47   | 63   | 36   | 690  | 2059 | 934  | 15   | 29   | 134  | 51   |
| WIDTHS          | 12.0 | 22.0 | 11.0 | 12.0 | 11.0 | 11.0 | 12.0 | 22.0 | 11.0 | 12.0 | 11.0 | .0   |
| LANES           | 1    | 2    | 1    | 1    | 1    | -1   | 1    | 2    | 1    | 1    | 1    | 0    |
| UTILIZATIONS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| TRUCKPERCENTS   | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  |
| PEAKHOURFACTORS | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  |
| ARRIVALTYPES    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |
| ACTUATIONS      | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  |
| REQCLEARANCES   | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  |
| MINIMUMS        | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  |
| IDEALSATFLOWS   | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| FACTORS         | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| DELAYFACTORS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| NSTOPFACTORS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| GROUPTYPES      | FFLW | NORM | NORM | FFLW | NORM | DOPT | FFLN | NORN | NORM | FFLW | NORM | NORM |
| SATURATIONFLOWS | 0    | 3601 | 353  | 0    | 1723 | 1711 | 0    | 3601 | 452  | 0    | 1150 | 0    |

Phasing Parameters

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06/27/95 KULA RESIDENT LOTS (386) 10:54:50 YEAR 2005 + PROJECT PH PEAK HOUR SIGHAL94/TEAPAC[V1 L1.2] - Capacity Analysis Summary Intersection Averages for Int # 1 - HANA HWY & KALEAKALA HWY Degree of Saturation (v/c) .68 Vehicle Delay 13.9 Level of Service 8 Sq 17 | Phase 1 | Phase 2 | Phase 3 | \*\*/\*\* ------+++> { <\*\*\*\* ++++ /1\ 1 ¥ \_ | V 12222 († \* + \* \*\*\*\*> North | 1 1 1 + \* - ; | G/C= .307 | G/C= .274 | G/C= .219 | G= 18.4" | G= 16.5" | G= 13.1" Y+R= 4.0" | Y+R= 4.0" | Y+R= 4.0" | OFF= .0% | OFF=37.3% | OFF=71.4% | C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0% ; Lane |Width/| g/C | Service Rate| Adj | | HCM | L |90% Max| ; Group ; Lanes; Reqd Used ; &C (vph) &E ;Volume; v/c ; Delay ; S ; Queue ; 10.1 8 SB Approach ; TH | 22/2 | .164 | .340 | 1176 | 1225 | 514 | .420 | 10.0 | B+; 143 ft; | LT | 11/1 | .000 | .340 | 89 | 114 | 49 | .408 | 11.1 | B | 27 ft| 14.3 B N8 Approach | TH | 22/2 | .290 | .340 | 1176 | 1225 | 983 | .802 | 14.4 |\*8 | 274 ft| LT | 11/1 | .000 | .340 | 119 | 150 | 16 | .104 | 8.8 | 8+ 25 ft 15.3 C+ W8 Approach | TH | 11/1-| .262 | .308 | 473 | 530 | 392 | .740 | 15.8 |\*C+| 229 ft LT | 11/1+| .253 | .308 | 469 | 526 | 372 | .707 | 14.9 | B | 217 ft 17.1 C+ E8 Approach !LT+TH ; 11/1 ; .215 ; .252 ; 238 ; 290 ; 195 ; .672 ; 17.1 ;\*C+; 123 ft;

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KULA RESIDENT LOTS (386) YEAR 2005 + PROJECT AN PEAK HOUR 06/27/95 11:27:22

### SIGNAL94/TEAPAC(V1 L1.2) - Summary of Parameter Values

Intersection Parameters for Int # 2 - PUKALANI BYPASS & MAKAWAO AV

| METROAREA      | NOM | IC8D |
|----------------|-----|------|
| LOSTTINE       |     | 2.0  |
| LEVELOFSERVICE | C   | S    |
| NODELOCATION   | 0   | 0    |

#### Approach Parameters

| APPLABELS       | <b>S</b> 8 | WB   | NB · | EB   |
|-----------------|------------|------|------|------|
| GRADES          | 2.0        | .0   | -2.0 | .0   |
| PEDLEVELS       | LOW        | LOW  | LOW  | LOW  |
| PARKINGSIDES    | NONE       | HONE | NONE | NONE |
| PARKVOLUMES     | 20         | 20   | 20   | 20   |
| BUSVOLUNES      | 0          | 0    | 0    | 0    |
| RIGHTTURNONREDS | 10         | 45   | 20   | 5    |

#### Novement Parameters

| MOVLABELS       | RT     | TH   | LT   | RŤ   | TH   | LT   | RT   | TH   | LT   | RT   | TH   | LT   |
|-----------------|--------|------|------|------|------|------|------|------|------|------|------|------|
| VOLUMES         | 81     | 52   | 10   | 457  | 263  | 350  | 213  | 1105 | 9    | 19   | 202  | 16   |
| WIDTHS          | 12.0 2 | 24.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| LANES           | 1      | 2    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    | 1    |
| UTILIZATIONS    | 1.00 1 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| TRUCKPERCENTS   | 2.0    | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  |
| PEAKHOURFACTORS | . 95   | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  |
| ARRIVALTYPES    | 3      | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |
| ACTUATIONS      | YES    | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  |
| REDCLEARANCES   | 4.0    | 4:0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  |
| MINIMUMS        | 5.0    | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  |
| IDEALSATFLOWS   | 1900 1 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| FACTORS         | 1.00 1 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| DELAYFACTORS    | 1.00 1 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| NSTOPFACTORS    | 1.00 1 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| GROUPTYPES      | KORN F | NORM | NORM | NORM | NORH | NORM | NORM | NORM | NORM | NORM | NORM | NORM |
| SATURATIONFLOWS | 1524 3 | 3688 | 199  | 1539 | 1863 | 1770 | 1554 | 1891 | 1531 | 1539 | 1863 | 940  |

Phasing Parameters

| SEQUENCES<br>PERNISSIVES<br>OVERLAPS<br>CYCLES | 12<br>YES<br>YES<br>60 | ALL<br>YES<br>YES<br>120 | YES<br>YES<br>10 | YES<br>YES | LEADLAGS<br>OFFSET<br>PEDTINE | NDNE<br>.00<br>.0 | NONE<br>1<br>0 |
|------------------------------------------------|------------------------|--------------------------|------------------|------------|-------------------------------|-------------------|----------------|
| GREENTIMES                                     | 35.03                  | 7.05                     | 5.92             |            |                               |                   |                |
| YELLOWTINES                                    | 4.00                   | 4.00                     | 4.00             |            |                               | •                 |                |
| CRITICALS                                      | 8                      | 6                        | 11               |            |                               |                   |                |
| EXCESS                                         | 0                      |                          |                  |            |                               |                   |                |

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|---|
| (EAR 2)<br>Im peal                                                                                                                                                                                                                                                                                                                                                             |                | · PROJE                                                                         | CT                                                                                        |                                                                                                                                    |                                                                                                                                                                                                                                       |                                                                                                                                               |                                                                                           |                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                             | 11:2                                                                                                          | 1:21                                                                               |   |
| ui ren                                                                                                                                                                                                                                                                                                                                                                         |                | 'n                                                                              |                                                                                           |                                                                                                                                    |                                                                                                                                                                                                                                       |                                                                                                                                               |                                                                                           |                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                             |                                                                                                               |                                                                                    |   |
| TAUAL                                                                                                                                                                                                                                                                                                                                                                          | 0.4 / T E      | ADADEN                                                                          |                                                                                           |                                                                                                                                    | aaibu A                                                                                                                                                                                                                               | 1                                                                                                                                             | Cuence                                                                                    | .,                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                             |                                                                                                               |                                                                                    |   |
| SIGNAL                                                                                                                                                                                                                                                                                                                                                                         | 94/1E          | APACLY                                                                          | 1 11.2                                                                                    | j - cap                                                                                                                            | acity A                                                                                                                                                                                                                               | aa1ys1s                                                                                                                                       | : Suenar                                                                                  | Ŷ                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                             |                                                                                                               |                                                                                    |   |
| Inters                                                                                                                                                                                                                                                                                                                                                                         | ectio          | n Aver                                                                          | ages f                                                                                    | or Int                                                                                                                             | 2 -                                                                                                                                                                                                                                   | PUKALA                                                                                                                                        | INI BYPA                                                                                  | ss & Ma                                                                          | KANAO A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | V                                                                                           | _                                                                                                             |                                                                                    |   |
| I                                                                                                                                                                                                                                                                                                                                                                              | Degre          | e of S                                                                          | aturat                                                                                    | ion (v/                                                                                                                            | c} .79                                                                                                                                                                                                                                | Vehic                                                                                                                                         | le Dela:                                                                                  | y 23.9                                                                           | Leve                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | lof                                                                                         | Servi                                                                                                         | ce C                                                                               |   |
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| ¦ Lane<br>¦ Gro<br>SB App                                                                                                                                                                                                                                                                                                                                                      | up ¦           | lidth/¦<br>Lanes                                                                | g<br>Reqd                                                                                 | /C<br>Usad                                                                                                                         | ¦ Servi<br>¦ eC (v                                                                                                                                                                                                                    | ce Rate<br>ph) EE                                                                                                                             | :¦ Adj<br>;Yolume                                                                         | <br>  v/c                                                                        | HCM<br>  Dela)<br>2.9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | L  <br>  S<br>  A                                                                           | 90 <b>%</b><br>Que                                                                                            | Hax;<br>u0 ;<br>                                                                   | · |
| ¦ Lane<br>¦ Gro<br>SB App<br>======<br>  RT<br>! TH                                                                                                                                                                                                                                                                                                                            | up  <br>roacl  | lidth/<br>Lanes<br>12/1<br>24/2                                                 | g<br>Reqd<br>                                                                             | /C<br>Used<br>: .617<br>: .617                                                                                                     | ; Servi<br>; eC (v<br>; 919<br>; 2276                                                                                                                                                                                                 | ce Rate<br>ph) QE<br>; 940<br>; 2276                                                                                                          | Adj<br>Yolume<br>75<br>55                                                                 | <br>  v/c<br>  .080<br>  .024                                                    | HCM<br>  Dela)<br>2.9<br>  3.0<br>  2.9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | A<br>A                                                                                      | 90%<br>Qua<br>25<br>25                                                                                        | Hax;<br>ua ;<br>====<br>ft;<br>ft;                                                 |   |
| ¦ Lane<br>¦ Gro<br>SB App<br>======<br>  RT<br>! TH                                                                                                                                                                                                                                                                                                                            | up  <br>roacl  | lidth/<br>Lanes<br>12/1<br>24/2                                                 | g<br>Reqd<br>.076<br>.025<br>.000                                                         | /C<br>Used<br>  .617<br>  .617<br>  .617<br>  .617                                                                                 | Servi<br>  eC (v<br>  919<br>  2276<br>  98                                                                                                                                                                                           | ce Rate<br>ph) EE<br>; 940<br>; 2276<br>; 120                                                                                                 | e¦ Adj<br>¦Volume<br>  75<br>  55<br>  11                                                 | v/c<br>.080<br>.024                                                              | HCM<br>  Delay<br>  3.0<br>  2.5<br>  3.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | A<br>A<br>A<br>A<br>A                                                                       | 90 <b>%</b><br>Que<br>25<br>25<br>25                                                                          | Hax;<br>u0 ;<br>====<br>ft;<br>ft;<br>ft;                                          |   |
| ¦ Lane<br>¦ Gro<br>SB App<br>======<br>  RT<br>! TH                                                                                                                                                                                                                                                                                                                            | up  <br>roacl  | lidth/<br>Lanes<br>12/1<br>24/2                                                 | g<br>Reqd<br>.076<br>.025<br>.000                                                         | /C<br>Used<br>  .617<br>  .617<br>  .617<br>  .617                                                                                 | Servi<br>  eC (v<br>  919<br>  2276<br>  98                                                                                                                                                                                           | ce Rate<br>ph) EE<br>; 940<br>; 2276<br>; 120                                                                                                 | Adj<br>Yolume<br>75<br>55                                                                 | v/c<br>.080<br>.024                                                              | HCM<br>  Delay<br>  3.0<br>  2.5<br>  3.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | A<br>A<br>A<br>A<br>A                                                                       | 90 <b>%</b><br>Que<br>25<br>25<br>25                                                                          | Hax;<br>u0 ;<br>====<br>ft;<br>ft;<br>ft;                                          |   |
| ¦ Lane<br>¦ Gro<br>SB App<br>======<br>  RT<br>! TH                                                                                                                                                                                                                                                                                                                            | roaci          | lidth/<br>Lanes<br>12/1<br>24/2<br>12/1                                         | g<br>Reqd<br>.076<br>.025<br>.000                                                         | /C<br>Used<br>: .617<br>: .617<br>: .617                                                                                           | ; Servi<br>; eC (v<br>; 919<br>; 2276<br>; 98                                                                                                                                                                                         | ce Rate<br>ph) @E<br>; 940<br>; 2276<br>; 120                                                                                                 | Adj<br> Volume<br>  75<br>  55<br>  11                                                    | v/c<br>.080<br>.024<br>.089                                                      | HCM<br>  Dela)<br>  3.0<br>  2.5<br>  3.0<br>  3.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                             | 90 <b>t</b><br>Que<br>25<br>25<br>25                                                                          | Hax;<br>uo ;<br>ft;<br>ft;<br>ft;                                                  |   |
| Lane<br>Gro<br>SB App<br>RT<br>RT<br>TH<br>LT                                                                                                                                                                                                                                                                                                                                  | up  <br>roaci  | lidth/<br>Lanes<br>12/1<br>24/2<br>12/1                                         | g<br>Raqd<br>.076<br>.025<br>.000                                                         | /C<br>Used<br>1 .617<br>1 .617<br>1 .617                                                                                           | ; Servi<br>; eC (v<br>; 919<br>; 2276<br>; 98                                                                                                                                                                                         | ce Rate<br>ph) 9E<br>  940<br>  2276<br>  120                                                                                                 | 4dj<br>;Volume<br>; 75<br>; 55<br>; 11                                                    | <br>  v/c<br>  .080<br>  .024<br>  .089                                          | HCM<br>  Dela)<br>  3.0<br>  2.5<br>  3.0<br>  3.0<br>  2.5<br>  3.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | L<br>  S<br>  A<br>  A<br>  A<br>  A<br>  A                                                 | 903  <br>Que<br>25<br>25<br>25                                                                                | Hax;<br>uo ;<br>ft;<br>ft;<br>ft;                                                  |   |
| Lane<br>  Gro<br>SB App<br>======<br>  RT<br>  TH<br>  LT<br>NB App<br>======<br>  RT<br>  TH                                                                                                                                                                                                                                                                                  | up  <br>roact  | lidth/<br>Lanes<br>12/1<br>24/2<br>12/1<br>12/1<br>12/1                         | g<br>Reqd<br>.076<br>.025<br>.000<br>.168<br>.625                                         | /C<br>Used<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .801<br>  .617                                                   | ; Servi<br>; eC (v<br>; 919<br>; 2276<br>; 98<br>; 98<br>; 1245<br>; 1147                                                                                                                                                             | ce Rate<br>ph) EE<br>; 940<br>; 2276<br>; 120<br>; 1245<br>; 1161                                                                             | 4 Adj<br>Volume<br>75<br>55<br>11                                                         | v/c<br>.080<br>.024<br>.089                                                      | + HCM<br>+ Delay<br>- 2.9<br>- 3.0<br>- 3.0                                                                                                                                                                                                                                                                                                                                                                                                                                                       | L<br>  S<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A                     | 903<br>Que<br>25<br>25<br>25<br>25<br>25<br>34<br>34                                                          | Hax;<br>uo ;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;                                    |   |
| Lane<br>  Gro<br>SB App<br>======<br>  RT<br>  TH<br>  LT<br>NB App<br>======<br>  RT<br>  TH                                                                                                                                                                                                                                                                                  | up  <br>roact  | lidth/<br>Lanes<br>12/1<br>24/2<br>12/1<br>12/1<br>12/1                         | g<br>Reqd<br>.076<br>.025<br>.000<br>.168<br>.625                                         | /C<br>Used<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617                                                   | Servi<br>  eC (v<br>  919<br>  2276<br>  98<br>  1245<br>  1245<br>  1147<br>  924                                                                                                                                                    | ce Rate<br>ph) eE<br>940<br>2276<br>120<br>1245<br>1161<br>945                                                                                | e Adj<br>Volume<br>75<br>55<br>11<br>203<br>1163<br>9                                     | v/c<br>.080<br>.024<br>.089<br>.163<br>1.002<br>.010                             | + HCM<br>Delay<br>2.5<br>3.0<br>2.5<br>3.0<br>2.5<br>3.0<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | L<br>  S<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  T<br>  A                            | 903  <br>Que<br>25<br>25<br>25<br>25<br>25<br>34<br>34<br>375<br>25                                           | Hax;<br>u0  <br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;               |   |
| Lane<br>  Gro<br>SB App<br>======<br>  RT<br>  TH<br>  LT<br>NB App<br>======<br>  RT<br>  TH                                                                                                                                                                                                                                                                                  | up  <br>roact  | lidth/<br>Lanes<br>12/1<br>24/2<br>12/1<br>12/1<br>12/1                         | g<br>Reqd<br>.076<br>.025<br>.000<br>.168<br>.625                                         | /C<br>Used<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617                                                   | Servi<br>  eC (v<br>  919<br>  2276<br>  98<br>  1245<br>  1245<br>  1147<br>  924                                                                                                                                                    | ce Rate<br>ph) eE<br>940<br>2276<br>120<br>1245<br>1161<br>945                                                                                | 4 Adj<br>Volume<br>75<br>55<br>11                                                         | v/c<br>.080<br>.024<br>.089<br>.163<br>1.002<br>.010                             | + HCM<br>Delay<br>2.5<br>3.0<br>2.5<br>3.0<br>2.5<br>3.0<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5<br>2.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | L<br>  S<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  T<br>  A                            | 903  <br>Que<br>25<br>25<br>25<br>25<br>25<br>34<br>34<br>375<br>25                                           | Hax;<br>u0  <br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;               |   |
| Lane<br>Gro<br>SB App<br>SB App<br>RT<br>TH<br>LT<br>NB App<br>RT<br>TH<br>LT                                                                                                                                                                                                                                                                                                  | roaci          | lidth/<br>Lanes<br>12/1<br>24/2<br>12/1<br>12/1<br>12/1<br>12/1                 | g<br>Reqd<br>.076<br>.025<br>.000<br>.168<br>.625<br>.000                                 | /C<br>Used<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617<br>; .617                                                             | ; Servi<br>; eC (v<br>; 919<br>; 2276<br>; 98<br>; 1245<br>; 1147<br>; 924                                                                                                                                                            | ce Rate<br>ph) EE<br>  940<br>  2276<br>  120<br>  1245<br>  1161<br>  945                                                                    | Adj<br>Volume<br>75<br>55<br>11<br>203<br>1163<br>9                                       | <br>  v/c<br>  .080<br>  .024<br>  .089<br>  .163<br>  .102<br>  .010            | + HCM<br>+ Delay<br>2.5<br>3.6<br>2.5<br>3.6<br>2.5<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | L<br>  S<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A              | 903<br>Que<br>25<br>25<br>25<br>25<br>34<br>375<br>25                                                         | Hax;<br>ue  <br>ft;<br>ft;<br>ft;<br>ft;<br>ft;                                    |   |
| Lane<br>Gro<br>SB App<br>RT<br>RT<br>LT<br>HB App<br>RT<br>LT<br>HB App                                                                                                                                                                                                                                                                                                        | roaci          | lidth/<br>Lanes<br>12/1<br>24/2<br>12/1<br>12/1<br>12/1<br>12/1                 | g<br>Reqd<br>.076<br>.025<br>.000<br>.168<br>.625<br>.000                                 | /C<br>Used<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617                                                             | ; Servi<br>; eC (v<br>; 919<br>; 2276<br>; 98<br>; 1245<br>; 1147<br>; 924                                                                                                                                                            | ce Rate<br>ph) EE<br>; 940<br>; 2276<br>; 120<br>; 1245<br>; 1161<br>; 945                                                                    | 4 Adj<br>Volume<br>75<br>55<br>11<br>203<br>1163<br>9                                     | <br>  v/c<br>  .080<br>  .024<br>  .089<br>  .163<br>  1.002<br>  .010           | HCM<br>  Delay<br>  2.5<br>  3.6<br>  3. | L<br>  S<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A              | 903  <br>Que<br>25<br>25<br>25<br>25<br>25<br>25<br>34<br>34<br>375<br>25                                     | Hax;<br>ue  <br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;                             |   |
| Lane<br>Gro<br>SB App<br>RT<br>RT<br>LT<br>NB App<br>RT<br>TH<br>LT<br>HB App                                                                                                                                                                                                                                                                                                  | roach          | lidth/<br>Lanes<br>12/1<br>24/2<br>12/1<br>12/1<br>12/1<br>12/1<br>12/1         | g<br>Reqd<br>.076<br>.025<br>.000<br>.168<br>.625<br>.000                                 | /C<br>Used<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617                                         | ; Servi<br>; ec (v<br>919<br>; 2276<br>; 98<br>; 1245<br>; 1147<br>; 924                                                                                                                                                              | ce Rate<br>ph) EE<br>; 940<br>; 2276<br>; 120<br>; 1245<br>; 1161<br>; 945<br>; 487                                                           | 4 Adj<br>Volume<br>75<br>55<br>11<br>203<br>1163<br>9                                     | v/c<br>.080<br>.024<br>.024<br>.089                                              | HCM<br>  Dela)<br>  2.9<br>  3.0<br>  3. | L<br>  S<br>  S<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A       | 903  <br>Que<br>25<br>25<br>25<br>25<br>34<br>375<br>25<br>25                                                 | Hax;<br>u0  <br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;                      |   |
| Lane           Lane           Gro           SB App           I TH           TH           H App           I TH           I TH           I TH           I TH           I TH           I TH           WB App           I TH           I TH | roaci          | lidth/<br>Lanes<br>12/1<br>24/2<br>12/1<br>12/1<br>12/1<br>12/1<br>12/1<br>12/1 | g<br>Reqd<br>.076<br>.025<br>.000<br>.168<br>.625<br>.000<br>.318<br>.182<br>.182<br>.165 | /C<br>Used<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .316<br>  .316<br>  .316<br>  .151           | ; Servi<br>; ec (v<br>; ec (v<br>; 919<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 924<br>; 1245<br>; 1147<br>; 924<br>; 432<br>; 532<br>; 532<br>; 532<br>; 532 | ce Rate<br>ph) EE<br>  940<br>  2276<br>  120<br>  1245<br>  1161<br>  945<br>  487<br>  589<br>  391                                         | Adj<br>Volume<br>Volume<br>155<br>11<br>203<br>1163<br>9<br>163<br>9<br>434<br>277<br>368 | <pre></pre>                                                                      | HCM<br>  Dela)<br>  3.0<br>  2.5<br>  3.0<br>  2.5<br>  3.0<br>  2.5<br>  28.1<br>  2.5<br>  28.1<br>  2.5<br>  21.1<br>  11.1<br>  34.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | L<br>  S<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A              | 903  <br>Que<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25                    | Hax;<br>ue ;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft  |   |
| Lane           Lane           Gro           SB App           I TH           TH           H App           I TH           I TH           I TH           I TH           I TH           I TH           WB App           I TH           I TH | roaci          | lidth/<br>Lanes<br>12/1<br>24/2<br>12/1<br>12/1<br>12/1<br>12/1<br>12/1<br>12/1 | g<br>Reqd<br>.076<br>.025<br>.000<br>.168<br>.625<br>.000<br>.318<br>.182<br>.182<br>.165 | /C<br>Used<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .316<br>  .316<br>  .316<br>  .151           | ; Servi<br>; ec (v<br>; ec (v<br>; 919<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 924<br>; 1245<br>; 1147<br>; 924<br>; 432<br>; 532<br>; 532<br>; 532<br>; 532 | ce Rate<br>ph) EE<br>  940<br>  2276<br>  120<br>  1245<br>  1161<br>  945<br>  487<br>  589<br>  391                                         | 4 Adj<br>Volume<br>75<br>55<br>11<br>203<br>1163<br>9                                     | <pre></pre>                                                                      | HCM<br>  Dela)<br>  3.0<br>  2.5<br>  3.0<br>  2.5<br>  3.0<br>  2.5<br>  28.1<br>  2.5<br>  28.1<br>  2.5<br>  21.1<br>  11.1<br>  34.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | L<br>  S<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A              | 903  <br>Que<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25                    | Hax;<br>ue ;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft  |   |
| Lane<br>Gro<br>SB App<br>RT<br>TH<br>LT<br>NB App<br>RT<br>TH<br>LT<br>WB App<br>RT<br>RT<br>TH<br>LT                                                                                                                                                                                                                                                                          | roach          | lidth/<br>Lanes<br>12/1<br>24/2<br>12/1<br>12/1<br>12/1<br>12/1<br>12/1<br>12/1 | g<br>Reqd<br>.076<br>.025<br>.000<br>.168<br>.625<br>.000<br>.318<br>.182<br>.182<br>.165 | /C<br>Used<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .316<br>  .316<br>  .316<br>  .151           | ; Servi<br>; ec (v<br>; ec (v<br>; 919<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 2276<br>; 98<br>; 924<br>; 1245<br>; 1147<br>; 924<br>; 432<br>; 532<br>; 532<br>; 532<br>; 532 | ce Rate<br>ph) EE<br>  940<br>  2276<br>  120<br>  1245<br>  1161<br>  945<br>  487<br>  589<br>  391                                         | Adj<br>Volume<br>Volume<br>155<br>11<br>203<br>1163<br>9<br>163<br>9<br>434<br>277<br>368 | <pre></pre>                                                                      | HCH<br>  Delay<br>  2.5<br>  3.0<br>  2.5<br>  3.0<br>  2.5<br>  3.0<br>  28.1<br>  28.1<br>  28.1<br>  28.1<br>  28.1<br>  11.1<br>  34.5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | L<br>  S<br>  S<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A<br>  A       | 903  <br>Que<br>25<br>25<br>25<br>25<br>25<br>34<br>375<br>25<br>25<br>25<br>125<br>125<br>160<br>160<br>1212 | Hax;<br>ue ;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft  |   |
| Lane<br>Gro<br>SB App<br>RT<br>RT<br>LT<br>NB App<br>LT<br>RT<br>LT<br>HB App<br>RT<br>LT<br>LT<br>EB App                                                                                                                                                                                                                                                                      |                | lidth/<br>Lanes<br>12/1<br>24/2<br>12/1<br>12/1<br>12/1<br>12/1<br>12/1<br>12/1 | g<br>Reqd<br>.076<br>.025<br>.000<br>.168<br>.625<br>.000<br>.318<br>.182<br>.182<br>.165 | /C<br>Used<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617<br>: .617<br>: .316<br>: .316<br>: .316<br>: .151 | <pre>     Servi     ec (v         919         2276         98         1245         1147         924         432         532         342 </pre>                                                                                        | ce Rate<br>ph) eE<br>; 940<br>; 2276<br>; 120<br>; 1245<br>; 1161<br>; 945<br>; 1161<br>; 945<br>; 391                                        | 4 Adj<br>Volume<br>75<br>55<br>11<br>203<br>1163<br>9<br>9                                | v/c<br>.080<br>.024<br>.089<br>.024<br>.089<br>.010<br>.010                      | <pre>     HCM     Delay     2.5     3.6     23.5     23.5     23.5     23.5     23.5     23.5     23.5     24.5     24.5     11.     34.6     31.5 </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A | 903<br>Que<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25                      | Hax;<br>u0  <br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;        |   |
| Lane<br>Gro<br>SB App<br>RT<br>RT<br>LT<br>NB App<br>RT<br>TH<br>LT<br>KB App<br>EB App<br>EB App                                                                                                                                                                                                                                                                              | proact         | iidth/<br>Lanes<br>12/1<br>24/2<br>12/1<br>12/1<br>12/1<br>12/1<br>12/1<br>12/1 | g<br>Reqd<br>.076<br>.025<br>.000<br>.168<br>.625<br>.000<br>.318<br>.182<br>.165         | /C<br>Used<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .151<br>  .316<br>  .151           | <pre>Servi<br/>ec (v)<br/>919<br/>2276<br/>98<br/>2276<br/>98<br/>1245<br/>1147<br/>924<br/>432<br/>532<br/>532<br/>532<br/>532<br/>532<br/>532<br/>532<br/>532<br/>532<br/>5</pre>                                                   | ce Rate<br>ph) eE<br>  940<br>  2276<br>  120<br>  1245<br>  1161<br>  945<br>  1161<br>  945<br>  391<br>  391<br>  391<br>  391             | Adj<br>Volume<br>75<br>55<br>11<br>203<br>1163<br>9<br>9<br>434<br>277<br>368             | <pre>.080 .024 .089 .024 .089 .024 .089 .010 .010 .010 .891 .470 .941 .074</pre> | <pre>     HCM     Delay     2.5     3.6     23.5     23.5     23.5     23.5     23.5     23.5     23.5     23.5     24.5     24.5     24.5     11.     34.6     31.5     14.5 </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A | 903<br>Que<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25                      | Hax;<br>u0  <br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft; |   |
| Lane<br>Gro<br>SB App<br>RT<br>RT<br>LT<br>NB App<br>RT<br>TH<br>LT<br>KB App<br>EB App<br>EB App                                                                                                                                                                                                                                                                              |                | lidth/<br>Lanes<br>12/1<br>24/2<br>12/1<br>12/1<br>12/1<br>12/1<br>12/1<br>12/1 | g<br>Reqd<br>.076<br>.025<br>.000<br>.168<br>.625<br>.000<br>.318<br>.182<br>.165<br>.165 | /C<br>Used<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .617<br>  .151<br>  .132<br>  .132<br>  .132 | <pre>     Servi     ec (v         919         2276         98         1245         1147         924         432         532         342         532         150         188 </pre>                                                    | ce Rate<br>ph) eE<br>940<br>2276<br>120<br>12276<br>120<br>1245<br>1161<br>945<br>1161<br>945<br>1161<br>1945<br>1161<br>1945<br>1161<br>1945 | 4 Adj<br>Volume<br>75<br>55<br>11<br>203<br>1163<br>9<br>9                                | v/c<br>.080<br>.024<br>.089<br>.024<br>.089<br>.010<br>.010<br>.010<br>.010      | <pre>     HCM     Delay     2.5     3.6     2.5     3.6     23.6     23.6     23.6     23.6     23.6     23.6     23.6     23.6     23.6     23.6     23.6     23.6     23.6     23.6     23.6     23.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.6     3.</pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A<br>A | 903<br>Que<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25<br>25                      | Hax;<br>tax;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft;<br>ft                |   |

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### SIGNAL94/TEAPAC(VI L1.2) - Summary of Parameter Values

Intersection Parameters for Int # 2 - PUKALANI BYPASS & MAKAWAD AV

METROAREANONCBDLOSTTINE2.0LEVELOFSERVICECNODELOCATION0

Approach Parameters

| APPLABELS       | SB   | WB   | พอ   | EB   |
|-----------------|------|------|------|------|
| GRADES          | 2.0  | .0   | -2.0 | .0   |
| PEDLEVELS       | LOW  | LOW  | LOW  | LOW  |
| PARKINGSIDES    | NONE | NONE | NONE | NONE |
| PARKVOLUMES     | 20   | 20   | 20   | 20   |
| BUSVOLUNES      | 0    | 0    | 0    | 0    |
| RIGHTTURNONREDS | 5    | 10   | 30   | 5    |

Novement Parameters

| MOVLABELS       | RT   | TH   | LT   | RT   | TH   | LT   | RT   | TH   | LT   | RT   | TH   | LT   |
|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|
| VOLUMES         | 67   | 587  | 362  | 115  | 307  | 196  | 281  | 340  | 9    | 16   | 258  | 12   |
| WIDTHS          | 12.0 | 24.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 | 12.0 |
| LANES           | 1    | 2    | 1    | 1    | 1    | 1    | · 1  | 1    | 1    | 1    | 1    | 1    |
| UTILIZATIONS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| TRUCKPERCENTS   | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  | 2.0  |
| PEAKHOURFACTORS | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  | .95  |
| ARRIVALTYPES    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    | 3    |
| ACTUATIONS      | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  | YES  |
| REQCLEARANCES   | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  | 4.0  |
| MINIMUMS        | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  | 5.0  |
| IDEALSATFLOWS   | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| FACTORS         | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| DELAYFACTORS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| NSTOPFACTORS    | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| GROUPTYPES      | NORM | HORM | NORM | NORH | NORM | NORM | NORM | HROK | HORM | NORM | KORM | NORM |
| SATURATIONFLOWS | 1524 | 3688 | 1752 | 1539 | 1863 | 1770 | 1554 | 1881 | 1787 | 1539 | 1863 | 684  |

