



# **Chapter 2.97, Maui County Code Environmental Assessment**

## **PROPOSED LILOA HALE SENIOR AFFORDABLE HOUSING PROJECT KĪHEI, MAUI (TMK NO. (2)2-2-002:072 (por.))**

**Prepared for:**

**Liloa Senior Housing, LP**

**Approving Agency:**

**County of Maui,  
Department of Housing and Human Concerns**

**August 2020**

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**MUNEKIYO HIRAGA**

Planning. Project Management. Sustainable Solutions.



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## **Executive Summary**

**Project Name:** Proposed Liloa Hale Senior Affordable Housing Project

**Type of Document:** Environmental Assessment

**Legal Authority:** Chapter 2.97, Maui County Code

**Location:** Maui Island  
Kīhei  
TMK No. (2)2-2-002:072 (por.)

**Landowner:** Hope Chapel  
300 E. Welakahao Road  
Kīhei, Hawai'i 96753

**Applicant and Developer:** Liloa Senior Housing, LP  
330 W. Victoria Street  
Gardena, California 90248  
Contact: Monte Heaton  
Phone: (424) 258-2910

**Approving Agency:** County of Maui  
Department of Housing and Human Concerns  
2200 Main Street, Suite 546  
Wailuku, Hawai'i 96793  
Contact: Linda Munsell, Deputy Director  
Phone: (808) 270-7805

**Consultant:** Munekiyo Hiraga  
305 High Street, Suite 104  
Wailuku, Hawai'i 96793  
Contact: Yukino Uchiyama, Senior Associate  
Phone: (808) 983-1233

## **Project Summary:**

In response to the current and projected shortage of affordable housing in Maui County, Liloa Senior Housing, LP proposes to develop a 117-unit, 100 percent affordable senior rental apartment complex in Kīhei, Maui, Hawai'i. The project will be developed on an approximately 3.61-acre portion of property identified as Tax Map Key (TMK) (2)2-2-002:072 (Parcel 72). Parcel 72 is currently owned by Hope Chapel. However, Liloa Senior Housing, LP intends to condominiumize Parcel 72 and purchase a 4.9-acre portion of the parcel. The remaining 1.29 acres of the purchased lot, containing an existing natural drainageway, will remain undeveloped.

Liloa Senior Housing, LP has partnered with Hale Mahaolu, a private non-profit corporation and co-developer for the project, to operate the new facility. All units within the project will be restricted to seniors earning 60 percent or less of the Area Median Income (AMI) in accordance with the annual affordable rent guidelines set forth by the County of Maui's Department of Housing and Human Concerns (DHHC).

The project site is designated "Urban" by the State Land Use Commission and "Project District" by the Kihei-Makena Community Plan. The underlying County zoning for the property is "Project District 5 (Piilani Village)" and the site is located within the "Multi-Family" and "Residential" subdistricts within Project District 5.

Liloa Senior Housing, LP proposes to seek a fast tracked affordable housing project approval from the Maui County Council pursuant to Chapter 2.97 of the Maui County Code (MCC). The Chapter 2.97, MCC fast tracked housing application review process was approved by the Maui County Council in December of 2018 via Ordinance 4941. The Chapter 2.97, MCC approval will allow Liloa Senior Housing, LP to amend or waive certain conditions relating to planning, zoning, construction standards for subdivisions, development and improvement of land, and the construction of the units thereon. In addition, the proposed project is located within the County of Maui's Special Management Area (SMA) and, as such, a SMA Use Permit will be obtained from the Maui Planning Commission.

The proposed project will be funded by Low Income Housing Tax Credits (LIHTC), the State of Hawai'i's Rental Housing Revolving Fund (RHRF), the County of

Maui's Affordable Housing Fund, as well as tax-exempt bonds. Additionally, the project proposes work within Liloa Drive, a County of Maui right-of-way and Pi'ilani Highway, a State of Hawai'i right-of-way. The use of State and County funds, as well as State and County lands are triggers for the preparation of a Chapter 343, Hawai'i Revised Statutes (HRS) Environmental Assessment (EA). Pursuant to Section 11-200.1-15.c(10) of Hawai'i Administrative Rules, the DHHC has issued an Exemption Declaration for the project, exempting the project from the preparation of a Chapter 343, HRS EA.

As such, pursuant to Section 2.97.040 of the MCC, this EA has been prepared as part of the Chapter 2.97, MCC fast track housing application to evaluate the technical characteristics, environmental impacts and alternatives, as well as to advance findings relative to the proposed project. The EA will serve as the primary technical supporting document for the Chapter 2.97, MCC application and SMA Use Permit application required for the project.

## List of Acronyms

ADA	Americans with Disabilities Act
AHF	Affordable Housing Fund
AIS	Archaeological Inventory Survey
ALISH	Agricultural Lands of Importance to the State of Hawai'i
AMI	Area Median Income
AMSL	Above Mean Sea Level
BMP	Best Management Practice
CATV	Cable Television
CDBG	Community Development Block Grant
cf	Cubic Feet
cfs	Cubic Feet per Second
CIA	Cultural Impact Assessment
DHHC	Department of Housing and Human Concerns
DOE	Department of Education
DOH	Department of Health
EA	Environmental Assessment
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
HAR	Hawai'i Administrative Rules
HCZMP	Hawaii Coastal Zone Management Program
HDOT	State of Hawai'i, Department of Transportation
HRS	Hawai'i Revised Statutes
ISWMP	Integrated Solid Waste Management Plan
KCA	Kihei Community Association
LIHTC	Low-Income Housing Tax Credit
LOS	Level of Service
LSB	Land Study Bureau
MCC	Maui County Code
MG	Million gallons
MGD	Million gallons per day
MIP	Maui Island Plan
MPC	Maui Planning Commission
MPD	Maui Police Department
MRTP	Maui Research and Technology Park
MUTCD	Manual on Uniform Traffic Control Devices
NPDES	National Pollutant Discharge Elimination System
PER	Preliminary Engineering Report
por.	portion
PZUE	Puuone Sand, 7 to 30 percent slopes
RGB	Rural Growth Boundary
RHRF	Rental Housing Revolving Fund
SDOT	State Department of Transportation
SHPD	State Historic Preservation Division
SLUC	State Land Use Commission

SMA	Special Management Area
SMAC	South Maui Advisory Committee
sq. ft.	square feet
STB	Small Town Boundaries
STIP	State Transportation Improvement Program
TIAR	Traffic Impact Analysis Report
TMK	Tax Map Key
UGB	Urban Growth Boundary
UHMC	University of Hawaii Maui College
USFWS	U.S. Fish and Wildlife Service



# PROJECT OVERVIEW



# I. PROJECT OVERVIEW

## A. PROJECT LOCATION, CURRENT LAND USE, AND OWNERSHIP

In response to the current and projected shortage of affordable housing in Maui County, Liloa Senior Housing, LP (hereinafter referred to as “Applicant”) is proposing the development of the Liloa Hale Senior Affordable Housing Project. The project site is comprised of approximately 3.61 acres of land, which is a portion (por.) of a larger 17.9-acre parcel identified as Tax Map Key (TMK) No. (2)2-2-002:072 (Parcel 72) and located in Kīhei, Maui, Hawai‘i. Parcel 72 is currently owned by Hope Chapel. However, the Applicant intends to condominiumize Parcel 72 and purchase a 4.9-acre portion of the parcel. The remaining 1.29 acres of the purchased lot contains an existing natural drainageway, which will remain undeveloped. The project site is bounded by the existing Hope Chapel church to the north, which currently shares the same parcel, Pi‘ilani Highway to the west, Hale Mahaolu Ehiku, an elderly affordable housing development, to the south, and Liloa Drive to the east. See **Figure 1** and **Figure 2**.

The project site is designated “Urban” by the State Land Use Commission, “Project District” by the Kihei-Makena Community Plan, and “Project District 5 (Piilani Village)” by Maui County Zoning. Specifically, the site falls within the “Residential” and “Multi-Family” subdistricts of Project District 5. The project site is also situated within the County of Maui’s Urban Growth Boundary (as set forth by the Maui Island Plan) and the Special Management Area (SMA).

## B. PROPOSED ACTION

The proposed project will consist of a single three-story building containing 117 apartment units and related improvements. Of the 117 units, 101 units will be one-bedroom units (approximately 650 square feet (sq.ft.)) of which, five (5) units will be the Americans with Disabilities Act (ADA) Standards compliant, while the remaining 16 units will be two-bedroom units (approximately 900 sq.ft.) of which, one (1) unit will be ADA compliant. See **Table 1**. Amenities at the property will include a community gathering space for residents of the complex, a mail room, a property manager’s living unit, office space for onsite staff, approximately 143 on-grade parking stalls and two (2) loading stalls. Related improvements include grading, construction of driveways, utility connections, landscaping, and drainage improvements including catch basins, subsurface drainage system, and onsite retention basin. The Applicant has partnered with Hale Mahaolu, a private non-profit corporation and co-developer for the project, to operate the new facility. See **Figure 3** and **Appendix “A”**, Project Plans.



Source: 2013 National Geographic Society, i-cubed

Figure 1

# Proposed Liloa Hale Senior Affordable Housing Project Regional Location Map



Prepared for: Liloa Senior Housing, LP



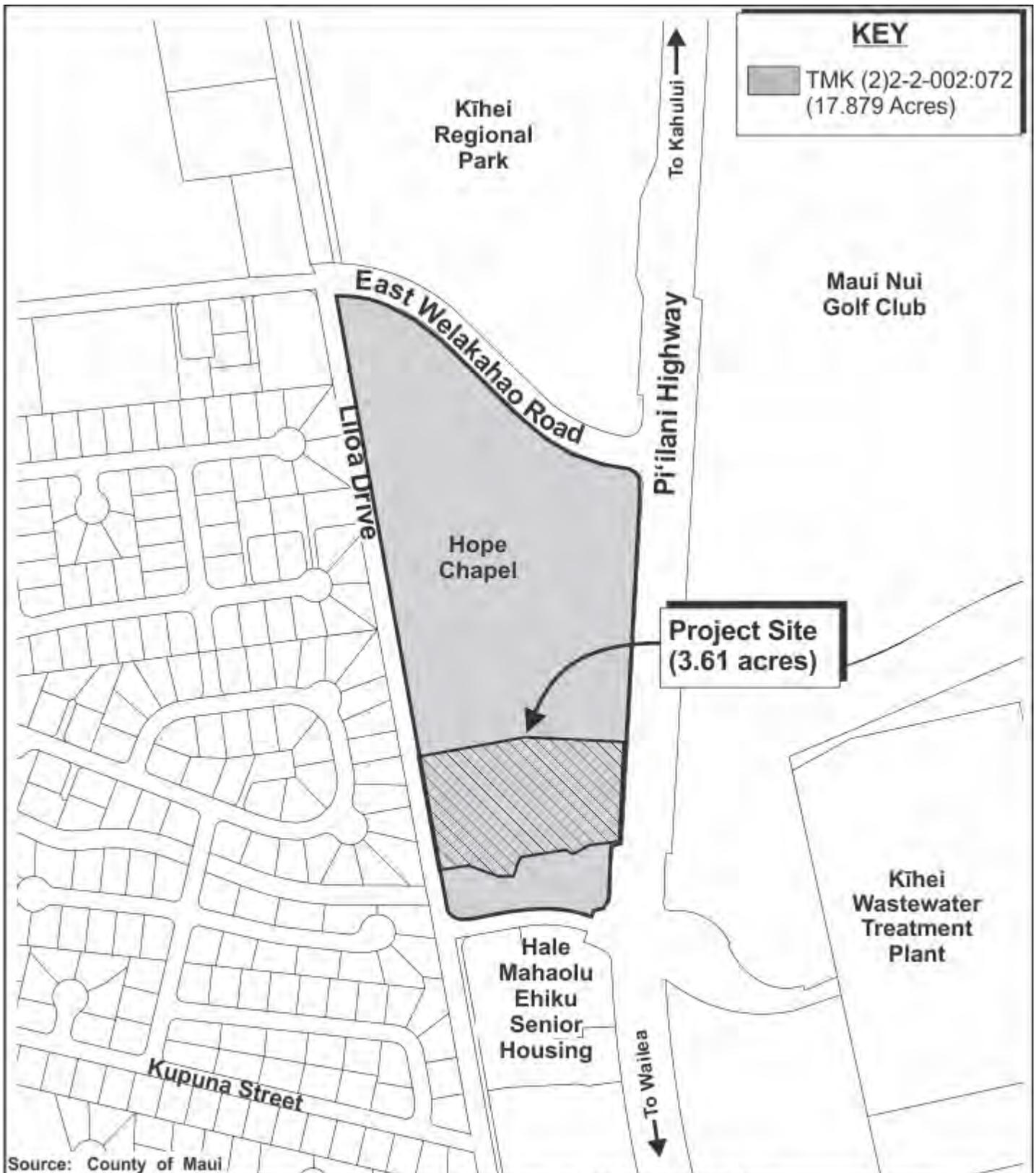
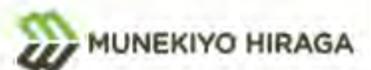


Figure 2

Proposed Liloa Hale Senior Affordable Housing Project  
Property Location Map



Prepared for: Liloa Senior Housing, LP





**SITE SUMMARY**

3 FLOORS:

1 BEDROOM ADAPTABLE UNITS (FHA):	96 UNITS
1 BEDROOM ACCESSIBLE UNITS (ADA):	5 UNITS
2 BEDROOM ADAPTABLE UNITS (FHA):	15 UNITS
2 BEDROOM ACCESSIBLE UNITS (ADA):	1 UNITS
<b>TOTAL UNITS:</b>	<b>117 UNITS</b>

**PARKING**

1 BEDROOM PARKING PROVIDED:	101 STALLS
2 BEDROOM PARKING PROVIDED:	32 STALLS
ACCESSIBLE PARKING PROVIDED:	7 CAR ACCESSIBLE STALLS 2 VAN ACCESSIBLE STALLS
<u>GUEST PARKING PROVIDED:</u>	<u>10 GUEST STALLS</u>
<b>TOTAL PARKING PROVIDED:</b>	<b>143 TOTAL STALLS</b>

12' X 34' LOADING STALLS PROVIDED: 2 LOADING STALLS

**DENSITY**

117 UNITS / 3.61 ACRES =  
32.4 UNITS / ACRE

**PROJECT AREA**

3.61 ACRES

**Floor Area Calculations**

First Floor:	35,298 sf
Second Floor:	33,696 sf
Third Floor:	33,696 sf
<b>Total Floor Area:</b>	<b>102,690 sf</b>

Total Horiz. Circulation:	16,960 sf
Total Vert. Circulation:	3,213 sf
Total Common Spaces:	6,776 sf
<b>Total Common Area:</b>	<b>26,949 sf</b>

Source: Design Partners, Inc.

Figure 3

Proposed Liloa Hale Senior Affordable Housing Project  
Preliminary Site Plan

NOT TO SCALE



**Table 1.** Distribution of Product Type and Floor Area

<b>Unit Type</b>	<b>Number of Units</b>	<b>Floor Area</b>
1 Bedroom/1 Bath	101 (including five (5) ADA units)	Standard: 642 sq. ft. ADA: 653 sq. ft.
2 Bedroom/2 Bath	16 (including one (1) ADA unit)	Standard: 878 sq. ft. ADA: 916 sq. ft.
<b>TOTAL NUMBER OF UNITS</b>	<b>117</b>	

Vehicular access to the proposed project will be provided via a new proposed access along Liloa Drive. Refer to **Figure 3**.

As noted previously, the project proposes improvements to Liloa Drive, a County right-of-way, and Pi'ilani Highway, a State right-of-way. Specifically, the project proposes the provision of a southbound left-turn lane with storage space at the project's driveway intersection with Liloa Drive. The project will also install delineators along the median of Pi'ilani Highway at the Pi'ilani Highway and Welakahao Road intersection. These roadway improvements are discussed further in Chapter II of this Environmental Assessment (EA).

### **C. PROJECT NEED**

In response to the current and projected shortage of affordable housing in Maui County, Liloa Senior Housing, LP proposes to develop and provide 117 units of 100 percent affordable senior rentals in Kihei. Liloa Senior Housing, LP has partnered with an established private non-profit corporation and co-developer of the project, Hale Mahaolu, to operate the facility. All units within the project will be restricted to seniors earning 60 percent or less of the Area Median Income (AMI) in accordance with the annual affordable rent guidelines set forth by the County of Maui's Department of Housing and Human Concerns (DHHC).

The County of Maui's housing prices continue to trend upward, putting pressure on housing rental rates. It is noted that most of Maui County's current projects in the development pipeline are affordable or workforce for-sale homes. The proposed project intends to serve a large unmet demand for senior affordable rental housing by providing 117 units of 100 percent affordable rentals in Kihei to Maui's aging population.

## **D. REGULATORY CONTEXT**

### **1. Chapter 2.97, Maui County Code**

All units within the project will be 100 percent affordable and restricted to seniors earning 60 percent or less of the AMI in accordance with the annual affordable rent guidelines set forth by the County of Maui's DHHC. In addition to offering apartments at monthly rental rates that will be significantly less than prevailing market rates, all units will retain their affordability for a minimum of 60 years, ensuring that residents are not priced out of their new homes as they age.

The Applicant has formulated the proposed project to meet the criteria for a Chapter 2.97, Maui County Code (MCC) fast tracked housing application. The Chapter 2.97 fast tracked housing application review process was approved by the Maui County Council and the Mayor in December of 2018 via Ordinance 4941. Chapter 2.97, MCC notes that an applicant may request exemptions or modifications of the MCC, which may include, but shall not be limited to the following:

1. *Title 19 of this code relating to zoning, with the understanding that if the application requests exemption of the project from any development standards, the application shall set forth alternative development standards.*
2. *Title 18 of this code relating to subdivision requirements.*
3. *Chapter 2.80B of this title relating to general plan and community plans.*
4. *Chapter 19.68 of this code relating to state land use district boundary amendments for projects less than fifteen acres in the agricultural, rural, and urban districts.*

As such, a Chapter 2.97, MCC application is being filed with DHHC to request exemptions from various County requirements in order to support the timely implementation of the project, without compromising public health, safety, or welfare considerations. Exemptions being requested by the Applicant are identified in Chapter IV of this EA.

### **2. Project District Processing Regulations**

As noted previously, the project site is located within the County of Maui's "Project District 5 (Piilani Village)". Pursuant to Chapter 2.97, MCC, the Applicant will file an application with DHHC to seek exemptions from various County requirements. One such exemption being requested will be an exemption to waive Project District processing requirements that are set forth in Chapters 19.45 (Project District Processing Regulations) and 19.74 (Kihei-Makena Project District 5) of the MCC, and would otherwise be required for projects proposed within a project district.

**3. Special Management Area (SMA) Use Permit**

The proposed project is located within the County of Maui's SMA. As such, the project will require a SMA Use Permit from the Maui Planning Commission (MPC) prior to implementation. The Chapter 2.97, MCC EA will serve as the supporting technical report of the Application for SMA Use Permit.

**4. Chapter 343, Hawai'i Revised Statutes, Regulatory Context**

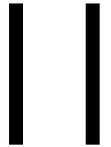
The proposed project will be funded by Low Income Housing Tax Credits (LIHTC), the State of Hawai'i's Rental Housing Revolving Fund (RHRF), the County of Maui's Affordable Housing Fund, as well as tax-exempt bonds. Additionally, the project proposes work within Liloa Drive, a County of Maui right-of-way and along Pi'ilani Highway, a State of Hawai'i right-of-way. The use of State and County funds as well as State and County lands are triggers for the preparation of a Chapter 343, Hawai'i Revised Statutes (HRS) EA. Pursuant to Section 11-200.1-15.c(10) of Hawai'i Administrative Rules (HAR), the DHHC has issued an Exemption Declaration for the project, exempting the project from the preparation of a Chapter 343, HRS EA. See **Appendix "B"**.

**E. PROJECT COST AND IMPLEMENTATION SCHEDULE**

The proposed action has an estimated project valuation of \$32.9 million. Construction is preliminarily scheduled to begin in February 2021. Total construction duration is estimated to be 13 months.



DESCRIPTION OF THE  
EXISTING ENVIRONMENT



## II. DESCRIPTION OF THE EXISTING ENVIRONMENT

### A. PHYSICAL ENVIRONMENT

#### 1. Surrounding Land Use

##### a. Existing Conditions

The project site, also referred to hereinafter as subject property, identified by TMK (2)2-2-002:072 (por.), covers an area of approximately 3.61 acres and is located in Project District 5, Kīhei, Maui, Hawai'i. The subject property is located immediately makai, or west of Pi'ilani Highway and Old Welakahao Road. Land uses to the west of the subject property include Liloa Drive and, beyond, single-family residential housing, including the Kalama Views Subdivision and the Waiohuli Subdivision. Hope Chapel is located immediately north of the project site, followed by Kihei Regional Park which constitutes the northern portion of the Kihei-Makena Project District 5. Northeast of the project, across Pi'ilani Highway lies the Maui Nui Golf Club. Southeast of the subject property, across Pi'ilani Highway, is the County of Maui Kīhei Wastewater Reclamation Facility. South of the subject property is Hale Mahaolu Ehiku, an elderly affordable housing development, and other multi-family residential and commercial developments. The subject property represents the southern extent of the area comprised as the Kihei-Makena Project District 5.

##### b. Potential Impacts and Proposed Mitigation Measures

The proposed project is an affordable rental project for low income seniors. It is located in a neighborhood of existing single-family and multi-family residences, including an affordable elderly housing project, as well as public/quasi-public and commercial land uses. The proposed project involves 117 units housed in a single 3-story building with onsite parking, landscaping and related improvements. The proposed project is not anticipated to adversely impact the physical character of the neighborhood and surrounding land uses.

#### 2. Climate

##### a. Existing Conditions

The Kīhei coast is generally sunny, warm, and dry the entire year. The average annual temperatures in Kīhei range between the low 60's to the

low 90's. June through August are historically the warmer months of the year, while the cooler months are January to March.

Average rainfall distribution in the Kīhei-Makena region varies from under ten (10) inches per year to twenty (20) inches per year in the higher elevations. Rainfall in the Kīhei-Makena region is highly seasonal, with most of the precipitation occurring in the winter months.

Northeast tradewinds prevail approximately 80 to 85 percent of the time. Winds average ten (10) to fifteen (15) miles per hour during afternoons, with slightly lighter winds during mornings and nights.

**b. Potential Impacts and Proposed Mitigation Measures**

According to the United States Environmental Protection Agency, the development of cities and suburban areas has a tendency to increase temperatures slightly (up to 10 degrees Fahrenheit, in dense cities) as compared to surrounding natural land cover. This “heat island” effect, as it is often denoted, refers to urban air and surface temperatures that may be higher than nearby rural or undeveloped areas (U.S. Environmental Protection Agency, 2019).

In order to minimize the potential of an elevated heat island profile, a number of landscaping measures are being incorporated into the project plans. For example, shade trees and landscape vegetation will be planted in the parking and near the building to take advantage of the natural cooling effects of shading and the evaporative effects of water from the soil and leaves. Refer to **Appendix “A”**.

It is anticipated that these mitigation measures will serve to offset the potential heat island effect of the building, and pavement in the proposed project. As a result, the proposed action is not anticipated to significantly alter local micro-climates.

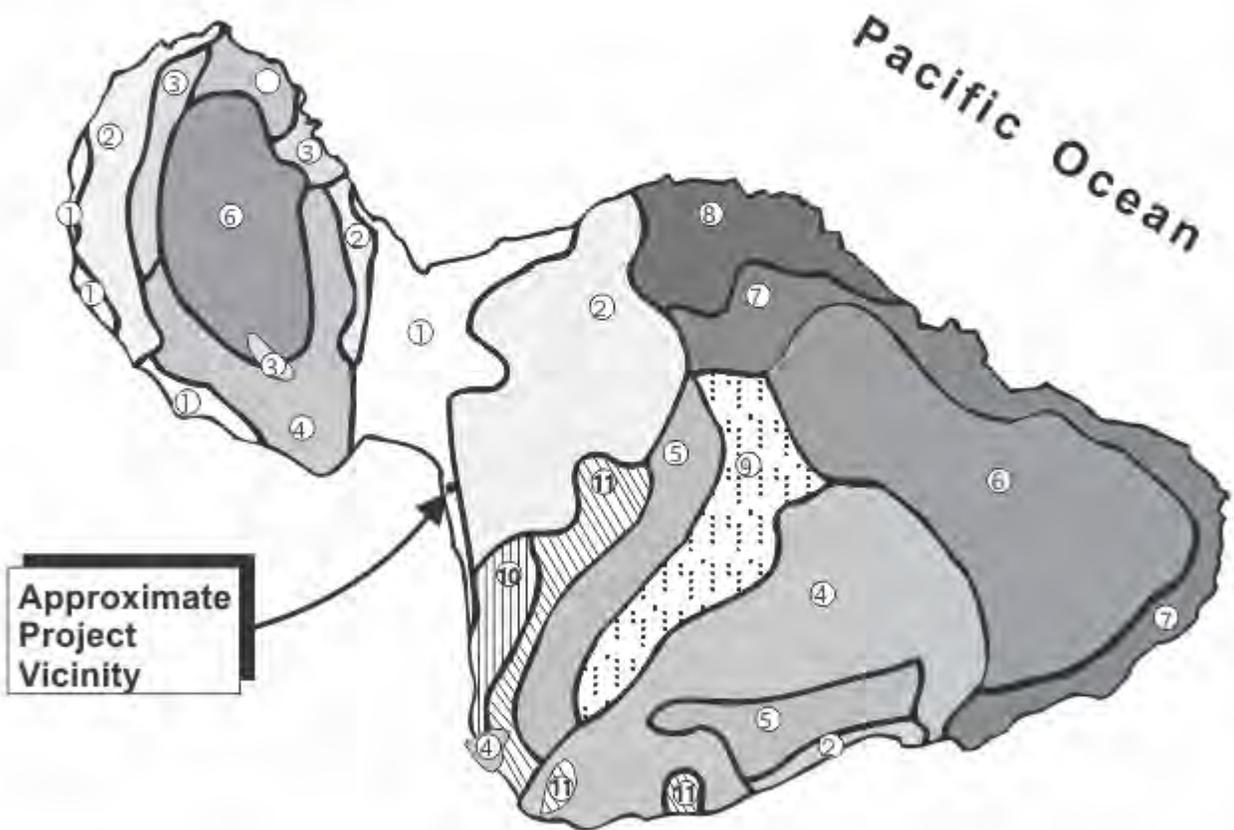
**3. Topography and Soil Characteristics**

**a. Existing Conditions**

The project site's northeasterly corner elevation sits at approximately 89 feet above mean sea level (AMSL), while the northwesterly corner elevation is at 66 feet AMSL, resulting in a slope of approximately four (4) percent from east to west. Underlying the subject property are soils belonging to the Pulehu-Ewa-Jaucas association. See **Figure 4**. The Soil Survey of the Islands of Kaua'i, O'ahu, Maui, Moloka'i, and Lāna'i, State of

# LEGEND

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



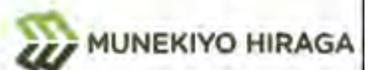
Source: U.S. Department of Agriculture, Natural Resources Conservation Service, 2006

**Figure 4** Proposed Liloa Hale Senior Affordable Housing Project Soil Association Map

NOT TO SCALE



Prepared for: Liloa Senior Housing, LP



Hawai'i, characterizes the soils of this association as deep and well drained and located on alluvial fans and in basins.

The soil series specific to the project site is Puuone Sand, 7 to 30 percent slopes (PZUE). See **Figure 5**. Puuone Sand consists of excessively drained soils found on the sandhills near the ocean. Permeability is rapid, runoff is slow, and the erosion hazard from wind is moderate to severe (U.S. Department of Agriculture Soil Conservation Service, 1972).

**b. Potential Impacts and Proposed Mitigation Measures**

The project site will be cleared, graded, and grubbed to ensure the slope of the development is compliant with Americans with Disabilities Act (ADA) design standards.

To control runoff, sedimentation, and erosion, Best Management Practices (BMPs) will be implemented in accordance with applicable provisions of the Maui County Code and the project-specific National Pollutant Discharge Elimination System (NPDES) permit, as applicable. These may include the following: constructing of retention and detention basins to capture sedimentation to minimize the quantity of sediment in storm water runoff leaving the site, protecting of natural vegetation, using wind erosion control, intercepting runoff above disturbed slopes, and using seeding and fertilizing or other soil erosion control. There are no geologic or soil hazard limitations associated with the project site, and the underlying topography does not pose a constraint to development. The site plan has been designed to integrate the proposed building, parking lot, and related improvements with the gentle slope of the landscape.

**4. Agriculture**

**a. Existing Conditions**

In 1977, the State Department of Agriculture developed a classification system to identify Agricultural Lands of Importance to the State of Hawai'i (ALISH). The classification system is based primarily, though not exclusively, upon the soil characteristics of the lands. The three (3) classes of ALISH lands are: "Prime", "Unique", and "Other Important" agricultural land, with all remaining lands termed "Unclassified". When utilized with modern farming methods, "Prime" agricultural lands have a soil quality, growing season, and moisture supply necessary to produce sustained crop yields economically. "Unique" agricultural lands possess a combination of soil quality, growing season, and moisture supply to produce sustained high yields of a specific crop. "Other Important" agricultural lands include

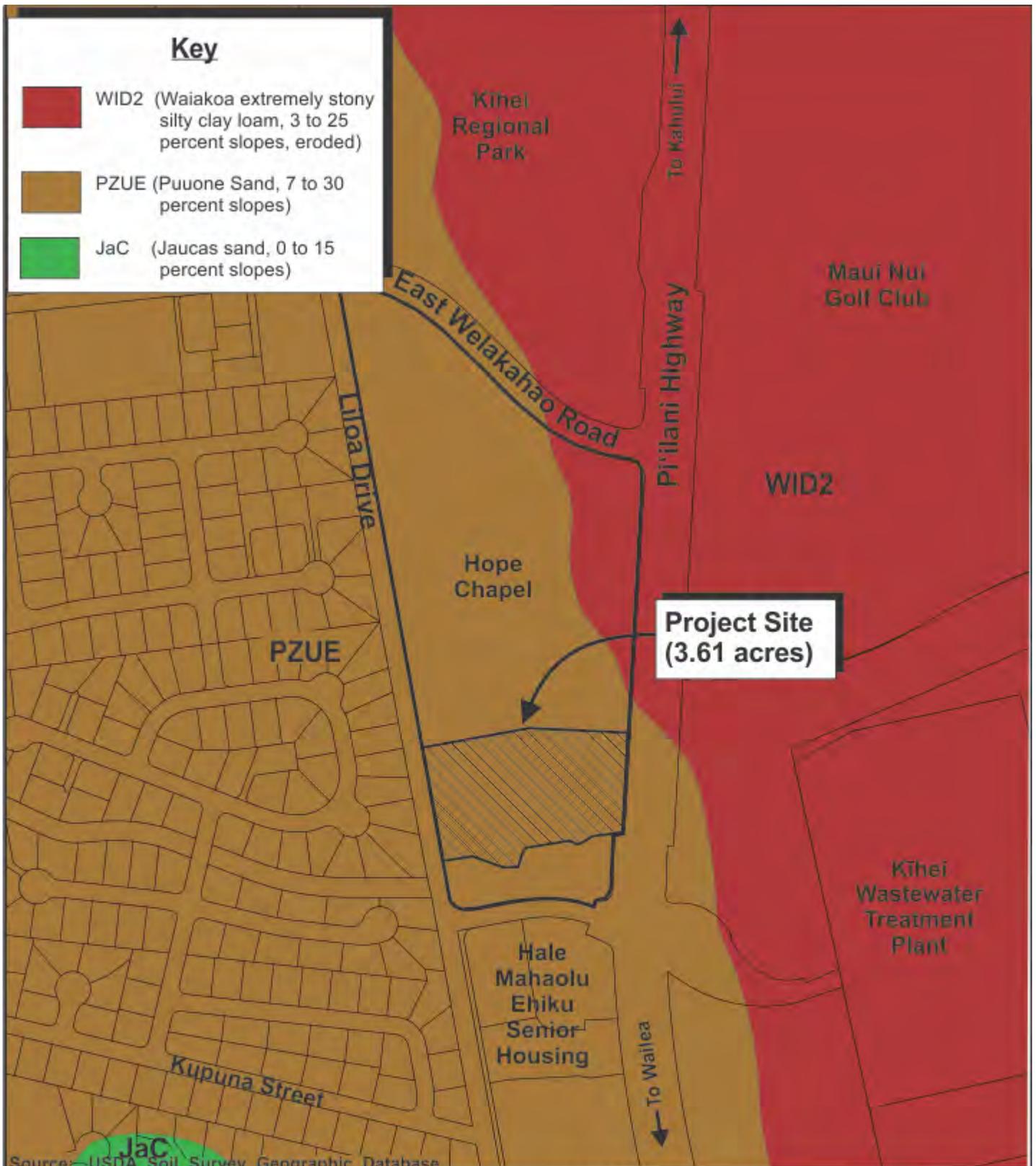
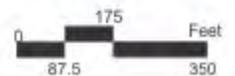


Figure 5

Proposed Liloa Hale Senior Affordable Housing Project  
Soil Classification Map



Prepared for: Liloa Senior Housing, LP



those that have not been rated as “Prime” or “Unique”, but are of state-wide or local importance for agricultural use. As reflected by the ALISH map for the project region, the project site is “Unclassified” and is located in an area designated for urban use.

The University of Hawaii, Land Study Bureau (LSB) developed the Overall Productivity Rating, which classified soils according to five (5) levels, with “A” representing the class of highest productivity soils and “E” representing the lowest. The majority of subject parcel is not rated, however, there is a small portion in the southeast corner with an LSB rating of “E”, the lowest productivity rating. See **Figure 6**.

**b. Potential Impacts and Proposed Mitigation Measures**

The project site is currently vacant and undeveloped. The site has not been used for cultivated crops. Residual agricultural pesticides and fertilizers are not anticipated in the vicinity of the project site.

In the context of the project site’s underlying designation as Project District 5 for residential and multi-family purposes and its neighboring urban environs, significant adverse impacts to agricultural resources are not anticipated as a result of the proposed project.

**5. Flood and Tsunami Hazard**

**a. Existing Conditions**

The Flood Insurance Rate Map in the project vicinity designates the project site as being located within Zone “X” (unshaded) (Federal Emergency Management Agency, 2015). Specifically, the Federal Emergency Management Agency (FEMA) describes Flood Zone “X” to be areas of minimal flood hazard. Flood Insurance purchase is not required in Zone “X”. See **Figure 7**.

According to the National Oceanic and Atmospheric Administrations’s (NOAA) Tsunami Evacuation Maps, the subject property is located beyond the limits of dangerous wave action and evacuation boundaries.

**b. Potential Impacts and Proposed Mitigation Measures**

The proposed project will not be developed within a Special Flood Hazard Area and is not located within a tsunami evacuation area. No adverse impacts with regard to flood and tsunami hazard parameters are anticipated with the implementation of the project.

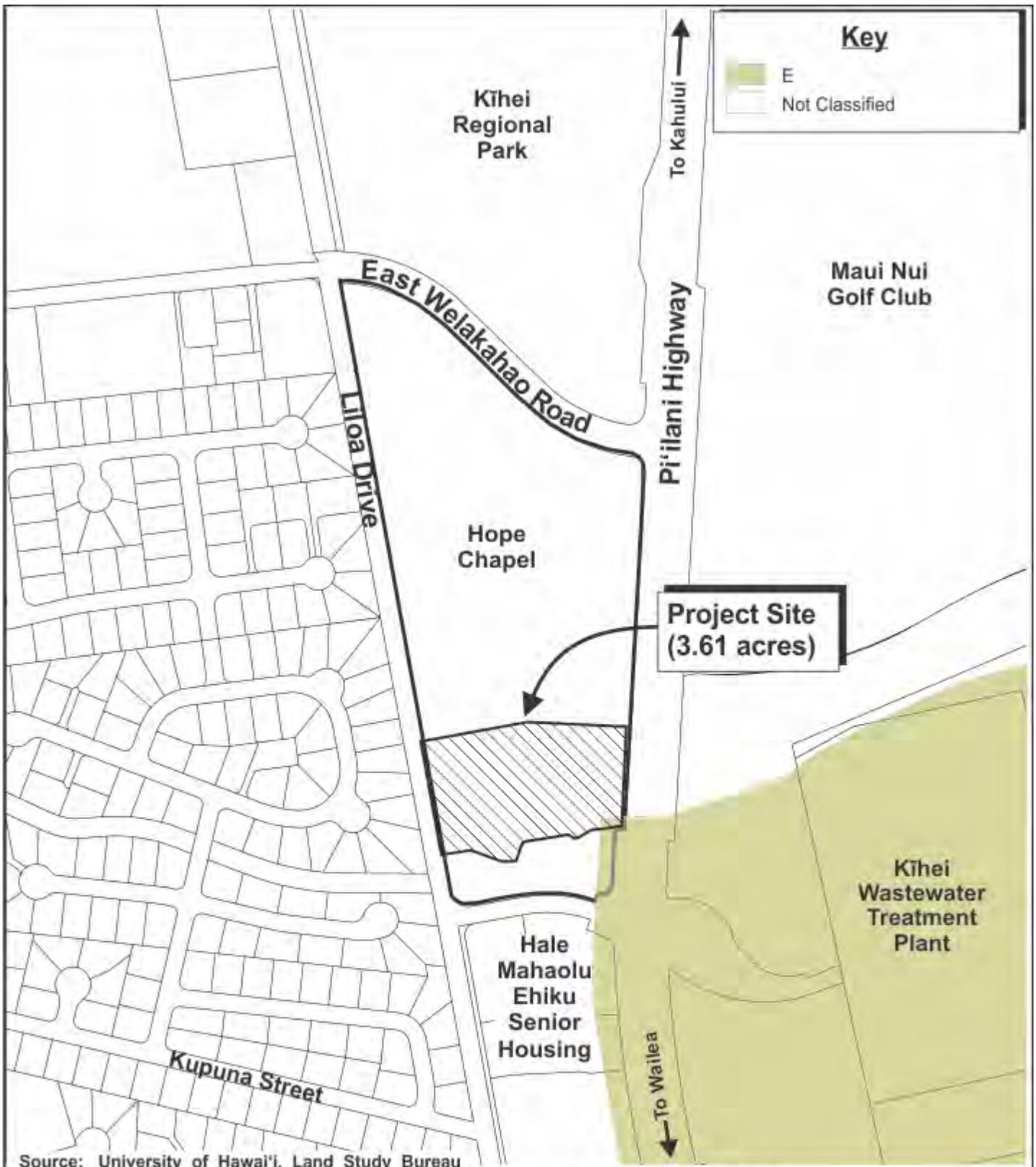
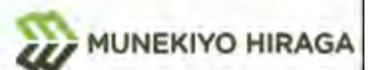


Figure 6

Proposed Liloa Hale Senior  
Affordable Housing Project  
Land Study Bureau Classification Map



Prepared for: Liloa Senior Housing, LP



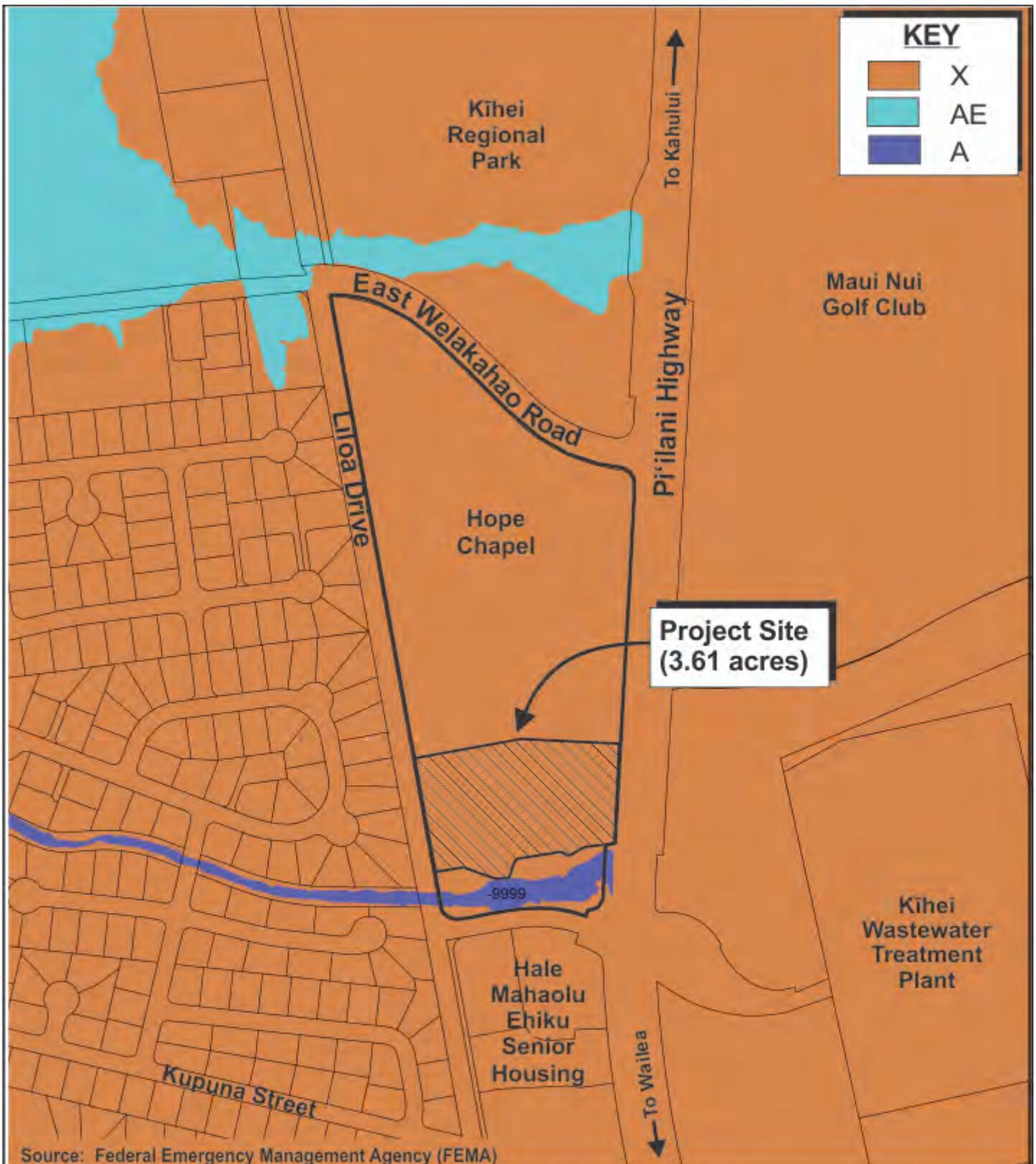
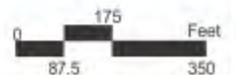


Figure 7

Proposed Liloa Hale Senior Affordable Housing Project  
Flood Insurance Rate Map



Prepared for: Liloa Senior Housing, LP



## 6. Flora and Fauna

### a. Existing Conditions

A Botanical and Fauna Survey was prepared for the project site by Robert W. Hobdy, an environmental consultant, in May 2019. See **Appendix “C”**. The objectives of the survey were to document species that occur or are likely to occur in the study area, the status and abundance of each species within the study area, the presence or occurrence of any threatened or endangered flora or fauna, and the presence of any critical habitats. An evening site visit was conducted to record twilight activities and vocalizations and to search for evidence of occurrence of the Hawaiian hoary bat (*Lasiurus cinereus semotus*) in the area.

The report describes the project site as a dry open grassland with a few small trees and shrubs. The survey recorded 43 species of plants, consisting of six (6) indigenous species and 35 non-native species. The buffelgrass (*Cenchrus ciliaris*) was found to be abundant throughout the project site and the hardy native sub-shrub 'uhaloa (*Waltheria indica*) was common at the site. The other 35 species were of rare occurrence. Six (6) indigenous native plant species found within the project site include the 'uhaloa, the 'ilima (*Sida fallax*), the kou (*Cordia subcordata*) the alena (*Boerhavia repens*), Koali 'awa (*Ipomoea indica*), and the koali kuahulu (*Merremia aegyptia*). None of these species are threatened or endangered and are found on all of the Hawaiian Islands.

One (1) non-native mammal, the domestic cat (*Felis catus*), was seen during the site visits. The report notes that mice (*Mus domesticus*), rats (*Rattus spp.*), mongoose (*Herpestes auropunctatus*), and domestic dogs (*Canis familiaris*) are also likely to occur at the site.

A special effort was made to look for the native Hawaiian hoary bat by making an evening survey using a bat detector (Batbox IIID). The device was set to the frequency of 27,000 Hertz that these bats are known to emit when echolocating for the nocturnal flying insects they feed on. No bat activity was detected with the use of this device.

Birdlife was rather sparse in the dry habitat. Five (5) non-native birds were recorded during the site visits. Two (2) species were common, the zebra dove (*Geopelia striata*) and the common myna (*Acridotheres tristis*). Two (2) species were uncommon, the spotted dove (*Streptopelia chinensis*) and the house sparrow (*Passer domesticus*). The cattle egret (*Bubulcus ibis*) was rare. No native birds were seen during the visits to the property.

Eleven (11) species of insects were recorded during the site visits. One (1) butterfly species, the long-tailed blue (*Lampides boeticus*), was common. Five (5) others were uncommon, including the dung fly (*Musca sorbens*), the monarch butterfly (*Danaus plexippus*), the spiderling plume moth (*Megalorhipida leucodactyla*), the globe skimmer dragonfly (*Pantala flavescens*) and the short-horned grasshopper (*Oedaleus abruptus*). Five (5) other species were of rare occurrence. The globe skimmer dragonfly is an indigenous native species which is widespread and common throughout Hawai'i.

**b. Potential Impacts and Proposed Mitigation Measures**

The Botanical and Fauna Survey report noted that the vegetation at the project site consists primarily of non-native species. Only six (6) common indigenous native plant species were recorded in the project site and none of these are of any conservation concern. The report noted that the proposed project is not expected to have a significant negative impact on the botanical resources in this part of Maui.

The habitat in the project area is dominated by non-native plant and animal species that are of no special conservation concern. One (1) native insect species, the globe skimmer dragonfly, was present. This dragonfly has a nearly world-wide natural occurrence and is rated as being environmentally of least concern.

While not detected during the survey, the Endangered Hawaiian hoary bat could occasionally show up in this habitat. These bats are strong flyers with wide ranging capability. They seek out areas where there are spikes in insect activity that they can take advantage of. As recommended by the report, should the Hawaiian hoary bat appear at the project site, the U.S. Fish and Wildlife Services (USFWS) will be consulted on actions that can be taken to ensure that these endangered bats are not harmed or destroyed during the development process.

During the survey, six (6) tree tobacco plants (*Nicotiana glauca*) were found. Tree tobacco is a potential host plant for the Endangered Blackburn's sphinx moth (*Manduca blackburni*). None of these moths, their eggs or their larvae were found on these plants but they could show up during the wet season. The environmental consultant provided the Applicant with guidance for actions for the removal of these plants that would ensure that these Endangered moths are not harmed or destroyed if they are present. In accordance with the guidance provided, the Applicant removed the tree tobacco plants that were identified during the

Botanical and Fauna Survey. No Blackburn's sphinx moths, their eggs, or their larvae were found on the plants that were removed.

While not observed during the survey, Hawaiian Petrel, the 'ua'u, and Newell's shearwater, the 'a'o, are known to overfly the area at dawn and dusk to their burrows high in the mountains between March and November. In late fall, young birds fledge from their burrows to take their first tentative flights out to sea. These inexperienced birds are easily confused and distracted by bright lights and often crash to the ground. The report recommends that any significant outdoor lighting, such as street lights or flood lights that are incorporated into the project design, be shielded to direct the light downward so that it is not visible from above. Refer to **Appendix "C"**.

With implementation of these mitigation measures, it is not anticipated that the proposed project will result in significant adverse impacts to the flora and fauna resources within the project site.

**7. Streams, Wetlands, and Reservoirs**

**a. Existing Conditions**

There is a natural drainageway that runs from an east to west direction immediately to the south of the 3.61-acre project site. There are no natural wetlands on or in the vicinity of the project site. The County of Maui's Kīhei Wastewater Treatment Plant, which contains a man-made reservoir, lies to the east of the project site. See **Figure 8**.

**b. Potential Impacts and Proposed Mitigation Measures**

The project site does not contain any streams, wetlands, or reservoirs. As such, the proposed project is not anticipated to impact any of these environmental features. The existing drainageway in the vicinity lies to the south and is located outside of the project site. No development is proposed in this area.

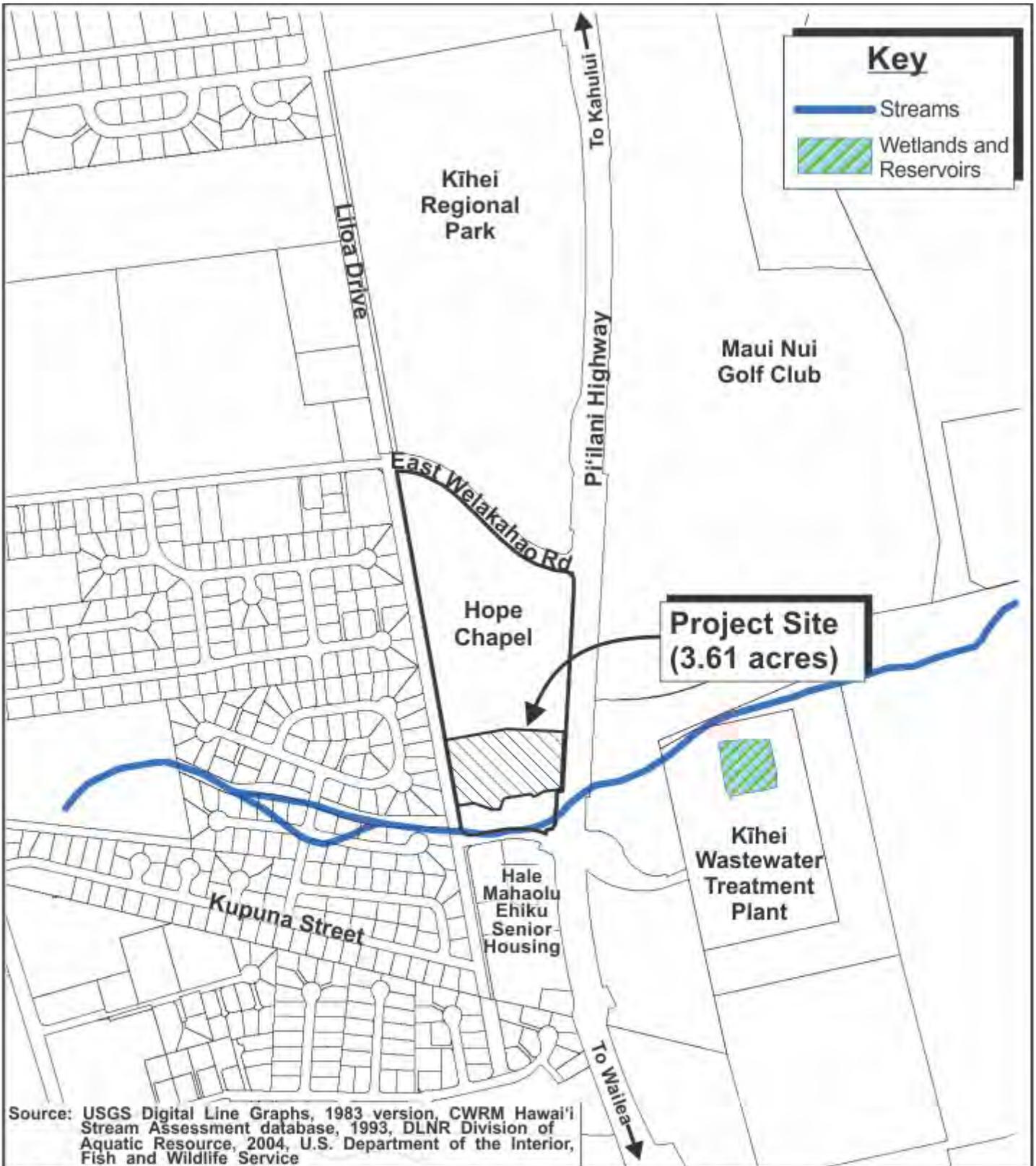


Figure 8

Proposed Liloa Hale Senior Affordable Housing Project  
Wetland and Stream Map



Prepared for: Liloa Senior Housing, LP



**8. Air Quality and Noise Characteristics**

**a. Existing Conditions**

The State Department of Health, Clean Air Branch, monitors ambient air quality throughout the State. The air quality monitoring station in Kīhei, one (1) of two (2) stations on Maui, indicates air quality in South Maui is generally “good”. The tradewinds help maintain good air quality.

There are no point sources of airborne emissions in the immediate vicinity of the project site. The air quality of the Kīhei area is considered good with existing airborne pollutants attributed primarily to automobile exhaust from the region’s roadways. However, prevailing tradewinds quickly disperse particulates which are generated.

There are no significant adverse noise sources in the project area. Noise generated in the vicinity of the subject property can be attributed to traffic traveling along adjoining roadways, including the Pi’ilani Highway.

**b. Potential Impacts and Proposed Mitigation Measures**

Air quality impacts attributed to the proposed project will include dust generated by short-term construction-related activities. Site work, such as clearing, grubbing and grading, and roadwork and construction will generate airborne particulates. Dust control measures such as dust fences and regular watering and sprinkling will be implemented to minimize wind-blown emissions. Graded and grubbed areas will be vegetated to mitigate dust-generated impacts. In the long term, the proposed project is not expected to adversely impact local and regional ambient air quality.

Ambient noise conditions will be temporarily impacted by construction activities. Heavy construction equipment, such as bulldozers, front-end loaders, and material-transport vehicles will likely be the dominant sources of noise during the construction period. In the long term, significant adverse impacts to ambient noise conditions are not anticipated. The proposed senior multi-family residential use is similar in nature to the nearby residential uses, such that no significant changes in ambient noise levels are anticipated.

9. **Scenic and Open Space Resources**

a. **Existing Conditions**

The Pacific Ocean and the off-shore islands of Molokini and Kahoolawe define the scenic and open space resources to the south and west (makai) direction of the subject property. The West Maui Mountains constitute the primary visual feature to the north, while Haleakala is the dominant visual feature to the east of the subject property. The project site is currently vacant, undeveloped, and generally, as noted in the Botanical and Fauna Survey report, a dry open grassland with a few small trees and shrubs. The site is located adjacent to the existing Hope Chapel to the north and Hale Mahaolu Ehiku to the south. The project site is not a designated view corridor.

b. **Potential Impacts and Proposed Mitigation Measures**

The proposed 3-story building will be located adjacent to existing developments, Hope Chapel and Hale Mahaolu Ehiku. A view analysis was prepared for the project. See **Appendix “D”**. By integrating computer generated renderings of the proposed building and landscaping with actual photographs, the analysis provides 3-dimensional perspectives of the proposed project from the vantage points of Pi’ilani Highway. To the extent practicable, the building and parking lot will be screened by landscaping and canopy trees. Given the project’s location adjacent to existing developments, together with the proposed screening by landscaping, the proposed project is not anticipated to present significant adverse impacts on scenic and open space resources.

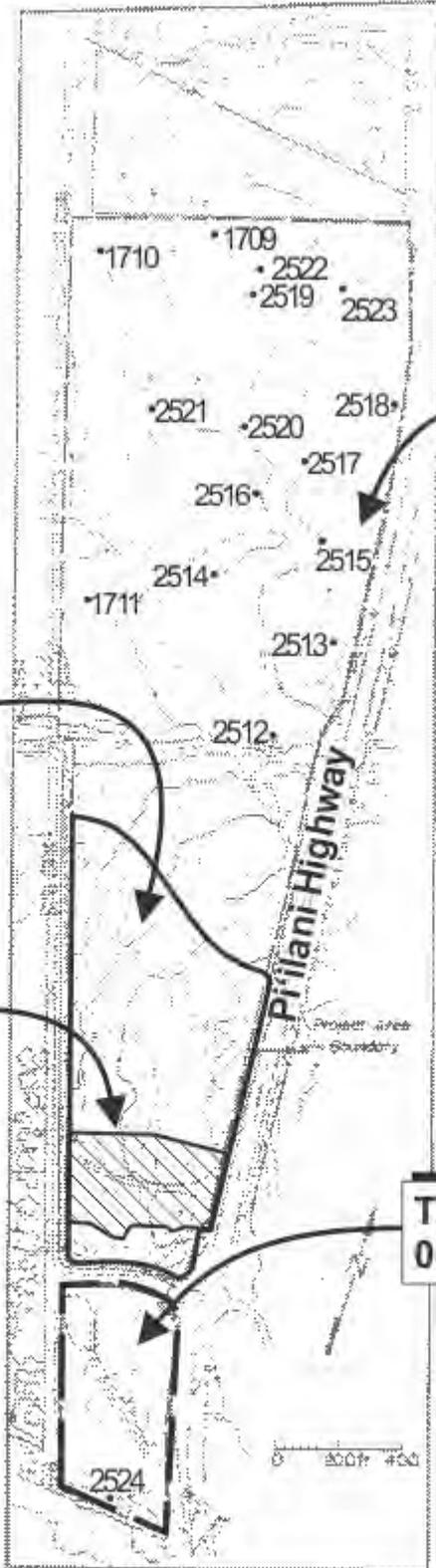
10. **Archaeological Resources**

a. **Existing Conditions**

In April 1990, Paul H. Rosendahl, Ph.D., Inc. completed an Archaeological Inventory Survey (AIS) for the southern portion of the Kihei-Makena Project District 5. The survey area included TMK No. (2)2-2-002:072, on which the project site is located, and the properties north and south of the subject parcel, identified by TMK No.: (2)2-2-002:042 (north) and TMK Nos.: (2)2-2-029:001, 002, 003, 005, and 006 (south). See **Appendix “E-1”**. The survey indicated the presence of sixteen (16) sites with thirty (30) component features, all of which were located on adjacent properties to the

**KEY**

- Previously Identified Archaeological Sites



TMK No.: (2)2-2-002:042

TMK No.: (2)2-2-002:072

Project Site

TMK Nos.: (2)2-2-0029:001, 002, 003, 005, 006

Source: Paul H. Rosendahl, Inc., 1990

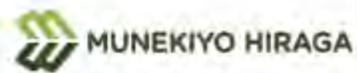
Figure 9

Proposed Liloa Hale Senior Affordable Housing Project  
Archaeological Sites

NOT TO SCALE



Prepared for: Liloa Senior Housing, LP



north and south. See **Figure 9**. Six (6) of the sites identified on Parcel 72 were assessed as archaeologically significant in terms informational value.

The AIS report indicated that no significant archaeological sites were identified within the project site at the time of the survey. The report did note that previous archaeological sites had been identified in the study area by the Environmental Impact Statement Corporation (EISC) during a 1982 survey and R. Cordy in 1977. Rosendahl indicated that grubbing activities between 1982 and 1990 destroyed all of the sites previously identified by EISC and Cordy. In addition to grubbing activities, the report also noted that erosion and cattle grazing combined to eliminate nearly all of the remnant archaeological resources of the subject property and properties to the south.

**b. Potential Impacts and Proposed Mitigation Measures**

According to the 1990 AIS report by Paul H. Rosendahl, Ph.D., Inc., no significant archaeological sites were identified within the project site. It is noted that prior correspondence with the State Historical Preservation Division (SHPD) for the subject parcel between 2003 and 2005 during the land use and construction permitting processes of Hope Chapel indicated that “no historic properties will be affected” in Parcel 72 based on the information presented in the 1990 AIS. See **Appendix “E-2”**.

This determination was based on the finding that *“an acceptable archaeological inventory found a single historic site, which was determined significant for information content only. Sufficient information was obtained during the inventory survey with no further archaeological work being necessary.”* In the letter dated September 20, 2005, the same finding was made with an additional caveat that *“in the event that historic sites (human skeletal remains, etc.) are identified during the construction activities, all work needs to cease in the immediate vicinity of the find, the find needs to be protected from additional disturbance, and the State Historic Preservation Office needs to be contacted immediately at 243-5169, on Maui, or at (808) 692-8023, on O’ahu.”* Refer to **Appendix “E-2”**.

In addition, pursuant to Hawai’i Revised Statutes (HRS) Chapter 6E-42 and Hawai’i Administrative Rules (HAR)13-284-1, the County of Maui, Department of Housing and Human Concerns (DHHC) has submitted a HRS 6E consultation request to SHPD on behalf of the Applicant for the proposed project. See **Appendix “E-3”**. According to the HRS 6E consultation request, as part of outreach with cultural descendants conducted for the project as part of a Cultural Background Review report,

there has been concern expressed over the presence of secondary sand deposits of an unknown origin within the project area, as well as potentially remnant pockets of an inland dune system. Given the results of this community consultation, the Applicant is agreeable to conducting onsite precautionary archaeological monitoring as an identification measure, per HAR 13-279-3, for all initial ground disturbing activities in areas where original natural grade is present. The HRS 6E consultation request is currently under review by the SHPD. Refer to **Appendix “E-3”**.

Based on the foregoing, significant adverse impacts to archaeological resources are not anticipated with implementation of the subject project and the proposed archaeological monitoring. As required by SHPD, should any historical sites (human skeletal remains, etc.) be encountered during project construction, all work will be ceased in the immediate vicinity of the find and the find will be protected from additional disturbance. The staff of SHPD will be notified accordingly in order to determine appropriate mitigation measures.

## 11. **Cultural Resources**

### a. **Existing Conditions**

A Cultural Background Review report was prepared by Aina Archaeology in February 2020 for the proposed project. See **Appendix “F”**. The purpose of the report was to identify potential impacts on cultural resources and involved a literature review of historical and archival documents, a pedestrian field inspection, as well as limited cultural consultation.

In terms of traditional Hawaiian perspectives of the island, the project site is situated within the *moku*, traditional land district, of Kula. Kula is comprised of 17 *ahupua‘a*, smaller, narrower land sections generally running from mountain into ocean, which, from north to south, include: Makaehu, Kohoilo, A‘apueo, Kalialinui, Oma‘opio, Pūlehunui, Pulehuiki, Kamehameiki, Kamehamenui, Kealahou, Waiakoa, Alae, Kaonoulu, Koheo, Waiohuli, Kēōkea, and Kama‘ole. The project site is located within the lower elevations of Kēōkea Ahupua‘a, which extends from the ridge line near the summit of Haleakalā at Pu‘ukeōkea (7,000 ft. above mean sea level) to the shoreline between the former village of Waimahaihai and the wetlands of La‘ie/Kulamoemalia.

Specific to the project site, the report noted that an intermittent stream once flowed to Waimahaihai and fed the fishing grounds and *limu* (seaweed) beds. However, with the modern growth of the Kula-kai (sea) shoreline for both resort and residential housing, the traditional cultural landscape of

Kēōkea-kai has been drastically altered as wetlands were filled in and the natural waterway courses diverted and modified in both the *mauka* (inland) reaches and at the *muliwai* (outlets) to the sea. This disruption of the natural drainage patterns, along with the development of the resort and residential areas within and just back of the coastal settlement zone, has likely contributed to the degradation and loss of shoreline resources. As referenced in the Cultural Background Review report, Mr. John Patterson of Hope Chapel noted that Hope Chapel acquired the project parcel from Haleakala Ranch over 20 years ago after the overall larger parcel was bisected by the construction of Pi'ilani Highway and classified as remnant by the ranch as the parcel could no longer be a part of their grazing lands. Further, noted as part of the report, in a site walk-through of the proposed project site on January 26, 2020, Mr. Vernon Kalinikau commented on the fact that the stream system had been severely altered by both the construction of Pi'ilani Highway and Liloa Drive and did not appear to be a living system in this section of the stream alignment. Nevertheless, the report noted that Mr. Kalanikau was encouraged that the existing drainageway to the south of the project site would be kept natural and remain uncovered rather than channelized and buried, thus allowing for natural percolation.

The report also indicated that the project site has been heavily disturbed by previous filling, grading, and materials staging from offsite construction activities. Additionally, sand mounds containing some silt, angular gravels, cement fragments, and displaced bedrock with calcium carbonate precipitates were noted in the southern portion of the project site. These mounds with intermixed construction debris were identified as imported materials by Mr. Patterson and Mr. Mark Spencer, formerly with Spencer Construction, and likely associated with both the construction of Hope Chapel to the north, Hale Mahaolu Ehiku to the south, and other offsite projects. Refer to **Appendix "F"**.

**b. Potential Impacts and Proposed Mitigation Measures**

According to the Cultural Background Review report, no current traditional and customary gathering practices were identified within the proposed project site. In addition, the report noted that the disruption of the natural drainage patterns that once ran along the southern boundary of the project site prior to the construction of Pi'ilani Highway, along with the development of the existing resort and residential areas, has likely contributed to the degradation and depletion of shoreline resources at Waimahaihai which was once a thriving traditional gathering area, close to the project site. Although the proposed project will be developing additional residential units

mauka of Waimahaihai, the existing drainageway will remain undeveloped and thereby alleviate any potential cumulative effects to the cycle in which the remaining shoreline resources rely.

The report also indicated that the previous SHPD correspondence for prior permits issued for the subject parcel have resulted in determinations that “no historic properties will be affected”, and prior historic era land disturbance, as well as ground alteration during the construction of the nearby projects, including Hope Chapel, has significantly altered the ground surface. During Mr. Kalanikau’s site visit on January 26, 2020, the presence of sand deposits within the project site was noted. As sand deposits are often used for interring *‘iwi kūpuna*, during the site visit Mr. Kalanikau had expressed concern over the possibility for encountering burials within the remnant pockets of sand, as well as the sand deposits that were potentially brought in from an offsite source during construction. Mr. Kalanikau recommended an archaeological monitoring program be in place during construction. As a result, the report concluded that archaeological monitoring is recommended for all initial ground disturbing activities in areas where the original natural grade is present. Refer to **Appendix “F”**. As noted in the previous section, an HRS 6E consultation request has been submitted to SHPD to request concurrence. Refer to **Appendix “E-3”**.

Based on the foregoing, significant adverse impacts to cultural resources or activities are not anticipated as a result of the proposed project which proposes archaeological monitoring.

## **B. SOCIO-ECONOMIC ENVIRONMENT**

### **1. Community Character**

#### **a. Existing Conditions**

From a regional standpoint, the subject parcel is part of the Kihei-Makena Community Plan region which stretches from Ma’alaea to La Perouse Bay. The region includes a diverse range of physical and socio-economic environments. With its dry and mild climate and proximity to recreation-oriented shoreline resources, the visitor based economy has grown steadily over the past few years. The town of Kihei serves as the commercial and residential center of the region with the master-planned communities of Wailea and Makena serving as the focal point for visitor activities.

**b. Potential Impacts and Proposed Mitigation Measures**

In its provision of 117 affordable units for seniors, the proposed Liloa Hale Senior Affordable Housing Project is considered to be similar, related to, and compatible with adjacent land uses, including the Hale Mahaolu Ehiku elderly housing project to the south and Hope Chapel to the north. The proposed project is an urban in-fill project which will be developed in the character of the surrounding properties and land uses. In this respect, adverse impacts to the regional character of the Kīhei area are not anticipated.

**2. Population**

**a. Existing Conditions**

The population of the County of Maui has exhibited a relatively strong growth over the past decades, with the 2000 census population of 128,241 reflecting a 27.7 percent increase over the 1990 population of 100,374 (U.S. Census Bureau, 1990 and 2000). Maui County's population increased from 128,094 residents in 2000 to 154,834 residents in 2010, indicating a 20.8 percent increase. Population on the island of Maui exhibited even stronger growth than the County as a whole, with a 22.8 percent population increase over the decade. Approximately 144,444 residents lived on the island of Maui in 2010 (U.S. Census Bureau, 2010). Maui County's resident population is projected to rise to 172,762 in 2020 and to 189,947 in 2030 (County of Maui, Department of Planning, 2006).

Just as the County's population has grown, the resident population of the region surrounding the project site has increased in the last two (2) decades. The estimated population of the Kīhei-Makena region in 2000 was 22,870, which comprised 19.4 percent of the island's population (County of Maui, 2006). According to the 2010 Census, the resident population for the region was approximately 27,200, an increase of 19.1 percent over 10 years (U.S. Census Bureau, 2010). The population of the Kīhei-Makena region is projected to increase to 35,307 in 2030.

**b. Potential Impacts and Proposed Mitigation Measures**

In light of the projected growth in the resident population of the Kīhei-Makena region, demand for housing and senior housing are anticipated to rise through 2030. The proposed Liloa Hale Senior Affordable Housing Project is being planned to support the projected growth in the senior low income population in the region. The proposed project will be for low income seniors earning 60 percent or less of the Area Median Income

(AMI) and is not considered to be a population generator; rather, is positioned to respond to the needs of the aging population in the region. The project site is also located within the Maui Island Plan Urban Growth Boundary (UGB) in the Kīhei-Makena region where growth has been planned for and accommodated. As such, the proposed project is not anticipated to adversely impact population parameters in the region.

### **3. Economy**

#### **a. Existing Conditions**

The economy of Maui is heavily dependent upon the visitor industry. The dependency on the visitor industry is especially evident in the Kīhei-Makena region, which is one of the State's major resort destination areas. The foundation for the region's visitor strength lies in the availability of vacation rentals in Kīhei and world-class resorts and recreational facilities located in Wailea and Makena. Support for the visitor industry is provided in Kīhei, where numerous retail commercial centers are found.

Alongside visitor accommodations, service support for the visitor industry is found in Kīhei, where numerous retail commercial centers are located. North Kīhei contains mixed retail, office and warehouse spaces, South Kīhei offers beach-oriented retail, and Wailea offers high-end retail and offices. In the vicinity of the project site, there are retail and office spaces in shopping center settings. Meanwhile, in support of the resident population, a number of businesses and medical offices are located in Kīhei as well.

In December 2019, the seasonally unadjusted unemployment rate in Hawai'i stood at 2.6 percent, the same rate as December 2018. In December 2019, the unemployment rate in the County of Maui was 2.2 percent, the same rate as December 2018. Unemployment for the Maui island was 2.2 percent in December 2019, also the same rate as December 2018 (State of Hawai'i, Department of Labor and Industrial Relations, January 2020).

#### **b. Potential Impacts and Proposed Mitigation Measures**

On a short-term basis, the proposed project will support construction and construction-related industries. Accordingly, the proposed project will have a beneficial impact on the local economy during the period of construction.

On a long-term basis, the proposed project will provide much needed housing for low income earning seniors. The project will also create job

opportunities for maintenance and operation of the rental housing, which will contribute to Maui's economy. The proposed project involves establishing apartment rental housing for Maui's aging population. In the context of the County of Maui's population projections through the year 2030, the proposed project is not anticipated to alter population trends. New rental housing inventory is anticipated to support the island's resident population.

#### **4. Housing**

##### **a. Existing Conditions**

The project site is located in Kīhei, the commercial and residential center of South Maui. Kīhei contains a mix of affordable and market priced single- and multi-family residential neighborhoods; in contrast, the resort-oriented communities of Wailea and Makena generally offer higher end homes and luxury condominiums, primarily for part-time residents. The Maui County General Plan and the Maui Island Plan expand residential growth in the Kīhei-Makena region with a number of new residential and in-fill developments being captured within the UGB of the Maui Island Plan.

##### **b. Potential Impacts and Proposed Mitigation Measures**

The proposed project will provide 117 units of affordable housing to low income seniors earning 60 percent or less of the AMI. The proposed project will help alleviate the need for affordable senior housing in an area that is lacking affordable rental opportunities. The proposed project will, therefore, have a positive impact on the housing market by increasing the inventory of affordable housing rental units to seniors.

### **C. PUBLIC SERVICES**

#### **1. Police and Fire Protection**

##### **a. Existing Conditions**

County of Maui's Police Department is headquartered in Wailuku. The Maui Police Department (MPD) consists of several patrol, investigative and administrative divisions. The MPD's Kīhei Patrol covers the Kīhei-Makena region. The department's Kīhei Police Station is located on the mauka (east) side of Pi'ilani Highway, approximately 0.7-mile to the southeast of the project site.

Fire prevention, suppression and protection services are offered by the County's Department of Fire Control. The department's Kīhei Station, which services the Kīhei-Makena region is located on South Kīhei Road approximately one-half mile to the west of the subject property. Meanwhile, the Wailea Fire Station is located about two (2) miles to the south of the project site. The Wailea Station services the area from Kamaole Beach Park II to Makena and provides back-up support for the Kīhei Station when required.

**b. Potential Impacts and Proposed Mitigation Measures**

The Liloa Hale Senior Affordable Housing Project will be located within an existing serviced area in South Maui and will not extend police, fire, or emergency services. As such, the proposed project is not anticipated to present significant adverse impacts on police and fire services.

**2. Medical Facilities**

**a. Existing Conditions**

Maui Memorial Medical Center, the only major medical facility on the island, services the Kīhei-Makena region. Acute, general and emergency care services are provided by this facility, which is licensed for 196 beds and is situated in Wailuku. Privately operated medical/dental offices are located in the Kīhei area to serve the region's residents and visitors.

**b. Potential Impacts and Proposed Mitigation Measures**

The proposed project will not extend medical services in the area. As such, the proposed project is not anticipated to adversely impact medical services and facilities.

**3. Recreational Facilities**

**a. Existing Conditions**

Diverse recreational opportunities are available in the Kīhei-Makena region. Recreational facilities in proximity to the subject property include Kīhei Regional Park, Kalama Park, Kamaole Beach Parks I, II and III, Kaleopolepo Park and the Maui Nui Golf Club. Shoreline recreation includes swimming, fishing, picnicking, snorkeling, and windsurfing.

Kīhei Regional Park, located to the north of the produce site, provides walking trails, playground and active ball fields. The 36.5-acre Kalama Park is located to the southwest of the subject property across South Kīhei

Road. In addition to shoreline activities, this park also has baseball and soccer fields, as well as tennis and basketball courts.

The Wailea and Makena resort areas to the south offer additional opportunities for golf, tennis and ocean-related activities.

In addition, the Kihei Community Center complex, located approximately 0.8-mile to the north of the subject property, provides for a community center, swimming pool, and athletic playfields.

**b. Potential Impacts and Proposed Mitigation Measures**

The proposed Liloa Hale Senior Affordable Housing project will provide 117 affordable housing units for low income seniors. As per the subdivision rules in Chapter 18.16.320, MCC, any development creating three (3) or more dwelling units is subject to a park dedication requirement. However, pursuant to Chapter 2.97, MCC where certain exemptions from development standards are available, an exemption from Section 18.16.320, MCC will be sought to relieve the project from the park and playground dedication requirements. Approval of this exemption will not adversely impact recreational facilities and services in the area as senior use of recreational facilities is limited to more passive activities and a social gathering space and other recreational amenities such as walking paths will be provided for project residents at the project site.

**4. Schools**

**a. Existing Conditions**

The State Department of Education (DOE) operates three (3) schools in the Kihei area. Kihei Elementary School and Kamali'i Elementary School cover grades K to 5, with 2018-2019 enrollments of approximately 690 and 472 students, respectively. Lokelani Intermediate School includes grades 6 to 8, with a 2018-2019 enrollment of 551 students. Public school students in grades 9 through 12 attend Maui High School in Kahului. However, the DOE is planning a new Kihei High School, which targets to open for the 2021-22 school year.

The Kihei Public Charter School for grades Kindergarten to 12 is also located in the region, with an enrollment of 652 students in the 2018-2019 school year (State of Hawai'i, Department of Education, 2019).

The University of Hawaii Maui College (UHMC), located in Kahului, is the primary higher education institution serving Maui.

**b. Potential Impacts and Proposed Mitigation Measures**

The DOE anticipates that within the next 25 to 30 years there will be significant growth in the Central Maui area, which includes the Kīhei-Makena region. The population growth in the Central Maui area will require the construction of new schools. Due to the anticipated need for educational facilities, the Board of Education adopted a School Impact District for Central Maui. However, due to the senior age group of the future tenants, it is anticipated that the proposed project will have little or no impact on educational resources or facilities. As required, the proposed project will comply with the requirement for school impact fees.

**5. Solid Waste**

**a. Existing Conditions**

Single-family residential solid waste collection service is provided by the County of Maui on a once-a-week basis. Residential solid waste collected by County crews are disposed at the County's 55-acre Central Maui Landfill located 4.0 miles southeast of the Kahului Airport. In addition to County-collected refuse, the Central Maui Landfill accepts commercial waste from private collection companies. According to the County of Maui Integrated Solid Waste Management Plan (ISWMP), the existing Central Maui Landfill has adequate capacity to accommodate residential and commercial waste needs through the year 2026 (County of Maui, Department of Environmental Management, 2009).

The County is currently in the process of planning a waste management facilities project adjacent to the Central Maui Landfill, which will extend the projected capacity of the landfill to 2042.

**b. Potential Impacts and Mitigation Measures**

A construction waste recycling, reuse, and disposal plan will be developed prior to the initiation of construction. The proposed project will be served by a private solid waste collection and disposal service. Solid waste will be disposed of at the Central Maui Landfill. The proposed project is not anticipated to affect the service capabilities of the County's residential solid waste collection system.

## D. **INFRASTRUCTURE**

### 1. **Roadway System**

#### a. **Existing Conditions**

The following is a summary of major roadways in the vicinity of the project site.

#### **South Kīhei Road**

This two-way, two-lane, undivided, north-south County roadway traverses the Kīhei coastline. It begins at a T-intersection with North Kīhei Road near Maui Veterans Highway and terminates at Okalani Drive in Wailea. This road provides local access to shopping centers and visitor accommodations.

#### **Liloa Drive**

This two-way, two-lane, undivided, north-south County road provides for travel between East Waipuilani Road and South Maui Community Park. Beyond the South Maui Community Park, further south, Liloa Drive continues as a short roadway segment that provides access for residential homes and churches between East Welakahao Road and Ehiku Street.

#### **Pi'ilani Highway**

This is a north-south State Highway that extends southward from Maui Veterans Highway at its intersection with North Kīhei Road and terminates approximately seven (7) miles to the south at Wailea Ike Drive. In the vicinity of the project, this highway is a two-way, four-lane, principal arterial that provides regional access to Kīhei and Wailea. Exclusive left-turn lanes and right-turn deceleration lanes are provided at all major intersections with the shoulder areas of the highway designated as bicycle lanes.

#### **Lipoa Street**

This is a two-way, two-lane, east-west County roadway that begins at a public beach access west of Uluniu Road and extends eastward beyond Pi'ilani Highway as Lipoa Parkway, ultimately terminating within the Maui Research and Technology Park (MRTP).

### **Halekuai Street**

This is a two-way, two-lane, east-west County roadway that extends from South Kīhei Road eastward to Liloa Drive adjacent to Lokelani Intermediate School and South Maui Community Park.

### **East Welakahao Road**

This is a two-way, two-lane, east-west, County roadway that begins at a public beach access west of Halama Street and terminates to the east at Pi'ilani Highway.

A Traffic Impact Analysis Report (TIAR) was prepared by Austin, Tsutsumi & Associates, Inc. for the proposed project in March 2020. See **Appendix "G"**.

The TIAR evaluated the following intersections:

- (1) South Kīhei Road/East Lipoa Street (Signalized)
- (2) Liloa Drive/East Lipoa Street (Signalized)
- (3) Pi'ilani Highway/East Lipoa Street (Signalized)
- (4) Liloa Drive/Lokelani Elementary School Driveway (Unsignalized)
- (5) Liloa Drive/Halekuai Street (Unsignalized)
- (6) South Kīhei Road/East Welakahao Road (Signalized)
- (7) East Welakahao Road/Liloa Drive (Unsignalized)
- (8) Pi'ilani Highway/East Welakahao Road (Signalized)
- (9) East Welakahao Road/Akai Street (Unsignalized)
- (10) South Kīhei Road/Halekuai Street (Unsignalized)
- (11) Liloa Drive/South Maui Regional Park Driveway (Unsignalized)

Level of service (LOS) of each intersection was evaluated as part of the TIAR. LOS is a measure of the acceptability of delay values to motorists at a given intersection. The criteria are given in **Table 2**, below.

**Table 2.** Level of Service Criteria for Signalized Intersections

<b>Level of Service</b>	<b>Control Delay per Vehicle (sec./veh)</b>
A	<10.0
B	> 10.0 and ≤ 20.0
C	> 20.0 and ≤ 35.0
D	> 35.0 and ≤ 55.0
E	> 55.0 and ≤ 80.0
F	> 80.0

Based on traffic counts, the weekday morning peak hour was determined to occur between 7:45 a.m. and 8:45 a.m. and the afternoon peak hour was determined to occur between 3:30 a.m. and 4:30 a.m.

Traffic along Pi'ilani Highway is generally higher in the southbound direction in the morning peak hour and higher in the northbound direction in the afternoon peak hour due to commuter traffic. Except for the intersections at Pi'ilani Highway/East Lipoa Street and South Kihei Road/Halekuai Street, the study intersections operated adequately at LOS D or better and under capacity conditions during the peak hours of traffic. However, the Pi'ilani Highway/Lipoa Street intersection operates at LOS E and LOS D during the morning and afternoon peak hours, respectively. Several minor movements operate at LOS E or F due to coordinated signal timing with the Pi'ilani Highway/Piikea Avenue intersection. In addition, at the intersection at South Kihei Road/Halekuai Street, the westbound left-turn movement currently operates at LOS E and LOS F during the morning and afternoon peak hours of traffic, respectively.

**b. Potential Impacts and Proposed Mitigation Measures**

The proposed project will include a new access along Liloa Drive. At the project's driveway intersection with Liloa Drive, a southbound left-turn lane with a minimum storage space of 50 feet in length is proposed.

The LOS at the study intersections for the existing, future (without project) ("Base Year 2022"), and future (with project) ("Future Year 2022") conditions has been analyzed to assess the proposed project's impacts to the traffic flow. The year 2022 was selected as the future year to reflect the project completion year. See **Table 3**.