Phasing Parameters

| SEQUENCES   | 42    | ALL   |      |       |          |      |      |  |
|-------------|-------|-------|------|-------|----------|------|------|--|
| PERMISSIVES | YES   | YES   | YES  | YES   | LEADLAGS | NONE | NONE |  |
| OVERLAPS    | YES   | YES   | YES  | YES   | OFFSET   | .00  | ì    |  |
| CYCLES      | 60    | 120   | 10   |       | PEDTINE  | .0   | 0    |  |
| GREENTIMES  | 10.69 | 14.91 | 6.82 | 11.58 |          |      |      |  |
| YELLOWTIMES | 4.00  | 4.00  | 4.00 | 4.00  |          |      |      |  |
| CRITICALS   | 3     | 8     | 6    | 11    |          |      |      |  |
| EXCESS      | 0     |       |      |       |          |      |      |  |
|             |       |       |      |       |          |      |      |  |

| EAR 2                                                                                                | RESIDENT LOTS<br>2005 + Projec<br>Ak Hour                                                                                                                                                  |                                                                                                                              |                                                                                                |                                                                                                         |                                                                                               |                                                                            |                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                 |                                                                                                                             |                                                                                                                                                                                                                     |                                                                                                  | /27/9<br>:49:5                                                                      |
|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| IGNAL                                                                                                | .94/TEAPAC(VI                                                                                                                                                                              | L1.2]                                                                                                                        | - Capa                                                                                         | icity A                                                                                                 | nalys                                                                                         | is Su                                                                      | Jenar                                                             | у                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                 |                                                                                                                             |                                                                                                                                                                                                                     |                                                                                                  |                                                                                     |
|                                                                                                      | section Avera<br>Degree of Sa                                                                                                                                                              |                                                                                                                              |                                                                                                |                                                                                                         |                                                                                               |                                                                            |                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                 |                                                                                                                             |                                                                                                                                                                                                                     | Ser                                                                                              | vice                                                                                |
| -                                                                                                    | ¦ Phase 1                                                                                                                                                                                  |                                                                                                                              | se 2                                                                                           | Phase                                                                                                   | e 3                                                                                           | ; Pi                                                                       | hase                                                              | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                 |                                                                                                                             |                                                                                                                                                                                                                     |                                                                                                  |                                                                                     |
| •                                                                                                    | : : · ·                                                                                                                                                                                    | ! + + +                                                                                                                      | • •                                                                                            |                                                                                                         | •                                                                                             | !                                                                          | -                                                                 | ł                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                 |                                                                                                                             |                                                                                                                                                                                                                     |                                                                                                  |                                                                                     |
| •                                                                                                    | * ++++<br>*>                                                                                                                                                                               | ++++                                                                                                                         |                                                                                                |                                                                                                         | ++++                                                                                          | i<br>i                                                                     | ŧ                                                                 | +++;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                 |                                                                                                                             |                                                                                                                                                                                                                     |                                                                                                  |                                                                                     |
| / <u> </u> \                                                                                         | *>                                                                                                                                                                                         | <pre></pre>                                                                                                                  | <b>`</b>                                                                                       |                                                                                                         | <b>(++++</b>                                                                                  | !                                                                          |                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                 |                                                                                                                             |                                                                                                                                                                                                                     |                                                                                                  |                                                                                     |
| i.                                                                                                   | i                                                                                                                                                                                          | V                                                                                                                            | -                                                                                              |                                                                                                         | ****<br>V                                                                                     | •                                                                          | • +                                                               | •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                 |                                                                                                                             |                                                                                                                                                                                                                     |                                                                                                  |                                                                                     |
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| Gro<br>App<br>RT<br>TH                                                                               | up ¦ Lanes;<br>roach<br>  12/1  <br>  24/2                                                                                                                                                 | Reqd<br>                                                                                                                     | Used  <br>                                                                                     | ec (vr<br>372  <br>977                                                                                  | oh) en<br>429<br>1039                                                                         | E ¦Vo<br><br>7 ¦<br>7 ¦                                                    | 65<br>618                                                         | .152<br>.595                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | c    <br><br>2  <br>5                                                                                                                           | 12.2<br>12.2<br>10.5<br>12.7                                                                                                | S<br>  B<br>  B                                                                                                                                                                                                     | Q(                                                                                               | eue<br><br>9 ft<br>7 ft                                                             |
| Gro<br>App<br>RT                                                                                     | up   Lanes <br>roach<br>  12/1  <br>  24/2                                                                                                                                                 | Reqd<br>                                                                                                                     | Used  <br>                                                                                     | ec (vr<br>372  <br>977                                                                                  | oh) en<br>429<br>1039                                                                         | E ¦Vo<br><br>7 ¦<br>7 ¦                                                    | 65<br>618                                                         | .152<br>.595                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | c    <br><br>2  <br>5                                                                                                                           | 12.2<br>12.2<br>10.5<br>12.7                                                                                                | S<br>  B<br>  B                                                                                                                                                                                                     | Q(                                                                                               | eue<br><br>9 ft<br>7 ft                                                             |
| Gro<br>App<br>RT<br>TH<br>LT                                                                         | up ¦ Lanes;<br>roach<br>  12/1  <br>  24/2  <br>  12/1                                                                                                                                     | Reqd<br>                                                                                                                     | Used  <br>                                                                                     | ec (vr<br>372  <br>977                                                                                  | oh) en<br>429<br>1039                                                                         | E ¦Vo<br><br>7 ¦<br>7 ¦                                                    | 65<br>618                                                         | .152<br>.595                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | c    <br><br>2  <br>5                                                                                                                           | 12.2<br>10.5<br>12.7<br>11.8                                                                                                | 8<br>8<br>8<br>8<br>8                                                                                                                                                                                               | Q(                                                                                               | eue<br><br>9 ft<br>7 ft                                                             |
| Gro<br>App<br>RT<br>TH<br>LT                                                                         | up ¦ Lanes;<br>roach<br>  12/1  <br>  24/2                                                                                                                                                 | Reqd<br>.069 ;<br>.188 ;<br>.168 ;                                                                                           | Used  <br>.282  <br>.282  <br>.211                                                             | eC (vp<br>372  <br>977  <br>456                                                                         | 429<br>1039<br>493                                                                            | E   Va                                                                     | 65<br>618<br>381                                                  | .152<br>.595<br>.773                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                 | 12.2<br>10.5<br>12.7<br>11.8                                                                                                | ₿<br>₿<br>₿<br>₿<br>₿<br>₿<br>₿<br>₿<br>₿<br>₿<br>₿<br>₿<br>₿<br>₿<br>₿<br>₿<br>₿<br>₿<br>₿                                                                                                                         |                                                                                                  | eue<br>9 ft<br>7 ft<br>2 ft                                                         |
| Gro<br>RT<br>TH<br>LT                                                                                | up   Lanes <br>roach<br>  12/1  <br>  24/2  <br>  12/1  <br>  12/1  <br>roach                                                                                                              | Reqd<br>.069 ;<br>.188 ;<br>.168 ;                                                                                           | Used  <br>.282  <br>.282  <br>.211                                                             | eC (vp<br>372  <br>977  <br>456                                                                         | 425<br>1035<br>493                                                                            | E   Va                                                                     | 65<br>618<br>381                                                  | , v/d<br>.152<br>.595<br>.773                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                 | 12.2<br>10.5<br>12.7<br>11.8                                                                                                | ₿<br>8<br>8<br>8<br>1<br>8<br>1<br>8<br>1<br>8                                                                                                                                                                      |                                                                                                  | e====<br>9 ft<br>7 ft<br>2 ft                                                       |
| Gro<br>App<br>RT<br>TH<br>LT<br>App<br>RT                                                            | up   Lanes <br>roach<br>  12/1  <br>  24/2  <br>  12/1  <br>roach<br>  12/1  <br>  12/1                                                                                                    | Reqd<br>.069 ;<br>.188 ;<br>.168 ;<br>.207 ;<br>.224 ;                                                                       | Used  <br>.282  <br>.282  <br>.211  <br>.462  <br>.282                                         | eC (vp<br>372<br>977<br>456<br>677<br>471                                                               | 25<br>425<br>1035<br>493<br>718<br>530                                                        | E   ¥0                                                                     | 65<br>618<br>381<br>264<br>358                                    | , 152<br>, 152<br>, 595<br>, 773<br>, 773                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                 | 12.2<br>10.5<br>12.7<br>11.8<br>11.3<br>6.9<br>14.7                                                                         | ¦ S<br>8<br>¦ 8<br>¦ 8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>                                                                                                                                                | Qu<br>  12<br>  12<br>  12<br>  12<br>  12<br>  21                                               | 19 ft<br>7 ft<br>2 ft<br>0 ft<br>7 ft                                               |
| Gro<br>App<br>RT<br>TH<br>LT                                                                         | up   Lanes <br>roach<br>  12/1  <br>  24/2  <br>  12/1  <br>  12/1  <br>  12/1                                                                                                             | Reqd<br>.069 ;<br>.188 ;<br>.168 ;<br>.207 ;<br>.224 ;                                                                       | Used  <br>.282  <br>.282  <br>.211  <br>.462  <br>.282                                         | eC (vp<br>372<br>977<br>456<br>677<br>471                                                               | 25<br>425<br>1035<br>493<br>718<br>530                                                        | E   ¥0                                                                     | 65<br>618<br>381<br>264<br>358                                    | , 152<br>, 152<br>, 595<br>, 773<br>, 773                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                 | 12.2<br>10.5<br>12.7<br>11.8<br>11.3<br>6.9<br>14.7                                                                         | ¦ S<br>8<br>¦ 8<br>¦ 8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>                                                                                                                                                | Qu<br>  12<br>  12<br>  12<br>  12<br>  12<br>  21                                               | 19 ft<br>7 ft<br>2 ft<br>0 ft<br>7 ft                                               |
| Gro<br>App<br>RT<br>TH<br>LT<br>App<br>RT<br>TH                                                      | up   Lanes <br>roach<br>  12/1  <br>  24/2  <br>  12/1  <br>roach<br>  12/1  <br>  12/1                                                                                                    | Reqd<br>.069 ;<br>.188 ;<br>.168 ;<br>.207 ;<br>.224 ;                                                                       | Used  <br>.282  <br>.282  <br>.211  <br>.462  <br>.282                                         | eC (vp<br>372<br>977<br>456<br>677<br>471                                                               | 25<br>425<br>1035<br>493<br>718<br>530                                                        | E   ¥0                                                                     | 65<br>618<br>381<br>264<br>358                                    | , 152<br>, 152<br>, 595<br>, 773<br>, 773                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                 | 12.2<br>10.5<br>12.7<br>11.8<br>11.3<br>6.9<br>14.7                                                                         | ¦ S<br>8<br>¦ 8<br>¦ 8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>                                                                                                                                                | Qu<br>  12<br>  12<br>  12<br>  12<br>  12<br>  21                                               | 19 ft<br>7 ft<br>2 ft<br>0 ft<br>7 ft                                               |
| Gro<br>App<br>RT<br>TH<br>LT<br>B App<br>RT<br>TH<br>LT                                              | up ¦ Lanes;<br>roach<br>  12/1  <br>  24/2  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1                                                                                                 | Reqd<br>.069 ;<br>.188 ;<br>.168 ;<br>.207 ;<br>.224 ;                                                                       | Used  <br>.282  <br>.282  <br>.211  <br>.462  <br>.282                                         | eC (vp<br>372<br>977<br>456<br>677<br>471                                                               | 25<br>425<br>1035<br>493<br>718<br>530                                                        | E   ¥0                                                                     | 65<br>618<br>381<br>264<br>358                                    | , 152<br>, 152<br>, 595<br>, 773<br>, 773                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                 | 12.2<br>10.5<br>12.7<br>11.8<br>11.3<br>6.9<br>14.7<br>4.8                                                                  | ; S<br>8<br>; 8<br>; 8<br>; 8<br>; 8<br>; 8<br>; 8<br>; 8<br>; 8<br>; 8<br>;                                                                                                                                        | Qu<br>  12<br>  12<br>  12<br>  21<br>  2                                                        | 19 ft<br>7 ft<br>2 ft<br>0 ft<br>7 ft                                               |
| Gro<br>Gro<br>RT<br>RT<br>H<br>LT<br>S<br>App.<br>RT<br>TH<br>LT                                     | up ¦ Lanes;<br>roach<br>  12/1  <br>  24/2  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1                                                                                                 | Reqd<br>.069 ;<br>.188 ;<br>.168 ;<br>.207 ;<br>.224 ;<br>.000 ;                                                             | Used  <br>.282  <br>.282  <br>.211  <br>.211  <br>.282  <br>.282  <br>.282  <br>.282  <br>.211 | eC (vp<br>372  <br>977  <br>456  <br>677  <br>471  <br>467                                              | bh) ef<br>425<br>1035<br>493<br>493<br>530<br>503                                             | E   Va<br>7  <br>7  <br>7  <br>7  <br>7  <br>7  <br>7  <br>7  <br>7  <br>7 | 65<br>618<br>381<br>264<br>358<br>9                               | .152<br>.595<br>.773<br>.368<br>.675                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | C    <br>2  <br>5  <br>3  <br>8  <br>5  <br>3                                                                                                   | 12.2<br>10.5<br>12.7<br>11.8<br>11.3<br>6.9<br>14.7<br>4.8<br>7.7                                                           | ; S<br>8<br>; 8<br>; 8<br>; 8<br>; 8<br>; 8<br>; 8<br>; 8<br>; 8<br>; 8<br>;                                                                                                                                        | Qu<br>  12<br>  12<br>  12<br>  12<br>  21<br>  2                                                | 9 ft<br>9 ft<br>2 ft<br>0 ft<br>7 ft<br>5 ft                                        |
| Gro<br>Gro<br>RT<br>TH<br>LT<br>B App<br>RT<br>TH<br>LT<br>S App<br>RT<br>TH<br>LT<br>RT<br>RT<br>RT | up   Lanes <br>roach<br>  12/1  <br>  24/2  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>roach<br>  12/1                                                                            | Reqd<br>.069 ;<br>.188 ;<br>.168 ;<br>.207 ;<br>.224 ;<br>.000 ;<br>.104 ;                                                   | Used  <br>                                                                                     | eC (vp<br>372  <br>977  <br>456  <br>677  <br>471  <br>467  <br>987                                     | bh) ef<br>429<br>1035<br>493<br>718<br>530<br>503                                             | E   Wo                                                                     | 264<br>358<br>9                                                   | , v/d<br>, 157<br>, 595<br>, 773<br>, 773<br>, 368<br>, 679<br>, 018                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | C    <br>2  <br>5  <br>3  <br>5  <br>3  <br>5  <br>3  <br>5  <br>3  <br>1                                                                       | 12.2<br>10.5<br>12.7<br>11.8<br>11.3<br>6.9<br>14.7<br>4.8<br>7.7<br>2.5                                                    | S<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8                                                                                                                                             | Qu<br>  12<br>  12<br>  12<br>  12<br>  21<br>  2<br>  2<br>  2<br>  3                           | eue<br>9 ft<br>7 ft<br>2 ft<br>0 ft<br>7 ft<br>5 ft<br><br>3 ft                     |
| Gro<br>Gro<br>RT<br>TH<br>LT<br>B App<br>RT<br>TH<br>LT<br>B App<br>RT<br>TH<br>TH                   | up   Lanes <br>roach<br>  12/1  <br>  24/2  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1                                                 | Reqd<br>.069 ;<br>.188 ;<br>.168 ;<br>.207 ;<br>.224 ;<br>.000 ;<br>.104 ;<br>.207 ;                                         | Used  <br>                                                                                     | eC (vp<br>372  <br>977  <br>456  <br>677  <br>471  <br>467  <br>987  <br>712                            | sh) ef<br>429<br>1035<br>1035<br>493<br>503<br>503<br>1003<br>758                             |                                                                            | 01ume<br>65<br>618<br>381<br>264<br>358<br>9<br>                  | , v/d<br>, 157<br>, 595<br>, 773<br>, 774<br>, 775<br>, 775  | C    <br>2  <br>5  <br>3  <br>8  <br>5  <br>3  <br>1  <br>5  <br>1  <br>5  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1 | 12.2<br>10.5<br>12.7<br>11.8<br>11.3<br>6.9<br>14.7<br>4.8<br>7.7<br>2.5<br>8.5                                             | ; S<br>B<br>; B<br>; B<br>; B<br>; B<br>; B<br>; B<br>; B<br>; A<br>; A<br>; B<br>; B<br>; A<br>; B<br>; A<br>; B<br>; A<br>; B<br>; A                                                                              | Qu<br>  12<br>  12<br>  12<br>  21<br>  2<br>  2<br>  3<br>  16                                  | eeue<br>9 ft<br>7 ft<br>2 ft<br>0 ft<br>5 ft<br><br>3 ft<br>2 ft                    |
| Gro<br>B App<br>RT<br>TH<br>LT<br>B App<br>RT<br>TH<br>LT<br>TH<br>LT<br>RT<br>RT<br>RT              | up   Lanes <br>roach<br>  12/1  <br>  24/2  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1                                                 | Reqd<br>.069 ;<br>.188 ;<br>.168 ;<br>.207 ;<br>.224 ;<br>.000 ;<br>.104 ;<br>.207 ;                                         | Used  <br>                                                                                     | eC (vp<br>372  <br>977  <br>456  <br>677  <br>471  <br>467  <br>987  <br>712                            | sh) ef<br>429<br>1035<br>1035<br>493<br>503<br>503<br>1003<br>758                             |                                                                            | 01ume<br>65<br>618<br>381<br>264<br>358<br>9<br>                  | , v/d<br>, 157<br>, 595<br>, 773<br>, 774<br>, 775<br>, 775  | C    <br>2  <br>5  <br>3  <br>8  <br>5  <br>3  <br>1  <br>5  <br>1  <br>5  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1 | 12.2<br>10.5<br>12.7<br>11.8<br>11.3<br>6.9<br>14.7<br>4.8<br>7.7<br>2.5<br>8.5                                             | ; S<br>B<br>; B<br>; B<br>; B<br>; B<br>; B<br>; B<br>; B<br>; A<br>; A<br>; B<br>; B<br>; A<br>; B<br>; A<br>; B<br>; A<br>; B<br>; A                                                                              | Qu<br>  12<br>  12<br>  12<br>  21<br>  2<br>  2<br>  3<br>  16                                  | eue<br>9 ft<br>7 ft<br>2 ft<br>0 ft<br>7 ft<br>5 ft<br><br>3 ft                     |
| Gro<br>B App<br>RT<br>TH<br>LT<br>B App<br>RT<br>TH<br>LT<br>B App<br>RT<br>TH<br>TH                 | up   Lanes <br>roach<br>  12/1  <br>  24/2  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1                                                 | Reqd<br>.069 ;<br>.188 ;<br>.168 ;<br>.207 ;<br>.224 ;<br>.000 ;<br>.104 ;<br>.207 ;                                         | Used  <br>                                                                                     | eC (vp<br>372  <br>977  <br>456  <br>677  <br>471  <br>467  <br>987  <br>712                            | sh) ef<br>429<br>1035<br>1035<br>493<br>503<br>503<br>1003<br>758                             |                                                                            | 01ume<br>65<br>618<br>381<br>264<br>358<br>9<br>                  | , v/d<br>, 157<br>, 595<br>, 773<br>, 774<br>, 775<br>, 775  | C    <br>2  <br>5  <br>3  <br>8  <br>5  <br>3  <br>1  <br>5  <br>1  <br>5  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1 | 12.2<br>10.5<br>12.7<br>11.8<br>11.3<br>6.9<br>14.7<br>4.8<br>7.7<br>2.5<br>8.5                                             | ; S<br>B<br>; B<br>; B<br>; B<br>; B<br>; B<br>; B<br>; B<br>; A<br>; A<br>; B<br>; B<br>; A<br>; B<br>; A<br>; B<br>; A<br>; B<br>; A                                                                              | Qu<br>  12<br>  12<br>  12<br>  21<br>  2<br>  2<br>  3<br>  16                                  | eeue<br>9 ft<br>7 ft<br>2 ft<br>0 ft<br>5 ft<br><br>3 ft<br>2 ft                    |
| Gro<br>Gro<br>RT<br>TH<br>LT<br>B App<br>RT<br>TH<br>LT<br>S App<br>RT<br>TH<br>LT                   | up   Lanes <br>roach<br>  12/1  <br>  24/2  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1                                     | Reqd<br>.069 ;<br>.188 ;<br>.168 ;<br>.207 ;<br>.224 ;<br>.000 ;<br>.104 ;<br>.207 ;                                         | Used  <br>                                                                                     | eC (vp<br>372  <br>977  <br>456  <br>677  <br>471  <br>467  <br>987  <br>712                            | sh) ef<br>429<br>1035<br>1035<br>493<br>503<br>503<br>1003<br>758                             |                                                                            | 01ume<br>65<br>618<br>381<br>264<br>358<br>9<br>                  | , v/d<br>, 157<br>, 595<br>, 773<br>, 774<br>, 775<br>, 775  | C    <br>2  <br>5  <br>3  <br>8  <br>5  <br>3  <br>1  <br>5  <br>1  <br>5  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1  <br>1 | 12.2<br>10.5<br>12.7<br>11.8<br>11.3<br>6.9<br>14.7<br>4.8<br>7.7<br>2.5<br>8.5                                             | ; S<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8<br>8                                                                                                                  | Qu<br>  12<br>  15<br>  12<br>  12<br>  21<br>  22<br>  21<br>  2<br>  16<br>  10                | eeue<br>9 ft<br>7 ft<br>2 ft<br>0 ft<br>5 ft<br><br>3 ft<br>2 ft                    |
| Gro<br>App<br>RT<br>TH<br>LT<br>B App<br>RT<br>TH<br>LT<br>S App<br>RT<br>TH<br>LT                   | up   Lanes <br>roach<br>  12/1  <br>  24/2  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1 | Reqd<br>.069 ;<br>.188 ;<br>.168 ;<br>.207 ;<br>.224 ;<br>.000 ;<br>.104 ;<br>.207 ;<br>.070 ;                               | Used  <br>                                                                                     | eC (vp<br>372  <br>977  <br>456  <br>677  <br>471  <br>467  <br>712  <br>344                            | sh) ef<br>429<br>1035<br>1035<br>493<br>718<br>530<br>503<br>1003<br>758<br>384               |                                                                            | 01ume<br>65<br>618<br>381<br>264<br>358<br>9<br>111<br>323<br>206 | , 157<br>, 595<br>, 773<br>, 774<br>, 774<br>, 775<br>, 775  | C    <br>2  <br>5  <br>3  <br>6  <br>6  <br>6  <br>6  <br>6  <br>7  <br>7  <br>7  <br>7  <br>7  <br>7  <br>7  <br>7                             | 12.2<br>10.5<br>12.7<br>11.8<br>11.3<br>6.9<br>14.7<br>4.8<br>7.7<br>2.5<br>8.5<br>9.4<br>15.3                              | + S<br>B<br>+ B<br>+ B<br>+ B<br>+ B<br>+ A<br>- B<br>+ A<br>- B<br>+ B<br>+ A<br>- B<br>+ B<br>+ A<br>- B<br>+ B<br>- C<br>+ B<br>- C<br>+ B<br>- C<br>+ B<br>- C<br>- C<br>- C<br>- C<br>- C<br>- C<br>- C<br>- C | Qu<br>  12<br>  12<br>  12<br>  12<br>  21<br>  2<br>  2<br>  3<br>  16<br>  10                  | eue<br>9 ft<br>7 ft<br>2 ft<br>0 ft<br>5 ft<br>3 ft<br>2 ft<br>3 ft<br>2 ft         |
| Gro<br>B App<br>RT<br>TH<br>LT<br>B App<br>RT<br>TH<br>LT<br>RT<br>RT<br>RT<br>RT<br>RT              | up   Lanes <br>roach<br>  12/1  <br>  24/2  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1                         | Reqd<br>.069 ;<br>.188 ;<br>.168 ;<br>.207 ;<br>.224 ;<br>.000 ;<br>.104 ;<br>.207 ;<br>.070 ;<br>.018 ;                     | Used  <br>                                                                                     | eC (vp<br>372  <br>977  <br>456  <br>677  <br>471  <br>467  <br>712  <br>344  <br>685                   | sh) ef<br>425<br>1035<br>493<br>493<br>493<br>503<br>503<br>1003<br>758<br>384<br>725         |                                                                            | 1111 323<br>206<br>122                                            | , v/d<br>, 157<br>, 599<br>, 773<br>, 774<br>, 774<br>, 775<br>, 7755<br>, 7755<br>, 775<br>, 775<br>, 775<br>, 775<br>, 775<br>, 775<br>, 775<br>, 775<br>, 77 | C    <br>2  <br>5  <br>5  <br>6  <br>6  <br>6  <br>7                                                                                            | 12.2<br>10.5<br>12.7<br>11.8<br>11.3<br>6.9<br>14.7<br>4.8<br>7.7<br>4.8<br>7.7<br>2.5<br>8.5<br>9.4<br>15.3<br>5.5         | + S<br>B<br>+ B<br>+ B<br>+ B<br>+ B<br>+ B<br>+ A<br>+ B<br>+ A<br>+ B<br>+ B<br>+ A<br>+ B<br>+ B<br>+ B<br>+ B<br>+ B<br>+ B<br>+ B<br>+ B                                                                       | ; Qu<br>; 12<br>; 12<br>; 12<br>; 12<br>; 21<br>; 2<br>; 2<br>; 3<br>; 16<br>; 10<br>; 10<br>; 2 | eue<br>9 ft<br>7 ft<br>2 ft<br>0 ft<br>5 ft<br>3 ft<br>2 ft<br>5 ft<br>5 ft         |
| Gro<br>Gro<br>RT<br>TH<br>LT<br>B App<br>RT<br>TH<br>LT<br>S App<br>RT<br>TH<br>LT<br>S App          | up   Lanes <br>roach<br>  12/1  <br>  24/2  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1  <br>  12/1             | Reqd<br>.069 ;<br>.188 ;<br>.168 ;<br>.168 ;<br>.227 ;<br>.224 ;<br>.000 ;<br>.104 ;<br>.207 ;<br>.070 ;<br>.018 ;<br>.180 ; | Used  <br>                                                                                     | eC (vy<br>372  <br>977  <br>456  <br>456  <br>471  <br>467  <br>712  <br>344  <br>344  <br>685  <br>360 | bh) ef<br>425<br>1035<br>1035<br>493<br>718<br>530<br>503<br>1003<br>758<br>384<br>725<br>422 |                                                                            | 1111<br>122<br>1111<br>122<br>121<br>122<br>122<br>12             | , 157<br>.599<br>.773<br>.773<br>.368<br>.675<br>.018<br>.018                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                 | 12.2<br>10.5<br>12.7<br>11.8<br>11.3<br>6.9<br>14.7<br>4.8<br>7.7<br>4.8<br>7.7<br>2.5<br>8.5<br>9.4<br>15.3<br>5.5<br>15.9 | + S<br>B<br>+ B<br>+ B<br>+ B<br>+ B<br>+ B<br>+ B<br>+ A<br>+ B<br>+ B<br>+ B<br>+ B<br>+ B<br>+ B<br>+ B<br>+ B                                                                                                   | Qu<br>  12<br>  12<br>  12<br>  12<br>  12<br>  12<br>  12<br>  12                               | eue<br>9 ft<br>7 ft<br>2 ft<br>0 ft<br>7 ft<br>3 ft<br>3 ft<br>5 ft<br>7 ft<br>7 ft |

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KULA RESIDENT LOTS (386) YEAR 2005 + PROJECT AM PEAK HOUR

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# SIGNAL94/TEAPAC[V1 L1.2] - Summary of Parameter Values

Intersection Parameters for Int # 3 - BYPASS/KULA HWY & HALEAKALA

METROAREANONCBDLOSTTIME2.0LEVELOFSERVICECNODELOCATION0

Approach Parameters

| APPLABELS<br>GRADES<br>PEDLEVELS<br>PARKINGSIDES<br>PARKVOLUMES<br>BUSVOLUMES | 58<br>2.0<br>LOW<br>NONE<br>20<br>0 | WB<br>.0<br>LOW<br>NONE<br>20<br>0<br>15 | N8<br>-2.0<br>LOW<br>Xone<br>20<br>0<br>5 | EB<br>.0<br>LOW<br>NONE<br>20<br>0<br>25 |
|-------------------------------------------------------------------------------|-------------------------------------|------------------------------------------|-------------------------------------------|------------------------------------------|
| RIGHTTURNONREDS                                                               | 0                                   | 15                                       | 2                                         |                                          |

Novement Parameters

| MOVLABELS               | RT TH L       | r rt th            | LT RT          | TH LT     | RT TH LT<br>314 72 3 |
|-------------------------|---------------|--------------------|----------------|-----------|----------------------|
| VOLUMES                 | 2 356 6       | 5 171 46           | 60 71          | 848 163   | •••                  |
| WIDTHS                  | 12.0 12.0 12. | 0 12.0 12.0        | .0 12.0        | 12.0 12.0 | 12.0 12.0 .0         |
| LANES                   | 1 1           | 1 1 1              | 0 1            | 1 1       | 1.00 1.00 1.00       |
| UTILIZATIONS            | 1.00 1.00 1.0 | • • • •            |                | 1.00 1.00 | 2.0 2.0 2.0          |
| TRUCKPERCENTS           | 2.0 2.0 2.    |                    |                |           | .95 .95 .95          |
| PEAKHOURFACTORS         | .95 .95 .9    |                    | .95 .95<br>3 3 |           | 3 3 3                |
| ARRIVALTYPES            | 3 3           | 3 3 3<br>S YES YES |                | •         | YES YES YES          |
| ACTUATIONS              | YES YES YE    |                    |                |           | 4.0 4.0 4.0          |
| REQCLEARANCES           | 4.0 4.0 4.    |                    |                |           | 5.0 5.0 5.0          |
| MINIMUMS                |               |                    |                |           | 1900 1900 1900       |
| IDEALSATFLOWS           | 1900 1900 190 |                    |                | 1.00 1.00 | 1.00 1.00 1.00       |
| FACTORS<br>DELAYFACTORS | 1.00 1.00 1.0 |                    | 1.00 1.00      | 1.00 1.00 | 1.00 1.00 1.00       |
| NSTOPFACTORS            | 1.00 1.00 1.0 |                    | 1.00 1.00      | 1.00 1.00 | 1.00 1.00 1.00       |
| GROUPTYPES              | HORM NORM NO  |                    | I NORM NORM    | • • • •   | HORM HORM HORM       |
| SATURATIONFLOWS         |               | 40 1539 152        | 5 0 1554       | 1881 1787 | 1539 1844 0          |
|                         |               |                    |                |           |                      |

Phasing Parameters

| SEQUENCES<br>PERMISSIVES<br>OVERLAPS<br>CYCLES<br>GREENTIMES<br>YELLOWTIMES<br>CRITICALS<br>EVEES | 31<br>YES<br>60<br>8.47<br>4.00<br>9 | ALL<br>YES<br>YES<br>120<br>28.79<br>4.00<br>8 | YES<br>YES<br>10<br>10.74<br>4.00<br>4 | YES<br>YES | LEADLAGS<br>OFFSET<br>PEDTIME | NONE<br>.00<br>.0 | NONE<br>1<br>0 |
|---------------------------------------------------------------------------------------------------|--------------------------------------|------------------------------------------------|----------------------------------------|------------|-------------------------------|-------------------|----------------|
| EXCESS                                                                                            | v                                    |                                                |                                        |            |                               |                   |                |

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**KULA RESIDENT LOTS (386)** 06/27/95 YEAR 2005 + PROJECT 12:03:24 AN PEAK HOUR SIGNAL94/TEAPAC[V1 L1.2] - Capacity Analysis Summary Intersection Averages for Int # 3 - BYPASS/KULA HWY & HALEAKALA Degree of Saturation (v/c) .50 Vehicle Delay 6.3 Level of Service 8+ Sq 31 | Phase 1 | Phase 2 | Phase 3 | \*\*/\*\* ----- 
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 7A İ 1 1 North : <\* + +>: ++++ + + + + ++++ | v \* + + | + \* + | v ; G/C= .141 ; G/C= .480 ; G/C= .179 ; G= 8.5" | G= 28.8" | G= 10.7" | Y+R= 4.0" | Y+R= 4.0" | Y+R= 4.0" | | OFF= .0% | OFF=20.8% | OFF=75.4% | C= 60 sec G= 48.0 sec = 80.0% Y=12.0 sec = 20.0% Ped= .0 sec = .0% -----{ Lane {Width/} g/C { Service Rate; Adj } { HCH } L {90% Max} ; Group ; Lanes; Reqd Used ; &C (vph) &E ;Volume; v/c ; Delay ; S ; Queue ; SB Approach 6.6 B+ RT | 12/1 | .004 | .513 | 747 | 782 | 2 | .003 | 4.6 | A | 25 ft; 

 TH
 12/1
 .237
 .513
 914
 946
 375
 .396
 5.9
 B+
 154
 ft

 LT
 12/1
 .000
 .513
 96
 119
 69
 .561
 10.6
 B
 28
 ft

 NB Approach 3.4 A ; RT ; 12/1 ; .070 ; .721 ; 1116 ; 1121 ; 69 ; .062 ; 1.6 ; A ; 25 ft; TH | 12/1 | .493 | .721 | 1356 | 1356 | 893 | .659 | 3.7 | #A | 210 ft LT | 12/1 | .000 | .175 | 539 | 565 | 172 | .304 | 2.2 |\*A | 40 ft; WB Approach 14.0 8 RT | 12/1 | .142 | .212 | 269 | 327 | 164 | .502 | 14.5 | #B | 109 ft LT+TH | 12/1 | .105 | .212 | 266 | 324 | 111 | .343 | 13.2 | B | 74 ft EB Approach 9.4 8+ RT | 12/1 | .236 | .420 | 601 | 647 | 304 | .470 | 8.5 | 8+| 149 ft; LT+TH | 12/1 | .066 | .212 | 330 | 392 | 79 | .202 | 12.6 | 8 | 52 ft

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KULA RESIDENT LOTS (386) YEAR 2005 + PROJECT PM PEAK HOUR

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## SIGHAL94/TEAPAC[VI L1.2] - Summary of Parameter Values

Intersection Parameters for Int # 3 - BYPASS/KULA HWY & HALEAKALA

| METROAREA      | NO | C8D |
|----------------|----|-----|
| LOSTTINE       |    | 2.0 |
| LEVELOFSERVICE | C  | S   |
| NODELOCATION   | 0  | 0   |

Approach Parameters

| APPLABELS       | SB   | WB   | NB   | EB   |
|-----------------|------|------|------|------|
| GRADES          | 2.0  | .0   | -2.0 | .0   |
| PEDLEVELS       | LOW  | LOW  | LOW  | LOW  |
| PARKINGSIDES    | NONE | NONE | NONE | NONE |
| PARKVOLUMES     | 20   | 20   | 20   | 20   |
| BUSVOLUKES      | 0    | 0    | 0    | 0    |
| RIGHTTURNONREDS | 0    | 10   | 5    | 25   |

Novement Parameters

MOVLABELS RT TH LT RT TH LT RT TH LT RŤ TH LĨ VOLUMES 5 687 88 111 41 42 17 510 186 7 42 229 12.0 12.0 12.0 12.0 12.0 WIDTHS .0 12.0 12.0 12.0 12.0 12.0 .0 LANES 1 1 1 1 0 1 1 1 1 1 1 0 UTILIZATIONS 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 TRUCKPERCENTS 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 PEAKHOURFACTORS .95 .95 .95 .95 .95 .95 .95 .95 .95 .95 .95 .95 ARRIVALTYPES 3 3 3 3 3 3 3 - 3 - 3 3 3 3 ACTUATIONS YES YES YES YES YES YES YES YES YES YES YES YES REQCLEARANCES 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 4.0 MINIMUMS 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 5.0 IDEALSATFLOWS FACTORS DELAYFACTORS **NSTOPFACTORS** GROUPTYPES SATURATIONFLOWS 1524 1844 1752 1539 1207 0 1554 1881 1787 1539 1262 0

Phasing Parameters

| SEQUENCES   | 41   | ALL   |       |     |          |      |      |
|-------------|------|-------|-------|-----|----------|------|------|
| PERMISSIVES | YES  | YES   | YES   | YES | LEADLAGS | NONE | NONE |
| OVERLAPS    | YES  | YES   | YES   | YES | OFFSET   | .00  | 1    |
| CYCLES      | 60   | 120   | 10    |     | PEDTINE  | .0   | Ō    |
| GREENTIMES  | 5.85 | 26.04 | 16.10 |     |          | ••   | v    |
| YELLOWTINES | 4.00 | 4.00  | 4.00  |     |          |      |      |
| CRITICALS   | 3    | 2     | 11    |     |          |      |      |
| EXCESS      | 0    |       |       |     |          |      |      |

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| 20                                                                                                         | ESIDE<br>105 +<br>( HOUF                                                            | PROJEC                                                                                          | •                                                                         | )                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                             |                                       |                                                                                   |                                                                 |    |                                                               |          |                                                                                                  |                                                                                                                                                                                           | •                                                                                          | 27/9<br>41:1                                                                               |
|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------|----|---------------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| ALS                                                                                                        | 94/TEI                                                                              | PAC(V1                                                                                          | L1.2                                                                      | ] - C                           | apa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | city                                                                                        | Analy                                 | sis                                                                               | Sunna                                                           | ry |                                                               |          |                                                                                                  |                                                                                                                                                                                           |                                                                                            |                                                                                            |
|                                                                                                            |                                                                                     | Avera<br>of Sa                                                                                  |                                                                           |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                             |                                       |                                                                                   |                                                                 |    |                                                               |          |                                                                                                  |                                                                                                                                                                                           | Serv                                                                                       | ice                                                                                        |
|                                                                                                            |                                                                                     | ise 1                                                                                           | ; Ph                                                                      | ase 2                           | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Pha                                                                                         | <br>se 3                              | ;                                                                                 |                                                                 |    |                                                               |          |                                                                                                  |                                                                                                                                                                                           |                                                                                            |                                                                                            |
| * •                                                                                                        |                                                                                     | * ^                                                                                             | ; + *                                                                     | : +                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                             | ~                                     |                                                                                   |                                                                 |    |                                                               |          |                                                                                                  |                                                                                                                                                                                           |                                                                                            |                                                                                            |
| ļ                                                                                                          |                                                                                     | * ++++                                                                                          | + <b>*</b>                                                                | +                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                             | +++                                   | ŧ                                                                                 |                                                                 |    |                                                               |          |                                                                                                  |                                                                                                                                                                                           |                                                                                            |                                                                                            |
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| h                                                                                                          | (                                                                                   | :+                                                                                              | !                                                                         | <+ +                            | +>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ****>                                                                                       |                                       | ļ                                                                                 |                                                                 |    |                                                               |          |                                                                                                  |                                                                                                                                                                                           |                                                                                            |                                                                                            |
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|                                                                                                            | •••••                                                                               | т<br>                                                                                           | ।<br>                                                                     | ····                            | т I<br>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | •<br>• • • • • •                                                                            |                                       |                                                                                   |                                                                 |    |                                                               |          |                                                                                                  |                                                                                                                                                                                           |                                                                                            |                                                                                            |
|                                                                                                            |                                                                                     | .098                                                                                            |                                                                           |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                             |                                       |                                                                                   |                                                                 |    |                                                               |          |                                                                                                  |                                                                                                                                                                                           |                                                                                            |                                                                                            |
|                                                                                                            |                                                                                     | 5.9"<br>: 4.0"                                                                                  |                                                                           |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                             |                                       |                                                                                   |                                                                 |    |                                                               |          |                                                                                                  |                                                                                                                                                                                           |                                                                                            |                                                                                            |
|                                                                                                            |                                                                                     | .01                                                                                             |                                                                           |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                             |                                       |                                                                                   |                                                                 |    |                                                               |          |                                                                                                  |                                                                                                                                                                                           |                                                                                            |                                                                                            |
| <br>na                                                                                                     | ¦Wi                                                                                 | sec<br>dth/¦                                                                                    | <br>g                                                                     | <br>/c                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Serv                                                                                        | ice R                                 | ate                                                                               | Adj                                                             |    |                                                               |          | ICH                                                                                              | <br>  L                                                                                                                                                                                   | <b>190</b> %                                                                               | Max                                                                                        |
| <br>na                                                                                                     | ¦Wi                                                                                 |                                                                                                 | <br>g                                                                     | <br>/c                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Serv                                                                                        | ice R                                 | ate                                                                               | Adj                                                             |    |                                                               |          | ICH                                                                                              | <br>  L                                                                                                                                                                                   | <b>190</b> %                                                                               | Max                                                                                        |
| na<br>rot                                                                                                  | ¦Wi                                                                                 | dth/¦<br>anes¦                                                                                  | g<br>Reqd                                                                 | /C<br>Use                       | l<br>Id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Serv<br>ec (                                                                                | ice R<br>vph)                         | ate<br>8E                                                                         | Adj<br>Volum                                                    |    | v/c                                                           | <br>  D( | ICH<br>1ay<br>13.0                                                                               | L<br>  S<br>  B                                                                                                                                                                           | <b>190</b> %                                                                               | Max                                                                                        |
| na<br>rot                                                                                                  | ¦Wi<br>IP ¦ l<br>roach                                                              | dth/¦<br>anes;                                                                                  | 9<br>Reqd                                                                 | /C<br>Use                       | id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Serv<br>ec (                                                                                | ice R<br>vph)                         | ate<br>2E                                                                         | Adj<br>Volum                                                    |    | v/c                                                           | <br>  D( | ICH<br>1ay<br>13.0                                                                               | ¦ L<br>¦ S<br>B                                                                                                                                                                           | 90%<br>  Qui                                                                               | Max<br>Bue                                                                                 |
| na<br>rot<br>ppi<br>sss<br>RT                                                                              | Wi<br>up   l<br>roach                                                               | dth/;<br>anes;<br>2/1 ;<br>2/1 ;                                                                | 9<br>Reqd<br><br>.009<br>.417                                             | /C<br>Use<br><br>: .46<br>: .46 | id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Serv<br>ec (<br>                                                                            | ica R<br>vph)<br>======<br>  7<br>  8 | ate<br>22<br>12                                                                   | Adj<br>Volum<br>5<br>723                                        |    | v/c<br><br>007<br>339                                         |          | ICH<br>1ay<br>3.0<br>5.5<br>4.2                                                                  | L<br>  S<br>  B<br>  B<br>  *B                                                                                                                                                            | 90%<br>  Qui                                                                               | Max<br>BUC<br><br>5 ft<br>5 ft                                                             |
| na<br>rot<br>ppi<br>sss<br>RT                                                                              | Wi<br>up   l<br>roach                                                               | dth/;<br>anes;<br>2/1 ;                                                                         | 9<br>Reqd<br><br>.009<br>.417                                             | /C<br>Use<br><br>: .46<br>: .46 | id                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Serv<br>ec (<br>                                                                            | ica R<br>vph)<br>======<br>  7<br>  8 | ate<br>22<br>12                                                                   | Adj<br>Volum<br>5<br>723                                        |    | v/c<br><br>007<br>339                                         |          | ICH<br>1ay<br>3.0<br>5.5<br>4.2                                                                  | L<br>  S<br>  B<br>  B<br>  *B                                                                                                                                                            | 90%<br>  Qui                                                                               | Max<br>BUC<br><br>5 ft<br>5 ft                                                             |
| na<br>rot<br>ppi                                                                                           | Wi<br>up   l<br>roach                                                               | dth/;<br>anes;<br>2/1 ;<br>2/1 ;                                                                | 9<br>Reqd<br>.009<br>.417<br>.002                                         | /C<br>Use<br>                   | id  <br>57  <br>57  <br>51                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Serv<br>ec (<br>                                                                            | ica R<br>vph)<br>7<br>8<br>3          | ate<br>82  <br>12  <br>52  <br>52                                                 | Adj<br>Volum<br>5<br>723<br>93                                  |    | v/c<br>007<br>339<br>264                                      |          | ICH<br>13.0<br>5.5<br>4.2<br>4.1                                                                 | L<br>  S<br>  B<br>  *B<br>  *A<br>  *A                                                                                                                                                   | 90 <b>%</b><br>  Qui<br>  2!<br>  32!<br>  2!                                              | Max<br>Bue<br>5 ft<br>5 ft                                                                 |
| na<br>rot<br>ppi<br>===<br>RT<br>TH<br>LT<br>                                                              | Wi<br>oach                                                                          | dth/;<br>anes;<br>2/1 ;<br>2/1 ;<br>2/1 ;                                                       | 9<br>Reqd<br>.009<br>.417<br>.002                                         | /C<br>Use<br>                   | id  <br>57  <br>57  <br>51                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Serv<br>EC (<br>                                                                            | ice R<br>vph)<br>7<br>8<br>3          | ate<br>22  <br>12  <br>52                                                         | Adj<br>Volu∎<br>5<br>723<br>93                                  |    | v/c<br>007<br>339<br>264                                      |          | ICH<br>blay<br>5.5<br>4.2<br>4.1<br>8.3                                                          | L<br>  S<br>  B <br> *B<br> *A<br> B                                                                                                                                                      | 90%<br>  Quu<br>  2:<br>  32:<br>  2:                                                      | Max<br>Bue<br>5 ft<br>5 ft<br>9 ft                                                         |
| na<br>rot<br>ppi<br>ssi<br>RT<br>TH<br>LT<br>Ppi<br>ssi<br>RT                                              | iwi<br>p i l<br>roach<br>i j<br>i j                                                 | dth/;<br>anes;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;                                     | g<br>Reqd<br>.009<br>.417<br>.002<br>.019<br>.316                         | /C<br>Use<br>                   | id  <br>57  <br>57  <br>51  <br>57  <br>51  <br>57  <br>57                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Serv<br>eC (<br>                                                                            | ice R<br>vph)<br>7<br>8<br>3<br>3     | ate<br>22<br>12<br>52<br>52                                                       | Adj<br>Volu<br>5<br>723<br>93<br>13<br>537                      |    | v/c<br><br>007<br>339<br>264<br>                              |          | 13.0<br>5.5<br>4.2<br>4.1<br>5.5<br>8.3<br>5.5<br>8.6                                            | L<br>  S<br>  S<br>  *B<br>  *A<br>  81                                                                                                                                                   | 90%<br>  Qu<br>  22<br>  32<br>  2<br>  2<br>  2<br>  2<br>  2<br>  2<br>  2<br>  2<br>  2 | Hax<br>BUE<br>5 ft<br>5 ft<br>9 ft<br>=====<br>5 ft<br>1 ft                                |
| na<br>rot<br>ppi<br>ssi<br>RT<br>TH<br>LT<br>Ppi<br>ssi<br>RT                                              | iwi<br>p i l<br>roach<br>i j<br>i j                                                 | dth/;<br>anes;<br>2/1 ;<br>2/1 ;<br>2/1 ;                                                       | g<br>Reqd<br>.009<br>.417<br>.002<br>.019<br>.316                         | /C<br>Use<br>                   | id  <br>57  <br>57  <br>51  <br>57  <br>51  <br>57  <br>57                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Serv<br>eC (<br>                                                                            | ice R<br>vph)<br>7<br>8<br>3<br>3     | ate<br>22<br>12<br>52<br>52                                                       | Adj<br>Volu<br>5<br>723<br>93<br>13<br>537                      |    | v/c<br><br>007<br>339<br>264<br>                              |          | 13.0<br>5.5<br>4.2<br>4.1<br>5.5<br>8.3<br>5.5<br>8.6                                            | L<br>  S<br>  S<br>  *B<br>  *A<br>  81                                                                                                                                                   | 90%<br>  Qu<br>  22<br>  32<br>  2<br>  2<br>  2<br>  2<br>  2<br>  2<br>  2<br>  2<br>  2 | Hax<br>BUE<br>5 ft<br>5 ft<br>9 ft<br>=====<br>5 ft<br>1 ft                                |
| na<br>rot<br>ppi<br>ssi<br>RT<br>TH<br>LT<br>Ppi<br>ssi<br>RT                                              | iwi<br>p i l<br>roach<br>i j<br>i j                                                 | dth/;<br>anes;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;                                     | g<br>Reqd<br>.009<br>.417<br>.002<br>.019<br>.316                         | /C<br>Use<br>                   | id  <br>57  <br>57  <br>51  <br>57  <br>51  <br>57  <br>57                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Serv<br>eC (<br>                                                                            | ice R<br>vph)<br>7<br>8<br>3<br>3     | ate<br>22<br>12<br>52<br>52                                                       | Adj<br>Volu<br>5<br>723<br>93<br>13<br>537                      |    | v/c<br><br>007<br>339<br>264<br>                              |          | 13.0<br>5.5<br>4.2<br>4.1<br>5.5<br>8.3<br>5.5<br>8.6                                            | L<br>  S<br>  S<br>  *B<br>  *A<br>  81                                                                                                                                                   | 90%<br>  Qu<br>  22<br>  32<br>  2<br>  2<br>  2<br>  2<br>  2<br>  2<br>  2<br>  2<br>  2 | Hax<br>BUE<br>5 ft<br>5 ft<br>9 ft<br>=====<br>5 ft<br>1 ft                                |
| na<br>rot<br>ppi<br>art<br>tH<br>LT<br>Ppi<br>RT<br>TH<br>LT                                               | iWi<br>pp i l<br>roach<br>i j<br>i j<br>i j<br>i j<br>i j                           | dth/;<br>anes;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;                   | g<br>Reqd<br>.009<br>.417<br>.002<br>.019<br>.316<br>.058                 | /C<br>Use<br>                   | id  <br>id  <br>i7  <br>i1  <br>i1  <br>i1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Serv<br>eC (<br>                                                                            | ice R<br>vph)                         | ate<br>22<br>12<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>59                   | Adj<br>Volum<br>5<br>723<br>93<br>13<br>537<br>196              |    | v/c<br><br>007<br>339<br>264<br><br>018<br>511<br>546         |          | 13.0<br>5.5<br>4.2<br>4.1<br>8.3<br>5.5<br>8.6<br>7.5                                            | L<br>  S<br>  B<br>  *B<br>  *A<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8                                                                                                                 | 90%<br>  Qu<br>  22<br>  32<br>  22<br>  24<br>  24                                        | Hax<br>BUE<br>5 ft<br>5 ft<br>9 ft<br>5 ft<br>1 ft<br>1 ft                                 |
| PPI<br>RT<br>TH<br>LT<br>PPI<br>RT<br>TH<br>LT<br>PPI<br>RT<br>RT<br>RT                                    | i Wi<br>poach<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J | dth/;<br>anes;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;          | g<br>Reqd<br>.009<br>.417<br>.002<br>.019<br>.316<br>.058                 | /C<br>Use<br>                   | id  <br>id  <br>i7  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Serv<br>eC (<br><br>671<br>824<br>316<br><br>687<br>841<br>320<br><br>687                   | ice R<br>vph)                         | ate<br>22<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52 | Adj<br>Volum<br>5<br>723<br>93<br>13<br>537<br>196              |    | v/c<br><br>007<br>339<br>264<br><br>546<br>                   |          | CH<br>blay<br>5.5<br>4.2<br>4.1<br>8.3<br>5.5<br>8.6<br>7.5<br>7.9<br>5.9                        | L<br>  S<br>  B<br>  *B<br>  *A<br>  B<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  1<br>  8<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1        | 90%<br>  Qui<br>  2!<br>  32!<br>  2<br>  24.<br>  6.                                      | Max<br>BUE<br>5 ft<br>5 ft<br>5 ft<br>1 ft<br>1 ft<br>1 ft                                 |
| PPI<br>RT<br>TH<br>LT<br>PPI<br>RT<br>TH<br>LT<br>PPI<br>RT<br>RT<br>RT                                    | i Wi<br>poach<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J | dth/;<br>anes;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;                            | g<br>Reqd<br>.009<br>.417<br>.002<br>.019<br>.316<br>.058                 | /C<br>Use<br>                   | id  <br>id  <br>i7  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Serv<br>eC (<br><br>671<br>824<br>316<br><br>687<br>841<br>320<br><br>687                   | ice R<br>vph)                         | ate<br>22<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52 | Adj<br>Volum<br>5<br>723<br>93<br>13<br>537<br>196              |    | v/c<br><br>007<br>339<br>264<br><br>546<br>                   |          | CH<br>blay<br>5.5<br>4.2<br>4.1<br>8.3<br>5.5<br>8.6<br>7.5<br>7.9<br>5.9                        | L<br>  S<br>  B<br>  *B<br>  *A<br>  B<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  1<br>  8<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1        | 90%<br>  Qui<br>  2!<br>  32!<br>  2<br>  24.<br>  6.                                      | Max<br>BUE<br>5 ft<br>5 ft<br>5 ft<br>1 ft<br>1 ft<br>1 ft                                 |
| PPI<br>RT<br>TH<br>LT<br>PPI<br>RT<br>TH<br>LT<br>PPI<br>RT<br>TH<br>LT                                    | iwi<br>p i l<br>coach<br>i j<br>i j<br>roach<br>i j<br>i j                          | dth/;<br>anes;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;          | g<br>Reqd<br>.009<br>.417<br>.002<br>.019<br>.316<br>.058                 | /C<br>Use<br>                   | id  <br>id  <br>i7  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Serv<br>eC (<br><br>671<br>824<br>316<br><br>687<br>841<br>320<br><br>687                   | ice R<br>vph)                         | ate<br>22<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52 | Adj<br>Volum<br>5<br>723<br>93<br>13<br>537<br>196              |    | v/c<br><br>007<br>339<br>264<br><br>546<br>                   |          | CH<br>blay<br>5.5<br>4.2<br>4.1<br>8.3<br>5.5<br>8.6<br>7.5<br>7.9<br>5.9<br>10.3                | L<br>  S<br>  B<br>  *B<br>  *A<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8                                                                                     | 90%<br>  Qu<br>  22<br>  32!<br>  22<br>  24<br>  24<br>  6.                               | Max<br>BUE<br>5 ft<br>5 ft<br>5 ft<br>1 ft<br>1 ft<br>1 ft                                 |
| PPI<br>RT<br>TH<br>LT<br>PPI<br>RT<br>TH<br>LT<br>PPI<br>RT<br>TH<br>PPI                                   | i Wi<br>poach<br>i 1<br>i 1<br>i 1<br>i 1<br>i 1<br>i 1<br>i 1<br>i 1<br>i 1<br>i 1 | dth/;<br>anes;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ; | g<br>Reqd<br>.009<br>.417<br>.002<br>.019<br>.316<br>.058                 | /C<br>Use<br>                   | id  <br>id  <br>i7  <br>i7  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1  <br>i1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Serv<br>eC (<br><br>671<br>824<br>316<br><br>687<br>841<br>320<br><br>676<br>312            | ice R<br>vph)                         | ate<br>22<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52<br>52 | Adj<br>Volum<br>5<br>723<br>93<br>13<br>537<br>196              |    | v/c<br><br>007<br>339<br>264<br><br>546<br>                   |          | CH<br>blay<br>5.5<br>4.2<br>4.1<br>8.3<br>5.5<br>8.6<br>7.5<br>7.9<br>5.9<br>10.3                | L<br>  S<br>  B<br>  *B<br>  *A<br>  B<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  1<br>  8<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1        | 90%<br>  Qu<br>  22<br>  32!<br>  22<br>  24<br>  24<br>  6.                               | Max<br>BUE<br>5 ft<br>5 ft<br>5 ft<br>1 ft<br>1 ft<br>1 ft                                 |
| PPDP<br>RT<br>TH<br>LT<br>PPDP<br>RT<br>TH<br>LT<br>PPDP<br>RT<br>TH<br>PPDP<br>RT<br>TH<br>RT<br>TH<br>RT | i Wi<br>poach<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J<br>i J | dth/;<br>anes;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;<br>2/1 ;          | g<br>Reqd<br>.009<br>.417<br>.002<br>.019<br>.316<br>.058<br>.100<br>.107 | /C<br>Use<br>                   | id  <br>id  <br>i7  <br>i1  <br>i7  <br>i1  <br>i1  <br>i2  <br>i3  <br>i4  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5  <br>i5 | Serv<br>eC (<br><br>671<br>824<br>316<br><br>687<br>841<br>320<br><br>676<br>312<br><br>676 | ice R<br>vph)                         | ate<br>EE  <br>52  <br>52  <br>52  <br>59  <br>17  <br>64  <br>17                 | Adj<br>Volum<br>5<br>723<br>93<br>13<br>537<br>196<br>106<br>87 |    | v/c<br><br>007<br>339<br>264<br><br>546<br><br>148<br>239<br> |          | CH<br>)1ay<br>5.5<br>4.2<br>4.1<br>8.3<br>5.5<br>8.6<br>7.5<br>7.9<br>5.9<br>10.3<br>17.6<br>5.5 | L<br>  S<br>  B<br>  *B<br>  *A<br>  B<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  8<br>  1<br>  8<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1<br>  1 | 90%<br>  Qui<br>  22<br>  322<br>  24<br>  24<br>  6<br>  5<br>  5                         | Hax<br>BUE<br>5 ft<br>5 ft<br>1 ft<br>1 ft<br>1 ft<br>5 ft<br>1 ft<br>5 ft<br>1 ft<br>5 ft |