**Table 3.** Level of Service of Existing Base Year 2022 and Future Year 2022 Conditions

Intersection	Existing Conditions		Base Year 2022		Future Year 2022	
	AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS
<b>1. S KThei Rd &amp; W Lipoa St/E Lipoa St</b>						
NB LT	A	A	A	A	A	A
NB TH	B	A	B	B	B	B
NB RT	A	A	A	A	A	A
EB LT/TH	B	D	C	D	C	D
EB RT	B	D	B	D	B	D
WB LT/TH	B	D	C	D	C	D
WB RT	B	D	B	D	B	D
SB LT	A	A	A	A	A	A
SB TH/RT	B	B	B	B	B	B
<b>Overall</b>	<b>B</b>	<b>B</b>	<b>B</b>	<b>B</b>	<b>B</b>	<b>B</b>
<b>2. Liloa Drive &amp; E Lipoa St</b>						
NB LT	B	B	B	B	B	B
NB TH	B	B	B	B	B	B
NB RT	B	B	B	B	B	B
EB LT	A	A	B	A	B	A
EB LT/TH	B	A	B	B	B	B
WB LT	A	A	B	A	B	A
WB TH	B	A	B	A	B	A
WB RT	B	A	B	A	B	A
SB LT	B	B	B	B	B	B
SB TH	B	B	B	B	B	B
SB RT	B	B	B	B	B	B
<b>Overall</b>	<b>B</b>	<b>B</b>	<b>B</b>	<b>B</b>	<b>B</b>	<b>B</b>
Intersection	Existing Conditions		Base Year 2022		Future Year 2022	
	AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS
<b>3. Piilani Hwy &amp; E Lipoa St</b>						
NB LT	F	F	F	F	F	F
NB TH	D	C	E	D	E	D
NB RT	D	B	D	B	D	B
EB LT/TH	F	F	F	F	F	F
EB RT	E	F	E	F	E	F
WB LT/TH	F	F	F	F	F	F
WB RT	F	F	F	F	F	F
SB LT	F	F	F	F	F	F
SB TH	D	D	D	D	D	D
SB RT	C	C	C	C	C	C
<b>Overall</b>	<b>E</b>	<b>D</b>	<b>E</b>	<b>E</b>	<b>E</b>	<b>E</b>
<b>4. Liloa Drive &amp; Lokelani Drwy</b>						
WB LT	B	A	C	A	C	A
WB RT	A	A	B	A	B	A
SB LT	A	A	A	A	A	A
<b>Overall</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>	<b>---</b>

Intersection	Existing Conditions		Base Year 2022		Future Year 2022	
	AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS
<b>5. S. Kīhei Rd &amp; Halekuai St</b>						
WB LT	E	F	F	F*	F	F*
WB RT	B	C	C	C	C	C
SB LT	A	A	A	B	A	B
<b>Overall</b>	---	---	---	---	---	---
<b>6. Liloa Drive &amp; Halekuai St</b>						
NB LT/TH	A	A	A	A	A	A
EB LT/RT	A	A	A	A	A	A
SB TH	A	A	A	A	A	A
SB RT	A	A	A	A	A	A
<b>Overall</b>	<b>A</b>	<b>A</b>	<b>A</b>	<b>A</b>	<b>A</b>	<b>A</b>
<b>7. Liloa Drive &amp; S Maui Community Park N Drwy</b>						
WB RT	---	---	A	A	A	A
SB LT	---	---	A	A	A	A
<b>Overall</b>	---	---	---	---	---	---
<b>8. S. Kīhei Rd &amp; W Welakahao Rd/E Welakahao Rd</b>						
NB LT	A	A	A	B	A	B
NB TH/RT	B	B	B	C	B	C
EB LT/TH/RT	C	C	C	C	C	C
WB LT/TH	C	C	C	C	C	C
WB RT	C	B	C	C	C	C
SB LT	A	A	A	B	A	B
SB TH/RT	A	B	B	B	B	B
<b>Overall</b>	<b>B</b>	<b>B</b>	<b>B</b>	<b>C</b>	<b>B</b>	<b>C</b>
<b>9. Akai St &amp; E Welakahao Rd</b>						
NB LT/TH/RT	---	---	B	B	B	B
NB LT/RT	B	B	---	---	---	---
EB LT	---	---	A	A	A	A
Intersection	Existing Conditions		Base Year 2022		Future Year 2022	
	AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS
WB LT	A	A	A	A	A	A
SB LT/TH/RT	---	---	B	B	B	B
<b>Overall</b>	---	---	---	---	---	---
<b>10. Liloa Drive &amp; E Welakahao Rd</b>						
NB LT/RT	B	B	B	B	B	B
WB LT	A	A	A	A	A	A
<b>Overall</b>	---	---	---	---	---	---
<b>11. Piilani Hwy &amp; E Welakahao Rd</b>						
NB LT	B	B	B	C	C	C
EB RT	C	C	C	C	C	C
<b>Overall</b>	---	---	---	---	---	---

Intersection	Existing Conditions		Base Year 2022		Future Year 2022	
	AM LOS	PM LOS	AM LOS	PM LOS	AM LOS	PM LOS
WB RT	---	---	---	---	A	A
SB LT	---	---	---	---	A	A
<b>Overall</b>	---	---	---	---	---	---
NB-North Bound SB-South Bound EB-East Bound WB-West Bound TH-Through RT-Right Turn LT-Left Turn *Denotes overcapacity condition, v/c ≥ 1.0						

By Year 2022, numerous developments are forecasted to be completed within the Project study area. Without project (Base Year 2022), it is estimated that regional through traffic along South Kīhei Road and Pi'ilani Highway may increase by approximately 15 percent due to ambient growth and traffic generated by other known development by Year 2022. At the South Kīhei Road/Halekuai Street intersection, the westbound left-turn movement is expected to operate at LOS F and over capacity conditions during the morning and afternoon peak hours. However, no significant exiting queuing was observed at this location during the peak hours of traffic. Due to signals located further north at Lipoa Street and south at East Welakahao Street, gaps in through traffic occurred along South Kīhei Road, which reduced delays for westbound left-turn vehicles. A median refuge lane for westbound left-turn vehicles may be considered by the County, to facilitate westbound left-turn vehicles to cross traffic at one direction at a time. However, the future Liloa Drive extension is expected to help operations at this intersection by reducing through and turning movement volume and improve traffic operations.

At the Pi'ilani Highway/Lipoa Street intersection, traffic operations are expected to deteriorate further with multiple movements (including the mainline through movement) and are anticipated to operate at LOS E/F. Long-term intersection widening improvements are planned at this intersection as future infill and development of the adjacent MRTP occurs. However, specific design improvements, phasing and construction timeframes are, as of yet, unknown.

The proposed project is forecasted to generate approximately 24 trips in the morning peak hour and 31 trips during the afternoon peak hour. By Future Year 2022 (with project), all study intersections are forecast to operate with similar LOS as Base Year 2022 traffic conditions. Regionally

along Pi'ilani Highway, traffic generated by the project will increase by approximately four (4) to six (6) vehicles in each direction per peak hour, which translates to a 0.24 percent increase in traffic. Similarly, along South Kihei Road, traffic will only increase by approximately four (4) to seven (7) vehicles in each direction per peak hour, which translates to only a 0.43 percent increase in traffic at the busier South Kihei Road//Lipoa Street intersection.

The Pi'ilani Highway/Lipoa Street intersection is expected to continue operating at low LOS similar to Base Year 2022 conditions. As noted previously, long-term intersection widening improvements are planned at this intersection, but specific design improvements, phasing and construction timeframes are unknown. The proposed project is expected to only add eight (8) vehicles during the morning and afternoon peak hours of traffic to the Pi'ilani Highway/Lipoa Street intersection. This minimally constitutes approximately 0.19 percent of the total traffic at that intersection.

At the Pi'ilani Highway/Welakahao Road intersection, the proposed project will only add two (2) and five (5) eastbound right-turn vehicles onto Pi'ilani Highway and six (6) and eight (8) southbound right-turn and northbound left-turn vehicles onto Welakahao Road during the morning and afternoon peak hours, respectively. This constitutes approximately 0.29 percent of the total traffic at this intersection.

Based on discussions with the State of Hawai'i, Department of Transportation (HDOT), the Applicant will provide delineators along the median of Pi'ilani Highway at the start of the northbound left-turn lane at the Pi'ilani Highway/Welakahao intersection and extend further south near to the end of the taper of the opposing southbound left-turn lane at the Pi'ilani Highway/Kihei Wastewater Treatment Plant intersection. These delineators will be installed to reduce the occurrence of eastbound right-turners turning into Pi'ilani Highway then making an illegal and immediate U-turn to head north on the highway, which HDOT has determined to be problematic.

Based on the Manual on Uniform Traffic Control Devices (MUTCD) Eight-Hour and Four-Hour Vehicular Volume traffic signal warrants, at the South Kihei Road/Halekuai Street intersection, a traffic signal is not anticipated to be warranted by the Future Year 2022 with Project volumes.

Based on the foregoing and proposed improvements within Liloa Drive and Pi'ilani Highway, the project is not anticipated to present significant adverse impacts on roadway infrastructure.

**2. Water System**

**a. Existing Conditions**

The Kihei-Makena region is served by the Central Maui Water System. The Central Maui Water System is serviced by the Mokuahau Wells.

The water system in the area consists of a 2.0 million gallon (MG) reservoir located east of Ohukai Road, approximately 1.0 mile mauka of Pi'ilani Highway. An 18-inch transmission line from the Central Maui source feeds the distribution system in the vicinity of the subject property, and will provide domestic water and fire protection for the proposed project.

According to the Preliminary Engineering Report (PER) prepared for the project by Otomo Engineering, Inc., there are existing 18-inch and 30-inch waterlines fronting the property along Liloa Drive, as well as an existing 12-inch reclaimed waterline. There are existing fire hydrants on the makai side of Liloa Drive fronting the project site, including one near its intersection with Old Welakahao Road. There are two (2) water meters assigned to the subject parcel – one (1) 2-inch domestic water meter and one (1) 2-inch reclaimed water meter for irrigation purposes. The meters are currently servicing the Hope Chapel development. See **Appendix "H"**.

**b. Potential Impacts and Proposed Mitigation Measures**

As noted in the PER, in accordance with the County of Maui, Department of Water Supply's Domestic Consumption Guidelines for commercial development, the average daily demand for the project is estimated at approximately 65,520 gallons per day. Fire flow demand for multi-family development is 2,000 gallons per minute for a 2-hour duration. As noted previously, there are existing fire hydrants on the makai side of Liloa Drive fronting the project site, including one near its intersection with Old Welakahao Road. Fire hydrants will be installed with a maximum spacing of 250 feet. The PER further notes that domestic and fire flow calculations will be prepared and submitted during the building permit process for the project. Water meter and fire protection improvements will be made as necessary to meet the requirements of the Department of Water Supply and Fire Department. Reclaimed water for irrigation will be utilized to the extent possible. Based on the foregoing, significant adverse impacts to the County of Maui water system are not anticipated. Refer to **Appendix "H"**.

### 3. Wastewater System

#### a. Existing Conditions

The service area for the County's Kīhei Wastewater Reclamation System extends from North Kīhei to Wailea. The system consists of a number of pump stations and force mains which convey wastewater through the County's transmission lines. The combined flows are transported to the Kīhei Wastewater Reclamation Facility, which is located approximately 600 feet to southeast of the project site, mauka of Pi'ilani Highway. The existing design capacity of the Kīhei Wastewater Reclamation Facility is 8.0 million gallons per day (MGD). The average flow into the Kīhei Wastewater Reclamation Facility is approximately 3.8 MGD, and the allocated capacity is 5.23 MGD. The remaining capacity is approximately 2.77 MGD.

According to the PER, there is an existing 8-inch sewerline along Liloa Drive that terminates at Hope Chapel. Wastewater collected from the Kīhei area is transported to the Kīhei Wastewater Reclamation Facility. Refer to **Appendix "H"**.

#### b. Potential Impacts and Proposed Mitigation Measures

The PER states that the proposed project is anticipated to generate approximately 29,835 gallons of wastewater daily. The onsite sewerage collection system will be designed to accommodate this flow. Offsite improvements will include extending the existing 8-inch sewerline along Liloa Drive, approximately 900 feet fronting the project site. According to the Wastewater Reclamation Division of the County of Maui, the Kīhei Wastewater Reclamation Facility has a capacity of 8.0 MGD. The average flow into the Kīhei Wastewater Reclamation Facility is approximately 3.8 MGD and the allocated capacity is 5.23 MGD. The remaining capacity is approximately 2.77 MGD. The wastewater generated from the proposed project will be transported to the Kīhei Wastewater Treatment Plant. The treatment plant has sufficient capacity to accommodate the additional wastewater generated from the proposed project. Refer to **Appendix "H"**.

### 4. Drainage

#### a. Existing Conditions

According to the PER, the elevation on the site ranges from approximately 66 feet amsl at the project site's northwesterly corner to approximately 89 feet amsl at the project site's northeasterly corner. The site generally slopes in an east to west direction toward Liloa Drive, averaging

approximately 4 percent. Onsite runoff generally sheet flows in an east to west direction across the property toward Liloa Drive. It is estimated that the existing 50-year, 1-hour storm runoff from the project site is approximately 5.101 cubic feet per second (cfs), corresponding to a runoff volume of 6,121 cubic feet (cf). Refer to **Appendix “H”**.

**b. Potential Impacts and Proposed Mitigation Measures**

The PER notes that after the development of the proposed project, it is estimated that the 50-year, 1-hour storm runoff will be 15.057 cfs, corresponding to a volume of 14,907 cf. The increase in runoff will be 9.956 cfs, with an increase in runoff volume of 8,786 cf. According to the PER, onsite runoff will be intercepted by catch basins located within the paved parking area and conveyed to a subsurface drainage system. The subsurface drainage system will consist of a perforated drainline embedded in crushed rock, which will be wrapped with a layer of filter fabric. Surface runoff entering the perforated pipe will be allowed to infiltrate into the ground. Overflow from the subsurface drainage system will be piped into an onsite retention basin. The drainage system will be designed to accommodate the increase in surface runoff volume from a 50-year, 1-hour storm for the proposed project. Refer to **Appendix “H”**.

The PER further notes that the design intent of the development plan will be to utilize the existing topography to the greatest extent practicable and to limit the need for extensive grading. Development of the project will include the implementation of site-specific BMPs during construction to provide erosion control and minimize impacts to downstream properties. The proposed project will also implement post-construction BMPs, which will improve the quality of storm water runoff from the proposed development. Refer to **Appendix “H”**.

According to the PER, the drainage design criteria will be to minimize any alterations to the natural pattern of the existing onsite surface runoff. The proposed drainage plan will meet the requirements of Chapter 4, “Rules for Design of Storm Drainage Facilities in the County of Maui” and Chapter 111, “Rules for the Design of Storm Water Treatment Best Management Practices.” Given the foregoing, the proposed project is not anticipated to significantly impact adjacent or downstream properties in the vicinity

**5. Electrical, Telephone and CATV Systems**

**a. Existing Conditions**

Electrical, telephone, and cable television (CATV) services are provided to properties in the vicinity of the proposed project by Maui Electric, Hawaiian Telcom, and Spectrum, respectively. Overhead utility services are provided along Liloa Street.

**b. Potential Impacts and Proposed Mitigation Measures**

Electrical, telephone, and CATV services for the project area will be coordinated with Maui Electric Company, Hawaiian Telcom, and Spectrum, respectively. It is anticipated that service capacity will be available, as required, and not adversely impacted. Services will be connected to the existing overhead utility lines.

**E. CUMULATIVE AND SECONDARY IMPACTS**

Cumulative impacts are defined as the impact on the environment which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. With respect to larger and foreseeable future actions, the County of Maui updated the County General Plan through the planning horizon of 2030. Among the components of the General Plan Update is the Maui Island Plan which delineates urban and rural growth boundaries (UGBs and RGBs, respectively). The purpose of the UGBs and RGBs is to direct future urban and rural growth to select areas of Maui Island, taking into account population projections and future demands for housing, infrastructure, services, and public facilities. The proposed project site is currently vacant and undeveloped and is an infill project located within the UGB for the Kīhei-Makena region.

Although the project site is located on vacant, undeveloped land, the site has been designated for urban land uses and is surrounded by urban development to the east, west, and south. The development of this site will not take agricultural land out of production, and with the implementation of BMPs for water quality, erosion and sedimentation control, adverse impacts on the neighboring parcels are not anticipated. Being an urban infill project in the midst of the existing Kīhei area, rather than an urban expansion project, the proposed project is not anticipated to result in any cumulative impacts.

Secondary impacts are those which have the potential to occur later in time or farther in distance, but are still reasonably foreseeable. They can be viewed as actions of others that are taken because of the presence of the project. Secondary impacts from highway projects, for example, can occur because they can induce development by removing one of the impediments to growth, transportation access.

The project site has ready access to necessary infrastructure, such that extensions of infrastructure systems will not be required. Existing County water and wastewater lines are located in the vicinity of the project site. In the short term, construction of the proposed project will generate employment and revenues for the construction industry and related fields. Over the long term, property tax revenues will provide additional funds for the County. As an affordable housing project, impacts on public infrastructure, facilities, and services have been assessed and significant adverse impacts are not anticipated as a result of the proposed project. As an urban infill project, existing service limits for police, fire, and emergency medical services will not be significantly affected by project implementation, although a small increase in service calls may result from operation of the project. In summary, the proposed action is not anticipated to result in significant adverse secondary impacts.

RELATIONSHIP TO  
GOVERNMENTAL PLANS,  
POLICIES, AND CONTROLS



### **III. RELATIONSHIP TO GOVERNMENTAL PLANS, POLICIES, AND CONTROLS**

This section discusses the relationship between the proposed Liloa Hale Senior Affordable Housing Project and State and County land use plans, policies, and controls.

#### **A. STATE LAND USE DISTRICTS**

Pursuant to Chapter 205, Hawai'i Revised Statutes (HRS), all lands in the State have been placed into one (1) of four (4) major land use districts by the State Land Use Commission (SLUC). These land use districts are designated "Urban", "Rural", "Agricultural", and "Conservation". The project site is located within the "Urban" district. See **Figure 10**. Pursuant to Chapter 205, Hawai'i Revised Statutes (HRS), the "Urban" districts shall include uses or activities provided by ordinances or regulations of the County in which the "Urban" district is located. Section H below, outlines the County of Maui's zoning regulations that are applicable to the proposed Liloa Hale Senior Affordable Housing Project. The proposed project is consistent with the "Urban" district designation.

#### **B. HAWAI'I STATE PLAN**

Chapter 226, HRS, also known as the Hawai'i State Plan, is a long-range comprehensive plan which serves as a guide for the future long-term development of the State by identifying goals, objectives, policies, and priorities, as well as implementation mechanisms. The Plan consists of three (3) parts. Part I includes the Overall Theme, Goals, Objectives, and Policies; Part II includes Planning, Coordination, and Implementation; and Part III establishes Priority Guidelines. Inasmuch as Part II of the State Plan covers its administrative structure and implementation process, discussion of the proposed project's applicability to Part II is not appropriate. Below is an analysis of the project's applicability to Part I and Part III of the Hawai'i State Plan.

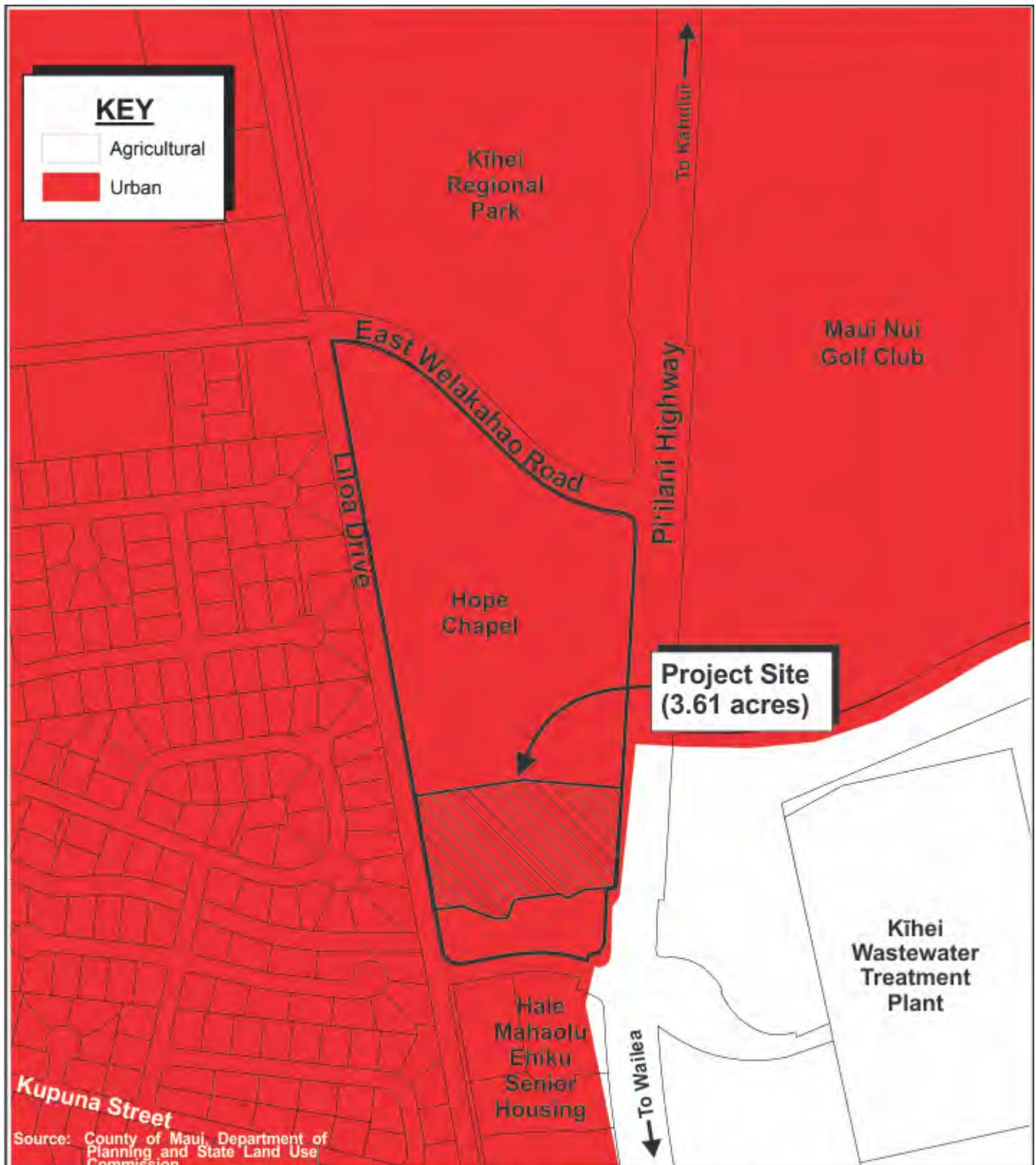
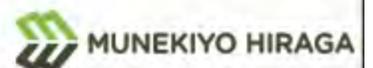


Figure 10

Proposed Liloa Hale Senior Affordable Housing Project  
State Land Use District Map



Prepared for: Liloa Senior Housing, LP



Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
<b>HRS 226-1: Findings and Purpose</b>			
<b>HRS 226-2: Definitions</b>			
<b>HRS 226-3: Overall Theme</b>			
<p><b>HRS 226-4: State Goals.</b> In order to guarantee, for the present and future generations, those elements of choice and mobility that insure that individuals and groups may approach their desired levels of self-reliance and self determination, it shall be the goal of the State to achieve:</p> <ol style="list-style-type: none"> <li>1. A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawaii's present and future generations.</li> <li>2. A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.</li> <li>3. Physical, social, and economic well-being, for individuals and families in Hawaii, that nourishes a sense of community responsibility, of caring, and of participation in community life.</li> </ol>			
<p><b>Analysis:</b> The Liloa Hale Senior Affordable Housing Project will provide a multi-family residential housing complex providing 100 percent affordable rental accommodations for low income seniors earning 60 percent or less of the Area Median Income (AMI) in an area that is close to the commercial services of Kihei. The proposed project is intended to reflect and meet the housing needs for Maui's seniors to create a livable neighborhood. An onsite amenity includes a community gathering place for social activities.</p> <p>The architectural design of the proposed project will reflect the character of the existing residential development in the surrounding area.</p>			
<b>Chapter 226-5 Objective and Policies for Population</b>			
<b>Objective:</b> It shall be the objective in planning for the State's population to guide population growth to be consistent with the achievement of physical, economic and social objectives contained in this chapter.	✓		
<b>Policies:</b>			
(1) Manage population growth statewide in a manner that provides increased opportunities for Hawaii's people to pursue their physical, social, and economic aspirations while recognizing the unique needs of each county.	✓		
(2) Encourage an increase in economic activities and employment opportunities on the neighbor islands consistent with community needs and desires.	✓		
(3) Promote increased opportunities for Hawaii's people to pursue their socio-economic aspirations throughout the islands.	✓		
(4) Encourage research activities and public awareness programs to foster an understanding of Hawaii's limited capacity to accommodate population needs and to address concerns resulting from an increase in Hawaii's population.			✓
(5) Encourage federal actions and coordination among major governmental agencies to promote a more balanced distribution of immigrants among the states, provided that such actions do not prevent the reunion of immediate family members.			✓
(6) Pursue an increase in federal assistance for states with a greater proportion of foreign immigrants relative to their state's population.			✓

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(7) Plan the development and availability of land and water resources in a coordinated manner so as to provide for the desired levels of growth in each geographic area.			✓
<b>Analysis:</b> The Liloa Hale Senior Affordable Housing Project will provide 100 percent affordable multi-family rental housing in close proximity to the commercial services of Kīhei. The proposed project will also create employment opportunities during build out of the project as well as during the operational period of the project.			
<b>Chapter 226-6 Objectives and policies for the economy – – in general</b>			
<b>Objectives:</b> Planning for the State's economy in general shall be directed toward achievement of the following objectives:			
(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people, while at the same time stimulating the development and expansion of economic activities capitalizing on defense, dual-use, and science and technology assets, particularly on the neighbor islands where employment opportunities may be limited.	✓		
(2) A steadily growing and diversified economic base that is not overly dependent on a few industries, and includes the development and expansion of industries on the neighbor islands.			✓
<b>Policies:</b>			
(1) Promote and encourage entrepreneurship within Hawaii by residents and nonresidents of the State.			✓
(2) Expand Hawaii's national and international marketing, communication, and organizational ties, to increase the State's capacity to adjust to and capitalize upon economic changes and opportunities occurring outside the State.			✓
(3) Promote Hawaii as an attractive market for environmentally and socially sound investment activities that benefit Hawaii's people.			✓
(4) Transform and maintain Hawaii as a place that welcomes and facilitates innovative activity that may lead to commercial opportunities.			✓
(5) Promote innovative activity that may pose initial risks, but ultimately contribute to the economy of Hawaii.			✓
(6) Seek broader outlets for new or expanded Hawaii business investments.			✓
(7) Expand existing markets and penetrate new markets for Hawaii's products and services.			✓
(8) Assure that the basic economic needs of Hawaii's people are maintained in the event of disruptions in overseas transportation.			✓
(9) Strive to achieve a level of construction activity responsive to, and consistent with, state growth objectives.			✓
(10) Encourage the formation of cooperatives and other favorable marketing arrangements at the local or regional level to assist Hawaii's small scale producers, manufacturers, and distributors.			✓
(11) Encourage labor-intensive activities that are economically satisfying and which offer opportunities for upward mobility.			✓

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(12) Encourage innovative activities that may not be labor-intensive, but may otherwise contribute to the economy of Hawaii.			✓
(13) Foster greater cooperation and coordination between the government and private sectors in developing Hawaii's employment and economic growth opportunities.	✓		
(14) Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems.	✓		
(15) Maintain acceptable working conditions and standards for Hawaii's workers.			✓
(16) Provide equal employment opportunities for all segments of Hawaii's population through affirmative action and nondiscrimination measures.			✓
(17) Stimulate the development and expansion of economic activities capitalizing on defense, dual-use, and science and technology assets, particularly on the neighbor islands where employment opportunities may be limited.			✓
(18) Encourage businesses that have favorable financial multiplier effects within Hawaii's economy, particularly with respect to emerging industries in science and technology.			✓
(19) Promote and protect intangible resources in Hawaii, such as scenic beauty and the aloha spirit, which are vital to a healthy economy.			✓
(20) Increase effective communication between the educational community and the private sector to develop relevant curricula and training programs to meet future employment needs in general, and requirements of new or innovative potential growth industries in particular.			✓
(21) Foster a business climate in Hawaii--including attitudes, tax and regulatory policies, and financial and technical assistance programs-- that is conducive to the expansion of existing enterprises and the creation and attraction of new business and industry.			✓
<b>Analysis:</b> The Liloa Hale Senior Affordable Housing Project provides affordable senior rental housing which will improve the living standard for seniors. In the short term, the proposed project will provide jobs in the construction industry during build out of the proposed project. It is anticipated that the development of this project will generate significant expenditures by the developer during the site work and construction of the project. With the infusion of new capital expenditures on this project, these investments are expected to favorably impact the Maui economy on a broad scale. At the time of operation, the project will employ a program manager and maintenance staff. It is noted that Low Income Housing Tax Credits (LIHTC), the State of Hawai'i's Rental Housing Revolving Fund (RHRF), the County of Maui's Affordable Housing Fund, as well as tax-exempt bonds will be utilized for the project.			
<b>Chapter 226-7 Objectives and policies for the economy -- agriculture.</b>			
<b>Objectives:</b> Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:			
(1) Viability of Hawaii's sugar and pineapple industries.			✓
(2) Growth and development of diversified agriculture throughout the State.			✓

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(3) An agriculture industry that continues to constitute a dynamic and essential component of Hawaii's strategic, economic, and social well-being.			✓
<b>Policies:</b>			
(1) Establish a clear direction for Hawaii's agriculture through stakeholder commitment and advocacy.			✓
(2) Encourage agriculture by making the best use of natural resources.			✓
(3) Provide the governor and the legislature with information and options needed for prudent decision-making for the development of agriculture.			✓
(4) Establish strong relationships between the agricultural and visitor industries for mutual marketing benefits.			✓
(5) Foster increased public awareness and understanding of the contributions and benefits of agriculture as a major sector of Hawaii's economy.			✓
(6) Seek the enactment and retention of federal and state legislation that benefits Hawaii's agricultural industries.			✓
(7) Strengthen diversified agriculture by developing an effective promotion, marketing, and distribution system between Hawaii's food producers and consumers in the State, nation, and world.			✓
(8) Support research and development activities that strengthen economic productivity in agriculture, stimulate greater efficiency, and enhance the development of new products and agricultural by-products.			✓
(9) Enhance agricultural growth by providing public incentives and encouraging private initiatives.			✓
(10) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.			✓
(11) Increase the attractiveness and opportunities for an agricultural education and livelihood.			✓
(12) In addition to the State's priority on food, expand Hawaii's agricultural base by promoting growth and development of flowers, tropical fruits and plants, livestock, feed grains, forestry, food crops, aquaculture, and other potential enterprises.			✓
(13) Promote economically competitive activities that increase Hawaii's agricultural self-sufficiency, including the increased purchase and use of Hawaii-grown food and food products by residents, businesses, and governmental bodies as defined under section 103D-104.			✓
(14) Promote and assist in the establishment of sound financial programs for diversified agriculture.			✓
(15) Institute and support programs and activities to assist the entry of displaced agricultural workers into alternative agricultural or other employment.			✓
(16) Facilitate the transition of agricultural lands in economically nonfeasible agricultural production to economically viable agricultural uses.			✓
(17) Perpetuate, promote, and increase use of traditional Hawaiian farming systems, such as the use of loko i'a, māla, and irrigated lo'i, and growth of traditional Hawaiian crops, such as kalo, 'uala, and 'ulu.			✓

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(18) Increase and develop small-scale farms.			✓
<b>Analysis: Not Applicable</b>			
<b>Chapter 226-8 Objective and policies for the economy – – visitor industry.</b>			
<b>Objective:</b> Planning for the State's economy with regard to the visitor industry shall be directed towards the achievement of the objective of a visitor industry that constitutes a major component of steady growth for Hawaii's economy.			✓
<b>Policies:</b>			
(1) Support and assist in the promotion of Hawaii's visitor attractions and facilities.			✓
(2) Ensure that visitor industry activities are in keeping with the social, economic, and physical needs and aspirations of Hawaii's people.			✓
(3) Improve the quality of existing visitor destination areas by utilizing Hawaii's strengths in science and technology.			✓
(4) Encourage cooperation and coordination between the government and private sectors in developing and maintaining well-designed, adequately serviced visitor industry and related developments which are sensitive to neighboring communities and activities.			✓
(5) Develop the industry in a manner that will continue to provide new job opportunities and steady employment for Hawaii's people.			✓
(6) Provide opportunities for Hawaii's people to obtain job training and education that will allow for upward mobility within the visitor industry.			✓
(7) Foster a recognition of the contribution of the visitor industry to Hawaii's economy and the need to perpetuate the aloha spirit.			✓
(8) Foster an understanding by visitors of the aloha spirit and of the unique and sensitive character of Hawaii's cultures and values.			✓
<b>Analysis: Not Applicable</b>			
<b>Chapter 226-9 Objective and policies for the economy – – federal expenditures.</b>			
<b>Objective:</b> Planning for the State's economy with regard to federal expenditures shall be directed towards achievement of the objective of a stable federal investment base as an integral component of Hawaii's economy.			✓
<b>Policies:</b>			
(1) Encourage the sustained flow of federal expenditures in Hawaii that generates long-term government civilian employment;			✓
(2) Promote Hawaii's supportive role in national defense, in a manner consistent with Hawaii's social, environmental, and cultural goals by building upon dual-use and defense applications to develop thriving ocean engineering, aerospace research and development, and related dual-use technology sectors in Hawaii's economy;			✓
(3) Promote the development of federally supported activities in Hawaii that respect statewide economic concerns, are sensitive to community needs, and minimize adverse impacts on Hawaii's environment;			✓

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(4) Increase opportunities for entry and advancement of Hawaii's people into federal government service;			✓
(5) Promote federal use of local commodities, services, and facilities available in Hawaii;			✓
(6) Strengthen federal-state-county communication and coordination in all federal activities that affect Hawaii; and			✓
(7) Pursue the return of federally controlled lands in Hawaii that are not required for either the defense of the nation or for other purposes of national importance, and promote the mutually beneficial exchanges of land between federal agencies, the State, and the counties.			✓
<b>Analysis: Not applicable.</b>			
<b>Chapter 226-10 Objective and policies for the economy – – potential growth and innovative activities.</b>			
<b>Objective:</b> Planning for the State's economy with regard to potential growth and innovative activities shall be directed towards achievement of the objective of development and expansion of potential growth and innovative activities that serve to increase and diversify Hawaii's economic base.			✓
<b>Policies:</b>			
(1) Facilitate investment and employment growth in economic activities that have the potential to expand and diversify Hawaii's economy, including but not limited to diversified agriculture, aquaculture, renewable energy development, creative media, health care, and science and technology-based sectors;			✓
(2) Facilitate investment in innovative activity that may pose risks or be less labor-intensive than other traditional business activity, but if successful, will generate revenue in Hawaii through the export of services or products or substitution of imported services or products;			✓
(3) Encourage entrepreneurship in innovative activity by academic researchers and instructors who may not have the background, skill, or initial inclination to commercially exploit their discoveries or achievements;			✓
(4) Recognize that innovative activity is not exclusively dependent upon individuals with advanced formal education, but that many self-taught, motivated individuals are able, willing, sufficiently knowledgeable, and equipped with the attitude necessary to undertake innovative activity;			✓
(5) Increase the opportunities for investors in innovative activity and talent engaged in innovative activity to personally meet and interact at cultural, art, entertainment, culinary, athletic, or visitor-oriented events without a business focus;			✓
(6) Expand Hawaii's capacity to attract and service international programs and activities that generate employment for Hawaii's people;			✓
(7) Enhance and promote Hawaii's role as a center for international relations, trade, finance, services, technology, education, culture, and the arts;			✓
(8) Accelerate research and development of new energy-related industries based on wind, solar, ocean, underground resources, and solid waste;			✓

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(9) Promote Hawaii's geographic, environmental, social, and technological advantages to attract new or innovative economic activities into the State;			✓
(10) Provide public incentives and encourage private initiative to attract new or innovative industries that best support Hawaii's social, economic, physical, and environmental objectives;			✓
(11) Increase research and the development of ocean-related economic activities such as mining, food production, and scientific research;			✓
(12) Develop, promote, and support research and educational and training programs that will enhance Hawaii's ability to attract and develop economic activities of benefit to Hawaii;			✓
(13) Foster a broader public recognition and understanding of the potential benefits of new or innovative growth-oriented industry in Hawaii;			✓
(14) Encourage the development and implementation of joint federal and state initiatives to attract federal programs and projects that will support Hawaii's social, economic, physical, and environmental objectives;			✓
(15) Increase research and development of businesses and services in the telecommunications and information industries;			✓
(16) Foster the research and development of nonfossil fuel and energy efficient modes of transportation; and			✓
(17) Recognize and promote health care and health care information technology as growth industries.			✓
<b>Analysis: Not Applicable</b>			
<b>Chapter 226-10.5 Objectives and policies for the economy – – information industry.</b>			
<b>Objective:</b> Planning for the State's economy with regard to telecommunications and information technology shall be directed toward recognizing that broadband and wireless communication capability and infrastructure are foundations for an innovative economy and positioning Hawaii as a leader in broadband and wireless communications and applications in the Pacific Region.			✓
<b>Policies:</b>			
(1) Promote efforts to attain the highest speeds of electronic and wireless communication within Hawaii and between Hawaii and the world, and make high speed communication available to all residents and businesses in Hawaii;			✓
(2) Encourage the continued development and expansion of the telecommunications infrastructure serving Hawaii to accommodate future growth and innovation in Hawaii's economy;			✓
(3) Facilitate the development of new or innovative business and service ventures in the information industry which will provide employment opportunities for the people of Hawaii;			✓
(4) Encourage mainland- and foreign-based companies of all sizes, whether information technology-focused or not, to allow their principals, employees, or contractors to live in and work from Hawaii, using technology to communicate with their headquarters, offices, or customers located out-of-state;			✓

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(5) Encourage greater cooperation between the public and private sectors in developing and maintaining a well-designed information industry;			✓
(6) Ensure that the development of new businesses and services in the industry are in keeping with the social, economic, and physical needs and aspirations of Hawaii's people;			✓
(7) Provide opportunities for Hawaii's people to obtain job training and education that will allow for upward mobility within the information industry;			✓
(8) Foster a recognition of the contribution of the information industry to Hawaii's economy; and			✓
(9) Assist in the promotion of Hawaii as a broker, creator, and processor of information in the Pacific.			✓
<b>Analysis: Not Applicable</b>			
<b>Chapter 226-11 Objectives and policies for the physical environment – – land based, shoreline, and marine resources.</b>			
<b>Objectives:</b> Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:			
(1) Prudent use of Hawaii's land-based, shoreline, and marine resources.	✓		
(2) Effective protection of Hawaii's unique and fragile environmental resources.	✓		
<b>Policies:</b>			
(1) Exercise an overall conservation ethic in the use of Hawaii's natural resources.	✓		
(2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.			✓
(3) Take into account the physical attributes of areas when planning and designing activities and facilities.	✓		
(4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.	✓		
(5) Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions.			✓
(6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawaii.	✓		
(7) Provide public incentives that encourage private actions to protect significant natural resources from degradation or unnecessary depletion.			✓
(8) Pursue compatible relationships among activities, facilities, and natural resources.	✓		
(9) Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes.			✓
<b>Analysis: The Liloa Hale Senior Affordable Housing Project will make prudent use of Hawaii's land base resources by utilizing land in close proximity to the existing commercial, social, and health services of Kihei which is environmentally suitable for residential purposes. This Environmental Assessment (EA) is being carried out to</b>			

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
<b>ensure the proposed project does not adversely impact Hawai'i's unique and fragile environmental resources.</b>			
The planning and design concept of the proposed project will reflect the architectural character of the neighboring residential developments. The project's design concept will meet the intent and stated objectives of HRS 226-11. Implementation of mitigation measures to minimize potential impacts on listed water birds (i.e., Hawaiian Petrel and Newell's shearwater) that may be transitioning through the area, will ensure that endangered species and their habitats are not adversely impacted.			
<b>Chapter 226-12 Objective and policies for the physical environment -- scenic, natural beauty, and historic resources.</b>			
<b>Objective:</b> Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/historical resources.			✓
<b>Policies:</b>			
(1) Promote the preservation and restoration of significant natural and historic resources.			✓
(2) Provide incentives to maintain and enhance historic, cultural, and scenic amenities.			✓
(3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.			✓
(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawaii's ethnic and cultural heritage.			✓
(5) Encourage the design of developments and activities that complement the natural beauty of the islands.			✓
<b>Analysis: Not Applicable</b>			
<b>Chapter 226-13 Objectives and policies for the physical environment -- land, air, and water quality.</b>			
<b>Objectives:</b> Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives.			
(1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources.	✓		
(2) Greater public awareness and appreciation of Hawaii's environmental resources.	✓		
<b>Policies:</b>			
(1) Foster educational activities that promote a better understanding of Hawaii's limited environmental resources.			✓
(2) Promote the proper management of Hawaii's land and water resources.	✓		
(3) Promote effective measures to achieve desired quality in Hawaii's surface, ground, and coastal waters.	✓		
(4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawaii's people.			✓

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.			✓
(6) Encourage design and construction practices that enhance the physical qualities of Hawaii's communities.	✓		
(7) Encourage urban developments in close proximity to existing services and facilities.	✓		
(8) Foster recognition of the importance and value of the land, air, and water resources to Hawaii's people, their cultures and visitors.			✓
<b>Analysis:</b> The Liloa Hale Senior Affordable Housing Project has been designed to be compatible with the neighboring residential community and incorporates drainage improvements which will reduce stormwater runoff on adjacent and downstream properties. The proposed project is located in close proximity to existing infrastructure, services and facilities and will not extend existing services. The proposed project will be designed to be complementary to the neighboring existing residential developments in Kihei and Hale Mahaolu Ehiku, a senior affordable housing development to the south. The proposed project is located adjacent to Pi'ilani Highway, the main thoroughfare to south, west, and central Maui. The project is inland and will not have any adverse impacts on shoreline resources.			
<b>Chapter 226-14 Objective and policies for facility systems – – in general.</b>			
<b>Objective:</b> Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.	✓		
<b>Policies:</b>			
(1) Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.	✓		
(2) Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.	✓		
(3) Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.	✓		
(4) Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction, and maintenance of facility systems.			✓
<b>Analysis:</b> The Liloa Hale Senior Affordable Housing Project is located within the Maui Island Plan (MIP)'s Urban Growth Boundary (UGB). The proposed project is located in an area designated Project District by the Kihei-Makena Community Plan Map. The planning and design concept of the proposed project will reflect the architectural character of the neighboring residential developments. The Applicant will consult with affected County agencies to ensure that the required facility systems for the project meet County and State standards. The proposed project will ensure that the required facility systems for the project can be supported within resource capacities of the project and at reasonable costs to the end users.			

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
<b>Chapter 226-15 Objectives and policies for facility systems – – solid and liquid waste.</b>			
<b>Objectives:</b> Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives:			
(1) Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes.	✓		
(2) Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility, and other areas.	✓		
<b>Policies:</b>			
(1) Encourage the adequate development of sewerage facilities that complement planned growth.	✓		
(2) Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic.			✓
(3) Promote research to develop more efficient and economical treatment and disposal of solid and liquid wastes.			✓
<b>Analysis:</b> The Liloa Hale Senior Affordable Housing Project will connect to the County wastewater system. The project's Preliminary Engineering Report (PER) indicates as of March 2020, there is available wastewater capacity for the project. It is noted solid waste generated by Project's residents will be disposed at the County's Central Maui Landfill.			
<b>Chapter 226-16 Objective and policies for facility systems – – water.</b>			
<b>Objective:</b> Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities.	✓		
<b>Policies:</b>			
(1) Coordinate development of land use activities with existing and potential water supply.	✓		
(2) Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs.			✓
(3) Reclaim and encourage the productive use of runoff water and wastewater discharges.			✓
(4) Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.			✓
(5) Support water supply services to areas experiencing critical water problems.			✓
(6) Promote water conservation programs and practices in government, private industry, and the general public to help ensure adequate water to meet long-term needs.	✓		
<b>Analysis:</b> The Liloa Hale Senior Affordable Housing Project is located in an area that is serviced by existing County water infrastructure. The proposed project is not anticipated to adversely impact water resources.			
<b>Chapter 226-17 Objectives and policies for facility systems – – transportation.</b>			
<b>Objectives:</b> Planning for the State's facility systems with regard to transportation shall be directed towards the achievement of the following objectives:			

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
(1) An integrated multi-modal transportation system that services statewide needs and promotes the efficient, economical, safe, and convenient movement of people and goods.			✓
(2) A statewide transportation system that is consistent with and will accommodate planned growth objectives throughout the State.			✓
<b><u>Policies:</u></b>			
(1) Design, program, and develop a multi-modal system in conformance with desired growth and physical development as stated in this chapter;			✓
(2) Coordinate state, county, federal, and private transportation activities and programs toward the achievement of statewide objectives;			✓
(3) Encourage a reasonable distribution of financial responsibilities for transportation among participating governmental and private parties;			✓
(4) Provide for improved accessibility to shipping, docking, and storage facilities;			✓
(5) Promote a reasonable level and variety of mass transportation services that adequately meet statewide and community needs;			✓
(6) Encourage transportation systems that serve to accommodate present and future development needs of communities;			✓
(7) Encourage a variety of carriers to offer increased opportunities and advantages to interisland movement of people and goods;			✓
(8) Increase the capacities of airport and harbor systems and support facilities to effectively accommodate transshipment and storage needs;			✓
(9) Encourage the development of transportation systems and programs which would assist statewide economic growth and diversification;			✓
(10) Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawaii's natural environment;			✓
(11) Encourage safe and convenient use of low-cost, energy-efficient, non-polluting means of transportation;			✓
(12) Coordinate intergovernmental land use and transportation planning activities to ensure the timely delivery of supporting transportation infrastructure in order to accommodate planned growth objectives; and			✓
(13) Encourage diversification of transportation modes and infrastructure to promote alternate fuels and energy efficiency.			✓
<b>Analysis: Not Applicable</b>			
<b>Chapter 226-18 Objectives and policies for facility systems – – energy.</b>			
<b>Objectives:</b> Planning for the State's facility systems with regard to energy shall be directed toward the achievement of the following objectives, giving due consideration to all:			
(1) Dependable, efficient, and economical statewide energy systems capable of supporting the needs of the people;			✓
(2) Increased energy security and self-sufficiency through the reduction and ultimate elimination of Hawaii's dependence on imported fuels for electrical generation and ground transportation.			✓

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(3) Greater diversification of energy generation in the face of threats to Hawaii's energy supplies and systems;			✓
(4) Reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply and use; and			✓
(5) Utility models that make the social and financial interests of Hawaii's utility customers a priority.			✓
(b) To achieve the energy objectives, it shall be the policy of this State to ensure the short- and long-term provision of adequate, reasonably prices, and dependable energy services to accommodate demand.			✓
<b>Policies:</b>			
(1) Support research and development as well as promote the use of renewable energy sources;			✓
(2) Ensure that the combination of energy supplies and energy-saving systems is sufficient to support the demands of growth;			✓
(3) Base decisions of least-cost supply-side and demand-side energy resource options on a comparison of their total costs and benefits when a least-cost is determined by a reasonably comprehensive, quantitative, and qualitative accounting of their long-term, direct and indirect economic, environmental, social, cultural, and public health costs and benefits;			✓
(4) Promote all cost-effective conservation of power and fuel supplies through measures, including:			✓
(A) Development of cost-effective demand-side management programs;			✓
(B) Education;			✓
(C) Adoption of energy-efficient practices and technologies; and			✓
(D) Increasing energy efficiency and decreasing energy use in public infrastructure			✓
(5) Ensure, to the extent that new supply-side resources are needed, that the development or expansion of energy systems uses the least-cost energy supply option and maximizes efficient technologies; and			✓
(6) Support research, development, demonstration, and use of energy efficiency, load management, and other demand-side management programs, practices, and technologies;			✓
(7) Promote alternate fuels and transportation energy efficiency;			✓
(8) Support actions that reduce, avoid, or sequester greenhouse gases in utility, transportation, and industrial sector applications;			✓
(9) Support actions that reduce, avoid, or sequester Hawaii's greenhouse gas emissions through agriculture and forestry initiatives;			✓
(10) Provide priority handling and processing for all state and county permits required for renewable energy projects;			✓
(11) Ensure that liquefied natural gas is used only as a cost-effective transitional, limited-term replacement of petroleum for electricity generation and does not impede the development and use of other cost-effective			✓

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
renewable energy sources; and			
(12) Promote the development of indigenous geothermal energy resources that are located on public trust land as an affordable and reliable source of firm power for Hawaii.			✓
<b>Analysis: Not Applicable</b>			
<b>Chapter 226-18.5 Objectives and policies for facility systems – – telecommunications.</b>			
<b>Objectives:</b>			
(a) Planning for the State's telecommunications facility systems shall be directed towards the achievement of dependable, efficient, and economical statewide telecommunications systems capable of supporting the needs of the people.			✓
(b) To achieve the telecommunications objective, it shall be the policy of this State to ensure the provision of adequate, reasonably priced, and dependable telecommunications services to accommodate demand.			✓
<b>Policies:</b>			
(1) Facilitate research and development of telecommunications systems and resources;			✓
(2) Encourage public and private sector efforts to develop means for adequate, ongoing telecommunications planning;			✓
(3) Promote efficient management and use of existing telecommunications systems and services; and			✓
(4) Facilitate the development of education and training of telecommunications personnel.			✓
<b>Analysis: Not Applicable</b>			
<b>Chapter 226-19 Objectives and policies for socio-cultural advancement – – housing.</b>			
<b>Objectives:</b> Planning for the State's socio-cultural advancement with regard to housing shall be directed toward the achievement of the following objectives:			
(1) Greater opportunities for Hawaii's people to secure reasonably priced, safe, sanitary, and livable homes, located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals, through collaboration and cooperation between government and nonprofit and for-profit developers to ensure that more affordable housing is made available to very low-, low- and moderate-income segments of Hawaii's population.	✓		
(2) The orderly development of residential areas sensitive to community needs and other land uses.	✓		
(3) The development and provision of affordable rental housing by the State to meet the housing needs of Hawaii's people.			✓
<b>Policies:</b>			
(1) Effectively accommodate the housing needs of Hawaii's people.	✓		
(2) Stimulate and promote feasible approaches that increase housing choices for low-income, moderate-income, and gap-group households.	✓		

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(3) Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing.	✓		
(4) Promote appropriate improvement, rehabilitation, and maintenance of existing housing units and residential areas.			✓
(5) Promote design and location of housing developments taking into account the physical setting, accessibility to public facilities and services, and other concerns of existing communities and surrounding areas.	✓		
(6) Facilitate the use of available vacant, developable, and underutilized urban lands for housing.	✓		
(7) Foster a variety of lifestyles traditional to Hawaii through the design and maintenance of neighborhoods that reflect the culture and values of the community.			✓
(8) Promote research and development of methods to reduce the cost of housing construction in Hawaii.			✓
<p><b>Analysis:</b> The Liloa Hale Senior Affordable Housing Project will provide 100 percent senior affordable rental housing for Hawai'i residents in proximity to commercial, social, and health services in Kihei. The proposed project will increase affordable rental opportunities and choices in size of rental units for seniors. It is also noted that most residential projects are for-sale home ownership opportunities and that senior affordable rental projects of this scale have been minimal on Maui. The project will be offering 101 one (1)-bedroom units of approximately 650 square feet (sq. ft.) and 16 two (2)-bedroom units of approximately 900 sq. ft. The design of the project will be complementary with the surrounding residential and commercial developments in the area. The density of the project is similar to many of the multi-family and condominium projects in the surrounding area. The proposed project is centrally located within the Kihei-Makena Community Plan region and is conveniently accessible to public facilities, transportation, and medical services making it a prime location for seniors.</p>			
<b>Chapter 226-20 Objectives and policies for socio-cultural advancement – – health.</b>			
<b>Objectives:</b> Planning for the State's socio-cultural advancement with regard to health shall be directed towards achievement of the following objectives:			
(1) Fulfillment of basic individual health needs of the general public.			✓
(2) Maintenance of sanitary and environmentally healthful conditions in Hawaii's communities.			✓
(3) Elimination of health disparities by identifying and addressing social determinants of health.			✓
<b>Policies:</b>			
(1) Provide adequate and accessible services and facilities for prevention and treatment of physical and mental health problems, including substance abuse.			✓
(2) Encourage improved cooperation among public and private sectors in the provision of health care to accommodate the total health needs of individuals throughout the State.			✓
(3) Encourage public and private efforts to develop and promote statewide and local strategies to reduce health care and related insurance costs.			✓
(4) Foster an awareness of the need for personal health maintenance and			✓

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preventive health care through education and other measures.			
(5) Provide programs, services, and activities that ensure environmentally healthful and sanitary conditions.			✓
(6) Improve the State's capabilities in preventing contamination by pesticides and other potentially hazardous substances through increased coordination, education, monitoring, and enforcement.			✓
(7) Prioritize programs, services, interventions, and activities that address identified social determinants of health to improve native Hawaiian health and well-being consistent with the United States Congress' declaration of policy as codified in title 42 United States Code section 11702, and to reduce health disparities of disproportionately affected demographics, including native Hawaiians, other Pacific Islanders, and Filipinos. The prioritization of affected demographic groups other than native Hawaiians may be reviewed every ten years and revised based on the best available epidemiological and public health data.			✓
<b>Analysis: Not Applicable</b>			
<b>Chapter 226-21 Objectives and policies for Socio-cultural advancement – – education.</b>			
<b>Objective:</b> Planning for the State's socio-cultural advancement with regard to education shall be directed towards achievement of the objective of the provision of a variety of educational opportunities to enable individuals to fulfill their needs, responsibilities, and aspirations.			✓
<b>Policies:</b>			
(1) Support educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups.			✓
(2) Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.			✓
(3) Provide appropriate educational opportunities for groups with special needs.			✓
(4) Promote educational programs which enhance understanding of Hawaii's cultural heritage.			✓
(5) Provide higher educational opportunities that enable Hawaii's people to adapt to changing employment demands.			✓
(6) Assist individuals, especially those experiencing critical employment problems or barriers, or undergoing employment transitions, by providing appropriate employment training programs and other related educational opportunities.			✓
(7) Promote programs and activities that facilitate the acquisition of basic skills, such as reading, writing, computing, listening, speaking, and reasoning.			✓
(8) Emphasize quality educational programs in Hawaii's institutions to promote academic excellence.			✓
(9) Support research programs and activities that enhance the education programs of the State.			✓
<b>Analysis: Not Applicable</b>			

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<b>Chapter 226-22 Objective and policies for socio-cultural advancement – – social services.</b>			
<b>Objective:</b> Planning for the State's socio-cultural advancement with regard to social services shall be directed towards the achievement of the objective of improved public and private social services and activities that enable individuals, families, and groups to become more self-reliant and confident to improve their well-being.			✓
<b>Policies:</b>			
(1) Assist individuals, especially those in need of attaining a minimally adequate standard of living and those confronted by social and economic hardship conditions, through social services and activities within the State's fiscal capacities.			✓
(2) Promote coordination and integrative approaches among public and private agencies and programs to jointly address social problems that will enable individuals, families, and groups to deal effectively with social problems and to enhance their participation in society.			✓
(3) Facilitate the adjustment of new residents, especially recently arrived immigrants, into Hawaii's communities.			✓
(4) Promote alternatives to institutional care in the provision of long-term care for elder and disabled populations.			✓
(5) Support public and private efforts to prevent domestic abuse and child molestation, and assist victims of abuse and neglect.			✓
(6) Promote programs which assist people in need of family planning services to enable them to meet their needs.			✓
<b>Analysis: Not Applicable</b>			
<b>Chapter 226-23 Objective and policies for socio-cultural advancement – – leisure.</b>			
<b>Objective:</b> Planning for the State's socio-cultural advancement with regard to leisure shall be directed towards the achievement of the objective of the adequate provision of resources to accommodate diverse cultural, artistic, and recreational needs for present and future generations.	✓		
<b>Policies:</b>			
(1) Foster and preserve Hawaii's multi-cultural heritage through supportive cultural, artistic, recreational, and humanities-oriented programs and activities.	✓		
(2) Provide a wide range of activities and facilities to fulfill the cultural, artistic, and recreational needs of all diverse and special groups effectively and efficiently.	✓		
(3) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.	✓		
(4) Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved.			✓
(5) Ensure opportunities for everyone to use and enjoy Hawaii's recreational resources.	✓		

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(6) Assure the availability of sufficient resources to provide for future cultural, artistic, and recreational needs.	✓		
(7) Provide adequate and accessible physical fitness programs to promote the physical and mental well-being of Hawaii's people.	✓		
(8) Increase opportunities for appreciation and participation in the creative arts, including the literary, theatrical, visual, musical, folk, and traditional art forms.	✓		
(9) Encourage the development of creative expression in the artistic disciplines to enable all segments of Hawaii's population to participate in the creative arts.	✓		
(10) Assure adequate access to significant natural and cultural resources in public ownership.			✓
<b>Analysis: Hale Mahaolu, co-developer and operator of the facility, offers many socio-cultural programs for its residents. Activities include physical fitness, music, and traditional arts and crafts to promote the physical and mental well-being of its senior residents.</b>			
<b>Chapter 226-24 Objective and policies for socio-cultural advancement – – individual rights and personal well-being.</b>			
<b>Objective:</b> Planning for the State's socio-cultural advancement with regard to individual rights and personal well-being shall be directed towards achievement of the objective of increased opportunities and protection of individual rights to enable individuals to fulfill their socio-economic needs and aspirations.	✓		
<b>Policies:</b>			
(1) Provide effective services and activities that protect individuals from criminal acts and unfair practices and that alleviate the consequences of criminal acts in order to foster a safe and secure environment.			✓
(2) Uphold and protect the national and state constitutional rights of every individual.			✓
(3) Assure access to, and availability of, legal assistance, consumer protection, and other public services which strive to attain social justice.			✓
(4) Ensure equal opportunities for individual participation in society.	✓		
<b>Analysis: The Liloa Hale Senior Affordable Housing Project will provide an opportunity for seniors to obtain housing.</b>			
<b>Chapter 226-25 Objective and policies for socio-cultural advancement – – culture.</b>			
<b>Objective:</b> Planning for the State's socio-cultural advancement with regard to culture shall be directed toward the achievement of the objective of enhancement of cultural identities, traditions, values, customs, and arts of Hawaii's people.			✓
<b>Policies:</b>			
(1) Foster increased knowledge and understanding of Hawaii's ethnic and cultural heritages and the history of Hawaii.			✓
(2) Support activities and conditions that promote cultural values, customs, and arts that enrich the lifestyles of Hawaii's people and which are sensitive and			✓

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable	S	N/S	N/A
responsive to family and community needs.			
(3) Encourage increased awareness of the effects of proposed public and private actions on the integrity and quality of cultural and community lifestyles in Hawaii.	✓		
(4) Encourage the essence of the aloha spirit in people's daily activities to promote harmonious relationships among Hawaii's people and visitors.			✓
<b>Analysis:</b> As previously discussed, a Cultural Background Review report has been prepared for the project. Based on the findings of the report, the project is not anticipated to impact cultural resources or activities. Refer to Appendix "F".			
<b>Chapter 226-26 Objectives and policies for socio-cultural advancement – – public safety.</b>			
<b>Objective:</b> Planning for the State's socio-cultural advancement with regard to public safety shall be directed towards the achievement of the following objectives:			
(1) Assurance of public safety and adequate protection of life and property for all people.	✓		
(2) Optimum organizational readiness and capability in all phases of emergency management to maintain the strength, resources, and social and economic well-being of the community in the event of civil disruptions, wars, natural disasters, and other major disturbances.	✓		
(3) Promotion of a sense of community responsibility for the welfare and safety of Hawaii's people.	✓		
<b>Policies (Public Safety):</b>			
(1) Ensure that public safety programs are effective and responsive to community needs.			✓
(2) Encourage increased community awareness and participation in public safety programs.			✓
<b>Policies (Public Safety-Criminal Justice):</b>			
(1) Support criminal justice programs aimed at preventing and curtailing criminal activities.			✓
(2) Develop a coordinated, systematic approach to criminal justice administration among all criminal justice agencies.			✓
(3) Provide a range of correctional resources which may include facilities and alternatives to traditional incarceration in order to address the varied security needs of the community and successfully reintegrate offenders into the community.			✓
<b>Policies (Public Safety – Emergency Management):</b>			
(1) Ensure that responsible organizations are in a proper state of readiness to respond to major war-related, natural, or technological disasters and civil disturbances at all times.			✓
(2) Enhance the coordination between emergency management programs throughout the State.			✓
<b>Analysis:</b> The Liloa Hale Senior Affordable Housing Project will be co-developed and operated by Hale Mahaolu, an experienced senior housing provider. Hale Mahaolu designs and operates their facilities in compliance with public safety regulations and has			

Hawai'i State Plan, Chapter 226, HRS Part I. Overall Themes, Goals, Objectives and Policies			
Key: S = Supportive, N/S = Not Supportive, N/A = Not Applicable			
S	N/S	N/A	
<b>in place an emergency response protocol in readiness of natural disaster and other major disturbances.</b>			
<b>Chapter 226-27 Objectives and policies for socio-cultural advancement – – government.</b>			
<b>Objectives:</b> Planning the State's socio-cultural advancement with regard to government shall be directed towards the achievement of the following objectives:			
(1) Efficient, effective, and responsive government services at all levels in the State.			✓
(2) Fiscal integrity, responsibility, and efficiency in the state government and county governments.			✓
<b>Policies:</b>			
(1) Provide for necessary public goods and services not assumed by the private sector.			✓
(2) Pursue an openness and responsiveness in government that permits the flow of public information, interaction, and response.			✓
(3) Minimize the size of government to that necessary to be effective.			✓
(4) Stimulate the responsibility in citizens to productively participate in government for a better Hawaii.			✓
(5) Assure that government attitudes, actions, and services are sensitive to community needs and concerns.			✓
(6) Provide for a balanced fiscal budget.			✓
(7) Improve the fiscal budgeting and management system of the State.			✓
(8) Promote the consolidation of state and county governmental functions to increase the effective and efficient delivery of government programs and services and to eliminate duplicative services wherever feasible.			✓
<b>Analysis: Not Applicable</b>			

HAWAI'I STATE PLAN, CHAPTER 226, HRS – PART III. PRIORITY GUIDELINES			
S	N/S	N/A	
<b>Chapter 226-101: Purpose.</b> The purpose of this part is to establish overall priority guidelines to address areas of statewide concern.			
<b>Chapter 226-102: Overall direction.</b> The State shall strive to improve the quality of life for Hawaii's present and future population through the pursuit of desirable courses of action in seven major areas of statewide concern which merit priority attention: economic development, population growth and land resource management, affordable housing, crime and criminal justice, quality education, principles of sustainability, and climate change adaptation.			
<b>Chapter 226-103: Economic priority guidelines.</b>			
<b>(a) Priority guidelines to stimulate economic growth and encourage business expansion and development to provide needed jobs for Hawaii's people and achieve a stable and diversified economy:</b>			
(1) Seek a variety of means to increase the availability of investment capital for new and expanding enterprises.	✓		
(A) Encourage investments which:			

HAWAII STATE PLAN, CHAPTER 226, HRS – PART III. PRIORITY GUIDELINES	S	N/S	N/A
(i) Reflect long term commitments to the State;	✓		
(ii) Rely on economic linkages within the local economy;			✓
(iii) Diversify the economy;			✓
(iv) Reinvest in the local economy;	✓		
(v) Are sensitive to community needs and priorities; and	✓		
(vi) Demonstrate a commitment to provide management opportunities to Hawaii residents; and			✓
(B) Encourage investments in innovative activities that have a nexus to the State, such as:			✓
(i) Present or former residents acting as entrepreneurs or principals;			✓
(ii) Academic support from an institution of higher education in Hawaii;			✓
(iii) Investment interest from Hawaii residents;			✓
(iv) Resources unique to Hawaii that are required for innovative activity; and			✓
(v) Complementary or supportive industries or government programs or projects.			✓
(2) Encourage the expansion of technological research to assist industry development and support the development and commercialization of technological advancements.			✓
(3) Improve the quality, accessibility, and range of services provided by government to business, including data and reference services and assistance in complying with governmental regulations.			✓
(4) Seek to ensure that state business tax and labor laws and administrative policies are equitable, rational, and predictable.			✓
(5) Streamline the processes for building and development permit and review, and telecommunication infrastructure installation approval and eliminate or consolidate other burdensome or duplicative governmental requirements imposed on business, where scientific evidence indicates that public health, safety and welfare would not be adversely affected.			✓
(6) Encourage the formation of cooperatives and other favorable marketing or distribution arrangements at the regional or local level to assist Hawaii's small-scale producers, manufacturers, and distributors.			✓
(7) Continue to seek legislation to protect Hawaii from transportation interruptions between Hawaii and the continental United States.			✓
(8) Provide public incentives and encourage private initiative to develop and attract industries which promise long-term growth potentials and which have the following characteristics:			✓
(A) An industry that can take advantage of Hawaii's unique location and available physical and human resources.			✓
(B) A clean industry that would have minimal adverse effects on Hawaii's environment.			✓
(C) An industry that is willing to hire and train Hawaii's people to meet the industry's labor needs at all levels of employment.			✓
(D) An industry that would provide reasonable income and steady employment.			✓
(9) Support and encourage, through educational and technical assistance programs and other means, expanded opportunities for employee ownership and participation in Hawaii business.			✓

HAWAII STATE PLAN, CHAPTER 226, HRS – PART III. PRIORITY GUIDELINES	S	N/S	N/A
(10) Enhance the quality of Hawaii’s labor force and develop and maintain career opportunities for Hawaii’s people through the following actions:			✓
(A) Expand vocational training in diversified agriculture, aquaculture, information industry, and other areas where growth is desired and feasible.			✓
(B) Encourage more effective career counseling and guidance in high schools and post-secondary institutions to inform students of present and future career opportunities.			✓
(C) Allocate educational resources to career areas where high employment is expected and where growth of new industries is desired.			✓
(D) Promote career opportunities in all industries for Hawaii’s people by encouraging firms doing business in the State to hire residents.			✓
(E) Promote greater public and private sector cooperation in determining industrial training needs and in developing relevant curricula and on-the-job training opportunities.			✓
(F) Provide retraining programs and other support services to assist entry of displaced workers into alternative employment.			✓
<b>(b) Priority guidelines to promote the economic health and quality of the visitor industry:</b>			
(1) Promote visitor satisfaction by fostering an environment which enhances the Aloha Spirit and minimizes inconveniences to Hawaii’s residents and visitors.			✓
(2) Encourage the development and maintenance of well-designed, adequately serviced hotels and resort destination areas which are sensitive to neighboring communities and activities and which provide for adequate shoreline setbacks and beach access.			✓
(3) Support appropriate capital improvements to enhance the quality of existing resort destination areas and provide incentives to encourage investment in upgrading, repair, and maintenance of visitor facilities.			✓
(4) Encourage visitor industry practices and activities which respect, preserve, and enhance Hawaii’s significant natural, scenic, historic, and cultural resources.			✓
(5) Develop and maintain career opportunities in the visitor industry for Hawaii’s people, with emphasis on managerial positions.			✓
(6) Support and coordinate tourism promotion abroad to enhance Hawaii’s share of existing and potential visitor markets.			✓
(7) Maintain and encourage a more favorable resort investment climate consistent with the objectives of this chapter.			✓
(8) Support law enforcement activities that provide a safer environment for both visitors and residents alike.			✓
(9) Coordinate visitor industry activities and promotions to business visitors through the state network of advanced data communication techniques.			✓
<b>(c) Priority guidelines to promote the continued viability of the sugar and pineapple industries:</b>			
(1) Provide adequate agricultural lands to support the economic viability of the sugar and pineapple industries.			✓
(2) Continue efforts to maintain federal support to provide stable sugar prices high enough to allow profitable operations in Hawaii.			✓
(3) Support research and development, as appropriate, to improve the quality and production of sugar and pineapple crops.			✓
<b>(d) Priority guidelines to promote the growth and development of diversified agriculture and aquaculture:</b>			

HAWAII STATE PLAN, CHAPTER 226, HRS – PART III. PRIORITY GUIDELINES	S	N/S	N/A
(1) Identify, conserve, and protect agricultural and aquacultural lands of importance and initiate affirmative and comprehensive programs to promote economically productive agricultural and aquacultural uses of such lands.			✓
(2) Assist in providing adequate, reasonably priced water for agricultural activities.			✓
(3) Encourage public and private investment to increase water supply and to improve transmission, storage, and irrigation facilities in support of diversified agriculture and aquaculture.			✓
(4) Assist in the formation and operation of production and marketing associations and cooperatives to reduce production and marketing costs.			✓
(5) Encourage and assist with the development of a waterborne and airborne freight and cargo system capable of meeting the needs of Hawaii's agricultural community.			✓
(6) Seek favorable freight rates for Hawaii's agricultural products from interisland and overseas transportation operators.			✓
(7) Encourage the development and expansion of agricultural and aquacultural activities which offer long-term economic growth potential and employment opportunities.			✓
(8) Continue the development of agricultural parks and other programs to assist small independent farmers in securing agricultural lands and loans.			✓
(9) Require agricultural uses in agricultural subdivisions and closely monitor the uses in these subdivisions.			✓
(10) Support the continuation of land currently in use for diversified agriculture.			✓
(11) Encourage residents and visitors to support Hawaii's farmers by purchasing locally grown food and food products.			✓
<b>(e) Priority guidelines for water use and development:</b>			
(1) Maintain and improve water conservation programs to reduce the overall water consumption rate.			✓
(2) Encourage the improvement of irrigation technology and promote the use of nonpotable water for agricultural and landscaping purposes.			✓
(3) Increase the support for research and development of economically feasible alternative water sources.			✓
(4) Explore alternative funding sources and approaches to support future water development programs and water system improvements.			✓
<b>(f) Priority guidelines for energy use and development:</b>			
(1) Encourage the development, demonstration, and commercialization of renewable energy sources.			✓
(2) Initiate, maintain, and improve energy conservation programs aimed at reducing energy waste and increasing public awareness of the need to conserve energy.	✓		
(3) Provide incentives to encourage the use of energy conserving technology in residential, industrial, and other buildings.			✓
(4) Encourage the development and use of energy conserving and cost-efficient transportation systems.			✓
<b>(g) Priority guidelines to promote the development of the information industry:</b>			
(1) Establish an information network, with an emphasis on broadband and wireless infrastructure and capability that will serve as the foundation of and catalyst for overall economic growth and diversification in Hawaii.			✓
(2) Encourage the development of services such as financial data processing, a products and services exchange, foreign language			✓

HAWAII STATE PLAN, CHAPTER 226, HRS – PART III. PRIORITY GUIDELINES	S	N/S	N/A
translations, telemarketing, teleconferencing, a twenty-four-hour international stock exchange, international banking, and a Pacific Rim management center.			
(3) Encourage the development of small businesses in the information field such as software development; the development of new information systems, peripherals, and applications; data conversion and data entry services; and home or cottage services such as computer programming, secretarial, and accounting services.			✓
(4) Encourage the development or expansion of educational and training opportunities for residents in the information and telecommunications fields.			✓
(5) Encourage research activities, including legal research in the information and telecommunications fields.			✓
(6) Support promotional activities to market Hawaii's information industry services.			✓
(7) Encourage the location or co-location of telecommunication or wireless information relay facilities in the community, including public areas, where scientific evidence indicates that the public health, safety, and welfare would not be adversely affected.			✓
<b>Analysis: The development of the project will generate significant expenditures by the Applicant during the site work and the construction of the new community. The project will also employ staff, during rental operations, which have a positive economic impact. The project also intends to contract services during operations to third party businesses on Maui that will perform maintenance assistance, such as landscaping, repairs during tenant move-outs, and other administrative services in the future which will benefit the Maui economy in the long run.</b>			
<b>Chapter 226-104: Population growth and land resources priority guidelines.</b>			
<b>(a) Priority guidelines to effect desired statewide growth and distribution:</b>			
(1) Encourage planning and resource management to insure that population growth rates throughout the State are consistent with available and planned resource capacities and reflect the needs and desires of Hawaii's people.			✓
(2) Manage a growth rate for Hawaii's economy that will parallel future employment needs for Hawaii's people.			✓
(3) Ensure that adequate support services and facilities are provided to accommodate the desired distribution of future growth throughout the State.	✓		
(4) Encourage major state and federal investments and services to promote economic development and private investment to the neighbor islands, as appropriate.			✓
(5) Explore the possibility of making available urban land, low-interest loans, and housing subsidies to encourage the provision of housing to support selective economic and population growth on the neighbor islands.			✓
(6) Seek federal funds and other funding sources outside the State for research, program development, and training to provide future employment opportunities on the neighbor islands.			✓
(7) Support the development of high technology parks on the neighbor islands.			✓
<b>(b) Priority guidelines for regional growth distribution and land resource utilization:</b>			
(1) Encourage urban growth primarily to existing urban areas where adequate public facilities are already available or can be provided with	✓		

HAWAII STATE PLAN, CHAPTER 226, HRS – PART III. PRIORITY GUIDELINES	S	N/S	N/A
reasonable public expenditures, and away from areas where other important benefits are present, such as protection of important agricultural land or preservation of lifestyles.			
(2) Make available marginal or nonessential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.			✓
(3) Restrict development when drafting of water would result in exceeding the sustainable yield or in significantly diminishing the recharge capacity of any groundwater area.			✓
(4) Encourage restriction of new urban development in areas where water is insufficient from any source for both agricultural and domestic use.			✓
(5) In order to preserve green belts, give priority to state capital-improvement funds which encourage location of urban development within existing urban areas except where compelling public interest dictates development of a noncontiguous new urban core.			✓
(6) Seek participation from the private sector for the cost of building infrastructure and utilities, and maintaining open spaces.			✓
(7) Pursue rehabilitation of appropriate urban areas.			✓
(8) Support the redevelopment of Kakaako into a viable residential, industrial, and commercial community.			✓
(9) Direct future urban development away from critical environmental areas or impose mitigating measures so that negative impacts on the environment would be minimized.	✓		
(10) Identify critical environmental areas in Hawaii to include but not be limited to the following: watershed and recharge areas; wildlife habitats (on land and in the ocean); areas with endangered species of plants and wildlife; natural streams and water bodies; scenic and recreational shoreline resources; open space and natural areas; historic and cultural sites; areas particularly sensitive to reduction in water and air quality; and scenic resources.			✓
(11) Identify all areas where priority should be given to preserving rural character and lifestyle.			✓
(12) Utilize Hawaii's limited land resources wisely, providing adequate land to accommodate projected population and economic growth needs while ensuring the protection of the environment and the availability of the shoreline, conservation lands, and other limited resources for future generations.	✓		
(13) Protect and enhance Hawaii's shoreline, open spaces, and scenic resources.	✓		
<p><b>Analysis:</b> The proposed project is in keeping with HRS 226-104 Priority Guidelines on Population, Growth, and Land Resources. The project is located within the UGB where adequate public facilities and services are already available, such as water and wastewater services. In addition, the project is located in very close proximity to parks, schools, medical facilities, fire, and police services and other public facilities that serve the Kihei-Makena Community Plan region. The proposed project will help meet the existing and projected affordable housing needs for Maui's seniors. The project location is substantially inland and will not have any adverse impacts on the shoreline or conservation lands.</p>			
<p><b>Chapter 226-105: Crime and criminal justice.</b></p>			
<p><b>Priority guidelines in the area of crime and criminal justice:</b></p>			

HAWAII STATE PLAN, CHAPTER 226, HRS – PART III. PRIORITY GUIDELINES	S	N/S	N/A
(1) Support law enforcement activities and other criminal justice efforts that are directed to provide a safer environment.			✓
(2) Target state and local resources on efforts to reduce the incidence of violent crime and on programs relating to the apprehension and prosecution of repeat offenders.			✓
(3) Support community and neighborhood program initiatives that enable residents to assist law enforcement agencies in preventing criminal activities.			✓
(4) Reduce overcrowding or substandard conditions in correctional facilities through a comprehensive approach among all criminal justice agencies which may include sentencing law revisions and use of alternative sanctions other than incarceration for persons who pose no danger to their community.			✓
(5) Provide a range of appropriate sanctions for juvenile offenders, including community-based programs and other alternative sanctions.			✓
(6) Increase public and private efforts to assist witnesses and victims of crimes and to minimize the costs of victimization.			✓
<b>Analysis: Not Applicable</b>			
<b>Chapter 226-106: Affordable housing.</b>			
<b>Priority guidelines for the provision of affordable housing:</b>			
(1) Seek to use marginal or nonessential agricultural land and public land to meet housing needs of low- and moderate-income and gap-group households.			✓
(2) Encourage the use of alternative construction and development methods as a means of reducing production costs.			✓
(3) Improve information and analysis relative to land availability and suitability for housing.			✓
(4) Create incentives for development which would increase home ownership and rental opportunities for Hawaii's low- and moderate-income households, gap-group households, and residents with special needs.			✓
(5) Encourage continued support for government or private housing programs that provide low interest mortgages to Hawaii's people for the purchase of initial owner-occupied housing.			✓
(6) Encourage public and private sector cooperation in the development of rental housing alternatives.	✓		
(7) Encourage improved coordination between various agencies and levels of government to deal with housing policies and regulations.	✓		
(8) Give higher priority to the provision of quality housing that is affordable for Hawaii's residents and less priority to development of housing intended primarily for individuals outside of Hawaii.	✓		
<b>Analysis: The proposed project will provide 117 affordable rental units for seniors. The project site is located in close proximity to existing infrastructure, transportation access, and commercial services in the Kihei-Makena Community Plan region. The project will add diversity to the product mix in the region which lacks in affordable and moderately priced rentals for seniors. The proposed project is complementary and consistent with its neighboring residential developments.</b>			
<b>Chapter 226-107: Quality education.</b>			
<b>Priority guidelines to promote quality education:</b>			

HAWAII STATE PLAN, CHAPTER 226, HRS – PART III. PRIORITY GUIDELINES	S	N/S	N/A
(1) Pursue effective programs which reflect the varied district, school, and student needs to strengthen basic skills achievement;			✓
(2) Continue emphasis on general education “core” requirements to provide common background to students and essential support to other university programs;			✓
(3) Initiate efforts to improve the quality of education by improving the capabilities of the education work force;			✓
(4) Promote increased opportunities for greater autonomy and flexibility of educational institutions in their decision making responsibilities;			✓
(5) Increase and improve the use of information technology in education by the availability of telecommunications equipment for:			✓
(A) The electronic exchange of information;			✓
(B) Statewide electronic mail; and			✓
(C) Access to the Internet.			✓
(6) Encourage programs that increase the public's awareness and understanding of the impact of information technologies on our lives;			✓
(7) Pursue the establishment of Hawaii's public and private universities and colleges as research and training centers of the Pacific;			✓
(8) Develop resources and programs for early childhood education;			✓
(9) Explore alternatives for funding and delivery of educational services to improve the overall quality of education; and			✓
(10) Strengthen and expand educational programs and services for students with special needs.			✓
<b>Analysis: Not Applicable</b>			
<b>CHAPTER 226-108: Sustainability</b>			
<b>Priority guidelines and principles to promote sustainability shall include:</b>			
(1) Encouraging balanced economic, social, community, and environmental priorities;	✓		
(2) Encouraging planning that respects and promotes living within the natural resources and limits of the State;			✓
(3) Promoting a diversified and dynamic economy;			✓
(4) Encouraging respect for the host culture;			✓
(5) Promoting decisions based on meeting the needs of the present without compromising the needs of future generations;	✓		
(6) Considering the principles of the ahupuaa system; and			✓
(7) Emphasizing that everyone, including individuals, families, communities, businesses, and government, has the responsibility for achieving a sustainable Hawaii.			✓
<b>Analysis: The Liloa Hale Senior Affordable Housing Project provides affordable rental housing for seniors in a manner that meets the current housing needs without compromising the needs of future generations. The project site is currently vacant and undeveloped. The project's construction plan will incorporate various mitigation measures to minimize potential adverse impacts to the environment.</b>			
<b>CHAPTER 226-109: Climate change adaptation</b>			
<b>Priority guidelines and principles to promote climate change adaptation shall include:</b>			
(1) Ensure that Hawaii's people are educated, informed, and aware of the impacts climate change may have on their communities;			✓

HAWAII STATE PLAN, CHAPTER 226, HRS – PART III. PRIORITY GUIDELINES	S	N/S	N/A
(2) Encourage community stewardship groups and local stakeholders to participate in planning and implementation of climate change policies;			✓
(3) Invest in continued monitoring and research of Hawaii’s climate and the impacts of climate change on the State;			✓
(4) Consider native Hawaiian traditional knowledge and practices in planning for the impacts of climate change;			✓
(5) Encourage the preservation and restoration of natural landscape features, such as coral reefs, beaches and dunes, forests, streams, floodplains, and wetlands, that have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change;			✓
(6) Explore adaptation strategies that moderate harm or exploit beneficial opportunities in response to actual or expected climate change impacts to the natural and built environments;			✓
(7) Promote sector resilience in areas such as water, roads, airports, and public health, by encouraging the identification of climate change threats, assessment of potential consequences, and evaluation of adaptation options;			✓
(8) Foster cross-jurisdictional collaboration between county, state, and federal agencies and partnerships between government and private entities and other nongovernmental entities, including nonprofit entities;			✓
(9) Use management and implementation approaches that encourage the continual collection, evaluation, and integration of new information and strategies into new and existing practices, policies, and plans; and			✓
(10) Encourage planning and management of the natural and built environments that effectively integrate climate change policy.			✓
<b>Analysis: Not Applicable</b>			

**C. ACT 127, RELATING TO RENTAL HOUSING**

The Legislature of the State of Hawai'i enacted Act 127, Relating to Rental Housing, which became effective on July 1, 2016. The purpose of the Act is to address rental housing, and more specifically: (1) establishes an affordable rental goal; and (2) establishes a special action team on affordable rental housing, chaired by the Director of the Office of Planning to make recommendations on actions to promote rental housing. Under the Act, the legislature establishes the goal for the state government, by itself or jointly with other parties, to develop or vest the development of at least 22,500 affordable rental housing units, ready for occupancy between January 1, 2017 and December 31, 2026. Furthermore, the legislature believes that the establishment of an affordable rental housing goal and special action team to make recommendations to achieve the goal are imperative.

**Discussion and Response:**

The proposed Liloa Hale Senior Affordable Housing Project meets the stated rental housing goal pursuant to Act 127. The proposed project will provide 117 units of affordable rental apartments for seniors earning 60 percent or less of the AMI as established by the

County of Maui, Department of Housing and Human Concerns. The proposed project will help address the critical housing needs of Maui's families.

#### **D. STATE FUNCTIONAL PLANS**

A key element of the Statewide Planning System is the Functional Plans which set forth the policies, statewide guidelines, and priorities within a specific field of activity. There are 13 Functional Plans which have been developed by the State agency primarily responsible for a given functional area. Together with the County General Plans, the State Functional Plans establish more specific strategies for implementation. In particular, State Functional Plans provide for the following:

- Identify major Statewide priority concerns
- Define current strategies for each functional area
- Identify major relationships among functional areas
- Provide direction and strategies for departmental policies, programs, and priorities
- Provide a guide for the allocation of resources
- Coordinate State and County roles and responsibilities in the implementation of the Hawai'i State Plan

Thirteen (13) Functional Plans have been prepared by State agencies. **Table 4** provides an assessment of the relationship between the proposed action and each of the 13 Functional Plans.

**Table 4.** Relationship Between the Proposed Liloa Hale Senior Affordable Housing Project and the State Functional Plans

No.	State Functional Plan	State Coordinating Agency	Purpose	Analysis
1	Agriculture Functional Plan (1991)	Department of Agriculture	Continued viability of agriculture throughout the State	Not applicable.
2	Conservation Lands State Functional Plan (1991)	Department of Land and Natural Resources	Addresses issues of population and economic growth and its strain on current natural resources; broadening public use of natural resources while protecting lands and shorelines from overuse; additionally, promotes the aquaculture industry	Not applicable.
3	Education State Functional Plan (1989)	Department of Education	Improvements to Hawai'i's educational curriculum, quality of educational staff, and access to adequate facilities	Not applicable.
4	Employment State Functional Plan (1990)	Department of Labor and Industrial Relations	Improve the qualifications, productivity, and effectiveness of the State's workforce through better education and training of workers as well as efficient planning of economic development, employment opportunities, and training activities	The proposed project will create short-term construction related jobs and long-term jobs for operation, management, and administration of the housing facility.
5	Energy State Functional Plan (1991)	Department of Business, Economic Development and Tourism	Lessen the reliance on petroleum and other fossil fuels in favor of alternative sources of energy so as to keep up with the State's increasing energy demands while also becoming a more sustainable island state; achieving dependable, efficient, and economical statewide energy systems	Not applicable.
6	Health State Functional Plan (1989)	Department of Health	Improve health care system by providing for those who don't have access to private health care providers; increasing preventative health measures; addressing 'quality of care' elements in private and public sectors to cut increasing costs	Not applicable.
7	Higher Education Functional Plan (1984)	University of Hawai'i	Prepare Hawai'i's citizens for the demands of an increasingly complex world through providing technical and intellectual tools	Not applicable.