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| Grade     Y4,V5,V6:     -2     V3     17      MIHOR STREET     v     v     MAJOR STREET       Hum of Lanes - V8:     1     v     KULA HWY       Shared Lane-V7,8,9:     3     v     i      HIHOR STREET     v     v     MAJOR STREET       Kula HWY     v     v     V       Shared Lane-V7,8,9:     3     v     i      HIHOR STREET     i     i     i       Shared Lane-V7,8,9:     3     v     i       Shared Lane-V7,8,9:     3     i     i       Stared Lane-V7,8,9:     3     i     i       Stared Lane-V11:     1     27     2     15       Grade - V10,V11,V12:     0     v7     V8     V9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ajor Street: XULA HWY<br>inor Street: OMAOPIO RD<br>Scenario: YEAR 2005 + PROJ<br>Peak Hour: AM | ECT                                                           |       |        |            |       |            | In     | Fil         | DATE:<br>inalyst:<br>ie Name:<br>tion #: | : 8<br>: | 27-Jun-95<br>IC<br>KULONA-A<br>4 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------|-------|--------|------------|-------|------------|--------|-------------|------------------------------------------|----------|----------------------------------|
| 173       25       9       C NURTH         Nua of Lanes - V2:       1       /       /       /         Excl. LT - V1 (Y/N):       N       /       /       /       /         Grade - V1, V2, V3:       2       /       /       /       /       /         Nua of Lanes - V5:       1       V1       38        7       V6         Excl. LT - V4 (Y/N):       N       V2       293        7       V6         Excl. LT - V4 (Y/N):       N       V2       293        15       V4         Grade - V4, V5, V6:       -2       V3       17        15       V4         Grade - V10, V11, V12:       0       /       /       /       /       NUA HWY         Grade - V10, V11, V12:       0       /       /       /       /       /       NUA HWY         MURE ADJUSTKENTS       1       2.3       4.5       6       7       8       9       10       11       12         ILUKE ADJUSTKENTS       1       2.3       4.5       6       7       8       9       10       11       12         IMURE ADJUSTKENTS       1 </th <th></th> <th></th> <th>٧12</th> <th></th> <th>¥11</th> <th></th> <th>V10</th> <th></th> <th></th> <th></th> <th></th> <th></th>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                 |                                                               | ٧12   |        | ¥11        |       | V10        |        |             |                                          |          |                                  |
| Num of Lanes - V2:       1         Excl II - V1 (Y/N):       N         PyYiaid - V3 (Y/N):       N         Rum of Lanes - V5:       1         PyYiaid - V3 (Y/N):       N         Excl II - V4 (Y/N):       N         Excl II - V4 (Y/N):       N         Excl II - V4 (Y/N):       N         PyYiaid - V3 (Y/N):       N         Excl II - V4 (Y/N):       N         V2 293>       C 641 V5         pyYiaid - V3 (Y/N):       N         V2 293>       C 641 V5         op/Yiaid - V3 (Y/N):       N         V       V3 17         V       MaJOR STREET         V       V3 17         V       V         Mus of Lanes - V8:       1         Grade - V1, V9, V9:       0         Grade - V1, V1, V12:       0         V7       V8         V9       V7         Num of Lanes - V1:       1         1       27         2       12         38 293       17       15         V1       38 293       17       15         V0UIKE ADJUSTHENTS       1       2       34       5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Peak Hour Factor: 1.00                                                                          |                                                               | 173   |        | 25         |       | 9          |        |             | < N                                      | ORTH     |                                  |
| Num of Lanes - V2:       1         Excl I - V1 (Y/R):       N         bp/Yield - V3 (Y/R):       N         op/Yield - V3 (Y/R):       N         frade - V1, V2, V3:       2         /       /         Rus of Lanes - V5:       1         V1       38         Excl II - V4 (Y/R):       N         Excl II - V4 (Y/R):       N         Prist of V(M):       N         V2       293         Frade - V1, V2, V3:       2         V       V3         Grade - V4, V5, V6:       -2         V3       17         Grade - V10, V11, V12:       0         Mum of Lanes - V11:       1       27         II - 2       34       5       6       7       8       9       11       12         MUME ADJUSTRENTS       1       2       3       4       5       7       9       12       13       293       17       15       641       7       30       2       17                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                 |                                                               | 1/5   |        | !          |       | ł          |        |             |                                          |          |                                  |
| Excl LT - VI (Y/N): N<br>Excl XT - V3 (Y/N): N<br>py/Yiaid - V3 (Y/N): N<br>py/Yiaid - V3 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V7 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Excl XT - V6 (Y/N): N<br>Exc XT - V6 (Y/N): N<br>Exc XT - V6 (Y/N): N<br>Exc XT - V6 (Y/N): N       |                                                                                                 |                                                               |       |        | i          |       | i          |        |             |                                          |          |                                  |
| Excl RT - V3 (Y/R): H<br>p)/Yield - V3 (Y/R): Y<br>Grade - V1, V2, V3: 2<br>Hum of Lanes - V5: 1<br>Kun of Lanes - V6: 1<br>Kum of Lanes - V8: 1<br>Kum of Lanes - V8: 1<br>Kum of Lanes - V8: 1<br>Grade - V4, V5, V6: -2<br>Kum of Lanes - V8: 1<br>Grade - V4, V1, V8, V9: 0<br>Shared Lane-V7, 8, 9: 3<br>Hum of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>Hum of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>Hum of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>Hum of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>Hum of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>Hum of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>Hum of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>Hum of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>Hum of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>Hum of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>HUM of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>HUM of Lanes - V1: 1<br>HUM of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>HUM of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>HUM of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>HUM of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>HUM of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>HUM of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>HUM of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>HUM of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>HUM of Lanes - V1: 1<br>Grade - V4, V1, V1: 2<br>HUM of Lanes - V1: 1<br>HUM of Lanes - V1: 1<br>Grade - V4, V2, V3: 2<br>HUM of Lanes - V1: 1<br>HUM of Lanes - V4: V4<br>HUM of Lan |                                                                                                 |                                                               | i     |        | i          |       | ۱          |        |             |                                          |          |                                  |
| pp/Yield - V3 (Y/N):       Y         Grade - V1, V2, V3:       2         Hus of Lanes - V5:       1         V1       38         propyrield - V4 (Y/N):       N         Excl IT - V4 (Y/N):       N         Pyrield - V3 (Y/N):       N         Pyrield - V4 (Y/N):       N         Pyrield - V4 (Y/N):       N         Pyrield - V4 (Y/N):       N         Pyrield - V3 (Y/N):       N         V2       293>         Grade - V4, V5, V6:       -2         V3       17         Was of Lanes - V8:       1         Grade - V1, V8, V9:       0         Shared Lane-V7, 8, 9:       3         +N: 1=LT, 2=TR, 3=LTR)       V         Hus of Lanes - V11:       1         Grade - V10, V11, V12:       0         Wared Lane-V10, 11, 12:       3         HOURY FLOW RATE, V(vph)       1       2       4       5       6       7       8       9       11       12         HUNE ADJUSTMENTS       1       2       3       2       17       10       28       190         VOUWE, V (poph)       1       2       4       5       6       7 <td></td> <td></td> <td>ć</td> <td></td> <td>v</td> <td></td> <td><b>ं</b>)</td> <td></td> <td></td> <td></td> <td></td> <td></td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                 |                                                               | ć     |        | v          |       | <b>ं</b> ) |        |             |                                          |          |                                  |
| Grade - V1,V2,V3:       2       /       /         Wus of Lanes - V5:       1       V1       38       /       /         Excl LT - V4 (Y/N):       N       V2       293       /       /       /         Grade - V4 (Y/N):       N       V2       293       /       /       /       /         Grade - V4 (Y/N):       N       V2       293       /       /       /       /         Grade - V4 (Y/N):       N       V2       293       /       /       /       /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ••••                                                                                            |                                                               |       |        |            |       |            |        |             |                                          |          |                                  |
| Num of Lanes - V5:       1       V1       38        7 V6         Excl RT - V4 (Y/M):       H       V2       293>       (       641 V5         op/Yield - V6 (Y/M):       H       V2       293>       (       641 V5         op/Yield - V6 (Y/M):       H       V2       293>       (       641 V5         op/Yield - V6 (Y/M):       H       V2       293>       (       641 V5         op/Yield - V6 (Y/M):       H       V3       17       (       641 V5         op/Yield - V6 (Y/M):       H       V3       17       (       641 V5         Shared Lane-V7,8,9:       3       (       (       KULA HWY       (                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | \ \ \ \ \ \                                                                                     | ^                                                             |       |        |            |       |            | •      |             |                                          |          |                                  |
| Num of Lanes - v3:       1       1       33      641 V5         Excl R - v6 (Y/N):       N       V2 293      >      641 V5         op/Yield - v6 (Y/N):       N       V2 293      >      641 V5         op/Yield - v6 (Y/N):       N       V2 293      >                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | diano (statuto) -                                                                               | 1                                                             |       |        |            |       |            | ١      |             | <b>.</b>                                 | _        |                                  |
| Excl LT - V4 (Y/N):       H       V2 293>       c 641 V5         Excl RT - V6 (Y/N):       H       V2 293>       c 641 V5         Grade - V4 (Y/N):       H       V3 17       15 V4         Grade - V4 (Y/N):       H       V3 17       /         Num of Lanes - V8:       1        /         Shared Lane-V7,8,9:       3        /         Num of Lanes - V8:       1       27       2       15         Grade - V10,V11,V12:       0            Num of Lanes - V11:       1       27       2       15         Grade - V10,V11,V12:       0            NUM of Lanes - V10,11,12:       3           NUME ADJUSTMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Num of Lanes - VS: 1                                                                            | Vi 38                                                         |       |        |            |       |            | •      |             | 7 V                                      | 6        |                                  |
| Excl RT - V6 (Y/R):       H       Y2 293>       Y2 293>         op/Yield - V6 (Y/R):       H       Y3 17       Bi V4         Grade - V4,V5,V6:       -2       Y3 17       HARD STREET         Num of Lanes - V8:       1       V       KULA HWY         Shared Lane-V7,98,9:       3       V       KULA HWY         Shared Lane-V7,98,9:       3       V10 Y11,V12:       V10 Y11,V12:         Num of Lanes - V11:       1       27       2       15         Grade - V10,V11,V12:       0            NUME of Lanes - V11:       1       27       2       15         MUME of Lanes - V10,V11,V12:       0            NUME of Lanes - V10,V11,V12:       0            NUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10       11       12         NUUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10       11       12         OUUME, v (pcph)       53                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                 |                                                               |       |        |            |       |            | -      |             |                                          | <b>E</b> |                                  |
| op/Yield - V6 (Y/N):       H       15 V4         Grade - V4, V5, V6:       -2       V3 17       /       //         Mum of Lanes - V8:       1       //       //       //         Grade - V7, V8, V9:       0       //       //       //         Shared Lane-V7, 8, 9:       3       //       //       //         Wum of Lanes - V8:       1       //       //       //         Shared Lane-V7, 8, 9:       3       //       //       //         Wum of Lanes - V11:       1       27       2       15         Grade - V10, V11, V12:       0       //       //       //         Mum of Lanes - V01:       1       27       2       15         Grade - V10, V11, V12:       0       //       //       //         Mum of Lanes - V01:       1       27       2       15         Grade - V10, V11, V12:       0       //       //       //         MUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10       11       12         MOURLY FLOW RATE, V(vph)       38       293       17       15<641                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                 |                                                               | >     |        |            |       |            | ->     |             | 641 V                                    | 3        |                                  |
| Grads - V4,V5,V6:       -2       V5       17       V       MAJOR STREET         Num of Lanes - V8:       1       V       KULA HWY       V       NUA HWY         Grade - V7,V8,V9:       0       V       V       NUA HWY       V         Shared Lane-V7,8,9:       3       V       V       V       NUA HWY         Shared Lane-V7,8,9:       3       V       V       V       V         Hum of Lanes - V11:       1       27       2       15         Grade - V10,V11,V12:       0       V       V7       V8       V9         v=N,1=LT,2=TR,3=LTR)       V7       V8       V9       V9         DUUHE ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10       11       12         MOULY FLOW RATE, V(vph)       38       293       17       15       641       7       30       2       17       10       28       190         TEP 1:       R1 FROM MINOR STREET       IConflicting Flows:       ICop,9 =       984       pcph       Cp,12 =       645       vhp         Potential Capacity:       ICo,9 =       984       pcph       Cm,12 =       0.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | top/Yield - V6 (Y/N): N                                                                         | f<br>9                                                        |       |        |            |       |            | _      |             | 15 0                                     |          |                                  |
| Num of Lanes - V8:       1       KULA HWY         Grade - V7, V8, V9:       0       1         Shared Lane-V7, 8, 9:       3       1         Hum of Lanes - V11:       1       27       2         Grade - V10, V11, V12:       0       1       27       2         Grade - V10, V11, V12:       0       1       27       2       15         Grade - V10, V11, V12:       0       1       27       2       15         Grade - V10, V11, V12:       0       1       27       2       15         JEN, 1=LT, 2=TR, 3=LTR)       NIXOR STREET - OMAOPID RD       1       1       2         JUUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10       11       12         JUUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10       11       12         JUUME ADURLY FLOW RATE, V(vph)       38       293       17       15       641       7       30       2       17       10       28       190         TEP 1: RT FROM MINOR STREET       VC9 = 1/2 V3 + V2 =       293 vhp       Vc12 = 1/2 V6 + V5 =                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Grads - ¥4, ¥5, ¥6: -2                                                                          | V3 17                                                         |       |        |            |       |            | ,      |             | 13 4                                     | •        |                                  |
| Num of Lanes - V8:       1         Grade - V7, V8, V9:       0         Shared Lane-V7, 8, 9:       3         =N, 1=LT, 2=TR, 3=LTR)       /         Num of Lanes - V11:       1         Grade - V10, V11, V12:       0         Garde - V10, V11, V12:       0         Garde - V10, V11, V12:       0         MUME Anne-V10, 11, 12:       3         J=N, 1=LT, 2=TR, 3=LTR)       V7         NUME ADJUSTMENTS       1         HOWENENT NO.       1         HOURLY FLOW RATE, V(vph)       38         V0LUKE, v (pcph)       38         V20       53         V20       V29         IEEP 1: RT FROM MINOR STREET       VC9 = 1/2 V3 + V2 = 293 vhp         VC12 = 1/2 V6 + V5 = 645 vhp         Conflicting Flows:       VC9 = 1/2 V3 + V2 = 293 vhp         VC12 = 1/2 V6 + V5 = 645 vhp         Conflicting Flows:       VC9 = 1/2 V3 + V2 = 293 vhp         Prb. of Queu-free State:       Ipo,9=1-v9/Ca,9=       0.98         Potential Capacity:       Ipo,9=1-v9/Ca,9=       0.98         Potential Capacity:       Ipo,9=1-v9/Ca,9=       0.98         Prb. of Queu-free State:       Ipo,9=1-v9/Ca,9=       0.98         Potential Capacity:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                 |                                                               |       |        |            |       |            | /      | н           | AJOR ST                                  | REET     |                                  |
| Rum of Lanes - V8:       1         Grade - V7,V8,V9:       0         Shared Lane-V7,8,9:       3         =R,1=LT,2=TR,3=LTR)       1         Num of Lanes - V11:       1         Grade - V10,V11,V12:       0         oared Lane-V10,11,12:       3         I=N,1=LT,2=TR,3=LTR)       V7       V8         NUME ADJUSTMENTS       1       2         HOWENENT NO.       1       2         HOURLY FLOW RATE, V(vph)       38       293         S3       293       17       15       641       7       27       2       15         FEP 1: RT FROM MINOR STREET       1/2       V3       V2       293       vhp       Vc12 = 1/2       V6 + V5 =       645       vhp         Potential Capacity:       1/2,9 =       984       pcph       Cp,12 =       653       pcph         Movement Capacity:       1/2,9 =       0,98       Potential Capacity:       1/2       0,71       0       28       1/2         FEP 2: LT FROM MAJOR STREET       1/2,4 = V2 + V3 =       293       vhp       Vc,1 = V5 + V6 =       648       vhp         Potential Capacity:       1/2,4 = V2 + V3 =       293       vhp       0,12=-vi2/Cm,12=       <                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                 | N N                                                           | 1     |        |            |       |            | ۲      |             |                                          |          |                                  |
| Grade - V, V, V, VY:       0         Shared Lane-V7, 8, 9:       3         =H, 1=LT, 2=TR, 3=LTR)       27       2       15         Num of Lanes - Vil:       1       27       2       15         Grade - VIO, VII, VI2:       0       V7       V8       V9         J=N, 1=LT, 2=TR, 3=LTR)       NINOR STREET - OMAOPIO RD       V7       V8       V9         DULHE ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10       11       12         MULHE ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10       11       12         MULHE ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10       11       12         MOURLY FLOW RATE, V(vph)       38       293       17       15       641       7       30       2       17       10       28       190         TEP 1:       RT FROM MINOR STREET       1       2.3       4.5       6.7       8.9       10       11       12         Conflicting Flows:       Vc9 = 1/2       V3 + V2 =                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                 | Ì                                                             | ,     |        | •          |       | ,          |        |             |                                          |          |                                  |
| =R, 1=LT, 2=TR, 3=LTR)       Image: Second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second sec                                                                                                                                                                                                                             |                                                                                                 |                                                               | ì     |        | ı          |       | i          |        |             |                                          |          |                                  |
| Num of Lanes - V11:       1       27       2       15         Grade - V10,V11,V12:       0       0       0       0       0         Jared Lane-V10,11,12:       3       0       7       V8       V9         DEW, 1=LT,2=TR,3=LTR)       NINOR STREET - OMAOPIO RD       0       11       12         MOVEMENT NO.       1       2       3       4       5       6       7       8       9       10       11       12         MOVEMENT NO.       38       293       17       15       641       7       27       2       15       9       25       173         YOUNE, v (pch)       38       293       17       15       641       7       30       2       17       10       28       190         TEP 1: RT FROM MINOR STREET       VC9 = 1/2 V3 + V2 =       293 vhp       Vc12 = 1/2 V6 + V5 =       645 vhp         Conflicting Flows:       VC9 = 1/2 V3 + V2 =       293 vhp       Vc12 = 1/2 V6 + V5 =       645 speph         Prb. of Queu-free State:       p0,9=1-v9/Ca,9=       0.98       p0,12=1-v12/Cm,12=       0.71         TEP 2: LT FROM MAJOR STREET       VC,4 = V2 + V3 =       293 vhp       Vc,1 = V5 + V6 =       648 vhp <td< td=""><td></td><td>1</td><td>``</td><td></td><td>ł</td><td></td><td>'</td><td></td><td></td><td></td><td></td><td></td></td<>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                 | 1                                                             | ``    |        | ł          |       | '          |        |             |                                          |          |                                  |
| NOB OF Lakes - V10, V11, V12:       0         Grade - V10, V11, V12:       0         Dared Lane-V10, 11, 12:       3         DEWN, 1=LT, 2=TR, 3=LTR)       NINOR STREET - OMAOPIO RD         NUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10       11       12         NOULUE ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10       11       12         NOURLY FLOW RATE, V(vph)       38       293       17       15       641       7       20       17       10       28       190         VOLUME, v (pcph)       53       293       17       15       641       7       30       2       17       10       28       190         FEP 1: RT FROM MINOR STREET       ICp, 9 =       984 pcph       Cp, 12 =       653 pcph       Cp, 12 =       653 pcph         Potential Capacity:       ICp, 9 =       984 pcph       Cm, 12=Cp, 12=       0.71         TEP 2: LT FROM MAJOR STREET       Ipo, 9=1-v9/Cm, 9=       0.98       Pot. 12=1-v12/Cm, 12=       0.71         TEP 2: LT FROM MAJOR STREET       Ipo, 9=1-v9/Cm, 9=       0.98       Cp, 1 =                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0=N,1=LT,2=TR,3=LTR)                                                                            | i<br>!                                                        |       |        |            |       |            |        |             |                                          |          |                                  |
| Grade - V10,V11,V12:       0       0       V7       V8       V9         hared Lane-V10,11,12:       3       V7       V8       V9         hint LT,2=TR,3=LTR)       MINOR STREET - OMAOPIO RD         DULUE ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10       11       12         MOVEMENT NO.       1       2       3       4       5       6       7       8       9       10       11       12         MOVEMENT NO.       1       2       3       4       5       6       7       8       9       10       11       12         MOVEMENT NO.       1       2       3       4       5       6       7       8       9       10       11       12         MOVEMENT NO.       18       233       17       15       641       7       30       2       17       10       28       190         V0LURE, v (pcph)       53       293       17       15       641       7       30       2       17       10       28       190         FEP 1: RT FROM MINOR STREET       Cp, 9 =       1/2       V3 + V2 = <td>Num of Lanes - Vil: 1</td> <td></td> <td>27</td> <td></td> <td>2</td> <td></td> <td>15</td> <td></td> <td></td> <td></td> <td></td> <td></td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Num of Lanes - Vil: 1                                                                           |                                                               | 27    |        | 2          |       | 15         |        |             |                                          |          |                                  |
| hared Lane-Vi0,11,12:       3       V7       V8       V9         hind strength       hind strength       hind strength       hind strength       hind strength         hind strength       1       2       3       4       5       6       7       8       9       10       11       12         hind strength       1       2       3       4       5       6       7       8       9       10       11       12         hind strength       1       2       3       4       5       6       7       8       9       10       11       12         hind strength       1       2       3       4       5       6       7       8       9       10       11       12         hind strength       1       2       3       4       5       6       7       8       9       10       11       12         hind strength       1       2       3       4       5       6       7       8       9       10       11       12         hind strength       1       10       28       17       10       28       190         feel                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                 |                                                               |       |        |            |       |            |        |             |                                          |          |                                  |
| N:I=LT,2=TR,3=LTR)       HINOR STREET - OMAOPIO RD         NUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10       11       12         MOVEMENT NO.       1       2       3       4       5       6       7       8       9       10       11       12         HOVEMENT NO.       38       293       17       15       641       7       27       2       15       9       25       173         VOLUME, v (pcph)       53       293       17       15       641       7       30       2       17       10       28       190         TEP 1: RT FROM MINOR STREET       Vc9 = 1/2 V3 + V2 =       293 vhp       Vc12 = 1/2 V6 + V5 =       645 vhp         Conflicting Flows:       Vc9 = 1/2 V3 + V2 =       293 vhp       Cp,12 =       653 pcph         Potential Capacity:       ICp,9 =       984 pcph       Cp,12 =       653 pcph         Prb. of Queu-free State:       Ipo,9=1-v9/Cm,9=       0.98       Pot.12=1-v12/Cm,12=       0.71         TEP 2: LT FROM MAJOR STREET       Cp,4 =       1243 pcph       Cp,1 =       648 vhp         Conflicting Flows:       Vc,4 = V2 + V3 =       293 vhp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                 |                                                               | ٧7    |        | V8         |       | V9         |        |             |                                          |          |                                  |
| DLUME ADJUSTMENTS       1       2       3       4       5       6       7       8       9       10       11       12         HOVEMENT NO.       38       293       17       15       641       7       27       2       15       9       25       173         HOURLY FLOW RATE, V(vph)       53       293       17       15       641       7       30       2       17       10       28       190         IEP 1: RT FROM MINOR STREET       VC9 = 1/2 V3 + V2 =       293       vhp       Vc12 = 1/2 V6 + V5 =       645       vhp         Conflicting Flows:       VC9 = 1/2 V3 + V2 =       293       vhp       Cp,12 =       653       pcph         Movement Capacity:       Cp,9 =       984       pcph       Cm,12=Cp,12=       653       pcph         Prb. of Queu-free State:       po,9=1-v9/Cm,9=       0.98       po,12=1-v12/Cm,12=       0.71         TEP 2: LT FROM MAJOR STREET       Cp,4 =       1243       pcph       Cp,1 =       648       vhp         Potential Capacity:       Cp,4 =       1243       pcph       Cp,1 =       648       vhp         Potential Capacity:       Cm,4=Cp,4=       1243       pcph       Cn,1=Cp,1= <td>Q=N,1=LT,2=TR,3=LTR)</td> <td>E .</td> <td></td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Q=N,1=LT,2=TR,3=LTR)                                                                            | E .                                                           |       |        |            |       |            |        |             |                                          |          |                                  |
| MOVEMENT NO.       1       2       3       4       5       6       7       8       9       10       11       12         HOURLY FLOW RATE, V(vph)       38       293       17       15       641       7       27       2       15       9       25       173         YOLUME, v (pcph)       53       293       17       15       641       7       30       2       17       10       28       190         TEP 1: RT FROM MINOR STREET       Image: Conflicting Flows:       Vc9 = 1/2       V3 + V2 =       293       vhp       Vc12 = 1/2       V6 + V5 =       645       vhp         Potential Capacity:       Cp, 9 =       984       pcph       Cp, 12 =       653       pcph         Prb. of Queu-free State:       po, 9=1-v9/Cm, 9=       0.98       po, 12=1-v12/Cm, 12=       0.71         TEP 2: LT FROM MAJOR STREET       Image: Conflicting Flows:       Vc, 4 = V2 + V3 =       293       vhp       Vc, 1 = V5 + V6 =       648       vhp         Potential Capacity:       Image: Cp, 4 =       1243       pcph       Cm, 1=Cp, 1=       842       pcph         Potential Capacity:       Image: Cm, 4=Cp, 4=       1243       pcph       Cm, 1=Cp, 1=       648 <t< td=""><td></td><td>[</td><td>HINOF</td><td>R STRE</td><td>ET - 0<br/></td><td>MAUPI</td><td>0 RD<br/></td><td></td><td></td><td></td><td></td><td></td></t<>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                 | [                                                             | HINOF | R STRE | ET - 0<br> | MAUPI | 0 RD<br>   |        |             |                                          |          |                                  |
| HOVEMENT NO.       1       2       3       4       5       6       7       8       9       10       11       12         HOURLY FLOW RATE, V(vph)       38       293       17       15       641       7       27       2       15       9       25       173         YOLUME, v (pcph)       53       293       17       15       641       7       30       2       17       10       28       190         TEP 1: RT FROM MINOR STREET        Vc9 = 1/2 V3 + V2 =       293 vhp       Vc12 = 1/2 V6 + V5 =       645 vhp         Conflicting Flows:       Vc9 = 1/2 V3 + V2 =       293 vhp       Vc12 = 1/2 V6 + V5 =       645 vhp         Potential Capacity:       Cp, 9 =       984 pcph       Cp, 12 =       653 pcph         Prb. of Queu-free State:       po, 9=1-v9/Cm, 9=       0.98       po, 12=1-v12/Cm, 12=       0.71         TEP 2: LT FROM MAJOR STREET        Vc, 4 = V2 + V3 =       293 vhp       Vc, 1 = V5 + V6 =       648 vhp         Conflicting Flows:       Vc, 4 = V2 + V3 =       293 vhp       Cp, 1 =       842 pcph         Potential Capacity:       Cp, 4 =       1243 pcph       Cp, 1 =       648 vhp         Prb. of Queu-free State:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | NINF ADJUSTMENTS                                                                                |                                                               |       |        |            |       |            |        |             |                                          |          |                                  |
| HOURLY FLOW RATE, V(vph)       38       293       17       15       641       7       27       2       15       9       23       173         VOLUME, v (pcph)       53       293       17       15       641       7       30       2       17       10       28       190         TEP 1: RT FROM MINOR STREET         Conflicting Flows:       Vc9 = 1/2 V3 + V2 =       293 vhp       Vc12 = 1/2 V6 + V5 =       645 vhp         Potential Capacity:       ICp,9 =       984 pcph       Cp,12 =       653 pcph         Movement Capacity:       ICm,9=Cp,9=       984 pcph       Cm,12=Cp,12=       653 pcph         Prb. of Queu-free State:       Ipo,9=1-v9/Cm,9=       0.98       Po.12=1-v12/Cm,12=       0.71         TEP 2: LT FROM MAJOR STREET         Conflicting Flows:       Vc,4 = V2 + V3 =       293 vhp       Vc,1 = V5 + V6 =       648 vhp         Potential Capacity:       ICp,4 =       1243 pcph       Cp,1 =       842 pcph         Prb. of Queu-free State:       Ipo,4=1-v4/Cm4=       0.99       Po.1=1-v1/Cm1=       0.94         Major Left Shared Lane       Ipo,4=1-v4/Cm4=       0.99       Ipo,1=1-v1/Cm1=       0.92                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                 | 1 2                                                           |       |        |            |       |            |        |             | 11                                       | 12       |                                  |
| VOLUME, v (pcph)       53 293 17 15 641 7 30 2 17 10 20 170         TEP 1: RT FROM MINOR STREET                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                 |                                                               |       |        |            |       |            |        |             |                                          |          |                                  |
| Conflicting Flows:       VC9 = 1/2 V3 + V2 =       293 Vhp       VC12 = 1/2 V6 + V3 =       043 Vhp         Potential Capacity:       Cp,9 =       984 pcph       Cp,12 =       653 pcph         Movement Capacity:       Cm,9=Cp,9=       984 pcph       Cm,12=Cp,12=       653 pcph         Prb. of Queu-free State:       po,9=1-v9/Cm,9=       0.98       po,12=1-v12/Cm,12=       0.71         TEP 2: LT FROM MAJOR STREET       Image: Conflicting Flows:       Vc.4 = V2 + V3 =       293 vhp       Vc,1 = V5 + V6 =       648 vhp         Conflicting Flows:       Vc.4 = V2 + V3 =       293 vhp       Vc,1 = V5 + V6 =       648 vhp         Potential Capacity:       Image: Cp,4 =       1243 pcph       Cm,1=Cp,1=       842 pcph         Movement Capacity:       Image: Cm,4=Cp,4=       1243 pcph       Cm,1=Cp,1=       0.94         Prb. of Queu-free State:       po,4=1-v4/Cm4=       0.99       po,1=1-v1/Cm1=       0.94         Major Left Shared Lane       Image: Cm,4=1-v4/Cm4=       0.99       Image: Cm,1=Image: Cm,1=       0.92                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                 | 53 293                                                        | 17 15 | 641    | 1          | 30    | 2          | 1/     | <br>TA      | 28                                       |          |                                  |
| Conflicting Flows:       VC9 = 1/2 V3 + V2 =       293 Vnp       VC12 = 1/2 V6 + V3 =       043 Vnp         Potential Capacity:       Cp,9 =       984 pcph       Cp,12 =       653 pcph         Movement Capacity:       Cm,9=Cp,9=       984 pcph       Cm,12=Cp,12=       653 pcph         Prb. of Queu-free State:       po,9=1-v9/Cm,9=       0.98       po,12=1-v12/Cm,12=       0.71         TEP 2: LT FROM MAJOR STREET       Image: Conflicting Flows:       Vc,4 = V2 + V3 =       293 vhp       Vc,1 = V5 + V6 =       648 vhp         Conflicting Flows:       Vc,4 =       V2 + V3 =       293 vhp       Vc,1 = V5 + V6 =       648 vhp         Potential Capacity:       Cp,4 =       1243 pcph       Cp,1 =       842 pcph         Movement Capacity:       Cm,4=Cp,4=       1243 pcph       Cm,1=Cp,1=       842 pcph         Prb. of Queu-free State:       po,4=1-v4/Cm4=       0.99       po,1=1-v1/Cm1=       0.94         Major Left Shared Lane       Image: Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Content and Con                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | TCO 1. OT COOM WINDD STOFFT                                                                     | ·····                                                         |       |        |            | 1     |            |        |             |                                          |          |                                  |
| Contricting Flows:       Cp,9 =       984 pcph       Cp,12 =       653 pcph         Movement Capacity:       Cm,9=Cp,9=       984 pcph       Cm,12=Cp,12=       653 pcph         Prb. of Queu-free State:       po,9=1-v9/Cm,9=       0.98       po,12=1-v12/Cm,12=       0.71         TEP 2: LT FROM MAJOR STREET       Image: Conflicting Flows:       Vc,4 = V2 + V3 =       293 vhp       Vc,1 = V5 + V6 =       648 vhp         Conflicting Flows:       Vc,4 =       V2 + V3 =       293 vhp       Cp,1 =       842 pcph         Potential Capacity:       Cp,4 =       1243 pcph       Cp,1 =       842 pcph         Movement Capacity:       Cm,4=Cp,4=       1243 pcph       Cm,1=Cp,1=       842 pcph         Prb. of Queu-free State:       po,4=1-v4/Cm4=       0.99       po,1=1-v1/Cm1=       0.94         Major Left Shared Lane       Image: Contract Capacity       Image: Contract Capacity       Image: Contract Capacity       0.92                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                 | $\frac{1}{100} = \frac{1}{2} \sqrt{3} + \frac{1}{2} \sqrt{3}$ | ¥2 =  | 293    | vhp        | i     | Vc12       | : 1/2  | V6 +        | ¥5 =                                     |          |                                  |
| Potential capacity:       Cm,9=Cp,9=       984 pcph       Cm,12=Cp,12=       653 pcph         Prb. of Queu-free State:       po,9=1-v9/Cm,9=       0.98       po,12=1-v12/Cm,12=       0.71         TEP 2: LT FROM MAJOR STREET       Image: Conflicting Flows:       Vc.4 = V2 + V3 =       293 vhp       Vc.1 = V5 + V6 =       648 vhp         Conflicting Flows:       Vc.4 = V2 + V3 =       293 vhp       Vc.1 = V5 + V6 =       648 vhp         Potential Capacity:       Cp,4 =       1243 pcph       Cp,1 =       842 pcph         Movement Capacity:       Cm,4=Cp,4=       1243 pcph       Cm,1=Cp,1=       842 pcph         Prb. of Queu-free State:       po,4=1-v4/Cm4=       0.99       po,1=1-v1/Cm1=       0.94         Major Left Shared Lane       0.92       0.92       0.92                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                 | •                                                             | -     |        |            |       |            |        |             |                                          |          |                                  |
| Prb. of Queu-free State:       po,9=1-v9/Cm,9=       0.98       po,12=1-v12/Cm,12=       0.71         TEP 2: LT FROM MAJOR STREET       Image: Conflicting Flows:       Vc.4 = V2 + V3 =       293 vhp       Vc.1 = V5 + V6 =       648 vhp         Conflicting Flows:       Vc.4 = V2 + V3 =       1243 pcph       Cp.1 =       842 pcph         Potential Capacity:       Cm,4=Cp,4=       1243 pcph       Cm,1=Cp,1=       842 pcph         Movement Capacity:       Cm,4=Cp,4=       1243 pcph       Cm,1=Cp,1=       842 pcph         Prb. of Queu-free State:       po,4=1-v4/Cm4=       0.99       po,1=1-v1/Cm1=       0.94         Major Left Shared Lane       0.92       Image: Content of the state       0.92                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                 | Cm,9=Cp,9=                                                    |       |        | •          |       |            |        |             |                                          |          | pcph                             |
| TEP 2: LT FROM MAJOR STREET       Vc.4 = V2 + V3 =       293 vhp       Vc.1 = V5 + V6 =       648 vhp         Conflicting Flows:       Vc.4 = V2 + V3 =       293 vhp       Vc.1 = V5 + V6 =       648 vhp         Potential Capacity:       Cp.4 =       1243 pcph       Cp.1 =       842 pcph         Hovement Capacity:       Cm,4=Cp.4=       1243 pcph       Cm,1=Cp.1=       842 pcph         Prb. of Queu-free State:       po,4=1-v4/Cm4=       0.99       po,1=1-v1/Cm1=       0.94         Major Left Shared Lane       0.92                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                 | po,9=1-v9/Cm,9=                                               |       | 0.98   |            | ł     | po,12      | :1-v12 | /Cm,1       | 12=                                      | 0.71<br> |                                  |
| Conflicting Flows:       Vc.4 = V2 + V3 =       293 Vnp       Vc.1 = V3 + V6 =       040 Vnp         Potential Capacity:       Cp.4 =       1243 pcph       Cp.1 =       842 pcph         Movement Capacity:       Cm.4=Cp.4=       1243 pcph       Cm.1=Cp.1=       842 pcph         Prb. of Queu-free State:       po.4=1-V4/Cm4=       0.99       po.1=1-V1/Cm1=       0.94         Major Left Shared Lane       1       0.92       1       0.92                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                 |                                                               |       |        |            |       |            |        |             |                                          |          |                                  |
| Confricting FlustCp,4 =1243 pcphCp,1 =842 pcphPotential Capacity:Cm,4=Cp,4=1243 pcphCm,1=Cp,1=842 pcphMovement Capacity:Cm,4=Cp,4=1243 pcphCm,1=Cp,1=842 pcphPrb. of Queu-free State:po,4=1-v4/Cm4=0.99po,1=1-v1/Cm1=0.94Major Left Shared Lane0.920.920.92                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                 | i<br>14-4 - 43 - 47                                           | -     | 293    | vho        | -     | Vc.1       | = vs + | ¥6 :        | :                                        | 648      | vhp                              |
| Potencial capacity:cp,4=cp,4=1243 pcphCm,1=Cp,1=842 pcphHovement Capacity:Cm,4=Cp,4=1243 pcph0.91=1-v1/Cm1=0.94Prb. of Queu-free State:po,4=1-v4/Cm4=0.99po,1=1-v1/Cm1=0.94Major Left Shared Lane0.920.920.92                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                 |                                                               | -     |        |            |       |            |        |             |                                          |          |                                  |
| Prb. of Queu-free State: po,4=1-v4/Cm4= 0.99 po,1=1-v1/Cm1= 0.94<br>Major Left Shared Lane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                 |                                                               |       |        |            |       | • -        |        |             |                                          | 842      | pcph                             |
| Major Left Shared Lane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                 |                                                               |       |        |            | i     |            |        | <b>m1</b> = |                                          | 0.94     |                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                 | i indiant talona.                                             |       |        |            | i     |            | •      |             |                                          |          |                                  |
| WIND, THE MURDIN LEDG MARING IN WEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                 | 1<br>10#0.4=                                                  |       | 0.98   |            | Ì     | p*o,i      | :      |             |                                          | 0.92     |                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                 |                                                               |       |        |            |       |            |        |             | con                                      | LINUE    | a                                |

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| Major Street: KULA HWY                             |           |                  |            | 12222222222222 | ============================ | NALYSIS<br>======== | 1994 HCM         | مي            |
|----------------------------------------------------|-----------|------------------|------------|----------------|------------------------------|---------------------|------------------|---------------|
| Major Street: KULA HWY<br>Minor Street: OMAOPIO RD |           |                  |            |                |                              | DAT                 | E: 27-Jun-95     |               |
| Scenario: YEAR 2005 +                              | 0001501   |                  |            |                |                              | Analys              | t: 8C            |               |
| Peak Hour: AM                                      | PROJECT   |                  |            |                |                              | File Ham            |                  | <b>**</b>     |
|                                                    |           |                  |            |                | Intesection                  | Intesection         | \$: 4            | :             |
| STEP 3: TH FROM MINOR STREET                       | · · ·     |                  |            |                |                              |                     |                  |               |
| Conflicting Flows:                                 | •         | 8 = 1/273        |            |                |                              |                     |                  | A             |
|                                                    | 1         | 2 - 1/243<br>2   | **2**1**0  |                |                              | 1/2V6+V5+V4+V       |                  |               |
| Potential Capacity:                                | 100 8     | -                |            | 994 vph        | :                            |                     | 987 vph          |               |
| Capacity Adj Factor:                               | f9 =      | -                |            | 328 pcph       | Cp,11 =                      |                     | 331 pcph         | La            |
| Novement Capacity:                                 | Ca. 8     | = Cn 8\$f\$      | ↓ -<br>} - | 0.91           | T11 = po,                    | 4*po,1 =            | 0.91             |               |
| Movement Capacity:<br>Prob. of Queue-free State    | · !no 8   | $= 1 - vR/C_{m}$ |            | 278 pcpn       | Um,11 = C                    | p,11*f11 =          | 300 pcph         | ,             |
|                                                    |           | - 1 VO/CM        |            | 0.79 ;         | po,11 = 1·                   | -v11/Cm,11 =        | 0.91             |               |
| TEP 4: LT FROM MINOR STREET                        | !         |                  |            |                |                              |                     | *************    | <b>B</b> arra |
| Conflicting Flows:                                 | Vc.7      | = 1/2V3+V        | 2+V1+1/2   | V6+V5+V4+      | V= 10 = 1                    |                     |                  | l.            |
| •                                                  |           | 1/2(1)1          | ±V12) =    | 1090 vph ;     |                              | 296+95+94+1/2       |                  |               |
| Potential Capacity:                                | Cp7 =     |                  |            | 248 pcph       | Cp10 =                       | ?(V8+V9) =          | •                | <b>L</b>      |
| Major Left, Minor Through                          | 1         |                  |            |                | CP10 -                       |                     | 279 pcph         |               |
| Impedance Factor:                                  | P''7=     | po,11≭f11        | :          | 0.82           | P''10≂po,8                   | <b>tf0</b> -        |                  |               |
| Major Left, Minor Through                          | -         |                  |            | 1              | P 10-p0,6                    | -10 -               | 0.90             | £             |
| Adjusted Impedance Factor                          | : [p'7 =  |                  |            | 0.86           | p'10 =                       |                     |                  |               |
| Capacity Adjustment Factor                         | : {f7 = } | 7*00.12          | :          | ,              |                              | *po,9 = (           | ).92             | • •           |
| Movement Capacity:                                 | C. 7      | : f7*Cp.7        | :          | 152 pcph       | $f_{10} = p_{10}$            | 0*Cp,10 =           | 7.71<br>754 aash |               |
|                                                    |           |                  |            |                | ·····                        | v-cp,1v -           | 234 pcpr         | 6 1           |
| LAY AND LEVEL OF SERVICE SU                        | MMARY     |                  |            | AVG            | 1                            | <br>                |                  | •             |
|                                                    |           |                  |            | TOTA           |                              | r<br>I              |                  |               |
| KOVENENT                                           | v(pcph    | ) ca(pop         | h) csh(p   | cph) DELA      |                              | \$<br>              |                  | 8             |
|                                                    |           |                  |            |                |                              |                     |                  | · · /         |
| MINOR LEFT TURN (7)                                | 30        | 152              | SHRD       | SHRD           |                              | I FVEL DE SE        | RVICE CRITERIA   | •             |
| HINOR THROUGH (8)                                  | 2         | 298              | 221        | 20.            |                              |                     | ATICE CALIENIN   | 2             |
| MINOR RIGHT TURN (9)                               | 17        | 984              | SHRD       | SHRD           | -                            | 1                   | AVG              |               |
|                                                    |           |                  |            | ••••••         |                              | LEVEL               | TOTAL            | <b>۴</b>      |
| MINOR LEFT TURN (10)                               | 10        | 254              | SHRD       | SHRD           |                              | OF                  | DELAY            |               |
| MINOR THROUGH (11)                                 | 28        | 300              | 538        | 11.9           |                              | SERVICE             | (SEC/VEH)        | 4 1           |
| MINOR RIGHT TURN (12)                              | 190       | 653              | SHRD       | SHRD           |                              |                     | (360/ 760)       | <b>*</b> -    |
|                                                    |           |                  |            |                |                              | A                   | <=5              |               |
| MAJOR LEFT (1)                                     | 53        | 842              | HA         | 4.6            | A                            | 8                   | >5&<=10          | ۷             |
| MAJOR LEFT (4)                                     | 15        | 1243             | NA         |                |                              | c c                 | >10&<=20         | <b>t</b> = 1  |
|                                                    |           |                  |            |                |                              | D                   | >20&<=30         |               |
| MINOR APPROACH (7)(8)(9)                           | •         | -                | •          | 20.9           | D                            | Ē                   | >30&<=45         | • •           |
| MINOR APPROACH (10)(11)(12)                        | -         | -                | •          | 11.5           |                              | F                   | >45              |               |
|                                                    |           |                  |            |                |                              | •                   |                  | F             |
| HAJOR APPROACH (1)(2)(3)                           | •         | -                | -          | 0.7            | A                            |                     |                  |               |
| HAJOR APPROACH (4)(5)(6)                           | -         | •                | -          | 0.1            | A L                          |                     |                  | · 1           |
| TOTAL INTERSECTION (1-12)                          |           |                  |            |                |                              |                     |                  | <b>₹</b> .~4  |
|                                                    |           |                  |            |                |                              |                     |                  |               |