No.	State Functional Plan	State Coordinating Agency	Purpose	Analysis
8	Historic Preservation State Functional Plan (1991)	Department of Land and Natural Resources	Preservation of historic properties, records, artifacts and oral histories; provide public with information/education on the ethnic and cultural heritages and history of Hawai'i	The proposed project is consistent with the Historic Preservation State Functional Plan. Based on the AIS prepared in 1990 and prior correspondence with SHPD, no significant adverse impacts to archaeological resources are anticipated as a result of development of the proposed project. It is noted that archaeological monitoring will be implemented for all initial ground disturbing activities in areas where the original natural grade is present. Refer to <b>Appendix "E-1"</b> , <b>Appendix "E-2"</b> , and <b>Appendix "E-3"</b> .
9	Housing State Functional Plan (1989)	Hawai'i Housing Finance and Development Corporation	Provide affordable rental and for-sale housing; increase homeownership and amount of rental housing units; acquiring public and privately-owned lands for future residential development; maintain a statewide housing data system	The proposed project is consistent with the Housing Functional Plan as the project is seeking to increase rental housing availability for Maui's senior population. The proposed project is anticipated to alleviate affordable senior rental housing needs in Hawai'i by providing 117 units to the inventory.
10	Human Services State Functional Plan (1989)	Department of Human Services	Refining support systems for families and individuals by improving elderly care, increasing preventative measures to combat child/spousal abuse and neglect; providing means for 'self-sufficiency'	Not applicable.

No.	State Functional Plan	State Coordinating Agency	Purpose	Analysis
11	Recreation State Functional Plan (1991)	Department of Land and Natural Resources	Manage the use of recreational resources via addressing issues: (1) ocean and shoreline recreation, (2) mauka, urban, and other recreation opportunities, (3) public access to shoreline and upland recreation areas, (4) resource conservation and management, (5) management of recreation programs/facilities/areas, and (6) wetlands protection and management	Not applicable.
12	Tourism State Functional Plan (1991)	Department of Business, Economic Development and Tourism	Balance tourism/economic growth with environmental and community concerns; development that is cognizant of the limited land and water resources of the islands; maintaining friendly relations between tourists and community members; development of a productive workforce and enhancement of career and employment opportunities in the visitor industry	Not applicable.
13	Transportation State Functional Plan (1991)	Department of Transportation	Development of a safer, more efficient transportation system that also is consistent with planned physical and economic growth of the state; construction of facility and infrastructure improvements; develop a transportation system balanced with new alternatives; pursue land use initiatives which help reduce travel demand	The proposed project is consistent with the Transportation State Functional Plan. Based on the discussions with the State Department of Transportation (HDOT), the Applicant will provide delineators along the median of Pi'ilani Highway at the Pi'ilani Highway/Welakahao intersection, which will prevent illegal U-turns and contribute to a safer transportation system.

## **E. MAUI COUNTY GENERAL PLAN**

As indicated by the Maui County Charter, the purpose of the General Plan shall be to:

*... indicate desired population and physical development patterns for each island and region within the county; shall address the unique problems and needs of each island and region; shall explain opportunities and the social, economic, and environmental consequences related to potential developments; and shall set forth the desired sequence, patterns and characteristics of future developments. The general plan shall identify objectives to be achieved, and priorities, policies, and implementing actions to be pursued with respect to population density; land use maps, land use regulations, transportation systems, public and community facility locations, water and sewage systems, visitor destinations, urban design, and other matters related to development.*

Chapter 2.80B of the Maui County Code (MCC), relating to the general plan and community plans, implements the foregoing Charter provision through enabling legislation which calls for a Countywide Policy Plan and a Maui Island Plan. The Countywide Policy Plan was adopted as Ordinance No. 3732 and took effect on March 24, 2010, while the Maui Island Plan, which delineates areas for future urban and rural growth as part of a Directed Growth Strategy, was adopted as Ordinance No. 4004 on December 21, 2012.

### **1. The Countywide Policy Plan**

With regard to the Countywide Policy Plan, Section 2.80B.030 of the MCC states the following:

*The countywide policy plan shall provide broad policies and objectives which portray the desired direction of the County's future. The countywide policy plan shall include:*

1. *A vision for the County;*
2. *A Statement of core themes or principles for the county; and*
3. *A list of countywide objectives and policies for population, land use, the environment, the economy, and housing.*

Core principles set forth in the Countywide Policy Plan are listed as follows:

1. *Excellence in the stewardship of the natural environment and cultural resources;*
2. *Compassion for and understanding of others;*
3. *Respect for diversity;*
4. *Engagement and empowerment of Maui County residents;*

5. *Honor for all cultural traditions and histories;*
6. *Consideration of the contributions of past generations as well as the needs of future generations;*
7. *Commitment to self-sufficiency;*
8. *Wisdom and balance in decision making;*
9. *Thoughtful, island-appropriate innovation; and*
10. *Nurturance of the health and well-being of our families and our communities.*

Congruent with these core principles, the Countywide Policy Plan identifies goals, objectives, policies and implementing actions for pertinent functional planning categories, which are identified as follows:

1. *Natural environment*
2. *Local cultures and traditions*
3. *Education*
4. *Social and healthcare services*
5. *Housing opportunities for residents*
6. *Local economy*
7. *Parks and public facilities*
8. *Transportation options*
9. *Physical infrastructure*
10. *Sustainable land use and growth management*
11. *Good governance*

With respect to the Liloa Hale Senior Housing project, the following goals, objectives, policies and implementing actions are illustrative of the project's compliance with the Countywide Policy Plan:

## **PROTECT THE NATURAL ENVIRONMENT**

### **Goal:**

*Maui County's natural environment and distinctive open spaces will be preserved, managed, and cared for in perpetuity.*

### **Policies:**

- (f) Protect the natural state and integrity of unique terrain, valued natural environments, and geological features.*

### **Objective:**

- (3) Improve the stewardship of the natural environment.*

### **Policy:**

- (c) Evaluate development to assess potential short-term and long-term impacts on land, air, aquatic, and marine environments.*

### **Implementing Actions:**

- (a) Document, record, and monitor existing conditions, populations, and locations of flora and fauna communities.*

**Response:** Careful consideration has been given to the placement of the building during the planning process to arrive at a site plan that is both sensitive and place-appropriate to the surrounding environment in Kīhei. A botanical and fauna survey has been completed for the project to document, record, and monitor existing conditions, populations, and locations of flora and fauna communities and ensure that the project will not result in significant adverse impacts to the flora and fauna resources in the project site.

## **STRENGTHEN SOCIAL AND HEALTHCARE SERVICES**

### **Goal:**

*Health and social services in Maui County will fully and comprehensively serve all segments of the population.*

### **Policy:**

- (f) Plan for the needs of an aging population and the resulting impacts on social services, housing, and healthcare delivery.*

**Response:** The proposed project intends to serve a large, unmet demand for senior affordable rental housing by providing 117 units of 100 percent affordable rentals in Kīhei to Maui's aging population.

## **EXPAND HOUSING OPPORTUNITIES FOR RESIDENTS**

### **Goal:**

*Quality, island-appropriate housing will be available to all residents.*

### **Objective:**

- (1) *Reduce the affordable housing deficit for residents.*

### **Policies:**

- (a) *Ensure that an adequate and permanent supply of affordable housing, both new and existing units, is made available for purchase or rental to our resident and/or workforce population, with special emphasis on providing housing for low- to moderate-income families, and ensure that all affordable housing remains affordable in perpetuity.*
- (b) *Seek innovative ways to lower housing costs without compromising the quality of our island lifestyle.*
- (c) *Seek innovative methods to secure land for the development of low- and moderate- income housing.*
- (e) *Provide for a range of senior-citizen and special needs housing choices on each island that affordably facilitates a continuum of care and services.*
- (k) *Ensure residents are given priority to obtain affordable housing units developed in their communities, consistent with all applicable regulations.*

### **Objective:**

- (2) *Increase the mix of housing types in towns and neighborhoods to promote sustainable land use planning, expand consumer choice, and protect the County's rural and small town character.*

### **Policies:**

- (d) *Promote infill housing in urban areas at scales that capitalize on existing infrastructure, lower development costs, and are consistent with existing or desired patterns of development.*

### **Objective:**

- (3) *Increase and maintain the affordable housing inventory.*

### **Policies:**

- (a) *Recognize housing as a basic human need, and work to fulfill that need.*
- (b) *Prioritize available infrastructure capacity for affordable housing.*

- (c) *Improve communication, collaboration, and coordination among housing providers and social-service organizations.*
- (h) *Encourage long-term residential use of existing and future housing to meet residential needs.*

**Response:** As noted previously, the proposed project will provide 117 units of 100 percent senior affordable rentals on Maui. All units will retain their affordability for a minimum of 60 years, ensuring that residents are not priced out of their new homes as they age. The project is considered an urban infill development, as the project site is located adjacent to existing urbanized areas and public services.

## **STRENGTHEN THE LOCAL ECONOMY**

### **Goal:**

*Maui County's economy will be diverse, sustainable, and supportive of community values.*

### **Policy:**

- (d) *Support and promote locally produced products and locally owned operations and businesses that benefit local communities and meet local demand.*

**Response:** The proposed project will create jobs and encourage spending in the short term for construction contractors and supplies. In the long term, the project will result in jobs and increased expenditures related to continuous operation and maintenance of the project. Landscape improvements will be implemented as part of the project to screen the building and parking lot from the surrounding roadways.

## **PROMOTE SUSTAINABLE LAND USE AND GROWTH MANAGEMENT**

### **Goal:**

*Community character, lifestyles, economies, and natural assets will be preserved by managing growth and using land in a sustainable manner.*

### **Objective:**

- (1) *Improve land use management and implement a directed-growth strategy.*

### **Policies:**

- (a) *Establish, map, and enforce urban- and rural-growth limits.*
- (b) *Direct urban and rural growth to designated areas.*

- (e) *Encourage redevelopment and infill in existing communities on lands intended for urban use to protect productive farm land and open-space resources.*
- (h) *Direct new development in and around communities with existing infrastructure and service capacity, and protect natural, scenic, shoreline, and cultural resources.*

**Policies:**

- (c) *Protect and enhance the unique architectural and landscape characteristics of each Community Plan Area, small town, and neighborhood.*
- (f) *Use trees and other forms of landscaping along rights-of-way and within parking lots to provide shade, beauty, urban-heat reduction, and separation of pedestrians from automobile traffic in accordance with community desires.*

**Policies:**

- (a) *Assess the cumulative impact of developments on natural ecosystems, natural resources, wildlife habitat, and surrounding uses.*
- (b) *Ensure that new development projects requiring discretionary permits demonstrate a community need, show consistency with the General Plan, and provide an analysis of impacts.*

**Response:** As will be discussed further in this chapter, the proposed project is located on lands that have the appropriate underlying land use designations to support the project. The project site is located within the UGB as designated in the MIP, and on lands suitable for development of residential uses.

In summary, the Liloa Hale Affordable Senior Housing project provides additional affordable senior rental housing units and will be developed in harmony with the surrounding environment and residential/commercial neighborhoods in Kīhei. As such, the project is consistent with the theme and principles of the Countywide Policy Plan.

## **2. Maui Island Plan**

The MIP is applicable to the island of Maui only, providing more specific policy-based strategies for population, land use, transportation, public and community facilities, water and sewage systems, visitor destinations, urban design, and other matters related to future growth.

As provided by Chapter 2.808, the MIP shall include the following components:

1. *An island-wide land use strategy, including a managed and directed growth plan*

2. *A water element assessing supply, demand and quality parameters*
3. *A nearshore ecosystem element assessing nearshore waters and requirements for preservation and restoration*
4. *An implementation program which addresses the County's 20-year capital improvement requirements, financial program for implementation, and action implementation schedule*
5. *Milestone indicators designed to measure implementation progress of the MIP*

It is noted that the Ordinance No. 4004 does not address the component relating to the implementation program. Chapter 2.80B of the Maui County Code, relating to the General Plan, was amended by Ordinance No. 3979, effective October 5, 2012, to provide that the implementation program component be adopted no later than one (1) year following the effective date of Ordinance No. 4004. In December 2013 and March 2014, the Council approved time extensions for adopting the implementation program component of the MIP. The implementation program component was adopted by Ordinance No. 4126 on May 19, 2014.

The MIP addresses a number of planning categories with detailed policy analysis and recommendations which are framed in terms of goals, objectives, policies and implementing actions. These planning categories address the following areas:

1. *Population*
2. *Heritage Resources*
3. *Natural Hazards*
4. *Economic Development*
5. *Housing*
6. *Infrastructure and Public Facilities*
7. *Land Use*

Additionally, an essential element of the MIP is its directed growth plan which provides a management framework for future growth in a manner that is fiscally, environmentally, and culturally prudent. Among the directed growth management tools developed through the MIP process are maps delineating UGB, small town boundaries (STB), and rural growth boundaries (RGB). The respective boundaries identify areas appropriate for future growth and their corresponding intent with respect to development character.

Although the proposed project is located on vacant, undeveloped land, the site is located within the UGB for the Kīhei-Makena region. In this regard, it does not conflict with the directed growth strategy defined via growth maps adopted in the MIP.

In addition, the proposed project has been reviewed with respect to pertinent goals, objectives, policies, and implementing actions of the MIP. A summary of these policy statements are provided below.

## **POPULATION**

### **Goal:**

1.1 *Maui's people, values, and lifestyles thrive through strong, healthy, and vibrant island communities.*

### **Objective:**

1.1.1 *Greater retention and return of island residents by providing viable work, education, and lifestyle options.*

### **Policies:**

1.1.1.b *Expand housing, transportation, employment, and social opportunities to ensure residents are able to comfortably age within their communities.*

**Response:** The proposed project will support residents on Maui by providing 117 units of 100 affordable senior rentals in response to the current and projected shortage of affordable senior housing on the island.

## **HOUSING**

### **Goal:**

5.1 *Maui will have safe, decent, appropriate, and affordable housing for all residents developed in a way that contributes to strong neighborhoods and a thriving island community.*

### **Objective:**

5.1.1 *More livable communities that provide for a mix of housing types, land uses, income levels, and age.*

### **Policies:**

5.1.1.a *Promote livable communities (compact/walkable/bikeable, access to transit) that provide for a mix of housing types and land uses, including parks, open space, and recreational areas.*

5.1.1.e *Use planning and regulatory approaches to provide higher housing densities.*

**Objective:**

5.1.3 *Provide affordable housing, rental or in fee, to the broad spectrum of our island community.*

**Objective:**

5.1.6 *Reduce the cost to developers of providing housing that is affordable to families with household incomes 160 percent and below of annual median income.*

**Policies:**

5.1.6.a *Support fast-track processing procedures for the following housing-related entitlements: affordable housing projects/units; indigenous Hawaiian housing/units; and special-needs housing units (seniors, disabled, homeless, etc.).*

**Response:** The proposed project involves development of 100 percent affordable rental housing for seniors earning 60 percent or less of the AMI. The Applicant has designed the proposed project to meet the criteria for a Chapter 2.97 MCC fast tracked housing application and will request exemptions from various County requirements in order to support the timely implementation of the project, without compromising public health, safety, or welfare considerations.

**DIRECTED GROWTH PLAN**

**URBAN AND SMALL TOWN GROWTH AREA**

**Goal:**

8.1 *Maui will have well-serviced, complete, and vibrant urban communities and traditional small towns through sound planning and clearly defined development expectations.*

**Policies:**

8.1.e *New development shall be consistent with the UGBs, STBs, and all other applicable policies of the MIP. New urban-density development shall not be allowed outside of a UGB or STB.*

**Response:** The proposed project site is located within the UGB as designated within the MIP.

**F. KIHEI-MAKENA COMMUNITY PLAN**

The project site is located within the Kihei-Makena Community Plan region, one (1) of nine (9) community plan regions established in the County of Maui. Each region's growth and development is guided by a Community Plan. The County's Community Plan reflects current and anticipated conditions in the Kihei-Makena region and advances planning goals, objectives, policies, and implementation considerations to guide decision-making

in the region. The primary purpose of the Community Plan is to outline a detailed agenda for carrying out these policies and objectives. The Kihei-Makena Community Plan was adopted by the County of Maui and became effective in 1998. The Community Plan land use map designates the subject property as "Project District". See **Exhibit "I"**, the project's Zoning and Flood Confirmation Form. Specifically, the project site is part of Project District 5, Piilani Village which covers a total area of 189.9 acres and is located just makai (towards the ocean) of Pi'ilani Highway between Kulanihakoi and south of Keokea Stream.

The proposed project is consistent with the following goals, objectives, and policies of the Kihei-Makena Community Plan as outlined below.

## **LAND USE**

### **Goal:**

*A well-planned community with land use and development patterns designed to achieve the efficient and timely provision of infrastructural and community needs while preserving and enhancing the unique character of Ma`alaea, Kihei, Wailea and Makena as well as the region's natural environment, marine resources and traditional shoreline uses.*

### **Objectives and Policies:**

- f. Establish a distribution of land uses which provides housing, jobs, shopping, open space, and recreation areas in close proximity to each other in order to enhance Kihei's neighborhoods and to minimize dependence on automobiles.*
- g. Encourage the establishment of single-family and multi-family land use designations which provide affordable housing opportunities for areas which are in close proximity to infrastructure systems and other urban service.*

**Response:** The proposed senior affordable housing project site is located within the UGB as designated within the MIP. Furthermore, the project site is located on land with appropriate existing land use designations with respect to the Kihei-Makena Community Plan and Maui County Zoning to support housing. It is also noted that the project site does not directly front the shoreline.

## **ENVIRONMENT**

### **Goal:**

*Preservation, protection, and enhancement of Kihei-Makena's unique and fragile environmental resources.*

## **Objectives and Policies**

\* \* \*

4. *Storm water run-off from proposed developments shall not adversely affect the marine environment and nearshore and offshore water quality.*

**Response:** A comprehensive drainage system will be installed as part of the project development to capture and retain the increase in runoff due to the project and remove pollutants typically contained in stormwater runoff.

## **HOUSING AND URBAN DESIGN**

### **Goal:**

*A variety of attractive, sanitary, safe and affordable homes for Kihei's residents, especially for families earning less than the median income for families within the County. Also, a built environment which provides complementary and aesthetically pleasing physical and visual linkages with the natural environment.*

### **Objectives and Policies**

- a. *Provide an adequate variety of housing choices and range of prices for the needs of Kihei's residents, especially for families earning less than the median income for families within the County, through the project district approach and other related programs. Choices can be increased through public/private sector cooperation and coordinated development of necessary support facilities and services.*
- b. *Require a mix of affordable and market-priced housing in all major residential projects, unless the project is to be developed exclusively as an affordable housing project.*

\* \* \*

- e. *Implement landscaped setbacks for future multi-family and commercial areas. Developments shall provide space for landscaped pedestrian ways and bikeways.*

\* \* \*

- g. *Encourage the use of native plants in landscaping in the spirit of Act 73, Session Laws of Hawaii, 1992.*

**Response:** As noted earlier in this report, all the 117 proposed rental units will be in conformance with the County of Maui's Workforce Housing Policy Rent Guidelines for those seniors earning 60 percent or less of the AMI. The proposed project will help meet the existing and projected affordable housing needs for

Maui's aging population. Landscape improvements will be implemented as part of the project and will utilize native plants, where available and feasible.

## **G. COUNTY ZONING**

The proposed project site has been designated "Project District 5 (Piilani Village)" by Maui County Zoning. Specifically, the site falls within the "Residential and "Multi-Family" subdistricts of "Project District 5". Refer to **Appendix "I"**. This EA and 2.97 MCC application, have been prepared with a request to exempt the proposed project from certain provisions of the MCC which will allow the proposed project to be developed without the need for Project District processing requirements. These exemptions are further described in Chapter IV of this document.

## **H. HAWAI'I COASTAL ZONE MANAGEMENT PROGRAM**

The Hawai'i Coastal Zone Management Program (HCZMP), as formalized in Chapter 205A, HRS, establishes objectives and policies for the preservation, protection, and restoration of natural resources of Hawai'i's coastal zone. The subject property is within the County of Maui's Special Management Area (SMA) and will require a SMA Use Permit from the Maui Planning Commission. See **Figure 11**. As such, the applicability of coastal zone management considerations has been reviewed and assessed.

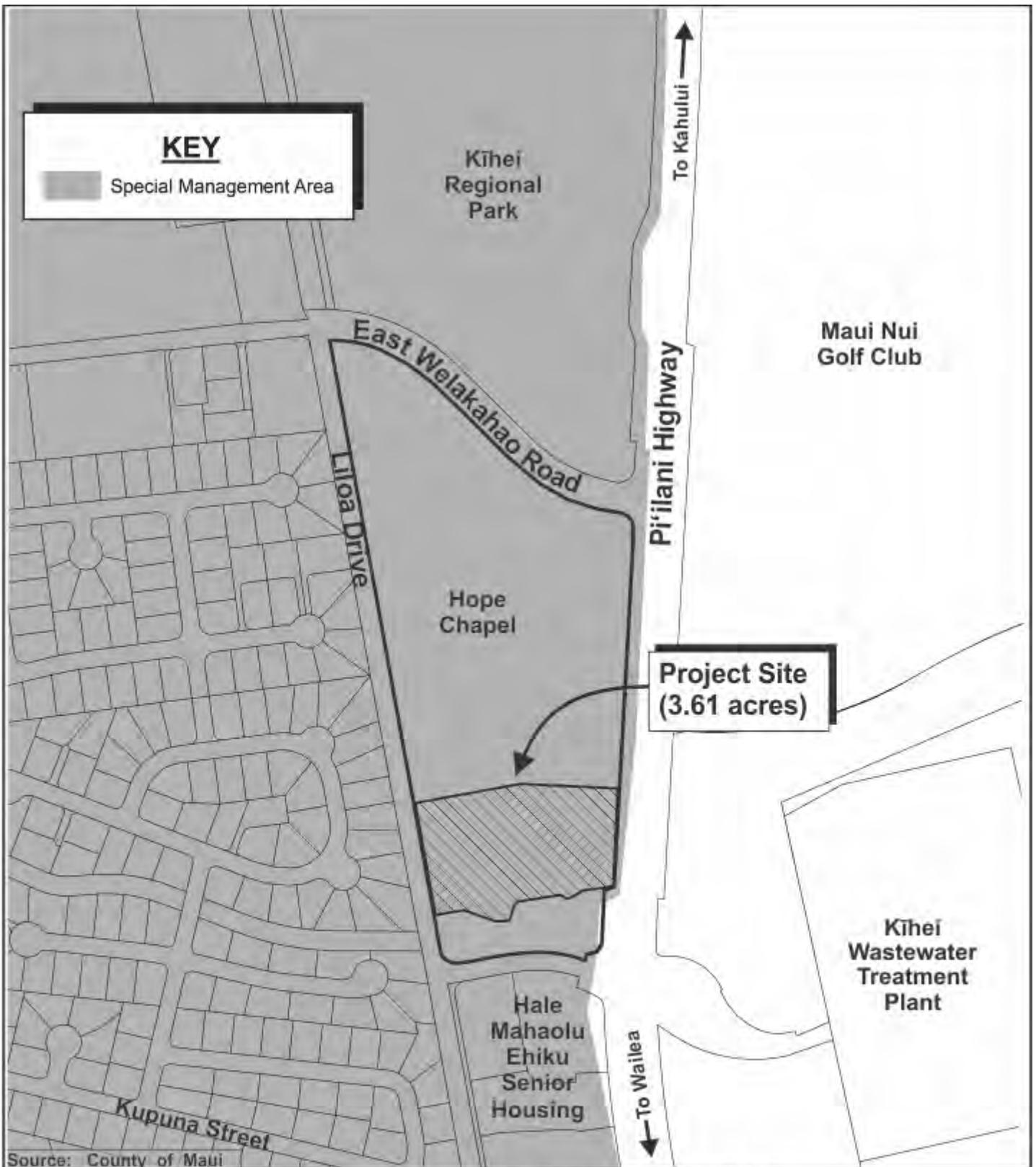
### **1. Recreational Resources**

#### **Objective:**

*Provide coastal recreational opportunities accessible to the public.*

#### **Policies:**

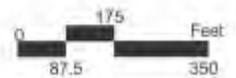
- a. *Improve coordination and funding of coastal recreational planning and management; and*
- b. *Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:*
  - i. *Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;*
  - ii. *Requiring replacement of coastal resources having significant recreational value including, but not limited to surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;*



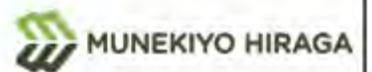
Source: County of Maui

Figure 11

Proposed Liloa Hale Senior Affordable Housing Project  
Special Management Area Map



Prepared for: Liloa Senior Housing, LP



- iii. *Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;*
- iv. *Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;*
- v. *Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;*
- vi. *Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;*
- vii. *Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and*
- viii. *Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of section 46-6.*

**Response:** The project site is located substantially inland and away from the coastline. As such, the proposed action will not impact coastal recreational opportunities or affect existing public access to the shoreline.

## **2. Historic/Cultural Resources**

### **Objective:**

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

### **Policies:**

- a. *Identify and analyze significant archaeological resources;*
- b. *Maximize information retention through preservation of remains and artifacts or salvage operations; and*
- c. *Support state goals for protection, restoration, interpretation, and display of historic resources.*

**Response:** The proposed project is not anticipated to have a significant adverse effect on historic or cultural resources. An Archaeological Inventory Survey (AIS) was conducted to assess the presence and/or absence of any historical and archaeological resources for the southern portion of the Kihei-Makena Project District 5 in 1990. The AIS indicated that no significant archaeological sites were identified within the project site at the time of the survey. Nonetheless, given the result of the community consultation, precautionary archaeological monitoring will be implemented for all initial ground disturbing activities in areas where the original natural grade is present. Should any archaeological deposits be encountered during project construction, all work will be halted in the vicinity of the find and the staff of the State Historic Preservation Division (SHPD) will be notified accordingly in order to determine appropriate mitigation measures.

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

**Objective:**

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

**Policies:**

- a. *Identify valued scenic resources in the coastal zone management area;*
- b. *Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;*
- c. *Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and*
- d. *Encourage those developments that are not coastal dependent to locate in inland areas.*

**Response:** As indicated previously, the project is not located on or near the shoreline or within a coastal area. The proposed project will be screened by landscaping and canopy trees to the extent practicable to mitigate impacts to coastal scenic and open space resources.

### 4. **Coastal Ecosystem**

**Objective:**

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

**Policies:**

- a. *Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;*
- b. *Improve the technical basis for natural resource management;*
- c. *Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;*
- d. *Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and*
- e. *Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.*

**Response:** The proposed project is located substantially inland, away from the coastal ecosystems and is, therefore, not anticipated to have significant adverse impacts on coastal/shoreline resources, including reefs and marine resources. Also, the proposed project does not include any stream diversions or channelization. Appropriate BMPs will be utilized to ensure that construction runoff is appropriately captured, minimizing any impact on coastal waters.

**5. Economic Use**

**Objective:**

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

**Policies:**

- a. *Concentrate coastal dependent development in appropriate areas;*
- b. *Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and*
- c. *Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of*

*presently designated areas when:*

- i. Use of presently designated locations is not feasible;*
- ii. Adverse environmental effects are minimized; and*
- iii. The development is important to the State's economy.*

**Response:** The proposed project is not a coastal dependent development. The project site is located substantially inland from the shoreline. The proposed project will stimulate the economy through the generation of construction jobs and related job opportunities during the development of the project. The proposed project does not contravene the objective and policies for economic use.

## **6. Coastal Hazards**

### **Objective:**

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

### **Policies:**

- a. Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;*
- b. Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;*
- c. Ensure that developments comply with requirements of the Federal Flood Insurance Program; and*
- d. Prevent coastal flooding from inland projects.*

**Response:** The project site falls within Zone X (unshaded), an area of minimal flooding. The project site is located well beyond the limits of the tsunami evacuation zone. Drainage improvements will be designed in accordance with the Drainage Standards of the County of Maui to ensure that the project will not adversely affect downstream properties from the effects of flooding and erosion.

Significant adverse impacts to hazard-sensitive areas are not anticipated as the project site is not located within a flood hazard zone and is not located near the shoreline. In addition, tsunami inundation parameters do not apply to the subject project.

## 7. Managing Development

### Objective:

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

### Policies:

- a. *Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;*
- b. *Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and*
- c. *Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.*

**Response:** Opportunities for agency review of the proposed action are provided through the Chapter 2.97 fast tracked housing application and SMA Use Permit application review processes. The Applicant has and will continue to engage the public through the development review process.

## 8. Public Participation

### Objective:

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

### Policies:

- a. *Promote public involvement in coastal zone management processes;*
- b. *Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and*
- c. *Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.*

**Response:** The Applicant has met with key stakeholders and various community organizations, including the Kihei Community Association (KCA) and the South Maui Advisory Committee (SMAC), and will continue to address public awareness, education, and participation objectives. Opportunities for agency

review of the proposed action are provided through the Chapter 2.97 application and SMA Use Permit review processes.

**9. Beach Protection**

**Objective:**

*Protect beaches for public use and recreation.*

**Policies:**

- a. *Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;*
- b. *Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities;*
- c. *Minimize the construction of public erosion-protection structures seaward of the shoreline;*
- d. *Prohibit private property owners from creating a public nuisance by inducing or cultivating the private property owner's vegetation in a beach transit corridor; and*
- e. *Prohibit private property owners from creating a public nuisance by allowing the private property owner's unmaintained vegetation to interfere or encroach upon a beach transit corridor.*

**Response:** The project site is located substantially inland, away from the shoreline and is not anticipated to impact shoreline processes.

**10. Marine Resources**

**Objective:**

*Promote the protection, use, and development of marine and coastal resources to assure their sustainability.*

**Policies:**

- a. *Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;*
- b. *Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;*
- c. *Assert and articulate the interests of the State as a partner with*

*federal agencies in the sound management of ocean resources within the United States exclusive economic zone;*

- d. Promote research, study, and understanding of ocean processes, marine life, and other ocean resources to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and*
- e. Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.*

**Response:** As previously stated, the project is located substantially inland, away from the ocean and is, therefore, not anticipated to have an impact on marine or coastal resources.

In addition to the foregoing objectives and policies, SMA permit review criteria pursuant to §205A.30.5(1) Prohibitions provides that:

*No special management area use permit or special management area minor permit shall be granted for structures that allow artificial light from floodlights, uplights, or spotlights used for decorative or aesthetic purposes when the light:*

- (1) Directly illuminates the shoreline and ocean waters; or*
- (2) Is directed to travel across property boundaries toward the shoreline and ocean waters.*

Further, artificial lighting provided by a government agency or its authorized users for government operations, security, public safety, or navigational needs shall make reasonable efforts to properly position or shield lights to minimize adverse impacts.

**Response:** All construction operations will be carried out during daylight hours. Upon completion, outdoor lights will be shielded and will not directly illuminate any shoreline or ocean waters. All outdoor lighting will comply with the County's Outdoor Lighting ordinance.

### **HRS 205A-26 Special Management Area Guidelines**

The proposed project is consistent with the State's guidelines for issuance of a SMA Use Permit by the Maui Planning Commission, as set forth in HRS, Chapter 205A-26:

- (1) All development in the special management area shall be subject to reasonable terms and conditions set by the authority in order to ensure:*

- (A) *Adequate access, by dedication or other means, to publicly owned or used beaches, recreation areas, and natural reserves is provided to the extent consistent with sound conservation principles;*
  - (B) *Adequate and properly located public recreation areas and wildlife preserves are reserved;*
  - (C) *Provisions are made for solid and liquid waste treatment, disposition, and management which will minimize adverse effects upon special management area resources; and*
  - (D) *Alterations to existing land forms and vegetation, except crops, and construction of structures shall cause minimum adverse effect to water resources and scenic and recreational amenities and minimum danger of floods, wind damage, storm surge, landslides, erosion, siltation, or failure in the event of earthquake.*
- (2) *No development shall be approved unless the authority has first found:*
- (A) *That the development will not have any substantial adverse environmental or ecological effect, except as such adverse effect is minimized to the extent practicable and clearly outweighed by public health, safety, or compelling public interests. Such adverse effects shall include, but not be limited to, the potential cumulative impact of individual developments, each one of which taken in itself might not have a substantial adverse effect, and the elimination of planning options;*
  - (B) *That the development is consistent with the objectives, policies, and special management area guidelines of this chapter and any guidelines enacted by the legislature; and*
  - (C) *That the development is consistent with the county general plan and zoning. Such a finding of consistency does not preclude concurrent processing where a general plan or zoning amendment may also be required.*
- (3) *The authority shall seek to minimize, where reasonable:*
- (A) *Dredging, filling or otherwise altering any bay, estuary, salt marsh, river mouth, slough or lagoon;*
  - (B) *Any development which would reduce the size of any beach or other area usable for public recreation;*
  - (C) *Any development which would reduce or impose restrictions upon public access to tidal and submerged lands, beaches, portions of rivers and streams within the special management areas and the mean high tide line where there is no beach;*
  - (D) *Any development which would substantially interfere with or detract from the line of sight toward the sea from the state highway nearest the coast; and*
  - (E) *Any development which would adversely affect water quality, existing areas of open water free of visible structures, existing and potential fisheries and fishing grounds, wildlife habitats, or potential or existing agricultural uses of land.*

## **I. MAUI PLANNING COMMISSION SPECIAL MANAGEMENT AREA RULES AND REGULATIONS**

As noted above, the project site is located within the County of Maui's Special Management Area (SMA). Refer to **Figure 11**. The Rules and Regulations of the Maui Planning Commission, Chapter 202 were established in order to implement HRS, Chapter 205A-26 relating to Coastal Zone Management and Special Management Areas. In addition to establishing procedures for processing of SMA applications and procurement of related permits, the rules assist the Maui Planning Commission in giving consideration to State policy regarding coastal zones.

This section addresses the project's relationship to applicable coastal zone management considerations as set forth in the Maui Planning Commission Rules and Regulations, Chapter 202, "Special Management Area Permit Procedures," which are provided for considering the significance of potential environmental and ecological effects of a proposed action. The criteria have been reviewed and analyzed with respect to the proposed project.

### **1. Involves an irrevocable commitment to loss or destruction of any natural or cultural resources.**

As noted previously, an AIS was carried out for the southern portion of Project District 5 in 1990. A Cultural Background Review report was also completed for the proposed project. Based on the findings of the AIS and Cultural Background Review report, the subject project is not anticipated to adversely impact cultural or historic resources. It is noted that archaeological monitoring will be implemented for all initial ground disturbing activities in areas where the original natural grade is present. In accordance with Section 6E-43.6, HRS and Chapter 13-300, HAR, if any significant cultural deposits or human skeletal remains are encountered, work will stop in the immediate vicinity and SHPD will be contacted to establish the appropriate protocols and level of mitigation. No streams or wetlands will be adversely impacted by the proposed project. In addition, no rare, threatened, or endangered species of plants or wildlife are anticipated to be adversely affected by the proposed project. Implementation of mitigation measures to minimize potential impacts on listed water birds (i.e., Hawaiian Petrel and Newell's shearwater) that may be transitioning through the area, will ensure that endangered species and their habitat are not adversely impacted.

2. **Significantly curtails the range of beneficial uses of the environment.**

The Liloa Hale Senior Affordable Housing Project will provide 117 affordable units for low income seniors and does not curtail the range of beneficial uses of the environment.

Applicable dust control, noise control, and drainage control measures will be implemented during construction activities to minimize impacts to the surrounding environment.

3. **Conflicts with the County's or the State's long-term environmental policies or goals.**

The proposed Liloa Hale Senior Affordable Housing Project does not conflict with the County's or State's long-term environmental policies or goals. A detailed assessment of the project's consistency with County and State policies and goals is provided in Sections A through E of this Chapter.

4. **Substantially affects the economic or social welfare and activities of the community, County, or State.**

On a short-term basis, the proposed project will support construction-related employment and benefit the local economy during construction. On a long-term basis, the project will employ staff, such as a property manager or maintenance staff during rental operations. In addition, the project's social gathering space will benefit senior residents' social welfare.

5. **Involves substantial secondary impacts, such as population changes and increased effects on public facilities, streets, drainage, sewage, and water systems, and pedestrian walkways.**

The proposed project is not anticipated to result in adverse, secondary impacts to population or public facilities or services. Proposed drainage improvements will accommodate the increase in runoff resulting from the proposed project. Water and Wastewater infrastructure services will be provided by the County. The project site is located in the UGB of the MIP and as such, increased effects on population changes and public facilities have been planned in the context of future land uses. As such, no substantial secondary impacts are anticipated on public facilities or services.

6. **In itself has no significant adverse effects but cumulatively has considerable effect upon the environment or involves a commitment for larger actions.**

The proposed project involves the development of a single apartment building containing 117 units and related improvements. The project site is located close to the existing infrastructure and commercial services. As such, it is not anticipated to have a cumulative adverse impact on the environment, nor involve a commitment to larger actions.

7. **Substantially affects a rare, threatened, or endangered species of animal or plant, or its habitat.**

No rare, threatened, or endangered species of fauna, flora, or their habitats were observed during the project's flora and fauna investigation in or adjacent to the project site. Implementation of mitigation measures to minimize potential impacts on listed water birds (i.e., Hawaiian Petrel and Newell's shearwater) that may be transitioning through the area, will ensure that endangered species and their habitat are not adversely impacted.

8. **Is contrary to the State plan, County's general plan, appropriate community plans, zoning and subdivision ordinances.**

The proposed action is in accordance with the Hawai'i State Plan, Countywide Policy Plan, and the MIP directed growth strategy and the Kihei-Makena Community Plan. The Applicant will seek certain exemptions from zoning which are permitted pursuant to Chapter 2.97 Maui County Code for fast track processing of affordable housing projects. Refer to Sections A through E in Chapter III (this chapter) of this EA for a more detailed assessment.

9. **Detrimentially affects air or water quality or ambient noise levels.**

Short-term air and water quality and noise impacts from the proposed project will be mitigated through the implementation of BMPs. In the long term, rules regarding noise at the facility will be enforced by the Applicant and co-developer of the project. Long-term impacts to air and water quality are not anticipated as a result of the proposed project.

10. **Affects an environmentally sensitive area, such as flood plains, shoreline, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh waters, or coastal waters.**

The project site is located within Flood Zone X (unshaded). Zone X designation denotes an area of low flood risk and minimal flooding with no development restrictions. The subject property is located inland, outside of the Tsunami

Evacuation and Extreme Tsunami Evacuation Zones, erosion prone areas, and geologically hazardous land. As such, the proposed project is not anticipated to significantly impact any environmentally sensitive areas.

11. **Substantially alters natural land forms and existing public views to and along the shoreline.**

The project is located inland, approximately 3,000 feet from the shoreline. The proposed project will not substantially alter natural land forms and public views to and along the shoreline. The proposed project will be screened by landscaping and canopy trees to the extent practicable.

12. **Is contrary to the objectives and policies of chapter 205A, HRS.**

A review of the objectives and policies of Chapter 205A, HRS, is provided in its entirety in Section H of Chapter III of this EA, which addresses the project's relationship to the Coastal Zone Management considerations. Based on the foregoing analysis, the project will appropriately and adequately mitigate impacts to SMA-relevant areas of interest. Accordingly, there are no significant adverse environmental impacts anticipated with the proposed project.

REQUESTED EXEMPTIONS  
PURSUANT TO  
CHAPTER 2.97, MCC

IV

## IV. REQUESTED EXEMPTIONS PURSUANT TO CHAPTER 2.97, MCC

### A. INTRODUCTION

The purpose of Maui County Code (MCC) Chapter 2.97, “Residential Workforce Housing Policy Incentives and Exemptions” is to establish a process by which developers of 100 percent residential workforce housing projects may seek fast track development of their projects by applying for County exemptions from this code. This process allows developers to seek exemptions from MCC including, but not limited to Title 19, MCC relating to zoning; Title 18, MCC relating to subdivision requirements; Chapter 2.80B, MCC relating to general plan and community plans; and Chapter 19.68, MCC relating to State land use district boundary amendments for projects less than 15 acres in the “Agricultural”, “Rural”, and “Urban” districts, provided that the project still meets the minimum requirements for health and safety.

The Liloa Hale Senior Affordable Housing Project will be a 117-unit affordable rental project offered to seniors earning 60 percent or less of the Area Median Income (AMI). Most of Maui County’s current projects in the development pipeline are affordable or workforce for-sale homes. Furthermore, affordable housing projects for seniors are even more limited within the County. The proposed project intends to serve an unmet demand for senior affordable rental housing. In response to this increasing senior affordable rental demand pressure and high cost of construction, Chapter 2.97, MCC exemptions are sought.

The exemption requests which follow are necessary to achieve and maintain the financial feasibility of the project and thereby reduce the per unit cost of the project. If the proposed exemptions are granted, Liloa Senior Housing, LP will be able to offer 117 units of senior affordable rental housing to qualified households earning 60 percent or less of the AMI. All units will retain their affordability for a minimum of 60 years.

### B. EXEMPTIONS TO BE REQUESTED

This Environmental Assessment (EA) has been prepared to support the Applicant’s Chapter 2.97, MCC application for submittal to the County of Maui, Department of Housing and Human Services (DHHC). Included in the Chapter 2.97, MCC filing will be a request to exempt the proposed project from certain provisions of the MCC which will allow the proposed project to be developed for senior affordable rental housing. It is noted that the list of exemptions is preliminary and subject to approval by the Maui County Council. Exemptions may be further modified as part of the Chapter 2.97 review and approval process. The proposed current exemptions are summarized below in **Table 5**.

**Table 5.** Summary of Requested Exemptions for Liloa Hale Senior Affordable Housing Project

Development Standard or Requirement	Relevant Section/ Requirement	Requested Exemption and Estimated Value Where Appropriate	Rationale for Request
<p>1. Requirement for acquiring disposal permit and payment of disposal charges</p>	<p>Title 8, Health and Safety, Maui County Code (MCC)  Chapter 8.04, Refuse Collection and Landfills</p>	<p><b><u>MCC 8.04.040 Disposal Permits – Application and Suspension; 8.04.050, Disposal Charges.</u></b> Exemption for project to dispose of construction waste during the construction of the project without the need to apply for a disposal permit and pay for disposal charges.  <b>Estimated value of exemption - \$95,000.00</b></p>	<p>An exemption from the requirements to apply for a disposal permit and pay associated charges will provide cost savings.</p>
<p>2. Requirement for payment of wastewater assessment fees</p>	<p>Title 14, Public Services, MCC  Section 14.34, Wastewater Assessment Fees for Facility Expansion for the Kihei Regional Wastewater Treatment System</p>	<p><b><u>MCC 14.34 Wastewater Assessment Fees for Facility Expansion for the Kihei Regional Wastewater Treatment System.</u></b> Exemption to allow the project to receive its building permits without the need to pay wastewater assessment fees.  Section 14.34.080, Exemptions, exempts developments comprised of 100% residential workforce housing units from the provisions of this chapter.</p>	<p>An exemption from the requirements to pay the wastewater assessment fee for the Kihei Regional Wastewater Treatment System will advance the affordability objectives of the project.</p>
<p>3. Requirement for payment of permit and inspection fees</p>	<p>Title 16, Buildings and Construction, MCC:  Sections 16.04C, Fire Code 16.18B, Electrical Code 16.20B, Plumbing Code 16.26B, Building Code</p>	<p><b><u>MCC Title 16 Building and Construction.</u></b> Exemptions from MCC Chapters:</p> <ul style="list-style-type: none"> <li>• 16.04C, <u>Fire Code.</u></li> <li>• 16.18B, <u>Electrical Code.</u></li> <li>• 16.20B, <u>Plumbing Code.</u> and</li> <li>• 16.26B, <u>Building Code.</u></li> </ul> <p>to exempt the project from fire, electrical, plumbing, and building permit, plan review, and inspection fees.  <b>Estimated value of exemption - \$338,101</b></p>	<p>These exemptions provide savings to ensure the project is financially feasible. The project intends to meet all inspection and code requirements.</p>

Development Standard or Requirement	Relevant Section/ Requirement	Requested Exemption and Estimated Value Where Appropriate	Rationale for Request
<p>4. Requirement for payment of permit and inspection fees</p>	<p>Title 20, Environmental Protection, MCC: Chapter 20.08, Soil Erosion and Sedimentation Control</p> <p>Section 20.08.090, Grubbing and Grading Permit Fees</p>	<p><b><u>MCC Section 20.08.090, Grubbing and Grading Permit Fees.</u></b> An exemption is sought to the submittal of grubbing and grading permit and inspection fees.</p> <p>Section 20.08.090(D) exempts developments comprised of 100% residential workforce housing units from the grubbing and grading permit fee.</p> <p><b>Estimated value of exemption - \$2,000.00</b></p>	<p>This exemption provides savings to ensure the project is financially feasible. The project intends to meet all inspection and code requirements.</p>
<p>5. Requirement for payment of park assessment fee</p>	<p>Title 18, Subdivisions, MCC: Chapter 18.16, Design Standards</p> <p>Section 18.16.320, Parks and Playgrounds</p>	<p><b><u>MCC18.16.320 Parks and Playgrounds.</u></b> An exemption is sought from the provision to submit a park assessment fee.</p> <p>Pursuant to Section 18.16.320(l)(5) Park Assessment Fees are exempt for workforce housing projects.</p> <p><b>Estimated value of exemption - \$770,000.00</b></p>	<p>This exemption provides savings to ensure the project is financially feasible. Onsite amenities (such as a club room, fitness center, common room, landscaped courtyard, and exterior walking paths) will be incorporated into the project design to serve the recreational needs of the senior residents living within the facility.</p>
<p>6. Requirements of all provisions relating to Project District Processing Regulations and Kihei-Makena Project District 5, and, to allow the use of the “A-2, Apartment” district zoning standards.</p>	<p>Title 19, Zoning, MCC: Chapter 19.12, Apartment District</p> <p>Chapter 19.45, Project District Processing Regulations</p> <p>Chapter 19.74, Kihei-Makena Project District 5</p>	<p><b><u>MCC 19.45 – Project District Processing Regulations. MCC 19.74 – Kihei-Makena Project District 5.</u></b> Exemptions from MCC 19.45 and 19.74 are sought to exempt the project from all provisions of these chapters, including application processing requirements.</p> <p><b><u>MCC 19.12, Zoning.</u></b> An exemption from Chapter 19, MCC, is sought to permit the development and use of the property for multi-family residential use according to the permitted uses, accessory uses and buildings, and development standards of the A-2, Apartment District pursuant to the provisions set forth in Chapter 19.12, Apartment District.</p>	<p>The project site is located within Piilani Village Project District (Project District 5) and is split zoned Residential (Single-Family/Multi-Family). This exemption would allow the project to be developed in accordance with the A-2, Apartment District zoning provisions, which are more applicable to the proposed development program.</p>

Development Standard or Requirement	Relevant Section/ Requirement	Requested Exemption and Estimated Value Where Appropriate	Rationale for Request
7. Requirement for number of parking stalls and number and sizes of loading areas	<p>Title 19, Zoning, MCC: Chapter 19.36B, Off-Street Parking and Loading</p> <p>Sections 19.36B.020 Designated Number of Off-Street Parking Spaces 19.36B.030 Designated Number of Loading Spaces</p>	<p><b><u>MCC 19.36B, Off-Street Parking and Loading.</u></b> An exemption from Section 19.36B.020 (Designated Number of Off-Street Parking Spaces) and Section 19.36B.030 (Designated Number of Loading Spaces) to allow for the flexibility in the number of parking stalls and number and sizes of loading areas required.</p> <p>The Applicant is seeking an exemption from the foregoing provisions of the code for a reduction in the number of parking stalls required for the project such that one (1) stall would be provided per unit with a minimum of 10 additional stalls provided for guests and employees, as well as for the community room/common areas of the facility (which will be private and utilized by the residents of the facility). In addition an exemption is being requested to the number and/or sizes of loading stalls to allow flexibility for either one (1) large loading stall at 12' x 35' to be provided or alternatively two (2) small loading at 8.5' x 19')</p>	<p>Reflects the lower parking demand and delivery characteristics associated with senior housing facilities and enables flexibility in the number of parking stalls and number and sizes of loading areas for the project.</p>
8. Urban standards relating to curb, gutters, and sidewalks	<p>Title 16.26B, Building and Construction, MCC: Chapter 16.20B Building Code</p> <p>Title 18, Subdivision, MCC: Chapter 18.20 - Improvements</p>	<p><b><u>MCC 16.26B.3600, Improvements to Public Streets MCC 18.20.040, 18.20.070, and 18.20.080, Existing Streets, Sidewalks, Curbs and Gutters.</u></b> An exemption from these provisions are sought for the portion of the parcel adjacent to Liloa Drive, not fronting the project site.</p> <p><b>Estimated value of exemption: \$82,000</b></p>	<p>The project site will be condominiumized and purchased from Hope Chapel. This exemption will allow the Applicant to install curb, gutters, and sidewalks along the portion of Liloa Drive fronting the project site only, but not the portion fronting Hope Chapel.</p>
9. Requirement for Community Plan Consistency Given Project's Use of "A-2" Zoning Standards	<p>Title 2, Administration and personnel, MCC: Chapter 2.80B, General Plan and Community Plans</p>	<p><b><u>MCC 2.80B, General Plan and Community Plans.</u></b> An exemption from 2.80B to allow project to be implemented without a Community Plan Amendment given project's use of "A-2" zoning standards and Planning Department's requirement for consistency between land use designations.</p>	<p>As project will be requesting to be developed in accordance with the "A-2" zoning standards, this exemption will be needed to allow project to proceed without amending the Kihei-Makena Community Plan to a "Multi-family" designation (from "Project District").</p>

In summary, Chapter 2.97, MCC provides certain provisions for qualified affordable and/or workforce housing projects to be exempt from MCC provisions, provided that the housing project is consistent with the purpose and intent of this chapter, and meets minimum requirements of health and safety. As such, the above noted exemptions will be filed as part of the Liloa Hale Senior Affordable Housing Project's Chapter 2.97, MCC application with the DHHC for review and action by the Maui County Council. These exemptions will expedite the delivery of affordable housing. The requested exemptions do not compromise the health and safety provisions of the proposed project.



ALTERNATIVES TO THE  
PROPOSED ACTION



## V. ALTERNATIVES TO THE PROPOSED ACTION

The following is a discussion of the various development alternatives that have been considered by the Applicant as part of the planning process that will provide needed affordable rental housing units for Maui's seniors.

### A. PREFERRED ALTERNATIVE

After studying market needs and in consultation with various local County officials, as well as community stakeholders, the proposed 117 senior affordable rental units represent the preferred alternative. This alternative will help to address the critical demand for senior affordable rental units for Maui's senior age groups. This preferred alternative to develop 117 senior affordable rental units on the approximately 3.61-acre site as shown in the preliminary site plan (refer to **Figure 3**) will help meet this critical housing need on the Island of Maui for seniors. The proposed project consists of a single three-story building. Of the 117 units, 101 units will be one-bedroom units (approximately 650 square foot (sq.ft.)) and 16 units will be two-bedroom units (approximately 900 sq.ft.).

It is noted that the proposed project was originally planned as a four-story building with 150 residential units. As a result of consultations with key community stakeholders as well as changes in the immediate availability of financing options, the project's density was lowered and was redesigned as a three-story building with 117 residential units.

The proposed 117 senior affordable rental units will be reasonably priced for senior households earning 60 percent or less of Maui's annual median income (AMI) pursuant to Department of Housing and Human Concerns (DHHC)'s affordable rent guidelines and will help meet the housing shortage on Maui.

The preferred alternative will provide much needed affordable senior housing in a location supported by the Maui Island Plan (MIP) that is available and underused, and in proximity to similar land uses.

### B. LOWER DENSITY ALTERNATIVE

The Applicant placed high priority on designing a project that is appropriate given the size and location of the subject property, existing residential/commercial character of the surrounding neighborhoods, affordable rental thresholds, and existing topography of the property. Initial design alternatives considered involved the study of spatial configuration of the project including lower building heights, provision of parking lot and open space, and site access and egress. Careful consideration was also given to view planes, open space amenities, building height relationships, and compatibility with the existing residential communities. Other factors considered included evaluation of the County zoning regulations and assessment of building heights and onsite parking requirements.

The lower density alternative would place less demand on public services, facilities, and resources, and would create fewer impacts on the environment from traffic and related infrastructure demands.

As noted previously, the original four-story building design was modified and redesigned as a three-story building with fewer residential units. Developing a project with a lower density was not viewed as viable to address project need and related financing requirements. Upon final analysis, the lower density alternative was rejected in order to achieve the goal of addressing critical senior affordable housing needs while assuring financial feasibility for the project, as represented by the Preferred Alternative, which spreads project costs over a greater number of units and achieves higher numbers of senior affordable rental units.

**C. NO ACTION ALTERNATIVE**

Under the “no action” alternative, the project site will not be developed for 117 affordable senior apartment rental units, and this no action alternative would involve the continued under-utilization of the 3.61-acre property. This alternative option would not address the current critical demand for affordable rental housing for Maui’s seniors.

The development of the subject property presents a beneficial opportunity to develop senior affordable rental housing surrounded by compatible land uses. If the “no action” alternative were implemented, the project site would continue to be underutilized as a vacant lot.

**D. DEFERRED ACTION ALTERNATIVE**

A deferral of the proposed project means that the action would be pursued at a later point in time, thus deferring the provision of new housing inventory to the island’s market. The need for new housing inventory to address overcrowding and the rising costs of housing for senior households is immediate. Additionally, deferring the project to a later point in time will likely result in higher development costs as labor and materials may be subject to inflationary pressures. Uncertainty as it relates to future cost scenarios places the project at risk from a financial feasibility standpoint. Thus, the deferred action alternative is not considered to be viable.



SUMMARY OF ADVERSE  
ENVIRONMENTAL EFFECTS  
WHICH CANNOT BE  
AVOIDED

VI

## **VI. SUMMARY OF ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED**

Assessment of construction-related impacts, noise and air quality impacts, and potential impacts on the physical and socio-economic environment, were carried out as part of the Environmental Assessment documentation process. The proposed development will have limited, unavoidable construction-related impact on the environment, as described in Chapter II.

In the short term, construction associated with the proposed project will have a temporary impact on air quality from dust generation and discharge of exhaust from construction equipment during ground altering activities and site grading. Appropriate Best Management Practices (BMPs) will be incorporated to mitigate adverse construction-related impacts, including but not limited to, watering of exposed surfaces and regular maintenance of construction equipment.

Construction of the Liloa Hale Senior Affordable Housing project will also generate unavoidable short-term noise impacts. The use of properly maintained construction equipment will mitigate noise impacts caused by equipment. The incorporation of the State Department of Health construction noise limits and curfew times are measures to mitigate noise impacts caused by construction activities.



IRREVERSIBLE AND  
IRRETRIEVABLE  
COMMITMENT OF  
RESOURCES

VII

## **VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES**

The proposed action will not entail a substantial commitment of public services or facilities. As an affordable rental senior housing development located adjacent to existing urban uses, the Liloa Hale Senior Affordable Housing project will be served by existing infrastructure and will not extend County service areas. Development of the proposed project will involve a commitment of energy, labor, fiscal, and material resources. The use of these resources, when weighed against the expected benefit to be derived from the project, is not considered an adverse commitment.



STAKEHOLDER  
MEETINGS

VIII

## VIII. STAKEHOLDER MEETINGS

### A. SUMMARY OF OUTREACH ACTIVITIES

#### 1. Kihei Community Association

A meeting was held with Kihei Community Association (KCA)'s Design Review Committee on November 11, 2019 at KCA's office in Kihei. The Applicant presented a brief summary and overview of the proposed project. Various design comments were shared by the Committee members at the meeting. A follow-up meeting was held with KCA's Design Review Committee on January 14, 2020. See **Appendix "J-1"**, Meeting Summaries. In addition, KCA provided formal comment letters summarizing their comments. The comment letters from KCA and response letters to KCA are included herein as **Appendix "J-2"**.

#### 2. South Maui Advisory Committee

The Applicant attended a South Maui Advisory Committee (SMAC) meeting on November 20, 2019. The Applicant presented a brief summary of the project and comments and questions from SMAC were discussed at the meeting. A follow-up meeting was held with SMAC on July 23, 2020. The Applicant discussed the design modifications to the project made after the November 20, 2019 meeting.

#### 3. Governmental Officials

In addition, the following local elected and agency officials were consulted in preparation of the Chapter 2.97, MCC application, SMA Use Permit application, and Environmental Assessment:

- Council Chair Kelly King
- Councilmember Tasha Kama (Chair, Affordable Housing Committee)
- Honorable Michael Victorino - Mayor, County of Maui
- Ms. Lori Tsuhako – Director, Maui Department of Housing and Human Concerns (DHHC)
- Ms. Linda Munsell - Deputy Director, DHHC
- Mr. Buddy Almeida - Housing Administrator, DHHC
- Ms. Michele Chouteau McLean - Director, Planning Department
- County of Maui's Attainable Housing for Maui Nui Committee
- County of Maui's Urban Design Review Board



LIST OF PERMITS AND  
APPROVALS

| IX



## **IX. LIST OF PERMITS AND APPROVALS**

The following permits and approvals may be required prior to the implementation of the project:

### **State of Hawai'i, Department of Health**

1. Chapter 11-46, Community Noise Control, as applicable
2. Chapter 11-60.1-33, Fugitive Dust
3. National Pollution Discharge Elimination System (NPDES) Permit, as applicable

### **County of Maui**

1. Construction permits (i.e., building and grading permits)
2. Chapter 2.97, Maui County Code (Maui County Council approval)
3. Special Management Area Use Permit

SIGNIFICANCE CRITERIA  
ASSESSMENT



## X. SIGNIFICANCE CRITERIA ASSESSMENT

Although this document is not a Chapter 343 Hawai'i Revised Statutes (HRS) Environmental Assessment (EA) and it has been prepared as a supporting document for the Chapter 2.97, Maui County Code (MCC) fast tracked housing application, the "Significance Criteria", defined in Subchapter 7 of the Chapter 11-200.1 of the Hawai'i Administrative Rules (HAR), have been utilized and analyzed to determine whether the proposed project will have significant impacts to the environment. The following criteria and analyses are provided:

1. **Irrevocably commit a natural, cultural, or historic resource;**

No known rare, threatened, or endangered species of flora, fauna, avifauna, or their critical habitats were identified during the project's Botanical and Fauna Survey. Implementation of mitigation measures to minimize potential impacts on listed water birds (i.e., Hawaiian Petrel and Newell's shearwater) that may be transitioning through the area, will ensure that endangered species and their habitat are not adversely impacted. As mentioned previously, an Archaeological Inventory Survey (AIS) Report for the southern portion of Project District 5 indicated that no significant archaeological sites were identified on the subject property at the time of the survey. In addition, the project's Cultural Background Review report noted that no current traditional and customary gathering practices were identified within the project site. It is noted that given the result of the community consultation, archaeological monitoring will be implemented for all initial ground disturbing activities in areas where the original natural grade is present. Should archaeological features, cultural artifacts, or human burials be located during construction activities, work in the immediate area of the find shall be promptly halted and the find protected from further disturbance. The State Historic Preservation Division (SHPD) will be immediately contacted to determine the significance of the find and establish appropriate mitigative measures, as necessary.

2. **Curtail the range of beneficial uses of the environment;**

The proposed action is located adjacent to existing urban uses, and the commitment of land resources will not curtail the range of beneficial uses of the environment. The project site is currently vacant and underutilized. The proposed use of the property for senior affordable rental housing is compatible with surrounding urban uses. As such, the proposed project is not expected to result in significant adverse effects upon the beneficial uses of the environment.

3. **Conflict with the State’s environmental policies or long-term environmental goals established by law;**

The proposed action does not conflict with the State’s environmental policies or long-term environmental goals as discussed in Chapter III.

4. **Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State;**

The proposed action will have a beneficial effect on the local economy during construction. In the long term, the proposed project will support the local economy through the contribution of salaries, wages, and benefits, as well as through the purchases of goods and services from local merchants and service providers. The project will provide affordable rental housing to seniors in Maui County. As such, the proposed project is deemed to be a socio-economic benefit for island residents.

5. **Have a substantial adverse effect on public health;**

No adverse impact to public health or welfare is anticipated as a result of the proposed action.

6. **Involve adverse secondary impacts, such as population changes or effects on public facilities;**

The proposed Liloa Hale Senior Affordable Housing project will provide affordable rental housing in close proximity to goods and services located in South Maui. The project is anticipated to service existing Maui residents and is not anticipated to involve substantial secondary impacts due to population change. The proposed project is in close proximity to existing residential and commercial neighborhoods and will be served by existing infrastructure and will not extend County service areas. As such, secondary impacts on public facilities are not anticipated.

7. **Involve a substantial degradation of environmental quality;**

No substantial degradation of environmental quality resulting from the action is anticipated. Best Management Practices (BMPs) and appropriate erosion control measures will be utilized during the construction period. Drainage system improvements will be constructed in accordance with applicable regulatory design standards to ensure that surface runoff will not have an adverse effect on adjacent or downstream properties.

Any potential short-term impacts to air and noise quality during the construction phase of the project, will be mitigated through employing BMPs. In the long term, the project will not adversely impact air quality and ambient noise levels.

8. **Be individually limited but cumulatively have substantial adverse effect upon the environment or involves a commitment for larger actions;**

The proposed development is located on land currently vacant and adjacent to existing commercial and residential neighborhoods. The proposed action is a stand-alone project, and does not represent a commitment for larger actions. Addition of project-related traffic is limited due to the nature of the project and operations at the intersections in the vicinity of the project site are not anticipated to be detrimentally affected. Refer to **Appendix "G"**. As a result, the project is not expected to result in cumulative impacts on the environment.

9. **Substantially affects a rare, threatened, or endangered species, or its habitat;**

No rare, threatened, or endangered species of flora, fauna, avifauna, or important habitats were identified during the project's Botanical and Fauna Survey. Implementation of mitigation measures to minimize potential impacts on listed water birds (i.e., Hawaiian Petrel and Newell's shearwater) that may be transitioning through the area, will ensure that endangered species and their habitat are not adversely impacted. Refer to **Appendix "C"**.

10. **Have a substantial adverse effect on air or water quality or ambient noise levels;**

Construction activities may pose a temporary short-term impact on air and noise quality; however, impacts will be mitigated through the use of BMPs. Dust control measures, such as regular watering and sprinkling, will be implemented to minimize wind-blown emissions. Noise impacts will be mitigated by limiting construction to daylight work hours. Utilizing approved BMPs, significant impacts to water quality are not anticipated.

In the long term, the proposed action is not anticipated to have a significant adverse impact on air and water quality or ambient noise levels.

11. **Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;**

According to the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM) currently in effect, the project site falls within Zone X (unshaded), an area of minimal flooding.

The project site is situated more than 3,000 feet inland from the nearest shoreline and is not anticipated to have adverse impacts upon coastal waters or resources, beaches, estuaries, or other fresh water bodies. The project site is located outside of the tsunami inundation zone. Drainage improvements will be designed to retain the increase of runoff due to the project in accordance with County drainage and stormwater rules and regulations. During construction, recommended BMPs will be implemented for erosion and sedimentation control to minimize potential impacts to water quality.

**12. Have a substantial adverse effect on scenic vistas and viewplanes, during day or night, identified in county or state plans or studies; or**

The proposed development will not impact any established significant scenic vistas, viewplanes, or corridors. The project is located inland more than 3,000 feet away from the nearest shoreline. A view analysis was prepared for the project from the vantage points of Pi'ilani Highway to ensure that the project will not substantially affect scenic vistas and viewplanes, during day or night. Refer to **Appendix "D"**.

**13. Require substantial energy consumption or emit substantial greenhouse gases;**

The proposed action will involve the short-term commitment of fuel for equipment, vehicles, and machinery during construction activities. However, this use is not anticipated to result in a substantial consumption of energy resources, as well as greenhouse gas emissions. In the long term, the project will create an additional demand for electricity, which in turn results in greenhouse gas emissions. However, this demand will not be substantially or excessively more than the energy consumed by similar developments throughout the region.

In summary, the project site is situated in an existing urban community, in close proximity to services and commercial areas in the Kihei-Makena region. This project will be served by existing infrastructure, and will not extend County service areas. The proposed development is not anticipated to have a significant adverse impact on the physical, cultural and socio-economic environments. The site is suitable for the development for multi-family housing and will help the Maui County meet the housing needs of the region. Based on the preceding analysis in this EA document, the County of Maui, Department of Housing and Human Concerns (DHHC) anticipates that the proposed project will result in a Finding of No Significant Impact (FONSI) determination.



REFERENCES

XI



## XI. REFERENCES

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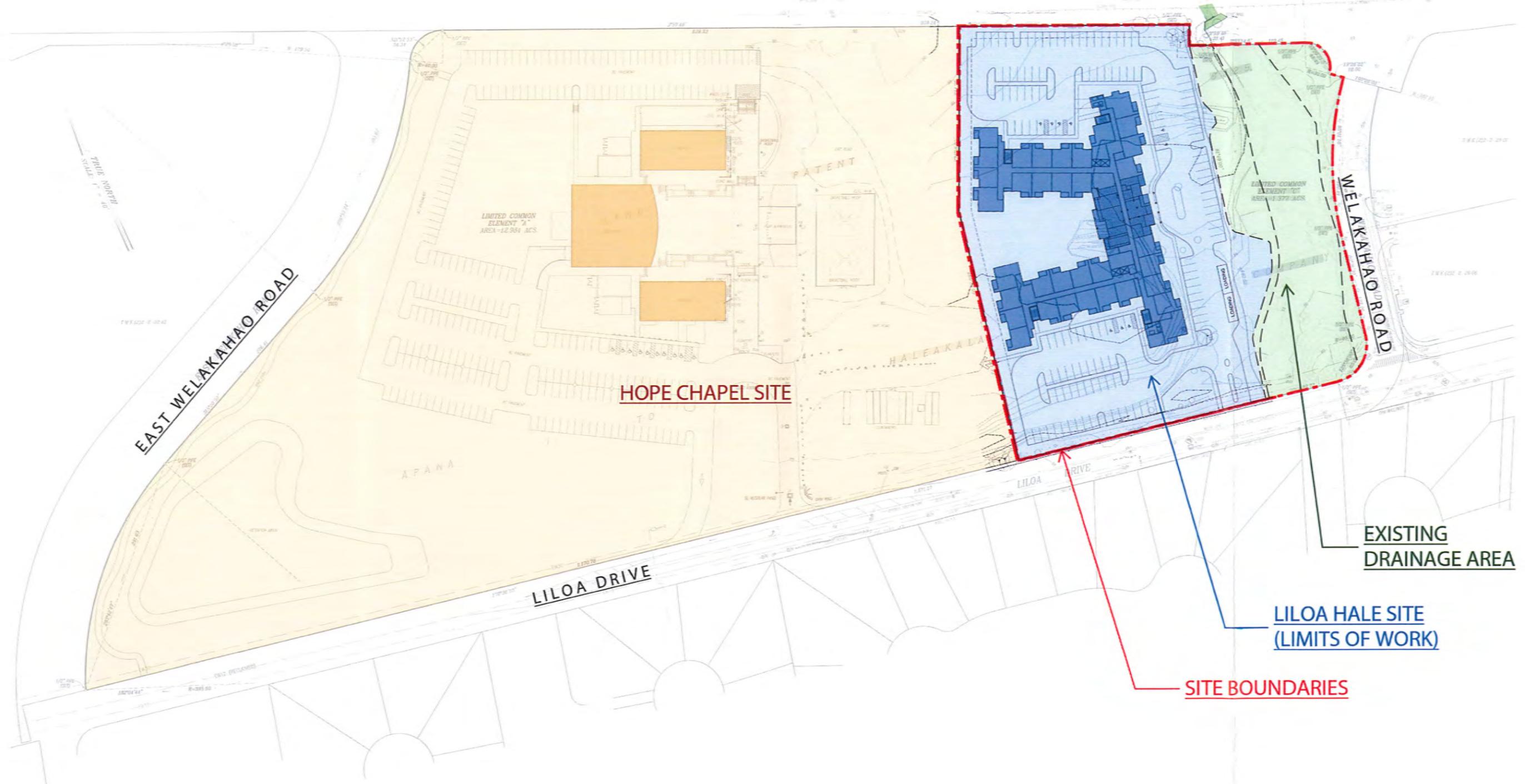


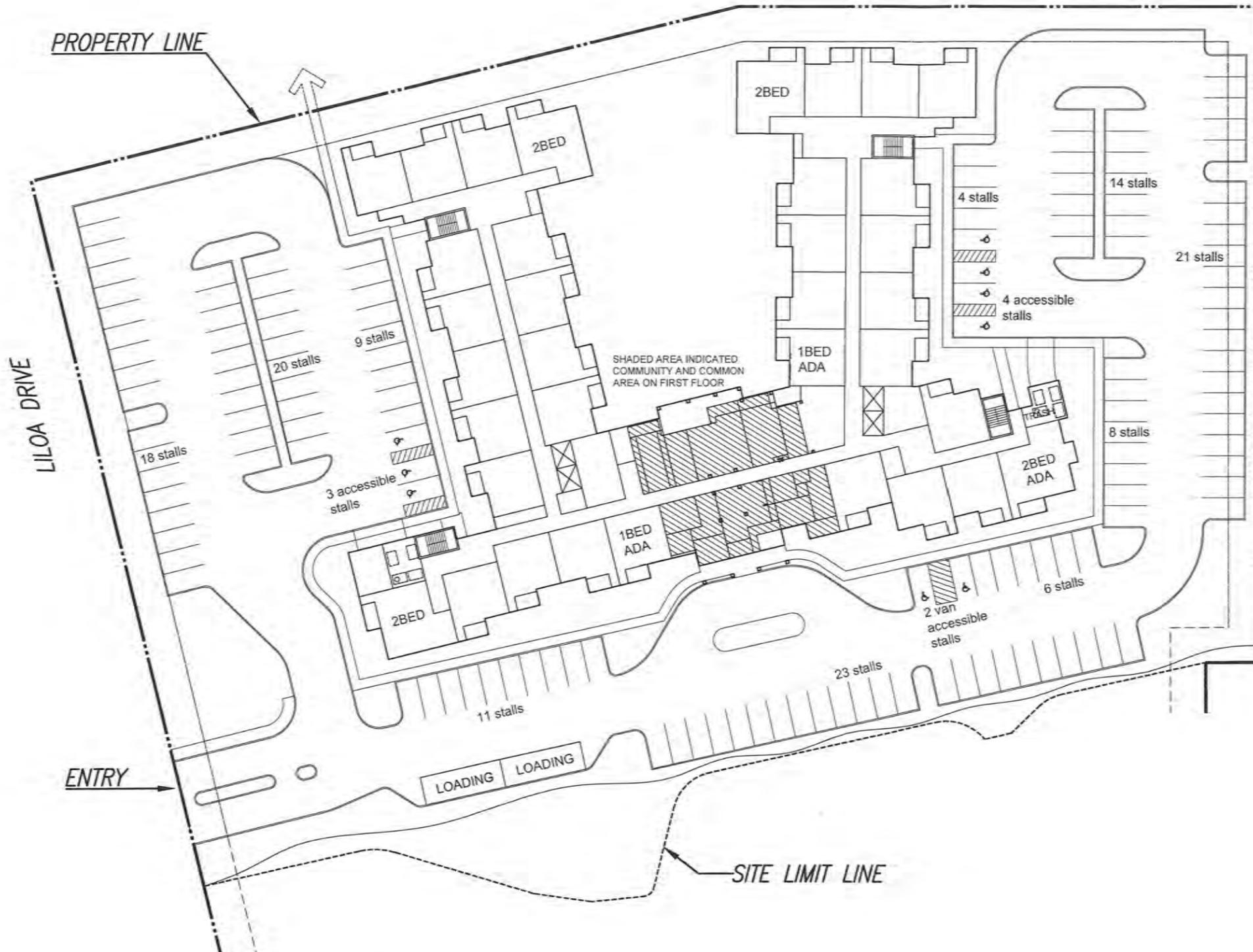
PROJECT PLANS

APPENDIX

A







**SITE SUMMARY**

**3 FLOORS:**

1 BEDROOM ADAPTABLE UNITS (FHA):	96 UNITS
1 BEDROOM ACCESSIBLE UNITS (ADA):	5 UNITS
2 BEDROOM ADAPTABLE UNITS (FHA):	15 UNITS
2 BEDROOM ACCESSIBLE UNITS (ADA):	1 UNITS
<b>TOTAL UNITS:</b>	<b>117 UNITS</b>

**PARKING**

1 BEDROOM PARKING PROVIDED:	101 STALLS
2 BEDROOM PARKING PROVIDED:	32 STALLS
ACCESSIBLE PARKING PROVIDED:	7 CAR ACCESSIBLE STALLS 2 VAN ACCESSIBLE STALLS
GUEST PARKING PROVIDED:	10 GUEST STALLS
<b>TOTAL PARKING PROVIDED:</b>	<b>143 TOTAL STALLS</b>
12' X 34' LOADING STALLS PROVIDED:	2 LOADING STALLS

**DENSITY**

117 UNITS / 3.61 ACRES =  
32.4 UNITS / ACRE

**PROJECT AREA**

3.61 ACRES

**Floor Area Calculations**

First Floor:	35,298 sf
Second Floor:	33,696 sf
Third Floor:	33,696 sf
<b>Total Floor Area:</b>	<b>102,690 sf</b>
Total Horiz. Circulation:	16,960 sf
Total Vert. Circulation:	3,213 sf
Total Common Spaces:	6,776 sf
<b>Total Common Area:</b>	<b>26,949 sf</b>

**Liloa Hale - SENIOR HOUSING**  
HIGHRIDGE COSTA

DESIGN PARTNERS INCORPORATED

**SITE PLAN**  
KIHEI, HAWAII



March 09, 2020





**TREE LEGEND**

- Large Monkey Pod Tree
- Rainbow Shower (2" cal., 6'-0" trunk ht.)
- Medium Shade Canopy (Parking Areas) (2" cal., 6'-0" trunk ht.)
- Milo, Fern Tree, Geiger Tree
- Small Accent Tree  
Singapore Plumeria (6-ft. planted ht.)  
Jatropha (6-ft. planted ht.)
- Naio Hedge
- Fruit Trees  
Citrus (Valencia Orange, Dancy Tangerine, Meyer's Lemon)  
Wurtz - Little Cado 'A' Avocado  
"B" Type Dwarf (i.e. Don Gillogly)  
Papaya

**PROJECT AREA**  
3.61 ACRES

**Liloa Hale - SENIOR HOUSING**  
HIGH RIDGE COSTA

**CONCEPTUAL LANDSCAPE PLAN**  
KIHEI, HAWAII

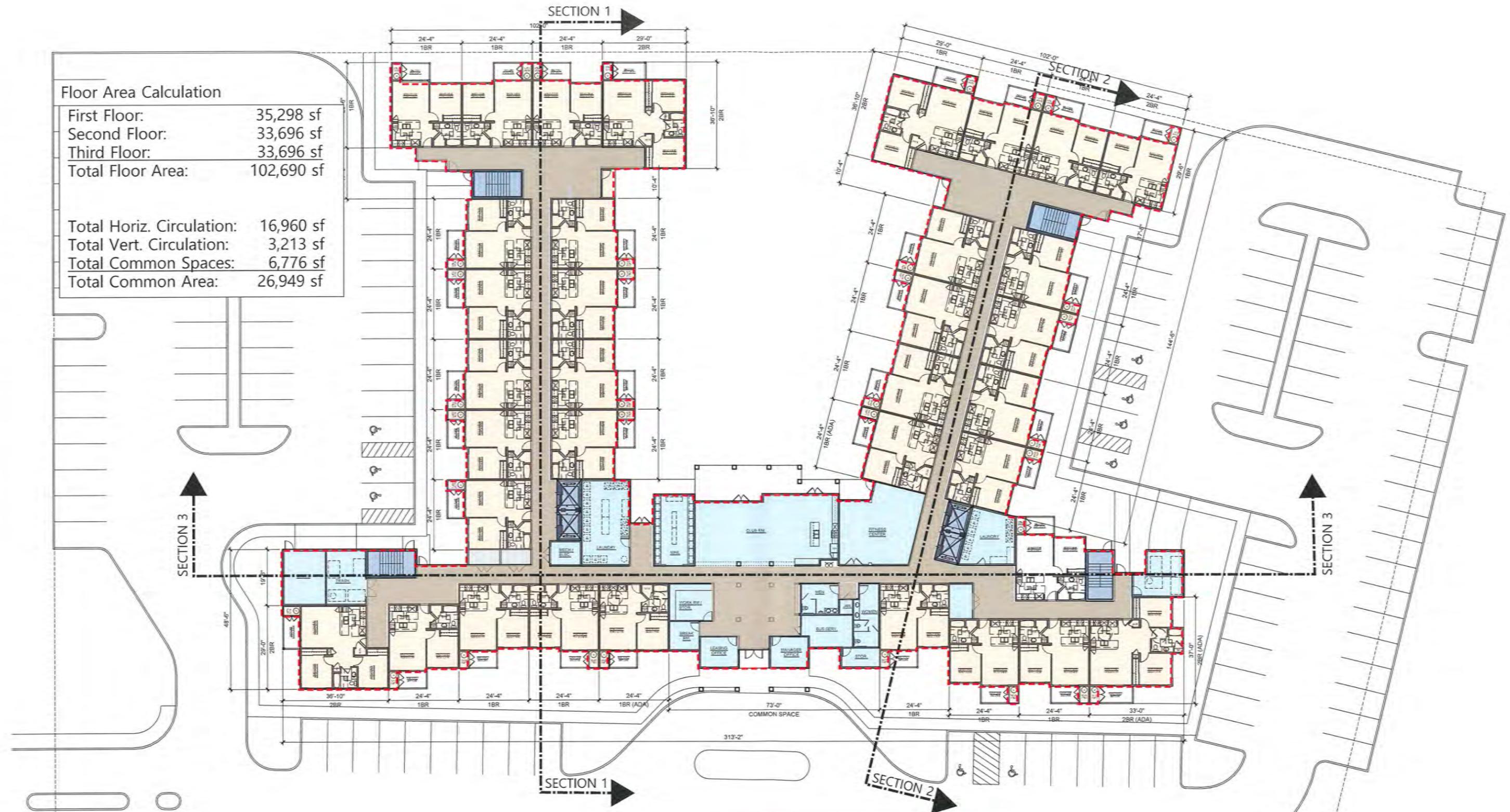


DESIGN PARTNERS INCORPORATED

March 09, 2020



Floor Area Calculation	
First Floor:	35,298 sf
Second Floor:	33,696 sf
Third Floor:	33,696 sf
<b>Total Floor Area:</b>	<b>102,690 sf</b>
Total Horiz. Circulation:	16,960 sf
Total Vert. Circulation:	3,213 sf
Total Common Spaces:	6,776 sf
<b>Total Common Area:</b>	<b>26,949 sf</b>



First floor gross area  
35,229 sf

**Liloa Hale - SENIOR HOUSING**  
HIGHRIDGE COSTA

DESIGN PARTNERS INCORPORATED

	5,572 sf	Horiz. Circulation
	1,071 sf	Vert. Circulation
	4,658 sf	Common Spaces

**CONCEPTUAL FIRST FLOOR PLAN**

KIHEI, HAWAII

March 09, 2020



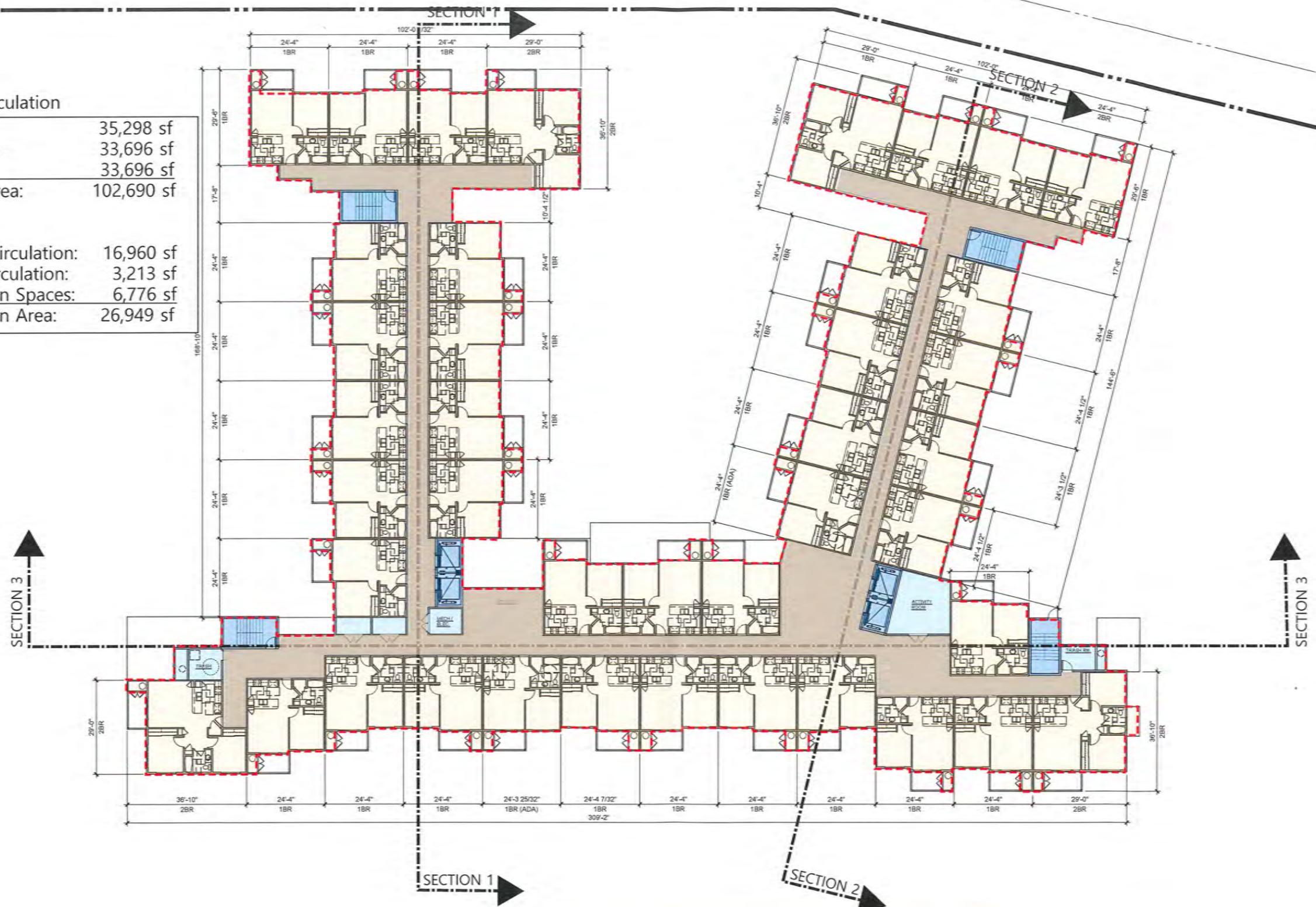
0 8' 16' 32'  
SCALE: 1/16" = 1'-0"



**Floor Area Calculation**

First Floor:	35,298 sf
Second Floor:	33,696 sf
Third Floor:	33,696 sf
<b>Total Floor Area:</b>	<b>102,690 sf</b>

Total Horiz. Circulation:	16,960 sf
Total Vert. Circulation:	3,213 sf
Total Common Spaces:	6,776 sf
<b>Total Common Area:</b>	<b>26,949 sf</b>



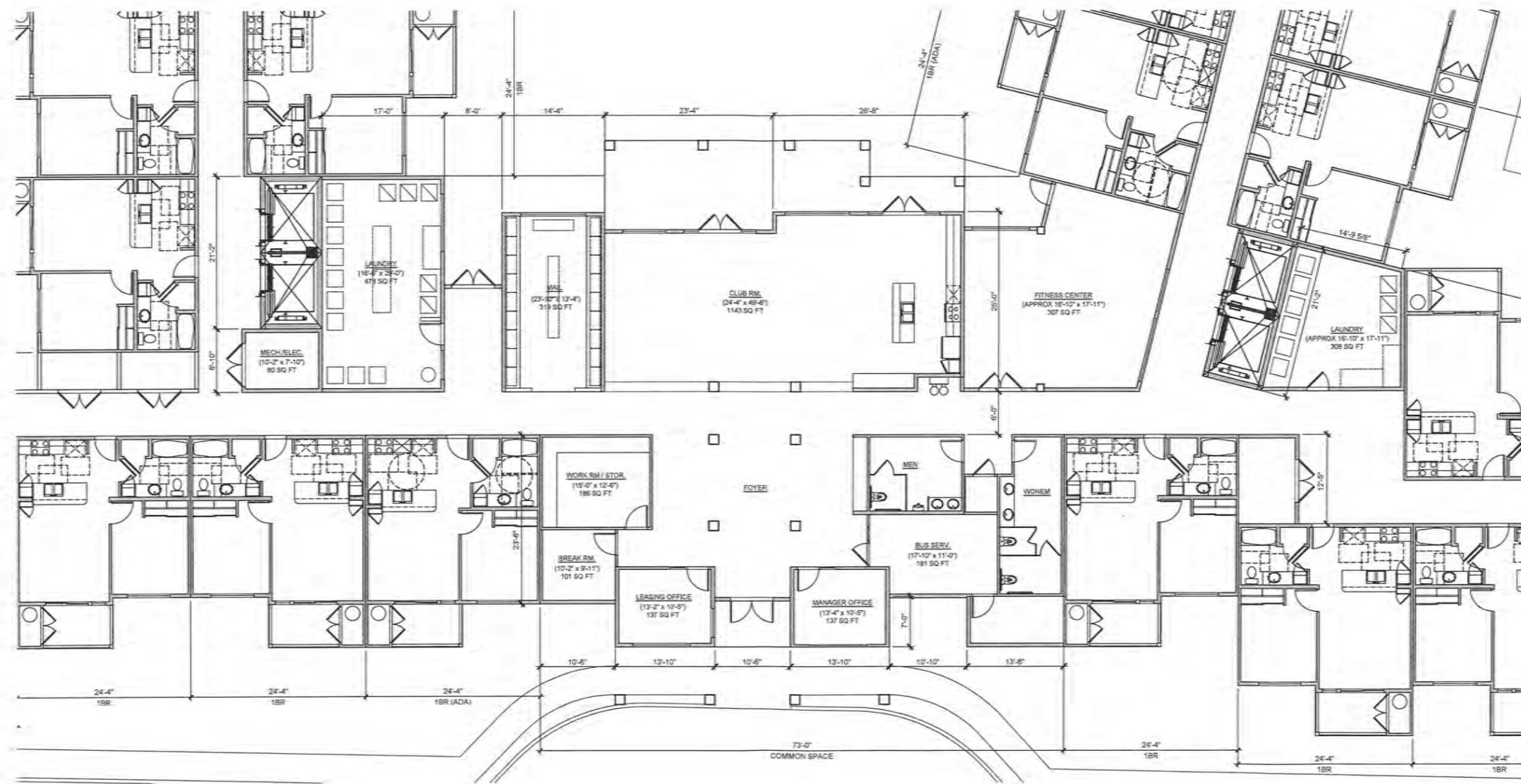
**Second thru third floor gross area**  
**33,696 sf**

	5,694 sf	Horiz. Circulation
	1,071 sf	Vert. Circulation
	1,059 sf	Common Spaces

**Liloa Hale - SENIOR HOUSING**  
 HIGHRIDGE COSTA

**CONCEPTUAL SECOND THRU THIRD FLOOR PLAN**

KIHEI, HAWAII



Liloa Hale - SENIOR HOUSING  
 HIGHRIDGE COSTA

DESIGN PARTNERS INCORPORATED

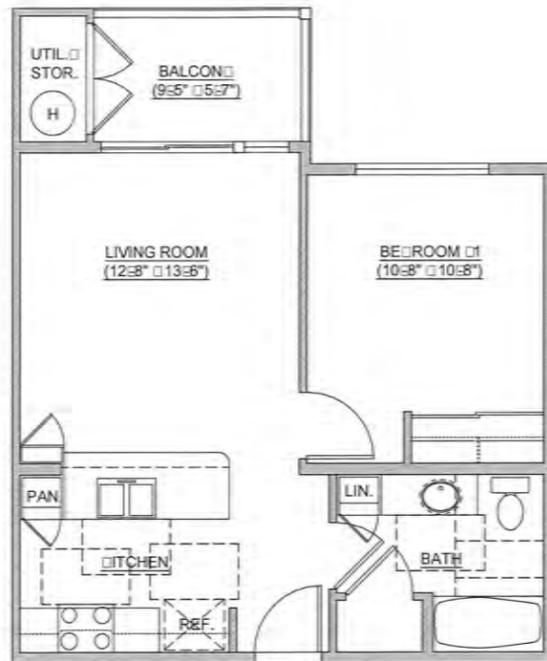
COMMON AREA ENLARGED PLAN

KIHEI, HAWAII

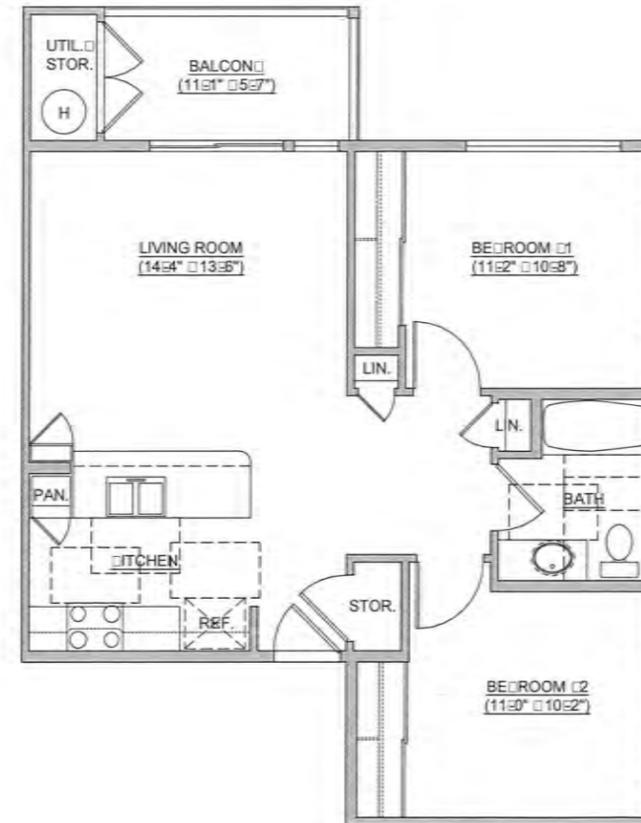
March 09, 2020



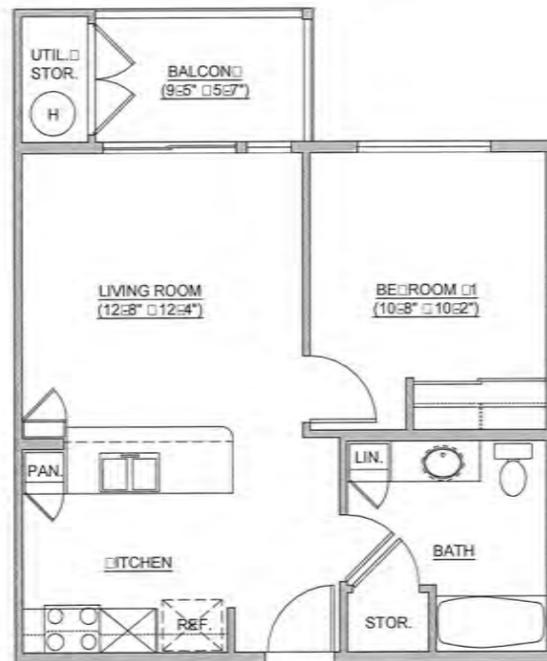
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 SCALE: 1/8" = 1'-0"



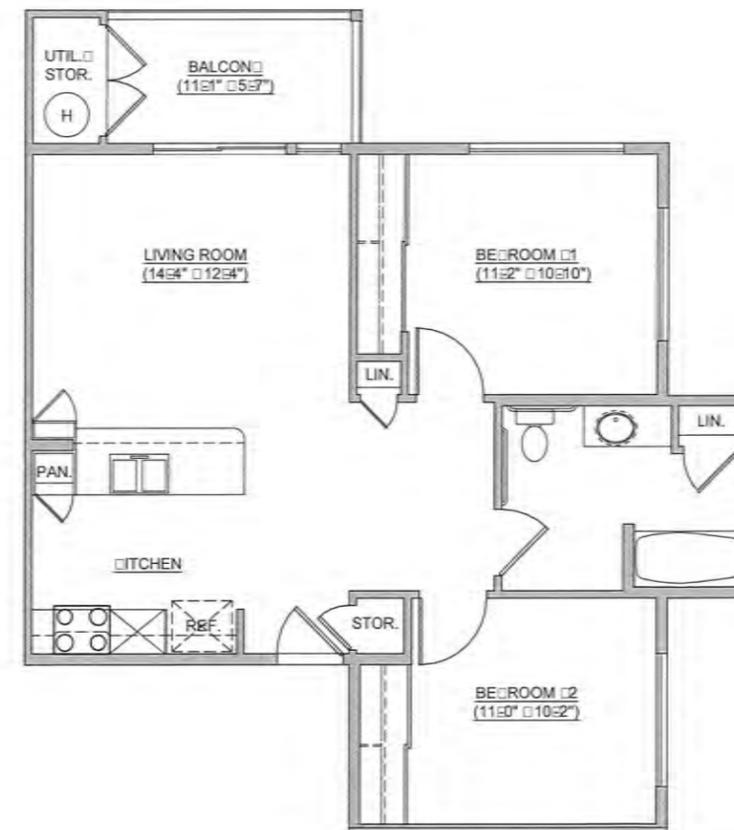
**UNIT 1**  
**1 BEDROOM UNIT**  
 LIVING AREA : 561 SF  
 BALCONY : 59 SF  
 E.Q.T. STORAGE : 22 SF  
**TOTAL : 642 SF**



**UNIT 2**  
**2 BEDROOM UNIT**  
 LIVING AREA : 787 SF  
 BALCONY : 69 SF  
 E.Q.T. STORAGE : 22 SF  
**TOTAL : 878 SF**



**UNIT 1 (ADA)**  
**1 BEDROOM UNIT**  
 LIVING AREA : 572 SF  
 BALCONY : 59 SF  
 E.O.T. STORAGE : 22 SF  
**TOTAL : 653 SF**



**UNIT 2 (ADA)**  
**2 BEDROOM UNIT**  
 LIVING AREA : 825 SF  
 BALCONY : 69 SF  
 E.O.T. STORAGE : 22 SF  
**TOTAL : 916 SF**



**NORTH SIDE ELEVATION**



**EAST SIDE ELEVATION**

**Liloa Hale - SENIOR HOUSING**  
 HIGHRIDGE COSTA

DESIGN PARTNERS INCORPORATED

**DRAFT COLORED ELEVATIONS**

KIHEI, HAWAII

March 09, 2020





**SOUTH SIDE ELEVATION**



**WEST SIDE ELEVATION**



WEST SIDE COURTYARD ELEVATION



EAST COURTYARD SIDE ELEVATION





**BUILDING SECTION 3**



**Liloa Hale - SENIOR HOUSING**  
 HIGHRIDGE COSTA

DESIGN PARTNERS INCORPORATED

**DRAFT COLORED SECTION**

KIHEI, HAWAII

March 09, 2020





CHAPTER 343, HRS  
ENVIRONMENTAL  
ASSESSMENT EXEMPTION  
DECLARATION ISSUED BY  
DEPARTMENT OF HOUSING  
AND HUMAN CONCERNS

APPENDIX

B



MICHAEL P. VICTORINO  
Mayor

LORI TSUHAKO  
Director

LINDA R. MUNSELL  
Deputy Director



**DEPARTMENT OF HOUSING  
& HUMAN CONCERNS**  
COUNTY OF MAUI  
2200 MAIN STREET, SUITE 546  
WAILUKU, MAUI, HAWAII 96793  
PHONE: (808) 270-7805

April 27, 2020

Keith Kawaoka, Acting Director  
State of Hawai'i  
Office of Environmental Quality Control  
Department of Health  
235 S. Beretania Street, Room 702  
Honolulu, Hawai'i 96813

Dear Mr. Kawaoka:

**SUBJECT: PROPOSED LILOA HALE SENIOR AFFORDABLE HOUSING  
PROJECT AT TMK (2)2-2-002:072 (POR.), KĪHEI, MAUI, HAWAII'**

With this letter, the County of Maui, Department of Housing and Human Concerns (DHHC) hereby requests withdrawal of the Exemption Notice for the Proposed Liloa Hale Senior Affordable Housing Project published on the December 8, 2019 Environmental Notice and transmits the enclosed new Exemption Notice for the project for publication in the next available edition of the Environmental Notice.

The purpose of this action is to address a modification that was recently made to the scope of the Liloa Hale Senior Affordable Housing Project. The project density has been reduced from a four-story building containing 150 units to a three-story building containing 117 units.

Enclosed is an Adobe Acrobat PDF file of the Exemption Notice and a Microsoft Excel file of the Department's updated list of Exemption Notices.

Keith Kawaoka, Acting Director  
April 27, 2020  
Page 2

We appreciate your assistance with this request. If there are any questions, please contact Mr. Buddy Almeida, Housing Administrator, at (808) 270-7351.

Sincerely,



LORI TSUHAKO, LSW, ACSW  
Director of Housing and Human Concerns

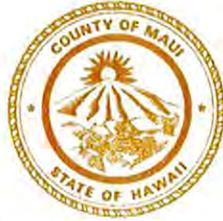
Enclosures

xc: Buddy Almeida, DHHC (w/enclosures)  
Mohannad H Mohanna, Liloa Senior Housing, LP (w/enclosures)  
Yukino Uchiyama, Munekiyo Hiraga (w/enclosures)

MICHAEL P. VICTORINO  
Mayor

LORI TSUHAKO  
Director

LINDA R. MUNSELL  
Deputy Director



DEPARTMENT OF HOUSING  
& HUMAN CONCERNS  
COUNTY OF MAUI  
2200 MAIN STREET, SUITE 546  
WAILUKU, MAUI, HAWAII 96793  
PHONE: (808) 270-7805

TO: Buddy Almeida, Housing Administrator  
Department of Housing and Human Concerns

Keith Kawaoka, Acting Director  
Office of Environmental Quality Control

Mohannad H. Mohanna  
Liloa Senior Housing, LP

Grant Chun, Executive Director  
Hale Mahaolu

FROM: Lori Tsuhako, Director   
Department of Housing and Human Concerns

DATE: April 27, 2020

SUBJECT: Exemption Declaration for Proposed Liloa Hale Senior Affordable Housing Project

#### BASES OF EXEMPTION

Check applicable box

This Exemption Declaration for the action described below above is based on the Exemption List for the (name of agency), reviewed and concurred in by the Environmental Council on (date of concurrence), Exemption Class and Number \_\_\_\_\_.

This Exemption Declaration for the action described below is based on

**§11-200.1-15.c(10):**

*New construction of affordable housing, where affordable housing is defined by the controlling law applicable for the state or county proposing agency or approving agency, that meets the following:*

*(A) Has the use of state or county lands or funds or is within Waikiki as the sole triggers for compliance with chapter 343, HRS;*

*(B) As proposed conforms with the existing state urban land use classification;*

*(C) As proposed is consistent with the existing county zoning classification that allows housing; and*

*(D) As proposed does not require variances for shoreline setbacks or siting in an environmentally sensitive area, as stated in section 11-200.1-13(b)(11).*

The Liloa Hale Senior Affordable Housing Project is a 100% workforce housing project. It is an applicant action which will be processed pursuant to Chapter 2.97, Maui County Code, Residential Workforce Housing Policy Incentives and Exemptions. The trigger for compliance with Chapter 343, Hawai'i Revised Statutes (HRS) is work anticipated to occur within the adjoining County roadway rights-of-way for utility system installation and connections, and possible improvements to the County roadways. The project site falls within the State Urban District and the proposed use is in consonance with Chapter 205, HRS, Land Use Commission. The underlying County zoning for the property is Project District 5 (Piilani Village), and the site is located within the Multi-Family and Residential subdistricts within this project district, which allows housing. The subject property will not require a shoreline setback variance nor is it located within an environmentally sensitive area.

## DESCRIPTION OF ACTION

Name of Agency or Applicant: Liloa Senior Housing, LP

Project Location and Tax Map Key No.: Kīhei, Maui, TMK No.: (2)2-2-002:072  
(por.)

Brief Description of the Action:

The proposed action involves the construction of 117 affordable senior apartments in a single three-story elevator-served building, on an approximately 4.9-acre site. Units will provide one (1) or two (2) bedrooms. Onsite parking will also be provided. The project's amenities will include a lobby and common areas, club room, fitness center, landscaped courtyard, and exterior walking paths.

## AGENCY AND COMMUNITY CONSULTATION

1. County of Maui, Department of Housing and Human Concerns
2. County of Maui, Department of Corporation Counsel
3. County of Maui, Department of Planning
4. County of Maui, Department of Public Works
5. County of Maui, Department of Parks and Recreation
6. County of Maui, Department of Water Supply
7. County of Maui, Department of Environmental Management

## CHAPTER 343, HRS EXEMPTION ASSESSMENT

The project is deemed to be exempt from Chapter 343, HRS, in accordance with Section 11-200.1 Hawai'i Administrative Rules.

The proposed Liloa Hale Senior Affordable Housing Project is located in Kihei, adjacent to the existing Hope Chapel, makai of Pi'ilani Highway. Preliminary agency consultation has been undertaken by the applicant. To date, there have been no significant comments raised relative to the proposed action. Additional consultation with agencies will be coordinated through the Maui County Office of the Managing Director and the Department of Housing and Human Concerns via the Chapter 2.97 application process, as well as through the Department of Planning via the application for Special Management Area Use Permit. As part of the application processes, the applicant will be conducting technical studies relating to preliminary engineering, traffic impact, flora and fauna resources, archaeology, and cultural impacts. The project site is not located in sensitive environments such as wetlands, streams or wildlife habitats. The project is not part of a larger action and is not considered to contribute to cumulative or significant secondary impacts.

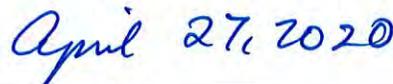
## APPROVAL OF EXEMPTION

I have considered the direct, cumulative, and potential impacts of the action described above pursuant to Chapter 343, Hawai'i Revised Statutes and Chapter 11-200.1, Hawai'i Administrative Rules. I declare that the action described above will have minimal or no significant impact on the environment and is therefore exempt from the preparation of an environmental assessment.

This document is on file in our office and is available for public review.



\_\_\_\_\_  
Director of Housing and Human Concerns



\_\_\_\_\_  
(Date)



BOTANICAL AND FAUNA  
SURVEY PREPARED BY  
ROBERT W. HOBDY

APPENDIX

C



BOTANICAL AND FAUNA SURVEY  
FOR THE  
LĪLOA HALE SENIOR HOUSING PROJECT  
KIHEI, MAUI

by

ROBERT W. HOB DY  
Environmental Consultant  
Kokomo, Maui  
May 2019

Prepared for: LILOA SENIOR HOUSING LP

BOTANICAL AND FAUNA SURVEY  
THE LĪLOA HALE SENIOR HOUSING PROJECT  
KIHEI, MAUI

INTRODUCTION

The Līloa Hale Senior Housing project lies on approximately 4.9 acres of undeveloped land in Kihei, Maui TMK (2) 2-2-002:072 (por.). The project area lies below Pi'ilani Highway, above Līloa Drive and adjacent to Hope Chapel (see Figure 1). This biological study was initiated to assess the flora and fauna resources on the project area in fulfillment of environmental requirements of the planning process.

SITE DESCRIPTION

The project area is mostly gently sloping with a moderately sloping portion at the lower boundary. Vegetation consists of a dry open grassland with a few small trees and shrubs. Soils are characterized as Makena Loam, Stony Complex, 3 – 15% slopes (MXC) and Puuone Sand, 7 – 30% slopes (PZUE) (Foote et al, 1972). Rainfall averages about 10 inches per year, with most occurring during the winter (Armstrong, 1983). Much of this terrain had previously been leveled several years ago.

SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna survey of the proposed Līloa Hale Senior Housing Project which was conducted in May 2019.

The objectives of the survey were to:

1. Document what plant and animal species occur on the property or may likely occur in the existing habitat.
2. Document the status and abundance of each species.
3. Determine the presence or likely occurrence of any native flora and fauna, particularly any that are Federally listed as Threatened or Endangered (USFWS, 2019). If such occur, identify what features of the habitat may be essential for these species.
4. Determine if the project area contains any special habitats which if lost or altered might result in a significant negative impact on the flora and fauna in this part of the island.

# BOTANICAL SURVEY REPORT

## SURVEY METHODS

A walk-through botanical survey method was used covering the entire project area. Notes were made on species, distribution and abundance as well as on terrain and substrate. Focus was placed on identifying native plant species and especially any that are Endangered or Threatened species that may require special attention.

## DESCRIPTION OF THE VEGETATION

The vegetation consisted of a variety of dry land adapted species of grasses, shrubs and trees. A total of 43 species were recorded during two site visits to the area. One grass species found to be abundant throughout the area, the buffelgrass (*Cenchrus ciliaris*). One other species was common, the hardy native sub-shrub 'uhaloa (*Waltheria indica*). Six species were uncommon, coat buttons (*Tridax procumbens*), creeping indigo (*Indigofera spicata*), siratro (*Macroptilium atropurpureum*), scarlet spiderling (*Boerhavia coccinea*), tree tobacco (*Nicotiana glauca*) and castor bean (*Ricinus communis*). Thirty-five other species were of rare occurrence.

Six indigenous native plant species were found in the project area. These were the 'uhaloa, the 'ilima (*Sida fallax*), the kou (*Cordia subcordata*), the alena (*Boerhavia repens*), koali 'awa (*Ipomoea indica*) and the koali kuahulu (*Merremia aegyptia*). These species are found on all of the Hawaiian Islands and none are rare. Thirty-five of the plant species recorded were non-native in Hawaii.

## DISCUSSION AND RECOMMENDATIONS

The environment in this 4.9 acre project area has been gradually altered over the last century and now consists primarily of non-native elements. Just six common native plant species survive here, and none of these are of any conservation concern. No Endangered or Threatened plant species occur here, nor do any significant native plant communities occur here either.

The proposed project is not expected to have a significant negative impact on the botanical resources in this part of Maui.

## PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically within two groups: Monocots and Dicots. Taxonomy and nomenclature of the flowering plants (Monocots and Dicots) are in accordance with Wagner et al. (1999).

For each species, the following information is provided:

1. Scientific name with author citation
2. Common English or Hawaiian name.
3. Bio-geographical status. The following symbols are used:

endemic = native only to the Hawaiian Islands; not naturally occurring anywhere else in the world.

indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).

Polynesian = plants brought to these islands by the Polynesians during the course of their migrations.

non-native = all those plants brought to the islands intentionally or accidentally after western contact.

4. Abundance of each species within the project area:

abundant = forming a major part of the vegetation within the project area.

common = widely scattered throughout the area or locally abundant within a portion of it.

uncommon = scattered sparsely throughout the area or occurring in a few small patches.

rare = only a few isolated individuals within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
<b>MONOCOTS</b>			
ASPHODELACEAE (Asphodel Family)			
<i>Aloe vera</i> (L.) Burm. F.			
POACEAE (Grass Family)			
<i>Cenchrus ciliaris</i> L.	buffelgrass	non-native	abundant
<i>Chloris barbata</i> (L.) Sw.	swollen fingergrass	non-native	rare
<i>Eragrostis pectinacea</i> (Michx.) Nees	Carolina lovegrass	non-native	rare
<b>DICOTS</b>			
AMARANTHACEAE (Amaranth Family)			
<i>Alternanthera pungens</i> Kunth	khaki weed	non-native	rare
<i>Amaranthus spinosus</i> L.	spiny amaranth	non-native	rare
APOCYNACEAE (Dogbane Family)			
<i>Calotropis procera</i> (Aiton) Aiton	small crown flower	non-native	rare
ASTERACEAE (Sunflower Family)			
<i>Bidens pilosa</i> L.	Spanish needle	non-native	rare
<i>Lactuca sativa</i> L.	prickly lettuce	non-native	rare
<i>Pluchea carolinensis</i> (Jacq.) G. Don	sourbush	non-native	rare
<i>Tridax procumbens</i> L.	coat buttons	non-native	uncommon
<i>Verbesina encelioides</i> (Cav.) Benth. & Hook.	golden corn-bear	non-native	rare
BORAGINACEAE (Borage Family)			
<i>Cordia subcordata</i> Lam.	kou	indigenous	rare
<i>Heliotropium curassavicum</i> L.	kipūkai	indigenous	rare
CONVOLVULACEAE (Morning Glory Family)			
<i>Ipomoea indica</i> (J. Burm.) Merr.	koali 'awa	indigenous	rare
<i>Ipomoea obscura</i> (L.) Ker-Gawl.	morning glory	non-native	rare
<i>Merremia egyptia</i> (L.) Urb.	koali kuahulu	indigenous	rare
CUCURBITACEAE (Gourd Family)			
<i>Cucumis dispsaceus</i> Ehrenb. ex Spach	hedgehog gourd	non-native	rare
EUPHORBIACEAE (Spurge Family)			
<i>Euphorbia hirta</i> L.	hairy spurge	non-native	rare
<i>Euphorbia hypericifolia</i> L.	graceful spurge	non-native	rare
<i>Euphorbia prostrata</i> Aiton	prostrate spurge	non-native	rare
<i>Ricinus communis</i> L.	Castor bean	non-native	uncommon
FABACEAE (Pea Family)			
<i>Crotalaria incana</i> L.	fuzzy rattlepod	non-native	rare
<i>Desmanthus pernambucanus</i> (L.) Thellung	slender mimosa	non-native	rare
<i>Desmodium tortuosum</i> (Sw.) DC.	Florida beggarweed	non-native	rare
<i>Indigofera spicata</i> Forssk.	creeping indigo	non-native	uncommon
<i>Leucaena leucocephala</i> (Lam.) de Wit	koa haole	non-native	rare
<i>Macroptilium atropurpureum</i> (DC.) Urb.	siratro	non-native	uncommon
<i>Macroptilium lathyroides</i> (L.) Urb.	wild bean	non-native	rare
<i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.) Kunth	kiawe	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
<i>Samanea saman</i> (Jacq.) Merr.	monkeypod	non-native	rare
<i>Vachella farinosa</i> (L.) Wight & Arnott	klu	non-native	rare
<i>Leonotis neptifolia</i> (L.) R. Br.	lion's ear	non-native	rare
MALVACEAE (Mallow Family)			
<i>Malva parvifolia</i> L.	cheese weed	non-native	rare
<i>Malvastrum coromandelianum</i> (L.) Garcke	false mallow	non-native	rare
<i>Sida fallax</i> Walp.	'ilima	indigenous	rare
<i>Sida spinosa</i> L.	prickly sida	non-native	rare
<i>Waltheria indica</i> L.	'uhaloa	indigenous	common
NYCTAGINACEAE (Four-o'clock Family)			
<i>Boerhavia cocinea</i> Mill.	scarlet spiderling	non-native	uncommon
<i>Boerhavia repens</i> L.	alena	indigenous	rare
SOLANACEAE (Nightshade Family)			
<i>Datura stramonium</i> L.	Jimson weed	non-native	rare
<i>Nicotiana glauca</i> R.C. Graham	tree tobacco	non-native	uncommon
VERBENACEAE (Verbena Family)			
<i>Lantana camara</i> L.	lantana	non-native	rare

# FAUNA SURVEY REPORT

## SURVEY METHODS

A walk-through fauna survey method was conducted in conjunction with the botanical survey. All parts of the project area were covered. Field observations were made with the aid of binoculars and by listening to vocalizations. Notes were made on species, abundance, activities and location as well as observations of trails, tracks, scat and signs of feeding. In addition an evening visit was made to record crepuscular activities and vocalizations and to see if there was any evidence of occurrence of the Hawaiian hoary bat (*Lasiurus cinereus semotus*) in the area.

## RESULTS

### MAMMALS

Just one non-native mammal was seen during two site visits to the project area, the domestic cat (*Felis catus*). Also likely to occur here would be mice (*Mus domesticus*), rats (*Rattus* spp.), mongoose (*Herpestes auropunctatus*) and domestic dogs (*Canis familiaris*).

An evening survey was conducted to look for the Hawaiian hoary bat. A bat detector (Batbox IIID) was employed, set to the frequency of 27,000 Hertz that these bats are known to emit when echolocating for the nocturnal flying insects they feed on. No bat activity was detected with the use of this device.

### BIRDS

Birdlife was rather sparse in this dry habitat. Five species of non-native birds were recorded during two site visits to the project area. Taxonomy and nomenclature follow American Ornithologists' Union (2019). Two species were common, the zebra dove (*Geopelia striata*) and the common myna (*Acridotheres tristis*). Two species were uncommon, the spotted dove (*Streptopelia chinensis*) and the house sparrow (*Passer domesticus*). The cattle egret (*Bubulcus ibis*) was rare. No native birds were seen.

### INSECTS

Eleven species of insects were recorded during two site visits. Taxonomy and nomenclature follow Nishida et al (1992). One butterfly species was common, the long-tailed blue (*Lampides boeticus*). Five others were uncommon, the dung fly (*Musca sorbens*), the monarch butterfly (*Danaus plexippus*), the spiderling plume moth (*Megalorhipida leucodactyla*), the globe skimmer dragonfly (*Pantala flavescens*) and the short-horned grasshopper (*Oedaleus abruptus*). Five other species were of rare occurrence. The globe skimmer dragonfly is an indigenous native species which is widespread and common throughout Hawaii.

### MOLLUSKS

One non-native species, the giant African snail (*Achatina fulica*) was found. These snails are of no conservation concern.

## DISCUSSION AND RECOMMENDATIONS

The habitat in the project area is dominated by non-native plant and animal species. Just one native insect species, the globe skimmer dragonfly, was present. This dragonfly has a nearly world-wide natural occurrence and is rated as being environmentally of least concern.

No Endangered or Threatened animal species were found in the project area.

While not detected during the survey, the Hawaiian hoary bat could occasionally show up in this habitat. These bats are strong flyers with wide ranging capability. They seek out areas where there are spikes in insect activity that they can take advantage of. Should these bats show up here, the U.S. Fish and Wildlife Service (USFWS) should be consulted on actions that can be taken to ensure that these Endangered bats are not harmed or destroyed during the development process.

During the survey six tree tobacco plants (*Nicotiana glauca*) were found. Tree tobacco are a potential host plant for the Endangered Blackburn's sphinx moth (*Manduca blackburni*) (USFWS, 2000). None of these moths, their eggs or their larvae were found on these plants but they could show up during the wet season. The USFWS may provide guidance for actions for the removal of these plants that will ensure that these Endangered moths are not harmed or destroyed if they are present.

While no protected seabirds were found on the property, the 'ua'u and 'a'o are known to overfly the area at dawn and dusk to their burrows high in the mountains between the months of March and November. In late fall young birds fledge from their burrows to take their first tentative flights out to sea. These inexperienced birds are easily confused and distracted by bright lights and often crash to the ground where they are particularly vulnerable to being run over by vehicles or killed by predators. It is recommended that any significant outdoor lighting such as street lights or flood lights that are incorporated into the project design be shielded to direct the light downward so that it is not visible from above.

With the above guidance, the project should be able to move forward without having any significant negative impact on the fauna resources in this part of Maui.

## ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged in descending abundance within three groups: Mammals, Birds and Insects. For each species the following information is provided:

1. Common name
2. Scientific name
3. Bio-geographical status. The following symbols are used:

endemic = native only to Hawaii; not naturally occurring anywhere else in the world.

indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).

non-native = all those animals brought to Hawaii intentionally or accidentally after western contact.

migratory = spending a portion of the year in Hawaii and a portion elsewhere.  
In Hawaii the migratory birds are usually in the overwintering/non-breeding phase of their life cycle.

4. Abundance of each species within the project area:

abundant = many flocks or individuals seen throughout the area at all times of day.

common = a few flocks or well scattered individuals throughout the area.

uncommon = only one flock or several individuals seen within the project area.

rare = only one or two seen within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
<b>MAMMALS</b>			
<i>Felis catus</i> L.	domestic cat	non-native	rare
<b>BIRDS</b>			
ARDEIDAE (Heron Family)			
<i>Bubulcus ibis</i> L.	cattle egret	non-native	rare
COLUMBIDAE (Dove Family)			
<i>Geopelia striata</i> L.	zebra dove	non-native	common
<i>Streptopelia chinensis</i> Scopoli	spotted dove	non-native	uncommon
PASSERIDAE (Sparrow Family)			
<i>Passer domesticus</i> L.	house sparrow	non-native	uncommon
STURNIDAE (Starling Family)			
<i>Acridotheres tristis</i> L.	common myna	non-native	common
<b>INSECTS</b>			
Order DIPTERA - flies			
MUSCIDAE (Housefly Family)			
<i>Musca sorbens</i> Wiedemann	dung fly	non-native	uncommon
Order HYMENOPTERA - bees, wasps, ants			
APIDAE (Honey Bee Family)			
<i>Apis mellifera</i> L.	honey bee	non-native	rare
<i>Xylocopa sonorina</i>	Sonoran carpenter bee	non-native	rare
Order LEPIDOPTERA - butterflies, moths			
LYCAENIDAE (Gossamer-winged Butterfly Family)			
<i>Brephidium exilis</i> Boisduval	western pygmy blue	non-native	rare
<i>Lampides boeticus</i> L.	long-tailed blue butterfly	non-native	common
NYMPHALIDAE (Brush-footed Butterfly Family)			
<i>Danaus plexippus</i> L.	monarch butterfly	non-native	uncommon
PIERIDAE (White and Sulful Butterfly Family)			
<i>Pieris rapae</i> L.	cabbage butterfly	non-native	rare
PTEROPHORIDAE (Plume Moth Family)			
<i>Megalorhipida leucodactyla</i> Fabricius	spiderling plume moth	non-native	uncommon
Order ODONATA - dragonflies, damselflies			
LIBELLULIDAE (Skimmer Dragonfly Family)			
<i>Pantala flavescens</i> Fabricius	globe skimmer	indigenous	uncommon
Order ORTHOPTERA - grasshoppers, crickets			
ACRIDIDAE (Grasshopper Family)			
<i>Odaleus abruptus</i> Thunberg	short-horned grasshopper	non-native	uncommon
<i>Schistocerca nitens</i> Thunberg	gray bird grasshopper	non-native	rare

**MOLLUSKS**

ACHATINIDAE (Achatinid Snail Family)

*Achatina fulica* Bowdich

giant African snail

non-native rare



**SITE SUMMARY**

**3 FLOORS**  
 1 BEDROOM ADAPTIBLE UNITS (BHA) 86 UNITS  
 1 BEDROOM ACCESSIBLE UNITS (ABA) 15 UNITS  
 2 BEDROOM ADAPTIBLE UNITS (BHA) 15 UNITS  
 2 BEDROOM ACCESSIBLE UNITS (ABA) 1 UNITS  
 TOTAL UNITS 117 UNITS

**PARKING**

1 BASKETBALL PARKING PROVIDED  
 3 BASKETBALL SPOTS PROVIDED  
 ACCESSIBLE PARKING PROVIDED - 7 CAR ACCESSIBLE STALLS  
 3 VAN ACCESSIBLE STALLS  
 18 GUEST STALLS  
 TOTAL PARKING PROVIDED 143 TOTAL STALLS  
 127 ADULT STALLS PROVIDED 3 VISITOR STALLS

**DENSITY**

177 UNITS / 3.81 ACRES = 46 UNITS/ACRE

**PROJECT AREA**  
 3.81 ACRES

**Floor Area Calculations**

First Floor	37,230 sf
Second Floor	35,330 sf
Third Floor	35,250 sf
<b>Total Floor Area</b>	<b>107,860 sf</b>
Total Horiz. Circulation	16,660 sf
Total Vert. Circulation	3,213 sf
Total Common Spaces	6,776 sf
<b>Total Common Area</b>	<b>26,649 sf</b>

**Liloa Hale - SENIOR HOUSING**  
 HIGHRIDGE COSTA

**SITE PLAN**

DESIGN PARTNERS INCORPORATED

KIHEI, HAWAII  
 March 02, 2020



Figure 1. Liloa Hale Senior Housing project

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VIEW ANALYSIS

APPENDIX

D









ARCHAEOLOGICAL  
INVENTORY SURVEY  
PREPARED BY PAUL H.  
ROSENDAHL, PH.D., INC.

APPENDIX

E-1



**Archaeological Inventory Survey  
Piilani Residential Community  
Phase II**

**Land of Keokea, Makawao District  
Island of Maui**

**PHRI**

**Paul H. Rosendahl, Ph.D., Inc.**

*Archaeological • Historical • Cultural Resource Management Studies & Services*

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**Archaeological Inventory Survey  
Piilani Residential Community  
Phase II**

**Land of Keokea, Makawao District  
Island of Maui**

by

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Prepared for

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April 1990

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## SUMMARY

At the request of Mr. Ed Kuniyoshi of Belt, Collins & Associates, representing Baldwin Pacific, Paul H. Rosendahl, Inc. (PHRI) conducted an archaeological inventory survey of the Phase II increment of the Piilani Residential Community project area, located in the Land of Keokea, Makawao District, Island of Maui (TMK:2-2-02:Por.42). The pedestrian survey portion of the inventory survey was conducted November 6-7, 1989, and site recording and testing was conducted December 28-30, 1989 and January 2-6, 1990.

Sixteen sites with 30 component features were identified during the survey. Three of these sites had been previously identified (Cordy 1977) and assigned numbers on the State Inventory of Historic Places (SIHP sites 1709-1711\*). Thirteen new SIHP site numbers were assigned during the current survey (Sites 2512-2524). Identified features include nine terraces, seven enclosures, four C-shapes, four rock piles, two platforms, two midden scatters, an alignment, and a modified outcrop.

Limited subsurface testing was conducted at five sites. Portable cultural remains were identified at one of the five tested sites (2516).

Six sites identified within the project area are assessed as having significant information value at the regional and local level, and further data recovery is recommended at these sites. Additional vegetation clearing, mapping, and/or excavation is recommended at Sites 1710, 2514-2516, 2519, and 2522. One of these sites (2512) may include a shrine feature; provisional preservation is recommended, pending the findings of data collection. Sufficient data has been recovered from the remaining ten sites to warrant a recommendation of no further work.

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

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# INTRODUCTION

## BACKGROUND

This report presents the results of an archaeological inventory survey conducted at the Phase II increment of the Piilani Residential Community project area, located at Kihei in the Land of Keokea, Makawao District, Island of Maui (TMK 2-2-02:Por.42). The survey was conducted by Paul H. Rosendahl, Ph.D., Inc. (PHRI) at the request of Mr. Ed Kuniyoshi of Belt, Collins & Associates, on behalf of their client, Baldwin Pacific. The overall purpose of the survey was to provide information appropriate to and sufficient for compliance with Special Management Area (SMA) and Phase II Project District development conditions as outlined by the County of Maui.

The pedestrian survey was conducted December 28-30, 1989, under the supervision of Supervisory Archaeologist Debra L. Soper, B.S., assisted by Field Archaeologists Jenny O'Clarey and Joanne SanFillipo. Site recordation and testing was conducted January 2-6, 1990 by Supervisory Archaeologist Theresa K. Donham, M.A., and Jenny O'Clarey. Approximately 180 labor-hours were expended during the field work portion of the survey.

This report constitutes the final report for the project. It includes project objectives and a scope of work, describes field methods and procedures, and findings, and presents general significance assessments and recommended general treatments for identified sites.

## SCOPE OF WORK

The basic purpose of an inventory survey is to identify—to discover and locate on available maps—all sites and features of potential archaeological significance present within a specified project area. An inventory survey 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. This level of survey indicates both the general nature and variety of archaeological remains present, and the general distribution and density of such remains. It permits a general significance assessment of the archaeological resources and facilitates formulation of realistic recommendations and estimates for any subsequent mitigation work as might be necessary or appropriate. Such work could include intensive data collection involving detailed recording of sites and features, and selected test excavations; and possibly

subsequent 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 basic objectives of this inventory survey were (a) to identify all sites within the project area, (b) to evaluate the potential general significance of all identified resources, (c) to determine the possible impacts of proposed development on the identified resources, and (d) to define the general scope of any subsequent data collection and/or other mitigation work that might be necessary or appropriate.

Based on a review of available background literature, general familiarity with the Kihei/Kula area, and discussions with Ms. Agnes Griffin, staff archaeologist for Maui and Molokai in DLNR-HSS/SHPO, the following specific tasks were determined to constitute an appropriate scope of work for the inventory survey:

1. Conduct limited archaeological and historical documentary background research involving review and evaluation of readily available archaeological and historical literature, historic documents and records, and cartographic sources relevant to the immediate project area;
2. Conduct 100% coverage, variable-intensity (30- to 90-ft intervals) surface survey of the Phase II increment area in order to identify, record, and evaluate (a) all previously identified sites, and (b) all newly identified sites;
3. Conduct limited subsurface testing of selected sites and features identified within the Phase I area (a) to determine the presence or absence of potentially significant buried cultural features or deposits, and (b) to obtain suitable samples for age determination analyses;
4. Analyze background and field data, and prepare appropriate reports; and
5. Prepare a formal Archaeological Data Recovery Plan, to be reviewed by DLNR-HSS/SHPO, to provide guidance for any subsequent archaeological mitigation work.

## PROJECT AREA DESCRIPTION

The Phase II increment of the Piilani Residential Community consists of a 74-acre parcel located in the Land of Keokea, Makawao District, Island of Maui (Figure 1). The parcel is bounded on the east side by Piilani Highway, on the south by Kihei Elementary and Intermediate School, on the west by Waiohuli-Keokea Beach Homesteads, and on the north by the Keokea-Kamaole boundary. Topography within the project area is gentle and the surface gradually slopes from southwest to northeast. Elevation ranges from 28 to 100 ft AMSL (above mean sea level).

Two ephemeral streams flow east to west through the project area; both originate in Keokea Gulch above Puu O Kali. Keokea Stream flows adjacent to Welekahao Road, at the southern end of the project area. This stream is currently affected by rubbish fill and surface grubbing in the vicinity. A second ephemeral stream flows through the center of the project area. This stream is in a steep-sided gully that has exposed rock cliffs up to c. 24 ft high. Small pools of water were observed in the rocky stream bed during the survey field work.

Pulehu clay loam is the predominant soil within the project area; it is upland alluvial wash with moderate permeability and slow runoff (Foote et al. 1972:115-116). The eastern inland edges of the project area consist of Waiakoa extremely stony silty clay loam, which is severely eroded with up to 15% of the surface as exposed stone (Foote et al. 1972: 127).

Bedrock is exposed along upper terrace slopes and along the crest of ridges within the project area, and in a number of locales where the thin soil mantle has eroded or has been scraped away. Coral pan and a few small locales of bare pahoehoe also occur, principally in the southern portion of the project area. Deposits of sandy loam were observed on a number of cultural features within the project area. It is uncertain at this time whether this soil was naturally or culturally deposited.

Vegetation within the project area consists primarily of *kiawe* (algaroba, *Prosopis pallida* [Humb. and Bonpl. ex Willd.] HBK) and assorted grasses, such as California grass (*Brachiaria mutica* [Forsk.] Stapf), wiregrass (*Eleusine indica* [L.] Gaertn), and fountain grass (*Pennisetum setaceum* [Forsk.] Chiov.). Scattered 'ilima (*Sida fallax* Walp.) occurs throughout the project area. *Kiawe* growth is thickest in the southern portion of the project area, where there are numerous mature trees. The *kiawe* and grass community within the northern portion of the project area was burned

c. 1978 during a large brush fire that affected several hundred acres along the Piilani Highway corridor. Numerous charred *kiawe* trunks are still standing, and indicate a more extensive *kiawe* stand than what is now present. Grasses cover nearly every square meter of the project area; total surface visibility is restricted to extremely rocky outcrops and roads.

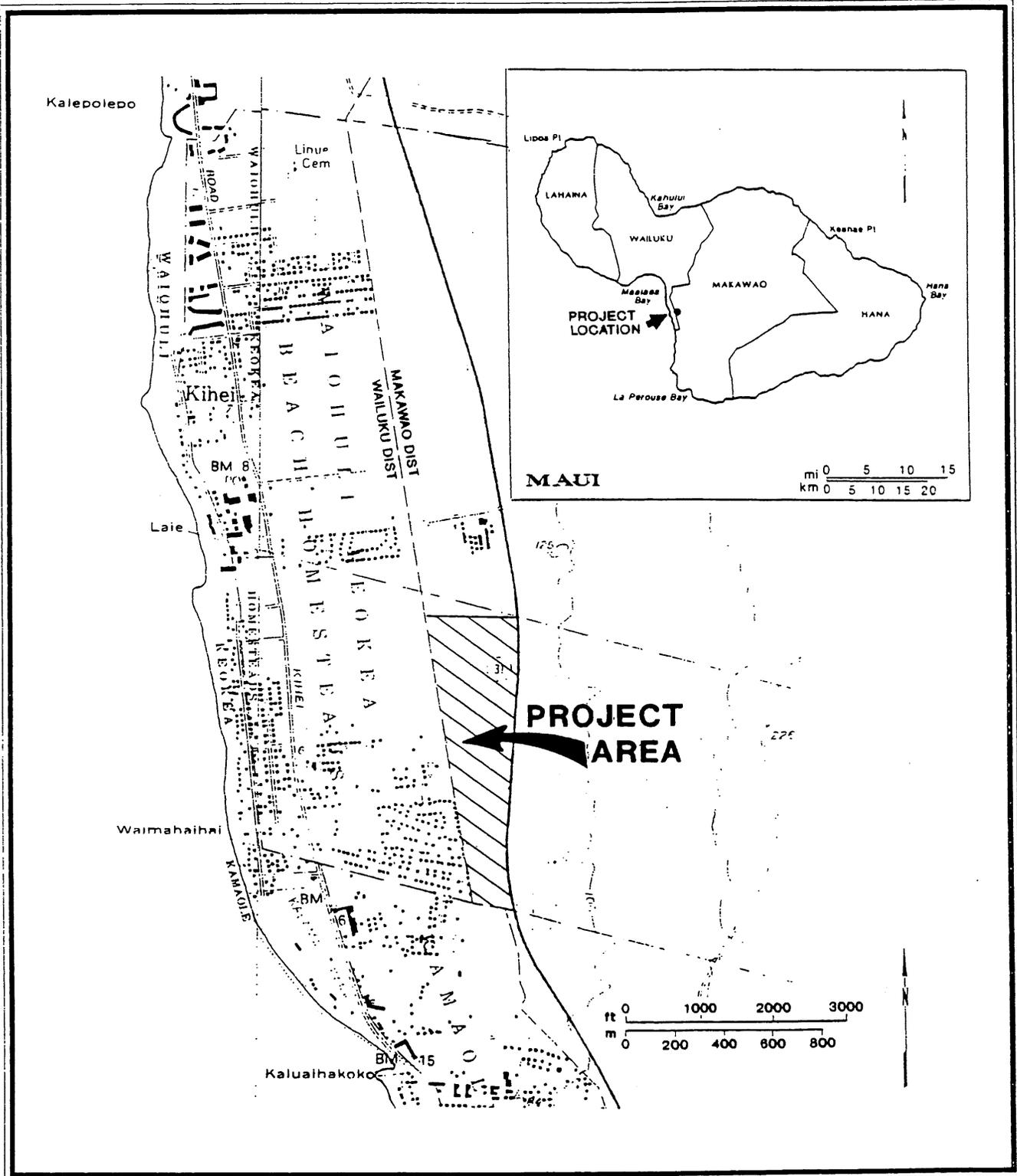
In 1982, Environmental Impact Statement Corporation (EISC) conducted a biological survey of the project area in conjunction with a cultural resources survey of the same area. At the time of their survey, EISC found that *kiawe* and sandbur (*Cenchrus echinatus* L.) were abundant. Common plants included Spanish needle (*Bidens pilosa* var. *pilosa*), and occasional 'ilima, bristly foxtail (*Setaria verticillata* [L.] Beauv.), khaki weed (*Alternanthera repens* [L.] Ktze.), *kou* (*Cordia subcordata* Lam.), and Australian saltbush (*Atriplex semibaccata* R. Br.) (EISC 1982:A-4-6). A single *wili-wili* tree was observed in Keokea Gulch, at the southern end of the project area.

The project area is situated within the dry, scrub zone referred to as the *kula*, or barren zone (Cox 1976 and Cordy 1977). The barren zone is defined primarily on the basis of rainfall patterns and associated changes in soil and vegetation. According to Cordy's calculations, this zone begins roughly one-quarter mile from the coast and extends inland for 6.8 miles in Keokea (Cordy 1977:5). This area has been interpreted as having been mostly unoccupied and used for limited agricultural purposes prior to the introduction of cattle.

The Phase II increment of the Piilani Residential Community is in generally better preservation than the Phase I increment, located across Lipoa Street to the north. There appears to be less destruction of surface features by grubbing and cattle ranching activities. However, substantial grubbing has occurred in the southern half of the project area, on both sides of Welekahao Road. Dozing has also occurred along the western boundary of the project area, in a strip parallel to the east side of the dirt road.

## PREVIOUS ARCHAEOLOGICAL WORK

Prior to the enactment of cultural resource management laws, very few site inventory surveys were conducted in east Maui. Principal among the early site inventories for the Island of Maui was Walker's (1931) survey, which identified 266 heiau and petroglyph sites. Walker identified only two sites (198, 199) along the Maalaea to Makena coastline. These were associated with a fishpond located near Keawakapu, south of Kihei (1931 map). Several sites



**Figure 1. PROJECT AREA LOCATION MAP**  
**ARCHAEOLOGICAL INVENTORY SURVEY**  
**PIILANI RESIDENTIAL COMMUNITY - PHASE II**  
**Land of Keokea, Makawao District, Island of Maui**  
**(TMK:2-2-02:Por.42)**

(including 11 heiau) were, however, recorded in the uplands of Waiohuli and Keokea (Walker 1931). Walker's survey, other less extensive surveys, and excavations conducted in Maui County prior to 1970 were summarized by Emory and Hommon (1972) in a broad cultural resource management plan prepared for the County of Maui.

Numerous archaeological studies have been conducted in the coastal portion of Makawao District since 1970 in conjunction with resort development. These studies are concentrated in the Wailea/Makena area, located approximately three miles south of the project area. One of the earliest contract projects in the Wailea/Makena area was Kirch's survey and subsequent excavations at Palauea (Kirch 1969, 1970, and 1971). Kirch's analysis of two coastal site complexes (SIHP Sites 1028 and 1029) offered hypotheses regarding Pre-Contact Period settlement patterns, subsistence, and social organization for leeward east Maui (Kirch 1971).

Kirch proposed that coastal settlement along the arid coastline of Palauea was nonpermanent, or transient, and was primarily for gathering sea resources. Permanent habitation sites were hypothesized to occur in upland resource zones, where intensive agriculture was conducted (Kirch 1971:83-85). Kirch also hypothesized that the residential complex examined (Site 1028) was probably occupied by a single descent group, whereas the heiau site (1029) was probably used or upkept by all occupants of the ahupua'a (Kirch 1971:83-85). A single radiocarbon date was assayed from a charred post excavated at Site 1028; it yielded a calendrical range of AD 1545-1745 (Kirch 1971:76).

Subsequent to Kirch's study, a number of reconnaissance and testing projects have been conducted in the Wailea/Makena area (Barrera 1974, Clark 1974, Cleghorn 1974 and 1975, Barrere 1975, Hommon 1975, Cordy 1978, Haun 1978, Sinoto 1978, Jourdane and Sinoto 1979, Bordner 1980, Schilt and Dobyms 1980, Bordner and Cox 1982, Walker, Rosendahl and Haun 1985, Dicks and Haun 1987, Dobyms 1988, Haun 1988, Shapiro and Haun 1988). Interpretation of findings for specific project areas by the B.P. Bishop Museum have generally upheld Kirch's model of temporary coastal use from permanent residential sites located in the uplands (Jourdane and Sinoto 1979, Schilt and Dobyms 1980). Schilt and Dobyms refer to this model as a "dual pattern of occupation and utilization" (1980:77).

Schilt and Dobyms located 76 features and tested six sites in the Mokapu Beach area of Wailea. Among the features identified were 23 C-shapes, 13 circular enclosures, 13 hillside terraces, wall segments, terraces, cairns, and a single platform. Radiometric dates obtained during the

testing are within the relatively late prehistoric period, between AD 1550 and 1750 (Schilt and Dobyms 1980:46). Many of the C-shapes and small enclosures were interpreted by Schilt and Dobyms as agricultural features, and they indicate that the presence of these features in the coastal zone is not in accordance with the rather specialized, nonpermanent use of this zone proposed by Kirch (Schilt and Dobyms 1988:77).

Radiometric dates assayed during additional testing and mitigation projects for coastal Makawao District have continued to exhibit late Pre-Contact Period use (Haun 1978:75, Dicks and Haun 1987:29).

Four previous studies have been conducted either within or adjacent to the project area. The earliest of these was a reconnaissance survey of the proposed Piilani Highway Corridor, which presently defines the eastern boundary of the project area. This corridor was examined by Cox (1976), who located two C-shapes in Keokea, and recovered volcanic glass, dated at AD 1724-1784, from a small cave in Kamaole (Cox 1976).

The following year, Cordy conducted a survey of nine drainage gullies and an inland corridor through the barren scrub zone between Kealia Pond and Wailea (1977). His survey corridor through Keokea incorporated a strip 300-350 ft wide to the east of the jeep road which defines the western boundary of the project area. At the time of Cordy's survey, Kihei Elementary and Intermediate School had not been constructed, although bulldozer disturbance was noted for both Waiohuli and Keokea (Cordy 1977:30-32). Cordy located seven sites within and immediately north of the project area in Keokea. These are summarized below:

Site 1706 - Rock mound and a 10-20.0 m long wall at the base of a knoll, at the northern end of the Keokea section of the corridor.

Site 1707 - Low enclosure on the knoll above Site 1706.

Site 1708 - Two low enclosures on a knoll, 20-30.0 m inland from Site 1707.

Site 1709 - Two low enclosures on a knoll, 20-30.0 m east of Site 1706.

Site 1710 - Enclosure located just inland of the jeep road along the western boundary of the corridor.

Site 1711 - Small C-shape.

Site 1712 - Low enclosure built on bare pahoehoe (Cordy 1977:34-39).

In conjunction with his survey, Cordy offered a reexamination of Kirch's settlement model for leeward East Maui. Briefly, he proposed that permanent habitation did occur at several locales along the coastline, as well as in the uplands, and that permanent coastal settlement was more likely to occur where the inland agricultural zone was less than seven miles from the coast (Cordy 1977:14-16). Coastal habitation sites were expected by Cordy to be less specialized than Kirch proposed, and to include small-scale agriculture, livestock raising, and aquaculture as well as fishing (1977:23).

In 1982, Environmental Impact Statement Corporation (EISC) conducted a biological and archaeological survey of the Phase I and II increments of the Piilani Residential Community project area. A single site was located within the Waiohuli (Phase I) portion of the project area, and eight sites were located in Keokea. The sites are summarized below:

Site 1 - L-shaped wall and C-shape on a ridge outcrop.

Site 2 - C-shaped shelter

Site 3 - Possible alignment on an outcrop

Site 4 - Alignment with uprights

Site 5 - Two alignments on an outcrop

Site 6 - Low enclosure between two outcrops

Site 7 - C-shape on the side of a large outcrop

Site 8 - Wall 25 m southwest of Site 7 (EISC 1982:B-3,B-4).

As far as could be determined, only one of the EISC sites (Site 2) correlates with a site previously recorded by Cordy (SHIP Site 1711). The EISC sites were not registered on the State Inventory of Historic Places at the time of that survey.

In 1986, Kennedy conducted a surface reconnaissance survey of the proposed golf course immediately east of the project area (Silversword Golf Course). Kennedy's brief letter report of findings indicates that no archaeological features were located within the project area (1986).

Other field work conducted within Keokea Ahupua'a includes studies by B.P. Bishop Museum and PHRI of Hawaiian Homes lands in upper Waiohuli and Keokea. In 1987, Riford reported findings 53 sites in the Waiohuli section; these were primarily agricultural features (60%), with about 20% interpreted as habitation features (Riford 1987:32-33). A reexamination of this area was recently completed by PHRI and the report of findings is in preparation (Haun et al., in prep).

## HISTORICAL DOCUMENTARY RESEARCH

As part of their corridor surveys associated with Piilani Highway, Cox (1976) and Cordy (1977) conducted archival research which focused on identifying Land Commission Awards (LCA) within the affected ahupua'a. EISC also conducted LCA record searches. These studies indicate that no native kuleana (house and/or garden plots) were claimed and awarded by the Land Commission within the project area. Land Commission Awards were given for the uplands of Keokea, in the area described in native testimonies as being between the mountain and the kula. Awards in this area were for patches of sweet potatoes, Irish potatoes, bananas, taro, sugarcane, and house lots (cf. Native Testimonies for LCA 6414-6417, 6540, 6543, 6592, 6656, 6705, 6738, and 7971).

Historical documentary research by Wong Smith (Appendix B) indicates that there are no known coastal heiau in Keokea; however, three major upland heiau were recorded by Walker (1931)—Molohai, Papakea, and Kaumiumimua Heiau. A fourth upland heiau (Ho'oula Ua) is described by Ashdown (1971:46 [Appendix B]). These heiau are described in Appendix B.

Cox's (1976) study includes information on two heiau which were known to exist at Kalepolepo along the coastal boundary between Waiohuli and Kaonoulu. These include Kalaihi Heiau (in Kaonoulu) and the Kealalipoa Heiau. Both heiau have apparently been destroyed (Cox 1976:14).

Cox also identified, from historic sources, three fishponds in coastal Waiohuli and Keokea (1976). These were constructed as walls on the shallow reef shelf present in this area. The ponds include Kalepolepo, Keokeakai, and Waiohulikai (Cox 1976:4). Kalepolepo Pond was apparently in use at the time of Kamehameha I, who had it rebuilt (Cox 1976:4). The wall remnants identified by Cordy at the mouth of Waipuilani Gulch (Site 1704) in Waiohuli may be remains of this pond.

The project area is within Apana I of Grant 9325 to Haleakala Ranch Company. Historic land use within the project area has been associated with ranch activities, such as cattle grazing.

## FIELD METHODS AND PROCEDURES

A 100%-coverage pedestrian survey was conducted at the project area November 6 and 7, 1989 by a crew of three persons. Pedestrian sweeps were oriented east-west, beginning at the northern end of the project area. The southernmost corridor of each sweep was flagged so that the adjacent sweep would be properly spaced. Crew members were spaced at 10.0 m intervals, except where grass was particularly thick. In these areas, intervals between surveyors were decreased to 5.0 m. The vicinities of previously located sites were subjected to further examination if these sites could not be relocated during the sweeps. All cultural features were flagged, given temporary site numbers, and were plotted on the project area topographic map (Belt Collins & Associates, 1":200') as they were encountered. After completion of the pedestrian sweeps, sites were returned to and cleared.

Twenty temporary site numbers were initially assigned during the sweeps. After vegetation clearing, it became obvious that four of these sites were the result of bulldozer disturbance, and were deleted (T-1, -5, -19, and -20). The remaining sixteen sites were recorded (described and measured), mapped, and photographed using 35 mm black and white Tri-X film. Recordation was conducted December 28-30 and January 2-4, 1990, by a crew of two persons. Each recorded site was marked with pink-and-blue flagging

tape and with an aluminum tag bearing the temporary site number, date, and PHRI project identification number (PHRI 89-698).

The correlation of temporary PHRI numbers, EISC numbers, and SIHP numbers is shown in Table 1. Five of the EISC sites (Sites 3-6 and 8) and four of the SIHP sites previously recorded by Cordy (1706-1708 and 1712) could not be relocated despite considerable effort to find them. All of the EISC sites not relocated are at the southern end of the project area, which has been extensively grubbed (by bulldozer). Three of the four SIHP sites not relocated were within the portion of Keokea affected by the Kihei Elementary and Intermediate School construction.

Subsurface testing was conducted January 4-6, 1990 by a crew of two persons. All test units were 0.5 by 0.5 m square and were excavated in natural soil layers, with arbitrary levels of 0.1 m when warranted. The deposits were generally quite thin, with most layers averaging c. 0.05 m thick. Standard PHRI excavation grid forms were completed for all layers and levels, and excavated soil was screened through 1/8" hardware cloth. Portable remains observed in the screen were retained by layer/level and were subsequently washed, counted, weighed, and tabulated.

Charcoal was observed in the project area, but in quantities insufficient for dating samples. Soil samples were collected from layers so that color, texture and consistence could be compared between the various tested features. All test units were photographed after excavation, one or two walls were profiled, and the units were backfilled.

Table 1.

## CORRELATION OF SITE NUMBERS

PHRI 1989 Survey		Cordy 1977 Survey	EISC 1982 Survey
Temp. No.	SIHP No.	SIHP No.	Temp.No.
T-2	2512	-	-
T-3	-	1711	2
T-4	2513	-	-
T-6	2514	-	-
T-7	2515	-	-
T-8	2516	-	-
T-9	2517	-	-
T-10	2518	-	-
T-11	2519	-	-
T-12	2520	-	-
T-13	2521	-	-
T-14	2522	-	7?
T-15	-	1710	-
T-16	2523	-	1
T-17	-	1709	-
T-18	2525	-	-

## FINDINGS

As mentioned previously, the project area was included in two previous archaeological surveys, one conducted in 1977 by Cordy and the other conducted in 1982 by Environmental Impact Study Corporation (EISC). Cordy located seven sites within the project area, and EISC located eight sites. One of the EISC sites had been previously recorded by Cordy, for a total of fourteen previously located sites within the project area. Five of these sites were relocated during the current survey. The remaining nine sites have been destroyed by construction activities and surface grubbing. Three of the previously identified sites that were relocated had been registered on the State Inventory of Historic Places (SIHP). Thirteen new SIHP numbers were assigned during the current survey.

### SURFACE FINDINGS

Sixteen archaeological sites with thirty component features were identified within the project area during the current project (Table 2). Nine of these sites consist of a single feature; four sites consist of two features; two sites have four features, and one site consists of five features. In general, the sites are located on the top and upper slope areas of low to prominent knolls situated along the edges of natural terraces. Elevation of the sites ranges from 38 to 96 ft AMSL; average elevation is 70 ft AMSL. All but one of the identified sites are in the northern half of the project area (Figure 2). This patterning is a reflection of recent grubbing activities, which have obliterated sites in the southern portion. At least four sites were destroyed in the southern portion of the project area, as indicated by the prior EISC survey.

Nine formal feature types are represented among the thirty identified features (Table 3). Terraces are the predominant formal type, with nine identified. It is likely that additional terraces will be located during further data recovery. Sites 2514, 2516, 2519, and 2522 are suspected of containing additional terrace features.

Two types of terraces were identified. The most common form consists of stepped soil flats defined by aligned boulders and cobbles. These features are most common along the slopes of knolls and natural terraces. They are generally in an eroded condition, and it is safe to assume they were once more clearly defined and probably contained more soil than is now present. None of the soil terraces have been tested to date; it is unlikely that cultural deposits or datable remains are present in subsurface

contexts at these features. Stepped soil terraces are currently identified at Sites 2512, 2518, and 2519. They occur in association with a low platform at Site 2512.

Four of the identified terrace features are rock-filled and occur on flat as opposed to sloping terrain. These terraces are generally small and low. The surface is either covered with rocks, or rocks are protruding out of a thin soil layer. In three cases (all at Site 2520) loose rocks are piled on top of the terraces.

A rock-filled terrace at Site 2520 was tested, and found to contain a layer of loose, loamy soil intermixed with rocks, overlying the old ground surface. This soil layer represents either naturally accumulated duff and colluvium, or it was artificially deposited at the time of terrace construction. In either case, the feature has been functional in retaining the soil.

Both types of terraces identified within the project area are assumed to reflect agricultural activities. They are all too small and irregular to be considered as habitation features. One terrace at Site 2512 (Feature D) may represent a shrine. Its perimeter alignments contain a number of branch coral heads, and two upright stones are present at the base of the lowest terrace level.

Six low enclosures were identified at five sites within the project area. These features are constructed with single alignments or two courses of stacked boulders or cobbles. The enclosures are a range of shapes, including circular, oval, rectangular, and square. Two size categories are represented among these features. Two relatively large enclosures with interior areas of 14.4 and 12.9 sq m were identified at Sites 1711 and 2516, respectively. The four smaller enclosures have interior areas which range from 6.96 to 4.10 sq m. Both of the large enclosures and one of the small ones were tested during this project. A cultural deposit which appears to reflect habitation was identified at one of the large enclosures (Site 2516, Feature B). This feature is associated with a second low enclosure (Feature B), which exhibits the smallest interior area among the identified enclosures.

The enclosures that were tested and which contained no cultural remains are interpreted as agricultural features. It should be noted that the portable cultural remains recovered from Feature B at Site 2516 were all very small and the deposit was somewhat indistinct. It is therefore possible

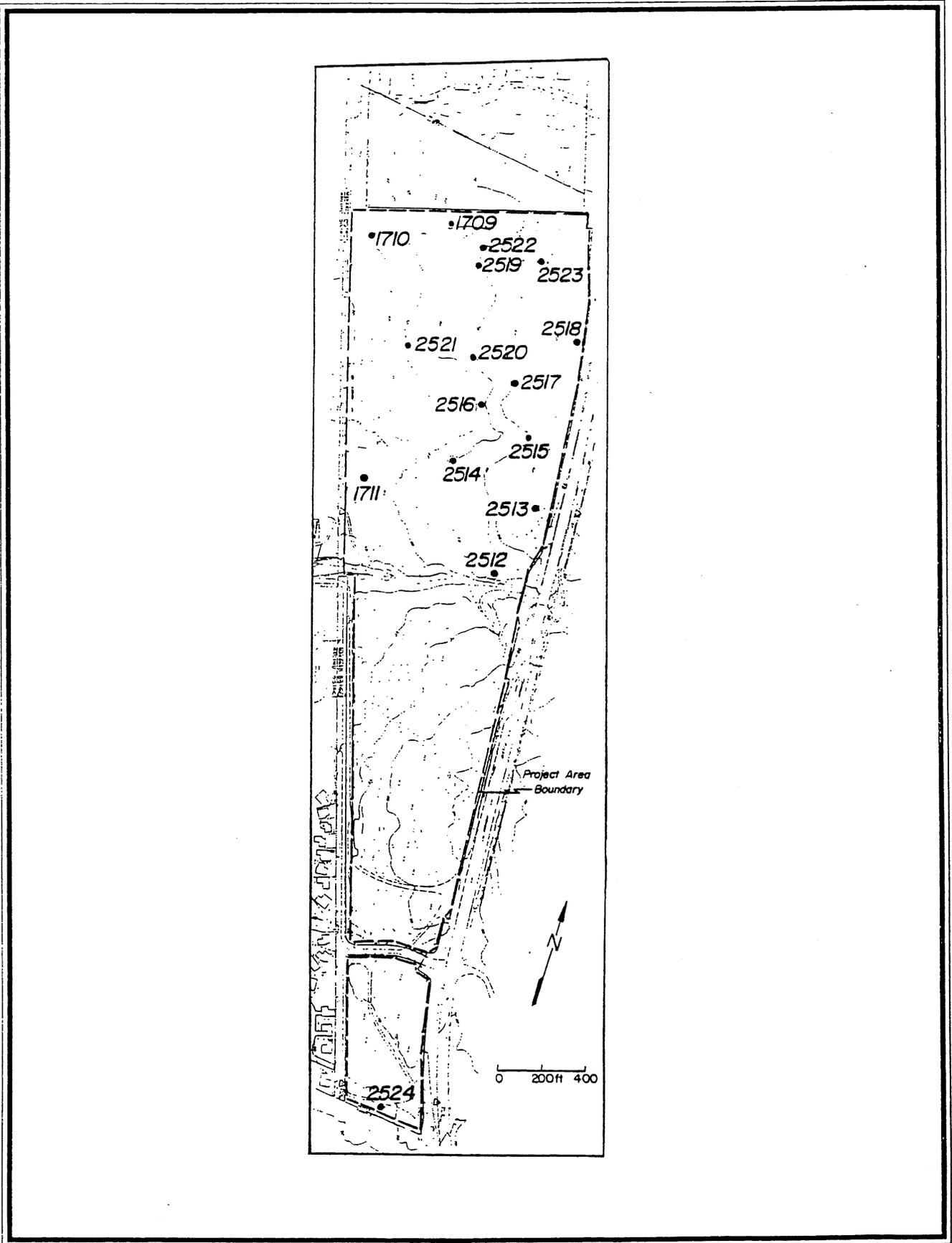


Figure 2. SITE LOCATION MAP

Table 2.

## SUMMARY OF IDENTIFIED SITES

*SIHP Site No.	Formal Site/Feature Type	Tentative Functional Interpretation	#CRM Value Mode Assess.			+Field Work Tasks		
			R	I	C	DR	SC	EX
1709	Low enclosure	Agriculture	M	L	L	-	-	-
1710	Enclosure	Agriculture/ temp. habitation	M	M	L	+	-	+
1711	Complex (2)++  A Low enclosure B C-Shape	Agriculture	M	L	L	-	-	-
2512	Complex (5)  A Platform B Low enclo. C Terrace D Terrace E Rock pile	Possible habitation Possible agriculture Agriculture Possible shrine Indeterminate	M/H	L	L/H	+	-	+
2513	Low enclosure	Agriculture	M	L	L	-	-	-
2514	Platform	Habitation	M	M	L	+	+	+
2515	Modified outcrop	Agriculture	L	L	L	-	-	-
2516	Complex (2)  A Low enclosure B Low enclo.	Agriculture Temp. habitation	M	L	L	+	-	+

\*State Inventory of Historic Places (SIHP) site number (50-50-10-)

#Cultural Resource Management Value Mode Assessment:

Value: R = scientific research  
I = interpretive  
C = cultural  
Degree: H = high  
M = moderate  
L = low

+Recommended Field Work Tasks:

DR = detailed recording  
SC = surface collection  
EX = excavation

++ Number of component features

Table 2. (cont.)

SIHP Site No.	Formal Site/Feature Type	Tentative Functional Interpretation	CRM Value Mode Assess.			Field Work Tasks		
			R	I	C	DR	SC	EX
2517	Midden Scatter	Habitation	L	L	L	-	-	-
2518	Complex (4) A Terrace B Terrace C Rock pile D Alignment	Agriculture	M	L	L	-	-	-
2519	Terrace	Agriculture	M	L	L	+	-	+
2520	Complex (4) A Terrace B Terrace C Terrace D Rock pile	Agriculture	M	L	L	-	-	-
2521	Midden scatter	Habitation	L	L	L	-	-	-
2522	Complex (2) A Box C-shape B Terrace	Agriculture/ poss. habitation	M	L	L	+	-	+
2523	Complex (2) A C-shape B C-shape	Agriculture	M	L	L	-	-	-
2534	Rock pile	Indeterminate	L	L	L	-	-	-

that the enclosure was used for agricultural purposes sometime after its use as a habitation feature, resulting in the mixing and considerable breakage of portable remains.

Among the low enclosures, only the one with the identified cultural deposit exhibits an opening in the perimeter alignment or wall. Three of the enclosures contain soil fill that is raised slightly above the surrounding ground surface, and three have depressed interiors. All are generally cleared of surface stones, and most appear to have no buried or partially buried stones inside.

A single relatively high-walled enclosure was identified within the project area (1710). Average wall height of this feature is about 0.7 m, and the interior area is 102.0 sq m. The interior wall height of this enclosure in most places is insufficient to indicate it was used as an animal pen. The interior surface along portions of the wall is nearly level with the top of the wall. This feature to date has not been tested; it may represent either agriculture or temporary habitation, or both.

Table 3.

## OCCURRENCE AND FREQUENCY OF FORMAL FEATURE TYPES

Formal Type	Count	% of Total	Occurrence (SIHP Site)
Alignment	1	3.33	2518 (D)
C-shape	4	13.33	1711 (B), 2522 (A), 2523 (A,B)
High enclosure	1	3.33	1710
Low enclosure	6	20.00	1709, 1711 (A), 2512 (B), 2513 2516 (A,B)
Modified outcrop	1	3.33	2515
Platform	2	6.67	2512 (A), 2514
Rock pile	4	13.33	2512 (E), 2518 (C), 2525 (D), 2524
Shell midden	2	6.67	2517, 2521
Terrace	9	30.00	2512 (C,D), 2518 (A,B), 2519, 2520 (A,B,C), 2522 (B)
<b>Total :</b>	<b>30</b>	<b>99.99</b>	

Four small C-shaped walls were identified at three sites within the project area. Interior area of these four features ranges from 5.0 to 3.0 sq m. Three of the four C-shapes are curved and are constructed of loosely piled rocks. One feature (2522 A) has straight sides and squared corners. This feature has an interior area of only 3.64 sq m, which is quite small to be considered as a possible habitation feature.

One of the C-shaped walls was tested during this survey (2523 A). This feature is one of the largest C-shapes identified (4.2 sq m interior area). No cultural remains were identified. In general, the interiors of the C-shapes are irregular and contain partially buried and surface rocks. They are interpreted as agricultural features.

It should be noted that in certain survey areas along the coast in Makawao District, C-shapes and low enclosures have been associated with WWII period infantry exercises (Haun 1988). The features identified in Keokea cannot be readily associated with modern military construction. All of these features were totally cleared for mapping and excavation and in no case were portable remains suggesting military use, such as tin cans, present. In addition, the features are generally eroded and in poorer condition than expected for structures erected c. 45 years ago.

Two platforms were identified within the project area (2512 and 2514). These features exhibit surface areas of 58.5 and 18.0 sq m, respectively. Shell midden occurs on

the surface of both features, and they appear to represent habitation features. The platforms are located along the edge of the same terrace formation, at similar elevations, 165.00 m apart. These features have not been tested to date.

Two surface scatters of marine shell were identified (2517 and 2521). These sites are both badly eroded, and little to no soil remains overlying bedrock. Both scatters are sparse with no visible concentrations.

Detailed descriptions of the recorded sites and features are presented in Appendix A.

### SUBSURFACE FINDINGS

Test units were excavated at five sites within the project area. As indicated above, all test units were 0.5 by 0.5 sq m, and were excavated in natural layers, with 1/8" mesh screening of all soil. The purpose of testing was to aid in determining the function of various features, to obtain samples for age determination, and to determine the nature and extent of any subsurface cultural deposits that might be present.

Features tested include three low enclosures, a rock-filled terrace, and a C-shape (Table 4). In all cases, excavation continued until virtually impenetrable decomposing bedrock was encountered. This stratum is very similar at all test unit locales, and was encountered at depths ranging from 0.15 to 0.27 m below surface. Three

soil layers were observed in all test units; Layer III was generally uniform at all sites, whereas Layers I and II varied somewhat.

Layer III consists of a gravelly silty loam or silty clay loam. Coloration of this layer ranges from 7.5YR3/2 to 2.5YR3/4 and 2.5/2. It is an undisturbed natural stratum in all features examined, and ranges in thickness from 0.08 to 0.12 m. Beginning depth of this layer ranges from 0.06 to 0.19 m below surface.

Layer II consists of silty loam in three cases, sandy loam in one case, and silty clay in one case (Table 4). The silty loam Layer II deposits are very thin, ranging in thickness from 0.02 to 0.05 m. These deposits are dark reddish-brown and are consistently darker than the underlying Layer III soils. They contain small amounts of naturally occurring gravels, and appear to be natural, undisturbed strata.

The sandy loam Layer II stratum at Site 2523 is 0.03 m thick and is dark reddish-brown (5YR3/4). It is uncertain whether the sand in this layer is naturally or artificially introduced. Sand does not occur in the overlying Layer I soil at this site.

The silty clay Layer II soil at Site 2516 is the only soil stratum encountered that can be considered a cultural deposit. It is 0.09 m thick, and begins 0.10 m below surface. The boundary between this and the two surrounding layers is diffuse; it is, however, distinguishable based on color, texture, consistence, the absence of natural gravels, and the presence of midden and artifacts. This layer is very dense and rather packed. Color is 5YR3/2-3/3 with patches of darker matrix.

A relatively wide range of portable remains were recovered from the Layer II deposit at Site 2516 (Table 5). At least four species of marine shellfish are represented, in

addition to Echinoidea and Crustacea. Charcoal and burned earth are present in small quantities, and both basalt and volcanic glass debitage is present. This deposit appears to represent a period of habitation (continuous or discontinuous) in and/or around the feature. The horizontal extent of the deposit is presently unknown. The known vertical extent is 0.09 m thick with no internal stratification observed.

A total of 4.45 g of portable remains were recovered from 36 liters of soil removed from Layer II. All of the portable remains are small, as indicated by the weight to count ratio. The overall size grade of the remains suggests that the deposit was subjected to exposure, or other factors causing breakage, after the remains were discarded. An insufficient quantity of charcoal was recovered for age determination. It appears, however, that a sufficient quantity should be obtainable if a larger area of the feature is excavated.

Layer I soils encountered in test units include silty sand, silty loam, and silty clay loam. Thickness of these layers range from 0.03 to 0.10 m. They are relatively free of gravel, although cobbles and surface stones are present in some cases. In general, this layer exhibits a very poorly defined to absent O horizon, or surface duff deposit. It is eroded in all cases, and probably represents the remnants of a deflated surface layer. No cultural remains were encountered in this layer.

The only feature containing a silty clay loam Layer I soil is Feature B, Site 2516, which also contains the cultural deposit. The setting of this feature contrasts with most of the tested features in that it is situated at the base of a steep terrace slope, rather than on top of the terrace. The clay components in the soil here may therefore be the effect of colluvial deposition.

Table 4.

## SUMMARY OF TEST UNIT EXCAVATIONS

Site	Feature	Layer I		Layer II		Layer III		Max. Depth
		Thkns.	Text.	Thkns.	Text.	Thkns.	Text.	
1711	A	0.03	SiS	0.03	SiL	0.09	GSiL	0.15
2513	-	0.03	SiL	0.05	SiL	0.13	GSiCL	0.21
2516	B	0.10	SiCL	0.09	SiC*	0.08	SSiCL	0.26
2520	A	0.08	SiL	0.02	SiL	0.17	GSiCL	0.27
2523	A	0.05	SiL	0.03	SL	0.12	GSiCL	0.20

Thickness (Thkns.) in meters

Texture (Text.): C=clay, G=gravelly, L=loam, S=sand, Si=silt

\*Cultural deposit

Table 5.

SUMMARY OF PORTABLE REMAINS, SITE 2516  
FEATURE B, LAYER II

	Count	Grams
<b>MARINE INVERTEBRATES</b>		
<b>GASTROPODS</b>		
Cypraeidae	1	0.70
<i>Litterina pintado</i> spp.	2	0.20
<i>Planaxis labiosa</i>	2	0.40
Unidentified gastropods	5	0.10
<b>SUBTOTAL GASTROPODS:</b>	<b>10</b>	<b>1.40</b>
<b>BIVALVES</b>		
<i>Brachidontes crebristriatus</i>	2	0.20
<b>OTHER</b>		
Echinoidea	49	2.10
Crustacea	12	0.30
<b>TOTAL M. INVERTEBRATES :</b>	<b>73</b>	<b>4.00</b>
<b>VEGETAL REMAINS</b>		
Charcoal	6	0.10
<b>OTHER</b>		
Burned earth	4	0.20
<b>ARTIFACTS</b>		
<b>LITHICS</b>		
Basalt flake	1	0.10
Volcanic glass flake	1	0.05
<b>TOTAL PORTABLE REMAINS :</b>	<b>85</b>	<b>4.45</b>

## CONCLUSION

### DISCUSSION

Among the 30 features identified during the current survey, 23 (77%) are interpreted as agricultural features, five appear to represent habitation activities (2512, Feature A; 2514 and 2516, Feature B; and 2517 and 2521), one feature (1710) is either agricultural or habitational, and one feature (2512, Feature D) is a possible shrine. Among the agricultural features, five are low enclosures, four are C-shapes, eight are terraces, four are rock piles, one is a modified outcrop, and one is an alignment. With one exception, the rock piles and alignment are associated with and appear to be functionally related to terraces.

The identified agricultural features occur at a range of elevations that include the lowest (38 ft AMSL) and highest (96 ft AMSL) site locales within the project area. Immediate topographic settings for these features include the upper slopes of low to prominent knolls at the edges of natural terraces, and relatively low lying flats at the bases of natural terrace slopes. The spatial patterning of agricultural features and sites in general within the project area is affected rather severely by historic and modern land alterations. The most representative area of site patterning occurs between Kihei Elementary and Intermediate School and the ephemeral drainage gully near the center of the project area. In this section, sites are regularly spaced, with no clear tendency to cluster.

Habitation features include two low platforms, two surface scatters of shell midden, and a low enclosure. The platforms could well represent relatively permanent habitation, whereas the other three features most likely reflect temporary or short-term habitation.

As mentioned previously, the project area is situated within the dry scrub zone referred to as the kula, or barren zone (Cox 1976 and Cordy 1977). In Keokea, the kula zone begins roughly one-quarter mile inland from the coast and extends inland for 6.8 miles. Prior to intensive archaeological investigations in the kula zone, the area was thought to have been mostly unoccupied and unexploited by traditional Hawaiian agriculturalists. According to Cordy, "Work in similar environments in Hawaii has indeed revealed that barren zones were not used for permanent housing or subsistence" (1977:24). Intensive use of the zone was assumed to have begun with the introduction of cattle, which were generally pastured on open kula ranges.

More recent survey work by Cordy and Athens (1988) in the Makena area, and Schilt and Dobyns (1980) in Paeahu, found a very similar distribution pattern of feature types within the lower elevations of the kula zone. Low enclosures, C-shapes, hillside terraces and rock piles were the most numerous features in the Paeahu survey area; these were interpreted as having an agricultural function (Schilt and Dobyns 1980:8-11; 22-24). Likewise, Cordy and Athens recorded low enclosures with cleared interiors, terraces, and alignments (1988:24). The latter study was also able to document clusters of these features associated with both temporary and permanent habitation sites (1988:24). The findings of the Makena survey led Cordy and Athens to postulate that "...the area of Makena from about 0.25 miles inland (80 ft) up to the old forest line at the 1200 ft contour 2.1 miles inland was the cultivation zone" (Cordy and Athens 1988:23).