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| Minor Street: 0                     | ULA HWY<br>MAOPIO RD <sup>.</sup><br>EAR 2005 +<br>PN | PRO                 | JECT            |       |             |     |       |        |          |       |            |      |                | Ana         | DATE:<br>lyst:<br>Hame:<br>Dn #: | 27-Jun-9<br>BC<br>KULDMA- |
|-------------------------------------|-------------------------------------------------------|---------------------|-----------------|-------|-------------|-----|-------|--------|----------|-------|------------|------|----------------|-------------|----------------------------------|---------------------------|
|                                     |                                                       |                     | •••••<br>•<br>• |       |             |     | ٧12   |        | V11      |       | ¥10        |      |                |             | *****                            |                           |
| Peak Hour Fac                       | ctor: 1                                               | .00                 |                 |       |             |     | 53    |        | 14       |       | 5          |      |                | <b>(-</b> - | NORT                             | H                         |
| HAJOR STA                           | REET                                                  |                     |                 |       |             |     | 1     |        | 1        |       | !          |      |                |             |                                  |                           |
| Num of Lanes -                      |                                                       | 1                   |                 |       |             |     | i     |        | i        |       | i          |      |                |             |                                  |                           |
| Excl LT - VI ()                     |                                                       | R                   |                 |       |             |     | i     |        |          |       | <u>`</u> ۱ |      |                |             |                                  |                           |
| Excl RT - V3 ()                     |                                                       | N I                 |                 |       |             |     | ć     |        | , v      |       | '          | >    |                |             |                                  |                           |
| Stop/Yield - V3 (Y                  |                                                       | Ŷ                   |                 |       |             |     | •     |        | •        |       |            |      |                |             |                                  |                           |
| Grade - V1,V2                       |                                                       | 2                   |                 |       |             | •   |       |        |          |       |            |      | •              |             |                                  |                           |
| 0:000 - 11,12                       | .,                                                    | 4 1                 |                 |       |             | 1   |       |        |          |       |            |      | ١              |             |                                  |                           |
| Hum of Lanes -                      | ¥5:                                                   | 1                   | V1              | 141   |             | -   |       |        |          |       |            |      |                | -           | 3 V6                             |                           |
| Excl LT - V4 (Y                     |                                                       | Ĥ                   | ••              |       |             |     |       |        |          |       |            |      |                |             |                                  |                           |
| Excl RT - V6 (Y                     |                                                       |                     | ٧2              | 612   |             | >   |       |        |          |       |            |      | (              | - 41        | 4 V5                             |                           |
|                                     |                                                       | - n - j<br>- 11 - 1 | 12              | 012   |             |     |       |        |          |       |            |      | •              | 74          |                                  |                           |
| Stop/Yield - V6 (Y                  |                                                       | . 1                 | 11.7            | 37    |             |     |       |        |          |       |            |      |                | - 1         | 7 14                             |                           |
| Grada - ¥4,¥5                       | ,401                                                  | -2                  | 42              | 23    |             | 1   |       |        |          |       |            |      | 1              | - 1         |                                  |                           |
| MINOR STR                           | EET                                                   | ·                   |                 |       |             | `٧  |       |        |          |       |            |      | v              | MAJOR       | STREET                           | ſ                         |
| Num of Lanes -                      | · V8:                                                 | 1                   |                 |       |             |     |       |        |          |       |            |      |                | KULA        | HNY                              |                           |
| Grade - V7,V8                       |                                                       | 0                   |                 |       |             |     | ٢     |        | -        |       |            | >    |                |             |                                  |                           |
| Shared Lane-V7,                     | -                                                     | 3                   |                 |       |             |     | 1     |        | !        |       | 1          | r i  |                |             |                                  |                           |
| (0=H,1=LT,2=TR,3=L                  | •                                                     |                     |                 |       |             |     | Ľ.    |        | 1        |       |            |      |                |             |                                  |                           |
| (4-011-0112-0010-0                  |                                                       | 1                   |                 |       |             |     |       |        | 1        |       | 1          |      |                |             |                                  |                           |
| Num of Lanes -                      | V11.                                                  | 1                   |                 |       |             |     | 23    |        | 22       |       | 22         |      |                |             |                                  |                           |
| Grade - V10,V11,                    |                                                       |                     |                 |       |             |     | 24    |        | 44       |       | 44         |      |                |             |                                  |                           |
|                                     |                                                       | 0                   |                 |       |             |     |       |        | uo       |       | 20         |      |                |             |                                  |                           |
| Shared Lane-V10,11                  | -                                                     | 3                   |                 |       |             |     | ¥7    |        | ¥8       |       | ٧9         |      |                |             |                                  |                           |
| (0=N,1=LT,2=TR,3=L                  | .(8)                                                  | i                   |                 |       |             |     | нтиля | e stri | EET - O  | MANPT | 0.80       |      |                |             |                                  | •                         |
|                                     |                                                       |                     |                 |       |             |     |       |        | •=-=     |       |            |      | *              |             |                                  |                           |
| VOLUNE ADJUSTNENTS                  |                                                       | ł                   |                 |       |             |     |       |        |          |       |            |      |                |             | _                                |                           |
| HOVEMENT NO.                        | _                                                     | ł                   |                 | 1     | 2           |     |       | 5      | 6        | 7     |            | 9    | 10             | 1           |                                  |                           |
| HOURLY FLOW RAT                     | E, Y(vph)                                             | F                   |                 |       |             |     | 17    |        |          |       | 22         |      | 5              |             | 4 53                             |                           |
| YOLUNE, v (pcph                     | )                                                     | . 1                 |                 | 197   | 612         | 23  | 17    | 414    | 3        | 25    | 24         | 24   | 6              | 1           | 5 58                             |                           |
|                                     |                                                       |                     |                 |       |             |     |       |        |          |       |            |      |                |             |                                  |                           |
| STEP 1: RT FROM MI                  |                                                       | •                   | u_ <b>^</b>     |       |             |     | _     |        | <b>L</b> | i     | 11-10      |      | <b>n</b> 117 - | 11 <b>1</b> |                                  | uhe                       |
| Conflicting Flo                     |                                                       | •                   |                 |       | 2 43 1      | YZ  | -     |        | vhp      | •     |            | •    | 2 16 1         | r ¥3 =      |                                  | vhp                       |
| Potential Capac                     |                                                       |                     | Cp,9            |       |             |     |       |        | pcph     |       | Cp,12      |      |                |             |                                  | pcph                      |
| Hovement Capaci                     |                                                       |                     | Cm,9:           |       |             |     |       |        | pcph     |       |            |      | 12:            |             |                                  | pcph                      |
| Prb. of Queu-fr                     | ee State:                                             | 1                   | pa,9:           | =1-v9 | )/Cm,9      | )=  |       | 0.96   |          | 1     | po,12      | =1-v | 12/Cm,         | 12=         | 0.93                             |                           |
| STEP 2: LT FROM MA                  | JOR STREFT                                            |                     |                 |       |             |     |       |        |          | !     |            |      |                |             |                                  |                           |
| Conflicting Flo                     |                                                       |                     | Vc.4            | :: V2 | 2 + V3      | : : |       | 612    | vhp      | 1     | Vc.1       | : 15 | + ¥6           | :           | 417                              | vhp                       |
| Potential Capac:                    |                                                       |                     | Cp,4            |       |             |     |       |        | pcph     |       | Cp,1       |      | • • •          | -           |                                  | pcph                      |
| ruisiliat lapac.                    | 16 <b>7</b> 0                                         |                     |                 |       | -           |     |       |        | poph     |       | Cm,1=      |      | -              |             |                                  | poph                      |
|                                     | <b>*</b> ***                                          | - B.                |                 |       |             |     |       |        | ou nn    |       | UM.13      | いりょし |                |             | 1003                             | hehit                     |
| Movement Capaci                     | -                                                     |                     | Cm,4:           |       |             |     |       |        | hohit    |       |            |      |                |             |                                  |                           |
| Hovement Capaci<br>Prb. of Queu-fro | ee State:                                             |                     |                 |       | -<br> /C∎4= | 1   |       | 0.98   | hohu     |       |            |      | /Ca1=          |             | 0.82                             |                           |
| Movement Capaci                     | ee State:<br>ed Lane                                  |                     |                 | :1-v4 |             | 1   |       |        | hehu     |       |            |      |                |             |                                  |                           |

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|---------------------------------------------------|-------------|------------|-------------------|-------------|-----------|-------|-----------------|---------------|------------|
| or Street: KULA HWY                               |             |            |                   |             |           |       | Analyst:        | BC            |            |
| )r Street: OMAOPIO RD<br>Scenario: YEAR 2005 + PR | OTECT       |            |                   |             |           |       | File Name:      | XULOMA-P      | t          |
| Peak Hour: PN                                     | 09201       |            |                   |             | Intesecti | on I  | ntesection #:   | 4             |            |
|                                                   |             |            |                   |             |           |       |                 |               | Ŀ          |
| 9 3: TH FROM MINOR STREET                         | i<br>Ivo A  | = 1/2¥3+¥2 | +01+04+04         | i<br>4Va !  | Vc. 11    | : 1/  | 246+45+44+43+4  | 2+V1          |            |
| Conflicting Flows:                                | • •         | :          |                   | 87 vph      |           |       |                 | 34 vph        |            |
| Potential Capacity:                               |             | -          |                   |             | Cp,11     |       | _               | 61 pcph       |            |
| Capacity Adj Factor:                              |             |            |                   |             |           |       | po,1 = 0.1      | 71            |            |
| lovement Capacity:                                | !Cn.8 =     | Co.8*f8 =  | 1                 |             |           |       | 11*f11 = 18     | 34 pcph       |            |
| Prob. of Queue-free State:                        | ;po,8 =     | 1-v8/Cm,8  | = <sup>.</sup> 0. | 87          | po,11     | = 1-v | 11/Cm,11 = 0.9  | 72            | B.         |
| ***************************************           |             |            |                   |             |           |       |                 |               |            |
| 4: LT FROM MINOR STREET                           |             | 1/2V3+V2+  | U111/0841         | UCIUAL I    | Vc 10     | = 1/2 | V6+V5+V4+1/2V3  | FV2+V1+       |            |
| Conflicting Flows:                                |             | 1/2434424  |                   |             | 10,10     | 1/2   | V8+V9) = 120    | 08 vph        | ٩.         |
| tabantia) Canaaituu                               | ;<br> Cp7 = | 112/11114  |                   | 08 pcph     | Cp10 =    |       |                 | 12 pcph       |            |
| Potential Capacity:<br>Major Left, Minor Through  | i<br>Iohi - |            | 2                 | i na kaku 1 | ohra -    |       |                 |               |            |
| Impedance Factor:                                 | 19"7=       | o,11*f11 = | 0.                | 65          | P''10=    | po.8¥ | f8 = 0.6        | 51            | 6-         |
| lajor Left, Minor Through                         | 1           |            |                   | !           |           |       | •               |               |            |
| Adjusted Impedance Factor:                        | n'7 =       |            | 0.                | 73          | p'10 =    |       | 0.7             | 70            | ,          |
| Capacity Adjustment Factor:                       |             | 7*00.12 =  | 0.                | 68          | •         |       | po,9 =      0.6 | 57            | <b>.</b>   |
| lovement Capacity:                                | Cm.7 =      | f7*Cp,7 =  | 1                 | 41 pcph     | Cm,10     | = f10 | *Cp,10 = 14     | 43 pcph       | ,          |
|                                                   |             |            |                   |             |           |       |                 |               | •          |
| AY AND LEVEL OF SERVICE SUM                       | MARY        |            |                   | AV<br>Tota  |           |       | i<br>I          |               | <b>s</b> - |
|                                                   |             | ) cm(pcph  | ) cch/aca         |             |           | OS    | 1               |               | <b>7</b> . |
| IOVENENT                                          |             |            | / csn(pep         |             |           |       | 1               |               | •          |
| INOR LEFT TURN (7)                                | 25          |            |                   | SHR         |           | ••    | LEVEL OF SER    | VICE CRITERIA | <b>j</b> - |
| IINOR THROUGH (8)                                 | 24          |            |                   | 25          |           | D     |                 |               | <b>5</b> , |
| INOR RIGHT TURN (9)                               | 24          | 678        | SHRD              | SHR         | • •       |       | LEVEL           | AVG<br>Total  |            |
|                                                   | ,           | 117        | 01100             | euo         | •         |       | OF              | DELAY         | •          |
| INOR LEFT TURN (10)                               | 6           | 143        | SHRD              | SHR         |           | ~     | SERVICE         | (SEC/VEH)     | <b>5</b> - |
| NINOR THROUGH (11)                                | 15          | 184<br>853 | 412<br>Shrd       | 10<br>Shri  |           | C     | i JERVICC       | (300) 1007    |            |
| INOR RIGHT TURN (12)                              | 58          | 039        | SHKU              | SUK         | •         |       | A               | <=5           | ā          |
| MAJOR LEFT (1)                                    | 197         | 1085       | NA                | 4           | .1        | A     | 1 B             | >5&<=10       | ÷.         |
| AJOR LEFT (1)                                     | 17          | 876        | NA                |             | .2        | A     | C               | >10&<=20      | е .,       |
|                                                   | • '         | 414        |                   | ,           |           |       | D               | >20&<=30      | а          |
| TINOR APPROACH (7)(8)(9)                          | -           | -          | -                 | 25          | .5        | D     | E E             | >30&<=45      | <b>*</b> - |
| (INOR APPROACH (10)(11)(12)                       | -           | -          | •                 | 10          |           | C     | f F             | >45           | 2          |
|                                                   |             |            |                   |             |           |       |                 |               |            |
| (AJOR APPROACH (1)(2)(3)                          | -           | -          | -                 |             | .0        | A     |                 |               |            |
| AJOR APPROACH (4)(5)(6)                           | -           | -          | •                 | 0           | .2        | A     |                 |               | B-1        |
| TOTAL INTERSECTION (1-12)                         |             |            |                   | •           | .1        | A     | i '             |               |            |

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| lajor Street: KULA HWY<br>linor Street: KEKAULIKE AV<br>Peak Hour: AM<br>Scenario: YEAR 2005 + PR |                    |                     |                       |                     |              |       |                  | Ana<br>File<br>Interse |      | : BC<br>: KULKEK-A  |
|---------------------------------------------------------------------------------------------------|--------------------|---------------------|-----------------------|---------------------|--------------|-------|------------------|------------------------|------|---------------------|
| Peak Hour Factor: 1.00<br>MAJOR STREET                                                            |                    | 376                 | >                     |                     |              |       | <                | - 175                  | V    | 5                   |
| Hum of Lanes - V2: 1                                                                              | •                  | 0                   |                       |                     |              |       |                  | - 22                   | ۷    | 4                   |
|                                                                                                   | ¥3                 | 8                   | 、                     |                     |              |       | 1                |                        |      |                     |
| Stop/Yield - V3 (Y/N): N<br>% Grade - V2,V3: 2                                                    |                    |                     | `v                    |                     |              |       | v                | MAJOR S<br>Kula HW     |      | :                   |
| Num of Lanes - V5: 1                                                                              | ł                  |                     | •                     | (                   |              | >     |                  |                        |      |                     |
| Excl LT - V4 (Y/H): H                                                                             | i                  |                     |                       | ۱                   |              | 1     |                  |                        |      |                     |
| \$ Grade - V4,V5: -2                                                                              |                    |                     |                       |                     |              |       |                  |                        |      |                     |
| MINOR STREET                                                                                      |                    |                     |                       | 20                  |              | 61    |                  |                        |      | NORTH>              |
| Hum of Lanes - V7,V9: 1                                                                           |                    |                     |                       |                     |              |       |                  |                        |      |                     |
| Shared Lane (Y/N): Y                                                                              |                    |                     |                       |                     |              | ٧٩    |                  |                        |      |                     |
| \$ Grade - V7&V9: -2                                                                              | ¦<br>              |                     | MINOR ST              | REET:               | KEKAUL       | LKE A | ¥<br>            |                        |      |                     |
| VOLUNE ADJUSTMENTS                                                                                |                    |                     |                       |                     |              |       | 5                | 7                      |      | 9                   |
| MOVEMENT NO.                                                                                      |                    |                     | 3                     | 4<br>22             |              |       | 175              | 20                     |      | 61                  |
| VOLUME, V (vph)<br>VOLUME, v (pcph)                                                               | 376                | )<br>)              | 8<br>8                | 22                  |              |       | 175              | 20                     |      | 61                  |
| STEP 1: RT FROM MINOR STREE<br>Conflicting flows:<br>Potential Capacity:<br>Movement Capacity:    | Vc,9 = 1<br>Cp,9 = | 1/2*V3+V2<br>Cp,9 = | 1                     | 4                   | +            | 376   | :                |                        | 889  | vph<br>pcph<br>pcph |
| STEP 2: LT FROM MAJOR STREE                                                                       | r - V4             |                     |                       |                     |              |       |                  |                        | 704  | vph                 |
| Conflicting Flows:                                                                                | 1                  | Yc,4 =              | V3+V2 =               |                     | 8            | t     | 376 =            |                        |      | pcph                |
| Potential Capacity:                                                                               | ł                  | Cp,4 =              | • • •                 |                     |              |       |                  |                        |      | poph .              |
| Hovement Capacity:<br>Prob. of Queue-free State                                                   | :                  | Cm,4 =<br>po,4 =    | Cp,4 =<br>1-v4/Cm,4 = | :                   |              |       |                  |                        | 0.98 | <b>F-F</b>          |
| Najor Left Shared Lane<br>Prob. of Queue-free Stat                                                | B:                 | p*o,4 =             |                       |                     |              |       |                  |                        | 0.98 |                     |
| STEP 3: LT FROM MINOR STREE                                                                       | <br>T - V7         |                     |                       |                     |              |       |                  |                        |      |                     |
| Conflicting Flows:                                                                                | ł                  | Vc,7 =              | 1/2¥3+¥2+¥5           | j <del>i</del> ¥4 = |              |       |                  |                        |      | vph                 |
| Potential Capacity:<br>Capacity Adjustment Facto                                                  | •                  | Cp,7 =              |                       |                     |              |       |                  |                        |      | pcph                |
| Due To Impeding Movement                                                                          |                    | f7=p0,4             | =                     |                     |              |       |                  |                        | 0.98 |                     |
| Novement Capacity:                                                                                |                    | Cm,7 =              |                       |                     |              |       |                  | *******                | 480  | pcph<br>            |
| DELAY AND LEVEL OF SERVICE<br>Novement                                                            | v(vo               | :ph)                | c#(pcph               | )                   | csh<br>(pcph |       | G TOTAL<br>DELAY | LOS                    |      |                     |
| MINOR LEFT TURN (7)                                                                               |                    | <br>!0              | 480                   | -                   | SHRD         | -     | SHRD             | SHRD                   |      |                     |
| MINOR RIGHT TURN (9)                                                                              |                    |                     | 889                   |                     | 734          |       | 5.5              | B                      |      |                     |
| MAJOR LEFT TURN (4)                                                                               |                    | 22                  | 1125                  |                     |              | -<br> | 3.3              | A                      |      |                     |
| AVERAGE NINOR APPROACT                                                                            |                    |                     |                       |                     | 0405 T       |       | THTEDSEC         | TON DEL                | Y =  | 0.8 sec/veh         |