The findings of Schilt and Dobyns (1980), Cordy and Athens (1988), and this survey, clearly indicate that the barren zone was more extensively utilized by traditional Hawaiian agriculturalists than has been assumed. In addition, it appears that despite a much more extensive kula zone for Keokea (6.8 miles vs. 2.1 miles for Makena), a very similar pattern of agricultural land use was implemented in both areas. The agricultural zone in Keokea began at a lower elevation than that indicated for Makena, but at a similar linear distance from the coast. The absence of clear patterning within the project area could well be a function of the size of the study area and recent land alterations.

It is clear that erosion, cattle grazing, and grubbing have effectively diminished much of the archaeological record in the portion of the kula immediately mauka of Kihei and Wailea. Grubbing within and immediately around the project area has reduced the site count considerably within the last decade, as indicated by the loss of sites recorded in earlier surveys by Cordy (1977) and EISC (1982). The extant remains therefore represent a fraction of the features that were once present, and a portion of the actual activities are therefore represented.

On the basis of age determination analysis completed for other projects in leeward East Maui, it is likely that the features within the survey area post date c. AD 1500 (Dobyns 1988:27 and Cordy and Athens 1988).

Available historical information for Keokea indicates that there was a substantial population within the ahupua'a, with permanent residencies concentrated in the upland portion of the ahupua'a. This pattern could be a reflection of changes in land use that occurred in the nineteenth century. The documentation of permanent residencies in the lower kula zone for the Pre-Contact Period is a crucial factor in determining if, and to what extent, residential sites were at one time more evenly distributed over the landscape.

There were also undoubtedly trails connecting the uplands with the coast, with associated shelters and other features located along the trails which crossed the kula zone. No indication of transportation routes between the coastal and upland zones of Keokea was observed within the project area, probably due to historic land alteration and dense ground cover. The temporary habitation features located within the project area could have been associated with trail corridors, but could have also been associated with agricultural activities conducted within the area. The locations of these sites do not, therefore, provide clues as to the possible routes of muaka/makai trails.

### GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED GENERAL TREATMENTS

A summary of tentative general significance assessments is given (Table 6) in order to facilitate HSS/SHPO review and cultural resource management planning. Significance categories are based on the National Register criteria for evaluation, as outlined in the Code of Federal Regulations (36CFR Par 60). Sites determined to be potentially significant for information content (Category A, Table 6) are assessed under Criterion D, which defines significant resources as ones which "...have yielded, or may be likely to yield, information important in prehistory or history." Sites potentially significant as excellent examples of a unique site or site type (Category B) 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 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 historic depth." The guidelines further specify that "[a]

property need not have been in consistent use since antiquity by a cultural system in order to have a traditional cultural value."

Ten of the 16 sites identified within the project area during this survey contained a limited amount of information for the study of past cultural systems at the local and regional level. Information currently considered to be of potential use or value has been collected from these sites, and no further data collection is recommended at this time. Sites for which no further work is recommended include 1709, 1711, 2513, 2515, 2517, 2518, 2520, 2521, 2523, and 2524.

Six sites (1710, 2512, 2514, 2516, 2519, and 2522) are assessed as still containing information of value in the study of past cultural systems at the regional level. The information contained in these sites will aid substantially in the development of a new land use model for the lower elevation kula zone of leeward East Maui. Additional vegetation clearing, mapping, and excavation is recommended at these six sites. One of the six sites (2512) contains a feature that may represent a shrine (Feature D). If the specific function of this feature can be determined with additional field work, and if it is determined to be a shrine, then preservation of the feature "as is" is recommended.

In order to facilitate future client management decision regarding site treatments, sites are further evaluated in terms of three PHRI cultural resource management (CRM) value modes which are derived from the previously mentioned state and federal evaluation criteria. The archaeological sites are evaluated in terms of potential scientific research, interpretive, and/or cultural values. **Research value** refers to the potential of archaeological resources for producing information useful in the understanding of culture history, past lifeways, and cultural processes at the local, regional, and interregional levels of organization. **Interpretive value** refers to the potential of archaeological resources for public education and recreation. **Cultural value** refers to the potential of archaeological resources to preserve and promote cultural and ethnic identity and values. CRM value modes for specific sites are presented in Table 2.

It should be noted that the evaluations and recommendations presented within this final report have been based solely on a surface and limited subsurface inventory survey. There is always the possibility that potentially significant, unidentified subsurface cultural features or deposits will be encountered during the course of future archaeological investigations or subsequent development activities. In such situations, archaeological consultation should be sought immediately.

Table 6.

**SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS  
AND RECOMMENDED GENERAL TREATMENTS**

Site Number	Significance Category				Recommended Treatment			
	A	X	B	C	FDC	NFW	PID	PAI
1709	-	+	-	-	-	+	-	-
1711	-	+	-	-	-	+	-	-
2513	-	+	-	-	-	+	-	-
2515	-	+	-	-	-	+	-	-
2517	-	+	-	-	-	+	-	-
2518	-	+	-	-	-	+	-	-
2520	-	+	-	-	-	+	-	-
2521	-	+	-	-	-	+	-	-
2523	-	+	-	-	-	+	-	-
2524	-	+	-	-	-	+	-	-
<b>Subtotal:</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>10</b>	<b>0</b>	<b>0</b>
1710	+	-	-	-	+	-	-	-
2514	+	-	-	-	+	-	-	-
2516	+	-	-	-	+	-	-	-
2519	+	-	-	-	+	-	-	-
2522	+	-	-	-	+	-	-	-
<b>Subtotal:</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>
2512	+	-	-	*	+	-	-	*
<b>Subtotal:</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>Total:</b>	<b>6</b>	<b>10</b>	<b>0</b>	<b>1</b>	<b>6</b>	<b>10</b>	<b>0</b>	<b>1</b>

**General Significance Categories:**

- A = Important for information content, further data collection necessary (CRM value mode=research value);
- X = Important for information content, no further data collection necessary (CRM value mode=research value, SHPO=not significant);
- B = Excellent example of site type at local, region, island, state, or national level (CRM value mode=interpretive value); and
- C = Culturally significant (CRM value mode=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;
- 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/treatment; definite assessment pending further data collection

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## APPENDIX A

### SITE DESCRIPTIONS

**SITE NO:** State: 1709 PHRI: T-17  
**SITE TYPE:** Low enclosure  
**ELEVATION:** 62 ft AMSL  
**TOPOGRAPHY:** On a prominent natural knoll along the right bank of an ephemeral drainage channel  
**VEGETATION:** Thick California grass, koa-haole, kiawe  
**CONDITION:** Fair to good, north side affected by bulldozing  
**INTEGRITY:** A portion of the site has been destroyed; the remaining feature has been modified by surveyors  
**PROBABLE AGE:** Prehistoric with recent modifications  
**FUNCTIONAL INTERPRETATION:** Agriculture; survey station  
**DIMENSIONS:** Interior 2.80 m E-W by 1.70 m N-S; overall 3.90 m E-W by 3.20 m N-S by 0.60 m maximum wall height  
**DESCRIPTION:** This site was recorded by Cordy in 1977, prior to the construction of the Kihei School. At that time, two enclosures were observed and mapped. The northwestern enclosure has since been dozed away, along with a portion of the knoll. A surveyor's datum is currently present inside the remaining enclosure. It has been recently cleared on the interior and the wall has been modified slightly.

The enclosure consists of rough boulders and cobbles arranged in a loosely stacked oval wall, with incorporated bedrock outcrops. It is situated on the eastern crest of a small knoll, overlooking a narrow drainage channel that is c. 3.00 m below the level of the site.

The northeastern side of the enclosure is stacked up to three courses high and has an average height of 0.50 m; width is 1.15 m. The northern side is primarily natural bedrock which averages 0.34 m high from the interior side. The south and west sides are less substantial and consists of 102 courses on exposed bedrock. A small entrance path lies on the east side.

The interior area has been cleared of rock, with the exception of a small cairn of cobbles arranged around a surveyor's datum pipe, located in the center of the floor.

**SITE NO:** State: 1710 PHRI: T-15 (*Figure A-1*)  
**SITE TYPE:** Enclosure  
**ELEVATION:** 38 ft AMSL  
**TOPOGRAPHY:** On the west side of a prominent vertical rock face, at the base of a ridge formation  
**VEGETATION:** Thick California grass, kiawe

**CONDITION:** Enclosure good to fair, associated features bulldozed  
**INTEGRITY:** Unaltered  
**PROBABLE AGE:** Prehistoric  
**FUNCTIONAL INTERPRETATION:** Agriculture or possibly temporary habitation  
**DIMENSIONS:** Interior area 10.00 m N-S by 10.20 m E-W; overall 15.00 m N-S by 13.00 m E-W by 1.56 m maximum wall height  
**DESCRIPTION:** This roughly square enclosure has three free-standing walls and one (east) wall that is mostly a natural rock face. The walls consist of boulders and cobbles and are generally bifaced with core filling of small cobbles and pebbles.

The eastern portion of the south wall is 0.85 m wide and 0.9 m high on the interior side, 0.40 m high on the exterior side. The faced sides are stacked up to six courses high. At the west end of the south wall, interior height is 0.42 m and exterior height is 0.15 m. This section of the wall appears to be disturbed.

The western wall is vertically stacked and faced on the interior side, 0.65 to 0.37 m above the interior surface. The exterior side of this wall slopes outward and downhill, and is 0.90 to 0.30 m high. Overall wall width from base to base is 1.50 m; the top to the wall is 1.00 m wide. At the northwestern corner, the wall is level with the interior surface and 0.60 m above the exterior surface.

The north wall has a narrow (0.60 m) entrance in the center. Interior wall height at the entrance is 0.20 m and exterior wall height is 0.60 m. At the northeastern corner, the wall is 0.80 m high on the exterior side and 0.70 m high on the interior side.

A 3.00 m long section of the eastern wall is free-standing, the remainder consists of alignments and stacked cobbles placed in cracks or open areas along the bedrock face. This is the highest portion of the enclosure; interior height ranges from 1.56 to 1.35 m. Exterior height of the stacked portions averages 0.10 m along the top of the rock face.

The interior of the enclosure is a sloping surface, with the highest portion along the north wall. Very few partially buried cobbles are present inside. The soil consists of sandy

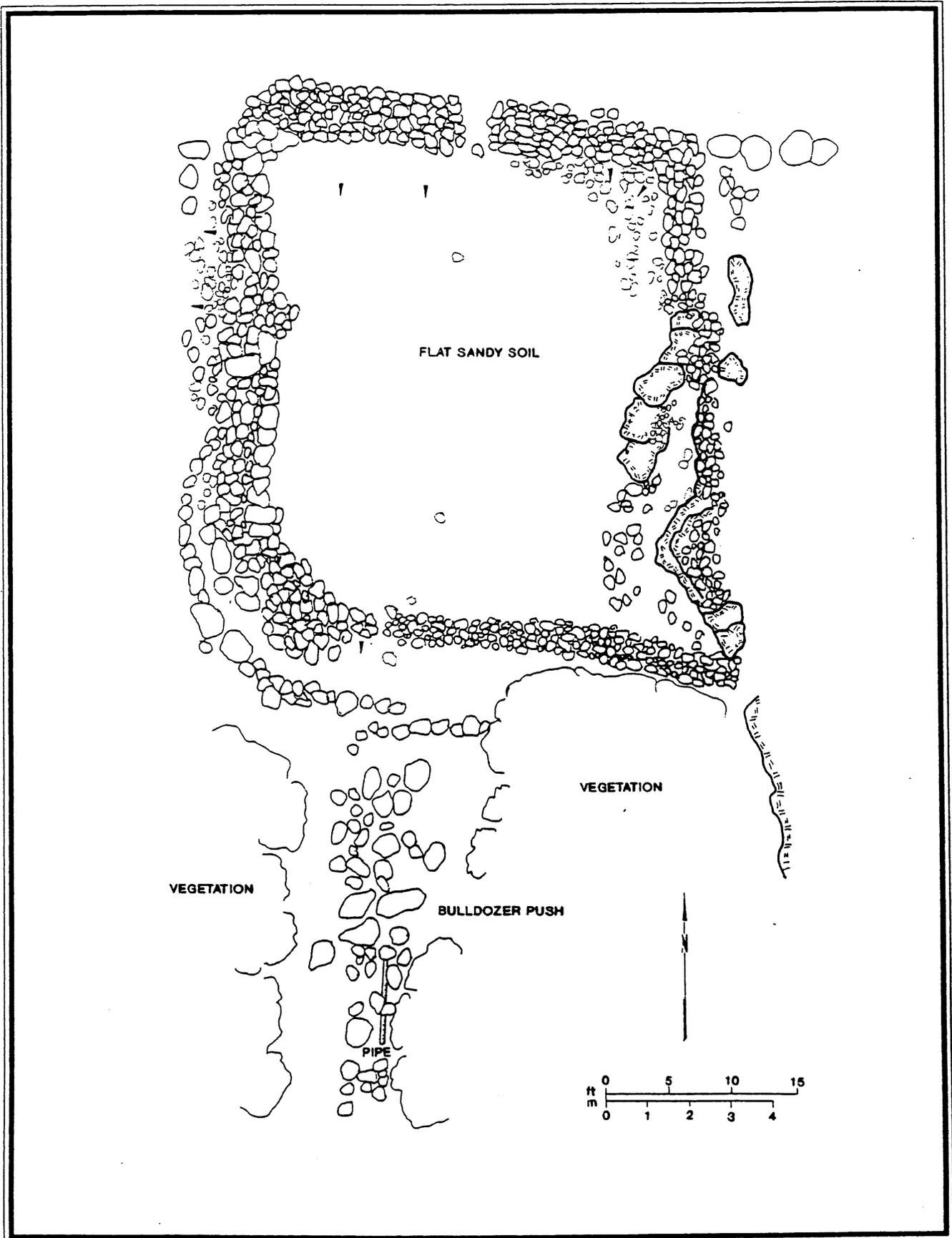


Figure A-1. SITE 1710 (T-15)

loam mixed with aeolian beach sand. No portable remains were observed on the surface inside the enclosure.

A terrace alignment is present at the base of the southwestern corner and south wall. The alignment consists of boulders and cobbles and is raised 0.50 m above the adjacent surface to the south. The area between the alignment and the enclosure wall is relatively flat, with small cleared patches.

Immediately to the south of the enclosure is a linear arrangement of bulldozed boulders and cobbles, intermixed with ceramic drainage tile. The relationship between this disturbed feature and the enclosure (if any) cannot be determined until additional vegetation clearing is conducted. It is possible that additional terraces are also present nearby.

**SITE NO:** State: 1711 PHRI: T-3 (*Figure A-2*)  
**SITE TYPE:** Complex (2 features)  
**ELEVATION:** 53 ft AMSL  
**TOPOGRAPHY:** Relatively level coral pan, slight western exposure  
**VEGETATION:** Thick grass, burned kiawe, koa-haole  
**CONDITION:** Fair; eroded and possibly affected by machinery  
**INTEGRITY:** Generally unaltered  
**PROBABLE AGE:** Prehistoric  
**FUNCTIONAL INTERPRETATION:** Agriculture  
**DIMENSIONS:** Overall site, 21.00 m NW-SE by 8.00 m NE-SW  
**DESCRIPTION:** A low enclosure (Feature A) and a C-shape (Feature B) were identified at this site. The features are spaced 13.20 m apart on a NW-SE axis. Portable remains observed at the site include two waterworn basalt cobbles. No midden remains were identified on the surface or in the subsurface test unit.

Feature B corresponds with the previously recorded SIHP site 1710 and with EISC site 2. The enclosure was not previously recorded.

**FEATURE A:** Low enclosure  
**FUNCTION:** Agriculture  
**DIMENSIONS:** Interior, 3.80 m N-S by 3.80 m E-W; overall 4.50 m N-S by 5.00 m E-W by 0.40 m maximum wall height  
**DESCRIPTION:** Feature A is a circular enclosure consisting of loosely stacked angular basalt and aa cobbles. The wall is stacked up to three courses high in places, and is a single course alignment along the east side. The interior area is mostly cleared of loose rubble and is leveled soil, raised slightly above the surrounding terrain. Wall height is

generally higher along the exterior side, where it averages 0.30 to 0.40 m high. Along the interior side, the wall averages 0.15 m high.

A 0.50 by 0.50 m square test unit was excavated into the soil deposit inside Feature A. Two culturally sterile soil layers were identified. Layer I, from surface to 0.06 m below surface, consists of dark yellowish-brown sandy silt. Layer II, from 0.06 to 0.15 m below surface, consists of silty clay loam with sand intermixed. This layer overlies extremely gravely decomposing bedrock. The only non-matrix material recovered from the screened soil was charcoal from a burned kiawe stump located adjacent to the test unit.

Two waterworn basalt cobbles lay at the eastern side of the interior, near the lowest portion of the wall. The stones are partially buried and scarred from what appears to be a bulldozer track.

**FEATURE B:** C-Shape  
**FUNCTION:** Probable agriculture  
**DIMENSIONS:** Interior, 2.00 m N-S by 1.50 m E-W; overall, 3.00 m N-S by 3.50 m E-W by 0.40 m maximum wall height  
**DESCRIPTION:** Feature B is a C-shaped wall which nearly forms a small enclosure. The wall is built up on the north side, and opens to the south, with a 1.00 m wide opening. The wall consists of aa cobbles and small angular basalt boulders loosely stacked up to three courses high. Width of the wall is greatest at the northern side, where it ranges from 1.00 to 0.50 m wide.

A deposit of loamy sand occurs within the wall, and covers an area 1.50 m in diameter in the center of the feature. The deposit was probed and found to be c. 0.15 m thick. No evidence of cultural remains could be located on the surface or in the upper layer of the deposit. Loamy sand also occurs immediately outside of the wall to the east.

**SITE NO:** State: 2512 PHRI: T-2 (*Figure A-3*)  
**SITE TYPE:** Complex (5 features)  
**ELEVATION:** 76 ft AMSL  
**TOPOGRAPHY:** Along the crest and west-facing upper slope of a knoll, at the northern edge (right bank) of a steep drainage gulch  
**VEGETATION:** Thick California grass, scattered kiawe  
**CONDITION:** Affected by slope erosion  
**INTEGRITY:** Original construction altered by erosion  
**PROBABLE AGE:** Prehistoric  
**FUNCTIONAL INTERPRETATION:** Agriculture, possible habitation or shrine  
**DIMENSIONS:** Overall site, 15.00 m N-S by 14.00 m E-W

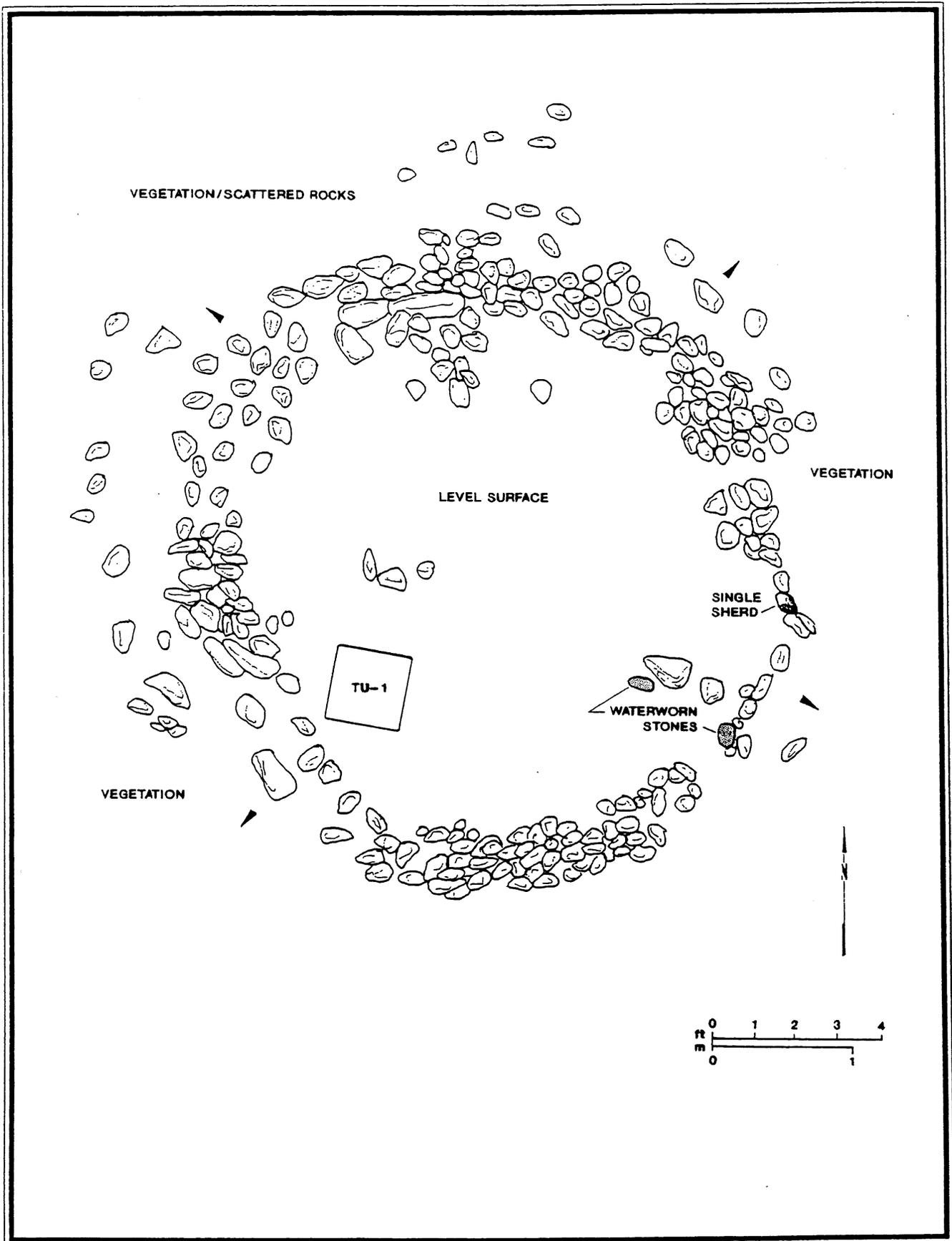


Figure A-2. SITE 1711 (T-3)

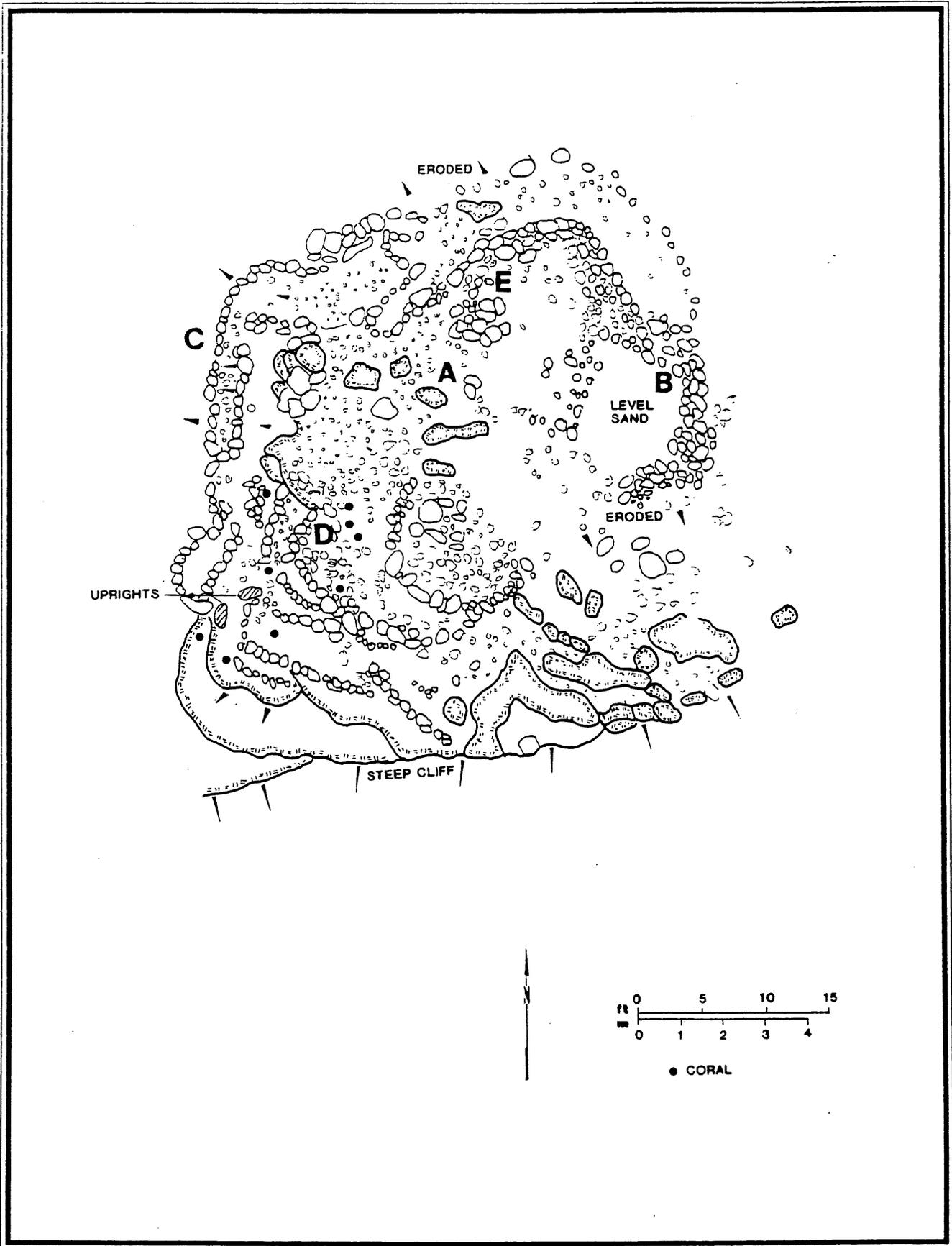


Figure A-3. SITE 2512 (T-2)

**DESCRIPTION:** This complex consists of a low, eroded platform (Feature A) that has a small enclosure (Feature B) at the southeastern corner. Two sets of terraces (Features C and D) are located below the western sides of the platform, along the slope of the knoll. A small rock mound (Feature E) is present on the platform.

The drainage gulch adjacent to the site has vertical, rock-faced sides. The streambed is c. 24 ft below the level of the site. At the time of survey, two water pools were visible in the streambed from the site. This is the only location of surface water observed within the project area.

**FEATURE A: Platform**

**FUNCTION:** Habitation or shrine

**DIMENSIONS:** 9.00 m NE-SW by 6.50 m NW-SE by 0.90 m maximum height

**DESCRIPTION:** Feature A appears to have been a rectangular platform situated on the crest of a small knoll, c. 1.20 m above surrounding terrain. The perimeter is intact at the northern, western and southern corners, and along the northeast-facing side. Other sections of the perimeter have been washed out by slope erosion or possibly moved during later modifications. Intact portions of the perimeter consist of stacked boulders and cobbles that average 0.25-0.30 m in height. The western corner incorporates a bedrock face, and is 0.90 m high. The surface of the feature is level; the western half is covered with small gravels and the eastern half is dark reddish-brown gravelly silt loam, leveled in places.

A small D-shaped terrace is present at the southern corner of the platform. This terrace is defined by a curved perimeter alignment along the west side, which raises the surface 0.15 m above the surrounding platform surface. The small terrace surface is littered with boulders and cobbles, some of which appear to be disturbed.

Downslope from the platform on the northern and southeastern side is a scattered deposit of small gravels and sparse fragments of Cypraeidae shell that appear to have washed off the platform. A considerable amount of soil also appears to have eroded from the top of the feature.

Three pieces of branch coral are present at the southwestern edge of the platform, adjacent to the Feature D terraces, which contains additional pieces of coral.

**FEATURE B: Low enclosure**

**FUNCTION:** Possible agriculture

**DIMENSIONS:** Interior area 2.90 m N-S by 2.40 m E-W;

overall 4.20 m N-S by 4.10 m E-W by 0.30 m maximum wall height

**DESCRIPTION:** Feature B is situated at the eastern corner of Feature A, and may represent a later modification to the original structure. The eastern wall of Feature B connects with the platform perimeter at the northern end of the enclosure. The southern side of the enclosure is also the southeastern side of the platform. Portions of the enclosure wall are up to 0.70 m wide and consist of two parallel boulder alignments with core filling. Other portions of the wall are loosely piled cobbles and boulders, or a single alignment of boulders.

The interior of the enclosure is cleared of all stones, and consists of level, light reddish-brown sandy loam with little to no gravel. The soil here contrasts with the soil present on most of the adjacent features. No portable remains were observed inside the enclosure. The interior surface is raised slightly above the platform surface and the adjacent ground to the east.

No opening is apparent in the low wall. The western side is in poor preservation, and the interior surface is nearly level with the top of the wall along this side.

**FEATURE C: Terrace**

**FUNCTION:** Agriculture/landscaping

**DIMENSIONS:** 8.90 m N-S by 1.50 m E-W by 0.30 m maximum height

**DESCRIPTION:** Feature C is a long, narrow terrace situated along the western slope of the knoll, immediately downslope from the Feature A platform. The terrace may have extended around the northern base of the platform at one time; this area is presently very eroded and only traces of a possible perimeter are currently discernable. The terrace riser (along the downhill side) is defined by aligned boulders and stacked cobbles. The back of the terrace (uphill side) is defined by a vertical bedrock face with stacked boulders and cobbles on the north end, and by the Feature D terraces on the south end.

Most of the interior surface area of the terrace is cleared of surface stone and leveled, with dark reddish-brown silty loam soil. No portable remains were observed on this terrace.

**FEATURE D: Terraced slope**

**FUNCTION:** Agriculture/landscaping; possible shrine

**DIMENSIONS:** 7.00 m NW-SE by 4.00 m NE-SW by 1.02 m maximum height

**DESCRIPTION:** At the southern end of Feature C, immediately upslope, is a series of small semicircular alignments arranged in five levels along a relatively steep portion of the knoll slope. The upper level of the feature is a small soil flat (2.00 by 0.50 m) adjacent to and just below the platform (Feature A) surface. The perimeter for this level is raised 0.20 m above the lower level to the west, and consists of cobbles and branch coral heads. A narrow flat is present around the base of this perimeter (3.00 by 0.30 m), which is defined by aligned cobbles 0.35 m above the adjacent, lower level. A single large branch coral head is incorporated into this riser.

A third soil flat (3.00 by 0.80 m) is present below the narrow terrace. This level is raised 0.32 m above the level below. At the northern end of this flat are two positioned upright slabs, both of which are 0.60 m high. The slabs are 0.40 m apart and define the southern end of a fourth small soil flat, which is raised 0.22 m above the Feature C terrace. Coral is scattered around the uprights and on the lower level soil flats. The lower terrace alignments are positioned on exposed bedrock.

**FEATURE E: Rock mound**

**FUNCTION:** Indeterminate/possible clearing pile

**DIMENSIONS:** 1.50 m NE-SW by 1.20 m NW-SE by 0.20 m maximum height

**DESCRIPTION:** This low rock mound (or pile) is located near the center of the Feature A platform, along the northwestern side. It consists of loosely piled boulders and cobbles, and is situated along the western edge of the cleared portion of the platform surface. The feature may represent a clearing pile; as such, it would probably be a later modification to the original platform.

**SITE NO:** State: 2513 PHRI: T-4 (*Figure A-4*)

**SITE TYPE:** Low enclosure

**ELEVATION:** 88 ft AMSL

**TOPOGRAPHY:** On relatively flat, broad terrace, c. 25.00 m from highway

**VEGETATION:** Thick California grass, dead kiawe

**CONDITION:** Fair to good, some erosion damage and wall displacement

**INTEGRITY:** Generally unaltered; evidence of bulldozing nearby

**PROBABLE AGE:** Prehistoric

**FUNCTIONAL INTERPRETATION:** Agriculture

**DIMENSIONS:** Interior, 2.70 m N-S by 2.00 m E-W; overall, 4.30 m N-S by 3.40 m E-W by 0.35 m maximum wall height

**DESCRIPTION:** This roughly oval-shaped enclosure consists of loosely piled basalt cobbles and boulders. Portions of the perimeter consist of a single course alignment, and

portions are piled up to four courses high. The perimeter incorporates exposed bedrock in places, and the lower course of the wall is partially to almost completely buried. Maximum wall height (0.35 m) is on the interior side and the northwestern corner. Maximum exterior wall height is 0.25 m. Wall width averages 0.60 to 0.70 m.

The interior of the enclosure is level and generally cleared of rubble, except for a small concentration partially buried cobbles near the center and scattered surface cobbles. The interior surface is depressed c. 0.05-0.10 m below the surrounding terrain outside the wall.

A 0.50 by 0.50 m square test unit was excavated at the northwestern end of the enclosure, where the soil deposit was determined by probing to be deepest. Soil here was also darker than other soil inside the enclosure. This difference was later determined to be the result of tree burning.

Three culturally sterile soil layers were identified in the test unit. Layer I, from surface to 0.03 m below surface, is black silty loam. Layer II, from 0.03 to 0.07 m below surface, is a strong reddish-brown gravelly silty loam.

Layer III, from 0.07 to 0.21 m below surface, is dark brown gravelly silty clay loam. The size and density of rock inclusions increases to cobble size in this layer, beginning at 0.10 m below surface. Layer II overlies generally impenetrable decomposing bedrock. No portable remains were recovered from the screened soil.

**SITE NO:** State: 2514 PHRI: T-6 (*Figure A-5*)

**SITE TYPE:** Platform

**ELEVATION:** 70 ft AMSL

**TOPOGRAPHY:** On a flat-topped knoll along the edge of a natural terrace, overlooking a broad drainage area

**VEGETATION:** Extremely thick California grass, sparsely scattered kiawe

**CONDITION:** Fair to good, affected by erosion

**INTEGRITY:** Unaltered

**PROBABLE AGE:** Prehistoric

**FUNCTIONAL INTERPRETATION:** Possible habitation

**DIMENSIONS:** Platform surface 4.50 m N-S by 4.00 m E-W; overall, 10.00 m E-W by 9.00 m N-S by 1.80 m maximum height

**DESCRIPTION:** The platform is situated on a level knoll and incorporates natural bedrock outcrops present along the slope and crest of the knoll. The perimeter consists of aa boulders and vesicular pahoehoe boulders and cobbles. The western side is terraced, and extends horizontally 5.25 m out from the platform surface. The eastern side is vertically stacked, with a maximum width of 0.75 m.

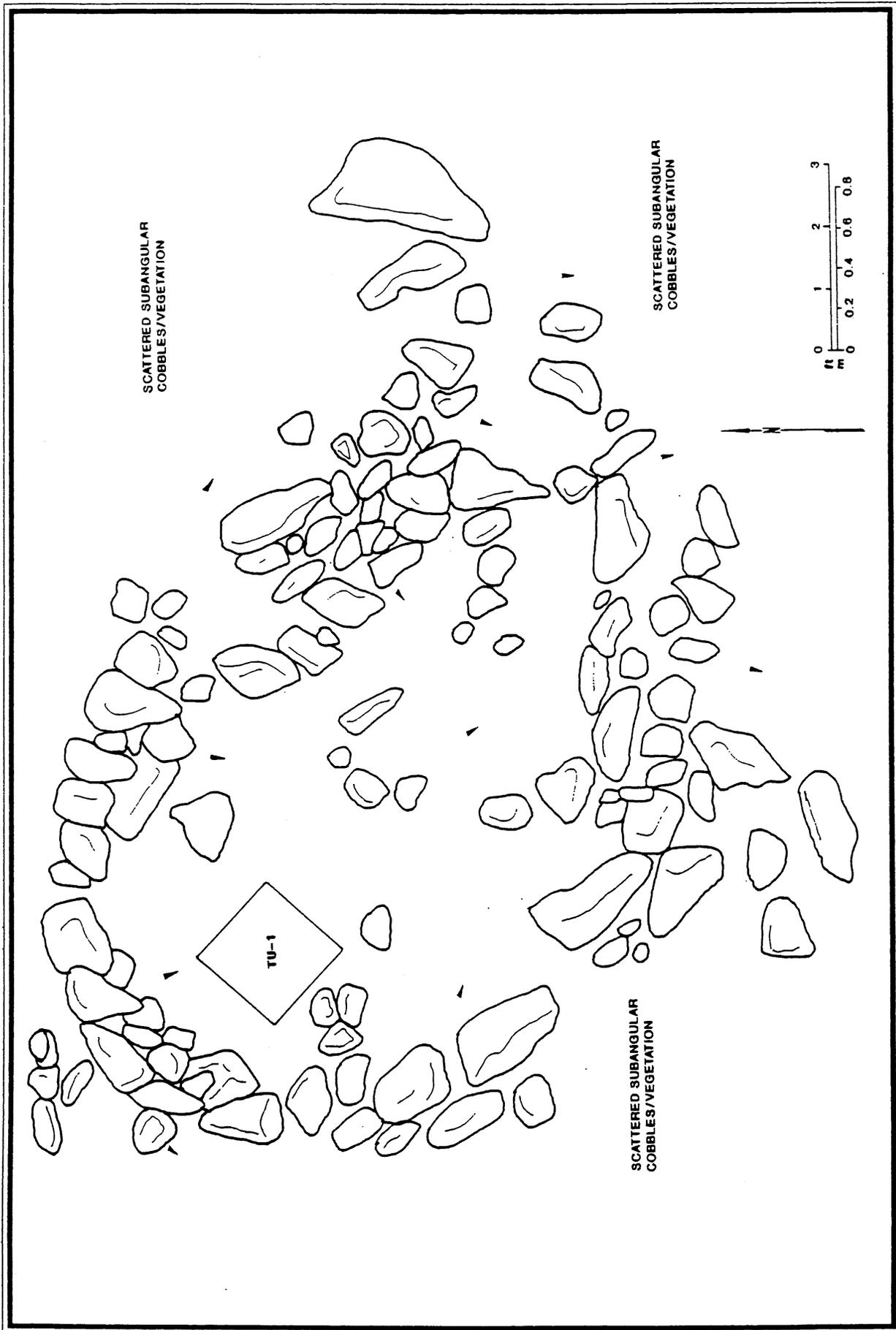


Figure A-4. SITE 2513 (T-4)

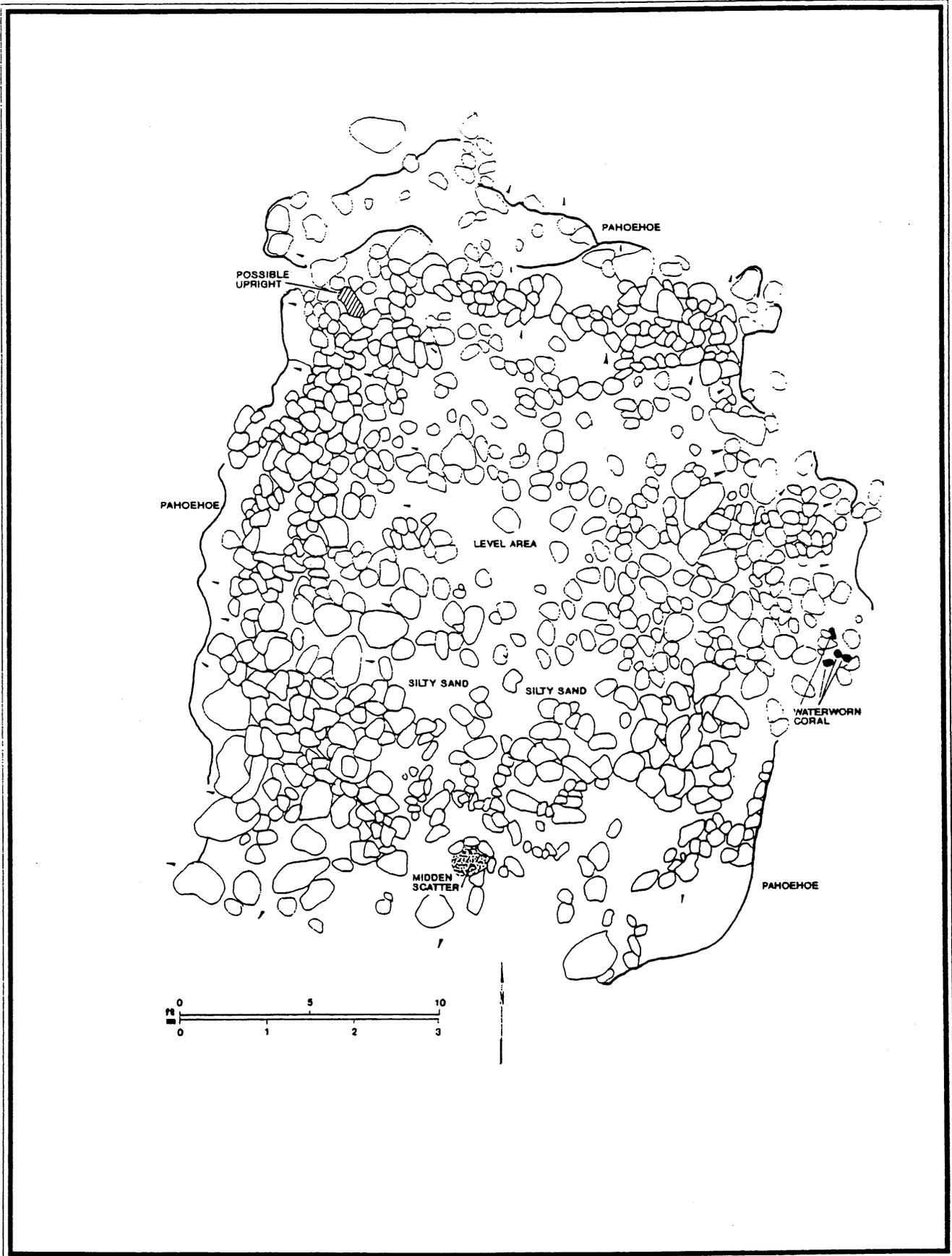


Figure A-5. SITE 2514 (T-6)

The platform surface is level, but irregular, due to protruding, partially buried stones. No pavement is evident. Sparsely scattered Cypraeidae shell fragments are present on the platform, in addition to several waterworn basalt pebbles. Pockets of reddish-brown sandy loam are present on and adjacent to the platform.

Additional terrace alignments may well be present along the natural terrace slope, to the north and south sides of the platform. These features will only be identified through extensive vegetation clearing.

**SITE NO:** State: 2515 PHRI: T-7  
**SITE TYPE:** Modified outcrop  
**ELEVATION:** 80 ft AMSL  
**TOPOGRAPHY:** On a south-facing knoll, along the edge of a natural terrace  
**VEGETATION:** Thick California grass  
**CONDITION:** Fair  
**INTEGRITY:** Questionable, in area of considerable dozer disturbance  
**PROBABLE AGE:** Indeterminate  
**FUNCTIONAL INTERPRETATION:** Indeterminate  
**DIMENSIONS:** 4.00 by 4.00 m  
**DESCRIPTION:** This site consists of two very minor rock alignments arranged on and adjacent to natural bedrock outcrops. The westernmost alignment is 1.00 m long and consists of a large boulder and two cobbles. The eastern alignment is 2.54 m long, and is located 3.5 m from the former. Numerous loose boulders and cobbles are scattered on the surface in this area, suggesting the former presence of additional surface features that have been disturbed. The alignments are probably the remnants of a more complex feature or features. Soil on the site is reddish-brown silty loam. No portable remains were observed on the surface.

**SITE NO:** State: 2516 PHRI: T-8 (*Figures A-6 and A-7*)  
**SITE TYPE:** Complex (2 features)  
**ELEVATION:** 62 ft AMSL  
**TOPOGRAPHY:** On a low, protected flat at the base of a steep, west-facing slope  
**VEGETATION:** Thick California grass  
**CONDITION:** Good to fair  
**INTEGRITY:** Appears unaltered  
**PROBABLE AGE:** Prehistoric  
**FUNCTIONAL INTERPRETATION:** Temporary habitation, possible agriculture  
**DIMENSIONS:** Overall site, 16.00 m N-S by 5.00 m E-W  
**DESCRIPTION:** Two low enclosures were identified at this site. Feature A is a circular enclosure and Feature B is roughly rectangular. They are located 6.50 m apart, along a N-S line. Feature A is the northernmost enclosure. Subsurface midden remains were collected from Feature B.

**FEATURE A:** Low enclosure

**FUNCTION:** Agriculture

**DIMENSIONS:** Interior, 2.05 m N-S by 2.00 m E-W; overall 3.80 m N-S by 4.70 m E-W by 0.45 m maximum wall height

**DESCRIPTION:** Feature A is a doughnut-shaped wall consists of loosely piled or mounded aa cobbles. A portion of the wall (northwest side) is stacked up to four courses high, but is not formally faced. This section has the highest exterior wall height (0.45 m). Average exterior wall height is 0.10 m, and average interior wall height is 0.20 m. Width of the wall varies from 0.90 to 1.40 m.

The interior area is level and free of surface stones, however, numerous buried stones are slightly protruding. Reddish-brown silty loam that is slightly darker than exterior soil is present inside the feature. No portable remains were found inside, however, two Cypraeidae fragments were observed outside, along the adjacent hillside to the east.

No obvious opening is present in the wall, however, there is a 2.00 m wide section at the south side that consists of a partially buried alignment with few surface stones. This section of the wall is considerably narrower than other sections.

**FEATURE B:** Low enclosure

**FUNCTION:** Temporary habitation

**DIMENSIONS:** Interior 4.80 m N-S by 2.70 m E-W; overall 6.00 m N-S by 4.40 m E-W by 0.40 m maximum wall height

**DESCRIPTION:** This enclosure is roughly rectangular in plan view, with the major axis oriented N-S. The wall consists of stacked cobbles and a single course of boulders turned on edge. Portions of the wall appear to have been double alignments (possibly bifaced) with core filling. Maximum wall height (0.40 m) is on the exterior side of a large boulder set on edge. This boulder is located at the southeastern corner of the wall, where four large boulders are concentrated. A 1.75 m wide opening is present in the center of the west side of the enclosure. Large boulders are set on end at both sides of this opening.

The interior area is flat and cleared of nearly all surface stones; no buried stones are indicated under the leveled soil floor. A 0.50 by 0.50 m square test unit was excavated near the center of the enclosure. Three soil layers were encountered, one of which (Layer II) contained cultural remains.

Layer I extends from the surface to 0.10 m below surface and consists of dark reddish-brown silty clay loam with a moderate amount of pebble-size gravels. Layer II

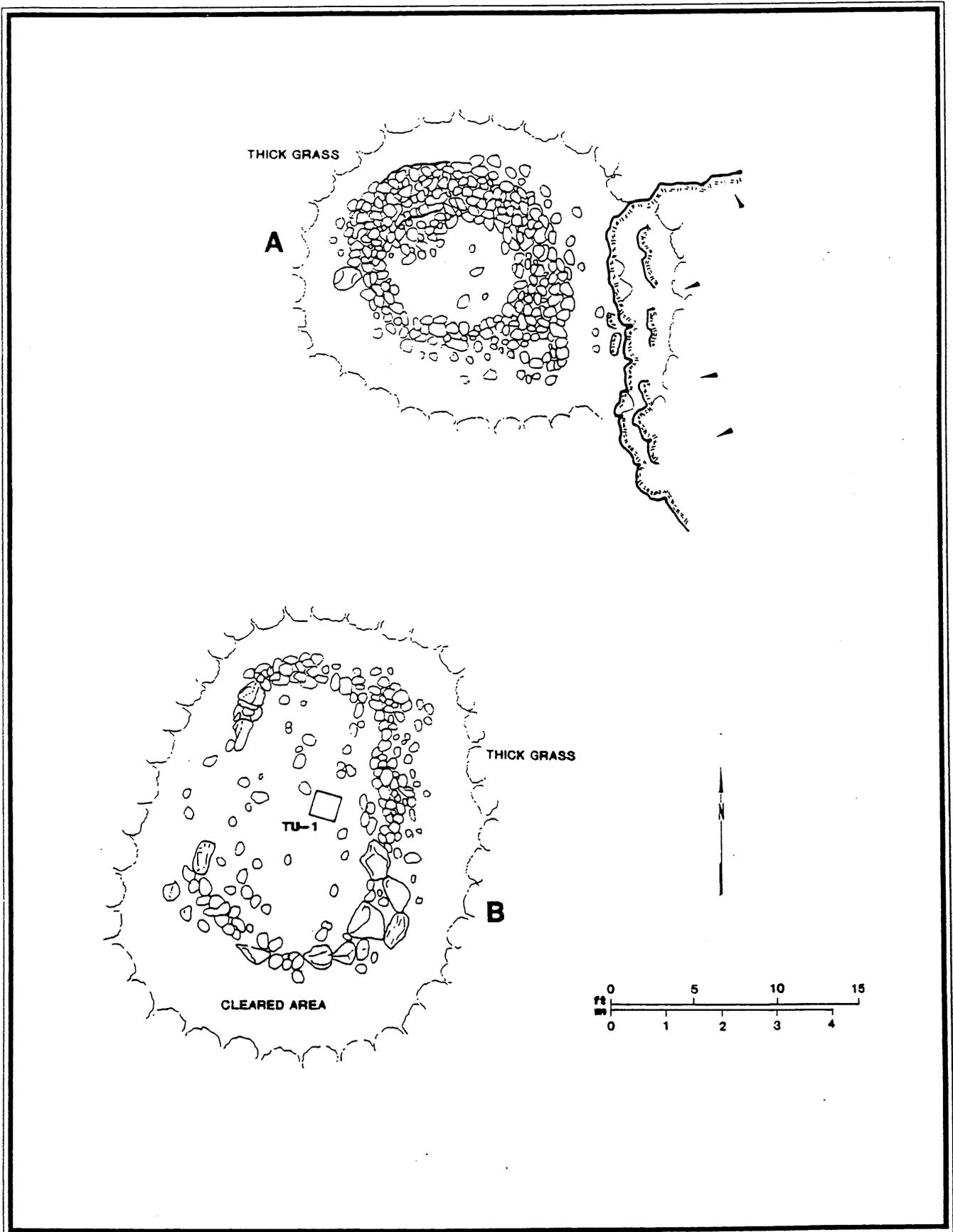


Figure A-6. SITE 2516, FEATURES A AND B (T-8)

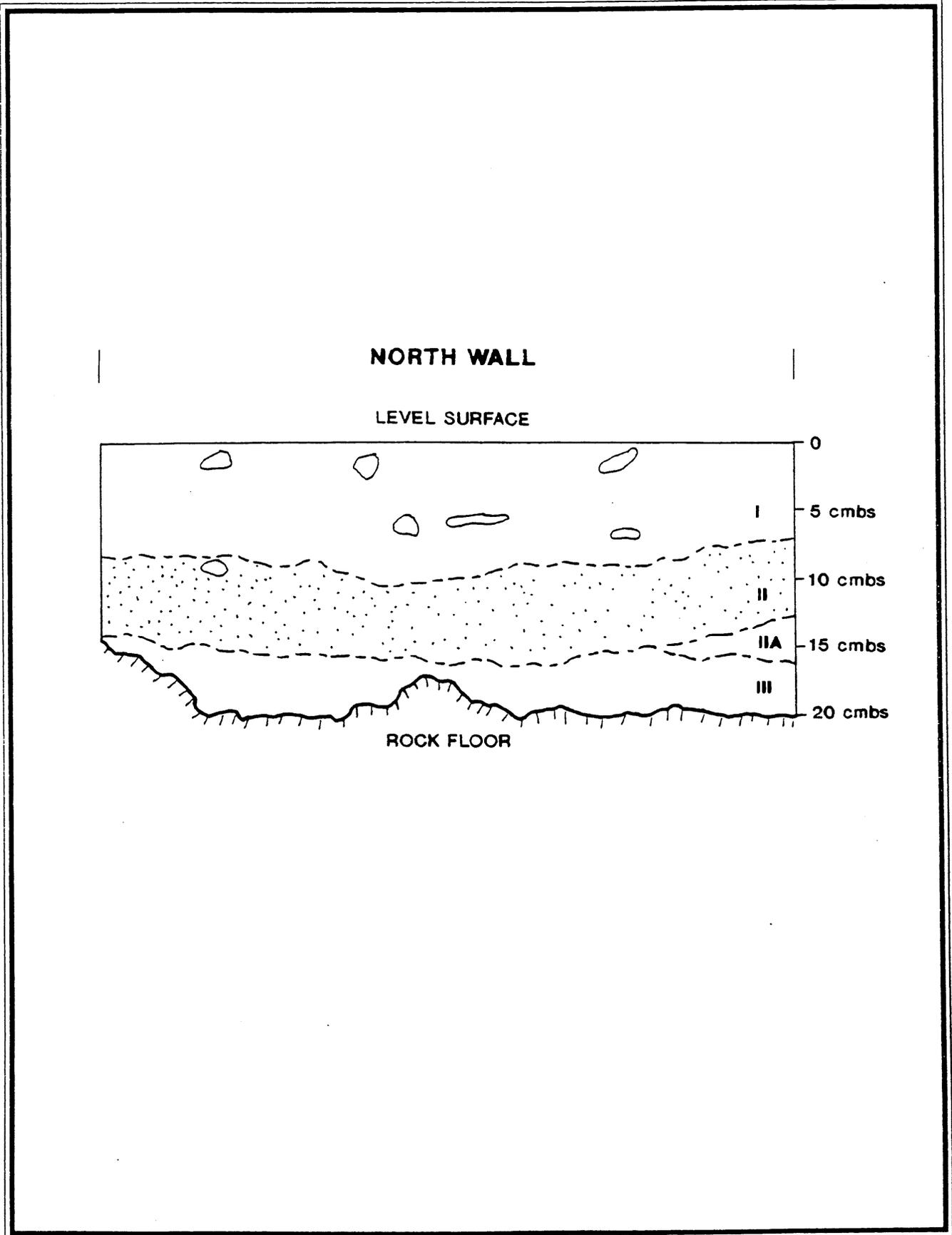


Figure A-7. SITE 2516, FEATURE B, TEST UNIT. NORTH WALL PROFILE.

extends from 0.10 to 0.19-0.21 m below surface and consists of dark reddish-brown silty clay with very few pieces of gravel. The boundary between Layers I and II is very diffuse, as is the boundary between Layers II and III. Layer III extends from 0.19-0.21 to 0.26 m below surface and consists of reddish-brown silty clay with densely packed large pebbles and small cobbles. This layer overlies impenetrable decomposing bedrock.

Portable remains recovered from screened Layer II soil include minute basalt and volcanic glass waste flakes (one of each), wood charcoal, Echinoidea, Crustacea, Cypræidae, and *Brachidontes c.* (quantities tabulated in subsurface findings section). All of the recovered portable remains are less than 1/4 inch in size. A single minute piece of Crustacea was recovered from the Layer III soil.

**SITE NO:** State: 2517 PHRI: T-9

**SITE TYPE:** Midden scatter

**ELEVATION:** 82 ft AMSL

**TOPOGRAPHY:** Along the gently sloping west face of a broad, shallow drainage area, c. 50.00 m upslope from Site T-8.

**VEGETATION:** Thick California grass, scattered kiawe

**CONDITION:** Poor, eroded

**INTEGRITY:** Original condition and nature indeterminate

**PROBABLE AGE:** Prehistoric

**FUNCTIONAL INTERPRETATION:** Habitation

**DIMENSIONS:** 20.00 m N-S by 20.00 m E-W

**DESCRIPTION:** The site consists of a very sparse surface scatter of Cypræidae and Conidae shell fragments. No definable area of concentration could be determined within the site boundaries. The surface here is deflated and nearly all soil has been washed away. It is very unlikely that subsurface deposits are present, and impossible to determine if the surface materials represent primary or secondary deposition.

**SITE NO:** State: 2518 PHRI: T-10 (*Figure A-8*)

**SITE TYPE:** Complex (4 features)

**ELEVATION:** 96 ft AMSL

**TOPOGRAPHY:** Along the crest and upper slopes of a linear ridge

**VEGETATION:** Thick California grass

**CONDITION:** Fair to poor, portions affected by bulldozing

**INTEGRITY:** Original site area indeterminate

**PROBABLE AGE:** Prehistoric

**FUNCTIONAL INTERPRETATION:** Agriculture

**DIMENSIONS:** 15.00 m E-W by 7.80 m N-S

**DESCRIPTION:** The site is currently comprised of two terraces (Features A and B), a rock pile (Feature C), and an alignment (Feature D). The eastern portion of the ridge is

within the Piilani Highway corridor, and has been bulldozed flat. Portions of the site to the west of the corridor are also bulldozed, particularly the northern slope of the ridge.

**FEATURE A:** Terrace

**FUNCTION:** Agriculture

**DIMENSIONS:** 6.90 m N-S by 3.5 m E-W by 1.38 m overall height

**DESCRIPTION:** Feature A is a stepped terrace situated around the western point of the ridge, near the base of the relatively steep upper slope section. It is parabolic in plan view, and is 6.90 m across the widest (east) portion. The retaining wall/alignment is most distinct on the south slope, where boulders were used with existing bedrock outcrops in construction of a section 3.50 m long. This section forms an upper level that is 0.68 m above the next stepped surface. There is a circular (1.10 m in diameter) cleared soil flat behind this section of the riser.

Below the upper level is a second step, formed by a curved alignment of cobbles and small boulders. This alignment is 1.50 m long and defines a semicircular flat 0.40 m wide. It is 0.10 m above the next stepped surface. Below this level is an eroded step, defined by aligned cobbles and patches of exposed bedrock raised 0.05 m above adjacent ground. The surface behind this alignment is washed out and consists of gravely silt loam with scattered cobbles. Overall length of the alignment is 5.0 m. The lowest terrace step is also eroded. It is formed by a curved alignment 3.50 m long and 0.10 to 0.16 m high.

**FEATURE B:** Terrace

**FUNCTION:** Agriculture

**DIMENSIONS:** 4.50 m E-W by 2.00 m N-S by 0.60 m maximum height

**DESCRIPTION:** Feature B is a stepped terrace consisting of aligned boulders along the south slope of the ridge. The upper level is located near mid-slope; the back is defined with exposed bedrock and the contained soil flat is 1.30 m wide. At the eastern end of the step is a small pile of large cobbles; these are placed on the retaining boulders.

The lower level is defined with aligned cobbles and two boulders set on edge, located at the east and west ends of the step. The soil flat here is 0.30 m wide and 3.60 m long. The central portion of the retaining alignment has washed downslope.

**FEATURE C:** Rock pile

**FUNCTION:** Agriculture

**DIMENSIONS:** 1.10 m E-W by 0.78 m N-S by 0.60 m maximum height

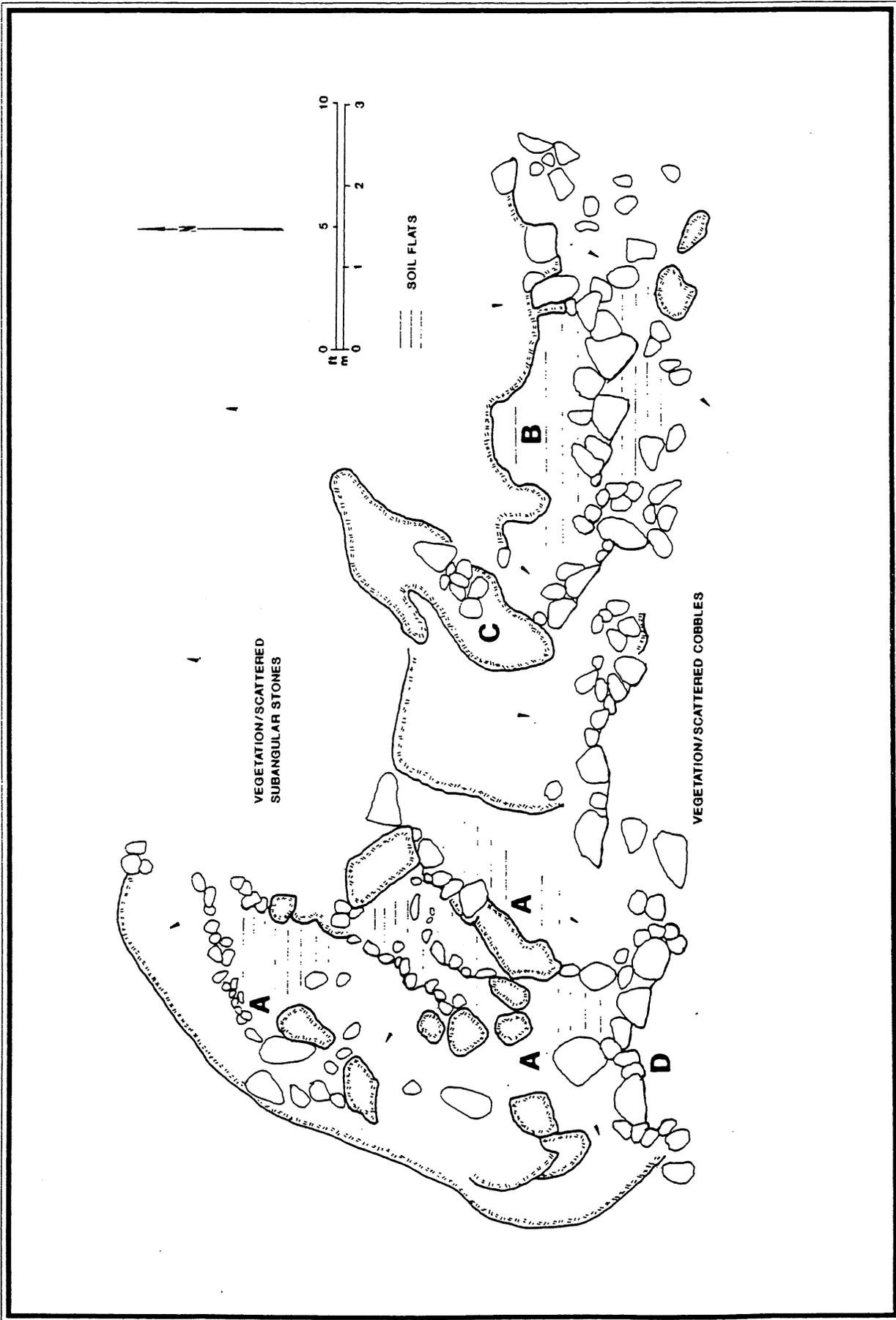


Figure A-8. SITE 1710 (T-15)

**DESCRIPTION:** Feature C consists of about six boulders and large cobbles stacked against the south side of a naturally upright bedrock formation. The pile is located on the top of the ridge, near the center of the site. Little to no soil is present in this area. The pile may represent an accumulation of rocks cleared from the adjacent terraces.

**FEATURE D: Alignment**

**FUNCTION:** Agriculture

**DIMENSIONS:** 2.17 m E-W by 0.50 m N-S by 0.45 m maximum height

**DESCRIPTION:** This alignment extends southwest from the south end of the Feature A terrace. It is comprised of nine large cobbles and a boulder, all of which are set on the ground surface. Portions of the alignment are on exposed bedrock.

**SITE NO:** State: 2519 PHRI: T-11

**SITE TYPE:** Terrace

**ELEVATION:** 70 ft AMSL

**TOPOGRAPHY:** Along the upper west-facing slope of a knoll, situated at the edge of a natural terrace, overlooking a small drainage basin

**VEGETATION:** Thick California grass, scattered kiawe

**CONDITION:** Good to fair

**INTEGRITY:** Appears unaltered

**PROBABLE AGE:** Prehistoric

**FUNCTIONAL INTERPRETATION:** Agriculture

**DIMENSIONS:** 7.5 m E-W by 5.0 m N-S (partial)

**DESCRIPTION:** This site consists of a stepped terrace system constructed around the contours of a natural terrace and knoll. Three levels were identified at the time of this survey, and it appears that additional levels are present, obscured by vegetation. The lower level contains a triangular, rock-filled terrace 0.15 m high, adjacent to a narrow drainage channel (possibly artificial). This terrace is 3.00 m long and 1.80 m wide. The two upper levels consist of aligned cobbles and small boulders; narrow soil flats are present immediately behind (upslope) the risers.

Additional vegetation clearing is needed in order to determine the extent and structure of this site. It may adjoin Site T-14, currently located c. 20 m to the north.

**SITE NO:** State: 2520 PHRI: T-12 (*Figures A-9 and A-10*)

**SITE TYPE:** Complex (4 features)

**ELEVATION:** 64-70 ft AMSL

**TOPOGRAPHY:** On a series of small rises along the edge of a natural terrace, overlooking a broad drainage basin

**VEGETATION:** Thick California grass, scattered burned kiawe

**CONDITION:** Good to fair; eroded

**INTEGRITY:** Unaltered

**PROBABLE AGE:** Prehistoric

**FUNCTIONAL INTERPRETATION:** Agriculture

**DIMENSIONS:** Overall site 24.50 m E-W by 6.00 m N-S

**DESCRIPTION:** Three rock-filled terraces with surface rock piles (Features A, B, C) and a rock pile (Feature D) were identified at this site. Features A and B are located at the highest, eastern end of the site, within 0.50 m of one another. Feature C is located 6.00 m west of Feature A, and Feature D is 18.50 m west of Feature C. All features follow the edge of a well-defined terrace face that drops vertically c. 0.50 m along the southern face. The area is eroded, and all features are deflated and washed out.

**FEATURE A: Rock-filled terrace**

**FUNCTION:** Agriculture

**DIMENSIONS:** 2.00 m E-W by 1.35 m N-S by 0.35 m maximum height

**DESCRIPTION:** This terrace has a perimeter of partially buried aligned boulders, and is filled with rocks and soil. The retaining alignment incorporates exposed bedrock and appears to define a filled area that is mostly below the surrounding bedrock surface. A concentration of cobbles 0.90 m by 0.80 m by 0.30 m high is located inside the retainer. The base of the concentration is partially buried, and upper stones are loosely piled on the surface of the buried rocks.

A 0.05 by 0.05 m test unit was excavated into the rock concentration of Feature A. Two layers of culturally sterile soil were encountered. Layer I consists of very loose, very dark reddish-brown loam that extends from the surface to 0.10 m below surface. This soil layer is present with the rock fill. Layer II consists of reddish-brown silty clay loam with large amounts of pebble-size gravel. This layer extends from 0.10 to 0.27 m below surface, and overlies a layer of densely packed cobbles and boulders in a matrix of decomposing bedrock.

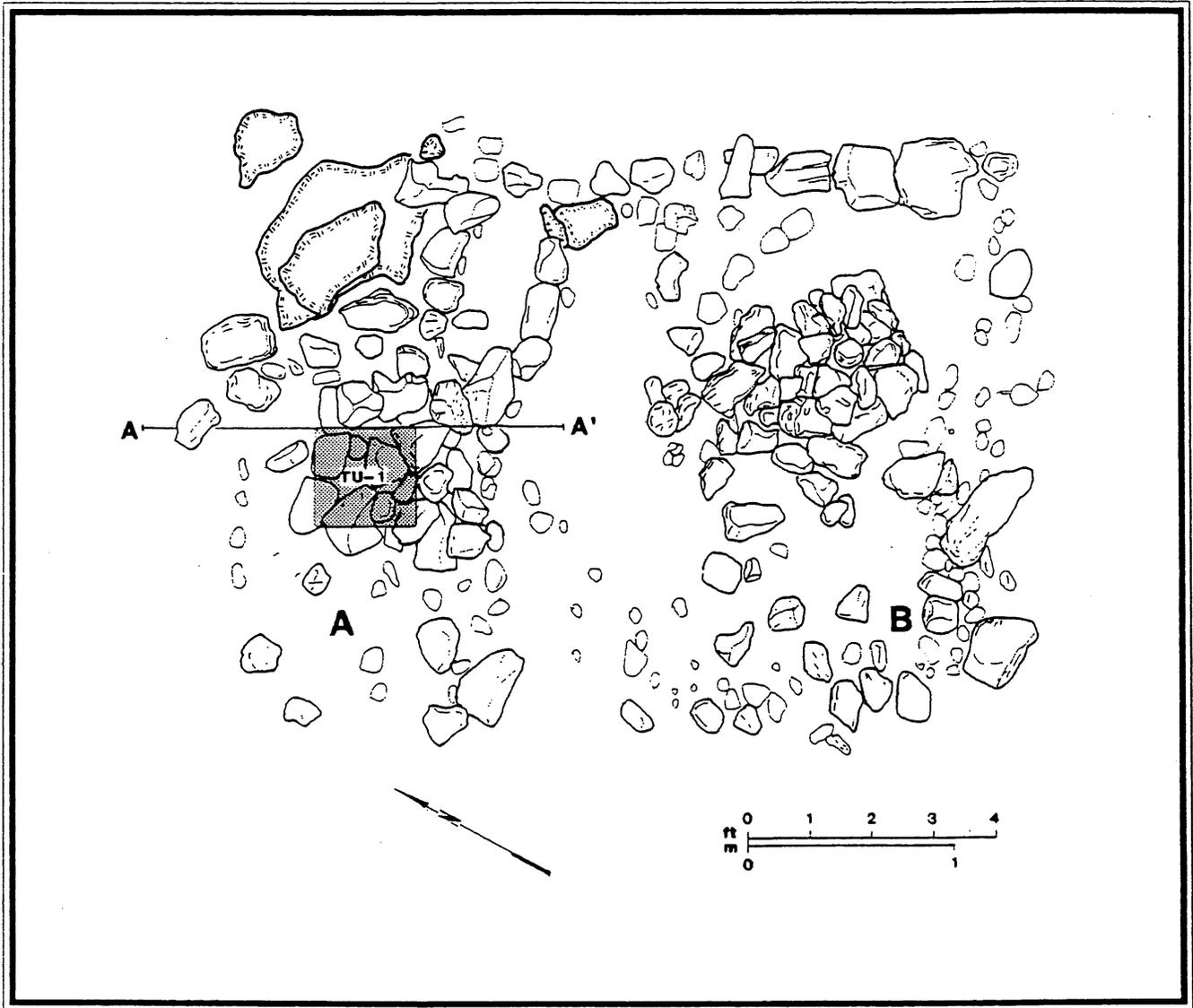
At the Layer I/II interface is a very thin lens of what appears to be an old duff deposit. This probably represents the original ground surface, prior to construction of the terrace. No portable remains were recovered from screened soil.

**FEATURE B: Rock-filled terrace**

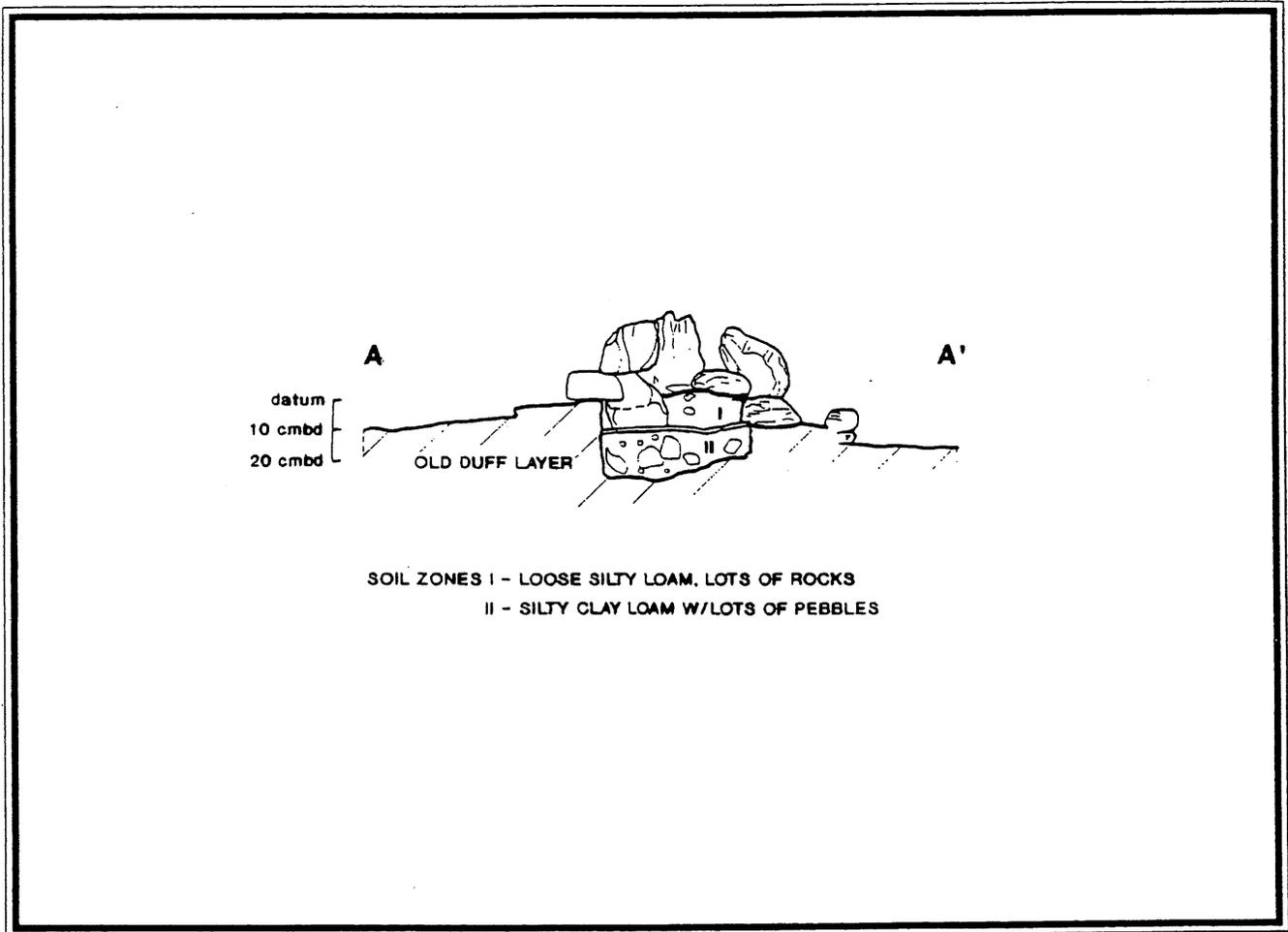
**FUNCTION:** Agriculture

**DIMENSIONS:** 1.90 E-W by 1.50 N-S by 0.35 m maximum height

**DESCRIPTION:** Feature B is a rock-filled terrace very similar in construction to Feature A. The perimeter consists



**Figure A-9. SITE 2520, FEATURES A AND B (T-12)**



**Figure A-10. SITE 2520, FEATURE A, PROFILE**

of partially buried boulders and cobbles and the corners are distinctly squared. The rock concentration on this terrace is more formalized than the Feature A concentration, and it has the appearance of a cairn. Two sides of the cairn are faced, two to three courses high. This feature also incorporates exposed bedrock.

**FEATURE C: Rock-filled terrace****FUNCTION:** Agriculture**DIMENSIONS:** 1.20 m N-S by 1.04 m E-W by 0.33 m maximum height

**DESCRIPTION:** This terrace is square to rectangular in plan view, with retaining alignments along the east, south and west sides. Most of the south side is defined by exposed bedrock; the east and west perimeter stones are partially buried cobbles and small boulders. A linear pile of cobbles and small boulders is present in the center of the terrace. It is 0.90 m long by 0.40 m wide. Immediately to the west of Feature C is a drainage channel that has washed soil down the natural terrace slope.

**FEATURE D: Rock pile****FUNCTION:** Agriculture**DIMENSIONS:** 1.50 m N-S by 1.00 m E-W by 0.25 m maximum height

**DESCRIPTION:** Feature D is a circular pile of large and small cobbles, situated around the burned stump of a kiawe tree. The pile is at the south edge of a natural terrace face that is extremely eroded and deflated. Immediately to the south of the pile is a shallow run-off channel.

**SITE NO:** State: 2521 PHRI: T-13**SITE TYPE:** Midden scatter**ELEVATION:** 50 ft AMSL**TOPOGRAPHY:** On a flat lowland terrace, overlooking a broad drainage basin**VEGETATION:** Thick California grass, immature kiawe  
**CONDITION:** Surface is eroded and deflated; bulldozing also likely**INTEGRITY:** Questionable**PROBABLE AGE:** Prehistoric**FUNCTIONAL INTERPRETATION:** Temporary habitation**DIMENSIONS:** 21.00 m in diameter

**DESCRIPTION:** The site consists of a sparse scattering (c. 20 pcs.) of Cypraeidae and Conidae shell fragments, with c. 14 small pieces of broken coral and one waterworn pebble. Very little soil is present on the site, which is mostly exposed bedrock. The surface appears as though it was bulldozed some time ago. No concentrations of portable remains were observed and there is a very limited possibility of subsurface deposits. The material present may be a

secondary deposit; the area is badly eroded in addition to being machinery disturbed.

**SITE NO:** State: 2522 PHRI: T-14**SITE TYPE:** Complex (2 features)**ELEVATION:** 70 ft AMSL**TOPOGRAPHY:** On the west-facing edge of a prominent terrace ridge formation, along the left bank of an ephemeral drainage channel**VEGETATION:** Thick California grass, dead kiawe**CONDITION:** Some disturbance and erosion is evident**INTEGRITY:** Generally unaltered**PROBABLE AGE:** Prehistoric**FUNCTIONAL INTERPRETATION:** Agriculture, possible temporary habitation**DIMENSIONS:** Overall site 7.5 m E-W by 6.0 m N-S

**DESCRIPTION:** A box C-shape (Feature A) and a terrace (Feature B) were identified at this site. The two features are immediately adjacent to one another, with Feature B to the east side of Feature A. It appears that additional hillside terracing is present at the site, obscured by vegetation. This site may be connective with Site T-11, located c. 20.0 m to the south on the same ridge formation.

**FEATURE A: Box C-shape****FUNCTION:** Agriculture or temporary habitation**DIMENSIONS:** Interior area 2.60 m NW-SE by 1.40 m NE-SW; overall 4.40 m NW-SE by 2.80 m NE-SW; maximum wall height 0.30 m

**DESCRIPTION:** This feature consists of a straight-sided, square-cornered C-shape, which opens to the south side. The walls consist of loosely stacked cobbles set in parallel alignments an average of 0.50 m apart. The walls are filled with additional cobbles; no faced portions are present. The east and west sides incorporate exposed bedrock, and the two corners are squared. Maximum wall height is at natural bedrock areas; the stacked portions average 0.15 m in height (2-3 courses). The interior area is level and generally cleared of loose rubble, with a few cobbles scattered on the surface. The soil deposit appears to be at least 0.10 m thick in places; no portable remains were observed in or around the feature.

**FEATURE B: Terrace****FUNCTION:** Agriculture**DIMENSIONS:** 3.00 m N-S by 3.00 m E-W

**DESCRIPTION:** Feature B abuts Feature A along the east wall, where exposed bedrock is present. It is a rock-filled terrace with perimeters defined by large aligned cobbles. It is triangular in plan view, with the broad side adjacent to Feature A and the point to the northeast. The surface of the terrace is level with the tops of the perimeter stones and

consists of rough cobbles and pebbles. A second terrace may be present to the northwest; additional vegetation clearing is necessary in order to determine the actual extent of the site.

**SITE NO:** State: 2523 PHRI: T-16 (*Figure A-11*)  
**SITE TYPE:** Complex (2 features)  
**ELEVATION:** 80 ft AMSL  
**TOPOGRAPHY:** On a low knoll at the western edge of a high terrace  
**VEGETATION:** Thick California grass, burned kiawe  
**CONDITION:** Fair, eroded  
**INTEGRITY:** Generally unaltered  
**PROBABLE AGE:** Prehistoric  
**FUNCTIONAL INTERPRETATION:** Agriculture  
**DIMENSIONS:** Overall site 10.00 m NW-SW by 4.0 m SE-NW  
**DESCRIPTION:** Two C-shape walls (Features A and B) were identified at this site. The features are 3.00 m apart on an northeastern axis, with Feature B to the northeast. Feature A is on the crest of the knoll, c. 1.00 m above Feature B, which is situated on a relatively level portion of the natural terrace.

**FEATURE A: C-shape**  
**FUNCTION:** Agriculture  
**DIMENSIONS:** Interior, 1.60 m in diameter; overall 4.00 m N-S by 3.40 m E-W by 0.45 m maximum wall height  
**DESCRIPTION:** This C-shape consists of cobbles and small boulders, arranged so as to incorporate exposed bedrock. The highest portion of the wall is along the north side, where five large, partially buried boulders naturally occur. The east side of the wall is the most artificially built up portion of the feature. It consists of loosely stacked cobbles, up to three courses high, with an average width of 0.80 m. The wall opens to the south; the opening is 1.60 m across. The interior area consists of soil-fill with partially buried cobbles and pebbles.

A 0.50 by 0.50 m square test unit was excavated in the center of Feature A. Three culturally sterile soil layers were identified. Layer I consists of dark reddish-brown silty loam with black silty mottling; it extends from surface to 0.05 m below surface. Layer II consists of brown sandy silt loam and is 0.03 m thick. Layer III is 0.10 to 0.12 m thick and

consists of dark brown silty clay loam with scattered cobbles and pebbles; rock density increases in the lower 0.06-0.08 m of this layer, and becomes impenetrable at the base of excavation, 0.20 m below surface.

**FEATURE B: C-shape**  
**FUNCTION:** Agriculture  
**DIMENSIONS:** Interior 2.80 m NE-SW by 1.50 m NW-SE; overall 3.50 m NE-SW by 4.50 m NW-SE by 0.47 m maximum wall height  
**DESCRIPTION:** Feature B consists of small boulders and cobbles loosely stacked on partially buried bedrock. The wall opens to the south, with a 1.30 m wide opening. Most of the wall is stacked two courses high, with the exception of a small faced section three courses high, at the southeastern side, near the corner. Interior wall height here is maximum for the feature. Average interior wall height is 0.26 m and average exterior wall height is 0.15 m. The corners of this feature are more squared than the Feature A wall, and it is more formally constructed. The interior area is leveled soil that is generally cleared of rubble.

A straight alignment of cobbles extends to the southeast from the eastern corner of the wall. This alignment is 1.30 m long and averages 0.30 m wide. No portable remains were observed in or around the feature.

**SITE NO:** State: 2524 PHRI: T-18  
**SITE TYPE:** Rock pile  
**ELEVATION:** 58 ft AMSL  
**TOPOGRAPHY:** On a pahoehoe flat with calcareous deposits; no soil present  
**VEGETATION:** Very sparse jilima, some California grass  
**CONDITION:** Good  
**INTEGRITY:** Looks unaltered  
**PROBABLE AGE:** Prehistoric  
**FUNCTIONAL INTERPRETATION:** Indeterminate  
**DIMENSIONS:** 1.40 m N-S by 0.74 m E-W by 0.50 m maximum height  
**DESCRIPTION:** The site consists of a linear pile of pahoehoe cobbles, situated along a surface fold in the pahoehoe mantle. The pile is stacked a maximum of three courses high and is comprised of approximately 24 stones. A naturally collapsed blister is located nearby, which is the probable source of the cobbles.

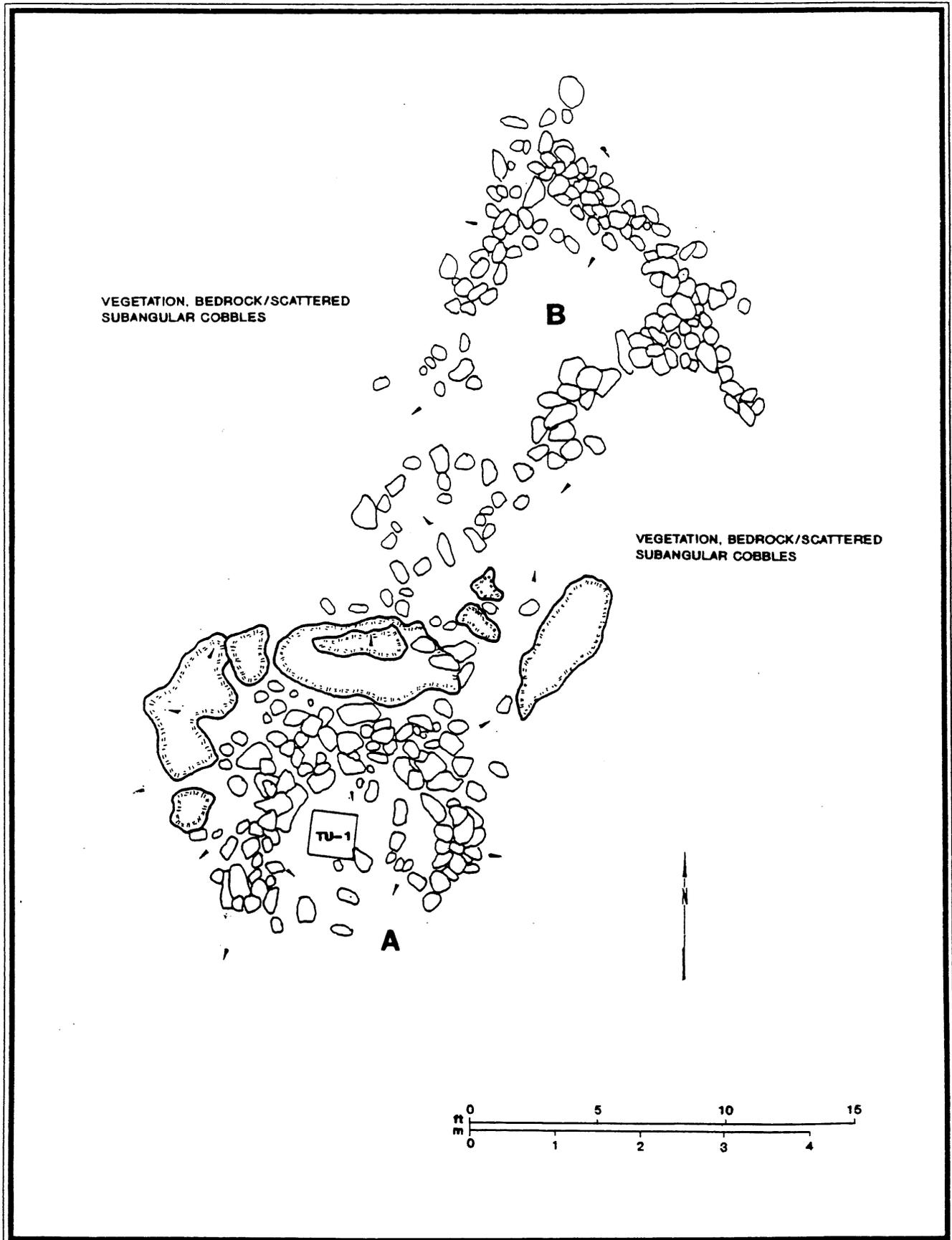


Figure A-11. SITE 2523 (T-16)

## APPENDIX B

### LIMITED HISTORICAL DOCUMENTARY RESEARCH

by Helen Wong Smith, B.A.

The ahupua'a of Keokea and Waiohuli are in the 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 Hamakauapoko 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, Heiau in the subject ahupua'a, 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 Journal of a Tour on Maui, also speaks of the unusual Makawao rain (Sterling n.d.):

We noticed a peculiar meteorological phenom 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 mountain 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 maka'u and ao 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. Nailili "E noho ana oe e oe ehoolono iki mai ana" Ke Au Okoa, Nov. 6, 1865, Hamakauapoko and Hamakualoa (Sterling n.d.).

In the area of Wahine'oma'o (now called the "Baseball Park" above the modern Poli-Poli camp) 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 trees such as California Redwood, Norfolk Pines 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 volcanic-looking 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 canoe 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 canoe and some overland, 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'i-honua 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:

Aloha, Aloha	Affectionate longing, ibid
Aloha wale o'u maku-a la	Affection for my (foster) parents,
e o'u makua,	my parents,
Aloha wale o'u makua	Affection for my parents
Mai na 'aina Hamakua,	Who belong to Hamakua,
He mau 'aina Hamakua elua,	The two districts of Hamakua
No'u mua kaikua'ana i noho ai	Where my elder brothers live.
He ala pali na'u he mau	My hillside trails are theirs
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-eating Ku-keawe" ('Aipua'a-a-Ku-keawe) (Kamakau 1961:142).

## HEAIU IN KEOKEA AND WAIHOLI

Three major heiau are present in Keokea ahupua'a, ma uka of the project area—Molohai, Papakea, and Kaumiumimua heiau. Molohai heiau, situated at an elevation of 2,275 feet above sea level, was initially described by Walker (n.d.), who described 26 heiau in the Kula region of which Molohai is the fourth largest. Walker about 1930 listed Molohai heiau as being 65 by 90 ft and constructed of rough a'a.

Walker surmised that the heiau was probably originally L-shaped; however, this could not be determined definitely, as the heiau had deteriorated and portions of it had been rebuilt as a modern wall. According to Walker, the front of the heiau 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 heiau 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 heiau has been placed on the State Register of Historic Places.

Papakea heiau is situated mauka of Molohai at an elevation of 2,300 ft above sea level. Walker (1931) describes the heiau as "an open platform of a construction 45'x88'...the front double-terraced to a height of 4'...some coral seen but no pebbles." While surveying the heiau 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 heiau were utilized in constructing the cistern and that Walker's measurement of the heiau excluded the property line of the house. Ashdown (1971:46) cites this heiau as a fishing shrine. This is questionable due to its location far inland.

Kaumiumimua heiau, according to M. Riford (1987), is situated makai of Papakea, on a large gully overlooking Ma'alaea Bay. In 1931, Walker commented that the heiau 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 heiau by the Historic Sites office in 1973 indicated that the east and south walls evidence two and possibly three separate construction periods. At one time, two heiau were located along the coast at Kelepolepo. At Koieie, was Kalaihi Heiau "which is now on Kaonoulu ranch land" (Cox 1976:14). Another heiau was Kealalipoa Heiau, once located in back of the Mormon Church property.

Ashdown (1971:46) mentions other heiau in Keokea and Waiohuli—Ho'ola and Ho'oula Ua heiau in Keokea and Kaimupeelua heiau in Waiohuli. Ho'ola heiau (Health temple) is situated just behind the Kula Sanatorium. Ashdown writes, "Ho'oula Ua heiau," 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 'awa was cultivated and there stood a temple to Lono." Kaimupeelua heiau is located in the Waiohuli ahupua'a. Although the heiau originally measured 17 by 25 meters, much of it has been reduced to rubble by cattle (Historic Sites Register 1973).

Other heiau mentioned by historic writers in the Makawao district include Kailua heiau (Thrum 1909:44), and Pa'uahu, Mahea, Kaumuopahu (or Kaunuopahu), Po'onahoehoe and Mana heiau. The latter heiau 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. Of Keokea it was noted, "the above land belongs to the King, and he'e is the tabu fish" (Silva IN Miura 1982). 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. 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 government 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 government, 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.

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 search of LCAs granted in Keokea and Waiohuli, Silva (IN Miura 1982) determined the general trend of land use. While specific LCA testimonies for the project area were not located, testimonies for other sections of these *ahupua'a* show a consistent use pattern for the region: "... at Keokea, from the mountain to the Kula there are two *mala* (larger garden area) of Irish potatoes, one *kula* (smaller garden)" (LCA 6415). At Waiohuli, from the mountains to the Kula, there are seven *mala* of taro, one *mala* of Irish potatoes, and one houselot" (LCA 6414). The bulk of the parcels is designated as *kula* land and houselots (Riford 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.

## 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 probability is that the market can not be supplied this autumn. Kula, however, is full of people. Strangers from Wailuku, Hakamakua, and Lahaina are there 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 a rich 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 MOWEE also mentions the fervor of cash-cropping:

During the gold 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. 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 Kwangtung Province. During the 1840s, most Kula Chinese acquired their farmland by lease or deed from the haoles ranchers or Hawaiian homesteaders. Much of this land was owned by the Hawaiian government, 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 The Honolulu Advertiser 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 mud, the ponds for which Kihei was once famous. Meanwhile Kula is dependent on pipe from Waikamoi watershed (Korte 1962 A:15).

By the 1880s the lower Kula sections, such as the project area, had largely become pasture for the booming cattle industry. Leases on large sections of crown land were leased for grazing acreage (Silva IN Miura 1982). 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 arrangement 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 Mowee, 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 Honouaulea 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.

Silva's research of inter-governmental communications indicates that the exploitation of kiawe was soon the major money maker in the area (Silva IN Miura 1982:B-2). Kiawe was initially used as cattle feed. Kiawe gathering has been the main use of the project area (Miura 1982:B-3).

A report on Kula would not be complete without some mention of Kula Sanatorium, founded for the care of tuberculosis sufferers. The sanatorium is located mauka of

the project area at an elevation of 3,000 feet (The Honolulu Advertiser 9/20/85 B:3). Land for the sanatorium was requested by Bill Pogue in 1909. Initially the sanatorium consisted of two tent-houses which accommodated 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 sanatorium, and in 1937 a new sanatorium was constructed (Jones 1940).

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

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.

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.

## CONCLUSION

Kula areas in the dry intermediate zone were areas of limited use and exploitation (Cox 1976). The main service of such zones was as a transitional zone of limited exploitation between the richer areas of more intensive use ma uka and ma kai (Miura 1982 B-4). 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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STATE HISTORIC  
PRESERVATION DIVISION  
CORRESPONDENCE

APPENDIX

E-2



LINDA LINGLE  
GOVERNOR OF HAWAII



PETER T. YOUNG  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON  
DEPUTY DIRECTOR - LAND

ERNEST Y.W. LAU  
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES  
BOATING AND OCEAN RECREATION  
BUREAU OF CONVEYANCES  
COMMISSION ON WATER RESOURCE MANAGEMENT  
CONSERVATION AND COASTAL LANDS  
CONSERVATION AND RESOURCES ENFORCEMENT  
ENGINEERING  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOOLAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS



**STATE OF HAWAII**  
**DEPARTMENT OF LAND AND NATURAL RESOURCES**

HISTORIC PRESERVATION DIVISION  
KAKUHIHEWA BUILDING, ROOM 555  
601 KAMOKILA BOULEVARD  
KAPOLEI, HAWAII 96707

**HAWAII HISTORIC PRESERVATION**  
**DIVISION REVIEW**

Log #: 2003.1802  
Doc #: 0309CD41

Applicant/Agency: Mr. Bert Ratte  
Address: County of Maui  
Department of Public Works and Environmental Management  
Development Services Administration  
250 South High Street  
Wailuku, Hawaii 96793

SUBJECT: Chapter 6E-42 Historic Preservation Review – Work on County Roadway Permit  
Application for the Proposed Water Lateral Installation for Hope Chapel (WTPC  
2003/43) [Count/DSA]

Ahupua`a: Keokea

District, Island: Makawao, Maui

TMK: (2) 2-2-002:072 (formerly parcel 042)

1. We believe there are no historic properties present, because:

- a) intensive cultivation has altered the land
- b) residential development/urbanization has altered the land
- c) previous grubbing/grading has altered the land
- d) an acceptable archaeological assessment or inventory survey found no historic properties
- e) other: an acceptable archaeological inventory survey found a single historic site, which was determined significant for information content only. Sufficient information was obtained during the inventory survey with no further archaeological work being necessary.

2. This project has already gone through the historic preservation review process, and mitigation has been completed \_\_\_\_.

Thus, we believe that “no historic properties will be affected” by this undertaking

Staff: Cathleen A. Dagher  
Cathleen A. Dagher  
Assistant Maui/Lana`i Island Archaeologist  
(808) 692-8023

Date: 17 September 2003

SEP 24 2003

LINDA LINGLE  
GOVERNOR OF HAWAII



PETER T. YOUNG  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON  
DEPUTY DIRECTOR - LAND

ERNEST Y.W. LAU  
DEPUTY DIRECTOR - WATER



**STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES**

HISTORIC PRESERVATION DIVISION  
KAKUHIHEWA BUILDING, ROOM 555  
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AQUATIC RESOURCES  
BOATING AND OCEAN RECREATION  
BUREAU OF CONVEYANCES  
COMMISSION ON WATER RESOURCE MANAGEMENT  
CONSERVATION AND COASTAL LANDS  
CONSERVATION AND RESOURCES ENFORCEMENT  
ENGINEERING  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOOLAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

**HAWAII HISTORIC PRESERVATION  
DIVISION REVIEW**

Log #: 2003.2199  
Doc #: 0310CD78

Applicant/Agency: Mr. Bert Ratte  
Address: County of Maui  
Department of Public Works and Environmental Management  
Development Services Administration  
250 South High Street  
Wailuku, Hawaii 96793

SUBJECT: Chapter 6E-42 Historic Preservation Review – Grading and Grubbing Permit  
Application for the Proposed Hope Chapel Mass Grading Project (WTPC  
2003/52) [Count/DSA]

Ahupua'a: Keokea  
District, Island: Makawao, Maui  
TMK: (2) 2-2-002:072 (formerly parcel 042)

1. We believe there are no historic properties present, because:

- a) intensive cultivation has altered the land
- b) residential development/urbanization has altered the land
- c) previous grubbing/grading has altered the land
- d) an acceptable archaeological assessment or inventory survey found no historic properties
- e) other: an acceptable archaeological inventory survey found a single historic site, which was determined significant for information content only. Sufficient information was obtained during the inventory survey with no further archaeological work being necessary.

2. This project has already gone through the historic preservation review process, and mitigation has been completed \_\_\_\_.

Thus, we believe that "no historic properties will be affected" by this undertaking

Staff: Cathleen A. Dagher  
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Date: 29 Oct 2003

OCT 29 2003



STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION  
KAKUHIHEWA BUILDING, ROOM 555  
801 KAMOKILA BOULEVARD  
KAPOLEI, HAWAII 96707

AQUATIC RESOURCES  
BOATING AND OCEAN RECREATION  
COMMISSION ON WATER RESOURCE  
MANAGEMENT  
CONSERVATION AND RESOURCES  
ENFORCEMENT  
CONVEYANCES  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
LAND  
STATE PARKS

HAWAII HISTORIC PRESERVATION  
DIVISION REVIEW

Log #: 30325  
Doc #: 0207CD35

Applicant/Agency: Mr. John E. Min, Planning Director  
Address: County of Maui  
Department of Planning  
250 South High Street  
Wailuku, Hawaii 96793

SUBJECT: Chapter 6E-42 Historic Preservation Review Pertaining to the Applications for  
Special Management Area Use, Project District Phase II Approval, and Special  
Use Permit for the Proposed Kihei Hope Chapel  
(Subject I.D.: PH2 2002/0002, SM1 2002/0008, CUP 2002/0003)

Ahupua`a: Keokea  
District, Island: Makawao, Maui  
TMK: (2) 2-2-002:072

1. We believe there are no historic properties present, because:

- a) intensive cultivation has altered the land  
 b) residential development/urbanization has altered the land  
 c) previous grubbing/grading has altered the land  
 d) an acceptable archaeological assessment or inventory survey found no historic  
properties  
 e) other:

2. This project has already gone through the historic preservation review process, and mitigation  
has been completed .

Thus, we believe that "no historic properties will be affected" by this undertaking.

Staff: Cathleen A. Dagher  
Cathleen A. Dagher  
Assistant Maui/Lana'i Island Archaeologist  
(808) 692-8023

Date: 12 July 2002

JUL 17 2002

LINDA LINGLE  
GOVERNOR OF HAWAII



PETER T. YOUNG  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA  
DEPUTY DIRECTOR - LAND

DEAN NAKANO  
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES  
BOATING AND OCEAN RECREATION  
BUREAU OF CONVEYANCES  
COMMISSION ON WATER RESOURCE MANAGEMENT  
CONSERVATION AND COASTAL LANDS  
CONSERVATION AND RESOURCES ENFORCEMENT  
ENGINEERING  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOOLAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION  
601 KAMOKILA BOULEVARD, ROOM 555  
KAPOLEI, HAWAII 96707

HAWAII HISTORIC PRESERVATION  
DIVISION REVIEW

Log No.: 2005.2082

Doc No.: 0509CD35

Received: March 8, 2005

Applicant/Agency: Mr. Bert Ratte  
Address: County of Maui  
Department of Public Works and Environmental Management  
Development Services Administration  
250 South High Street  
Wailuku, Hawaii 96793

SUBJECT: Chapter 6E-42 Historic Preservation Review – Grading and Grubbing Permit  
Application for the Proposed Mass Grading for Hope Chapel – Phase 2  
((G t2005/23) [County/DSA]

Ahupua`a: Keokea  
District, Island: Makawao, Maui  
TMK: (2) 2-2-002:072

1. We believe there are no historic properties present, because:

- a) intensive cultivation has altered the land
- b) residential development/urbanization has altered the land
- c) previous grubbing/grading has altered the land
- d) an acceptable archaeological assessment or inventory survey found no historic properties
- e) other: An acceptable archaeological inventory survey found a single historic site, which was determined significant for information content only. Sufficient information was obtained during the inventory survey with no further archaeological work being necessary.

2. This project has already gone through the historic preservation review process, and mitigation has been completed .

Thus, we believe that "no historic properties will be affected" by this undertaking

In the event that historic sites (human skeletal remains, etc.) are identified during the construction activities, all work needs to cease in the immediate vicinity of the find, the find needs to be protected from additional disturbance, and the State Historic Preservation Office needs to be contacted immediately at 243-5169, on Maui, or at (808) 692-8023, on O`ahu.

Staff: Cathleen A. Dagher Date: September 26, 2005  
Cathleen A. Dagher, Assistant Maui/Lana`i Island Archaeologist, (808) 692-8023  
SEP 27 2005



HRS 6E CONSULTATION  
REQUEST SUBMITTED TO  
STATE HISTORIC  
PRESERVATION DIVISION

APPENDIX

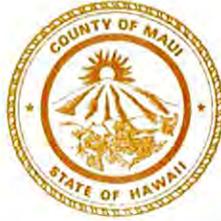
E-3



**MICHAEL P. VICTORINO**  
Mayor

**LORI TSUHAKO**  
Director

**LINDA R. MUNSELL**  
Deputy Director



**DEPARTMENT OF HOUSING  
& HUMAN CONCERNS**  
COUNTY OF MAUI  
2200 MAIN STREET, SUITE 546  
WAILUKU, MAUI, HAWAII 96793  
PHONE: (808) 270-7805

March 27, 2020

Dr. Alan Downer, Administrator  
State Historic Preservation Division  
601 Kamokila Blvd., #555  
Kapolei, Hawaii 96707

Dear Dr. Downer:

**SUBJECT: Hawaii Revised Statutes, Chapter 6E-42, Review of Proposed Projects  
Liloa Senior Housing Project – SMA Permit and Application for 2.97 Maui  
County Code Approval for Fast Track Housing  
TMK: (2) 2-2-002:072 por.  
Kēōkea Ahupua‘a, Kula Moku, Makawao Tax District, Maui Island**

The County of Maui - Department of Housing and Human Concerns (DHHC) is submitting the Liloa Senior Housing Project – SMA Permit and Application for 2.97 Maui County Code Approval for Fast Track Housing for State Historic Preservation Division (SHPD) review and comment, pursuant to HRS Chapter 6E-42 and HAR 13-284-1.

**GENERAL INFORMATION**

**Project Name:** Liloa Senior Housing Project – SMA Permit and Application for 2.97 Maui County Code Approval for Fast Track Housing

**Agency & Project Contact:** County of Maui - Department of Housing and Human Concerns  
2200 Main Street, Suite 546, Wailuku, Hawaii 96793  
Contact: Lori Tshako  
Phone: (808) 270-7805  
[director.hhc@mauicounty.gov](mailto:director.hhc@mauicounty.gov)

**Project Applicant** Liloa Senior Housing, LP  
330 W. Victoria Street, Gardena, California 90248  
Contact: Mohannad H. Mohanna  
Phone: (424) 258-2906

**Planner Contact:** Erin Mukai - Manager  
Munekiyo Hiraga  
305 High Street, Suite 104, Wailuku, Hawaii 96793  
Phone: (808) 244-2015  
[erin@munekiyohiraga.com](mailto:erin@munekiyohiraga.com)

**Archaeology Contact:** Tanya L. Lee-Greig, M.A.  
'Āina Archaeology  
725 Kapi'olani Blvd. C400, Honolulu, HI 96813  
Phone: (808) 593-3020  
[tanya@ainaarch.com](mailto:tanya@ainaarch.com)

**Project Area and Proposed Project Description:**

Liloa Hale will be condominiumizing TMK (2) 2-2-002:072, which is located on the island of Maui and within Kēōkea Ahupua'a, Kula Moku (Makawao Modern Tax District), and purchasing approximately 4.9-acres (project site) of the overall parcel which is currently owned by Hope Chapel (**Exhibit 1**). While the Liloa Hale portion of the parcel will extend to the existing drainage area to the south, the construction footprint of the proposed project, or project area, will cover only 3.61-acres of the overall project.

The proposed Liloa Hale Senior Housing project (Project) is a proposed senior living project that will consist of 117 total units (101 – 1 bedroom units and 16 – 2 bedroom units) along with 143 parking stalls (**Exhibit 2**). No improvements or work within the drainage area will be completed.

**IDENTIFICATION OF HISTORIC PLACES & EVALUATION OF SIGNIFICANCE**

**SUMMARY OF PREVIOUS ARCHAEOLOGICAL STUDIES WITHIN A ONE-MILE RADIUS OF THE CURRENT PROJECT AREA**

A search of archaeological investigations within a one-mile radius of the current project area shows the completion of roughly 34 studies (**Exhibit 3**). The following provides a summary of identified historic properties (see also **Exhibit 4**) as gathered through a review of the studies and reports presented in **Exhibit 3**.

- Traditional Hawaiian burial interment (SIHP 50-50-10-0496)
- Traditional Hawaiian agricultural and associated habitation areas (SIHP 50-50-10-1709 through -1711, -2476, -2513, -2518, -2519, -2520, -2522, -2523, -2512)
- Traditional Hawaiian habitation (SIHP 50-50-1-2514, -2517, -2521, -3193, -3529)
- Traditional Hawaiian habitation with a ceremonial component (SIHP 50-50-10-6484)
- Traditional Hawaiian trail markers (SIHP 50-50-10-2475)
- Historic ranching features (SIHP 50-50-10-6522 and 5647)
- World War II and historic military training sites (SIHP 50-50-10-6485, -06521)

#### **PRIOR SHPD CORRESPONDENCE AND PREVIOUS ARCHAEOLOGICAL STUDIES SPECIFIC TO THE PROJECT AREA**

##### **Previous Archaeological Studies**

Specific to the project area, and prior to subdivision of TMK 2-2-002:42 into several parcels (Parcels 001-006, 042, and 072), Paul H. Rosendahl, Ph.D., Inc. (PHRI) completed an archaeological inventory survey of the 74- acre parcel for the then proposed Piilani Residential Community Phase II (Donham 1990) (see also **Exhibit 4**).

This study consisted of a 100% systematic pedestrian survey followed by site recordation and archaeological testing at selected sites and features (Donham 1990:6). A total of 16 historic properties comprised of 30 component features were recorded as a result of the study (Donham 1990:8). Five of the historic properties were previously identified and recorded during an archaeological reconnaissance completed for the U.S. Army Corps. of Engineers' (Cordy 1977), three of which were given SIHP numbers (SIHP 1709-1711) and two of which were assigned SIHP numbers (SIHP 2522 and 2523) during the PHRI study (Donham 1990:8). The remaining 11 are newly identified sites (SIHP 2513-2521 and 2524) that were situated in the northern portion of the study area (Donham 1990:8). Formal types and functional interpretations include agricultural terraces, mounds, and enclosures (SIHP 1711, 2512 Features B and C, 2513, 2515, 2516 Feature A, 2518, 2519, 2520, and 2523), temporary and recurrent habitation enclosures, platforms, and remnant midden scatters (SIHP 2512 Feature A, 2515, 2516 Feature B, 2517, and 2521), possible multi-functional enclosures and terraces (SIHP 1710 and 2522), as well as a terrace with a possible ceremonial function (SIHP 2512 Feature D) and rock piles or mounds of an indeterminate function (SIHP 2512 Feature E and 2524) (Donham 1990:Table 2). Subsurface testing, consisting of the excavation of 0.5 m x 0.5 m units, was carried out at three low enclosures (SIHP 1711 Feature A, 2513, and 2516 Feature B), a rock-filled terrace (SIHP 2520 Feature A), and a C-shape (SIHP 2523 Feature A) encountered decomposing bedrock between 0.15 to 0.27 m below surface (Donham 1990:12-13, Table 4). Only two artifacts, one basalt flake and one volcanic glass flake, were recovered from excavated contexts, while the remainder included 4.0 g of marine invertebrates, 0.1 g of charcoal, and 0.2 g of thermally altered earth (Donham 1990:Table 5).

The documented historic properties discussed above were identified and located to the north (Parcel 042) and south (Parcel 005) of the currently proposed project (**Exhibit 4**). No historically significant archaeological sites were identified within Parcel 072 as a part of the 1990 study.

##### **Previous Correspondence with SHPD**

Prior correspondence with the division for the subject parcel had been carried out between 2003 and 2005 during the permitting and construction of Hope Chapel as well as grading and grubbing for Phase 2 construction which resulted in a finding that "no historic properties will be affected" (**Exhibit 5**). This determination was based on the finding that "(a)n acceptable archaeological inventory found a single historic site, which was determined significant for information content only. Sufficient information was obtained during the inventory survey with no further archaeological work being necessary." (SHPD Log No: 2003.1802; Doc No: 0309CD41). In the letter dated March 8, 2005 (SHPD Log No: 2005.2082; Doc No: 0509CD35) the same finding was made with an additional caveat that "In the event that historic sites (human skeletal remains, etc.) are identified during the construction activities, all work needs to cease in the immediate vicinity of the find, the find needs to be protected from additional disturbance, and the State Historic Preservation Office needs to be contacted immediately at 243-5169, on Maui, or at (808) 692-8023, on O'ahu."

## Effect Assessment

A field inspection of the proposed project site was completed on August 15<sup>th</sup>, 2019, by 'Āina Archaeology (**Exhibit 6**). The results of the field inspection showed that a portion of the northern section had been previously disturbed and filled with coarse gravels. Boulder push piles with construction debris consisting of concrete waste was present along the edges of the fill deposits. Additionally, sand deposits were also observed in the southern section of the project area, portions of which show construction debris within the deposit.

The extent of previous groundwork and materials staging in relation to the construction of the Hope Chapel facility was confirmed in a teleconference on December 04, 2019 with Mr. John Patterson of Hope Chapel and Mr. Mark Spencer, the general contractor for the construction of Hope Chapel and formerly with Spencer Construction. Prior to purchase by Hope Chapel, Mr. Patterson noted that the parcel was previously owned by Haleakala Ranch and identified as a remnant parcel following the construction of Pi'ilani Highway with very little agricultural potential. Mr. Patterson also verified the construction timeline for Hope Chapel and environmental conditions noting that construction started roughly 15-20 years ago. Mr. Mark Spencer further noted that the majority of the overall parcel had been previously graded and described the subsurface conditions specific to the Hope Chapel footprint as having consisted of shallow, highly compacted soils with some areas of blue rock. Although a small pocket of Pu'uone Dune sands was encountered near the drainage area in the southwest corner of the overall parcel, and subsequently used as bedding and cushioning for construction, no additional sandy areas were noted within the parcel. Regarding the dust fencing noted in during the archaeological field inspection (see also **Exhibit 6**), Mr. Spencer attributed the construction of the fence to work completed by Hale Mahaolu. Both Mr. Patterson and Mr. Spencer indicated that materials associated with the construction of Hope Chapel and associated facilities, including construction spoils, were stockpiled in the *mauka* section of the overall parcel. This description of the general stratigraphy is consistent with the results of soil borings that showing fill over shallow compacted soils and bedrock (**Exhibit 7**). Mr. Patterson further noted that there has been a history of people dumping both green waste and hard waste on the parcel. This practice likely accounts for the sand deposits containing construction waste that was noted during the archaeological field inspection.

While previous SHPD correspondence for prior permits issued on the proposed project parcel have resulted in determinations that "no historic properties will be affected," and prior historic era land disturbance; as well as, ground alteration during the construction of both Hope Chapel and initial ground work on the parcel that is thought to have been completed by Hale Mahaolu has significantly altered the ground surface, as a part of outreach with cultural descendants, the project proponent has heard concern expressed over the presence of secondary sand deposits of an unknown origin within the project area, as well as, potentially remnant pockets of an inland dune system. DHHC understands that areas of sand are known to be culturally sensitive, and is recommending onsite, precautionary archaeological monitoring as an identification measure, pursuant to HAR 13-279-3, of all initial ground disturbing activities in areas where the original natural grade is present. DHHC respectfully requests concurrence on this finding.

Thank you for your time and consideration. We respectfully request that all electronic and mail correspondence include courtesy copies to Erin Mukai of Munekiyo Hiraga and Tanya L. Lee-Greig at 'Āina Archaeology. Please feel free to call either myself or Erin Mukai of Munekiyo Hiraga at 808.244.2015 should you or your staff have any questions regarding the proposed project or Tanya

Dr. Alan Downer, Administrator  
State Historic Preservation Division  
March 27, 2020  
Page 5 of 5

Lee-Greig at (808) 593-3020 should you or your staff have any archaeological questions. We look forward to working with SHPD on this project.

Sincerely,



LORI TSUHAKO, LSW, ACSW  
Director of Housing and Human Concerns

xc: Housing Division  
Erin Mukai, Munekiyo Hiraga  
Tanya L. Lee-Greig, 'Āina Archaeology

**Exhibit List**

- Exhibit 1: General Project Area Location Maps
- Exhibit 2: Liloa Senior Housing Plans
- Exhibit 3: Previous Archaeological Studies
- Exhibit 4: Previously Identified Historic Properties
- Exhibit 5: Previous SHPD Correspondence
- Exhibit 6: Archaeological Field Inspection Log
- Exhibit 7: Hope Chapel Geotechnical Report

References Cited

**Donham, Theresa K.**

1990 *Archaeological Inventory Survey Piilani Residential Community Phase II Land of Keokea, Makawao District Island of Maui*. Prepared for Belt Collins & Associates, Honolulu, HI. Paul H. Rosendahl, Ph.D., Inc., Hilo, HI. On file at Hawai'i State Historic Preservation Division.

## Exhibit 1 General Project Area Location Maps

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Liloa Senior Housing Project



-  Liloa Hale Senior Housing Project Area
-  Liloa Hale Senior Housing Project Overall TMK Boundary

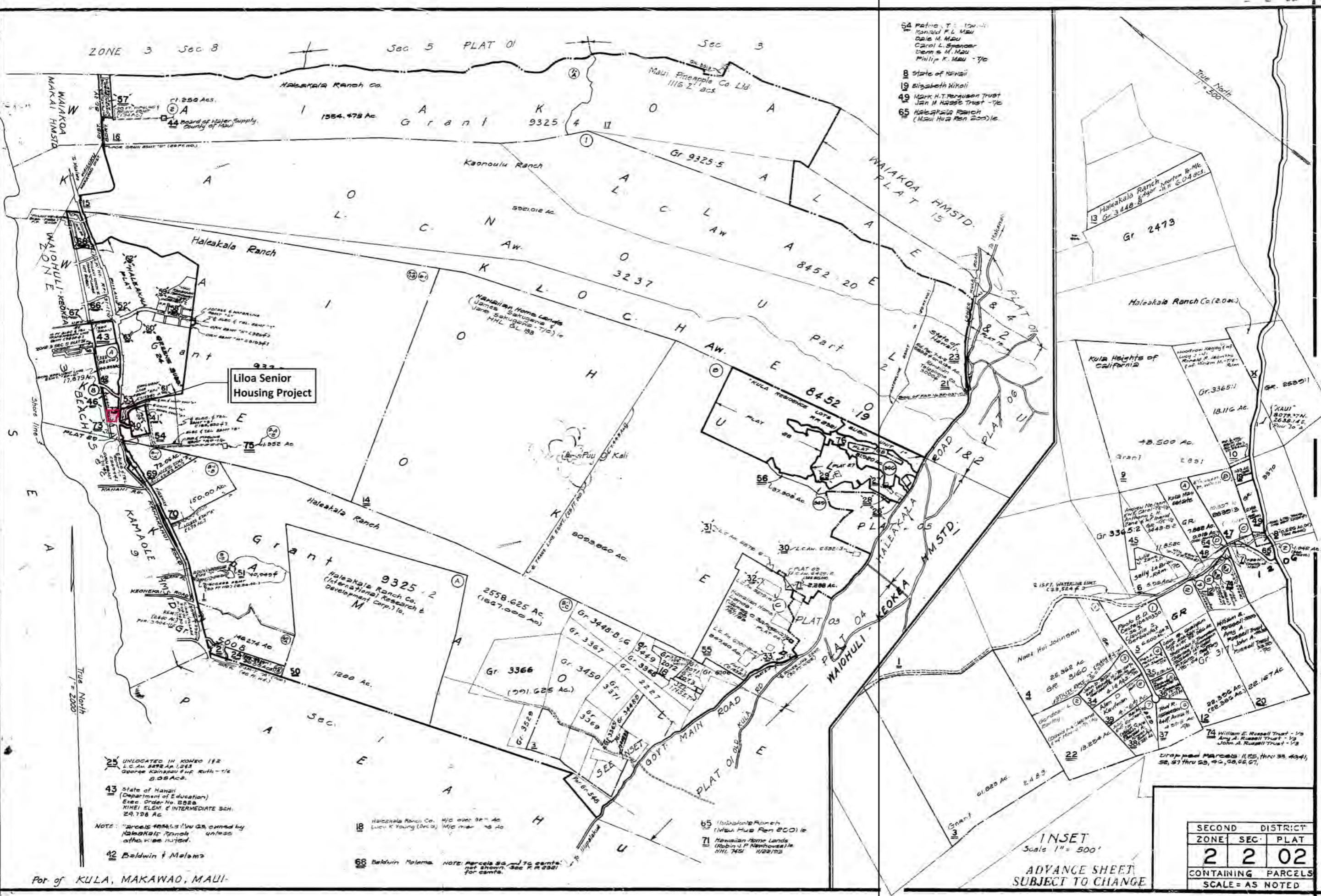
0 250 500 1,000 1,500 2,000 Meters



0 1,000 2,000 4,000 6,000 8,000 Feet



Base Map  
 U.S. Geological Survey  
 1992 Puu o Kali Quadrangle [map]. 1:24000.  
 U.S. Department of Interior, USGS, Reston, VA.  
 GIS Layers  
 Aina Archaeology 2019 (Proj Code 1911)



- 54 Patricia T. ...
- 19 Elizabeth Niholi
- 49 Mark H.T. Ferguson Trust
- 65 Haleakala Ranch (Maui Hua Ren 200) etc.

**Liloa Senior Housing Project**

UNLOCATED IN KONO 112  
L.C. No. 5892 Am 1243  
George Kainapau & Ruth - 1/2  
8.05 Ac.

State of Hawaii  
(Department of Education)  
Exec. Order No. 8828  
KIHAI ELEM. & INTERMEDIATE SCH.  
24,798 Ac.

NOTE: Parcels 499A, 519, 520, owned by  
Haleakala Ranch unless  
otherwise noted.

Baldwin & Malama

Haleakala Ranch Co. 1/2 over 32" Ac  
Lucy K. Young (Exec.) 1/2 over 32" Ac

Baldwin Malama. NOTE: Parcels 55 and 76 combs  
not shown. See P. 232  
for combs.

Haleakala Ranch  
(Maui Hua Ren 200) etc.  
Hawaiian Home Lands  
(Robin J.P. Newhouse) etc.  
HNL 7431 1/22/192

**INSET**  
Scale 1" = 500'  
**ADVANCE SHEET**  
SUBJECT TO CHANGE

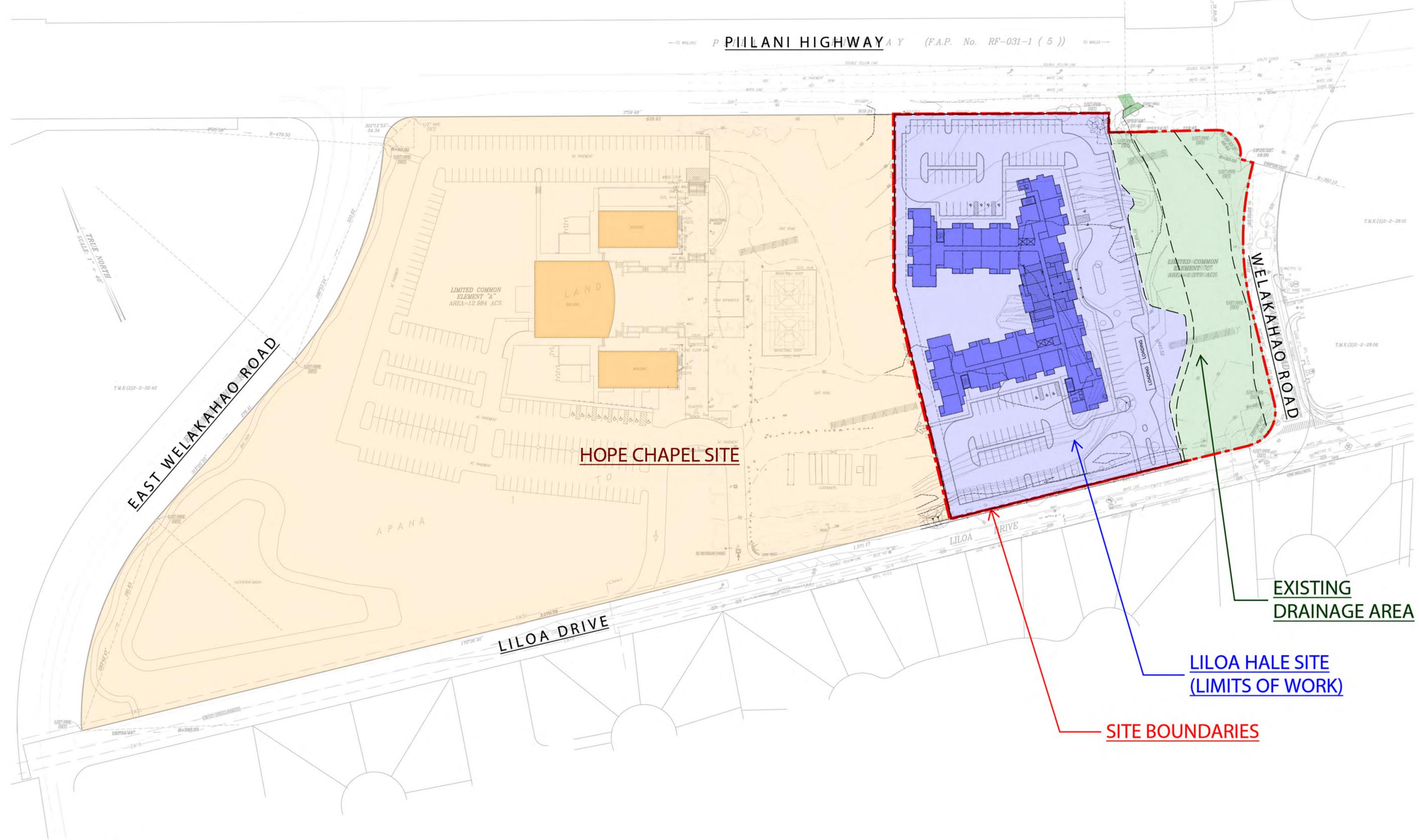
SECOND DISTRICT		
ZONE	SEC.	PLAT
2	2	02
CONTAINING PARCELS		
SCALE = AS NOTED		

PRINTED

Por of KULA, MAKAWAO, MAUI.

# Exhibit 2 Liloa Senior Housing Plans

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EAST WELAKAHA ROAD

HOPE CHAPEL SITE

LILOA DRIVE

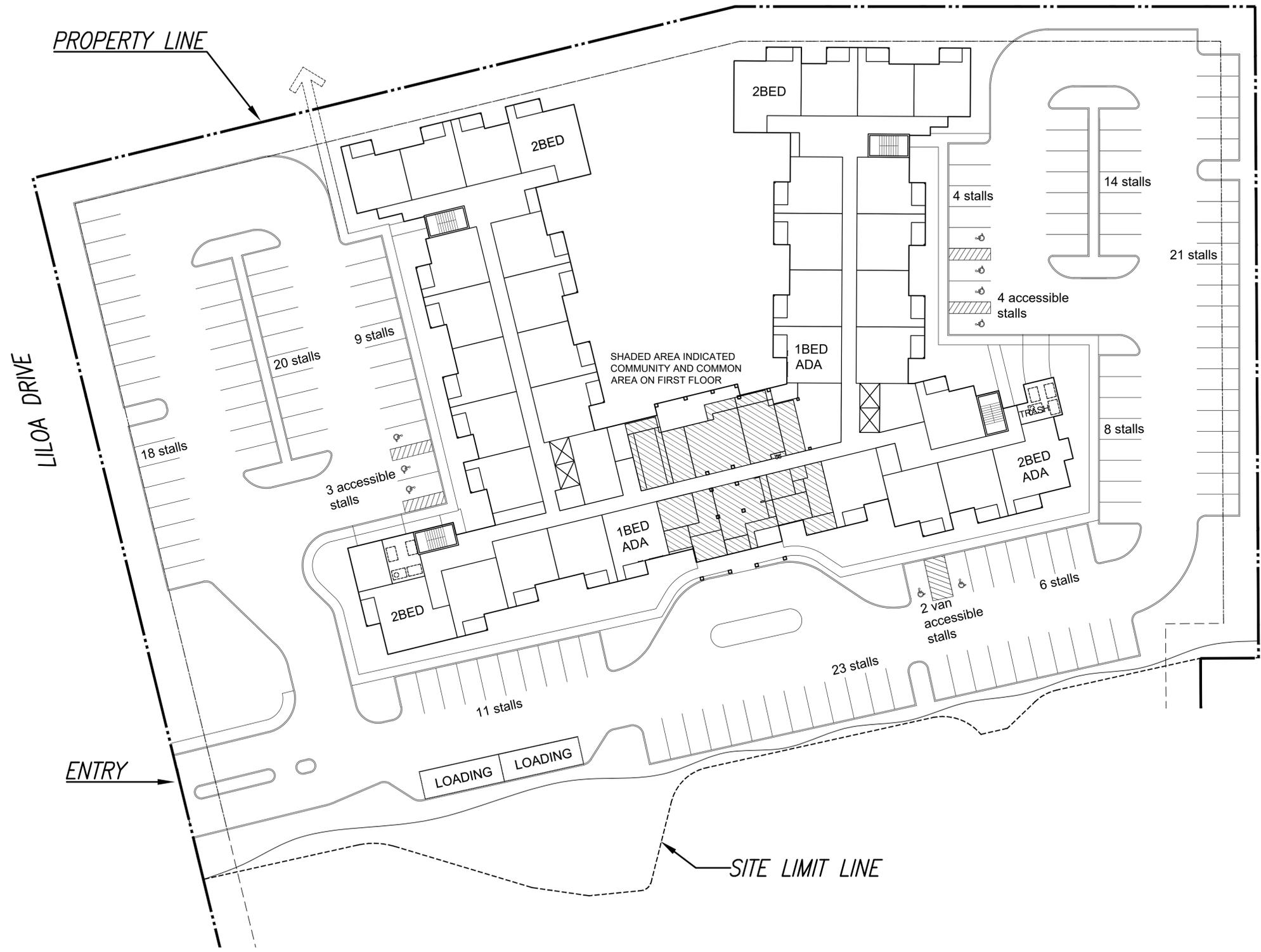
WELAKAHA ROAD

EXISTING DRAINAGE AREA

LILOA HALE SITE (LIMITS OF WORK)

SITE BOUNDARIES





**SITE SUMMARY**

3 FLOORS:

1 BEDROOM ADAPTABLE UNITS (FHA):	96 UNITS
1 BEDROOM ACCESSIBLE UNITS (ADA):	5 UNITS
2 BEDROOM ADAPTABLE UNITS (FHA):	15 UNITS
2 BEDROOM ACCESSIBLE UNITS (ADA):	1 UNITS
<b>TOTAL UNITS:</b>	<b>117 UNITS</b>

**PARKING**

1 BEDROOM PARKING PROVIDED:	101 STALLS
2 BEDROOM PARKING PROVIDED:	32 STALLS
ACCESSIBLE PARKING PROVIDED:	7 CAR ACCESSIBLE STALLS 2 VAN ACCESSIBLE STALLS
GUEST PARKING PROVIDED:	10 GUEST STALLS
<b>TOTAL PARKING PROVIDED:</b>	<b>143 TOTAL STALLS</b>

12' X 34' LOADING STALLS PROVIDED: 2 LOADING STALLS

**DENSITY**

117 UNITS / 3.61 ACRES =  
32.4 UNITS / ACRE

**PROJECT AREA**  
3.61 ACRES

**Floor Area Calculations**

First Floor:	35,298 sf
Second Floor:	33,696 sf
Third Floor:	33,696 sf
<b>Total Floor Area:</b>	<b>102,690 sf</b>

Total Horiz. Circulation:	16,960 sf
Total Vert. Circulation:	3,213 sf
<b>Total Common Spaces:</b>	<b>6,776 sf</b>
<b>Total Common Area:</b>	<b>26,949 sf</b>

**Liloa Hale - SENIOR HOUSING**  
HIGHRIIDGE COSTA  
DESIGN PARTNERS INCORPORATED

**SITE PLAN**  
KIHEI, HAWAII



March 09, 2020





### TREE LEGEND

- Large Monkey Pod Tree
- Rainbow Shower (2" cal., 6'-0" trunk ht.)
- Medium Shade Canopy (Parking Areas) (2" cal., 6'-0" trunk ht.)
- Milo, Fern Tree, Geiger Tree
- Small Accent Tree
- Singapore Plumeria (6-ft. planted ht.)
- Jatropha (6-ft. planted ht.)
- Naio Hedge
- Fruit Trees
- Citrus (Valencia Orange, Dancy Tangerine, Meyer's Lemon)
- Wurtz - Little Cado 'A' Avocado
- "B" Type Dwarf (i.e. Don Gillogly)
- Papaya

**PROJECT AREA**  
3.61 ACRES

PIILANI HIGHWAY

LILOA DRIVE

ENTRY

**Liloa Hale - SENIOR HOUSING**

HIGHRIDGE COSTA

DESIGN PARTNERS INCORPORATED

**CONCEPTUAL LANDSCAPE PLAN**

KIHEI, HAWAII

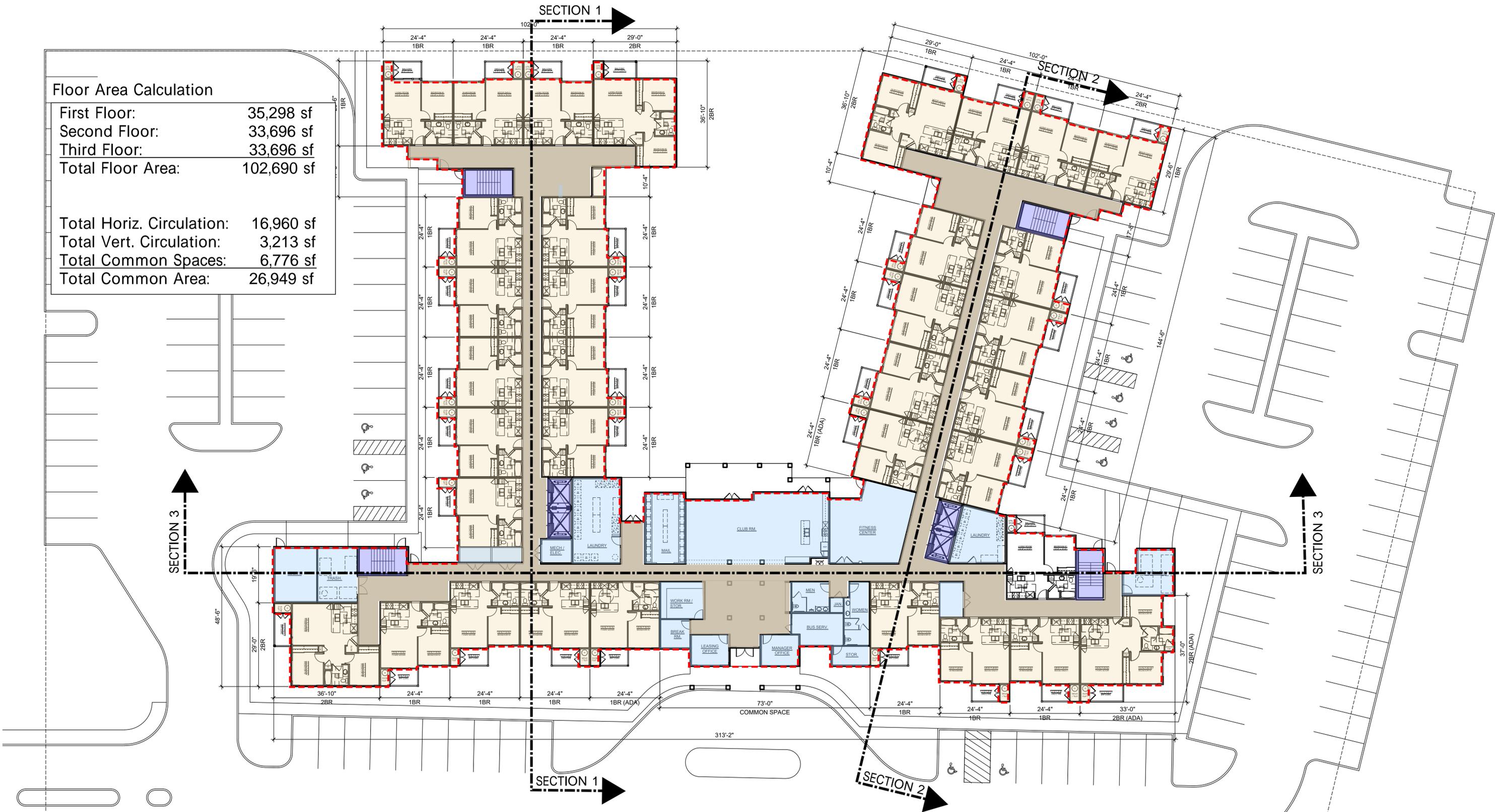
March 09, 2020



**Floor Area Calculation**

First Floor:	35,298 sf
Second Floor:	33,696 sf
Third Floor:	33,696 sf
<b>Total Floor Area:</b>	<b>102,690 sf</b>

Total Horiz. Circulation:	16,960 sf
Total Vert. Circulation:	3,213 sf
Total Common Spaces:	6,776 sf
<b>Total Common Area:</b>	<b>26,949 sf</b>



First floor gross area  
 35,229 sf

	5,572 sf	Horiz. Circulation
	1,071 sf	Vert. Circulation
	4,658 sf	Common Spaces

**CONCEPTUAL FIRST FLOOR PLAN**



**Liloa Hale - SENIOR HOUSING**  
 HIGHRIDGE COSTA

KIHEI, HAWAII

DESIGN PARTNERS INCORPORATED

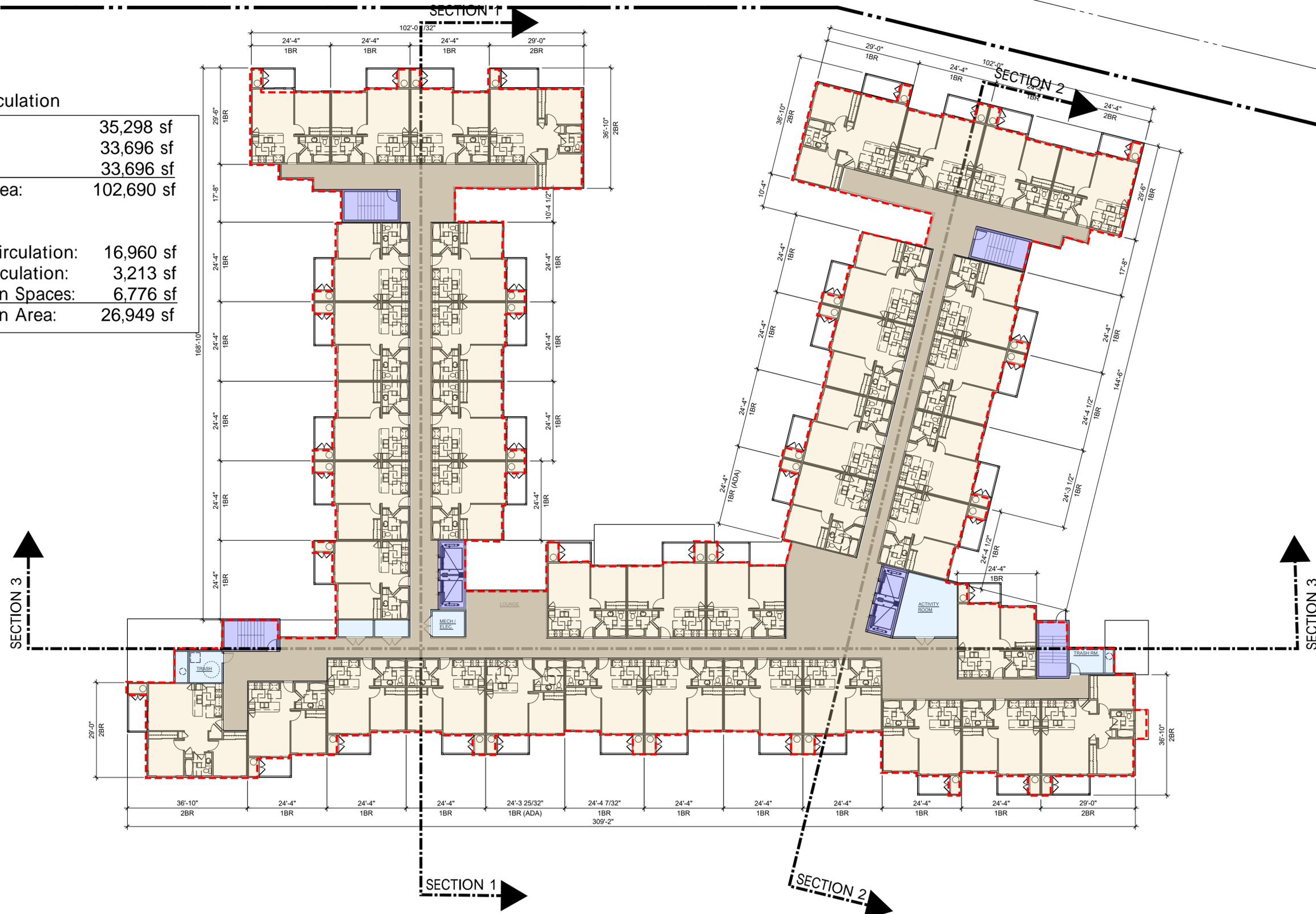
March 09, 2020



**Floor Area Calculation**

First Floor:	35,298 sf
Second Floor:	33,696 sf
Third Floor:	33,696 sf
<b>Total Floor Area:</b>	<b>102,690 sf</b>

Total Horiz. Circulation:	16,960 sf
Total Vert. Circulation:	3,213 sf
Total Common Spaces:	6,776 sf
<b>Total Common Area:</b>	<b>26,949 sf</b>



Second thru third floor gross area  
 33,696 sf

	5,694 sf	Horiz. Circulation
	1,071 sf	Vert. Circulation
	1,059 sf	Common Spaces

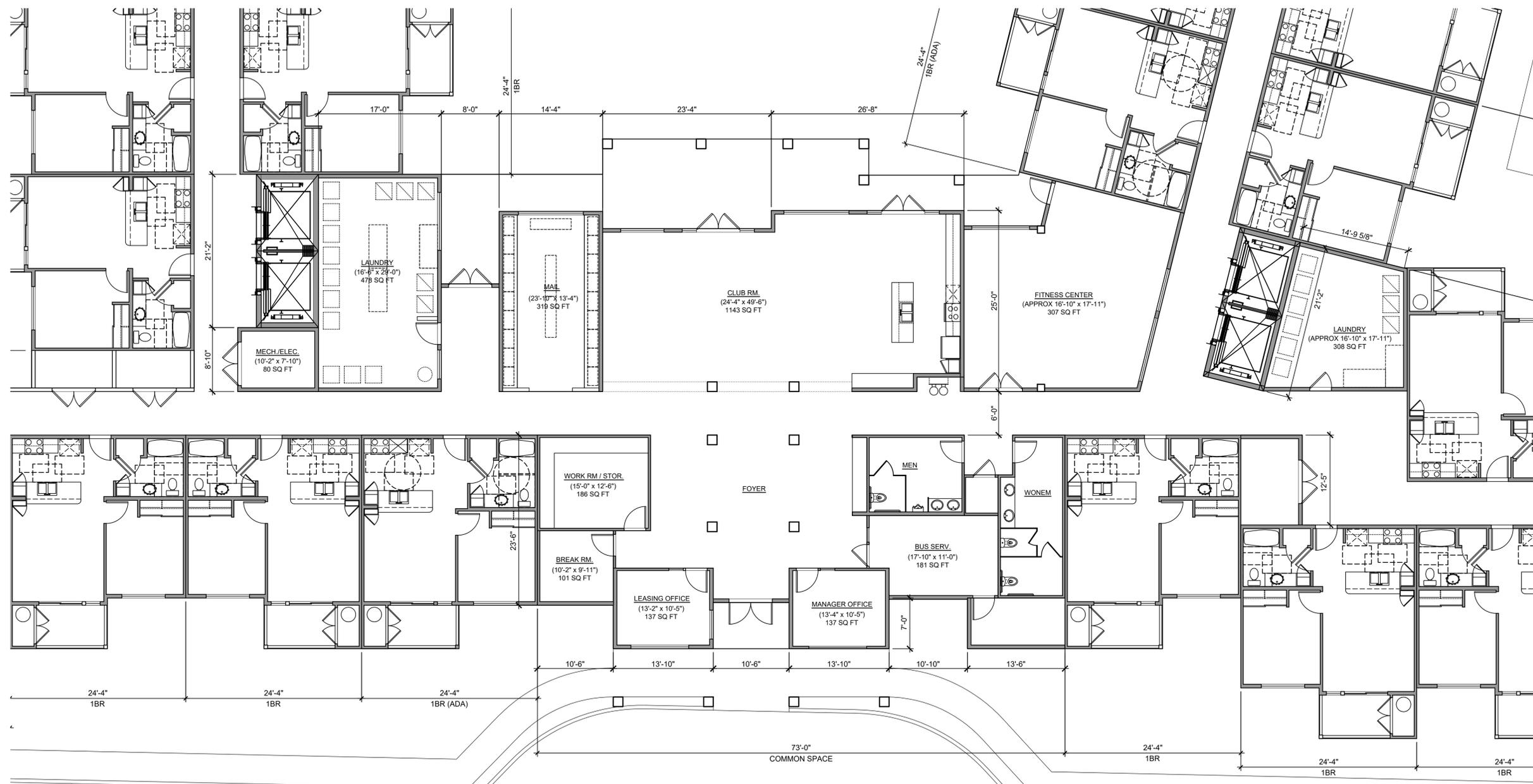
**CONCEPTUAL SECOND THRU THIRD FLOOR PLAN**

KIHEI, HAWAII

March 09, 2020

**Liloa Hale - SENIOR HOUSING**  
 HIGHRIDGE COSTA

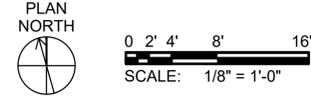
DESIGN PARTNERS INCORPORATED

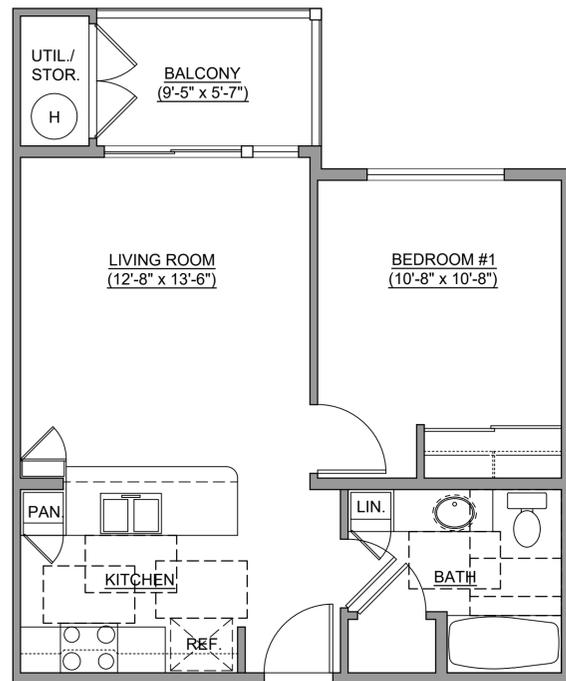


**COMMON AREA ENLARGED PLAN**

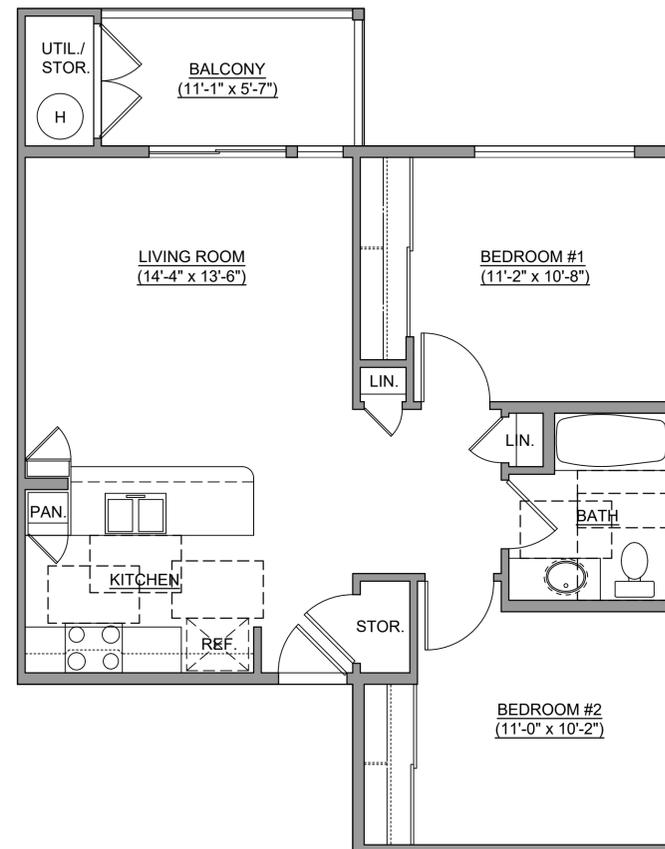
KIHEI, HAWAII

March 09, 2020

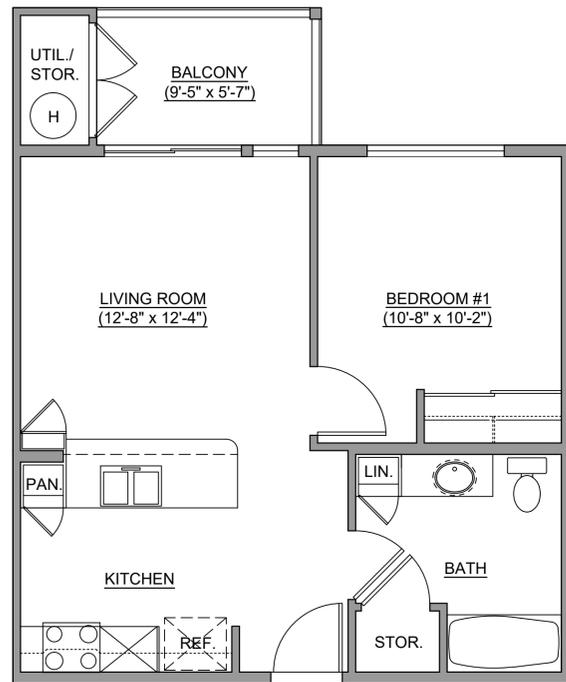




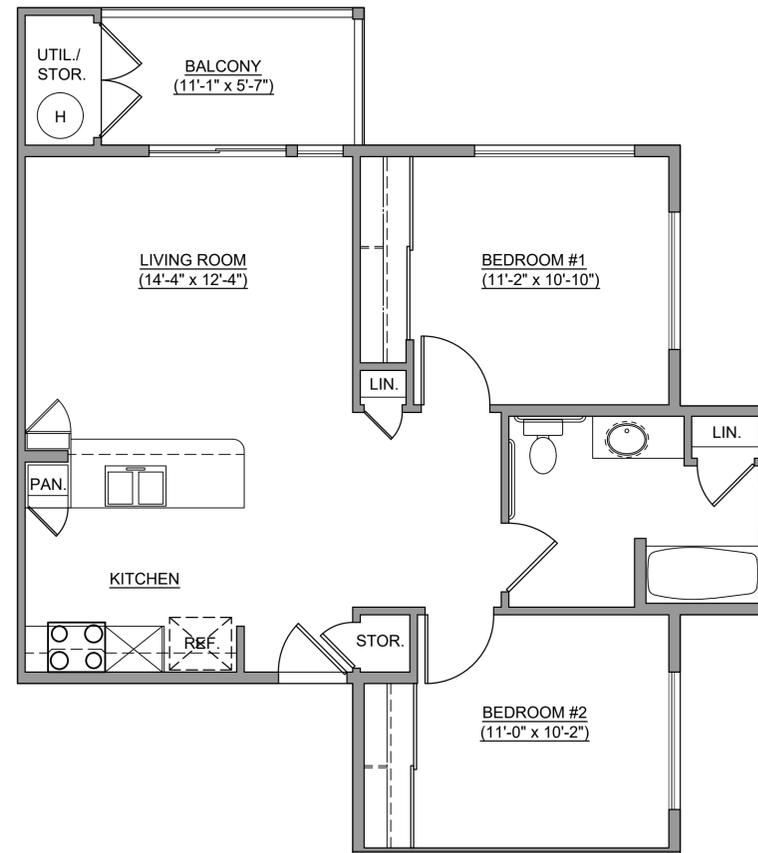
**UNIT 1**  
**1 BEDROOM UNIT**  
 LIVING AREA : 561 SF  
 BALCONY : 59 SF  
 EXT. STORAGE : 22 SF  
**TOTAL : 642 SF**



**UNIT 2**  
**2 BEDROOM UNIT**  
 LIVING AREA : 787 SF  
 BALCONY : 69 SF  
 EXT. STORAGE : 22 SF  
**TOTAL : 878 SF**



**UNIT 1 (ADA)**  
**1 BEDROOM UNIT**  
 LIVING AREA : 572 SF  
 BALCONY : 59 SF  
 EXT. STORAGE : 22 SF  
**TOTAL : 653 SF**



**UNIT 2 (ADA)**  
**2 BEDROOM UNIT**  
 LIVING AREA : 825 SF  
 BALCONY : 69 SF  
 EXT. STORAGE : 22 SF  
**TOTAL : 916 SF**



NORTH SIDE ELEVATION



EAST SIDE ELEVATION

**Liloa Hale - SENIOR HOUSING**

HIGHRIDGE COSTA

DESIGN PARTNERS INCORPORATED

**DRAFT COLORED ELEVATIONS**

KIHEI, HAWAII

March 09, 2020



SOUTH SIDE ELEVATION



WEST SIDE ELEVATION

**Liloa Hale - SENIOR HOUSING**

HIGHRIDGE COSTA

DESIGN PARTNERS INCORPORATED

KIHEI, HAWAII

March 09, 2020

DRAFT COLORED ELEVATIONS



WEST SIDE COURTYARD ELEVATION



EAST COURTYARD SIDE ELEVATION

**Liloa Hale - SENIOR HOUSING**

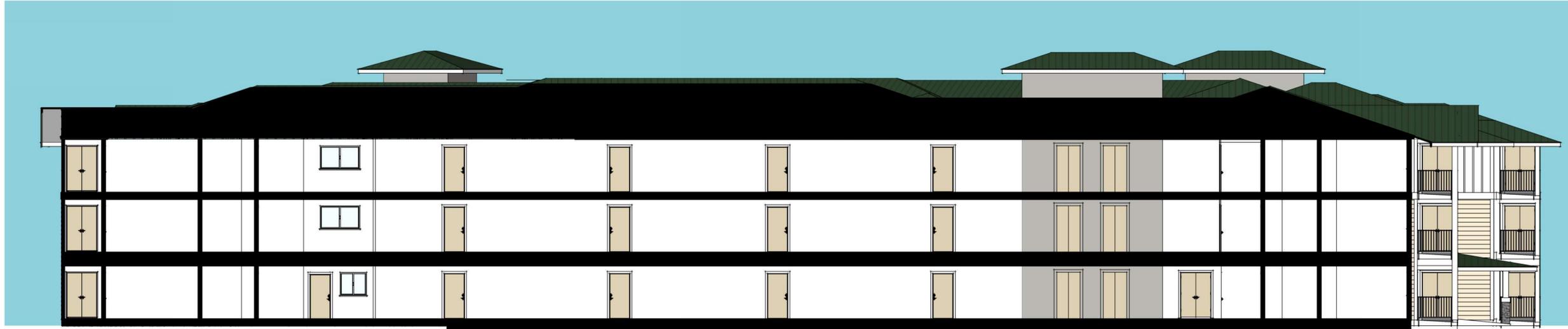
HIGHRIDGE COSTA

DESIGN PARTNERS INCORPORATED

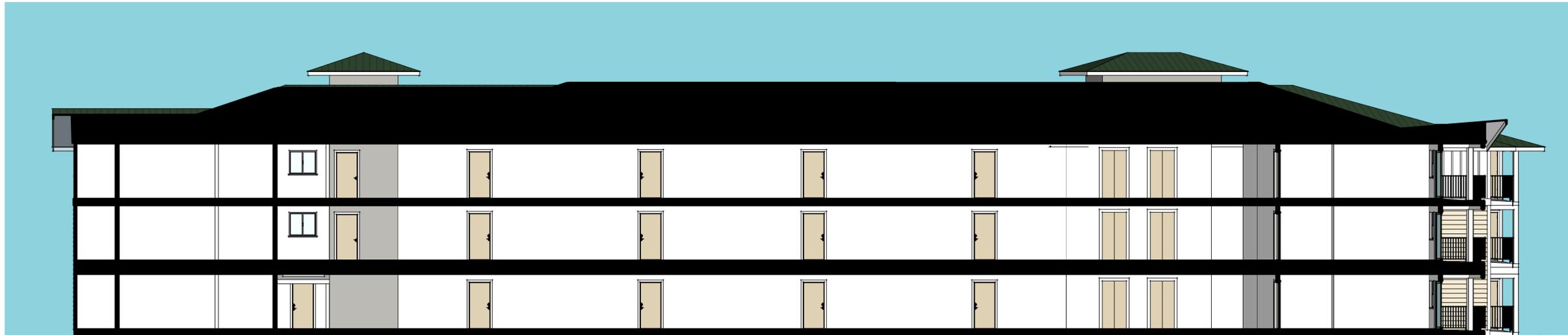
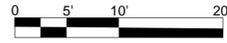
**DRAFT COLORED ELEVATIONS**

KIHEI, HAWAII

March 09, 2020



**BUILDING SECTION 1**



**BUILDING SECTION 2**





**BUILDING SECTION 3**



**Liloa Hale - SENIOR HOUSING**

HIGHRIDGE COSTA

DESIGN PARTNERS INCORPORATED

**DRAFT COLORED SECTION**

KIHEI, HAWAII

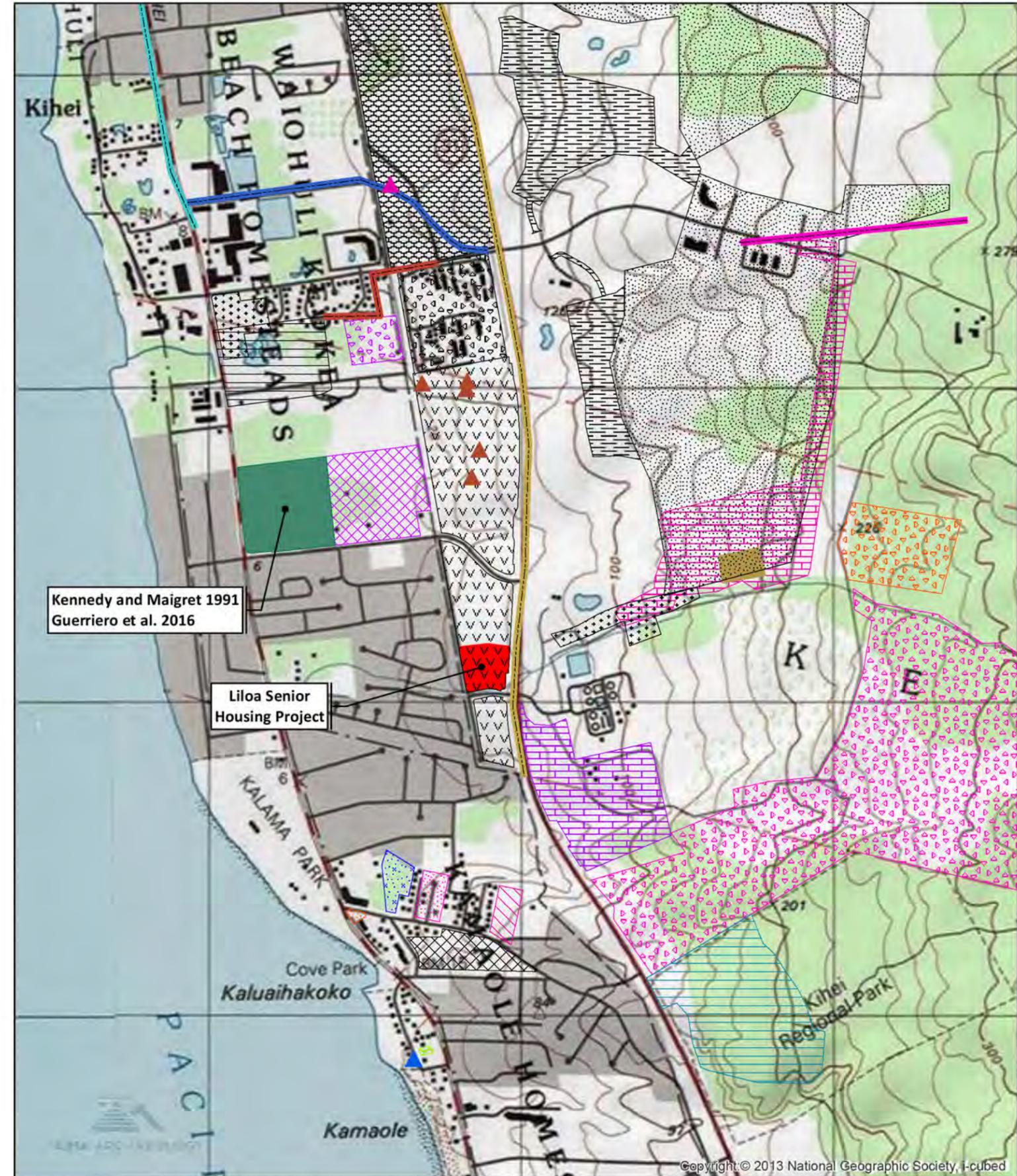
March 09, 2020

## Exhibit 3 Previous Archaeological Studies

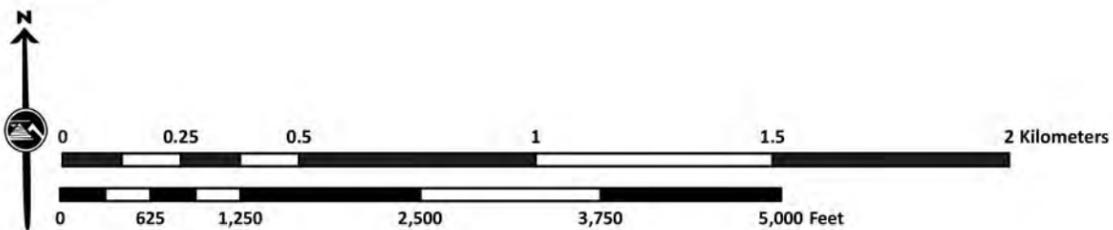
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# Previous Archaeological Studies within a One-Mile Radius of the Proposed Liloa Senior Housing Project

- |  |                                 |
|--|---------------------------------|
| ■ Liloa Hale Senior Housing Project Area | ■ Guerriero et al., 2016        |
| ▲ Fortini and Dega, 2006                 | ■ Hammatt and Shideler, 2000b   |
| ▲ Fredericksen and Fredericksen, 1995a   | ■ Kennedy and Maigret, 1991     |
| ▲ Johnson and Spear, 2005                | ■ Kikiloi et al., 2000          |
| ▲ Burgette and Spear, 1998               | ■ Madeus and Fredericksen, 2008 |
| ▲ Cordy, 1977                            | ■ Madeus and Fredericksen, 2009 |
| ▲ Fredericksen and Fredericksen, 1995b   | ■ Monahan, 2004                 |
| ▲ Fredericksen, 2006                     | ■ Morawski and Dega, 2005       |
| ▲ Hammatt and Shideler, 2000a            | ■ Pantaleo, 2003                |
| ■ Burgett and Spear, 1996                | ■ Perzinski and Dega, 2010      |
| ■ Burgette and Spear, 1998               | ■ Pestana et al., 2008          |
| ■ D. Fredericksen, 1993                  | ■ Pestana et al., 2010          |
| ■ Dega, 2003                             | ■ Rotunno-Hazuka et al., 2005   |
| ■ Dega, 2008                             | ■ Tome and Dega, 2002           |
| ■ Donham, 1989                           | ■ W. Fredericksen et al., 1991b |
| ■ Donham, 1990                           | ■ W. Fredericksen et al., 1994  |
| ■ W. M. Fredericksen et al., 1991a       |                                 |



Base Map  
 U.S. Geological Survey  
 1992 Puu o Kali Quadrangle [map], 1:24000. U.S. Department of Interior, USGS, Reston, VA.  
 GIS Layers  
 'Aina Archaeology 2019 (Proj Code 1911)



Author	Type of Study and Summary of Findings
<b>Cordy 1977</b>	<b>Reconnaissance:</b> Identified 38 historic properties within the study corridor: 30 in Waiohuli, 0 in Kaonoulu, and 8 in Kēōkea
<b>Donham 1989</b>	<b>Inventory Survey:</b> Pedestrian survey of an approximate 114-acre study area resulted in the identification of five historically significant archaeological sites comprised of 15 component features. These historic properties included structural remnants associated with ranching (SIHP 50-50-10-2473 and -2474), a historic wall section (SIHP -1705), two cairns representing possible burials (SIHP -2475), five alignments interpreted as possible precontact agricultural terraces (SIHP -2476).
<b>Donham 1990</b>	<b>Inventory Survey:</b> Pedestrian survey and archaeological site testing conducted across approximately 74-acres resulting in the recordation of a total of 16 historic properties comprised of 30 component features. Recorded sites included three previously identified historic properties (SIHP 1709-1711) , as well as, an additional 13 newly identified sites (SIHP 2513-2524). Formal feature types included terraces, enclosure, C-shapes, rock mounds, platforms, midden scatters, an alignment, and a modified outcrop.
<b>W.M. Fredericksen et al. 1991a</b>	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing of an approximate 3.14-acre study area. A total of 37 exploratory trenches were excavated, ranging in length from 3 to 6 m, resulting in the observation of recent refuse (e.g. construction debris, animal bones, and domestic trash) along with two railroad spikes. No historically significant archaeological sites were identified on either the surface or within subsurface contexts.
<b>W.M. Fredericksen et al. 1991b</b>	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing of an approximate 10,545 sq. ft. area. A total of 23 stratigraphic trenches, measuring roughly 3-3.5 m in length were excavated. Findings included the identification of a recent refuse pit, as well as, a modern pet burial which consisted of a small dog wrapped in a blanket. No historically significant archaeological sites were identified on either the surface or within subsurface contexts.
<b>Kennedy and Maigret 1991</b>	<b>Inventory Survey:</b> Study was limited to a systematic pedestrian survey of an approximate 20-acre area. No historically significant archaeological sites were identified on the surface. Subsurface testing was recommended within the sand dune area within the southeastern section of the study area.

Author	Type of Study and Summary of Findings
<b>D.L. Fredericksen et al. 1993</b>	<b>Inventory Survey</b> and Data Recovery: Pedestrian survey and subsurface excavation within an approximate 2-acre area resulted in the identification and documentation of a rock shelter (SIHP 50-50-10-3193) interpreted as a short-term or recurrent habitation site. Excavation resulted in the recovery of dietary remains consisting of marine fauna and formal artifacts which included over 1 00 volcanic glass flakes, basalt cores and flakes, bone picks, a coral file, and a piece of worked bone. A radiocarbon 14 sample yielded a date of 270 +/- 120 BP (Cal AD 1560-1800).
<b>W.M. Fredericksen et al. 1994</b>	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing of seven continuous parcels. While no historically significant archaeological sites were identified on the surface, subsurface testing did encounter sparse amounts of modern cultural material debris in three of sixteen stratigraphic trenches, as well as, as recent refuse pit. No historically significant layers or cultural materials were identified or recovered from subsurface contexts.
<b>E.M. Fredericksen and Fredericksen 1995a</b>	<b>Data Recovery:</b> Archaeological data recovery of SIHP 50-50-10-3529, a low rock overhang interpreted as a temporary habitation shelter and activity area focused on use and refinement of volcanic glass material and fishhook manufacture. Charcoal samples recovered from fire hearths just outside of the drip line returned dates of occupation ranging from cal AD 1470 to 1700. Significant amounts of marine shell dietary remains were recovered from 21 test units within and adjacent to the overhang shelters, along with portable artifacts consisting of coral abraders and files, volcanic glass cores and utilized flakes, utilized basalt flakes, worked bone and fishhook pieces.
<b>E.M. Fredericksen and Fredericksen 1995b</b>	<b>Inventory Survey:</b> Pedestrian and subsurface testing of an approximate 150 ft. wide corridor resulted in the identification of a rock shelter and associated cultural deposit covering a 20 to 25 sq. m. area (SIHP 50-50-10-3529) representing a short-term or recurring habitation area.
<b>Burgett and Spear 1996</b>	<b>Inventory Survey:</b> Systematic pedestrian survey and limited subsurface testing of an approximate 8.67-acre study area resulted in the identification of a stone alignment of an indeterminate function (SIHP 50-50-10-4400 Feature 1), a pit feature (SIHP -440 Feature 2) that was encountered in TU-1, and associated low density deposits (Deposits 1 and 2). The pit feature was interpreted as either a storage feature or offering based on the presence of coral pieces and lack of charcoal or faunal remains. Additionally, Basalt flakes (n=5) along with marine shell and marine invertebrate remains (389.4 g) were recovered from TU-1 through TU-6.
<b>Burgett and Spear 1998</b>	<b>Inventory Survey:</b> Pedestrian survey with manual subsurface testing within a 6.95 acre area and along an approximate 2046 ft. of drain line. No historically significant archaeological remains or structures were identified as a result of the study.