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| Major Street: KULA NY       Date: 27-50         Minor Street: KEANULE AY       File Name: 80         Peak Nor: Far 2005 PROJECT       Intersection: 5         Manual Street: Far 2005 PROJECT       Intersection: 5         Peak Nor: Far 2005 PROJECT       Intersection: 5         Manual Street: Far 2005 PROJECT       Intersection: 5         Peak Nor: Far 20 (YM): N       V2       20         Mus of Lanss - V2: 1       V       V         Stop/Yield - V3 (YA): N       V3       27                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ATA Inc.         | STOP CO                   | NTROLLED          | T-INTERSECTIO | N LEVEL OI | SERVICE   | AKALTSIS<br>======= |              | 1994 HCN          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------|-------------------|---------------|------------|-----------|---------------------|--------------|-------------------|
| Hinor Street: EXAMULTE AV       File Name: KULKK-P         Pask Hour: PH       Intersection: 5         Pask Hour: FAR 2005 + PROJECT       Intersection: 5         Pask Hour: Fast 2017: 1.00       V2       280         Pask Hour: Fast 2017: 1.00       V2       280         Num of Lanes - V3: 1       V3       27         Stop/Tide - V3 (VR): N       V       20         Num of Lanes - V3: 1       V       V         Excl. IT - V3 (VR): N       V       V         Num of Lanes - V3: 1       V       V         Excl. IT - V3 (VR): N       V       V         A Grade - V4.V5: -2       V       NULA HAY         Num of Lanes - V5: 1       V       V         Stored Lane (VR): Y       Y       V         Y       Y       Y         Y       Y       Y         Y       Y       Y         Y       Y       Y         Y       Y       Y         Y       Y       Y         Y       Y       Y         Y       Y       Y         Y       Y       Y         Y       Y       Y         Y       Y       Y <th>Hainr Street: XU</th> <th>LA HWY</th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Hainr Street: XU | LA HWY                    |                   |               |            |           |                     |              |                   |
| Peak Hour:         PH         FILE NAME:         ACKLAR           Senaric:         YEAR 2005 + PR0JECT         Intersection:         5           Peak Hour Factor:         1.00         V         280                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                           |                   |               |            |           |                     |              |                   |
| Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection:           Intersection: <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>-</td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                           |                   |               |            |           |                     |              | -                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                           | ECT               |               |            |           |                     | Intersection | ): J              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | nook Hour Fortor | • 1 00 !                  |                   |               |            |           |                     |              |                   |
| Hue of Lanos - V2: 1       V3       27        57       V4         Stop/Tidel - V3 (Y/H): H       V3       27        57       V4         Nue of Lanos - V5: 1       V       V       Nue of Lanos - V7: 1       Nue of Lanos - V7: 1       Nue of Lanos - V7: 1       V       Nue of Lanos - V7: 9: 1       V       V       Nue of Lanos - V7: 9: 1       V       V       Nue of Lanos - V7: 9: 1       V       V       V       NUE NUE       NUE NUE       NUE NUE       V       V       NUE NUE       E NUE NUE NUE NUE NUE NUE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | •                |                           | V2 2              | 80            | ->         |           | <b>&lt;</b>         | 384          | /5                |
| Excl RT - V3 (Y/R): N       V       V       V       Halde STREET:<br>XULA HAY         StopYield - V3 (Y/R): N       V       V       Halde STREET:<br>XULA HAY         Num of Lanes - V2, V3: 2       V       Halde STREET:<br>XULA HAY         Num of Lanes - V4, V(R): N       N       V       V       Halde STREET:<br>XULA HAY         Num of Lanes - V7, V9: 1       V       V       V       V       NORTH>         Num of Lanes - V7, V9: 1       V       V7       V9       V9         Starde - V4, V9: -2       V       V1       V9         Starde - V4, V9: -2       V1       V9       V1       V9         StopViller Allow STREET: V9       V1       V9       V1       V9         VOLUME, V (vph)       280       27       57       384       22       38         VULME, V (vph)       280       27       57       384       22       38         STEP 1: RT FROM HINGS STREET - V9       200       27       57       384       22       39         STEP 2: LI FROM HADDE STREET - V9       200       27       27       280       294       vph         Potential Capacity:       Cp. 9 =       92       93       926       93       926                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                           |                   |               |            |           |                     | e7 1         | 44                |
| \$\$ Grade - V2, V3: 2       V       V       Mous Addetsion Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Stree |                  | <b>.</b>                  | V3                | 27            |            |           | ,                   | 57           | **                |
| \$\$ Grade - V2, V3: 2       V       V       Mous Addetsion Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Streetsing Stree | Stop/Yield - V3  | (Y/N): N                  |                   | ١             |            |           |                     | NATOD STOFF  | τ.                |
| Num of Lanes - V5: 1       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V       V                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                           |                   | ۷             |            |           | v                   |              | 1.                |
| Excl LT - V4 (V/N): N<br>% Grade - V4,V5: -2       2       38       NORTH>         Num of Lanes - V7,V9: 1       22       38       NORTH>         Shared Lane (V/N): Y       Y       Y7       Y9         \$ Grade - V7XV9: -2       HINOR STREET: KEKAULIKE AV         VOLUME ADJUSTNENTS       Y       Y7       Y9         NOVEMENT NO.       2       3       4       5       7       9         VOLUME, V (vph)       280       27       57       384       22       38         VOLUME, V (pcph)       280       27       57       384       22       38         STEP 1: RI FROM MINOR STREET - V9       Conflicting Flows:       1 Vc, 9 = 1/24V3FV2 =       14       280       =       294       Vph         Potential Capacity:       C G, 9 =       983 pcph       983 pcph       983 pcph         Movement Capacity:       C G, 4 = C D, 4 =       1224 pcph       1224 pcph       1224 pcph         Movement Capacity:       C G, 4 = 1-V4/CE, 4 =       0.95       1224 pcph       1224 pcph         Potential Capacity:       C G, 4 = 1-V4/CE, 4 =       0.94       1224 pcph       1224 pcph         Movement Capacity:       C G, 7 = 1/2V3FV2+V5+V4 =       0.94       1224 pcph                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Num of Lanas     | - 45- 1                   |                   |               | <          | :         | <b>&gt;</b>         |              |                   |
| 4 Grade - V4, V5: -2       22       38       HORTH>         Hua of Lanes - V7, V9: 1       22       38       HORTH>         Shared Lane (V/N): Y       Y       V7       V9         A Grade - V7, V9: -2       Y1       Y7       V9         MUMENT NO.       2       3       4       5       7       9         MUMENT NO.       2       3       4       5       7       9         VOLUME, ADJUSTNENTS       280       27       57       384       22       38         VOLUME, V (pcph)       280       27       57       384       22       38         STEP 1: RT FROM MINOR STREET - V9       Conflicting Flows:   Vc, 9 = 1/2#V3*V2 =       14       +       280       294       vph         Potential Capacity:       Cp, 9 =       933       pcph       933       pcph         Potential Capacity:       Cp, 4 =       0,94       224       pch         Movement Capacity:       Cp, 4 =       0,74 =       0,224       pch         Prob. of Queue-free State:       p.4 = 1-v4/(a, 4 =       0.55       1224       pch         Movement Capacity:       Cc, 7 = 1/2V3+V2+S+V4 =       0.54       0.54       0.54       0.54                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                           |                   |               | 1          | - 1       |                     |              |                   |
| NINOR STREET         22         33         NORTH>           Nus of Lanes - V7, V9: 1         V7         V9           Shared Lane (V/M): Y         V7         V9           * Grade - V74V9: -2         V1HNOR STREET: KERAULKE AV           VOLUME AOUUSTMENTS         2         3           MOVENENT NO.         2         3         4           VOLUME, V (vph)         280         27         57           VOLUKE, V (pcph)         280         27         57           STEP 1: RT FROM MINOR STREET - V9         Conflicting Flows:         V C, 9 = 1/22V34V2 =         14         280         2           STEP 2: LI FROM MADOR STREET - V9         Conflicting Flows:         V C, 9 = 1/22V34V2 =         14         280         2         38           STEP 2: LI FROM MADOR STREET - V9         Conflicting Flows:         V C, 4 = V34V2 =         27         + 280         =         307         Vph           Potential Capacity:         C D, 4 =         1224         pch         1224         pch           STEP 2: LI FROM MADOR STREET - V4         C G, 4 = C D, 9 =         307         Vph           Conflicting Flows:         V C, 7 = 1/V4/Ca, 4 =         0.95         1224         pch           Movement Capacity: <td></td> <td></td> <td></td> <td></td> <td>ł</td> <td>-</td> <td></td> <td></td> <td></td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                           |                   |               | ł          | -         |                     |              |                   |
| Num of Lanes - V7,V9: 1       V7       V9         Shared Lane (Y/M): Y       V7       V9         \$ Grade - V74V9: -2       HING STREET: KEKAULIKE AV         VOLUME ADJUSTMENTS       2       3         MOVERENT NO.       2       3       4       5       7       9         VOLUME, V (vph)       280       27       57       384       22       38         VOLUME, V (vph)       280       27       57       384       22       38         VOLUME, V (vph)       280       27       57       384       22       38         VOLUME, V (vph)       280       27       57       384       22       38         VOLUME, V (vph)       280       27       57       384       22       38         VOLUME, V (vph)       280       27       57       384       22       38         VOLUME, V (vph)       280       27       57       384       22       38         VOLUME, V (vph)       280       27       57       384       22       38         STEP 1: AF FADM HINDR STREET - V9       Conflicting Flows:       VC,4 = V3+V2 =       27       4       20       507       pph                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1 diaus          | 14,12                     |                   |               | Ì          | ł         |                     |              |                   |
| Nus of Lanes - V7,V9:       1       V7       V9         X Grade - V74V9:       -2       HINOR STREET: KEKAULIKE AV         VOLUME ADJUSIMENIS       2       3       4       5       7       9         MOVENENT K0.       2       3       4       5       7       9         VOLUME ADJUSIMENTS       280       27       57       384       22       38         VOLUME, V (vph)       280       27       57       384       22       38         VOLUME, V (vph)       280       27       57       384       22       38         STEP 1: RT FROM MINOR STREET - V9       280       27       57       384       22       38         STEP 2: LT FROM MINOR STREET - V9       280       27       57       983       pcph         Potential Capacity:       Cp,9 =       983       pcph       983       pcph         Koreant Capacity:       Cp,4 =       V3+V2 =       27       + 280       1224       pch         Potential Capacity:       Cp,4 =       0,94       1244       pch       pch       1244       pch         Prob. of Queue-free State:       po,4 = 1-v4/Cm,4 =       0.95       1244       pch       1244                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  | REET                      |                   |               | 22         | 31        | 8                   |              | NORTH>            |
| Shared Lang (Y/N):       Y       Y       Y       Y       Y         ¥ Grade - V7&V9:       -2:       HINOR STREET:       KEKAULIKE AV         VOLUME, V(pch)       280       27       57       384       22       38         STEP 1:       RT FROM MINOR STREET - V9       280       27       57       384       22       38         STEP 1:       RT FROM MINOR STREET - V9       280       27       983       925       926         Novement Capacity:       (Cp, 9 =       983       920       983       920       927         STEP 2:       LT FROM MAJOR STREET - V4       Ca, 4 = Cp, 4 =       1224       920       924       926         Potential Capacity:       Cp, 4 =       V4/Ca, 4 =       0.95       935       926         Prob. of Queue-free State:       pp6.4 =       0.94       925       926       926         Prob. of Queue-free State:       pr0.42                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |                           |                   |               |            |           |                     |              |                   |
| \$ Grade - V74V9: -2 !       HIND STREET: READULAE AV         VOLUME ADJUSTMENTS       00VEMENT NO.       2       3       4       5       7       9         VOLUME, V (vph)       280       27       57       384       22       38         VOLUME, V (vph)       280       27       57       384       22       38         STEP 1: RF FAUM MINDR STREET - V9       200       27       57       384       22       38         STEP 1: RF FAUM MINDR STREET - V9       C0.9 =       933       pcph         Potential Capacity:       C0.9 =       933       pcph         Potential Capacity:       Cm, 4 = Cp.9 =       933       pcph         Potential Capacity:       Cm, 4 = Cp.9 =       937       poth         Prob. of Queue-free State:       po.4 = 1-v4/Cm.4 =       0.95         Prob. of Queue-free State:       p50, 4 =       0.94       275       375       y98       pcph         STEP 3: LI FROM MINOR STREET - V7       Conflicting Flows:       V c, 7 = 1/2V34V2 + V54V4 =       0.95       935       poth         Prob. of Queue-free State:       p50, 4 =       0.94       1-v4/Cm.4 =       0.95         Prob. of Queue-free State:       p50, 4 =       0.94       0.94 <td></td> <td></td> <td>i<br/>t</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                  |                           | i<br>t            |               |            |           |                     |              |                   |
| MOVEMENT NO.       2       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       3       4       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       <                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                           |                   | HINC          | R STREET:  | KEKAULIKE | AV                  |              |                   |
| MOVEMENT NO.       2       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       4       3       3       4       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       3       <                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                           |                   |               |            |           |                     |              |                   |
| NOVELNE, V (vph)       20       27       57       384       22       38         VOLUME, V (pph)       280       27       57       384       22       38         STEP 1: RT FROM HINOR STREET - V9         Conflicting Flows:   Vc,9 = 1/2*V3+V2 =       14       +       280       =       294       vph         Potential Capacity:       Cp,9 =       983       pcph         Movement Capacity:       Cm,p = Cp,9 =       983       pcph         STEP 2: LI FROM MAJOR STREET - V4       Cp,4 =       1224       pcph         Conflicting Flows:       Vc,4 = V3+V2 =       27       +       280 =       307       Vph         Potential Capacity:       Cp,4 =       1224       pcph       1224       pcph         Movement Capacity:       Cp,4 =       0.95       98       pcph         Prob. of Queue-free State:       pro,4 =       0.95       98       pcph         Conflicting Flows:       Vc,7 = 1/2V3+V2+V5+V4 =       735       vph         Conflicting Flows:       Cp,7 =       398       pcph         Prob. of Queue-free State:       pro,4 =       0.94       338       pcph         Conflicting Flows:       Cp,7 =       375                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                  | 110                       | 2                 | 3             | 4          |           | 5                   | 7            | -                 |
| VULUKE, V (pch)       20       27       57       384       22       38         STEP 1: RI FROM MINOR STREET - V9         Conflicting Flows:   Vc,9 = 1/2±V3+V2 =       14       + 280       =       294       vph         Potential capacity:   Cp,9 =         Movement Capacity:   Cm,p = Cp,9 =         STEP 2: LT FROM MAXOR STREET - V4         Conflicting Flows:   Vc,4 = v3+v2 =       27       + 280       =       307       vph         Optential Capacity:   Cm,4 = Cp,4 =         Potential Capacity:   Cp,4 =         Potential Capacity:   Cp,4 =         Potential Capacity:   Cp,4 =         Potential Capacity:   Cp,4 =         Potential Capacity:   Cp,4 =       0.95         Movement Capacity:   Cp,7 =       0.94         Prob. of Queue-free State:   p <sup>2</sup> 0,4 =         Prob. of Queue-free State:   p <sup>2</sup> 0,4 =         Optential Capacity / Vc,7 = 1/2V3+V2+V5+V4 =         Optential Capacity:   Cp,7 =         Optential Capacity:   Vc,7 = 1/2V3+V2+V5+V4 =         Optential Capacity:   Cp,7 =         Optential Capacity:   Cp,7 =          0.94                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  | <b>L</b> )                |                   |               | 57         |           | 384                 |              |                   |
| NUCKET, V (pp)         STEP 1: RT FROM MINOR STREET - V9         Conflicting Flows:         VC, 9 = 1/2±V3HV2 :       14 + 280 :       294 vph         Potential Capacity:       Cp, 9 :       983 pcph         Movement Capacity:       Cm, p : Cp, 9 :       983 pcph         STEP 2: LT FROM MAJOR STREET - V4       Conflicting Flows:       VC, 4 = V3+V2 :       27 + 280 :       307 vph         Potential Capacity:       Cp, 4 :       Cp, 4 :       1224 pcph         Potential Capacity:       Cp, 4 :       0.94 :       0.95         Prob. of Queue-free State:       pa, 4 :       0.95         Prob. of Queue-free State:       p±0, 4 :       0.94         Potential Capacity:       VC, 7 : 1/2V3+V2+V5+V4 :       398 pcph         Capacity Adjusteent Factor       0.94       0.94         Due To Iapeding Novements:       f7=p0, 4:       0.94         Novement <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>384</td> <td>22</td> <td>38</td>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                           |                   |               |            |           | 384                 | 22           | 38                |
| Conflicting Flows:       ! Vc,9 = 1/2#V3#V2 =       14       Y       200       -       983 pcph         Potential Capacity:       ! Cp,9 =                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | TULUNC, V (PC    |                           |                   |               |            |           |                     |              |                   |
| Conflicting Flows:       YC, Y = 1/2V3VY2 -       YK = Y = KK = YK = YK = YK = YK = YK =                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | STEP 1: RT FROM  | MINOR STREET              | - 19              |               |            | 1 20      | •                   | - 294        | voh               |
| Potential Capacity:       : Cp,9 =       983 pcph         Novement Capacity:       : Cm,p = Cp,9 =         STEP 2: LI FROM MAJOR STREET - V4         Conflicting Flows:       : Vc,4 = V3+V2 =       27 + 280 =       307 vph         Potential Capacity:       : Cp,4 =       :: 1224 pcph         Movement Capacity:       : Cm,4 = Cp,4 =       :: 0.95         Major Left Shared Lane       : po,4 = 1-v4/Cm,4 =       :: 0.95         Prob. of Queue-free State:       : po,4 =       :: 0.94         STEP 3: LI FROM MINOR STREET - V7       :: Vc,7 = 1/2V3+V2+V5+V4 =       :: 735 vph         Conflicting Flows:       : Vc,7 = 1/2V3+V2+V5+V4 =       :: 398 pcph         Outential Capacity:         :: De To Lapeding Movements:       : f7=po,4=         :: Due To Lapeding Movements:       : f7=po,4=       :: 0.94         :: DeLAY AND LEVEL OF SERVICE SUMMARY       :: Csh AVG TOTAL       :: 0.94         :: MiNOR RIGHT TURN (7)       : 22       : 373       : 0.94         IMNOR SIRED TURN (7)       : 22       : 373         MiNOR RIGHT TURN (9)       : 38       : 983       : 615       : 6.5       : 8         MAJOR LEFT TURN (4)       : 57       : 1224       :       : 3.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Conflicting F    | lows:   Y                 | c,9 = 1/2         | *V3+V2 =      | 14         | T 20      | v                   |              |                   |
| Movement Capacity:       ; Cm, p = Cp, y =         STEP 2: LT FROM MAJOR STREET - V4       Conflicting Flows:       Vc, 4 = V3+V2 =       27 + 280 =       307 vph         Potential Capacity:       Cp, 4 =       1224 pcph         Potential Capacity:       Cm, 4 = Cp, 4 =       1224 pcph         Prob. of Queue-free State:       po, 4 = 1-v4/Cm, 4 =       0.95         Major Left Shared Lane       prob. of Queue-free State:       pro, 4 =       0.94         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       Vc, 7 = 1/2V3+V2+V5+V4 =       735 vph         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       Vc, 7 = 1/2V3+V2+V5+V4 =       398 pcph         Outential Capacity:       Cp, 7 =       0.94       0.94         Due To Iapeding Movements:       f7=po, 4=       0.94         DUE To Iapeding Movements:       f7=po, 4=       0.94         Movement Capacity:       Cm, 7 = Cp, 7 =       373 pcph         DELAY AND LEVEL OF SERVICE SUMMARY       Cm (pcph)       0ELAY       LDS         MINOR RIGHT TURN (7)       22       373       SHRD       SHRD         MINOR RIGHT TURN (9)       38       983       615       6.5       B         MAJOR LEFT TURN (4)       57       1224                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Potential Cap    |                           |                   | _             |            |           |                     |              |                   |
| Conflicting Flows:       Vc,4 = V34V2 =       27 + 280 -       0.00 + 000 -         Potential Capacity:       Cp,4 =       1224 pcph         Novement Capacity:       Cm,4 = Cp,4 =       0.95         Prob. of Queue-free State:       p0,4 = 1-v4/Cm,4 =       0.95         Major Left Shared Lane       p*0,4 =       0.94         Prob. of Queue-free State:       p*0,4 =       0.94         Prob. of Queue-free State:       p*0,4 =       0.94         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       Vc,7 = 1/2V3+V2+V5+V4 =       735 vph         Capacity Adjustment Factor       Due To Iapeding Movements:       f7=p0,4=       0.94         Due To Iapeding Movements:       f7=p0,4=       0.94       0.94         Movement Capacity:       'Cm,7 = Cp,7 =       373 pcph         Movement V(vcph)       cm(pcph)       OELAY LOS         Movement V(vcph)       cm(pcph)       OELAY LOS         MINOR LEFT TURN (7)       22       373       SHRD       SHRD         MINOR RIGHT TURN (9)       38       983       615       6.5       B         MAJOR LEFT TURN (4)       57       1224        3.1       A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Novement Capa    | city: ¦ (                 | <b>m</b> ,p = Cp, | 9 =           |            |           |                     |              | ,                 |
| Conflicting Flows:       Vc,4 = V3+V2 =       2/       Y       280 -       1224 pcph         Potential Capacity:       Cp,4 =       1224 pcph       1224 pcph         Novement Capacity:       Cm,4 = Cp,4 =       0.95         Prob. of Queue-free State:       pc,4 =       0.94         Prob. of Queue-free State:       p²o,4 =       0.94         Prob. of Queue-free State:       p²o,4 =       0.94         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       Vc,7 = 1/2V3+V2+V5+V4 =       735 vph         Conflicting Flows:       Vc,7 = 1/2V3+V2+V5+V4 =       398 pcph         Capacity Adjustment Factor       0.94       0.94         Due To Iapeding Movements:       f7=po,4=       0.94         Movement Capacity:       Cm,7 = Cp,7 =       373 pcph         Movement Queue free State:       v(vcph)       cm(pcph)       0ELAY         LOS       Movement Queue-free State:       f7=po,4=       0.94         DELAY AND LEVEL OF SERVICE SUMMARY       cm(pcph)       0ELAY       LOS         MINOR LEFT TURN       (7)       22       373       SHRD       SHRD         MINOR LEFT TURN       (9)       38       983       615       6.5       B         MAJOR LEFT TURH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | STEP 2: LT FROM  | HAJOR STREET              | - ¥4              |               |            | <b>.</b>  |                     | - 707        | voh               |
| Potential Capacity:       Cp, 4 =       1124 pcph         Movement Capacity:       Cm, 4 = Cp, 4 =       1224 pcph         Prob. of Queue-free State:       po, 4 = 1-v4/Cm, 4 =       0.95         Major Left Shared Lane       p*o, 4 =       0.94         Prob. of Queue-free State:       p*o, 4 =       0.94         STEP 3: LT FROM MINOR STREET - V7       0.94       0.94         Conflicting Flows:       Vc, 7 = 1/2V3+V2+V5+V4 =       735 vph         Potential Capacity:       Cp, 7 =       398 pcph         Capacity Adjustment Factor       0.94       0.94         Due To Impeding Movements:       f7=po, 4z       0.94         Due To Impeding Novements:       f7=cp, 7 =       373 pcph         DELAY AND LEVEL OF SERVICE SUMMARY       csh AVG TOTAL       LOS         Minor LEFT TURN (7)       22       373 SHRD       SHRD         MINOR RIGHT TURN (9)       38       983       615       6.5       B         MAJOR LEFT TURN (4)       57       1224        3.1       A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |                           | ; V               | c,4 = V3+V2 = | :          | 27 +      | 280                 |              |                   |
| Movement Capacity:       Cm,4 = Cp,4 =       122.7 pc/m         Prob. of Queue-free State:       po,4 = 1-v4/Cm,4 =       0.95         Major Left Shared Lane       p*o,4 =       0.94         Prob. of Queue-free State:       p*o,4 =       0.94         STEP 3: LT FRON MINOR STREET - V7       0.94         Conflicting Flows:       Vc,7 = 1/2V3+V2+V5+V4 =       735 vph         Potential Capacity:       Cp,7 =       398 pcph         Capacity Adjustment Factor       0.94       0.94         Due To Impeding Movements:       f7=p0,4=       0.94         Novement Capacity:       Cm,7 = Cp,7 =       373 pcph         DELAY AND LEVEL OF SERVICE SUMMARY       csh AVG TOTAL       LOS         MINOR LEFT TURN       (7)       22       373 SHRD       SHRD         MINOR RIGHT TURN       (9)       38       983       615       6.5       B         MAJOR LEFT TURN       (4)       57       1224        3.1       A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  |                           |                   | ;p,4 =        |            |           |                     |              |                   |
| Prob. of Queue-free State:       po,4 = 1-v4/Cm,4 =       0.75         Major Left Shared Lane       p*o,4 =       0.94         Prob. of Queue-free State:       p*o,4 =       0.94         SIEP 3: LT FROM MINOR STREET - V7       0.94         Conflicting Flows:       Vc,7 = 1/2V3+V2+V5+V4 =       735 vph         Potential Capacity:       Cp,7 =       398 pcph         Capacity Adjustment Factor       0.94         Due To Impeding Movements:       f7=po,4=       0.94         Movement Capacity:       Cm,7 = Cp,7 =       373 pcph         DELAY AND LEVEL OF SERVICE SUMMARY       Cm(pcph)       DELAY       LOS         MINOR LEFT TURN       (7)       22       373       SHRD       SHRD         MINOR RIGHT TURN       (9)       38       983       615       6.5       8         MAJOR LEFT TURN       (4)       57       1224        3.1       A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                           |                   |               |            |           |                     |              |                   |
| Hajor Left Shared Lane       prob. of Queue-free State:       prod. 4 =       0.94         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       YC,7 = 1/2Y3+V2+V5+V4 =       735 vph         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       YC,7 = 1/2Y3+V2+V5+V4 =       735 vph         Potential Capacity:       Cp,7 =       398 pcph         Capacity Adjustment Factor       0.94         Due To Impeding Movements:       f7=p0,4=       0.94         Movement Capacity:       Cm,7 = Cp,7 =       373 pcph         DELAY AND LEVEL OF SERVICE SUMMARY       Csh AVG TOTAL       0         Movement       v(vcph)       cm(pcph)       DELAY       LOS         MINOR LEFT TURN (7)       22       373       SHRD       SHRD         MINOR RIGHT TURN (9)       38       983       615       6.5       B         MAJOR LEFT TURH (4)       57       1224       3.1       A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Prob. of Que     | e-free State:             |                   | 00,4 = 1-v4/C | 1,4 =      |           |                     | 0.95         |                   |
| Prob. of Queue-free State:       pto,4 =       0.00000000000000000000000000000000000                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                  |                           | ł                 |               | •          |           |                     | 0.94         |                   |
| Conflicting Flows:Vc,7 = 1/2V3+V2+V5+V4 =105Potential Capacity:Cp,7 =398Capacity Adjustment Factor0.94Due To Impeding Movements:f7=po,4=Novement Capacity:Cm,7 = Cp,7 =DELAY AND LEVEL OF SERVICE SUNMARYcsh AVG TOTALMINOR LEFT TURNV(vcph)Cm(pcph)DELAYMINOR LEFT TURNC1V(vcph)Cm(pcph)MINOR RIGHT TURNC1V(vcph)Cm(pcph)MINOR RIGHT TURNC1V(vcph)C122STASHRDMINOR RIGHT TURNSTAV(vcph)C1224CallerStrandMINOR LEFT TURNC1V(vcph)C1224CallerStrandMINOR RIGHT TURNSTAV(vcph)C1224CallerStrandV(vcph)StrandCallerStrandV(vcph)StrandCallerStrandV(vcph)StrandCallerStrandV(vcph)StrandCallerStrandV(vcph)StrandCallerStrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Prob. of Que     | eue-free State            | : ; ;             | *0,4 =        |            |           |                     | V.74         |                   |
| Conflicting Flows:Vc,7 = 1/2V3+V2+V5+V4 =105Potential Capacity:Cp,7 =398Capacity Adjustment Factor0.94Due To Impeding Movements:f7=po,4=Novement Capacity:Cm,7 = Cp,7 =DELAY AND LEVEL OF SERVICE SUNMARYcsh AVG TOTALMINOR LEFT TURNV(vcph)Cm(pcph)DELAYMINOR LEFT TURNC1V(vcph)Cm(pcph)MINOR RIGHT TURNC1V(vcph)Cm(pcph)MINOR RIGHT TURNC1V(vcph)C122STASHRDMINOR RIGHT TURNSTAV(vcph)C1224CallerStrandMINOR LEFT TURNC1V(vcph)C1224CallerStrandMINOR RIGHT TURNSTAV(vcph)C1224CallerStrandV(vcph)StrandCallerStrandV(vcph)StrandCallerStrandV(vcph)StrandCallerStrandV(vcph)StrandCallerStrandV(vcph)StrandCallerStrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)StrandV(vcph)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                  |                           | - ¥7              |               |            |           |                     |              |                   |
| Potential Capacity:Cp,7 =398 pcphCapacity Adjustment Factor0.94Due To Impeding Movements:f7=po,4=Novement Capacity:Cm,7 = Cp,7 =DELAY AND LEVEL OF SERVICE SUMMARYcsh AVG TOTALMovementv(vcph)Cm(pcph)DELAYLOSMINOR LEFT TURN(7)22373SHRDSHRDMINOR RIGHT TURN(9)389836156.5BMAJOR LEFT TURN(4)5712243.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                  |                           |                   | /c.7 = 1/2V3+ | v2+v5+v4 = |           |                     |              |                   |
| Capacity Adjustment Factor<br>Due To Impeding Movements:f7=p0,4=0.94Novement Capacity:Cm,7 = Cp,7 =373 pcphDELAY AND LEVEL OF SERVICE SUMMARYcsh AVG TOTAL<br>(pcph)LOSMovementv(vcph)cm(pcph)MINOR LEFT TURN(7)22373SHRDSHRDMINOR RIGHT TURN(9)389836156.5MAJOR LEFT TURN(4)5712243.1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |                           |                   |               |            |           |                     | 398          | pcph              |
| Due To Impeding Movements:       : f7=p0,4=       373 pcph         Movement Capacity:       : Cm,7 = Cp,7 =       373 pcph         DELAY AND LEVEL OF SERVICE SUMMARY       csh AVG TOTAL       DELAY LOS         Movement       v(vcph)       cm(pcph)       DELAY LOS         MINOR LEFT TURN       (7)       22       373       SHRD       SHRD         MINOR RIGHT TURN       (9)       38       983       615       6.5       B         MAJOR LEFT TURN       (4)       57       1224        3.1       A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | PULENCIAL VA     | veuluy.<br>Wetmont Factor |                   | · F T ·       |            |           |                     |              |                   |
| Movement Capacity:       :       Cm,7 = Cp,7 =       S73 pcpm         DELAY AND LEVEL OF SERVICE SUMMARY       csh AVG TOTAL       DELAY       LOS         Movement       v(vcph)       cm(pcph)       DELAY       LOS         MINOR LEFT TURN       (7)       22       373       SHRD       SHRD         MINOR RIGHT TURN       (9)       38       983       615       6.5       B         MAJOR LEFT TURN       (4)       57       1224        3.1       A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                  |                           |                   | f7=00.4=      |            |           |                     |              |                   |
| DELAY AND LEVEL OF SERVICE SUMMARYcsh avg TotalMovementv(vcph)cm(pcph)DELAYMINOR LEFT TURN(7)22373SHRDSHRDSHRDMINOR RIGHT TURN(9)389836156.5BMAJOR LEFT TURN(4)571224                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                  |                           | • •               | Cm.7 = Co.7 = |            |           |                     | 373          | pcph              |
| DELAY AND LEVEL OF SERVICE SUMMAT       Cm(pcph)       (pcph)       DELAY       LOS         MOVEMENT       v(vcph)       cm(pcph)       0       0       0         MINOR LEFT TURN       (7)       22       373       SHRD       SHRD         MINOR RIGHT TURN       (9)       38       983       615       6.5       B         MAJOR LEFT TURN       (4)       57       1224        3.1       A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | UnAgment rah     |                           | ;<br>*********    |               |            |           |                     |              |                   |
| Hovement         V(VCph)         Curpony         <                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  | L OF SERVICE S            | UMMARY            | <u></u>       | ncnhì      |           |                     |              |                   |
| MINOR LEFT TURN (7)       22       373       SHRD       SHRD         MINOR RIGHT TURN (9)       38       983       615       6.5       B         MAJOR LEFT TURN (4)       57       1224        3.1       A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Novemant         |                           | v(vcph            | •             |            | -         |                     |              |                   |
| MINOR RIGHT TURN (7) 38 983 615 6.5 B<br>MINOR RIGHT TURN (9) 38 983 615 6.5 B<br>MAJOR LEFT TURN (4) 57 1224 3.1 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                  | 1104 (7)                  |                   |               |            |           | SHRD                | SHRD         |                   |
| MINOR RIGHT TORR (4) 57 1224 3.1 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  |                           |                   |               |            |           | 6.5                 | 8            |                   |
| NAUK LETT TOKA (4)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                  |                           |                   |               |            |           | 3.1                 | A            |                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                  |                           |                   |               |            |           |                     |              | • • • • • • • • • |

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| jor Street: KULA HWY<br>nor Street: ACCESS ROAD<br>Peak Hour: AM<br>Scenario: YEAR 2005 4 | ) "A"  |                  |       |          |           |       |      |        |          |   | A<br>Fil<br>Inters | e Name   | ::<br>:: | 27-Jun<br>BC<br>(ULRDA-A<br>6 |
|-------------------------------------------------------------------------------------------|--------|------------------|-------|----------|-----------|-------|------|--------|----------|---|--------------------|----------|----------|-------------------------------|
|                                                                                           | .00    |                  | 170   |          | )         |       |      |        | (        |   | 77                 | ١        | /5       |                               |
| MAJOR STREET<br>Num of Lanes - V2:                                                        | 1 1    | ۲4               | 110   |          |           |       |      |        | •        |   |                    |          |          |                               |
| Exc1 RT - V3 (Y/N):                                                                       |        | ٧3               | 24    |          |           |       |      |        |          |   | 5                  | ١        | /4       |                               |
| op/Yield - V3 (Y/N):                                                                      |        |                  |       | ١        |           |       |      |        | 1        |   |                    |          |          |                               |
| \$ Grade - V2,V3:                                                                         |        |                  |       | v        |           |       |      |        | ۷        |   | NAJOR<br>KULA H    |          | :        |                               |
| Num of Lanes - V5:                                                                        | 1      |                  |       |          | <         |       |      | >      |          |   |                    |          |          |                               |
| Excl LT - V4 (Y/N):                                                                       | N      |                  |       |          | 1         |       |      | 1      |          |   |                    |          |          |                               |
| \$ Grade - ¥4,¥5:                                                                         | -2     |                  |       |          |           |       |      | {      |          |   |                    |          |          |                               |
|                                                                                           |        |                  |       |          | i         | 69    |      | i<br>S |          |   |                    | <b>(</b> | NORTH    |                               |
| MINOR STREET                                                                              |        |                  |       |          |           | 07    |      |        |          |   |                    | •        |          |                               |
| ium of Lanes - V7,V9:<br>Shared Lane (Y/N):                                               | L<br>V | i                |       |          | ٧7        | 1     |      | ٧9     |          |   |                    |          |          |                               |
| \$ Grade - V74V9:                                                                         | -2     | 1<br> <br>       |       | HI       | NOR STREE |       |      | ROAD   | • "A"    |   |                    |          |          |                               |
| LUME ADJUSTNENTS                                                                          |        |                  |       |          |           |       |      |        | -        |   |                    |          | 9        |                               |
| MOVEMENT NO.                                                                              |        | 2                |       | 3        |           | 4     |      |        | 5        |   | 7<br>69            |          | 5        |                               |
| VOLUME, V (vph)                                                                           |        | 170              |       |          |           | 5     |      |        | 77<br>77 |   | 69                 |          | 5        |                               |
| VOLUME, v (pcph)                                                                          |        | 170              |       | 24       |           | J<br> |      |        |          |   |                    |          |          |                               |
| TEP 1: RT FROM MINOR ST                                                                   | REET   | - ¥9             |       |          |           |       |      |        |          |   |                    | 102      | vph      |                               |
| Conflicting Flows:                                                                        | Y      | c, 9 = 1         | /2*V3 | ŧ¥2 =    |           | 12    | +    | 170    |          | : |                    |          | pcph     |                               |
| Potential Capacity:<br>Movement Capacity:                                                 | C      | ₽,9 =<br>∎.0 = C | o.9 = | :        |           |       |      |        |          |   |                    |          | pcph     |                               |
|                                                                                           |        |                  |       |          |           |       |      |        |          |   |                    |          |          |                               |
| TEP 2: LT FROM MAJOR ST                                                                   |        | - 44             | Vn A  | = V3+V2  | :         |       | 24   | ŧ      | 170      | : |                    | 194      | vph      |                               |
| Conflicting Flows:                                                                        |        | 1                | Cp,4  |          |           |       | - '  | •      |          |   |                    |          | pcph     |                               |
| Potential Capacity:                                                                       |        |                  |       | = Cp,4   | :         |       |      |        |          |   |                    | 1386     | pcph     |                               |
| Movement Capacity:<br>Prob. of Queue-free S                                               | tate:  |                  | 00.4  | = 1-v4   | Cm.4 =    |       |      |        |          |   |                    | 1.00     |          |                               |
| Major Left Shared Lan                                                                     |        |                  |       | •        |           |       |      |        |          |   |                    |          |          |                               |
| Prob. of Queue-free                                                                       |        |                  | p*0,  | ,4 =     |           |       |      |        |          |   |                    | 1.00     |          |                               |
| TEP 3: LT FROM MINOR S                                                                    | TREET  | - 77             |       |          |           | 4 -   |      |        |          |   |                    | 264      | vph      |                               |
| Conflicting Flows:                                                                        |        | •                |       |          | 3+V2+V5+V | 4 :   |      |        |          |   |                    |          | pcph     |                               |
| Potential Capacity:                                                                       |        | •                | Cp,   | 1 7      |           |       |      |        |          |   |                    |          | r-r*     |                               |
| Capacity Adjustment F                                                                     | actor  |                  | ŧ7-   | pa,4=    |           |       |      |        |          |   |                    | 1.00     |          |                               |
| Due To Impeding Hove<br>Hovement Capacity:                                                | Ments: |                  |       | 7 = Cp,7 | :         |       |      |        |          |   |                    | 742      | pcph     |                               |
| ELAY AND LEVEL OF SERV                                                                    | ICE S  | UNMARY           |       |          |           |       | csh  |        | G TOTA   | L |                    |          |          |                               |
| Novement                                                                                  | ~~u 4  | v(vc)            | )<br> | c<br>    | e(pcph)   |       |      | -      |          |   | LOS<br>            | ;<br>    |          |                               |
| NINOR LEFT TURN (7)                                                                       | )      |                  |       |          | 742       |       | SHRD |        | SHRD     | • |                    |          |          |                               |
| MINOR RIGHT TURN (9)                                                                      |        |                  | 5     |          | 1120      |       | 759  |        | 5.3      |   | A                  |          |          |                               |
|                                                                                           |        |                  |       |          | 1704      |       |      | -      | 2.6      |   | A                  |          |          |                               |
| MAJOR LEFT TURN (4)                                                                       |        |                  | 5     |          | 1900      |       |      |        |          |   |                    |          |          |                               |

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| John J. D. Teke 2005 + PADJECT         Intersection:         6           Peak Nour Factor:         1.00         1/2         322                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Major Street: KULA HWY<br>Minor Street: ACCESS ROAD *<br>Peak Hour: PM<br>Scenario: YEAR 2005 + PM |               |                               |             |              | File         | Date:<br>alyst:<br>Name: | 27-Jun<br>BC<br>KULRDA-P |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|---------------|-------------------------------|-------------|--------------|--------------|--------------------------|--------------------------|--|
| Num of Lanes - V2; 1       V2       322                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                    | **********    |                               |             |              | 111601301    |                          | D                        |  |
| Nue of Lanes - V2: 1       1       1       1         ECL AT - V3 (Y/A): H       V3       83 5       V4         Stop/Yield - V3 (Y/A): H       V       HAJOR STREET: KULA HHY         Nue of Lanes - V5: 1       C       X       X         Excl LT - V4 (Y/A): H       Y       Y       HAJOR STREET: KULA HHY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | PEAK HOUF FACTOR: 1.00                                                                             | <br>  V2 72   |                               |             | 1            |              | UF                       |                          |  |
| Stop/Yield - v3 (Y/N): N       N       Najor Street: XULA HAY         Nue of Lanes - V5: 1       X       X       Najor Street: XULA HAY         Excl LT - V4 (YM): N       H       X       Starde - V4, V5: -2       XULA HAY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Rum of Lanes - V2: 1                                                                               |               | ······,                       |             | (            | 1/2          | V5                       |                          |  |
| t Grade - V2, V3: 2       v       v       MAJOR STREET:<br>KULA HAY         Num of Lanes - V7; 1<br>Excl LT - V4 (V/M): N<br>t Grade - V4, V5: -2       45       5       < NORTH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Excl RT - V3 (Y/H): H                                                                              | ¥3 83         |                               |             |              | 5            | ¥4                       |                          |  |
| Num of Langs - V5: 1<br>Excl LT - V4 (V/N): N<br>4 Grade - V4, V5: -2       Num of Langs - V7, V9: 1<br>Shared Lang (V/N): Y       Num of Langs - V7, V9: 1<br>Shared Lang (V/N): Y       V7       V9         Num of Langs - V7, V9: 1<br>Shared Lang (V/N): Y       V7       V9       V7       V9         VOLUME ADJUSTMENTS       V7       V9       V9       V1         NUMUKE ADJUSTMENTS       V0LUME, V (poh)       322       83       5       172       45       5         VOLUME, V (poh)       322       83       5       172       45       5       5         STEP 1: RI-FROM MINOR STREET - V9       Conflicting flows: 1       VC, 9 = 1/2*V3+V2 =       42       522       364       Vph         Potential Capacity: 1       Ca, p = Cp, p =       906       poph       906       poph         STEP 2: LT FROM MINOR STREET - V4       Conflicting flows: 1       VC, 4 = V3+V2 =       83       + 322       405       Vph         Movement Capacity: 1       Ca, p = Cp, 9 =       906       poph       906       poph         Frob. of Queue-free State: 1       po, 4 = 1-v4/Ca, 4 =       1.09       poph       90         Prob. of Queue-free State: 1       po, 4 = 1-v4/Ca, 4 =       1.00       N       N       90         STEP 3: LT RADM MINOR STREET - V                            | · · · · · · · · · · · · · · · · · · ·                                                              |               | 1                             |             | 1            |              |                          |                          |  |
| Nus of Lanes - V5: 1       1       1       1         Excl L1 - V4 (V/N): H       4       5       1         * Brade - V4,V5: -2       45       5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | * di dub - 42,43: 2                                                                                | i             | V                             |             | v            |              |                          |                          |  |
| \$ Grade - V4,V5: -2       45       5       NORTH         Num of Lanss - V7,V9: 1       1       5       5       NORTH         Shared Lans (Y/N): Y       Y       Y       Y       Y       Y         VOLUME ADJUSTMENTS       Y       Y       Y       Y       Y       Y         VOLUME ADJUSTMENTS       Y       Y       Y       Y       Y       Y         VOLUME, Y       Y       Y       Y       Y       Y       Y       Y         VOLUME, Y       Y       Y       Y       Y       Y       Y       Y         Y       Y       Y       Y       Y       Y       Y       Y       Y         Y       Y       Y       Y       Y       Y       Y       Y       Y         Y       Y       Y       Y       Y       Y       Y       Y       Y         Y       Y       Y       Y       Y       Y       Y       Y       Y       Y         Y       Y       Y       Y       Y       Y       Y       Y       Y       Y       Y       Y         Y       Y       Y       Y                                                                                                                                                                                                                                                                                                                                                   |                                                                                                    | 1             |                               | <u>ر</u>    | >            | NULH HWT     |                          |                          |  |
| Ave of Lanes - V7, V9: 1       45       5       C HORTH         Shared Lane (V/H): Y       Y       Y7       V9         t Grade - V7kV9: -2       Y7       V9         MUME AJUSTRENTS       Y7       V9         MOVENENT NO.       2       3       4       5       7       9         VOLUME, V (vph)       322       83       5       172       45       5         VOLUME, V (vph)       322       83       5       172       45       5         STEP 1: RT-FROM MINOR STREET - V9       Conflicting Flows:       V (v, 9 = 1/2*V3+V2 =.       42 + 322       364       vph         Moreantial Capacity:       Cp, 9 =       906       poph       906       poph         STEP 2: LT FROM MINOR STREET - V4       Conflicting Flows:       V (v, 4 = V3+V2 =       83 + 322 =       405       vph         Moreantial Capacity:       Cp, 4 =       1099       poph       poph       poph       poph         Prob. of Queue-free State:       p40, 4 =       0.99       0.99       0.99       0.99         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       V (7, 7 = 1/2V3+V2+V5+V4 =       0.99       0.99         Torn Licting Flowstent Factor       p40, 4 =                                                                                                                             |                                                                                                    | t<br>I        |                               | 1           | 1            |              |                          |                          |  |
| Num of Lanes - V7, V9: 1       1       V0                                                                                                                                                                                                                                                      | ¥ Grade - ¥4,¥5: -2                                                                                |               |                               | 1           |              |              |                          |                          |  |
| Num of Lanos - V7, V9: 1       1       V1       V7       V9         Shared Lane (Y/M): Y       V7       V9       V1       V9         Stared Lane (Y/M): Y       V1       V9       V1       V9         Stared Lane (Y/M): Y       V1       V9       V9       V1       V9         Stared Lane (Y/M): Y       V1       V9       V9       V1       V9         Volume Adjustments       V1       V9       V1       V9       V1         Volume, V (vph)       322       83       5       172       45       5         VOLUME, V (pch)       322       83       5       172       45       5         STEP 1: AF FROM MINOR STREET - V9       Conflicting Flows:       V C,9 = 1/2*V3+V2 =       42       422       364       vph         Movement Capacity:       Ca,9 = Cp,9 =       906       pcph       906       pcph         Movement Capacity:       Ca,4 = Cp,4 =       1099       pcph       90       pcph         Prob. of Queue-free State:       p±0,4 = 1-v4/Ca,4 =       1.00       1.00       M32       90         STEP 3: LT FROM MINOR STREET - V4       Conflicting Flows:       Y C,7 = 1/2V3+V2+V5+V4 =       0.99       0.99                                                                                                                                                                  | MINOR STREET                                                                                       | 1             |                               | 45          | i<br>c       | 1            | - 00070                  | r                        |  |
| 1 Grade - V74V9: -2 !       NIHOR STREET: ACCESS ROAD "A"         VOLUME ADJUSTMENTS         MOVEMENT NO.       2       3       4       5       7       9         VOLUME, V (vph)       322       83       5       1.72       45       5         VOLUME, V (vph)       322       83       5       1.72       45       5         VOLUME, V (vph)       322       83       5       1.72       45       5         VOLUME, V (pph)       322       83       5       1.72       45       5         VOLUME, V (pph)       322       83       5       1.72       45       5         VOLUME, V (pph)       322       83       5       1.72       45       5         STEP 1: AT FROM MINOR STREET - V9         Conflicting Flows:       VC,4 = V3+V2 =       83       +       322       906       pcph         Movement Capacity:       Cp,4 =       1099       pcph         Prob. of Queue-free State:       po,4 = 1-V4/Cm,4 =       1.00         Major Left Shared Lane       prod. 4 =       0.99          VC,7 = 1/2V3+V2+V5+V4 =                                                                                                                                                                                                                                                                              | Num of Lanes - ¥7,¥9: 1                                                                            |               |                               | 43          | 5            | (            | - 40818                  | I                        |  |
| VOLUME ADJUSTMENTS         MOVENENT NO.       2       3       4       5       7       9         VOLUME, V (vph)       322       83       5       172       45       5         VOLUME, V (oph)       322       83       5       172       45       5         STEP 1: RT FROM MINOR STREET - V9       Conflicting Flows:       1 Vc,9 = 1/22V3+V2 =.       42       +       322       =       364       vph         Potential Capacity:       1 Cp,9 =       906       pcph       906       pcph         STEP 2: LT FROM MJOR STREET - V4       Cn/1 icting Flows:       1 Vc,4 = V3+V2 =       83       +       322       =       405       vph         Potential Capacity:       Cp,4 =       0.9       =       906       pcph         Rovement Capacity:       Cp,4 =       1097       pcph       Novement Capacity:       0.99       906         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       yc,7 = 1/2V3+V2+V5+V4 =       0.99       0.99       906         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       yc,7 = 1/2V3+V2+V5+V4 =       0.99       0.99         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       if 7:po,4 =       0.99       0                                                                                                 | Shared Lane (Y/N): Y                                                                               | 1             |                               |             |              |              |                          |                          |  |
| MOVEMENT NO.       2       3       4       5       7       9         VOLUME, V (vph)       322       83       5       172       45       5         STEP 1: RT FROM MINOR STREET - V9       Conflicting Flows:       V C,9 = 1/2*V3*V2 =.       42       +       322       =       364       vph         Potential Capacity:       Cp,9 =       906       pcph       906       pcph         Movement Capacity:       Cp,9 =       906       pcph       906       pcph         STEP 2: LT FROM MAJOR STREET - V4       Conflicting Flows:       V C,4 = V3+V2 =       83       +       322       =       306       pcph         Movement Capacity:       Cp,4 =       1099       pcph       pcph       pcph       pcph       pcph       pcph         Movement Capacity:       Cp,4 =       1099       pcph                                                                                                                                                         | \$ Grade - V7&V9: -2                                                                               | ]             | NINOR ST                      | REET: ACCES | S ROAD "A"   |              |                          |                          |  |
| MOVEMENT ND.       2       3       4       5       7       9         VOLUME, V (vph)       322       83       5       172       45       5         STEP 1: RT FROM MINOR STREET - V9       Conflicting Flows:       V C,9 = 1/2*V3*V2 =.       42       +       322       =       364       vph         Potential Capacity:       Cp,9 =                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | VOLUNE ADJUSTMENTS                                                                                 |               |                               |             |              |              |                          |                          |  |
| VOLUME, V (vph)       322       83       5       172       45       5         VOLUME, V (pch)       322       83       5       172       45       5         STEP 1: RT-FROM MINOR STREET - V9       Conflicting Flows:       VC,9 = 1/2±V3+V2 =.       42       +       322       =       364       vph         Potential Capacity:       i       Cp,9 =       906       pcph         Movement Capacity:       i       Cp,9 =       906       pcph         STEP 2: LT FROM MAJOR STREET - V4       Conflicting Flows:       ! Vc,4 = V3+V2 =       83       +       322       =       405       vph         Potential Capacity:       ! Cp,4 =       0.99       pcph       1099       pcph         Prob. of Queue-free State:       pro,4 =       1.00       1.00       Major Left Shared Lane       p±o,4 =       0.99         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       ! Vc,7 = 1/2V3+V2+V5+V4 =       0.99       515       pcph         Capacity Adjustment Factor       !       Dv,7 =       ! S15       pcph         Due To Impeding Movements:       ! f7=p0,4=       0.99                                                                                                                                                                                                   | HOVEMENT NO.                                                                                       | 2             | 3                             | 4           | S            | 7            | 9                        |                          |  |
| STEP 1: AT FROM MINOR STREET - V9         Conflicting Flows:       VC,9 = 1/2*V3+V2 =.       42 + 322 =       364 vph         Potential Capacity:       Cp,9 =       906 pcph         Movement Capacity:       Cp,9 =       906 pcph         STEP 2: LT FROM MAJOR STREET - V4       VC,4 = V3+V2 =       83 + 322 =       405 vph         Conflicting Flows:       VC,4 = V3+V2 =       83 + 322 =       405 vph         Potential Capacity:       Cp,4 =       1099 pcph         Prob. of Queue-free State:       p0,4 = 1-v4/Cm,4 =       1.00         Major Left Shared Lane       p*0,4 =       0.99         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       VC,7 = 1/2V3+V2+V5+V4 =       541 vph         Potential Capacity:       Cp,7 =       515 pcph         Oue To appeding Movements:       f7=p0,4=       0.99         Movement Capacity:       Ca,7 = Cp,7 =       512 pcph         DeLAY AND LEVEL OF SERVICE SUMMARY       csh AVG TOTAL       Movement V(vcph)         MINOR LEFT TURM (7)       45       512       SHRD       SHRD         MHOR REGHT TURH (9)       5       906       536       7.4       8                                                                                                                                                           |                                                                                                    |               |                               |             | 172          | 45           | 5                        |                          |  |
| Conflicting Flows:       YC,9 = 1/2*V3+V2 =.       42 + 322 =       364 vph         Potential Capacity:       Cp,9 =       906 pcph         Movement Capacity:       Cm,p = Cp,9 =       906 pcph         STEP 2: LT FROM MAJOR STREET - V4       906 pcph         Conflicting Flows:       YC,4 = V3+V2 =       83 + 322 =       405 vph         Potential Capacity:       Cp,4 =       1099 pcph         Movement Capacity:       Cp,4 =       1099 pcph         Prob. of Queue-free State:       po,4 = 1-v4/Cm,4 =       1.00         Major Left Shared Lane       pro,4 =       0.99         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       VC,7 = 1/2V3+V2+V5+V4 =         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       Vc,7 = 1/2V3+V2+V5+V4 =         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       Pro,4 =         Dot of Queue-free State:       pfo,4 =       0.99         Movement Capacity:       Cp,7 =       S15 pcph         Capacity:       Cp,7 =       S12 pcph         Due To Tapeding Movements:       f7=po,4=       0.99         Movement Capacity:       Cm,7 = Cp,7 =       S12 pcph         DELAY AND LEVEL OF SERVICE SUMMARY       Csh AVG TOTAL       DMOR         MINOR                                             | YULUNE, V (PCPh)                                                                                   | 322           | 83                            | 5           | 172          | 45           | 5                        |                          |  |
| Conflicting Flows:       ! Vc,9 = 1/2*V3+V2 =.       42 + 322 =       364 vph         Potential Capacity:       ! Cp,9 =       906 pcph         Movement Capacity:       ! Cm,p = Cp,9 =       906 pcph         STEP 2: LT FROM MAJOR STREET - V4       0099 pcph         Conflicting Flows:       ! Vc,4 = V3+V2 =       83 + 322 =       405 vph         Potential Capacity:       ! Cp,4 =       1099 pcph         Movement Capacity:       ! Cm,4 = Cp,4 =       1099 pcph         Movement Capacity:       ! Cm,4 = 1-v4/Cm,4 =       1.00         Major Left Shared Lane       p*o,4 =       0.99         Tob. of Queue-free State:       ! p*o,4 =       0.99         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       ! Vc,7 = 1/2V3+V2+V5+V4 =         Potential Capacity:       ! Cp,7 =       S15 pcph         Capacity Adjustment Factor       !       0.99         Movement Capacity:       ! Cm,7 = Cp,7 =       S12 pcph         DELAY AND LEVEL OF SERVICE SUMMARY       csh AVG TOTAL       Movement         Movement       v(vcph)       cm(pcph)       DELAY       LDS                                                                                                                                                                                                  | STEP 1: RT FROM MINOR STREET                                                                       | <br>- V9      |                               |             | ,#=>=#>===== |              |                          |                          |  |
| Potential Capacity:       : Cp,9 =       906 pcph         Movement Capacity:       : Cm,P = Cp,9 =       906 pcph         STEP 2: LT FROM MAJOR STREET - V4       Conflicting Flows:       Vc,4 = V3+V2 =:       83 + 322 =:       405 vph         Potential Capacity:       : Cp,4 =:       1099 pcph         Movement Capacity:       : Cm,4 = Cp,4 =:       1099 pcph         Prob. of Queue-free State:       : po,4 = 1-v4/Cm,4 =:       1.00         Major Left Shared Lane       : p*0,4 =       0.99         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       : Vc,7 = 1/2V3+V2+V5+V4 =:         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       : Vc,7 = 1/2V3+V2+V5+V4 =:         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       : Vc,7 = 1/2V3+V2+V5+V4 =:         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       : Step 3:         Out To Impeding Movements:       : f7=p0,4=:       0.99         Movement Capacity:       : Cm,7 = Cp,7 =:       : Step 3:         DELAY AND LEVEL OF SERVICE SUMMARY       : Csh AVG TOTAL         Movement       : v(vcph)       : cm(pcph)       DELAY         MINOR LEFT TURM       : Sti2       : Sti2       : Stip Strep         MINOR RIGHT TURM       : Sti2       : Stip Strep | Conflicting Flows:   Y                                                                             | c,9 = 1/2≭V3+ | V2 =.                         | 42 ±        | 322          | = 36         | 4 voh                    |                          |  |
| STEP 2: LT FROM MAJOR STREET - V4       Conflicting Flows:       Vc.4 = V3+V2 =       83 + 322 =       405 vph         Potential Capacity:       Cp.4 =       1099 pcph         Hovement Capacity:       Ca.4 = Cp.4 =       1099 pcph         Prob. of Queue-free State:       p.4 = 1-v4/Cm.4 =       1.00         Major Left Shared Lane                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Potential Capacity: C                                                                              | p,9 =         |                               |             |              |              | •                        |                          |  |
| Conflicting Flows:       / Vc,4 = V3+V2 =       83 + 322 =       405 vph         Potential Capacity:       Cp,4 =       1099 pcph         Movement Capacity:       Cm,4 = Cp,4 =       1099 pcph         Prob. of Queue-free State:       po,4 = 1-v4/Cm,4 =       1.00         Major Left Shared Lane       p±o,4 =       0.99         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       / Vc,7 = 1/2V3+V2+V5+V4 =         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       / Vc,7 = 1/2V3+V2+V5+V4 =         Potential Capacity:       Cp,7 =       541 vph         Potential Capacity:       / Cp,7 =       515 pcph         Oue To Impeding Movements:       f7=po,4=       0.99         Movement Capacity:       / Cm,7 = Cp,7 =       512 pcph         DELAY AND LEVEL OF SERVICE SUMMARY       Csh AVG TOTAL       Movement         Movement       v(vcph)       cm(pcph)       DELAY       LOS                                                                                                                                                                                                                                                                                                                                                                      | novement capacity: C                                                                               | 1,p = Cp,9 =  |                               |             |              | 90           | s pcph                   |                          |  |
| Conflicting Flows:       Vc,4 = V3+V2 =       83 + 322 =       405 vph         Potential Capacity:       Cp,4 =       1099 pcph         Movement Capacity:       Cm,4 = Cp,4 =       1099 pcph         Prob. of Queue-free State:       po,4 = 1-v4/Cm,4 =       1.00         Major Left Shared Lane       p±o,4 =       0.99         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       Vc,7 = 1/2V3+V2+V5+V4 =         STEP 3: LT FROM MINOR STREET - V7       Conflicting Flows:       Vc,7 = 1/2V3+V2+V5+V4 =         Step 3: LT FROM MINOR STREET - V7       Conflicting Flows:       Vc,7 = 1/2V3+V2+V5+V4 =         Potential Capacity:       Cp,7 =       515 pcph         Capacity Adjustment Factor       Jue To Impeding Movements:       f7=po,4=       0.99         Movement Capacity:       Cm,7 = Cp,7 =       512 pcph         DELAY AND LEVEL OF SERVICE SUMMARY       Csh AVG TOTAL       Movement         Movement       v(vcph)       cm(pcph)       DELAY       LOS         MINOR RIGHT TURH (7)       45       512       SHRD       SHRD         MINOR RIGHT TURH (9)       5       906       536       7.4       8                                                                                                                                                    | STEP 2: LT FROM MAJOR STREET                                                                       | · ¥4          | ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ |             | ,            |              |                          |                          |  |
| Potential Capacity:       Cp.4 =       1099 pcph         Movement Capacity:       Cm.4 = Cp.4 =       1099 pcph         Prob. of Queue-free State:       po.4 = 1-v4/Cm.4 =       1.00         Major Left Shared Lane       p*o.4 =       0.99         STEP 3: LT FROM MINOR STREET - V7       0.99         Conflicting Flows:       Vc.7 = 1/2V3+V2+V5+V4 =       541 vph         Potential Capacity:       Cp.7 =       515 pcph         Capacity Adjustment Factor       0.99         Due To Impeding Movements:       f7=po.4=       0.99         Movement Capacity:       Cm.7 = Cp.7 =       512 pcph         DELAY AND LEVEL OF SERVICE SUMMARY       csh AVG TOTAL       Movement         Movement       v(vcph)       cm(pcph)       DELAY       LOS         MINOR REGHT TURN (7)       45       512       SHRD       SHRD         MINOR REGHT TURN (9)       5       906       536       7.4       B                                                                                                                                                                                                                                                                                                                                                                                             | Conflicting Flows:                                                                                 |               | : V3+V2 =                     | 83          | + 322        | = 40         | i vph                    |                          |  |
| Prob. of Queue-free State: $p0,4 = 1-v4/Cm,4 =$ 1.00Major Left Shared Lanep*0,4 =0.99Prob. of Queue-free State: $p*0,4 =$ 0.99STEP 3: LT FROM MINOR STREET - V7Conflicting Flows:Vc,7 = 1/2V3+V2+V5+V4 =Conflicting Flows:Vc,7 = 1/2V3+V2+V5+V4 =541 vphPotential Capacity:Cp,7 =515 pcphCapacity Adjustment Factor0.99Due To Impeding Movements:f7=p0,4=0.99Movement Capacity:Cm,7 = Cp,7 =512 pcphDELAY AHD LEVEL OF SERVICE SUMMARYCsh AVG TOTAL<br>MovementMINOR LEFT TURN (7)45512SHRDMINOR RIGHT TURN (9)59065367.4BHRD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                    |               |                               |             |              | 1099         | pcph                     |                          |  |
| Major Left Shared Lane<br>Prob. of Queue-free State:p*0,4 =0.99STEP 3: LT FROM MINOR STREET - V7<br>Conflicting Flows:Vc,7 = 1/2V3+V2+V5+V4 =541 vphPotential Capacity:Vc,7 = 1/2V3+V2+V5+V4 =541 vphPotential Capacity:Cp,7 =515 pcphCapacity Adjustment FactorDue To Impeding Movements:f7=p0,4=Due To Impeding Movements:f7=p0,4=0.99Movement Capacity:Cm,7 = Cp,7 =512 pcphDELAY AND LEVEL OF SERVICE SUMMARYcm(pcph)DELAYLOSMINOR LEFT TURN(7)45512SHRDSHRDMINOR RIGHT TURN(9)S9065367.48                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                    |               |                               |             |              |              |                          |                          |  |
| Prob. of Queue-free State: $p \pm 0, 4 =$ $0.99$ STEP 3: LT FROM MINOR STREET - V7<br>Conflicting Flows: $VC, 7 = 1/2V3+V2+V5+V4 =$ $541$ vphPotential Capacity: $VC, 7 = 1/2V3+V2+V5+V4 =$ $541$ vphPotential Capacity: $Cp, 7 =$ $515$ pcphCapacity Adjustment Factor $Due$ To Impeding Movements: $f7=p0, 4=$ Due To Impeding Movements: $f7=p0, 4=$ $0.99$ Movement Capacity: $Cm, 7 = Cp, 7 =$ $512$ pcphDELAY AND LEVEL OF SERVICE SUMMARY $Cm(pcph)$ $Cm(pcph)$ $DELAY$ MOVEment $v(vcph)$ $cm(pcph)$ $DELAY$ $LOS$ MINOR LEFT TURN $(7)$ $45$ $512$ $SHRD$ $SHRD$ MINOR RIGHT TURN $(9)$ $5$ $906$ $536$ $7.4$ $B$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                    | 1 po,4 :      | · 1-84/08,4 =                 |             |              | 1.00         | 1                        |                          |  |
| STEP 3: LT FROM MINOR STREET - V7         Conflicting Flows:       Vc,7 = 1/2V3+V2+V5+V4 =         Potential Capacity:       Cp,7 =         S1EP 3: LT FROM MINOR STREET - V7         Conflicting Flows:       Vc,7 = 1/2V3+V2+V5+V4 =         Potential Capacity:       Cp,7 =         S1EP 3: LT FROM MINOR STREET - V7         Conflicting Flows:       Yc,7 = 1/2V3+V2+V5+V4 =         Potential Capacity:       Cp,7 =         S1E pcph         Oue To Impeding Movements:       f7=po,4=         Movement Capacity:       Cm,7 = Cp,7 =         DELAY AND LEVEL OF SERVICE SUMMARY       Csh AVG TOTAL         Movement       v(vcph)         Cm(pcph)       DELAY         MINOR LEFT TURM       (7)         45       512       SHRD         MINOR RIGHT TURM       (9)       5         906       536       7.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                    | p*a,4         | :                             |             |              | 0.99         |                          |                          |  |
| Conflicting Flows:YC,7 = 1/2V3+V2+V5+V4 =541 vphPotential Capacity:Cp,7 =515 pcphCapacity Adjustment FactorDue To Impeding Movements:f7=po,4zDue To Impeding Movements:f7=po,4z0.99Movement Capacity:Cm,7 = Cp,7 =512 pcphDELAY AND LEVEL OF SERVICE SUMMARYCsh AVG TOTAL<br>(pcph)DELAY LOSMINOR LEFT TURN(7)45512SHRDSHRDSHRD<br>SHRDMINOR RIGHT TURN(9)5906SHRDSHRD<br>SHRD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | **************************************                                                             |               |                               |             |              |              |                          |                          |  |
| Potential Capacity:       Cp,7 =       515 pcph         Capacity Adjustment Factor       0.99         Due To Impeding Novements:       f7=po,4=       0.99         Movement Capacity:       Cm,7 = Cp,7 =       512 pcph         DELAY AND LEVEL OF SERVICE SUMMARY       csh AVG TOTAL       Novement         Movement       v(vcph)       cm(pcph)       DELAY       LOS         MINOR LEFT TURN       (7)       45       512       SHRD       SHRD         MINOR RIGHT TURN       (9)       5       906       536       7.4       B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                    |               | 1/30710600000                 |             |              | <b></b>      |                          |                          |  |
| Capacity Adjustment Factor       Indext population         Due To Impeding Movements:       f7=po,4=       0.99         Hovement Capacity:       Cm,7 = Cp,7 =       512 pcph         DELAY AND LEVEL OF SERVICE SUMMARY       csh AVG TOTAL         Movement       v(vcph)       cm(pcph)         Movement       v(vcph)       cm(pcph)         MINOR LEFT TURN       (7)       45         512       SHRD       SHRD         MINOR RIGHT TURN       (9)       5         906       536       7.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                    |               |                               | · •         |              |              |                          |                          |  |
| Hovement Capacity:; Cm,7 = Cp,7 =512 pcphDELAY AND LEVEL OF SERVICE SUMMARYcsh AVG TOTAL<br>(pcph)DELAY LOSHovementv(vcph)cm(pcph)(pcph)HINOR LEFT TURN(7)45512SHRDSHRDSHRDHINOR RIGHT TURN(9)59065367.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Capacity Adjustment Factor                                                                         | <br> <br>     |                               |             |              | ليلال        | hehit                    |                          |  |
| DELAY AND LEVEL OF SERVICE SUMMARY     csh     AVG TOTAL       Movement     v(vcph)     cm(pcph)     (pcph)     DELAY       MINOR LEFT TURN     (7)     45     512     SHRD     SHRD       MINOR RIGHT TURN     (9)     5     906     536     7.4     B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                    |               |                               |             |              |              |                          |                          |  |
| Hovementv(vcph)cm(pcph)(pcph)DELAYLOSMINOR LEFT TURN(7)45512SHRDSHRDMINOR RIGHT TURN(9)59065367.48                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | novement Capacity:                                                                                 | Cm,7 =        | Cp,7 =                        |             |              | 512          | pcph                     |                          |  |
| Hovementv(vcph)cm(pcph)(pcph)DELAYLOSHINOR LEFT TURN(7)45512SHRDSHRDHINOR RIGHT TURN(9)59065367.4B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | DELAY AND LEVEL OF SERVICE SUM                                                                     | (ARY          |                               | <br>neh     | AVG TOTAL    | ************ | *******                  |                          |  |
| HINOR LEFT TURN         (7)         45         512         SHRD         SHRD         SHRD           MINOR RIGHT TURN         (9)         5         906         536         7.4         B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                    |               | cm(pcph)                      |             |              | LOS          |                          |                          |  |
| HINDR RIGHT TURN (9) 5 906 536 7.4 B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                    |               |                               |             |              |              |                          |                          |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                    | 45            |                               |             |              |              |                          |                          |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                    | 5             |                               |             |              | -            |                          |                          |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | UNAUK LEFT INNN (4)                                                                                |               |                               |             | 3.5          | 8            |                          |                          |  |

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| NTA Inc. STOP CO<br>Inc. STOP CO<br>Inc. Street: KULA HWY |                |                       |           |         | ************************************** | ===== |         | zzzzz<br>Date | 1994 HCM<br>   |
|-----------------------------------------------------------|----------------|-----------------------|-----------|---------|----------------------------------------|-------|---------|---------------|----------------|
| inor Street: ACCESS ROAD "8"                              |                |                       |           |         |                                        |       |         |               | :: BC          |
| Peak Hour: AM                                             |                |                       |           |         |                                        |       |         | Name          |                |
| Scenario: YEAR 2005 + PROJ                                | ECT            |                       |           |         |                                        | I<br> | nterse  | ction         | 1: 7           |
| Peak Hour Factor: 1.00                                    |                |                       |           |         |                                        |       |         |               | 15             |
| HAJOR STREET                                              |                | )                     |           |         | <                                      |       | 182     | ۲             | 0              |
| Num of Lanes - V2: 1                                      |                | )                     |           |         | -                                      |       | 5       | v             | 14             |
| Excl RT - V3 (Y/N): H<br>Stop/Yield - V3 (Y/H): H         |                | ,<br>\                |           |         | 1                                      |       | •       |               |                |
| Stop/Yield - V3 (Y/H): H<br>\$ Grade - V2,V3: 2           |                | `v                    |           |         | v                                      | н     | IAJOR S | TREET         | í:             |
| 4 GIAUG - TE,TS. E                                        |                | ·                     |           |         |                                        | X     | WLA HW  | IY            |                |
| Num of Lanes - V5: 1                                      |                |                       | <         | ,       |                                        |       |         |               |                |
| Excl LT - V4 (Y/H): H                                     |                |                       | 1         | /       |                                        |       |         |               |                |
| <b>%</b> Grade - ¥4,¥5: -2                                |                |                       | -         |         |                                        |       |         |               |                |
| MINOR STREET                                              |                |                       | 139       | 5       |                                        |       | <       |               | NORTH          |
| Num of Lanes - V7,V9: 1                                   |                |                       |           |         |                                        |       |         |               |                |
| Shared Lane (Y/H): Y                                      |                |                       | V7        |         |                                        |       |         |               |                |
| <b>\$</b> Grade - V7&V9: -2                               |                | MINDR ST              | REET: ACC | ESS ROA | D 8                                    |       |         |               |                |
| OLUNE ADJUSTNENTS                                         |                |                       |           |         |                                        |       |         |               |                |
| MOVEMENT NO.                                              | . 2            | 3                     | 4         |         | 5                                      |       | 7       |               | 9              |
| VOLUNE, V (vph)                                           | 121            | 49                    | 5         |         | 182                                    |       |         |               | 5              |
| VOLUME, v (pcph)                                          | 121            | 49                    | 5         |         | 182                                    |       | 139     |               | J<br>          |
| TEP 1: RT FROM MINOR STREET                               | - ¥9           |                       |           |         |                                        |       |         |               |                |
| Conflicting Flows:   V                                    | c,9 = 1/2*V    | 3+V2 =                | 25 ÷      | 121     |                                        | :     |         | 146           | vph            |
| Potential Capacity:   C                                   | p,9 =          |                       |           |         |                                        |       |         | 100           | pepn           |
| Movement Capacity: ; C                                    | ∎,p = Cp,9     |                       |           |         |                                        |       |         |               | pcph<br>       |
| TEP 2: LT FROM MAJOR STREET                               | - 74           |                       |           |         |                                        |       |         | _             |                |
| Conflicting Flows:                                        |                | 4 = V3+V2 =           | 4         | 9 +     | 121                                    | :     |         |               | vph            |
| Potential Capacity:                                       | Cp,            |                       |           |         |                                        |       |         |               | pcph           |
| Novement Capacity:                                        |                | $4 = Cp_{4} = 4$      |           |         |                                        |       |         | 1.00          | pcph           |
| Prob. of Queue-free State:                                | ; po,          | 4 = 1-v4/Ca,4 =       | i         |         |                                        |       |         |               |                |
| Hajor Left Shared Lane<br>Prob. of Queue-free State:      | 0*0            | ,4 =                  |           |         |                                        |       | 1       | 1.00          |                |
|                                                           |                |                       |           |         |                                        |       |         |               | ************** |
| STEP 3: LT FROM HINOR STREET                              | • ¥7           | 1 - 1/001110100       | 4VA -     |         |                                        |       |         | 333           | vph            |
| Conflicting Flows:<br>Potential Capacity:                 | ; vc,<br>} Cp, | 7 = 1/2V3+V2+V<br>7 = |           |         |                                        |       |         |               | pcph           |
| Capacity Adjustment Factor                                | • • •          | • -                   |           |         |                                        |       |         |               |                |
| Due To Impeding Movements:                                |                | pa,4=                 |           |         |                                        |       | 1       | 1.00          |                |
| Novement Capacity:                                        |                | 7 = Cp,7 =            |           |         |                                        |       |         | 677           | pcph           |
|                                                           |                |                       |           | ih A'   | G TOTA                                 | <br>L |         |               |                |
| DELAY AND LEVEL OF SERVICE SU<br>Movement                 | v(vcph)        | ca( pcph              | ) (pa     |         | DELAY                                  |       | LOS     |               |                |
|                                                           |                |                       |           |         |                                        |       |         |               |                |
| MINOR LEFT TURN (7)                                       | 139            |                       |           | Ð       |                                        |       | SHRD    |               |                |
| NINOR RIGHT TURN (9)                                      | 5              | 1168                  |           |         |                                        |       | 8       |               |                |
| MAJOR LEFT TURN (4)                                       | 5              | 1423                  | •••       |         | 2.5                                    |       | A<br>   |               |                |
| AVERAGE NINOR APPROACH D                                  | FI 67 - 4      | K sac/vah !           | AVERACI   | TOTAL   | INTERS                                 | ECTIO | N DELA  | ¥ =           | 1.9 sec/veh    |
| 1 5451 05 850                                             | VICE =         | R !                   |           |         | LEVE                                   | LOF   | SERATC  | t =           | н              |
| PPIPP AL API                                              |                |                       |           |         |                                        |       |         |               |                |

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| Peak Hour: PN<br>Scenario: YEAR 2005 + P                                                                                                                                                      |                                          |                                     |                       |                            |                       | lyst:<br>lame: | 27-Jun<br>BC<br>KULRD8-P<br>7 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------------------------|-----------------------|----------------------------|-----------------------|----------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Peak Hour Factor: 1.00                                                                                                                                                                        | }                                        |                                     |                       |                            |                       | ******         |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| MAJOR STREET                                                                                                                                                                                  |                                          | )                                   | ,                     | (                          | 173                   | ٧5             |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Num of Lanes - V2: 1                                                                                                                                                                          | •                                        |                                     |                       |                            |                       |                |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b></b>                                                                                                                                                                                       | •                                        |                                     |                       |                            | 5                     | ¥4             |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                               |                                          | ١                                   |                       | 1                          |                       |                |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| · · · · · · · · · · · · · · · · · · ·                                                                                                                                                         |                                          | v                                   |                       | v                          | MAJOR STR<br>Kula hny | EET:           |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Num of Lanes - V5: 1                                                                                                                                                                          |                                          |                                     | (                     | >                          | AUCH NWI              |                |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Excl LT - V4 (Y/N): N                                                                                                                                                                         | •                                        |                                     | 1                     | Í                          |                       |                |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>t</b> Grade - V4,V5: -2                                                                                                                                                                    |                                          |                                     | 1                     | l.                         |                       |                |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                               |                                          |                                     | 1                     | 1                          |                       |                |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| MINOR STREET                                                                                                                                                                                  |                                          |                                     | 90                    | 5                          | <                     | - NORTH        |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Num of Lanes - V7,V9: 1<br>Shared Lane (Y/N): Y                                                                                                                                               | •                                        |                                     |                       |                            |                       |                |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Shared Lane (Y/N): Y<br>% Grade - V7&V9: -2                                                                                                                                                   |                                          | NINDO S                             | V7<br>IREET: ACCESS   | ¥9                         |                       |                |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                               | ;<br>                                    |                                     | AUGEDS                |                            |                       |                |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| VOLUME ADJUSTMENTS                                                                                                                                                                            |                                          |                                     |                       |                            |                       |                |                               | i                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| HOVENENT NO.                                                                                                                                                                                  | 2                                        | 3                                   | 4                     | 5                          | 7                     | 9              |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| VOLUME, V (vph)                                                                                                                                                                               | 153                                      | 169                                 | 5                     | 173                        | 90                    | 5              |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| VOLUME, v (pcph)                                                                                                                                                                              | 153                                      | 169                                 | 5                     | 173                        | 90                    | 5              |                               | تو<br>تو                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Potential Capacity: { {<br>Movement Capacity: { {                                                                                                                                             | Cm,p = Cp,9 =                            |                                     |                       |                            | 1050<br>1050          | • •            |                               | ۰<br>. بو                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| TEP 2: LT FROM MAJOR STREET                                                                                                                                                                   |                                          |                                     |                       |                            |                       |                |                               | ,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Conflicting Flows:                                                                                                                                                                            | Yc,4                                     | : V3+V2 :                           | 169                   | + 153                      | = 322                 | vph            | ,                             | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Potential Capacity:                                                                                                                                                                           |                                          |                                     |                       |                            | 1204                  | pcph           |                               | 4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Novement Capacity:<br>Prob. of Queue-free State:                                                                                                                                              |                                          | Cp,4 =                              |                       |                            | 1204                  | pcph           |                               | •                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Major Left Shared Lane                                                                                                                                                                        | i po,4                                   | : 1-v4/Cm,4 =                       |                       |                            | 1.00                  |                |                               | <b>y</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Prob. of Queue-free State:                                                                                                                                                                    | p±0,4                                    | :                                   |                       |                            | 1.00                  |                |                               | <b>L</b> -                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                               |                                          |                                     |                       |                            | ····                  |                |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| EP 3: LT FROM MINOR STREET                                                                                                                                                                    |                                          |                                     |                       |                            |                       |                |                               | ¥**                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                               |                                          | 1/243+45+                           | ·¥4 =                 |                            | 416                   | •              |                               | ŕ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Conflicting Flows:                                                                                                                                                                            |                                          |                                     |                       |                            | 608                   | pcph           |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Conflicting Flows:<br>Potential Capacity:                                                                                                                                                     | · Cp,7 :                                 |                                     |                       |                            |                       |                |                               | e - 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor                                                                                                                       |                                          |                                     |                       |                            |                       |                |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:                                                                                         | f7=po,                                   | 4=                                  |                       |                            | 1.00                  |                |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:                                                                                         | f7=po,                                   | 4=<br>Cp,7 =                        |                       |                            | 606                   | pcph           |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:                                                                   | f7=pa,<br>Cm,7 =                         | 4=<br>Cp,7 =                        | csh                   |                            | 606                   | pcph           |                               | de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya de la companya |
| Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:                                                                   | f7=pa,<br>Cm,7 =                         | 4=<br>Cp,7 =                        | csh<br>(pcph)         | AVG TOTAL<br>Delay         | 606<br>               | pcph<br>       |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>LAY AND LEVEL OF SERVICE SU<br>Movement                        | f7=po,<br>C=,7 =<br>HNARY<br>v(vcph)     | 4=<br>Cp,7 =<br>cm(pcph)            | csh<br>(pcph)         | AVG TOTAL<br>Delay         | 606<br>LOS            | pcph           |                               | true.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>HAY AND LEVEL OF SERVICE SU<br>Movement<br>MINOR LEFT TURN (7) | f7=po,<br>Cm,7 =<br>MNARY<br>v(vcph)     | 4=<br>Cp,7 =                        | csh<br>(pcph)<br>SHRD | AVG TOTAL<br>DELAY<br>Shrd | 606<br>LOS<br>SHRD    | pcph<br>       |                               | braan<br>2 − 2<br>Brand                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Conflicting Flows:<br>Potential Capacity:<br>Capacity Adjustment Factor<br>Due To Impeding Movements:<br>Movement Capacity:<br>LAY AND LEVEL OF SERVICE SU<br>Movement                        | f7=po,<br>Cm,7 =<br>MMARY<br>v(vcph)<br> | 4=<br>Cp,7 =<br>cm(pcph)<br><br>606 | csh<br>(pcph)         | AVG TOTAL<br>Delay         | 606<br>LOS            | pcph           |                               | , s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

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**Preliminary Engineering Report** 

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AUSTIN, TSUTSUMI & ASSOCIATES, INC. CIVIL ENGINEERS . SURVEYORS

CONTINUING THE ENGINEERING PRACTICE FOUNDED BY H. A. R. AUSTIN IN 1924

KEN KI KUROKAWAI FE Senior Vice President N

Maul Branch Office March 21

TED S KAWAHIGASHI PE KENNETH K KUROKAWA PE IVAN K TIAKATSUKA PE LAMBERT J YAMASHITA PE. HOWARD H W MAU, PE

# FOR THE FOR THE KULA RESIDENCE LOTS, UNIT 1 AT WAIOHULI, KULA, MAKAWAO, MAUI, HAWAII

## TAX MAP KEY: 2-2-02:56 AND 2-2-02:POR 14

### I. INTRODUCTION

The purpose of this report is to summarize the basis of design used in the preparation of the grading and construction plans for the proposed 386-lot, single-family residential subdivision project. A description of the proposed project, the existing site conditions and the proposed grading, drainage and utility improvements are also provided in this report.