Author	Type of Study and Summary of Findings
<b>Hammatt and Shideler 2000a</b>	<b>Inventory Survey:</b> Field reconnaissance and monitoring of soil borings resulted in negative findings. No historically significant archaeological sites identified.
<b>Hammatt and Shideler 2000a</b>	<b>Inventory Survey:</b> Pedestrian survey of 4.75 acres. Extensive alteration noted within the project area (e.g. bulldozer push-piles and cleared roadways). Remnants of cattle ranching also observed in the project area. No historically significant archaeological sites documented within the project area.
<b>Kikiloi et al. 2000</b>	<b>Inventory Survey:</b> Pedestrian survey of approximately 20 acres. Modern land altering activities related to utility installation and ranching activities was noted across the project area. No historically significant archaeological sites were identified on the surface of the study area.
<b>Tome and Dega 2002</b>	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing within an approximate 3-acre study area resulted in the identification of a temporary habitation area (SIHP 50-50-10-5192) comprised of four component features. These features include a remanant rock alignment and associated cultural material scatter (Feature 1), as well as three additional discrete, low density cultural material scatters likely representing single-use activity areas.
<b>Dega 2003</b>	<b>Inventory Survey:</b> Systematic pedestrian survey of a 564 m by 17 m road corridor and 83 m by 23 m utility area. Survey observations noted the presence of exposed bedrock throughout the study area indicating shallow soils and sediment. No historically significant archaeological sites were identified within the study area.
<b>Pantaleo 2003</b>	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing consistng of 19 exploratory trenches was completed within an approximate 21-acre study area. No historically significant archaeological sites were identified on the surface or within subsurface contexts.
<b>Monahan 2004</b>	<b>Inventory Survey:</b> Pedestrian survey of an approximate 56.647-acre area with manual subsurface testing at selected sites. A total of four surface features were identified and consisted of pre-contact x and one historic military training enclosure (SIHP -5508).
<b>M01965</b>	
<b>Morawski and Dega 2005</b>	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing of an approximate 36.8 acre study area resulted in the identification of one historic ranching site consisting of a concrete reservoir (SIHP 50-50-10-5647).

Author	Type of Study and Summary of Findings
<b>Rotunno-Hazuka et al. 2005</b>	<b>Inventory Survey:</b> Pedestrian survey along with both manual and mechanically assisted subsurface testing within an approximate 3-acre study area that was situated on a remnant sand dune . A total of nine <i>in situ</i> historic era burials and the displaced remains of nine individuals were documented at 27 localities (SIHP 50-50-10-4962) within the study area. The report goes on to note that an additional eight individuals were disturbed within the study during grading activities in 2001.
<b>Fortini and Dega 2006</b>	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing of a 0.4-acre study area. Subsurface testing showed extensive fill deposits within the project area. No historically significant archaeological sites were identified either on the surface or within subsurface contexts as a result of the study.
<b>E.M. Fredericksen 2006</b>	<b>Inventory Survey:</b> Archaeological pedestrian survey and mechanically assisted subsurface testing of an approximate 2.2 km (1.39 mile) long by 15 m (50 ft) wide corridor. The pedestrian survey noted extensive earth moving activities associated with access road construction while testing resulted in the identification of two , culturally sterile silty clay and compacted clay layers. No historically significant or culturally sensitive archaeological sites were identified.
<b>Dega 2008</b>	<b>Inventory Survey:</b> Pedestrian survey of an approximate 282-acre study area resulting in the identification of three archaeological sites consisting of two historic era modified outcrop (SIHP 50-50-10-6239 and -6240) and a pre-contact to historic era boundary wall (SIHP -6241). All three historic properties were identified adjacent and to the south of Waipuilani Gulch and Stream.
<b>Madeus and Fredericksen 2008</b>	<b>Inventory Survey:</b> Pedestrian survey, as well as manual and mechanically assisted subsurface testing of a 155-acre portion of an overall 310-acre parcel. Two historic properties consisting of a pre-contact temporary habitation site with possible ceremonial associations (SIHP 50-5010-6484) and a possible World War II era complex consisting of transportation features and markers (Features A through D) likely associated with military training and uses (SIHP -6485).
<b>Pestana et al. 2008</b>	<b>Inventory Survey:</b> Systematic pedestrian survey and limited mechanically assisted subsurface testing of an approximate 5.246-acre study area. Excavation of five trenches showed the presence of culturally sterile sand deposits in the northwestern portion of the study area. No historically significant archaeological sites or culturally sensitive features were identified on either the surface or within subsurface contexts.

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Author	Type of Study and Summary of Findings
<b>Madeus and Fredericksen 2009</b>	<b>Inventory Survey:</b> Pedestrian survey and extensive mechanically assisted subsurface testing resulted in the identification and documentation of an intact cultural deposit (SIHP 50-50-10-6598) representing pre-contact habitation in the area. Modest amounts of marine shell remains, sea urchin, fish bone, one volcanic glass flake, and sparse amounts of charcoal. Report notes the presence of multiple post-contact burials (SIHP -4962) located directly north and adjacent to the study area.
<b>Perzinski and Dega 2010</b>	<b>Inventory Survey:</b> Pedestrian survey of an approximate 25-acre study area. Extensive ground alterations associated with historic era ranching was noted throughout. No historically significant archaeological sites were identified within the study area.
<b>Pestana et al. 2010</b>	<b>Inventory Survey:</b> Pedestrian survey and subsurface testing within a 10-acre study area resulted in the identification of two historic properties comprised of six component features. These sites included SIHP 50-50-10-6521 (historic military training enclosures: C-shape, L-shape, and V-shape) and SIHP -6522 (two historic ranch related rectangular concrete slabs). No portable cultural material remains were recovered as a result of testing at these features.
<b>Geurriero et al. 2016</b>	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing consisting of 11 exploratory trenches was completed on an approximate 20-acre study area. No historically significant archaeological sites were identified on the surface or within subsurface contexts.

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## Exhibit 4 Previously Identified Historic Properties

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SIHP -03529

SIHP -02475

SIHP -02476

SIHP -03193

SIHP -01709

SIHP -02522

SIHP -01710

SIHP -02523

SIHP -02520

SIHP -02519

SIHP -02521

SIHP -02516

SIHP -02518

SIHP -02515

SIHP -02517

SIHP -01711

SIHP -02513

SIHP -02514

SIHP -02512

Liloa Senior  
Housing Project

SIHP -02524

SIHP -05647

SIHP -04962

SIHP -06485  
Feature A

SIHP -06485  
Feature B

SIHP -06485  
Feature C

SIHP -06598

SIHP -06484

SIHP -06485  
Feature D

SIHP -06522  
Feature 2

Cove Park  
Kaluaiahakoko

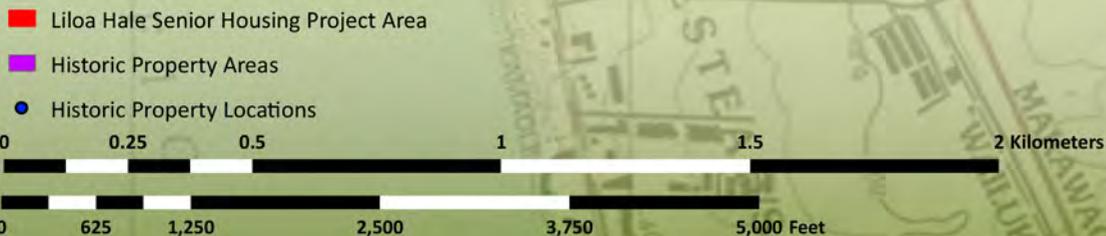
SIHP -0652  
Feature 3

SIHP -06522  
Feature 3

SIHP -06522  
Feature 1

SIHP -06521  
Feature 2

SIHP -06521  
Feature 1



■ Liloa Hale Senior Housing Project Area

■ Historic Property Areas

● Historic Property Locations



Base Map  
U.S. Geological Survey  
1992 Puu o Kali Quadrangle [map]. 1:24000.  
U.S. Department of Interior, USGS, Reston, VA.  
GIS Layers  
Aina Archaeology 2019 (Proj Code 1911)

*Previously Identified Historic Properties within a One-Mile Radius of the Liloa Senior Housing Project*

<b>SIHP No</b>	<b>Feature</b>	<b>Formal Type</b>	<b>Inferred Function</b>	<b>Age</b>
<b>50-50-10-</b>				
<b>01709</b>		Enclosure	Agriculture	Pre-contact
<b>01709</b>		Enclosure	Agriculture	Pre-Contact
<b>01710</b>		Enclosure	Agriculture/ Temporary Habitation	Pre-contact
<b>01710</b>		Enclosure	Agriculture/ Possible Habitation	Pre-Contact
<b>01711</b>		Complex	Agriculture	Pre-Contact
<b>02475</b>		Cairn	Marker	Pre-Contact
<b>02476</b>		Alignment	Possible Agriculture	Possible Pre-Contact
<b>02512</b>		Complex	Agriculture/Habitation	Pre-Contact
<b>02513</b>		Enclosure	Agriculture	Pre-Contact
<b>02514</b>		Platform	Possible Habitation	Pre-Contact
<b>02515</b>		Modified Outcrop	Indeterminate	Indeterminate
<b>02516</b>		Complex	Possible Agriculture/ Temporary Habitation	Pre-Contact
<b>02517</b>		Cultural Material Scatter	Habitation	Pre-Contact
<b>02518</b>		Complex	Agriculture	Pre-Contact
<b>02519</b>		Terrace	Agriculture	Pre-Contact
<b>02520</b>		Complex	Agriculture	Pre-Contact
<b>02521</b>		Cultural Material Scatter	Habitation	Pre-Contact
<b>02522</b>		Complex	Agriculture/ Possible Habitation	Pre-Contact
<b>02523</b>		Complex	Agriculture	Pre-Contact
<b>02524</b>		Cairn	Indeterminate	Pre-Contact
<b>03193</b>		Rock Shelter/ Subsurface Deposit	Temporary Habitation	Pre-Contact
<b>03193</b>		Rock Shelter/ Subsurface Deposit	Temporary Habitation	Pre-Contact
<b>03529</b>		Rock Shelter/ Cultural Deposit	Temporary Habitation	Pre-Contact
<b>04962</b>		Human Burial	Human Burial	Pre-Contact to Historic
<b>05647</b>		Reservoir	Water Control	Historic - Ranch
<b>06484</b>		Wall	Temporary Habitation/ Ceremonial	Pre-Contact
<b>06485</b>	A	Terrace	Military Training	Historic - World War II
<b>06485</b>	B	Mound	Marker	Historic - World War II
<b>06485</b>	C	Ford	Transportation	Historic - World War II
<b>06485</b>	D	Road Bed	Transportation	Historic - World War II
<b>06521</b>	1	C-Shape	Military Training	Historic - World War II
<b>06521</b>	2	V-Shape	Military Training	Historic - World War II

<b>SIHP No</b>	<b>Feature</b>	<b>Formal Type</b>	<b>Inferred Function</b>	<b>Age</b>
<b>50-50-10-</b>				
<b>06521</b>	3	L-Shape	Military Training	Historic - World War II
<b>06522</b>	1	Wall	Animal Control	Historic = Ranch
<b>06522</b>	2	Concrete Slab	Livestock Maintenance	Historic - Ranch
<b>06522</b>	3	Concrete Slab	Livestock Maintenance	Historic - Ranch

## Exhibit 5 Previous SHPD Correspondence

---

LINDA LINGLE  
GOVERNOR OF HAWAII



PETER T. YOUNG  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON  
DEPUTY DIRECTOR - LAND

ERNEST Y.W. LAU  
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES  
BOATING AND OCEAN RECREATION  
BUREAU OF CONVEYANCES  
COMMISSION ON WATER RESOURCE MANAGEMENT  
CONSERVATION AND COASTAL LANDS  
CONSERVATION AND RESOURCES ENFORCEMENT  
ENGINEERING  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOOLAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION  
KAKUHIHEWA BUILDING, ROOM 555  
601 KAMOKILA BOULEVARD  
KAPOLEI, HAWAII 96707

HAWAII HISTORIC PRESERVATION  
DIVISION REVIEW

Log #: 2003.1802  
Doc #: 0309CD41

Applicant/Agency: Mr. Bert Ratte  
Address: County of Maui  
Department of Public Works and Environmental Management  
Development Services Administration  
250 South High Street  
Wailuku, Hawaii 96793

SUBJECT: Chapter 6E-42 Historic Preservation Review – Work on County Roadway Permit  
Application for the Proposed Water Lateral Installation for Hope Chapel (WTPC  
2003/43) [Count/DSA]

Ahupua`a: Keokea  
District, Island: Makawao, Maui  
TMK: (2) 2-2-002:072 (formerly parcel 042)

1. We believe there are no historic properties present, because:

- a) intensive cultivation has altered the land
- b) residential development/urbanization has altered the land
- c) previous grubbing/grading has altered the land
- d) an acceptable archaeological assessment or inventory survey found no historic properties
- e) other: an acceptable archaeological inventory survey found a single historic site, which was determined significant for information content only. Sufficient information was obtained during the inventory survey with no further archaeological work being necessary.

2. This project has already gone through the historic preservation review process, and mitigation has been completed \_\_\_\_.

Thus, we believe that "no historic properties will be affected" by this undertaking

Staff: Cathleen A. Dagher  
Cathleen A. Dagher  
Assistant Maui/Lana`i Island Archaeologist  
(808) 692-8023

Date: 17 September 2003

SEP 24 2003

LINDA LINGLE  
GOVERNOR OF HAWAII



PETER T. YOUNG  
CHAIRPERSON  
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COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON  
DEPUTY DIRECTOR - LAND

ERNEST Y.W. LAU  
DEPUTY DIRECTOR - WATER



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION  
KAKUHIHEWA BUILDING, ROOM 555  
601 KAMOKILA BOULEVARD  
KAPOLEI, HAWAII 96707

AQUATIC RESOURCES  
BOATING AND OCEAN RECREATION  
BUREAU OF CONVEYANCES  
COMMISSION ON WATER RESOURCE MANAGEMENT  
CONSERVATION AND COASTAL LANDS  
CONSERVATION AND RESOURCES ENFORCEMENT  
ENGINEERING  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOOLAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

HAWAII HISTORIC PRESERVATION  
DIVISION REVIEW

Log #: 2003.2199  
Doc #: 0310CD78

Applicant/Agency: Mr. Bert Ratte  
Address: County of Maui  
Department of Public Works and Environmental Management  
Development Services Administration  
250 South High Street  
Wailuku, Hawaii 96793

SUBJECT: Chapter 6E-42 Historic Preservation Review – Grading and Grubbing Permit  
Application for the Proposed Hope Chapel Mass Grading Project (WTPC  
2003/52) [Count/DSA]

Ahupua`a: Keokea  
District, Island: Makawao, Maui  
TMK: (2) 2-2-002:072 (formerly parcel 042)

1. We believe there are no historic properties present, because:

- a) intensive cultivation has altered the land
- b) residential development/urbanization has altered the land
- c) previous grubbing/grading has altered the land
- d) an acceptable archaeological assessment or inventory survey found no historic properties
- e) other: an acceptable archaeological inventory survey found a single historic site, which was determined significant for information content only. Sufficient information was obtained during the inventory survey with no further archaeological work being necessary.

2. This project has already gone through the historic preservation review process, and mitigation has been completed \_\_\_\_.

Thus, we believe that "no historic properties will be affected" by this undertaking

Staff: Cathleen A. Dagher  
Cathleen A. Dagher  
Assistant Maui/Lana`i Island Archaeologist  
(808) 692-8023

Date: 29 Oct 2003

OCT 29 2003



STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION  
KAKUHIHEWA BUILDING, ROOM 555  
601 KAMOKILA BOULEVARD  
KAPOLEI, HAWAII 96707

AQUATIC RESOURCES  
BOATING AND OCEAN RECREATION  
COMMISSION ON WATER RESOURCE  
MANAGEMENT  
CONSERVATION AND RESOURCES  
ENFORCEMENT  
CONVEYANCES  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
LAND  
STATE PARKS

HAWAII HISTORIC PRESERVATION  
DIVISION REVIEW

Log #: 30325  
Doc #: 0207CD35

Applicant/Agency: Mr. John E. Min, Planning Director  
Address: County of Maui  
Department of Planning  
250 South High Street  
Wailuku, Hawaii 96793

SUBJECT: Chapter 6E-42 Historic Preservation Review Pertaining to the Applications for  
Special Management Area Use, Project District Phase II Approval, and Special  
Use Permit for the Proposed Kihei Hope Chapel  
(Subject I.D.: PH2 2002/0002, SM1 2002/0008, CUP 2002/0003)

Ahupua'a: Keokea  
District, Island: Makawao, Maui  
TMK: (2) 2-2-002:072

1. We believe there are no historic properties present, because:

- a) intensive cultivation has altered the land
- b) residential development/urbanization has altered the land
- c) previous grubbing/grading has altered the land
- d) an acceptable archaeological assessment or inventory survey found no historic properties
- e) other:

2. This project has already gone through the historic preservation review process, and mitigation has been completed .

Thus, we believe that "no historic properties will be affected" by this undertaking.

Staff: Cathleen A. Dagher  
Cathleen A. Dagher  
Assistant Maui/Lana'i Island Archaeologist  
(808) 692-8023

Date: 12 July 2002

JUL 17 2002

LINDA LINGLE  
GOVERNOR OF HAWAII



PETER T. YOUNG  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA  
DEPUTY DIRECTOR - LAND

DEAN NAKANO  
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES  
BOATING AND OCEAN RECREATION  
BUREAU OF CONVEYANCES  
COMMISSION ON WATER RESOURCE MANAGEMENT  
CONSERVATION AND COASTAL LANDS  
CONSERVATION AND RESOURCES ENFORCEMENT  
ENGINEERING  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOOLAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION  
601 KAMOKILA BOULEVARD, ROOM 555  
KAPOLEI, HAWAII 96707

HAWAII HISTORIC PRESERVATION  
DIVISION REVIEW

Log No.: 2005.2082

Doc No.: 0509CD35

Received: March 8, 2005

Applicant/Agency: Mr. Bert Ratte  
Address: County of Maui  
Department of Public Works and Environmental Management  
Development Services Administration  
250 South High Street  
Wailuku, Hawaii 96793

SUBJECT: Chapter 6E-42 Historic Preservation Review – Grading and Grubbing Permit  
Application for the Proposed Mass Grading for Hope Chapel – Phase 2  
((G t2005/23) [County/DSA]

Ahupua`a: Keokea  
District, Island: Makawao, Maui  
TMK: (2) 2-2-002:072

1. We believe there are no historic properties present, because:

- a) intensive cultivation has altered the land
- b) residential development/urbanization has altered the land
- c) previous grubbing/grading has altered the land
- d) an acceptable archaeological assessment or inventory survey found no historic properties
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2. This project has already gone through the historic preservation review process, and mitigation has been completed \_\_\_.

Thus, we believe that "no historic properties will be affected" by this undertaking

In the event that historic sites (human skeletal remains, etc.) are identified during the construction activities, all work needs to cease in the immediate vicinity of the find, the find needs to be protected from additional disturbance, and the State Historic Preservation Office needs to be contacted immediately at 243-5169, on Maui, or at (808) 692-8023, on O`ahu.

Staff: Cathleen A. Dagher  
Cathleen A. Dagher, Assistant Maui/Lana`i Island Archaeologist, (808) 692-8023

Date: September 26, 2005  
SEP 27 2005

Exhibit 6 Archaeological Field Inspection Log

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Project Type: Field Inspection

<b>Vegetation Density</b>	medium	<b>Vegetation Type</b>	non-native grasses, haole koa, tree tobacco, small leaf pluchia?
<b>Ground Visibility</b>	good	<b>Topography</b>	flat, undulating
<b>Setting</b>	undeveloped lands	<b>Field Problems Encountered</b>	none
<b>Number of Historic Properties Identified</b>		none observed	
<b>General Project Notes</b>			
<ul style="list-style-type: none"> <li>• Overflow parking area and storage area is overlain by large to medium sized angular construction gravels.</li> <li>• Connex boxes located on the north west portion of the project.</li> <li>• Sand deposits located in the southern section of the project area. Mounded sand observed in the area. Visible matrix contains some silt, angular gravels, cement fragments, and displaced bedrock with calcium carbonate precipitates.</li> <li>• Finally, wood posts from a former dust fence lines on the western boundary indicating previous construction activity. Portion of the project area parallel to the remnant dust fence appears to have been filled to bring it near to the current grade of Pi'ilani Highway.</li> </ul>			
<b>Photos</b>			
			
Concrete and plaster remnants incorporated into push pile debris, detail		Green waste in the southern portion of the project area, view to west	

Photos (continued)



Closeup of sand mounds within the southern portion of the project area, view to south



Overall project area from the southeast corner of the project area., view northeast to northwest



Overall view of graded and filled area, view to north

Landscape modification/fill in the southern section of the project area, view to northeast

Photos (continued)



Boulder push pile, large boulder shows evidence of machine scarring, view to west-northwest



Dust fence posts on the west boundary, view to north-northwest



Overview of project area from northern boundary, top and bottom view from west to south

Exhibit 7 Hope Chapel Geotechnical Report

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Geotechnical  
Environmental  
Water Resources  
Ecological

## Report of Geotechnical Assessment

### Senior Housing Development

Kihei, Maui, Hawaii

Submitted to:

**Highridge Costa Development Company, LLC**

330 West Victoria Street  
Gardena, CA 90248

Submitted by:

**GEI Consultants, Inc.**

4601 DTC Boulevard, Suite 900  
Denver, Colorado 80237

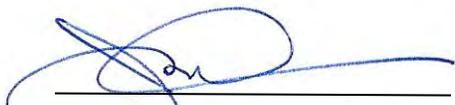
February 12, 2019

Project 1804955

The report was prepared by  
me or under my supervision



  
George Onorato  
Geotechnical Consultant

  
James W. Niehoff, PE  
Senior Geotechnical Consultant  
License Expires 4/30/20

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# 1. Introduction

---

GEI Consultants, Inc. (GEI) completed a geotechnical assessment for a proposed senior housing development to be located at 300 East Welakahao Road within the Hope Chapel Property in Kihei, Maui, Hawaii. Services for this geotechnical assessment were conducted in accordance with GEI's proposal dated August 21, 2018 and authorized by Mr. Mohannad Mohanna through execution of a Professional Services Agreement.

The purpose of this study was to conduct exploratory borings within the proposed development site to assess subsurface conditions for a proposed low-rise development. This study was intended to provide recommendations for site preparation and foundation systems for the proposed structures. This report presents a brief review of GEI's understanding of the project, a discussion of the site and subsurface conditions as disclosed by the field and laboratory testing programs, and recommendations for site preparation, foundation design, slab-on-grade design, and other geotechnical considerations applicable to foundation construction.

## **2. Project Information**

---

The following sections present a description of the site and an overview of GEI's understanding of the project. Descriptions of the site are based upon observations made by GEI representatives and information presented by the Owner. The geotechnical recommendations presented in this report are based upon the available project information and the subsurface materials characterized by our study. If any of the noted information is incorrect or different, please inform GEI so that the recommendations presented in this report can be amended, if appropriate.

### **2.1 Site Information**

GEI understands the proposed project will consist of the construction of one or more low-rise (less than four stories) garden style senior housing buildings to be located within a trapezoidal-shaped parcel bordered by Liloa Drive, East Welakahao Road, Highway 31 and the existing Hope Chapel property in Kihei, Maui (Figure 1, Appendix A). This site is currently undeveloped and covered with light vegetation and gravel paved parking areas.

Site topography is relatively planar with gentle relief sloping downward from the east to the west approximately 10 feet over the limits of the property.

### **2.2 Proposed Development**

Development plans for this site are at a very preliminary stage. The structure(s) will likely be 2 to 3 stories in height with a total of 140 housing units. For structures of this size, column loads could range from about 100 to 300 kips in magnitude. The housing units are expected to be constructed at or near current grades. Cuts and fills are expected to be less than 4 feet.

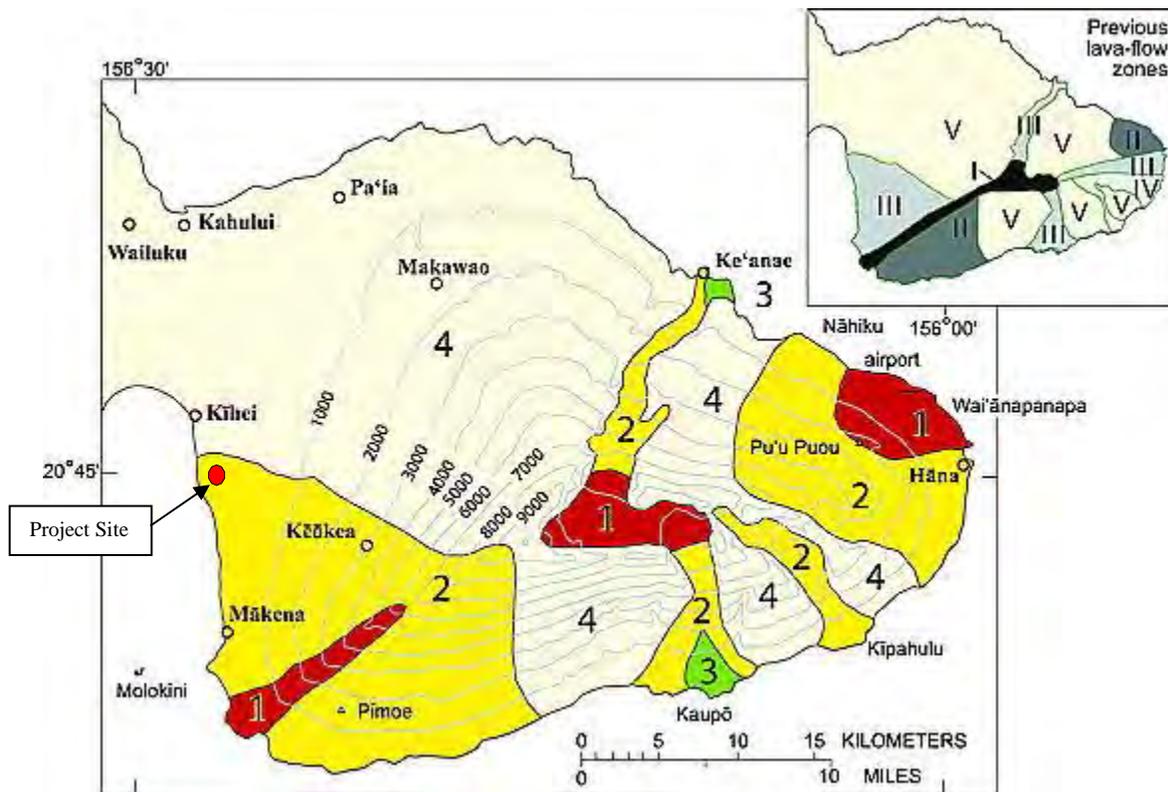
### 3. Subsurface Information

The following sections provide information relating to subsurface conditions in the area of the proposed development.

#### 3.1 Regional Geology

The site of the proposed development is located within a broad plain situated between the West Maui Mountains and the Haleakala Volcano in central Maui. Haleakala is considered dormant, but not extinct. The most recent eruption was thought to have occurred in the 1500s. The geology of the Kihei area generally consists of basalt strata deposited during the many eruptions of Haleakala during the past 30,000 years.

Lava flow zones hazards are rated on a 1 to 9 scale, with 1 having the highest risk. The map below indicates these risk zones on Maui as defined by the USGS.



As may be noted, the project site is located near the border of Zones 2 and 4, suggesting a higher than average risk of potential lava impact.

## **3.2 Exploratory Borings**

Subsurface conditions within the site of the proposed development were explored by means of six exploratory borings drilled by Valley Well Drilling under contract to GEI. The borings were drilled in the approximate positions shown on the Boring Location Plan, Figure 2, in Appendix A. Borings were laid out in the field by taping distances from existing topographic features.

All of the borings were initially advanced using hollow stem augers. Overburden materials were classified by observing drill cuttings as they were returned to the surface. Consistency of the soils was gauged by the rate of penetration of the hollow stem augers.

At depths ranging from 2-1/2 to 5 feet, the hollow stem augers reached practical refusal. The refusal materials were subsequently cored with diamond bits to a total depth of 11-1/2 to 14 feet below current grades. Individual logs of all borings are presented in Appendix B. GEI notes that subsurface conditions presented on the boring logs are representative of conditions at the specific locations drilled, and that subsurface conditions likely vary between and beyond the specific locations explored.

Our geotechnical study did not include an assessment of anthropological environmental conditions in the soil, bedrock, surface water, groundwater, or air, on or below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

### **3.2.1 *Subsurface Conditions***

All of the borings initially encountered fill or disturbed residual soils consisting of weathered basalt composed of sand, gravel, cobble and boulder sized fragments. Based upon the penetration rate of the augers, this surficial material extending to a depth of up to 5 feet was medium dense.

As noted previously, auger refusal was encountered at depths ranging from 2-1/2 to 5 feet below current grades. Cores of the underlying material revealed relatively weathered basalt bedrock. The upper few feet of the basalt was found to be variably weathered as revealed by core recoveries ranging from 8 to 90 percent. Below a depth of 9 feet, rock was found to be less weathered as indicated by core recoveries greater than 85 percent. The Rock Quality Designation was found to be poor to good. Lower RQD values were generally attributed to closely spaced fracturing of the bedrock.

All of the borings were terminated in competent basaltic bedrock. Upon completion, borings were backfilled to grade with soil cuttings.

### **3.2.2 *Groundwater Conditions***

None of the borings encountered groundwater to the boring termination depths of 11-1/2 to 14 feet. The site lies within a relatively arid portion of the Island of Maui, with rainfall totals only

about 15 inches per year. Where present, groundwater consists of temporary perched systems below soil cover and atop relatively continuous bedrock.

### **3.3 Seismic Parameters**

The project site is located within a municipality that employs the 2006 Edition of the International Building Code. As part of this code, the design of structures must consider dynamic forces resulting from seismic events. These forces are dependent upon the magnitude of the earthquake event as well as the properties of the soils that underlie the site.

#### **3.3.1 Soil Profile Type and Code Parameters**

As part of the procedure to evaluate seismic forces, the code requires the evaluation of the Seismic Site Class, which categorizes the site based upon the characteristics of the subsurface profile within the upper 100 feet of the ground surface. As bedrock is present within a few feet of the ground surface, site conditions are consistent with the characteristics of Seismic Site Class B as defined by the building code, and we recommend its use in the design of this development.

Other seismic parameters associated with this portion of the site are presented in the following table.

<b>Parameter</b>	<b>Value</b>
S <sub>s</sub>	1.00g
S <sub>1</sub>	0.26g
F <sub>a</sub>	1.0
F <sub>v</sub>	1.0

## **4. Geotechnical Evaluation**

---

It is our opinion that the geotechnical conditions encountered in the test borings are favorable for the proposed low-rise buildings. The soil and rock strata are considered suitable for support of the buildings using shallow footing foundations bearing in compacted surface soils or on bedrock. The primary geotechnical factor which may adversely impact the cost of development is the presence of shallow bedrock. Site grading requiring cuts greater than about 4 feet will likely encounter hard bedrock. Materials excavated from the site will generally not be suitable for reuse as fill without crushing and other processing.

Recommendations for site preparation and foundation design and construction are presented in the following sections of this report.

## **5. Site Preparation and Grading**

---

Prior to constructing the proposed buildings, the site should be properly prepared. First, all vegetation, topsoil and surface debris should be cleared from the proposed building areas and wasted offsite. The sections, which follow, provide recommendations for site preparation, excavation and fill placement and compaction.

### **5.1 Site Excavation**

Based upon current site grades, we anticipate that site grading will require cuts and fills on the order of 4 to 5 feet to create level building pads. As noted in the sections above, near surface materials generally consist of fill or disturbed residual soils composed of sands, gravels, cobbles and boulders. Excavation of these materials to a depth of about 4 feet may generally be carried out with conventional earth moving equipment. Excavation below a depth of about 4 feet will likely require the use of rippers to loosen fractured bedrock. In some instances, such as in deeper utility trenches, blasting may be required for removal of bedrock.

### **5.2 Site Grading**

In areas requiring fill to raise grades, we recommend that existing subgrade materials be scarified to a depth of at least 12 inches, moisture conditioned to within 2 percent of the optimum moisture content, then compacted with a heavy vibratory roller. Compaction of the subgrade soils should continue until the soils within the upper 12 inches achieves at least 95 percent of the maximum dry density determined by the Modified Proctor Test (ASTM D1557).

In general, the material excavated from high areas of the site will not be suitable for reuse as fill in lower areas of the site as it will be too coarse. It may be used for fill if it is crushed to meet the criteria for GW, GP, GM, or SW materials in accordance with the Unified Soil Classification System. Imported materials may include the foregoing materials plus SM, and SC soils.

New fill meeting the requirements noted above should be brought to within  $-2$  to  $+2$  percent of the optimum moisture content and placed in maximum 8-inch loose lifts. Fill should be compacted to a minimum of 95 percent of the maximum density as determined by the Modified Proctor Test (ASTM D1557). Field density tests should be conducted on a regular basis to confirm that this level of compaction is being achieved.

## **6. Foundation Recommendations**

---

As we noted in Section 4, subsurface conditions within this site are compatible with the use of shallow spread footing foundations. The sections, which follow, provide recommendations for appropriate foundation systems for the structures associated with this development.

### **6.1 Low-Rise Structures**

Low-rise structures, including housing units and any administrative/clubhouse buildings may be supported by shallow footing foundations. Footings may be designed assuming an allowable bearing capacity of 4,000 pounds per square foot (psf) bearing in compacted native materials or new fill. Individual spread footings should incorporate minimum lateral dimensions of 24 inches and should bear at a depth of at least 18 inches for exterior foundations, and 12 inches for foundations constructed beneath interior floor slabs.

Prior to placing reinforcing steel, the bearing materials in all foundation locations should be observed by a representative of the geotechnical engineer to confirm that soils are consistent with those encountered in the geotechnical exploration.

We estimate that shallow footing foundations supporting column loads of 300 kips or less will experience settlements on the order of ½ inch.

Lateral resistance will be available from the friction generated between the foundation concrete and the bearing soil. A coefficient of sliding resistance of 0.3 may be employed in design.

### **6.2 Slabs on Grade**

The ground floor of the proposed structures are expected to support only light loads and may consist of a concrete slab on grade. Provided that the site is properly prepared as recommended in Section 5, we recommend the use of a Modulus of Subgrade Reaction (k) of 100 pci. To reduce the risk of cracking, the slab should be constructed independently of columns and shear walls and should incorporate expansion joints. While no groundwater is expected near the ground surface, we recommend that slab on grade floors incorporate a capillary break layer 4 inches in thickness composed of free draining gravel as well as a moisture retarder immediately beneath the floor slab.

### **6.3 Below Grade Walls**

Based upon our understanding of project plans, the structures are expected to be constructed at or close to existing grades. However, multi-floor structures may require elevators. These will need to incorporate structural elements that will extend several feet below the finished first floor level. Below grade walls that are restrained from moving at the top should be designed employing at-rest earth pressures. For compacted granular fills constructed level with the top of the walls, we recommend an equivalent fluid pressure of 55 psf per foot of wall

height. Provided that walls extend less than 10 feet below current grades, groundwater is not expected to be encountered during construction. However, landscape watering may result in the formation of localized perched groundwater. Consideration should be given to the installation of a sump below elevator pits to collect such water and to relieve hydrostatic pressures on the base slab.

## 7. Pavements

---

The development will require paved access drives, loading dock areas and parking. We have not been provided with traffic data. However, for the purposes of preliminary design, we have assumed that pavements will support both light duty (primarily cars) and heavy duty (limited heavy trucks) traffic. For the light duty sections, we have assumed that the pavement would need to support an average total of 50 cars and 1 heavy truck per day for a 20-year design life. For the heavy-duty section, we assumed an average traffic volume of 2 heavy trucks per day. We have evaluated both flexible and rigid pavement sections for both traffic conditions as noted in the table below.

<b>Pavement Type</b>	<b>Surface</b>	<b>Base</b>
Light Duty – Flexible	3 inches asphaltic concrete	6 inches crushed stone
Heavy Duty - Flexible	4 inches asphaltic concrete	8 inches crushed stone
Light Duty – Rigid	5 inches concrete	4 inches crushed stone
Heavy Duty - Rigid	6 inches concrete	6 inches crushed stone

Pavements should be constructed above a compacted subgrade soil with a California Bearing Ratio (CBR) value of at least 8 and a Modulus of Subgrade Reaction of 100 pci. For the rigid pavements, concrete should have a minimum 28-day compressive strength of 4,000 psi and appropriate reinforcement. The base course for all pavement sections should consist of an open graded aggregate conforming to an ASTM Number 57 or 67 stone.

## **8. Limitations**

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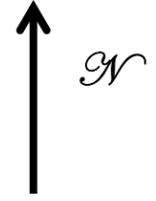
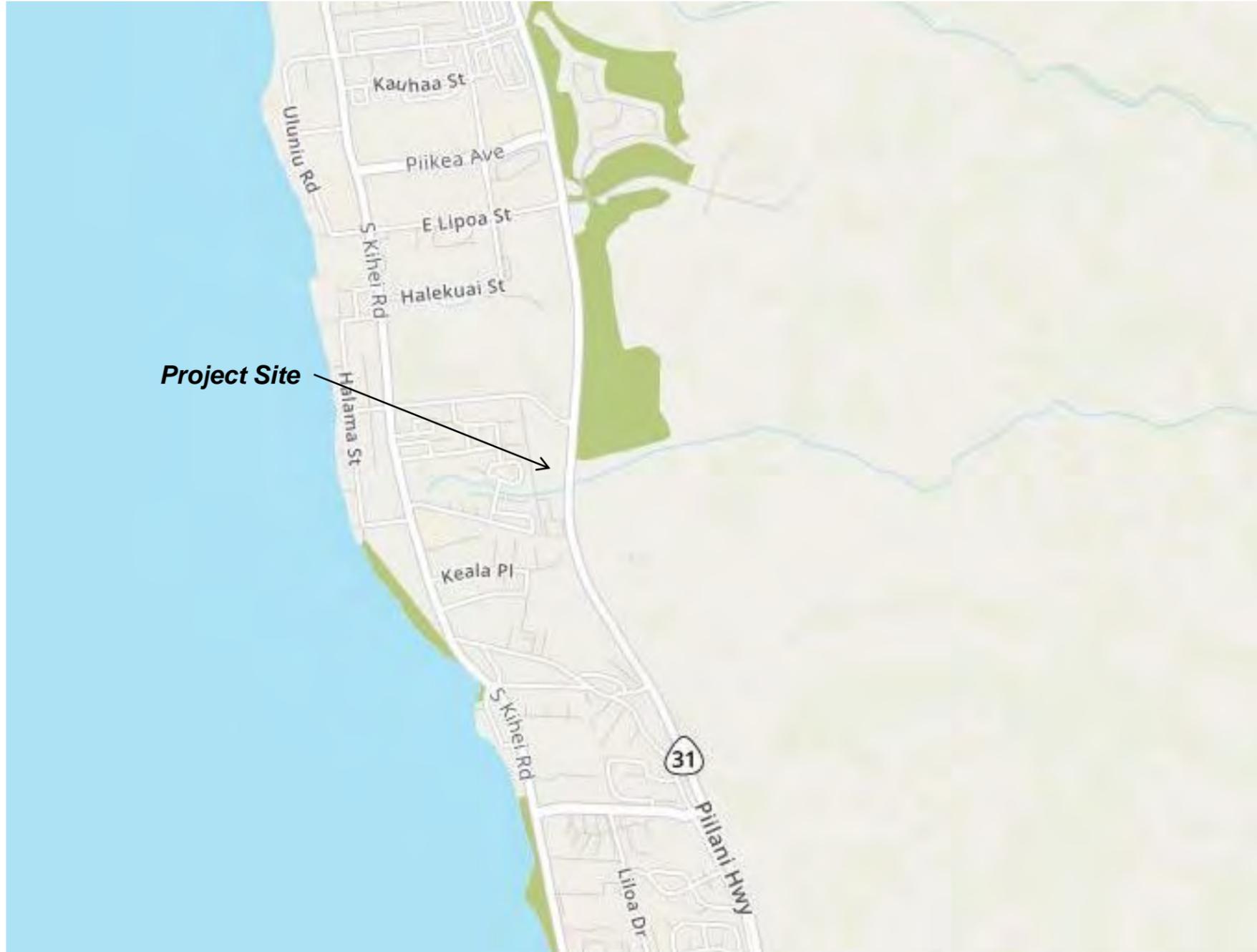
The recommendations submitted herein are based upon the available subsurface information available to GEI as noted herein and current design details furnished by the project team. The recommendations presented in this report are intended to provide sufficient information to allow for the assessment of the suitability of the site for the proposed development relative to geotechnical conditions and to develop plans for the design of foundations.

The geotechnical engineer warrants that the findings, recommendations, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices. No other warranties are implied or expressed.

# Appendix A

---

## Figures



**Figure 1**

**Site Location Plan  
Senior Housing Project  
Kihei, Maui, Hawaii**

Project Number 1804955

Prepared by: JWN





**Figure 2**

**Boring Location Plan  
Senior Housing Project  
Kihei, Maui, Hawaii**

Project Number 1804955

Prepared by: JWN



# Appendix B

---

## Boring Logs

# BORING B-1

CLIENT: GEI Consultants	EARTH ENGINEERS, INC. PROJECT NO.: 18-218-1
PROJECT: Maui Senior Housing, 300 E Welakahao Road, Kihei, Maui, Hawaii	EQUIPMENT: Mobile Drill B-57
LOCATION: 235' S, 35' W of the SE Corner of existng Hope Chapel asphalt parking lot	APPROXIMATE ELEVATION: 90' msl
DATE DRILLED: January 7, 2019	LOGGED BY: Ray Aliperti

DEPTH (ft)	SAMPLE NO.	SAMPLE	SAMPLE RECOVERY	SOIL DESCRIPTION	BLOWS PER 6 INCHES	N - Value	% PASSING #200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT (%)	RQD	REMARKS
				Fractured/weathered Basalt with sand and gravel FILL, gray								
5	CORE - 1		90%	Basalt bedrock, gray, slightly weathered, closely fractured, extremely strong, very porous							70% Fair	
10	CORE - 2		87%								73% Fair	
15				Boring B-1 terminated at 10.5'.  Boring B-1 was backfilled on 1/7/19 using drilling spoils.  Groundwater was not encountered.  Elevation was estimated from Google Earth.  Hollow Stem Auger was performed from 0'-2.5'.  Rock coring was performed from 2.5'-7.5' and 7.5'-10.5' below existng ground surface.								
20												
25												
30												



## BORING B-2

CLIENT: GEI Consultants	EARTH ENGINEERS, INC. PROJECT NO.: 18-218-1
PROJECT: Maui Senior Housing, 300 E Welakahao Road, Kihei, Maui, Hawaii	EQUIPMENT: Mobile Drill B-57
LOCATION: 120' S, 50' W of the SE Corner of existng Hope Chapel Basketball Court	APPROXIMATE ELEVATION: 83' msl
DATE DRILLED: January 7, 2019	LOGGED BY: Ray Aliperti

DEPTH (ft)	SAMPLE NO.	SAMPLE	SAMPLE RECOVERY	SOIL DESCRIPTION	BLOWS PER 6 INCHES	N - Value	% PASSING #200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT (%)	RQD	REMARKS
				3/4" to 1-1/2" open graded gravel FILL, gray, dry, loose								3" thick
				Fractured/weathered Basalt with sand and gravel FILL, gray								
5	CORE - 1		90%	Basalt bedrock, gray, slightly weathered, closely fractured, extremely strong, very porous							45% Fair	
10	CORE - 2		90%								40% Fair	
15				Boring B-2 terminated at 12.5'.  Boring B-2 was backfilled on 1/7/19 using drilling spoils.  Groundwater was not encountered.  Elevation was estimated from Google Earth.  Hollow Stem Auger was performed from 0'-2.5'.  Rock coring was performed from 2.5'-7.5' and 7.5'-12.5' below existng ground surface.								
20												
25												
30												

# BORING B-4

CLIENT: GEI Consultants	EARTH ENGINEERS, INC. PROJECT NO.: 18-218-1
PROJECT: Maui Senior Housing, 300 E Welakahao Road, Kihei, Maui, Hawaii	EQUIPMENT: Mobile Drill B-57
LOCATION: 280' S, 88' W of the SW Corner of existing Hope Chapel Basketball Court	APPROXIMATE ELEVATION: 81' msl
DATE DRILLED: January 7, 2019	LOGGED BY: Ray Aliperti

DEPTH (ft)	SAMPLE NO.	SAMPLE	SAMPLE RECOVERY	SOIL DESCRIPTION	BLOWS PER 6 INCHES	N - Value	% PASSING #200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT (%)	RQD	REMARKS
5				Fractured/weathered Basalt with sand and gravel FILL, gray, some boulder sized basalt pieces just below the surface								
10	CORE - 1		83%	Basalt bedrock, dark gray, slightly weathered, closely fractured, extremely strong, very porous							79% Good	
	CORE - 2		90%								61% Fair	
15				Boring B-4 terminated at 14'.								
20				Boring B-4 was backfilled on 1/7/19 using drilling spoils.								
				Groundwater was not encountered.								
				Elevation was estimated from Google Earth.								
				Hollow Stem Auger was performed from 0'-5'.								
				Rock coring was performed from 5'-9' and 9'-14' below existing ground surface.								
25												
30												



# BORING B-5

CLIENT: GEI Consultants	EARTH ENGINEERS, INC. PROJECT NO.: 18-218-1
PROJECT: Maui Senior Housing, 300 E Welakahao Road, Kihei, Maui, Hawaii	EQUIPMENT: Mobile Drill B-57
LOCATION: 234' S, 40' N of the SW Corner of existing Hope Chapel Basketball Court	APPROXIMATE ELEVATION: 83' msl
DATE DRILLED: January 7, 2019	LOGGED BY: Ray Aliperti

DEPTH (ft)	SAMPLE NO.	SAMPLE	SAMPLE RECOVERY	SOIL DESCRIPTION	BLOWS PER 6 INCHES	N - Value	% PASSING #200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT (%)	RQD	REMARKS
				Fractured/weathered Basalt with gravel and boulder FILL, gray								
5	CORE - 1	CORE - 1	53%	Basalt bedrock, dark gray, slightly weathered, closely fractured, extremely strong, porous							30% Poor	
10			95%								39% Poor	
15				Boring B-5 terminated at 14'.								
				Boring B-5 was backfilled on 1/7/19 using drilling spoils.								
				Groundwater was not encountered.								
				Elevation was estimated from Google Earth.								
20				Hollow Stem Auger was performed from 0'-5'.								
				Rock coring was performed from 4'-9' and 9'-14' below existing ground surface.								
25												
30												



# BORING B-3

CLIENT: GEI Consultants	EARTH ENGINEERS, INC. PROJECT NO.: 18-218-1
PROJECT: Maui Senior Housing, 300 E Welakahao Road, Kihei, Maui, Hawaii	EQUIPMENT: Mobile Drill B-57
LOCATION: 136' S, 124' W of the SW Corner of existng Hope Chapel Basketball Court	APPROXIMATE ELEVATION: 80' msl
DATE DRILLED: January 7, 2019	LOGGED BY: Ray Aliperti

DEPTH (ft)	SAMPLE NO.	SAMPLE	SAMPLE RECOVERY	SOIL DESCRIPTION	BLOWS PER 6 INCHES	N - Value	% PASSING #200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT (%)	RQD	REMARKS
5				Fractured/weathered Basalt with sand and gravel FILL, gray, some boulder sized basalt pieces just below the surface								
	CORE - 1		8%	Basalt bedrock, dark gray, slightly weathered, closely fractured, extremely strong, very porous							0% Very Poor	
10	CORE - 2		81%									
15				Boring B-3 terminated at 12'.  Boring B-3 was backfilled on 1/7/19 using drilling spoils.  Groundwater was not encountered.  Elevation was estimated from Google Earth.  Hollow Stem Auger was performed from 0'-5'.  Rock coring was performed from 5'-8' and 8'-12' below existng ground surface.								
20												
25												
30												



# BORING B-6

CLIENT: GEI Consultants	EARTH ENGINEERS, INC. PROJECT NO.: 18-218-1
PROJECT: Maui Senior Housing, 300 E Welakahao Road, Kihei, Maui, Hawaii	EQUIPMENT: Mobile Drill B-57
LOCATION: 445' S, 45' W of the SE Corner of existing Hope Chapel Asphalt parking lot	APPROXIMATE ELEVATION: 87' msl
DATE DRILLED: January 8, 2019	LOGGED BY: Ray Aliperti

DEPTH (ft)	SAMPLE NO.	SAMPLE	SAMPLE RECOVERY	SOIL DESCRIPTION	BLOWS PER 6 INCHES	N - Value	% PASSING #200 SIEVE	LIQUID LIMIT	PLASTIC LIMIT	MOISTURE CONTENT (%)	RQD	REMARKS	
				Fractured/weathered Basalt with gravel and boulder FILL, gray									
5	CORE - 1		93%	Basalt bedrock, gray, slightly weathered, closely fractured, extremely strong, porous							60% Fair		
10	CORE - 2		95%								53% Fair		
15				Boring B-6 terminated at 12.5'.  Boring B-6 was backfilled on 1/8/19 using drilling spoils.  Groundwater was not encountered.  Elevation was estimated from Google Earth.  Hollow Stem Auger was performed from 0'-2.5'.  Rock coring was performed from 2.5'-7.5' and 7.5'-12.5' below existing ground surface.									
20													
25													
30													



CULTURAL BACKGROUND  
REVIEW REPORT  
PREPARED BY AINA  
ARCHAEOLOGY

APPENDIX

F





**COVER PHOTO:** HAWAIIAN GOVERNMENT SURVEY MAP OF MAUI HIGHLIGHTING THE AHUPUA‘A OF KĒŌKEA IN RELATION TO KULA MOKU

MANA‘O (MEANING) BEHIND ‘ŌLELO NO‘EAU 1821:

In olden days relatives and friends exchanged products. The upland dwellers brought poi, taro, and other foods to the shore to give to kinsmen there. The shore dweller gave fish and other seafoods. Visits were never made empty-handed but always with something from one’s home to give. (*Pukui 1983:197*)

THIS ‘ŌLELO NO‘EAU IS PARTICULARLY MEANINGFUL FOR KULA MOKU WHERE THE INTENSIVE AGRICULTURAL LANDS OF KULA-UKA WERE RELATIVELY DISTANT FROM THE THRIVING SHORELINES OF KULA-KAI

DRAFT

# CULTURAL BACKGROUND REVIEW FOR THE PROPOSED LILOA HALE SENIOR AFFORDABLE HOUSING PROJECT

Kēōkea Ahupua'a, Kula Moku (Makawao Modern Tax District), Mokupuni o Maui  
TMK: (2) 2-2-002:072 por.  
2/12/2020

**State or County Agency**

County of Maui - Department of Housing and Human Concerns  
Wailuku, HI

**Project Applicant**

Liloa Senior Housing, LP  
330 W. Victoria Street  
Gardena, CA.

**Under Contract To:**

Munekiyo Hiraga  
305 S High Street #104  
Wailuku, HI

**Prepared By:**

Tanya Lee-Greig, M.A.

## Management Summary

<b>Project Name:</b>	Cultural Background Review for the Proposed Liloa Hale Senior Affordable Housing Project
<b>Project Area and Project Description:</b>	<p>The proposed project is located on a portion of TMK (2) 2-2-002:072, approximately 0.6 miles from the shoreline (Figure 1-1 and Figure 1-2) and bound by Pi'ilani Highway to the east, Liloa Drive to the west, Hope Chapel to the north, and Hale Mahaolu Ehiku to the south.</p> <p>Liloa Senior Housing, LP is proposing a senior living project that will consist of 117 total units (101 – 1 bedroom units and 16 – 2 bedroom units) along with 143 parking stalls (Figure 1-3). To accomplish this, the project proponent will be condominiumizing the larger TMK (2) 2-2-002:072 and purchasing approximately 4.9-acres (project site) of the overall parcel which is currently owned by Hope Chapel. While the Liloa Hale portion of the parcel will extend to the existing drainage area to the south, no improvements or work within the drainage area will be completed within the drainage area as a part of the proposed project.</p>
<b>Project Acreage:</b>	Overall Project Area: 4.9-acres Construction Footprint: 3.61-acres
<b>Land Owner and/or Jurisdiction:</b>	Private: Hope Chapel and Liloa Senior Housing, LP.
<b>Regulatory Context:</b>	<p>The proposed project is subject to review by the Hawai'i Department of Land and Natural Resources' State Historic Preservation Division (DLNR/SHPD) under Hawai'i Revised Statutes (HRS) §6E-42 and in accordance with Hawai'i Administrative Rules (HAR) Chapter 13-284.</p> <p>This project is additionally subject to the preparation of a 2.97.040 Maui County Code Environmental Assessment (EA) for Chapter 2.97 Residential Workforce Housing Policy Incentives and Exemptions.</p>

## Findings and Recommendations

No current traditional and customary gathering practices were identified within the proposed project footprint. Additionally, it should be noted that the disruption of the natural drainage patterns that once ran along the southern boundary of the project area prior to the construction of Pi'ilani Highway, along with the development of the resort and residential areas within and just back of the traditional coastal settlement area, has likely contributed to the degradation and depletion of shoreline resources at Waimahaihai which was once a thriving traditional gathering area located closest to the current project area (see Sections 3.2 and 4.0). Though the proposed project will be adding additional residential units *mauka* of Waimahaihai, the drainage that runs through the project site will not be modified or improved and left natural, thereby potentially alleviating any potential cumulative effects to the cycle in which the remaining shoreline resources rely.

Finally, although previous SHPD correspondence for prior permits issued on the proposed project parcel have resulted in determinations that “no historic properties will be affected,” and prior historic era land disturbance; as well as, ground alteration during the construction of both Hope Chapel and initial ground work in in the immediate project footprint that was possibly completed by Hale Mahaolu as a part of a past project (Mr. Mark Spencer – former general contractor for Spencer Construction, personal communication December 04, 2019) has significantly altered the ground surface, it is understood that there are areas of secondary sand deposits, as well as, potential pockets of remnant sands from the former sand dune that once covered the parcel (see Section 2.1). Sandy areas are known to be highly culturally sensitive due to a common association of these types of deposits with burials of *‘iwi kupuna*. Therefore, and as a result of consultation, archaeological monitoring is recommended for all initial ground disturbing activities in areas where the original natural grade is present.

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## 1.0 INTRODUCTION

---

At the request of Munekiyo Hiraga, on behalf of Liloa Senior Housing, LP, 'Āina Archaeology completed a documentary review of historic preservation compliance documents and cultural concerns for the proposed Liloa Hale Senior Affordable Housing Project (Liloa Hale). Located in the Kula Kai section of Kēōkea Ahupua'a (modern tax district of Makawao), the proposed project is situated on a portion of TMK (2) 2-2-002:072, approximately 0.6 miles from the shoreline (Figure 1-1 and Figure 1-2) and bound by Pi'ilani Highway to the east, Liloa Drive to the west, Hope Chapel to the north, and Hale Mahaolu Ehiku to the south.

### 1.1 PROJECT DESCRIPTION

In order to fulfill a need for senior affordable housing units in South Maui, Liloa Senior Housing, LP is proposing a senior living project that will consist of 117 total units (101 – 1 bedroom units and 16 – 2 bedroom units) along with 143 parking stalls (Figure 1-3). To accomplish this, the project proponent will be condominiumizing the larger TMK (2) 2-2-002:072 and purchasing approximately 4.9-acres (project site) of the overall parcel which is currently owned by Hope Chapel. While the Liloa Hale portion of the parcel will extend to the existing drainage area to the south, the construction footprint of the proposed project, hereafter referred to as project area, will cover only 3.61-acres of the overall project site. No improvements or work within the drainage area will be completed within the drainage area as a part of the proposed project (Figure 1-4).

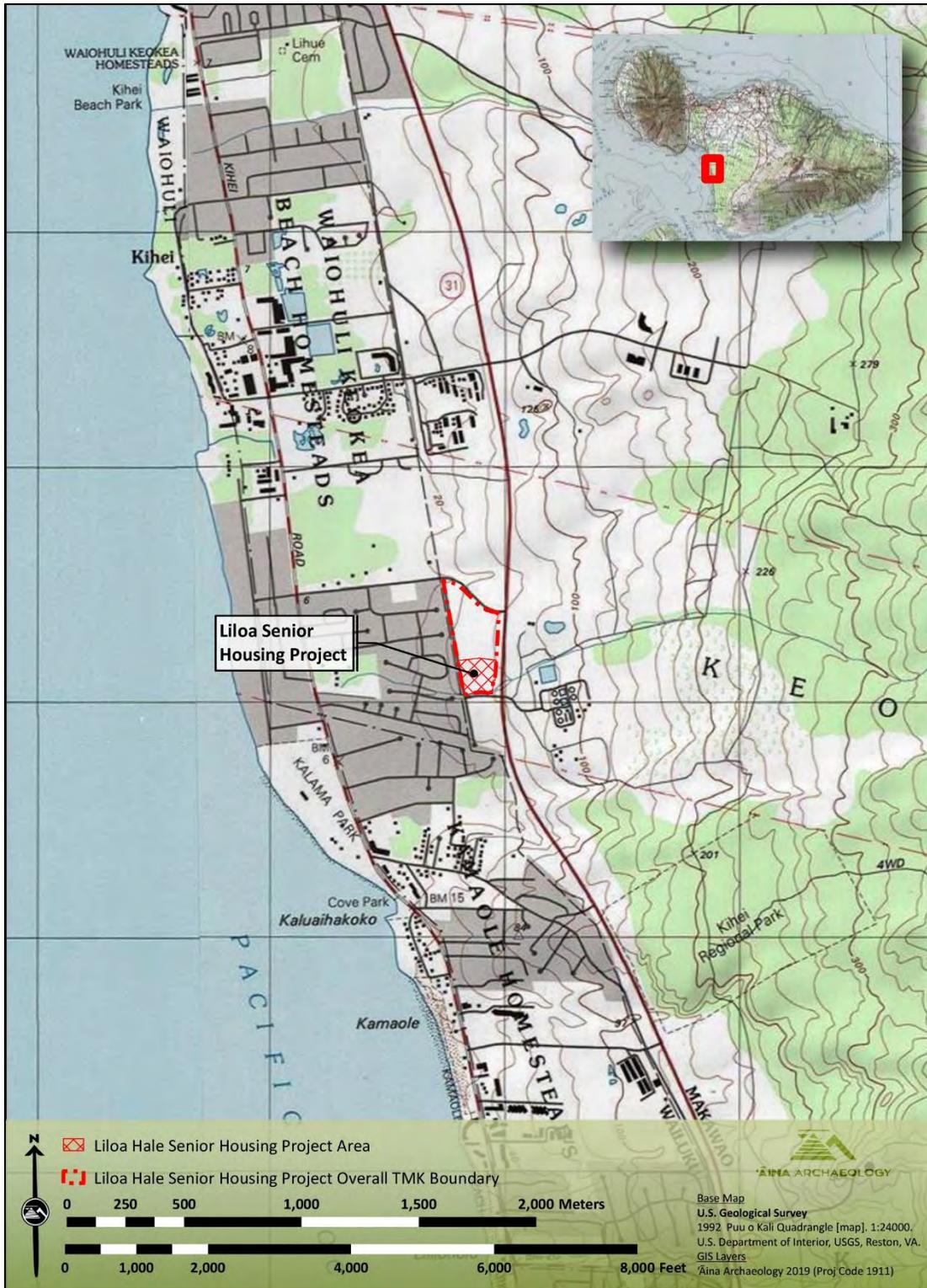


Figure 1-1. A portion of the 1992 USGS 7.5' topographic map series, Puu o Kali Quadrangle 1:24000 scale, showing the location of the overall TMK (outlined in red) in relation to the proposed project area (cross-hatched in red).

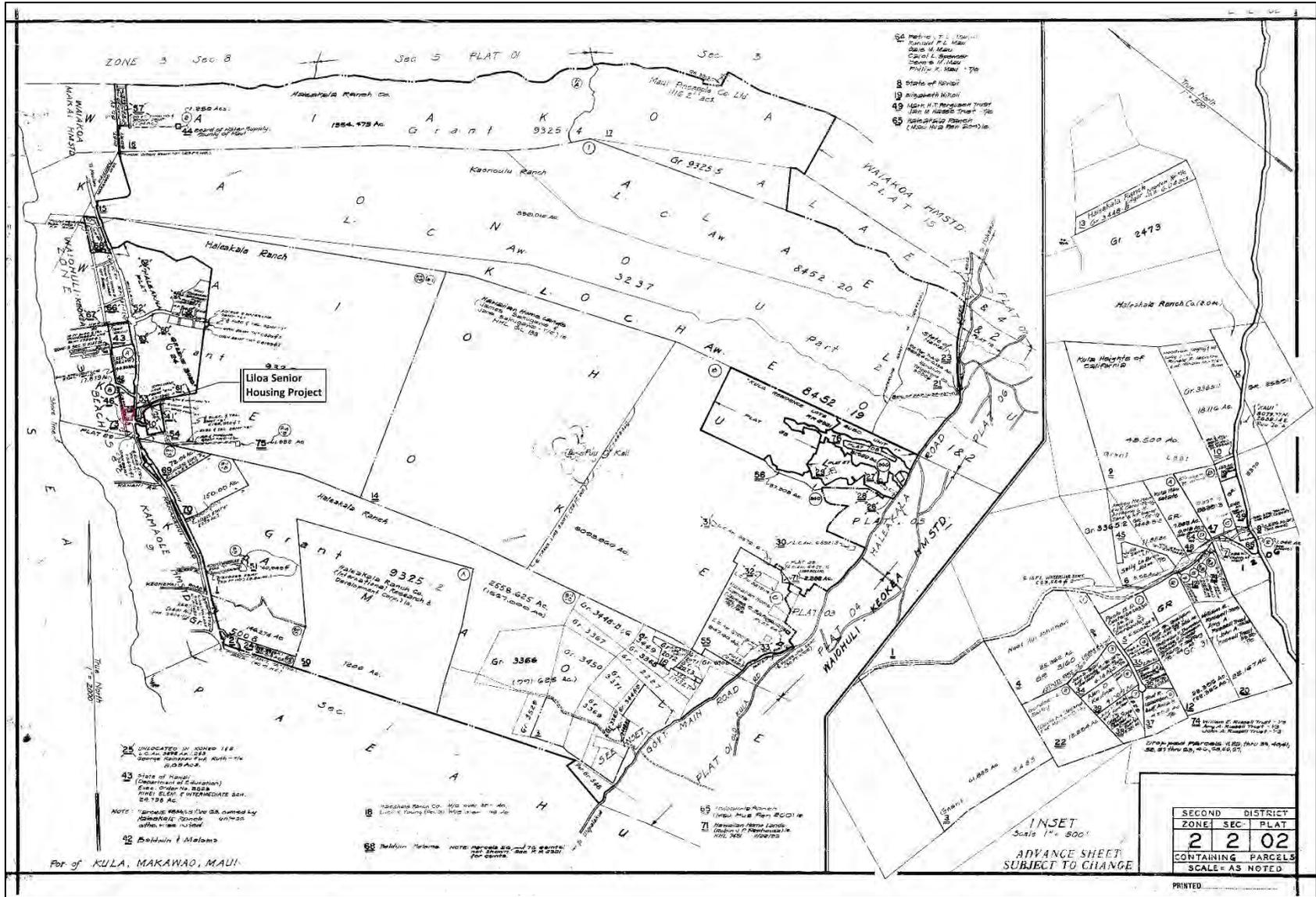


Figure 1-2. TMK map (2) 2-2-002 showing the location of the proposed project area outline in red.

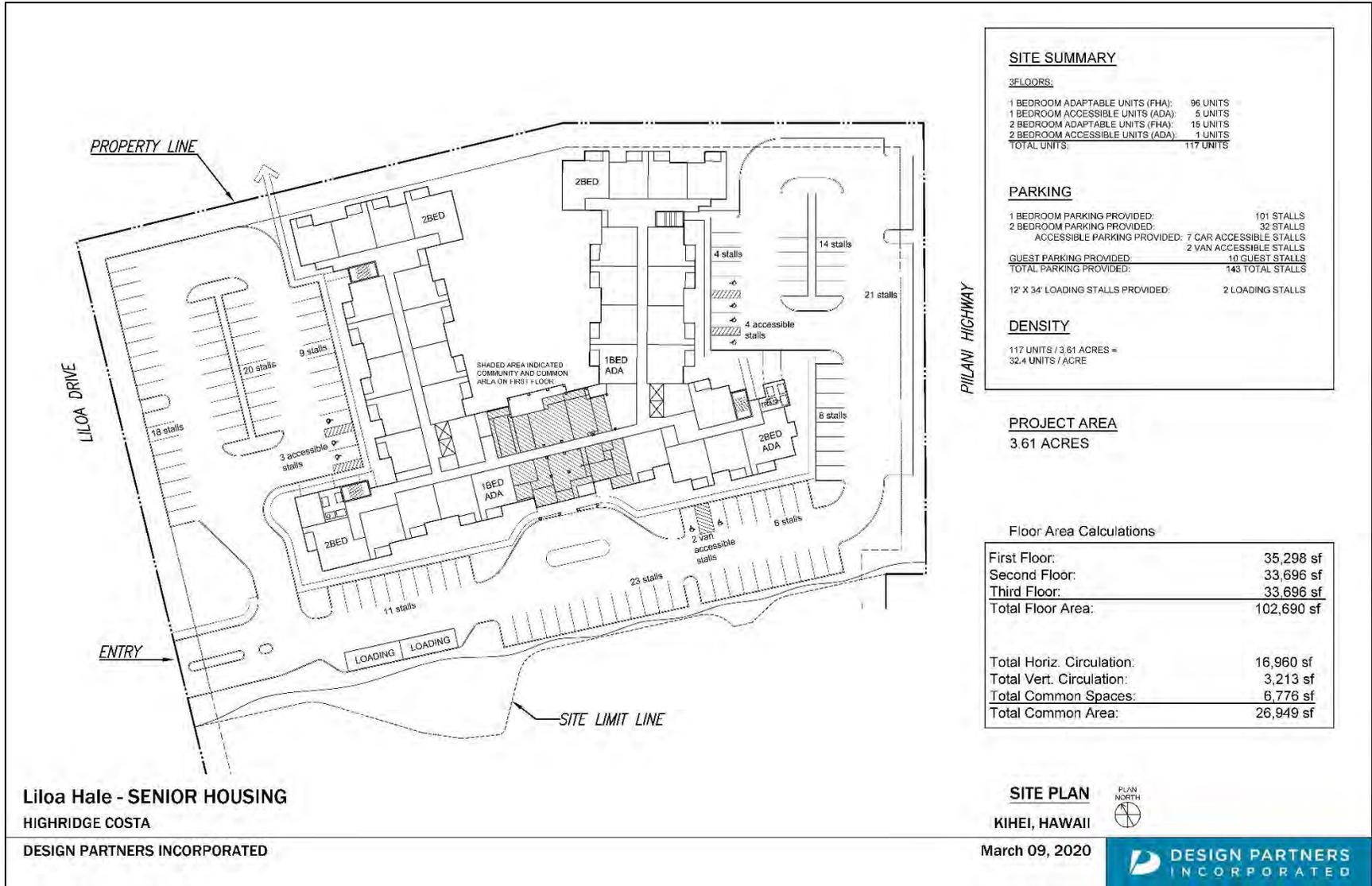


Figure 1-3. Proposed Residential and Parking Plan (courtesy of Liloa Senior Housing, LP.)

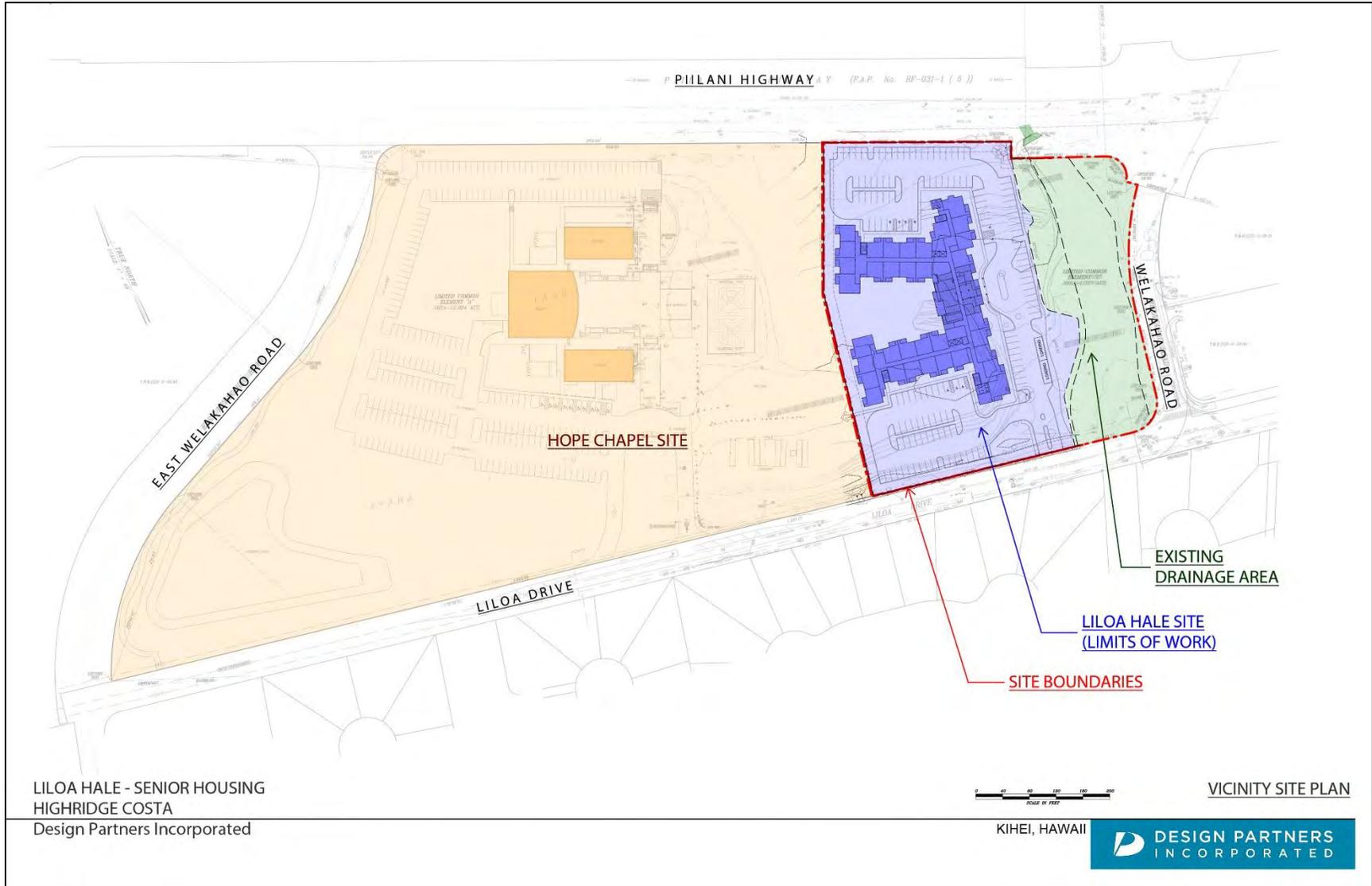


Figure 1-4. Proposed project limits (in blue) in relation to the Hope Chapel Site and drainage area (in green).



Figure 1-5. Orthophoto (Esri et al. 2018) showing the surrounding built environment in relation to the overall project parcel (outlined in red) in relation to the Liloa Hale Senior Project Site (cross-hatched in red) and limits of work or project area (shaded in blue).

## 1.2 SCOPE OF WORK

Archaeological fieldwork was limited to a pedestrian field inspection along with limited cultural consultation. In order to facilitate permitting review and identify areas of potential concern, the following scope of work served as guidance for this documentary review and the compilation of information contained herein:

- Research on the locations and results of previous archaeological and cultural impact assessment studies completed within Kēōkea Kai, or *makai* extent of Kēōkea Ahupua'a.
- Development of the Cultural and Archaeological Summary of the project area to be comprised of synopses of previous archaeological and cultural studies, identification and descriptions of specific historic properties within the vicinity of project area, , images, GIS maps that summarize the findings of the above in relation to the proposed alternatives, and discussion of traditional cultural practices and/or resources within the region.
- Consultation and a site visit with Mr. Vernon Kalanikau, former *po'o* for Kula Moku – Makai and cultural descendant with recognized traditional cultural and customary practices connections to Kēōkea Kai.
- Incorporation of the above work to comply with the cultural requirements of Item 5 for a 2.97.040 Environmental Assessment (EA) for Chapter 2.97 Residential Workforce Housing Policy Incentives and Exemptions which states that the EA will provide a "(g)eneral description of the project's technical, economic, social, cultural, and environmental characteristics."

## 1.3 METHODS

### 1.3.1 Document Review

Research venues included a search of the SHPD libraries at Kapolei and Ma'alaea Harbor and the EA and EIS digital library hosted by the Office of Environmental Quality Control (<http://oeqc2.doh.hawaii.gov>), as well as in-house hardcopy and digital resources.

### 1.3.2 GIS Methods

Previous archaeology study areas, site location maps, historic maps and AutoCAD files were georeferenced in relation to Maui Island TMK shapefile and portions of the Puu O Kali Quadrangle 7.5-minute USGS topographic map (U.S. Geological Survey 1992a) using known points and ArcView 9.3. All topographic maps presented herein were created using ArcGIS Desktop 10.6.1. Figures showing the project area boundary overlain on historic maps and in relation to previously identified historic property locations should be considered approximate and used for informational purposes only.

## 2.0 ENVIRONMENTAL SETTING

---

### 2.1 NATURAL ENVIRONMENT

The most prominent geologic features of the study area is the large, dormant shield volcano of Haleakalā, with the broad flanks, deep gulches in the *mauka* reaches that grade to moderate to shallow waterways toward the shoreline. The general aridity of the region is a result of the rain-shadow effects from both Haleakala and the West Maui Mountains (Giambelluca et al. 1986:16). The average annual rainfall accumulation at the elevation of the current project area is generally less than 5 inches per year (Giambelluca et al. 2013), with the heaviest rainfall, approximately 2-3 inches, occurring in December through February during a time period referred to as Ho'oilō when the temperatures are cooler, trade winds less common and widespread storm rainfall is more frequent. The dry season occurs during the summer months of June through August, when there is little (~0.25") to no rainfall. In the Hawaiian climate cycle, this period is referred to as Kau, or the high-sun period that corresponds to warm temperatures and steady trades (Giambelluca et al. 2013; Giambelluca et al. 1986:17; Pratt and Gon III 1998:56).

The U.S. Department of Agriculture (USDA) soil survey data shows that the sediments within the current project area are a part of the Pulehu-Ewa-Jaucus Association which are well-drained and excessively drained soils on alluvial fans and in basins that developed in alluvium weathered from basic igneous rock, coral, and seashells (Foote et al. 1972:8 and Maui General Soils Map). More specifically, the northeast portion of the current project overlies the lower limits of Waiakoa extremely stony silty clay loam (WID2) and the southern extent of the Puuone sand (PZUE) that covers most of the central isthmus of Maui (Figure 2-1).

The Waiakoa Series consists of well-drained soils that can be found in the upland areas at elevations that range from 100 to 1,000 feet (Foote et al. 1972:126). These soils are generally gently sloping to moderately steep, with the upper portion of the profile influenced by volcanic ash. At the time of the USDA Soil Survey, Waiakoa soils were used for sugarcane, pasture, homesites, and wildlife habitat. WID2 soils are generally eroded with stones covering 3-15% of the surface. A representative profile shows a surface layer that is a dark reddish-brown silty clay loam (~2 in. thick). The subsoil (~23 in. thick), is a dark reddish-brown and very dark grayish-brown silty clay loam that has prismatic structure or is massive. The substratum is very dark brown silty clay loam and hard, basic igneous rock (Foote et al. 1972:126-127).

Puuone sands are not terrestrial in origin, but rather derived from coral and seashells and found on sandhills near the sea with a surface layer that is grayish brown, calcareous sand roughly 20 inches thick and underlain by grayish-brown cemented sand (Foote et al. 1972:117).

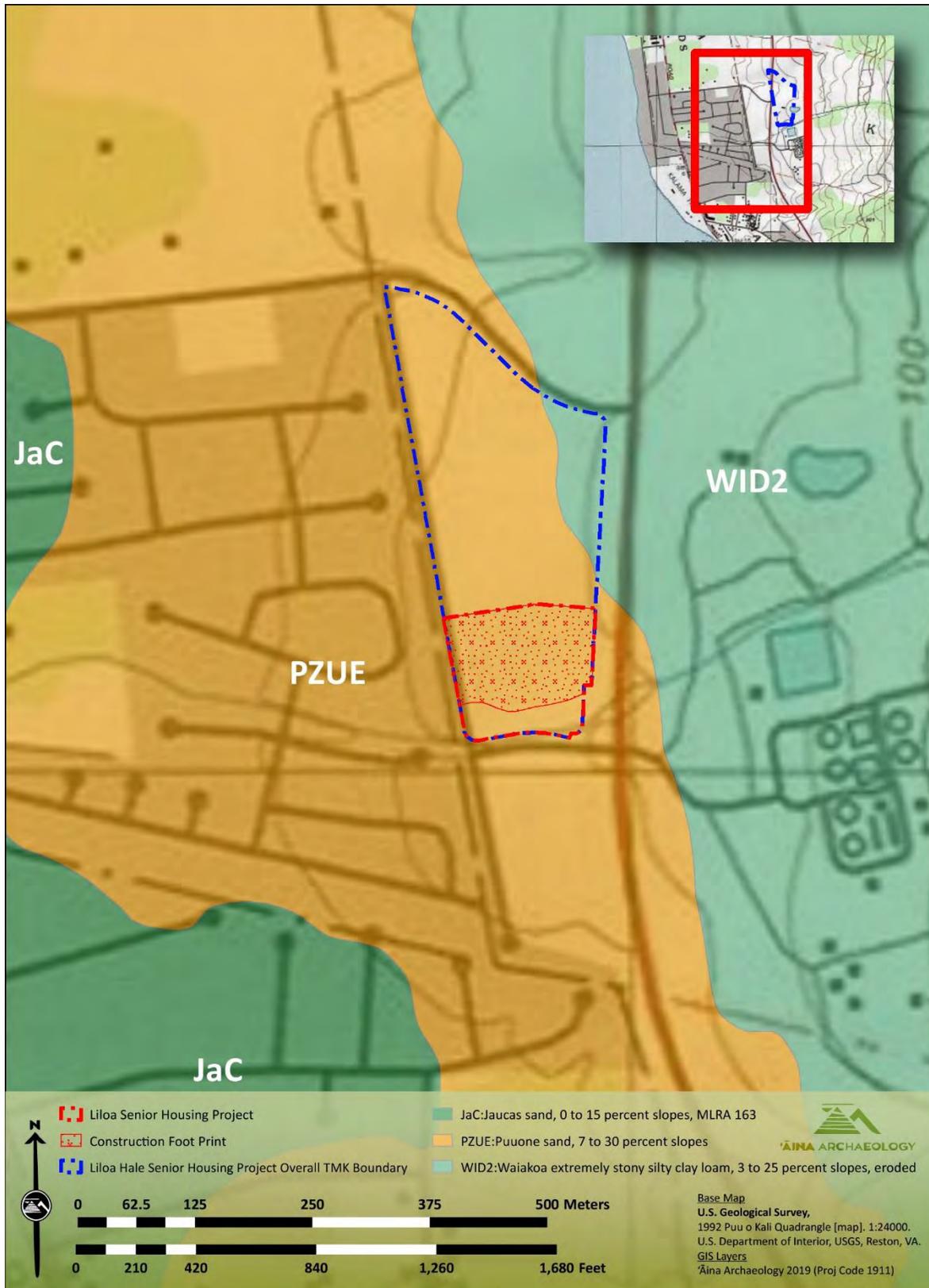


Figure 2-1. A portion of the 1992 USGS 7.5' topographic map series, Puu o Kali Quadrangle, showing the location of the project parcel in relation to underlying soils and sediments (USDA-NRCS-NCGC 2001)

The above described geology, pattern of rainfall, and underlying soils once supported a lowland dry shrubland and grassland native ecosystem bordering coastal communities (Pratt and Gon III 1998:127, 128). Vegetation along the lower elevation plains that would have been supported include grasslands of *pili* (*Heteropogon contortus*), *a'ali'i* (*Dodonaea viscosa*) shrublands, small patches of *ma'o* (Hawaiian cotton, *Gossypium tomentosum*), and dwarf shrublands of *'ākoko* (*Chamaesyce* sp.) along with some occurrences of the now endangered *ko'oloa'ula* (*Abutilon menziesii*) and shrubs of the amaranth family (*Achyranthes splendens* var. *rotundata*) (Pratt and Gon III 1998:127-128). Currently, the vegetation within the project area is dominated by non-native grasses with small stands or occurrences of *haole koa* (*Leucaena leucocephala*), tree tobacco (*Nicotiana glauca*), and pluchea (*Pluchea carolinensis*); as well as, small patches of *'uhaloa* (*Waltheria indica*) (Figure 2-2).



Figure 2-2. Overview of current project area from the southeast corner of the project area., view northeast to northwest



Figure 2-3. Overview of project area from northern boundary, from east to south

With regard to cultural uses of this zone, Pratt and Gon III (1998:128) point out that the lowland dry shrubland areas, potable water was limited and habitation was sparse, except for where springs were present. Sparse habitation notwithstanding, the dry environment was noted by Pratt and Gon as being ideal for burial and storage caves.

## 2.2 BUILT ENVIRONMENT

The immediate surrounding built environment consists of the four-lane Pi'ilani Highway on the eastern boundary, Hope Chapel to the north, Liloa Drive and a single-family residential subdivision to the west, and East Welakahao Rd. and Hale Mahaolu to the south (see Figure 1-5).

In general, the lands of the current project area have been heavily disturbed by previous filling, grading, and materials staging from off-site construction activities (Figure 2-4 and Figure 2-5). Additionally, sand mounds containing some silt, angular gravels, cement fragments, and displaced bedrock with calcium carbonate precipitates were noted in the southern portion of the project area (Figure 2-6). These mounds with intermixed construction debris were identified as imported materials by Mr. John Patterson of Hope Chapel and Mr. Mark Spencer formerly with Spencer Construction and likely associated with both the construction of Hope Chapel to the north, the construction of Hale Mahaolu to the south, and other off-site projects (personal communication, December 04, 2019).

Finally, wood posts from a former dust fence lines on the western boundary indicating previous construction activity with a portion of the project area that runs parallel to the remnant dust fence appearing to have been filled to bring it near to the current grade of Pi'ilani Highway (Figure 2-7).