### II. PROPOSED PROJECT

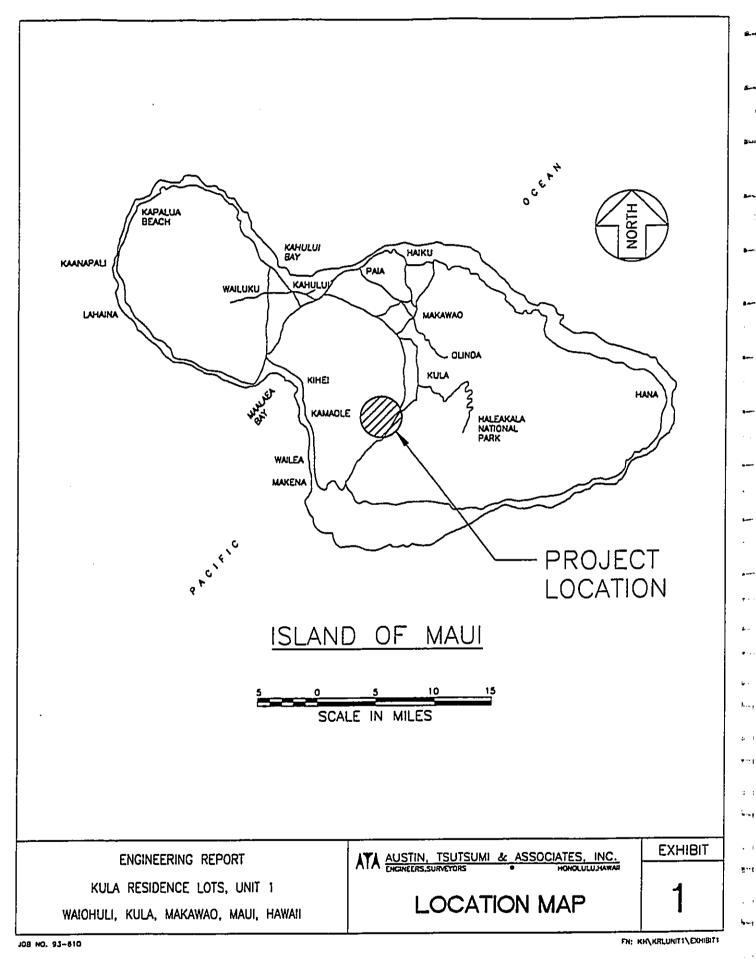
### A. Location

The proposed project is located in the Waiohuli area of the Kula District on the island of Maui (refer to Exhibit 1). The site is located on the west side of Kula Highway, across from the Waiohuli-Keokea Homesteads. The total parcel area, designated by Tax Map Key Nos. 2-2-02:56 and 2-2-02:Por. 14, encompasses 668.25 acres (refer to Exhibit 2); however, the project will utilize approximately 460 acres of the total area. The project site is designated as "rural", as described in the Hawaii Revised Statutes, Section 205.

### B. Land Ownership

The land owner and developer for this project is the State of Hawaii, Department of Hawaiian Home Lands.

OFFICES IN HONOLULU, HAWAII WAILLIKU, MAG, HAWAII • HILD HEALE

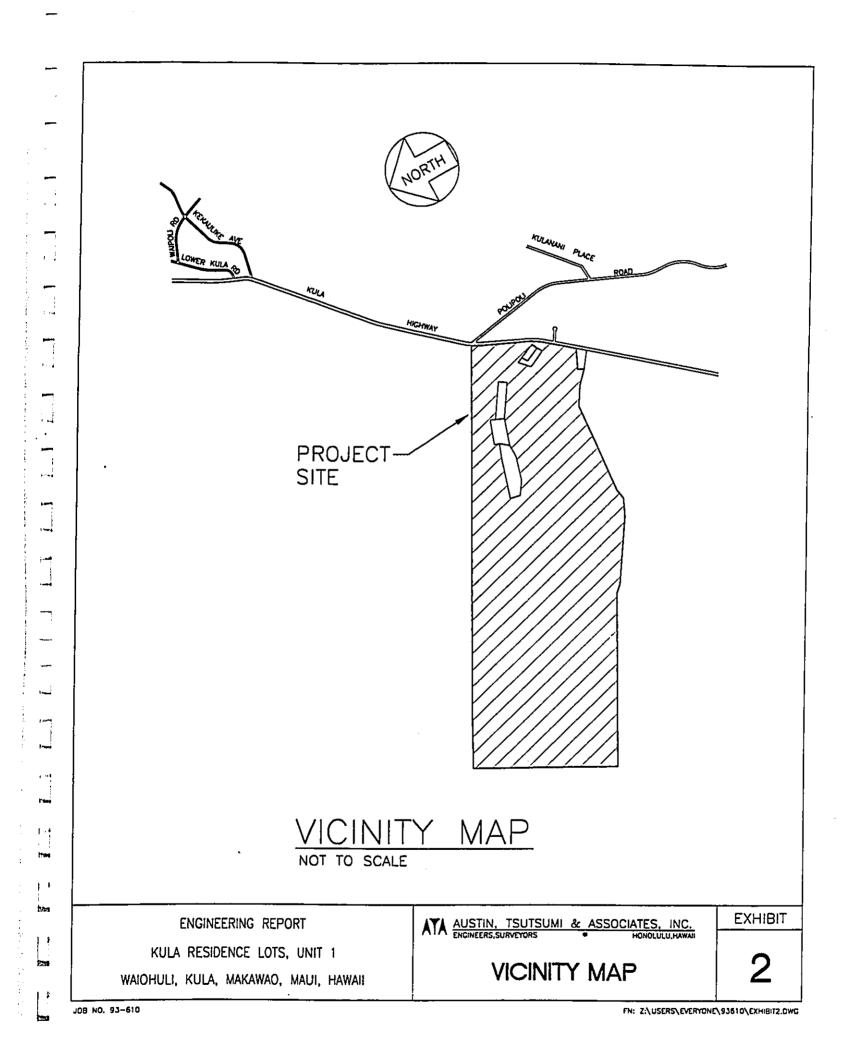


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## CIVIL ENGINEERS + SURVEYORS

Five privately-owned kuleana parcels are located within the project site and are excluded from the proposed development. Access to these parcels will be maintained.

### C. Project Description

The proposed Kula Residence Lots, Unit 1 rural subdivision will consist of 386 single-family residential lots, roadways and related infrastructure. Lot sizes will range from one-half acre to one acre. A 16acre parcel will be set aside for park use. Additional parcels will be set aside to serve as water storage tank sites, electrical substations and other community needs. See schematic plat map (Exhibit 3).

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Drainage, water and individual wastewater systems will be provided, along with overhead electrical lines and a street lighting system. Catch basins, drain manholes, drain lines and water transmission lines will be provided within the proposed roadway right-of-way. Drainage culverts with inlet and outlet structures will be provided under sections of the roadway to accommodate drainage through the project site.

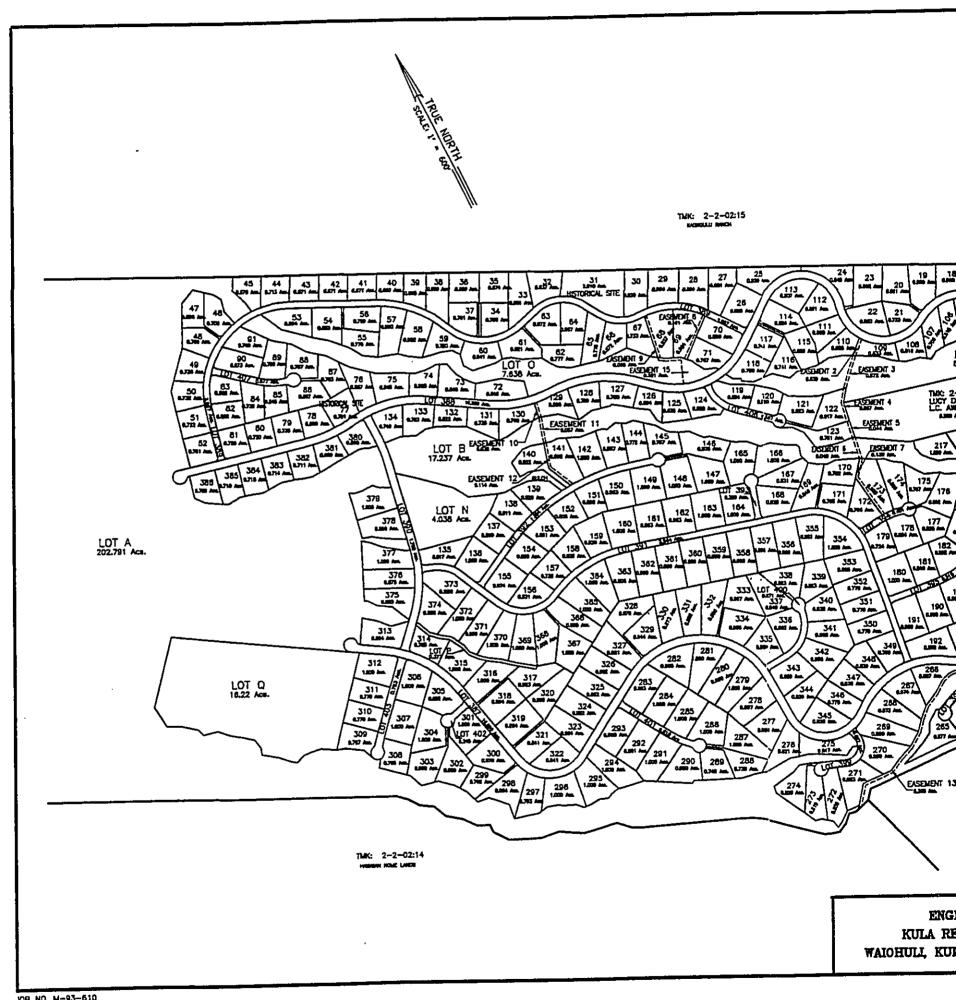
Archaeological sites on Lot 77 and the park parcel will be preserved and maintained. Other sites and features have been inventoried; the State Historic Preservation Division will investigate all finds and assess their significance. If data recovery is not completed before the commencement

of construction, the sites will be protected by buffer zones.

### III. EXISTING CONDITIONS

## A. Topography and Soil Conditions

The project site slopes away from Kula Highway in a northwesterly direction at an average of 10 to 15 percent. The elevation ranges from 3,000 feet above Mean Sea Level (MSL) at Kula Highway to 1,800 feet (above MSL) at the outskirts of the site. The upper regions of the site are overgrown with trees, while the lower section is grassy, with lantana and



JOB NO. M-93-610 FN: 93610EX.dwg/CLN

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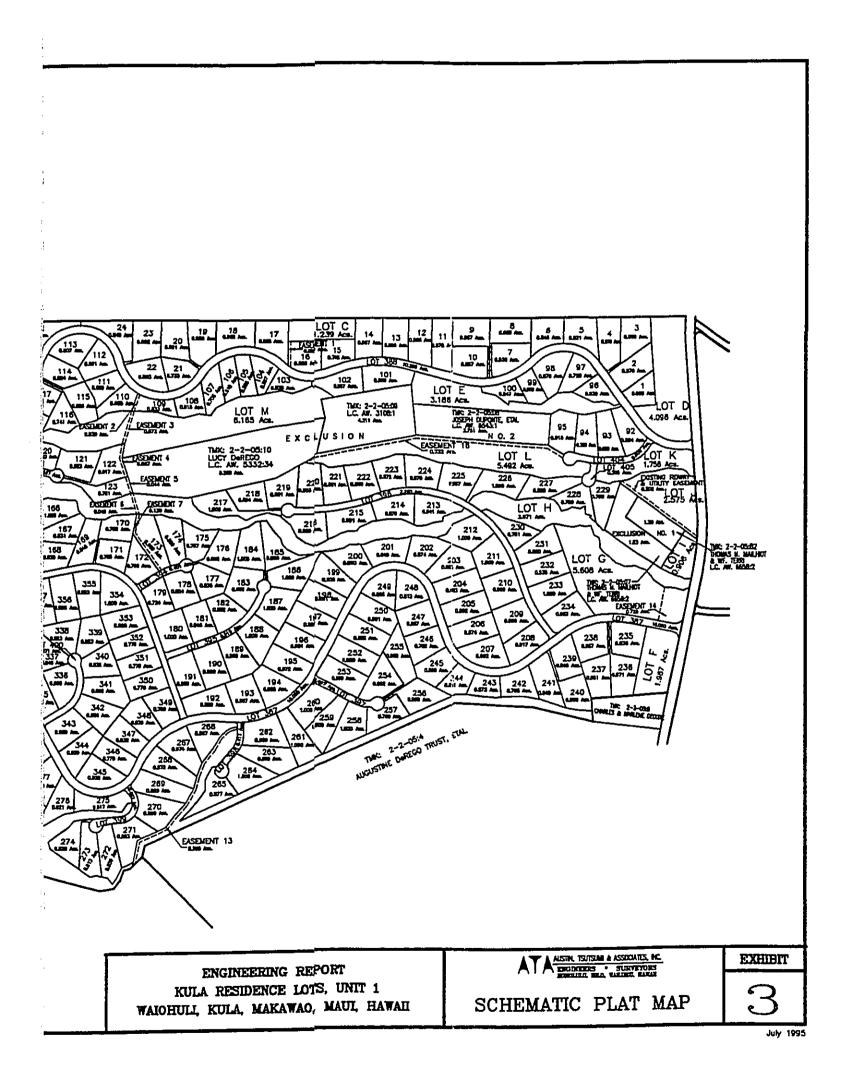
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There are two types of soil classifications, as identified by the U.S. Department of Agriculture (USDA) Soil Conservation Service "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii", found on the project site. In the higher elevations, near Kula Highway, the soil series for the general area is Kula cobbly loam (KxaD), with 12 to 20 percent slopes. This soil is generally found on the intermediate uplands on the island of Maui. Permeability is moderately rapid. Runoff is medium, and the erosion hazard is moderate. At the lower elevations of the site, the soil classification is described as Kamaole very stony silt loam (KGKC), 3 to 15 percent slopes. This well-drained soil is found on the uplands of Maui. Permeability is moderate.

A soils investigation has been conducted and a report will be prepared by Ernest K. Hirata and Associates, Inc.

### B. Climate and Rainfall

The Kula area is generally sunny and cool throughout the year with temperatures averaging 75 degrees. The median annual rainfall amounts to 25 to 40 inches and is well distributed throughout the year. The Kula area has a climate typical of areas in the Hawaiian Islands exposed to prevailing northeasterly tradewinds. During the rainy season, October to April, the winds may vary with occasional strong, southerly winds accompanying cyclonic "Kona" storms.

### C. Drainage

Presently, the offsite and onsite storm water runoff sheet flows in a northwesterly direction across the project site. Gullies and gulches located onsite convey the runoff through the site and towards two gulches bordering the site, Kaakaulua Gulch to the north and Waiohuli Gulch to the

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south. Downstream of the project site, Kaakaulua Gulch and Waiohuli Gulch will discharge runoff into Kulanihakoi Gulch and Waipuilani Gulch, respectively. See Offsite Hydrology Map (Exhibit 4). Ultimately, runoff from the gulches will be discharged into the Pacific Ocean. است

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### D. Water

No water system exists within the project site. There are existing 6inch waterlines that terminate at the intersection of Polipoli Road at Kula Highway and Lepelepe Place at Kula Highway, which are serviced from the Upper Kula Water Line. These waterlines are owned and maintained by the County of Maui, Department of Water Supply.

### E. Wastewater

There is no County wastewater collection system or treatment facility in the vicinity. The project site is located in a "not critical" area, as shown on the State Department of Health "Critical Wastewater Disposal Areas" map.

### IV. GRADING AND DRAINAGE PLAN

### A. Grading

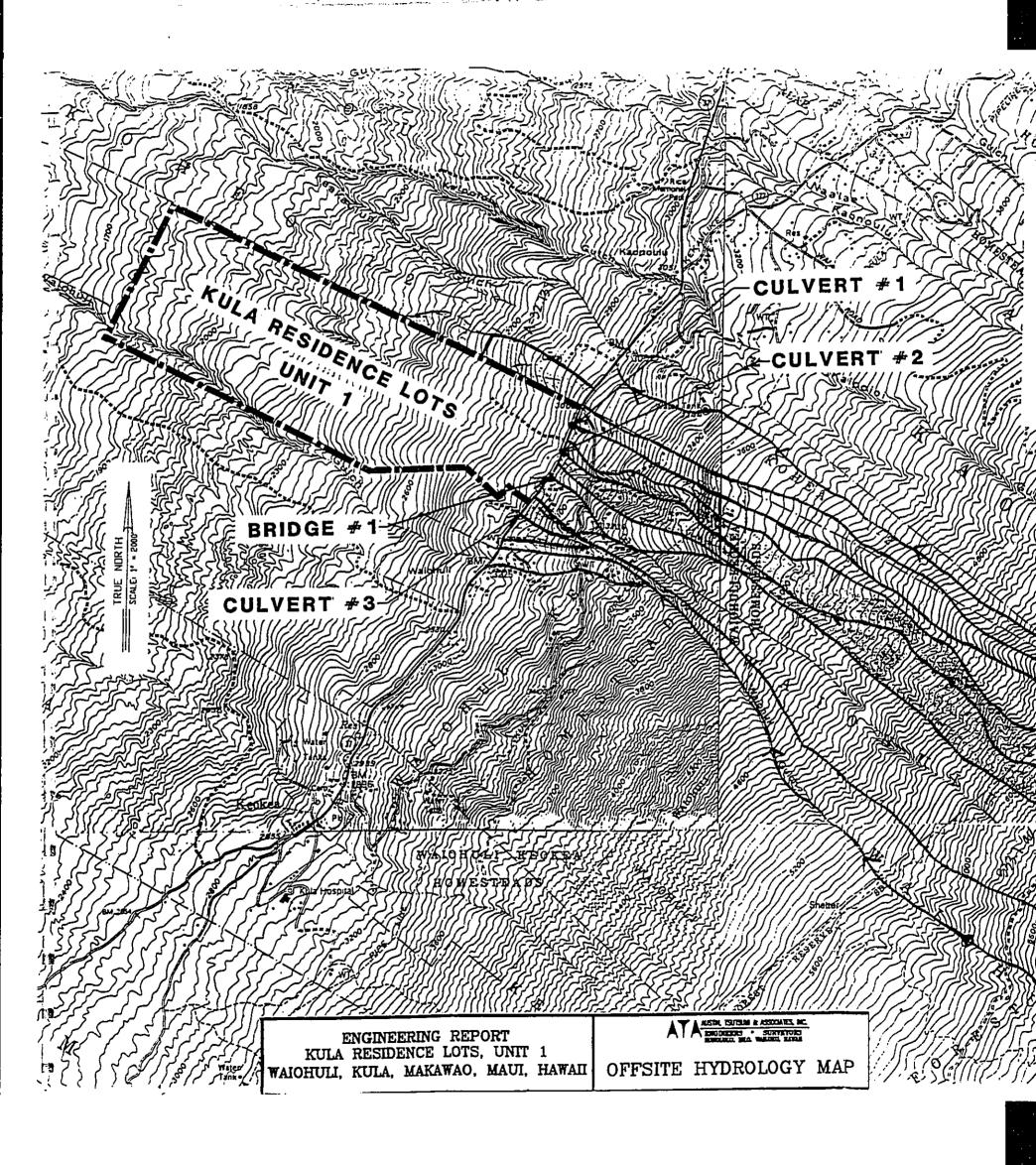
Grading for the project site will involve excavation and embankment within the roadway right-of-way and within some of the adjacent lots. Erosion control measures will be utilized during construction to minimize soil loss and erosion hazards.

#### B. Drainage

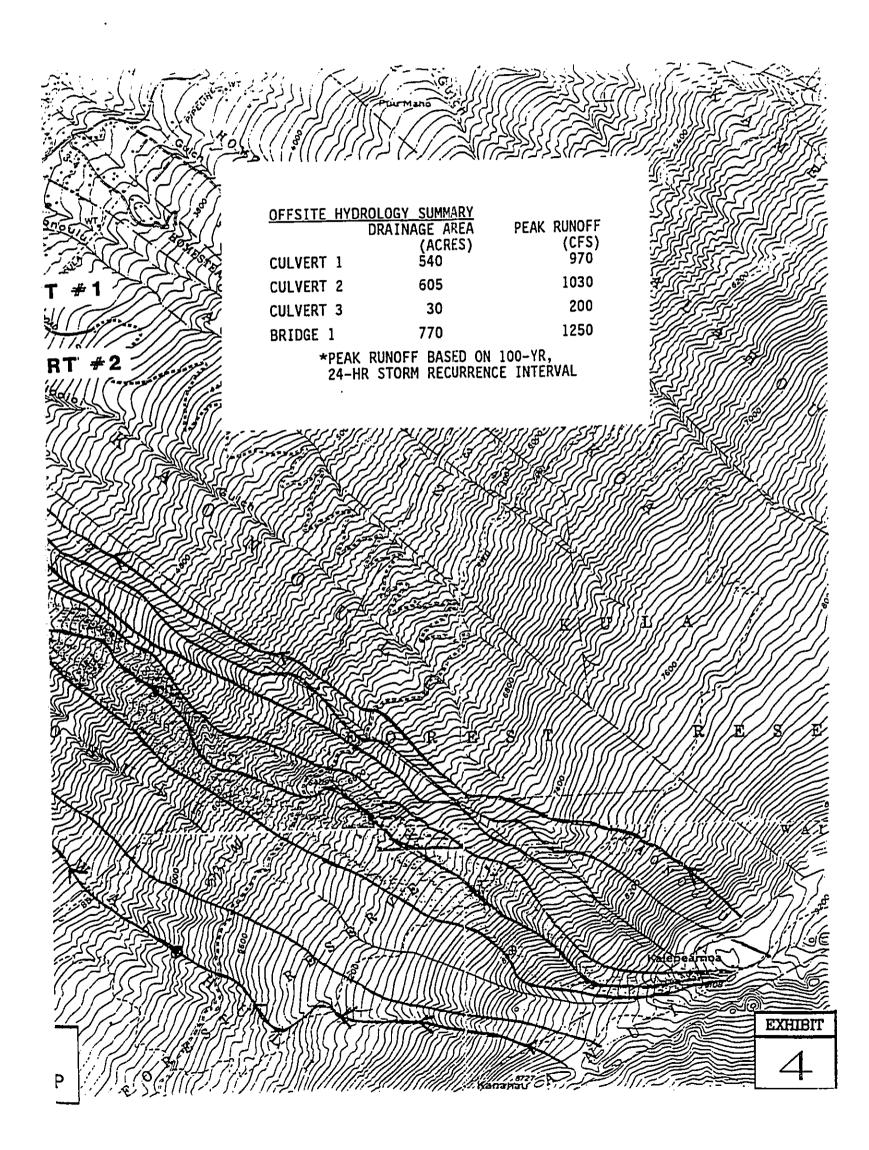
The drainage plan for the project will include grassed and paved swales along roadways, diversion ditches and swales, subsurface drainage system, roadway culverts, detention basins and realigning an existing gulch drainageway. The subsurface drainage system will include drain inlets, drain manholes, piping system and outlet structures.

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In general, the Rational Method will be used to determine the onsite storm water runoff quantities. The roadway and diversion swales and subsurface drainage system will be designed for the 10-year/1 hour storm recurrence interval. Detention basins and roadway culverts will be designed for the 50-year/1 hour storm recurrence interval. The Rational Method is briefly described as follows:

$$\mathbf{Q} = \mathbf{C}\mathbf{I}\mathbf{A}$$

Where:

Q = storm water runoff quantity (cfs)

C = runoff coefficient

- rainfall intensity in inches per hour for a duration equal to the
   time of concentration (Tc)
- A = drainage area (acres)

Applicable sections of the "Drainage Standards for County of Maui", County of Maui, Department of Public Works and Waste Management, July 1995, will be used as a reference.

The Natural Resources Conservation Service (NRCS) Hydrograph Analysis Method or the NRCS computer program TR20 will be used to determine the peak offsite storm runoff when analyzing the hydraulics for the culvert crossings at the major gulches and realignment of the existing gulch drainageway. The "National Engineering Handbook, Section 4, Hydrology, Supplement A", or latest revision will be used as reference. Preliminary calculations of peak offsite storm runoff that flow through the project site have been completed, using the method described in the "Erosion and Sediment Control Guide for Hawaii", NRCS, March 1981. The peak flows for the existing culvert crossings at Kula Highway are shown on Exhibit 4. . ..

### V. UTILITIES

### A. Water System

The proposed water system will be constructed in accordance with the "Water System Standards" of the County of Maui, Department of Water Supply. ة مىللا

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The proposed water system will be made up of four service zones. Service zone 1 will connect to the existing Upper Kula System. Service zone 2 will consist of a 1.5 MG reservoir tank with pipelines ranging in diameter from 6 to 12 inches. Service zone 3 will consist of a 0.2 MG reservoir tank with pipelines ranging in diameter from 6 to 12 inches. Service zone 4 will consist of a 0.1 MG reservoir tank with pipelines ranging in diameter from 12 to 6 inches.

Water from the existing Lower Kula System will flow into the proposed 0.2 MG tank in Service zone 3 via a new transmission line from Naalae Road. Water will then be pumped up to the proposed 1.5 MG tank in Service zone 2.

The design of the proposed water system pipelines will be based on parameters taken from the "Water System Standards," State of Hawaii, County of Maui, Volume 1, 1985 edition. Parameters used are as follows:

- 1. The average daily demand for a single family for Maui County will be equal to 600 gallons per day (gpd) per unit.
- 2. The average daily demand for the park will be equal to 1,700 gpd per acre.
- 3. The fire flow requirement will be based on a rural land use equal to 400 gallons per minute (gpm) for a duration of 2 hours.
- 4. The maximum daily flow plus fire flow will have a residual pressure of 20 psi at a critical fire hydrant.

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|-----|-------------------|------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|
|     |                   | 5.         | The                           | peak hour flow will have a minimu                                                                                                                                         | im residual pressure of 40 psi.                               |
|     |                   | 6.         | The                           | "C" values to be applied will be:                                                                                                                                         |                                                               |
|     |                   |            |                               | Diameter                                                                                                                                                                  | <u>"C"</u>                                                    |
|     |                   |            |                               | · 4", 6"                                                                                                                                                                  | 100                                                           |
|     |                   |            |                               | 8", 12"                                                                                                                                                                   | 110                                                           |
|     |                   | 7.         | The r                         | naximum velocity in mains will be                                                                                                                                         | :                                                             |
|     |                   |            |                               | 10 feet per second for distributior                                                                                                                                       |                                                               |
|     |                   |            |                               | 20 feet per second for transmissio                                                                                                                                        | n mains without water services                                |
|     |                   |            |                               | or fire flow.                                                                                                                                                             |                                                               |
|     |                   |            |                               | 13 feet per second for fire line.                                                                                                                                         | test is converting toly 205 000                               |
|     |                   | 11         |                               | average daily demand for the pro                                                                                                                                          | bject is approximately 505,000                                |
|     |                   | -          | ons pe                        |                                                                                                                                                                           |                                                               |
|     | В.                | Was        |                               | er System                                                                                                                                                                 |                                                               |
|     |                   | Hav<br>exc | tems (l<br>vaii, Do<br>eed th | proposed project will utilize cessives (WS) for each lot. A variance wite partment of Health for the use to 50-lot limit, as described in the 1-62, "Wastewater Systems". | Il be sought from the State of of IWS, since the project will |
|     | C.                | Roa        | adway                         | System                                                                                                                                                                    |                                                               |
|     |                   | Co         |                               | proposed roadway system will t<br>th the following exceptions:                                                                                                            | be based on the Maui County                                   |
| •   |                   | 1.         | Gras                          | s and paved swales will be used                                                                                                                                           | instead of curbs and gutters.                                 |
|     |                   | 2.         | Ther                          | e will be no sidewalks.                                                                                                                                                   |                                                               |
|     |                   | З.         | The<br>lots.                  | cul-de-sacs may be more than 5                                                                                                                                            | 50 feet or serve more than 20                                 |
| •   |                   |            |                               |                                                                                                                                                                           |                                                               |
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4. Street trees will not be planted. Trees will be planted in the front of each parcel and maintained by individual lot owners.

The proposed roadway system will consist of collector streets, minor streets and cul-de-sacs. The collector streets will have a right-of-way width of 50 feet with a pavement width of 24 feet. The minor streets will have a right-of-way width of 40 feet with a pavement width of 22 feet. The cul-desacs will have a right-of-way width of 40 feet with a pavement width of 22 feet. All of the proposed streets will have 2-inch asphaltic concrete pavement and 6-inch crushed rock base course, with a 6-inch subbase course where required. Portland cement concrete pavement will be used for road slopes that exceed the paving limits of asphaltic concrete.

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## D. Electric, Street Lighting, Telephone and Cable Television Systems

Overhead lines for electrical, street lighting, telephone and cable television services will be provided by the respective utility companies.

### VI. CONCLUSION

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The proposed project will not have a significant short- or long-term impact on the existing community for the following reasons:

- 1. Five privately-owned kuleanas are located within the project site and are excluded from the proposed development, with access to these parcels being maintained.
- 2. The proposed project will provide the required onsite and offsite infrastructure improvements and, therefore, will not burden the existing utility systems surrounding the project.
- 3. Erosion control measures will be utilized during construction to minimize soil loss and erosion hazards.
- 4. The drainage system will be designed to minimize the impact of the project storm runoff to downstream and adjoining properties.

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5. Archaeological sites, as designated by the State Historical Preservation Division, will be protected as required if data recovery is not completed before the commencement of construction. The archaeological findings on Lot 77 and the park parcel will be preserved and maintained as historical and cultural sites.