*Figure 2-4. Boulder push pile, large boulder shows evidence of machine scarring, view to west-northwest*



*Figure 2-5. Landscape modification/fill in the southern section of the project area, view to northeast*



Figure 2-6. Closeup of sand mounds within the southern portion of the project area, view to south



Figure 2-7. Dust fence posts on the west boundary, view to north-northwest

### 3.0 REVIEW OF CULTURAL HISTORICAL CONTEXTS

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The division of Maui's lands into political districts occurred during the rule of Kaka'alaneo, under the direction of his *kahuna*, Kalaiha'ōhi'a (Beckwith 1970:383). This division resulted in the creation of twelve districts or *moku* during traditional times: Kula, Honua'ula, Kahikinui, Kaupō, Kīpahulu, Hāna, Ko'olau, Hāmākua Loa, Hāmākua Poko, Na Poko or Na Wai 'Ehā (Wailuku), Kā'anapali, and Lāhainā (Alexander 1882; Sterling 1998:3). The *moku o loko*, or *moku* as it is most commonly called, literally means "to cut across, divide, separate" (Lucas 1995:77). When used as a term of traditional land tenure, a *moku* is similar to a modern political district.

Within these *moku* are smaller units of land called *ahupua'a*, a word that is derived from the Hawaiian term *ahu* (altar), which was erected at the point where the boundary of land was intersected by the *alaloa* (main road encircling the island), upon which a carved *pua'a* (hog) image, made of kukui wood and stained with red ochre was placed along with the tax of food items from that particular land unit as payment to the *ali'i* (chief) during the annual progression of the *akua makahiki* (Alexander 1882:4). The typical configuration of the *ahupua'a* extends from the sea to the mountain so that the *ali'i* (chiefs), as well as the *maka'āinana* (common people) could have access to products of the *uka* (mountain region), the cultivated land, and the *kai* (sea) (Alexander 1882:4). While the boundary generally followed prominent landforms (i.e. ridge lines, the bottom of a ravine, or defined by a depression) there were times where a stone or rock that was notable from a tradition or sacred use would mark a corner or determine a line (Alexander 1890:105-106). Along similar lines, the growth of a certain kind of tree, herb or grass, or the habitat of a certain kind of bird would sometimes define a division (Alexander 1890:105-106).

Kula is comprised of some seventeen *ahupua'a*, which, from north to south include: Makaehu, Kohoilo, A'apueo, Kalialinui, Oma'opio, Pūlehunui, Pulehuiki, Kamehameiki, Kamehamenui, Kealahou, Waiakoa, Alae, Kaonoulu, Koheo, Waiohuli, Kēōkea, and Kama'ole. The current project area is located within the lower elevations of Kēōkea Ahupua'a, a traditional land division located within the traditional *moku* of Kula and one of only six *ahupua'a* that extend to the shoreline. Situated on the southwest flank Haleakalā (Figure 3-1), Kēōkea Ahupua'a extends from the ridge line near the summit of Haleakalā at Pu'ukeōkea (~7,000 ft. above means sea level) to the shoreline between the former village of Waimahaihai and the wetlands of La'ie/Kulamoaemalia (Figure 3-2 and Figure 3-3). More specifically, the current project area is situated toward the shared boundary between Kēōkea and Kama'ole Ahupua'a, and is centrally located between the historic ports of Kalepolepo and Keawekapu, between the 20 ft. and 100ft. elevation contours (see also Figure 1-1).

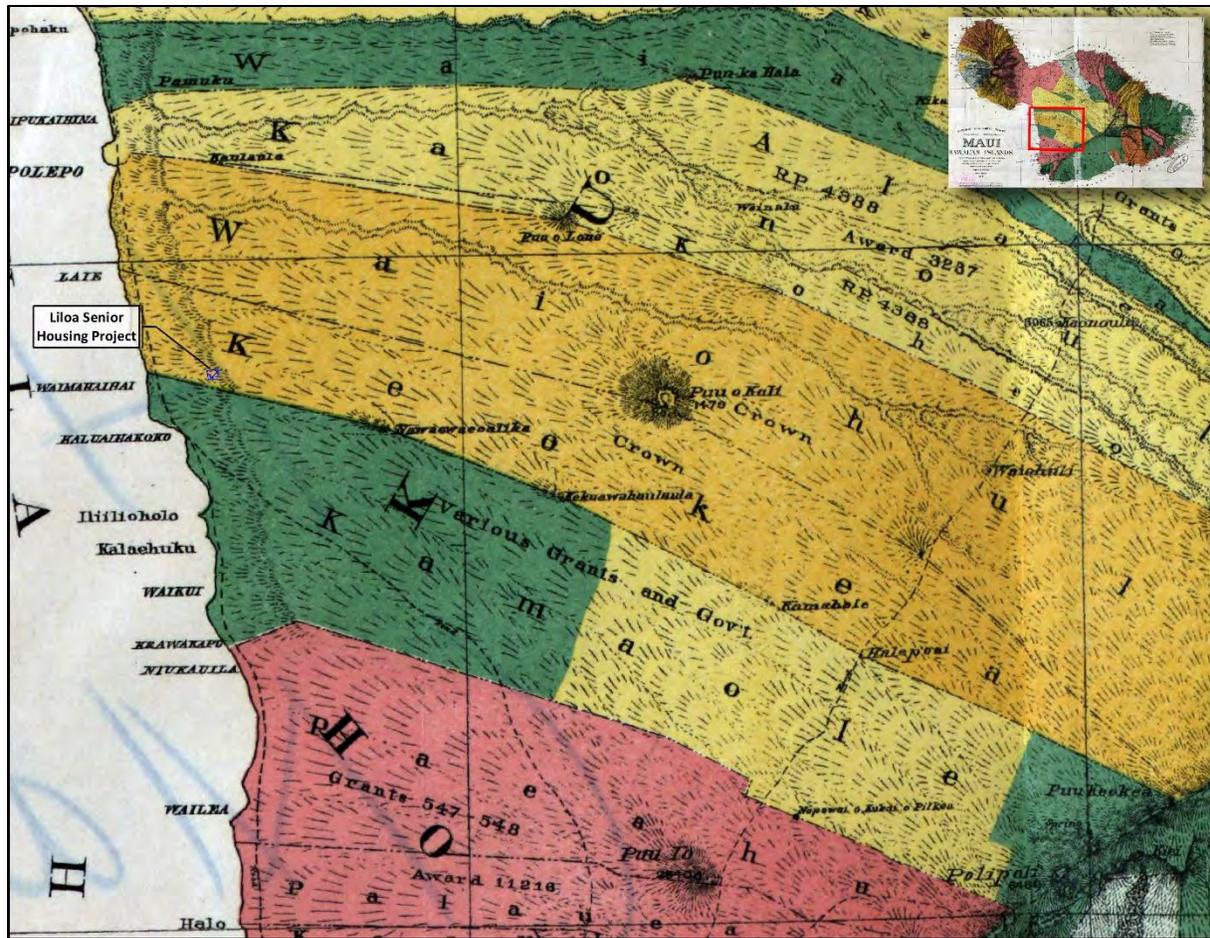


Figure 3-1. A portion of the F.S. Dodge map of Maui (1885) showing the current project area (in blue) in relation to Kāōkea Ahupua‘a and Kula Moku, Hawaiian Government lands in green and Crown lands in yellow.

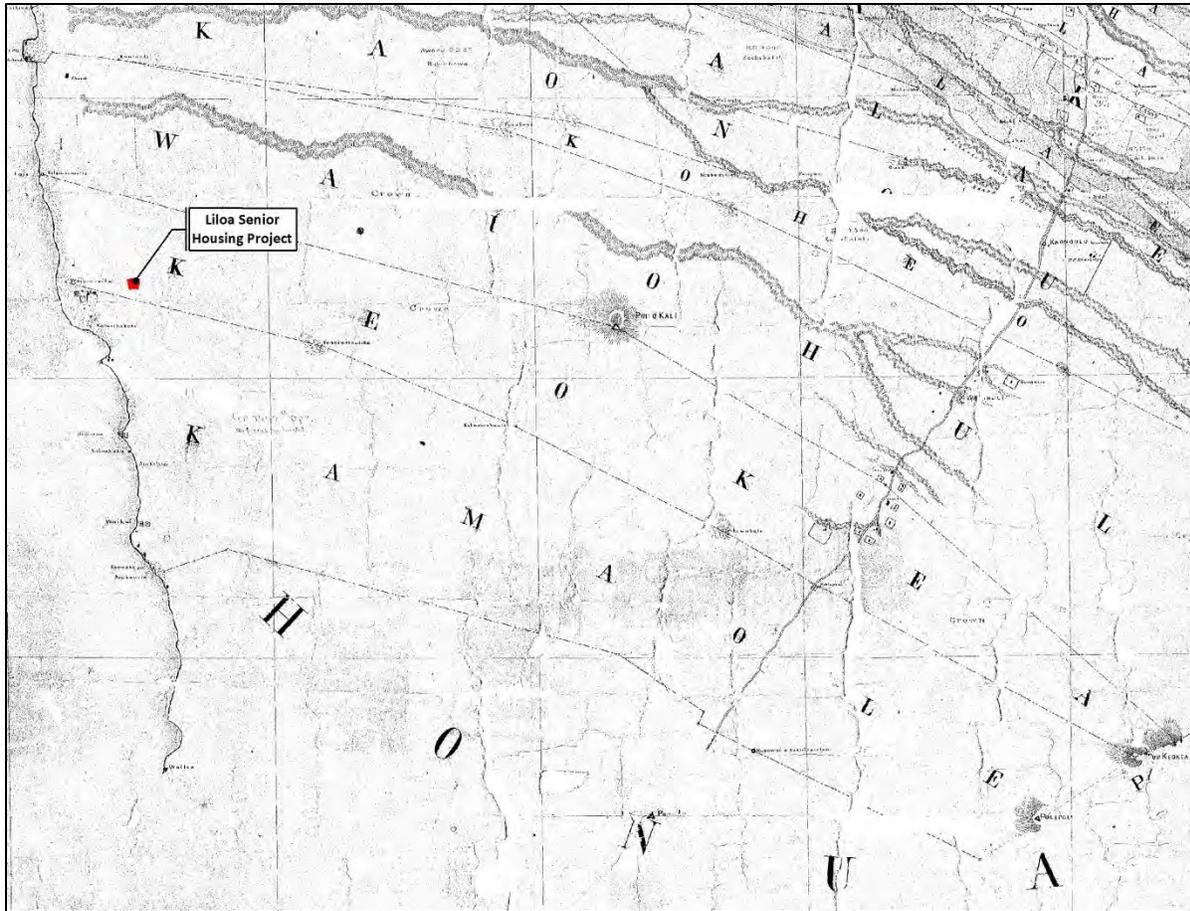


Figure 3-2. A portion of the Hawaiian Government Survey map (Monsarrat and Dodge 1880) of Kula Moku showing the configuration of Kēōkea Ahupua‘a in relation to the current project area (outlined in red) and adjacent ahupua‘a and prominent gulches of Kula Moku.

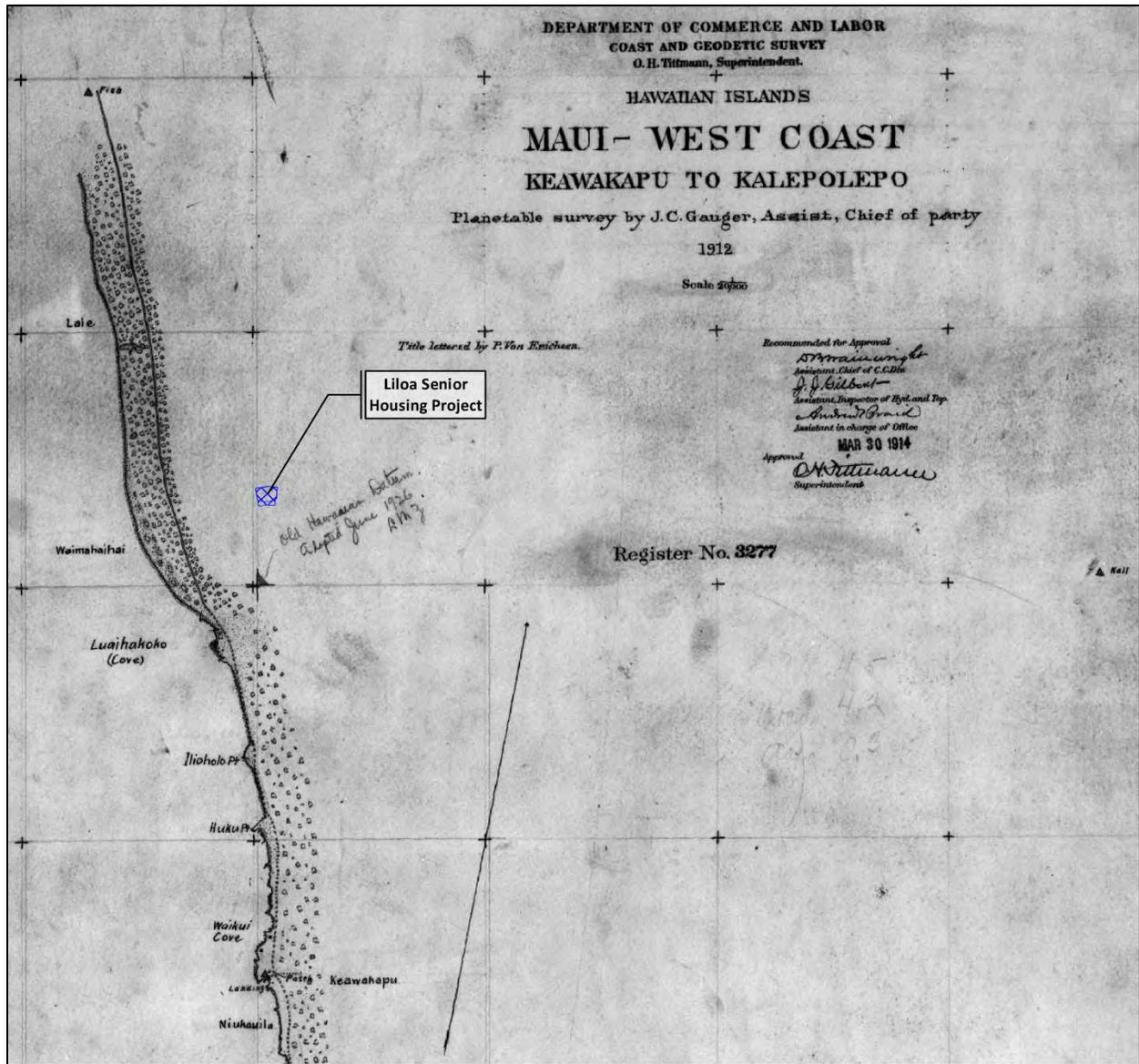


Figure 3-3. Early survey of the Kula-kai shoreline (Gauger 1912) showing the location of the current project area (cross-hatched in blue) in relation to the historic ports of Kalepolepo (Fish Benchmark) and Keawakapu, as well as coastal vegetation density and wetlands between La’ie and Waimahaihai.

### 3.1 HE MAU MO’OLELO O KA AHUPUA’A ‘O KĒŌKEA I KA WĀ KAHIKO

The island of Maui has been known by several names throughout history and across the *pae ‘āina*. The ancient name of Ihipalauaewa, after the child of Wakea and Papa who is the ancestral origin of the people of Maui, was once attributed to the island of Maui. Maui has also been referred to Kulua for the two prominent volcanoes that comprise the island, Nā Hono-a-Pi’ilani for Pi’ilani, the great 16<sup>th</sup> Century chief of Maui, and Maui Nui a Kama for Kamalalawalu the grandson of Pi’ilani (Kapiikauinamoku 1956; Sterling 1998:1). An origin story of the Hawaiian people speaks to the creation of their islands as being born to the gods Papa and Wakea. In the

ancient *oli* (chant) that tells this origin story, Hawai‘i Island is first to be born, followed by Maui, and then the rest:

*Hanau o Maui he moku, he  
aina,  
Na kama o Kamalawalu e  
noho.*

Maui was born an island, a land,  
A dwelling place for the children of  
Kamalalawalu.  
(Fornander 1916:2-3)

In this chant, Maui is called “a dwelling place for the children of Kamalalawalu,” who was the grandson of Pi‘ilani, a 16th century Mō‘ī (paramount ruler) of Maui and founder of one of its greatest dynasties (Barrere 1975:1). Thus, the traditional poetic name for Maui as Maui-a-Kama, named after Kamalalawalu, whose children are the people of Maui. It’s because of them that we have the ability to know the historical names, *mo‘olelo*, cultural sites and practices of the area in and around Kēōkea.

### 3.1.1 Wahi ‘Inoa – Place Names of Kēōkea

In the preface of *Place Names of Hawaii* (Pukui et al. 1974:x), Samuel Elbert states that:

*Hawaiians named taro patches, rocks and trees that represented deities and ancestors, sites of houses and heiau, canoe landings, fishing stations in the sea, resting places in the forests, and the tiniest spots where miraculous or interesting events are believed to have taken place.*

*Place names are far from static ... names are constantly being given to new houses and buildings, land holdings, airstrips, streets, and towns and old names are replaced by new ones ... it is all the more essential, then to record the names and the lore associated with them (the ancient names) now.*

Lyons also notes that as a consequence of the long tenancy of the people on land, “every piece of land had its name, as individual and characteristic as that of its cultivation” (Lyons 1903:23) Intrinsic to our knowledge of place names is their ability to tell the story or keep record of an area’s resources or characteristics prior to European contact. An analysis of the *wahi inoa* for the study area may yield some insight into the stories, patterns of life and land use within Kēōkea Ahupua‘a. The names and geographic characteristics listed below are for land areas, fisheries, land divisions, markers, and other resources noted within the lower elevations of Kēōkea Ahupua‘a. These areas were identified through research of available historic literary resources which include the Hawaiian Government and Territorial Survey Maps (F.S. Dodge 1885; Monsarrat and Dodge 1880), and the USGS Topographic 7.5-Minute Series Maps. Unless indicated otherwise, the spelling, orthography, and translations presented below are taken from Pukui and others (1974) where provided.

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**Kēōkea** *Lit., the white sand (ō is short for one [sand])*  
**(ahupua‘a)**

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**Waiohuli** *Lit., water of change.*  
**(ahupua‘a)**

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<b>Kama'ole</b> <b>(ahupua'a)</b>	<i>Lit.</i> , childless
<b>Kulamoemalia</b> <b>(wahi 'inoa)</b>	Potentially a reference to a place of stillness or rest within the <i>ahupua'a</i> where <i>kula</i> translates to plain or a reference to place, <i>moe</i> refers to a sleeping place, and <i>malia</i> is a variation of <i>mālie</i> which means calm or stillness (Pukui and Elbert 1986:178, 249, 233)
<b>La'ie</b> <b>(wahi 'inoa)</b>	<i>Lit.</i> , 'ie leaf which is a climbing screwpine ( <i>Freycinetia arborea</i> )
<b>Kaluaihākōkō</b> <b>(cove or lae)</b>	No known translation; potentially a reference to a place for wrestling where "hākōkō" means wrestling or to grapple; also potentially the name of a chief of the area (Alotta 1994:566); noted as both a cove (Gauger 1912) and <i>lae</i> (point) (United States Navy Department - Hydrographic Office 1943:15) known today as "Cove Park" just north of the stretch of beach now known as "Charley Young's"
<b>Waimahaihai</b> <b>(wahi 'inoa, kauhale [village])</b>	<i>Lit.</i> , broken water
<b>Nawaewaeolika</b> <b>(pu'u)</b>	No known translation; literal translation of <i>waewae</i> is to be very choosy or fastidious ( <i>kūlana waewae</i> ) where <i>wa'ewa'e</i> is the head fisherman in charge of <i>ku'ula</i> , or the <i>pōhaku</i> (stones) that are set in <i>ko'a</i> (fishing shrines) (Pukui and Elbert 1986:376)
<b>Kekuawaha'ula'ula</b> <b>(wahi 'inoa)</b>	<i>Lit.</i> , the red-mouth god
<b>Kamahale</b> <b>(pu'u)</b>	<i>Lit.</i> , house child
<b>Halepoi</b> <b>(wahi 'inoa, marker)</b>	No known translation
<b>Pu'u Kēōkea</b> <b>(pu'u)</b>	Potentially named for the <i>ahupua'a</i>
<b>Pu'u o Kali</b> <b>(pu'u)</b>	Puuokali was a <i>mo'o</i> (lizard) <i>akua</i> or <i>aumakua</i> who joined with Puuhele and gave birth to a <i>mo'o</i> child Puuoinaina who would later be split in two by Pele for also taking Lohiau, the husband of Pele, as her own. The head of Puuoinaina would become Molokini and her tail would become Pu'u Ola'i. All three <i>mo'o</i> manifestations would become prominent <i>pu'u</i> landmarks of Wailuku, Kula, and Honua'ula Moku (Fornander 1919).
<b>Kula</b> <b>(moku)</b>	<i>Lit.</i> , plain, probable reference to the broad flanks of Kula Moku

While the place names are fairly sparse, we see reference on the coastline to not only resources like the 'ie vine that would have been and important resources for fish trap manufacture near the fishpond of Kēōkea-kai, but also a possible reference to resting areas for transit at Kulamoemalia between the shoreline and *mauka* agricultural lands.

### 3.1.2 Nā Loko I‘a o Kula Kai – Construction of the Fishponds along the Kula Shoreline

A *mo‘olelo* about the construction of the *loko i‘a* (fishponds) of Kula Makai was included in an article about Kalepolepo written by Charles Wilcox for the magazine *Paradise of the Pacific* (Wilcox 1905). In the article, Wilcox attributes the construction of the fishponds of Keokea-kai (located approximately one mile north of the current project area), Waiahuli-kai (Waiohuli), and Ka‘ono‘ulu-kai to Umi, the *mo‘i* (King) of Hawai‘i Island.

When the *kono‘hiki* (landlord) for Umi summoned the people of Maui to construct the fishponds, a *Kilo* (seer or reader of omens) by the name of Kikau protested and said that the work could not be completed without the help of the *Menehune*. For his protest, the *kono‘hiki* declared that Kikau would be killed when all of the ponds of Kula Makai were complete. At the completion of Keokea-kai and Waiahuli-kai (Waiohuli), the *kono‘hiki* would ride in procession upon the final capstone for the fishpond wall that was carried upon the shoulders of the men who constructed the ponds. The capstone was placed with great ceremony by the *kono‘hiki*, who summoned Kikau each time to ask what he thought. At the last pond at Ka‘ono‘ulu however, the litter carrying the capstone and *kono‘hiki* broke, causing both the stone and *kono‘hiki* to fall to the ground in the dust of Kalepolepo. This was followed by a raging storm that brought “wind, rain, hail, thunder and lightning, and earthquake and a heavy sea with a flood of red waters from the uplands” (Wilcox 1905:67). Under the cover of this storm, the brothers of Kikau, the *e‘epa* (supernatural beings), or elves as Wilcox refers to them, gathered and were seen tearing down the *pā pōhaku* (sea walls) and undoing the work of the *kono‘hiki* to save Kikau from death and taking the capstone. This happened for one more night until the *kono‘hiki* had acknowledged that he had been wrong and requested help to complete his *kuleana* (responsibility, task) to the Umi. Kikau advised that food should be brought from Ko‘olau and Wailuku to bring the *Menehune* who would perform the task. That evening, the *Menehune* came across the plains of Kama‘oma‘o (Maui’s central isthmus) to Kalepolepo:

*That evening the signs of the coming of the hosts of menehunes were seen by the rising of far-off spirals of red dust in the uplands, growing in numbers as they neared the lowlands until swirling clouds of red dust filled the air above Kalepolepo. But not until the evening star had set did their clamor break the silence of the tabued [sic] night, and the menehunes appeared in swarms and in great numbers, so that the hum of their voices drowned the sound of the surf breaking on the reefs, as they quickly fell to work by companies. (Wilcox 1905:67)*

In what seemed like no time at all, the pond walls were reconstructed and the capstone, named “Kikaupohaku” for their brother Kikau, was laid upon the unfinished gap and the work was complete. The *Menehune* feasted on the prepared food and when the Morning Star rose, the *Menehune* left for the uplands and forests. Kikau was from then on known as a *Kilo* who could summon *Menehune* and lived for a time at the court of Umi in Waipio, Hawai‘i.

While the use of *loko i'a* of Kēōkea-kai and Waiohuli-kai was discontinued over time, thus resulting in the walls falling into a remnant state (Figure 3-4), Kō'ie'ie fishpond at Kalepolepo caught the eye of Kamehameha I, who would later rebuild that *loko i'a* to the north, as well as, the *loko i'a* at Haneo'o in Lāhainā. It is interesting that in order to accomplish this task, Kamehameha I would engage the men of women of East Maui to work on the opposite side of Maui at Haneo'o and the men and women of West Maui would work at Kalepolepo (S.M. Kamakau in Sterling 1998:250).



Figure 3-4. 2013 Google Earth image showing the location of the current project area in relation to the loko i'a of Kula Kai, or makai section of Kula Moku.

### 3.2 KA ‘ĀINA A ME KE KAI MOMONA O KĒŌKEA-KAI – THE TRADITIONAL CULTURAL LANDSCAPE OF KĒŌKEA-KAI

It is well known that the natural state of the lands just inland of Kula-kai shoreline from Kēōkea to Pūlehunui once consisted of marshy wetlands that served as the drainage basins of the west-facing Kula watershed (Figure 3-5). The connectivity of the water ways to the wetland was important to maintain the marine abundance of Kēōkea-kai. Harnessing and the need for stewardship of these resources can be seen in traditional aqua-culture adaptations focused the construction of fishponds to ensure a reliable fish resource, as well as the natural broad reef system which supplied fish, shellfish, and *limu* (seaweed) resources. This abundant marine resource environment relied on the natural drainage system of the *mauka* lands that would empty into the former wetlands of Kēōkea before making its way to the sea, as well as, freshwater seeps for healthy *limu* beds.

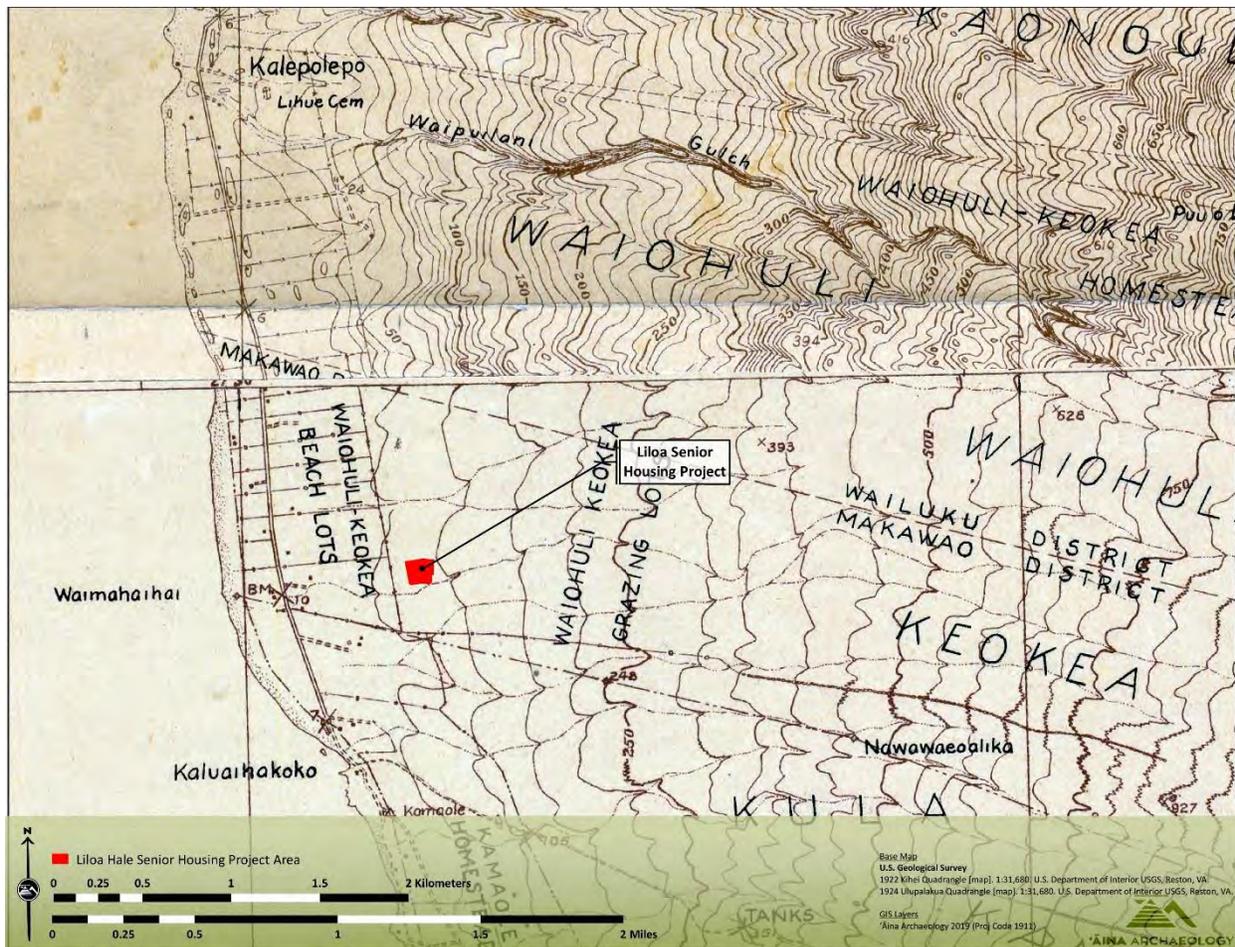


Figure 3-5. Portions of the 1922 USGS Kihei Topographic Quadrangle and 1924 Ulupalakua Topographic Quadrangle showing the lands of the current project area in relation to the general drainage and lowland wetland environment of Kula Kai prior to major land alteration.

As a part of an interview for the neighboring Welakahao Village Subdivision, Mr. Vernon Kalanikau described the wetlands of La'ie to the immediate north and Waimahaihai to the south, as well as, the resources on which his family would rely (Smith 2018:34-36):

*The wisdom that his kūpuna shared with him is that fresh water has to “touch the sea,” meaning that the streams and springs have to run to the sea. The inlet to La'ie wetlands is currently blocked by a sand dune. In his childhood, the inlet was open to the ocean, allowing fish to swim into the muliwai [stream mouth]. He remembers netting guppies (gobi fish), which his mother would bake with patis (fish sauce) until dry and crunchy. His family enjoyed eating them with fresh mangoes. “It was salty, and afterward, my dad would eat bitter melon to counteract the salt.”*

*As a child, Mr. Kalanikau saw 'aholehole fish, 'o'opu fish and 'opae shrimp in the wetlands too....*

*Gathering on this coastline near Waimāhaihai, Halama, Keokea, Waiohuli was for 'ele'ele seaweed and lipoa, as well as wāwae 'iole and another leafy seaweed for which he could not remember the name. There were places to gather wana (sea urchin) too. He spoke of the wetlands as a “filtering system for all the water that comes down through lava tubes and over the land. There was no flooding in this area in the old days.” He said that today, one can still push his feet down into the sand and feel the cold fresh water springs at the beach. “It's cold and the spring water is right there in the sand.”*

Mr. Cody Nemet Tuavaiti, also a participant in the Welakahao Villages Cultural Impact Assessment described fishing at Waimahaihai for *pāpio*, *moe*, and *'awa* (Smith 2018:36). From the low wetlands and sand dunes of the Kēōkea-kai, the lands of the *ahupua'a* would rise and cross the transitional lands of the current project to the rich agricultural soils of the uplands and forested region of the *kuahiwi* ridge of Haleakalā at an elevation of 9,000 ft. amsl. The lands of these upper elevations would support thriving traditional agriculture, roughly 6.5 miles *mauka* of the current project area (Figure 3-6), and be accessed by trail systems to and from the lowlands which provided marine resources from both the wetland, near-shore, and off-shore environments.

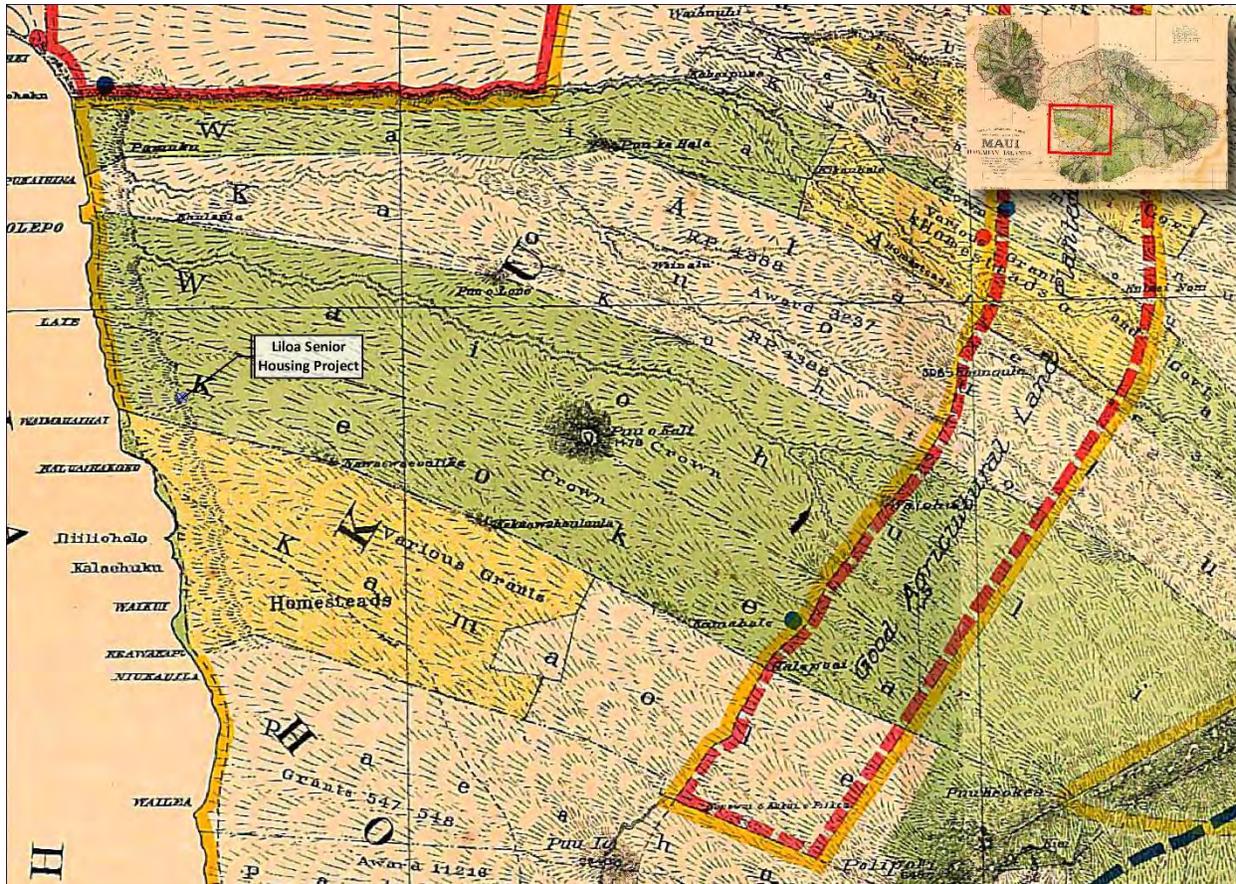


Figure 3-6. A portion of the revised Government Survey Map of Maui (F. S. Dodge 1903 (1885)) showing the “Good Agricultural Land” of the mauka region in relation to the Kōōkea shoreline and current project area.

### 3.3 PREVIOUS ARCHAEOLOGICAL STUDIES COMPLETED WITHIN AND ADJACENT TO THE LILOA HALE PROJECT SITE

A search of archaeological investigations within a one-mile radius of the Liloa Hale Project Site shows the completion of roughly 34 studies. The following provides an overview of the results of these studies (Table 3-1 and Figure 3-7), an in-depth summaries of the archaeological inventory survey completed within the former TMK of 2-2-002:042 prior to subdividing out the current project parcel (Section 3.3.1), as well as, a review of identified historic properties within an approximate one-mile radius (Section 3.3.2).

Table 3-1. Summary of Previous Archaeological Studies Completed Within a One-Mile Radius of the Liloa Hale Project Site (Figure 3-7)

Author	Type of Study and Summary of Findings
Cordy 1977	<b>Reconnaissance:</b> Identified 38 historic properties within the study corridor: 30 in Waiohuli, 0 in Kaonoulu, and 8 in Kēōkea
Donham 1989	<b>Inventory Survey:</b> Pedestrian survey of an approximate 114-acre study area resulted in the identification of five historically significant archaeological sites comprised of 15 component features. These historic properties included structural remnants associated with ranching (SIHP 50-50-10-2473 and -2474), a historic wall section (SIHP -1705), two cairns representing possible burials (SIHP -2475), five alignments interpreted as possible precontact agricultural terraces (SIHP -2476).
Donham 1990	<b>Inventory Survey:</b> Pedestrian survey and archaeological site testing conducted across approximately 74-acres resulting in the recordation of a total of 16 historic properties comprised of 30 component features. Recorded sites included three previously identified historic properties (SIHP 1709-1711) , as well as, an additional 13 newly identified sites (SIHP 2513-2524). Formal feature types included terraces, enclosure, C-shapes, rock mounds, platforms, midden scatters, an alignment, and a modified outcrop.
W.M. Fredericksen et al. 1991a	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing of an approximate 3.14-acre study area. A total of 37 exploratory trenches were excavated, ranging in length from 3 to 6 m, resulting in the observation of recent refuse (e.g. construction debris, animal bones, and domestic trash) along with two railroad spikes. No historically significant archaeological sites were identified on either the surface or within subsurface contexts.
W.M. Fredericksen et al. 1991b	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing of an approximate 10,545 sq. ft. area. A total of 23 stratigraphic trenches, measuring roughly 3-3.5 m in length were excavated. Findings included the identification of a recent refuse pit, as well as, a modern pet burial which consisted of a small dog wrapped in a blanket. No historically significant archaeological sites were identified on either the surface or within subsurface contexts.

Table 3-1 (continued). Summary of Previous Archaeological Studies Completed Within a One-Mile Radius of the Liloa Hale Project Site (Figure 3-7)

Author	Type of Study and Summary of Findings
<b>Kennedy and Maigret 1991</b>	<b>Inventory Survey:</b> Study was limited to a systematic pedestrian survey of an approximate 20-acre area. No historically significant archaeological sites were identified on the surface. Subsurface testing was recommended within the sand dune area within the southeastern section of the study area.
<b>D.L. Fredericksen et al. 1993</b>	<b>Inventory Survey</b> and Data Recovery: Pedestrian survey and subsurface excavation within an approximate 2-acre area resulted in the identification and documentation of a rock shelter (SIHP 50-50-10-3193) interpreted as a short-term or recurrent habitation site. Excavation resulted in the recovery of dietary remains consisting of marine fauna and formal artifacts which included over 100 volcanic glass flakes, basalt cores and flakes, bone picks, a coral file, and a piece of worked bone. A radiocarbon 14 sample yielded a date of 270 +/- 120 BP (Cal AD 1560-1800).
<b>W.M. Fredericksen et al. 1994</b>	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing of seven continuous parcels. While no historically significant archaeological sites were identified on the surface, subsurface testing did encounter sparse amounts of modern cultural material debris in three of sixteen stratigraphic trenches, as well as, as recent refuse pit. No historically significant layers or cultural materials were identified or recovered from subsurface contexts.
<b>E.M. Fredericksen and Fredericksen 1995a</b>	<b>Data Recovery:</b> Archaeological data recovery of SIHP 50-50-10-3529, a low rock overhang interpreted as a temporary habitation shelter and activity area focused on use and refinement of volcanic glass material and fishhook manufacture. Charcoal samples recovered from fire hearths just outside of the drip line returned dates of occupation ranging from cal AD 1470 to 1700. Significant amounts of marine shell dietary remains were recovered from 21 test units within and adjacent to the overhang shelters, along with portable artifacts consisting of coral abraders and files, volcanic glass cores and utilized flakes, utilized basalt flakes, worked bone and fishhook pieces.
<b>E.M. Fredericksen and Fredericksen 1995b</b>	<b>Inventory Survey:</b> Pedestrian and subsurface testing of an approximate 150 ft. wide corridor resulted in the identification of a rock shelter and associated cultural deposit covering a 20 to 25 sq. m. area (SIHP 50-50-10-3529) representing a short-term or recurring habitation area.

Table 3-1 (continued). Summary of Previous Archaeological Studies Completed Within a One-Mile Radius of the Liloa Hale Project Site (Figure 3-7)

Author	Type of Study and Summary of Findings
<b>Burgett and Spear 1996</b>	<b>Inventory Survey:</b> Systematic pedestrian survey and limited subsurface testing of an approximate 8.67-acre study area resulted in the identification of a stone alignment of an indeterminate function (SIHP 50-50-10-4400 Feature 1), a pit feature (SIHP -440 Feature 2) that was encountered in TU-1, and associated low density deposits (Deposits 1 and 2). The pit feature was interpreted as either a storage feature or offering based on the presence of coral pieces and lack of charcoal or faunal remains. Additionally, Basalt flakes (n=5) along with marine shell and marine invertebrate remains (389.4 g) were recovered from TU-1 through TU-6.
<b>Burgett and Spear 1998</b>	<b>Inventory Survey:</b> Pedestrian survey with manual subsurface testing within a 6.95 acre area and along an approximate 2046 ft. of drain line. No historically significant archaeological remains or structures were identified as a result of the study.
<b>Hammatt and Shideler 2000a</b>	<b>Inventory Survey:</b> Field reconnaissance and monitoring of soil borings resulted in negative findings. No historically significant archaeological sites identified.
<b>Hammatt and Shideler 2000a</b>	<b>Inventory Survey:</b> Pedestrian survey of 4.75 acres. Extensive alteration noted within the project area (e.g. bulldozer push-piles and cleared roadways). Remnants of cattle ranching also observed in the project area. No historically significant archaeological sites documented within the project area.
<b>Kikiloi et al. 2000</b>	<b>Inventory Survey:</b> Pedestrian survey of approximately 20 acres. Modern land altering activities related to utility installation and ranching activities was noted across the project area. No historically significant archaeological sites were identified on the surface of the study area.
<b>Tome and Dega 2002</b>	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing within an approximate 3-acre study area resulted in the identification of a temporary habitation area (SIHP 50-50-10-5192) comprised of four component features. These features include a remanant rock alignment and associated cultural material scatter (Feature 1), as well as three additional discrete, low density cultural material scatters likely representing single-use activity areas.

Table 3-1 (continued). Summary of Previous Archaeological Studies Completed Within a One-Mile Radius of the Liloa Hale Project Site (Figure 3-7)

Author	Type of Study and Summary of Findings
<b>Dega 2003</b>	<b>Inventory Survey:</b> Systematic pedestrian survey of a 564 m by 17 m road corridor and 83 m by 23 m utility area. Survey observations noted the presence of exposed bedrock throughout the study area indicating shallow soils and sediment. No historically significant archaeological sites were identified within the study area.
<b>Pantaleo 2003</b>	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing consisting of 19 exploratory trenches was completed within an approximate 21-acre study area. No historically significant archaeological sites were identified on the surface or within subsurface contexts.
<b>Monahan 2004</b>	<b>Inventory Survey:</b> Pedestrian survey of an approximate 56.647-acre area with manual subsurface testing at selected sites. A total of four surface features were identified and consisted of pre-contact x and one historic military training enclosure (SIHP -5508).
<b>Johnson and Spear 2005</b>	<p><b>Data Recovery:</b> Archaeological data recovery of five previously documented historic properties (SIHP 50-50-10-1710, -2512, -2514, -2516, -2522) to the north of the current project area which were comprised of ten component features. The results of which resulted in the following:</p> <ul style="list-style-type: none"> <li>-1710 -- historic era enclosure overlying sandy deposits, recovered material included both indigenous (volcanic glass pebble) and Euro-American portable artifacts.</li> <li>-2512 -- late pre-contact to early post-contact habitation area with a ceremonial component</li> <li>-2514 -- pre-contact Hawaiian habitation area (calAD 1460-1660) with relatively high density cultural material deposits with a higher frequency of echinoderm over other marine fauna.</li> <li>-2516 -- pre-contact Hawaiian habitation area (calAD 1460-1660) with relatively high density cultural material deposits with a higher frequency of echinoderm over other marine fauna.</li> <li>-2522 -- recovery of sparse amounts of unidentifiable fragments of marine shell</li> </ul>

Table 3-1 (continued). Summary of Previous Archaeological Studies Completed Within a One-Mile Radius of the Liloa Hale Project Site (Figure 3-7)

Author	Type of Study and Summary of Findings
<b>Morawski and Dega 2005</b>	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing of an approximate 36.8 acre study area resulted in the identification of one historic ranching site consisting of a concrete reservoir (SIHP 50-50-10-5647).
<b>Rotunno-Hazuka et al. 2005</b>	<b>Inventory Survey:</b> Pedestrian survey along with both manual and mechanically assisted subsurface testing within an approximate 3-acre study area that was situated on a remnant sand dune . A total of nine <i>in situ</i> historic era burials and the displaced remains of nine individuals were documented at 27 localities (SIHP 50-50-10-4962) within the study area. The report goes on to note that an additional eight individuals were disturbed within the study during grading activities in 2001.
<b>Fortini and Dega 2006</b>	<b>Inventory Survey:</b> Pedestrian survey and mechanically assisted subsurface testing of a 0.4-acre study area. Subsurface testing showed extensive fill deposits within the project area. No historically significant archaeological sites were identified either on the surface or within subsurface contexts as a result of the study.
<b>E.M. Fredericksen 2006</b>	<b>Inventory Survey:</b> Archaeological pedestrian survey and mechanically assisted subsurface testing of an approximate 2.2 km (1.39 mile) long by 15 m (50 ft) wide corridor. The pedestrian survey noted extensive earth moving activities associated with access road construction while testing resulted in the identification of two , culturally sterile silty clay and compacted clay layers. No historically significant or culturally sensitive archaeological sites were identified.
<b>Dega 2008</b>	<b>Inventory Survey:</b> Pedestrian survey of an approximate 282-acre study area resulting in the identification of three archaeological sites consisting of two historic era modified outcrop (SIHP 50-50-10-6239 and -6240) and a pre-contact to historic era boundary wall (SIHP -6241). All three historic properties were identified adjacent and to the south of Waipuilani Gulch and Stream.

Table 3-1 (continued). Summary of Previous Archaeological Studies Completed Within a One-Mile Radius of the Liloa Hale Project Site (Figure 3-7)

Author	Type of Study and Summary of Findings
<b>Madeus and Fredericksen 2008</b>	<b>Inventory Survey:</b> Pedestrian survey, as well as manual and mechanically assisted subsurface testing of a 155-acre portion of an overall 310-acre parcel. Two historic properties consisting of a pre-contact temporary habitation site with possible ceremonial associations (SIHP 50-5010-6484) and a possible World War II era complex consisting of transportation features and markers (Features A through D) likely associated with military training and uses (SIHP -6485).
<b>Pestana et al. 2008</b>	<b>Inventory Survey:</b> Systematic pedestrian survey and limited mechanically assisted subsurface testing of an approximate 5.246-acre study area. Excavation of five trenches showed the presence of culturally sterile sand deposits in the northwestern portion of the study area. No historically significant archaeological sites or culturally sensitive features were identified on either the surface or within subsurface contexts.
<b>Madeus and Fredericksen 2009</b>	<b>Inventory Survey:</b> Pedestrian survey and extensive mechanically assisted subsurface testing resulted in the identification and documentation of an intact cultural deposit (SIHP 50-50-10-6598) representing pre-contact habitation in the area. Modest amounts of marine shell remains, sea urchin, fish bone, one volcanic glass flake, and sparse amounts of charcoal. Report notes the presence of multiple post-contact burials (SIHP -4962) located directly north and adjacent to the study area.
<b>Perzinski and Dega 2010</b>	<b>Inventory Survey:</b> Pedestrian survey of an approximate 25-acre study area. Extensive ground alterations associated with historic era ranching was noted throughout. No historically significant archaeological sites were identified within the study area.
<b>Pestana et al. 2010</b>	<b>Inventory Survey:</b> Pedestrian survey and subsurface testing within a 10-acre study area resulted in the identification of two historic properties comprised of six component features. These sites included SIHP 50-50-10-6521 (historic military training enclosures: C-shape, L-shape, and V-shape) and SIHP -6522 (two historic ranch related rectangular concrete slabs). No portable cultural material remains were recovered as a result of testing at these features.

Table 3-1 (continued). Summary of Previous Archaeological Studies Completed Within a One-Mile Radius of the Liloa Hale Project Site (Figure 3-7)

Author	Type of Study and Summary of Findings
<b>Geurriero et al. 2016</b>	Inventory Survey: Pedestrian survey and mechanically assisted subsurface testing consisting of 11 exploratory trenches was completed on an approximate 20-acre study area. No historically significant archaeological sites were identified on the surface or within subsurface contexts.

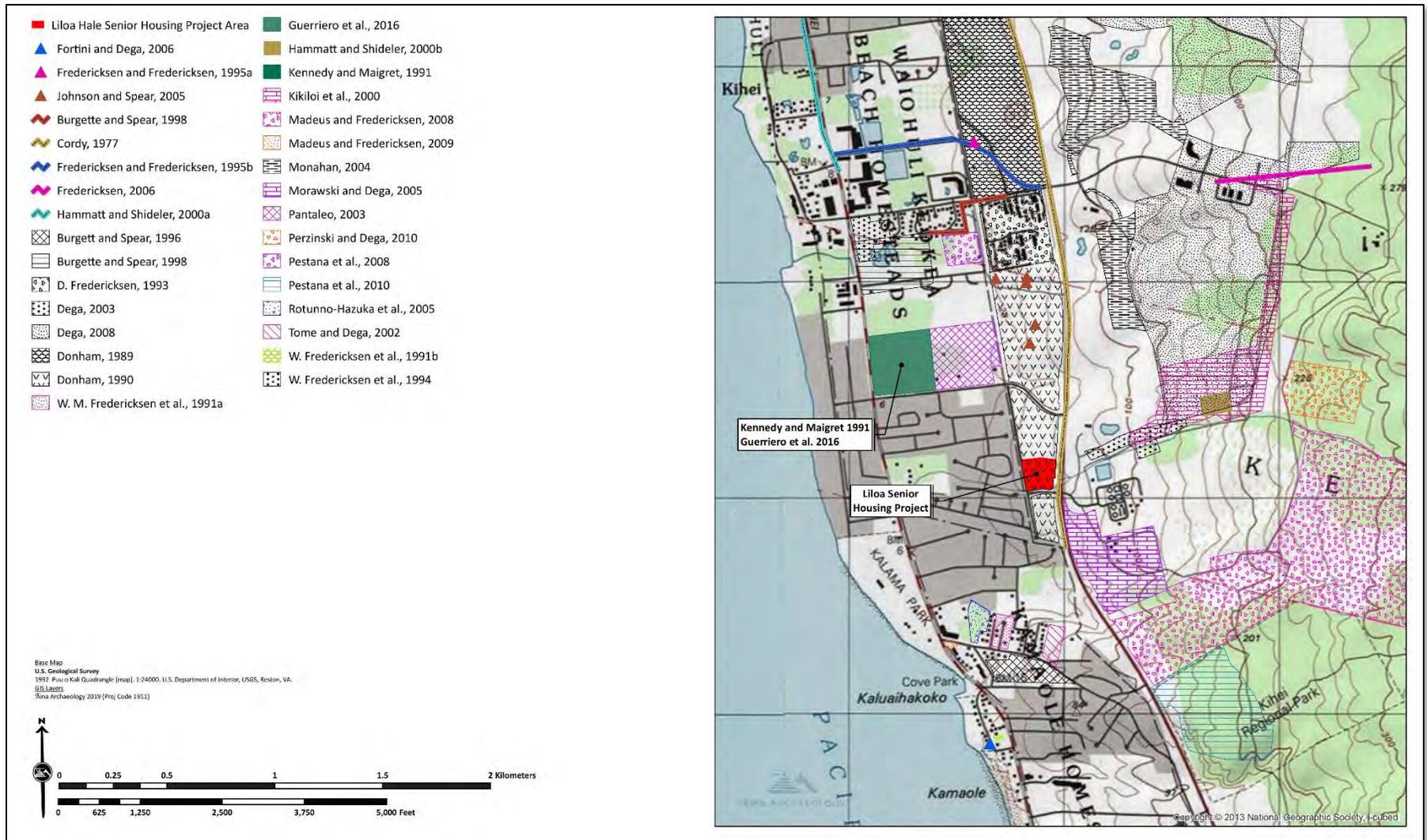


Figure 3-7. A portion of the 1992 USGS 7.5' topographic map series, Puu o Kali Quadrangle 1:24000 scale, showing the proposed project area (shaded in red) in relation to previous archaeological sites.

### 3.3.1 Archaeological Studies Specific to the Liloa Hale Tax Map Key and Project Site

Specific to the project area, and prior to subdivision of TMK 2-2-002:42 into several parcels (Parcels 001-006, 042, and 072), Paul H. Rosendahl, Ph.D., Inc. (PHRI) completed an archaeological inventory survey of the 74- acre parcel for the then proposed Piilani Residential Community Phase II (Donham 1990) (see also Figure 3-7).

This study consisted of a 100% systematic pedestrian survey followed by site recordation and archaeological testing at selected sites and features (Donham 1990:6). A total of 16 historic properties comprised of 30 component features were recorded as a result of the study (Donham 1990:8). Five of the of the historic properties were previously identified and recorded during an archaeological reconnaissance completed for the U.S. Army Corps. of Engineers' (Cordy 1977), three of which were given SIHP numbers (SIHP 1709-1711) and two of which were assigned SIHP numbers (SIHP 2522 and 2523) during the PHRI study (Donham 1990:8). The remaining 11 are newly identified sites (SIHP 2513-2521 and 2524) that were situated in the northern portion of the study area (Donham 1990:8). Formal types and functional interpretations include agricultural terraces, mounds, and enclosures (SIHP 1711, 2512 Features B and C, 2513, 2515, 2516 Feature A, 2518, 2519, 2520, and 2523), temporary and recurrent habitation enclosures, platforms, and remnant midden scatters (SIHP 2512 Feature A, 2515, 2516 Feature B, 2517, and 2521), possible multi-functional enclosures and terraces (SIHP 1710 and 2522), as well as a terrace with a possible ceremonial function (SIHP 2512 Feature D) and rock piles or mounds of an indeterminate function (SIHP 2512 Feature E and 2524) (Donham 1990:Table 2). Subsurface testing, consisting of the excavation of 0.5 m x 0.5 m units, was carried out at three low enclosures (SIHP 1711 Feature A, 2513, and 2516 Feature B), a rock-filled terrace (SIHP 2520 Feature A), and a C-shape (SIHP 2523 Feature A) encountered decomposing bedrock between 0.15 to 0.27 m below surface (Donham 1990:12-13, Table 4). Only two artifacts, one basalt flake and one volcanic glass flake, were recovered from excavated contexts, while the remainder included 4.0 g of marine invertebrates, 0.1 g of charcoal, and 0.2 g of thermally altered earth (Donham 1990:Table 5).

### 3.3.2 Historic Properties Identified Within and Immediately Adjacent to the Liloa Hale Project Site

While the chronological timeline for settlement of Kula-kai is still being debated, it is without a doubt that coastal habitation within Kula-kai and Kula-uka settlement areas was firmly established by A. D. 1400-1500. The few available and reliable radiocarbon dates from the Kula-kai area were consistent in their rather broad, later prehistoric age determinations which most commonly clustered after A.D. 1500 (D. L. Fredericksen et al. 1993; E. M. Fredericksen and Fredericksen 1995b; Johnson and Spear 2005:38, 49). This intensified settlement of Kula-kai during later portion of the Traditional Period, or late pre-contact, corresponds with the expansion of upland permanent habitation, ceremonial constructions, and agricultural clearing circa A.D. 1400-1500 (Kolb et al. 1997:281-282).

The majority of permanent habitation in the uplands would have been fairly wide spread and along the well-watered and fertile agricultural areas while coastal permanent habitations were likely less

numerous and clustered around the ceremonial structures and shoreline fish ponds which potentially date to the 1500s (Kolb et al. 1997:66).

The results of previous archaeological studies in the coastal and upland regions have led to archaeological site and traditional settlement models based on three zones: 1. Coastal (Kula-kai); 2. Barren or Transitional (Kula-waena); and 3. Inland or Upland (Kula-uka) (Cordy 1977; Cox 1976; Walton 1972). Cordy defines the coastal zone as an approximate ¼ mile wide band running along the shoreline that encompassed the flat area near the coastline and inclusive of the brackish marshlands at the mouths of gulches and associated raised areas (Cordy 1977:3). The inland zone was marked by the 30-inch rainfall contour, approximately five to seven miles from the shore, and characterized by larger rainfall accumulation and lush vegetation (Cordy 1977:3). In contrast, the transitional or barren zone, where the current project area is situated (Figure 3-8), consists of the area between the coastal zone and inland zone and is generally characterized by brush and scrub vegetation with low annual rainfall accumulation (Cordy 1977:4) (see also Section 2.1). The archaeological sites and features that would have been associated with this zone were thought to have been reflective of more transient functions like temporary shelter areas in overhangs and caves, as well as, trails and trail markers to facilitate transit between Kula-kai and Kula-uka, rather than long-term or intensive use of the area.

Early interpretations notwithstanding, based on work within and adjacent to the current project area, Donham (1990) concluded that there had likely been a more extensive and intensive use of the “transitional” or barren zone just back from the coastal zone than had been previously suggested. This view of more intensive use of the transitional zone just back from the coastal zone, or lower Kula-waena, is illustrated by the types and functional interpretations of archaeological finds at elevations and distances from the shoreline that are comparable current project area (Table 3-2 and Figure 3-9. A portion of the 1992 USGS 7.5’ topographic map series, Puu o Kali Quadrangle, showing the location of the project parcel in relation to the coastal settlement zone proposed by Cordy (1977) and previously identified historic properties. Figure 3-9). The more typical archaeological site types that were commonly associated with the Kula-waena sections of Kula Moku, such as traditional Hawaiian trails and trail markers, were identified *mauka* of this transitional zone habitation and agricultural area, between the 200 ft. and 300 ft. contours, and as the grade of the slope increased (SIHP 50-50-10-2475).

Overall, a minimum 35 archaeological sites and features have been identified within a one-mile radius of the current project area. These include traditional Hawaiian burial interment (SIHP 50-50-10-0496) at in the coastal dunes, traditional Hawaiian agricultural and associated habitation areas (SIHP 50-50-10-1709 through -1711, -2476, -2513, -2518, -2519, -2520, -2522, -2523, -2512), traditional Hawaiian habitation (SIHP 50-50-1-2514, -2517, -2521, -3193, -3529), and traditional Hawaiian habitation with a ceremonial component (SIHP 50-50-10-6484).

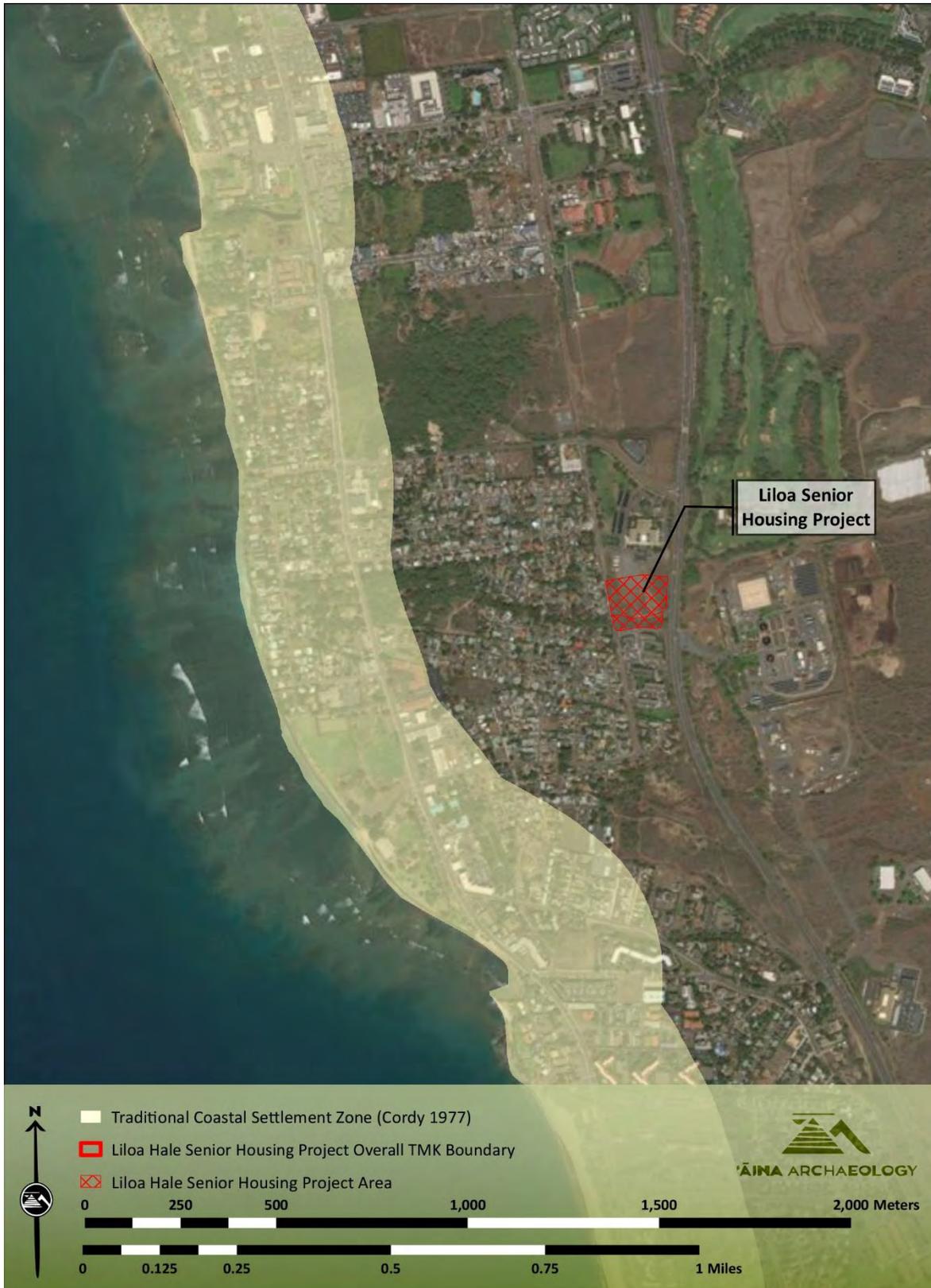


Figure 3-8. World Imagery orthophoto (Esri et al. 2018) showing fringing reef of Kula-kai and the coastal settlement zone in relation to the proposed Liloa Senior Housing Project (cross-hatched in red).

Table 3-2. Previously Identified Historic Properties within a One-Mile Radius of the Liloa Senior Housing Project

SIHP No	Feature	Formal Type	Inferred Function	Age
<b>50-50-10-</b>				
<b>01709</b>		Enclosure	Agriculture	Pre-contact
<b>01709</b>		Enclosure	Agriculture	Pre-Contact
<b>01710</b>		Enclosure	Agriculture/ Temporary Habitation	Pre-contact
<b>01710</b>		Enclosure	Agriculture/ Possible Habitation	Pre-Contact
<b>01711</b>		Complex	Agriculture	Pre-Contact
<b>02475</b>		Cairn	Marker	Pre-Contact
<b>02476</b>		Alignment	Possible Agriculture	Possible Pre-Contact
<b>02512</b>		Complex	Agriculture/Habitation	Pre-Contact
<b>02513</b>		Enclosure	Agriculture	Pre-Contact
<b>02514</b>		Platform	Possible Habitation	Pre-Contact
<b>02515</b>		Modified Outcrop	Indeterminate	Indeterminate
<b>02516</b>		Complex	Possible Agriculture/ Temporary Habitation	Pre-Contact
<b>02517</b>		Cultural Material Scatter	Habitation	Pre-Contact
<b>02518</b>		Complex	Agriculture	Pre-Contact
<b>02519</b>		Terrace	Agriculture	Pre-Contact
<b>02520</b>		Complex	Agriculture	Pre-Contact
<b>02521</b>		Cultural Material Scatter	Habitation	Pre-Contact
<b>02522</b>		Complex	Agriculture/ Possible Habitation	Pre-Contact
<b>02523</b>		Complex	Agriculture	Pre-Contact
<b>02524</b>		Cairn	Indeterminate	Pre-Contact
<b>03193</b>		Rock Shelter/ Subsurface Deposit	Temporary Habitation	Pre-Contact
<b>03193</b>		Rock Shelter/ Subsurface Deposit	Temporary Habitation	Pre-Contact
<b>03529</b>		Rock Shelter/ Cultural Deposit	Temporary Habitation	Pre-Contact
<b>04962</b>		Human Burial	Human Burial	Pre-Contact to Historic
<b>05647</b>		Reservoir	Water Control	Historic - Ranch
<b>06484</b>		Wall	Temporary Habitation/ Ceremonial	Pre-Contact
<b>06485</b>	A	Terrace	Military Training	Historic - World WarII
	B	Mound	Marker	Historic - World War II
	C	Ford	Transporation	Historic - World War II
	D	Road Bed	Transportation	Historic - World War II

Table 3-2 (continued). Previously Identified Historic Properties within a One-Mile Radius of the Liloa Senior Housing Project

SIHP No	Feature	Formal Type	Inferred Function	Age
<b>50-50-10-</b>	1	C-Shape	Military Training	Historic - World War II
<b>06521</b>	2	V-Shape	Military Training	Historic - World War II
	3	L-Shape	Military Training	Historic - World War II
	1	Wall	Animal Control	Historic - Ranch
<b>06522</b>	2	Concrete Slab	Livestock Maintenance	Historic - Ranch
	3	Concrete Slab	Livestock Maintenance	Historic - Ranch



## 4.0 CURRENT CONDITIONS IN THE VICINITY OF THE PROPOSED LILOA SENIOR HOUSING PROJECT

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With regard to traditional areas of occupation and traditional cultural resources, the proposed Liloa Hale Senior Housing Project is situated within the lower elevations of Kula-waena region, a settlement zone that had long been referred to as transitional or barren. While the intensity of traditional settlement and use of the region was thought to have been minimal in comparison to the coastal and upland settlement areas, recent archaeological studies completed in this settlement zone shows that the use of the lower Kula-waena area had been more intensively used for small scale agriculture and temporary or recurrent habitation (Donham 1990; Johnson and Spear 2005; Madeus and Fredericksen 2008). The presence of agricultural features at these elevations, where the dune sands begin to transition into alluvium (see Figure 2-1), is not surprising given the presence of potentially fertile agricultural soils during the Ho'oilō season (see Section 2.1) and the proximity to the wetland ecosystem and once thriving ocean resources between La'ie and Waimahaihai.

With the modern growth of the Kula-kai shoreline for both resort and residential housing however, the traditional cultural landscape of Kēōkea-kai has been drastically altered as wetlands were filled in and the natural waterway courses diverted and modified in both the *mauka* reaches and at the *muliwai* or outlets to the sea. Specific to the current project area, the intermittent stream that once flowed to Waimahaihai and fed the fishing grounds and *limu* beds noted by Mr. Vernon Kalanikau and Mr. Cody Tuavaiti in their interviews for the Welekahao Villages project (Smith 2018:34-36) was once situated just south of the current project area. According to Mr. Johnson Patterson of Hope Chapel (personal communication, December 04, 2019), and as can be seen in the following map and aerial photo overlay, this stream was diverted both *mauka* and *makai* of Pi'ilani Highway prior to the construction of the highway (Figure 4-1) and has not run freely since.

This disruption of the natural drainage patterns, along with the development of the resort and residential areas within and just back of the coastal settlement zone (see Figure 3-8) has likely contributed to the degradation and loss of shoreline resources (Smith 2018:34-36). Mr. Patterson further noted that Hope Chapel acquired the project parcel from Haleakala Ranch over 20 years ago after the overall larger parcel was bisected by the construction of Pi'ilani Highway and classified as remnant by the ranch as the parcel could no longer be a part of their grazinglands. In a site walk-through of the proposed project area on January 26, 2020, Mr. Vernon Kalinikau remarked on the fact that the stream system had been severely altered by both the construction of Pi'ilani Highway and Liloa Drive and did not appear to be a living system in this section of the stream alignment. This factor notwithstanding, Mr. Kalanikau was encouraged that the drainage way would be kept natural and remain uncovered rather than channelized and buried, thus allowing for natural percolation.



Figure 4-1. Current aerial photo of the Kōōkea-kai (Esri et al. 2018) in relation to the 1924 USGS topographic map, Ulupalakua Quadrangle showing the location of the current project area in relation to the historic and modern stream drainage.

With regard to the significant archaeological sites and features, it should be noted that the historic properties that were documented in the initial archaeological inventory survey (Donham 1990) and subsequently data recovered (Johnson and Spear 2005) were identified and located to the north (Parcel 042) and south (Parcel 005) of the currently proposed project. No historically significant archaeological sites were identified within Parcel 072 as a part of the 1990 study, a factor which is likely due to the observance that “substantial grubbing has occurred in the southern half of the project area, on both sides of Welekahao Road” (Donham 1990:2). Additionally, Mr. Mark Spencer, the former contractor for the construction of Hope Chapel and associated facilities, also noted that the majority of the overall parcel in which the current project area is situated had been previously graded and further described the subsurface conditions specific to the Hope Chapel footprint as having consisted of shallow, highly compacted soils with some areas of blue rock (personal communication, December 04, 2019). The extent of this ground disturbance was noted during an August 15<sup>th</sup>, 2019 archaeological field inspection completed by ‘Āina Archaeology and described in Section 2.2 Built Environment. Previous ground alterations

notwithstanding, during Mr. Kalanikau's site visit on January 26, 2020, the presence of sand deposits within the current project area were noted. Mr. Kalanikau remarked on the similarities between the pockets of sand within the Liloa Senior Housing project area and the intact sand dunes within the Welakahao Villages project area to the immediate north. Knowing that sand deposits are favored for interring *'iwi kūpuna*, Mr. Kalanikau expressed extreme concern over the possibility for encountering burials within the remnant pockets of sand, as well as, the sand deposits that were potentially brought in from an off-site source during construction and felt strongly about having an archaeological monitoring program in place during construction.

While previous SHPD correspondence for prior permits issued on the proposed project parcel have resulted in determinations that "no historic properties will be affected," and prior historic era land disturbance; as well as, initial ground work within the immediate project footprint that was possibly completed by Hale Mahaolu as a part of a past project (Mr. Mark Spencer – former general contractor for Spencer Construction, personal communication, December 04, 2019) has significantly altered the ground surface, it is understood that areas of sand are known to be culturally sensitive. Therefore, archaeological monitoring is recommended for all initial ground disturbing activities in areas where the original natural grade is present.

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TRAFFIC IMPACT ANALYSIS  
REPORT PREPARED BY  
AUSTIN, TSUTSUMI &  
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APPENDIX

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# **TRAFFIC IMPACT ANALYSIS REPORT LILOA HALE SENIOR HOUSING PROJECT**

**KIHEI, MAUI, HAWAII**

**FINAL DRAFT**

March 9, 2020

Prepared for:

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**TRAFFIC IMPACT ANALYSIS REPORT**  
**LILOA HALE SENIOR HOUSING PROJECT**  
Kihei, Maui, Hawaii

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## **TRAFFIC IMPACT ANALYSIS REPORT**

### **Liloa Hale Senior Housing Project**

#### **Kihei, Maui, Hawaii**

## **1. INTRODUCTION**

This report documents the findings of a traffic study conducted by Austin, Tsutsumi, and Associates, Inc. (ATA) to evaluate the traffic impacts resulting from the proposed Liloa Hale Senior Housing Project (hereinafter referred to as the “Project”) located in Kihei, Maui, Hawaii.

### **1.1 Project Location**

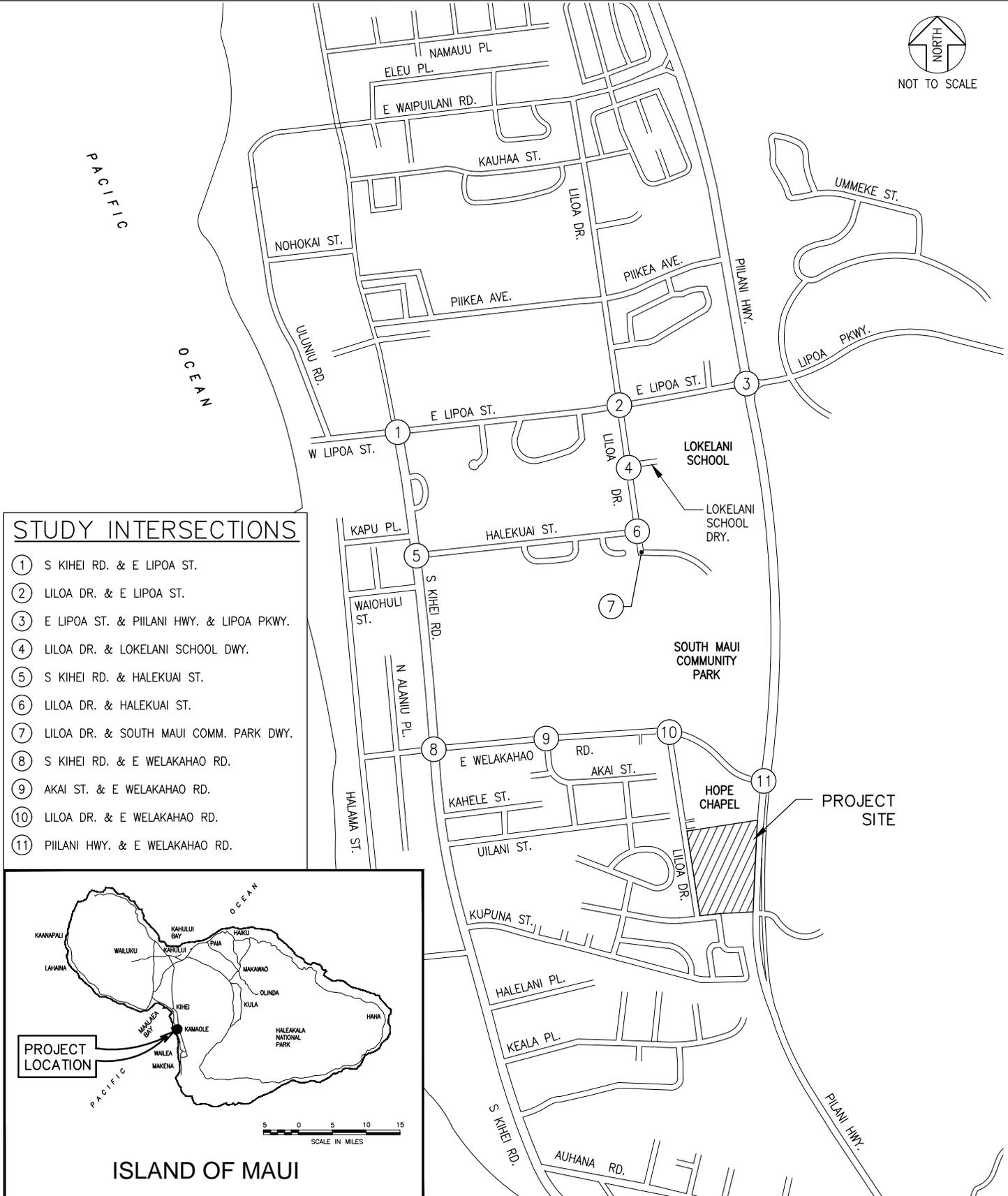
The Project is located in Kihei on the island of Maui on parcels of land more specifically identified as TMK: (2) 2-2-002:072. The Project will be located on approximately 3.61 acres of land within the larger parcel that houses the existing Hope Chanel on the southeast corner of the Liloa Drive/East Welakahao intersection. See Figure 1.1 for Project location.

### **1.2 Project Description**

The Project is envisioned to be an affordable senior rental housing project which will include approximately 117 senior rental units. Vehicular traffic to the Project will be provided primarily by a new Project access along Liloa Drive. The Project is anticipated to be completed by the Year 2022. See Figure 1.2 for Project Site Plan.



NOT TO SCALE



### STUDY INTERSECTIONS

- ① S KIHEI RD. & E LIPOA ST.
- ② LILOA DR. & E LIPOA ST.
- ③ E LIPOA ST. & PIILANI HWY. & LIPOA PKWY.
- ④ LILOA DR. & LOKELANI SCHOOL DWY.
- ⑤ S KIHEI RD. & HALEKUAI ST.
- ⑥ LILOA DR. & HALEKUAI ST.
- ⑦ LILOA DR. & SOUTH MAUI COMM. PARK DWY.
- ⑧ S KIHEI RD. & E WELAKAHAO RD.
- ⑨ AKAI ST. & E WELAKAHAO RD.
- ⑩ LILOA DR. & E WELAKAHAO RD.
- ⑪ PIILANI HWY. & E WELAKAHAO RD.

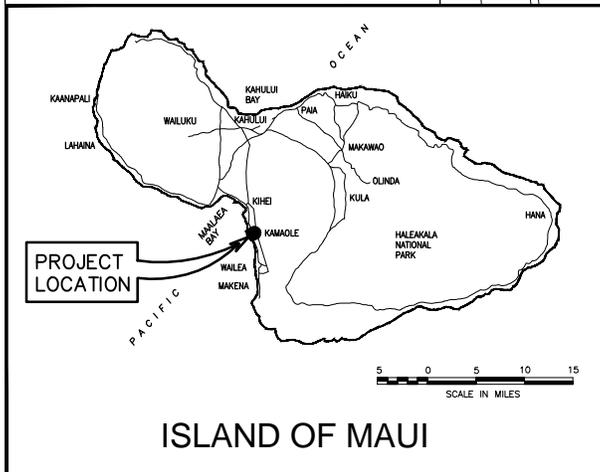


FIGURE 1.1

LOCATION MAP

# LILOA HALE SENIOR HOUSING TIAR

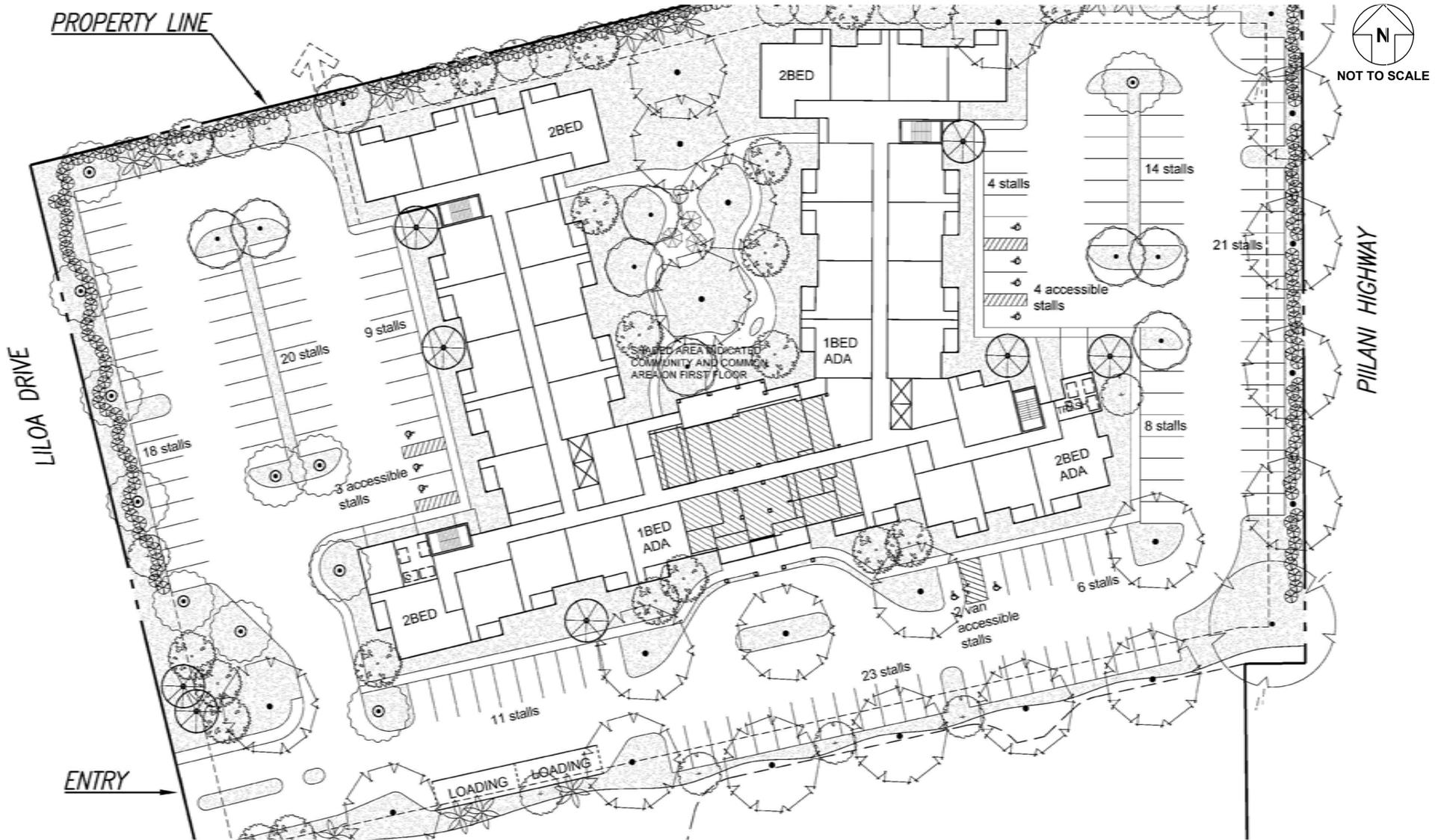


FIGURE 1.2

SITE PLAN

## **2. METHODOLOGY**

### **2.1 Study Methodology**

This study will address the following:

- Assess existing traffic operating conditions at key intersections during the weekday morning (AM) and afternoon (PM) peak hours of traffic within the study area.
- Traffic projections for Base Year 2022 (without the Project) including traffic generated by other known developments in the vicinity of the Project in addition to an ambient growth rate. These other known developments are projects that are currently under construction or known new/future developments that are anticipated to affect traffic demand and operations within the study area.
- Trip generation and traffic assignment characteristics for the proposed Project.
- Traffic projections for Future Year 2022 (with the Project), which includes Base Year traffic volumes in addition to traffic volumes generated by the Project.
- Recommendations for Base Year and Future Year roadway improvements or other mitigative measures, as appropriate, to reduce or eliminate the adverse impacts resulting from traffic generated by known developments in the region or the Project.

### **2.2 Intersection Analysis**

Level of Service (LOS) is a qualitative measure used to describe the conditions of traffic flow at intersections, with values ranging from free-flow conditions at LOS A to congested conditions at LOS F. The Highway Capacity Manual (HCM), 6<sup>th</sup> Edition, includes methods for calculating volume to capacity ratios, delays, and corresponding Levels of Service that were utilized in this study. LOS definitions for signalized and unsignalized intersections are provided in Appendix B.

Analyses for the study intersections were performed using the traffic analysis software Synchro, which is able to prepare reports based on the methodologies described in the HCM. These reports contain control delay results as based on intersection lane geometry, signal timing, and hourly traffic volumes. Based on the vehicular delay at each intersection, a LOS is assigned to each approach and intersection movement as a qualitative measure of performance. These results, as confirmed or refined by field observations, constitute the technical analysis that will form the basis of the recommendations outlined in this report.

### **2.3 Study Area Intersection Analysis**

Intersection analysis within the Project's study area was performed on the following intersections due to their proximity to the Project:

- South Kihei Road/East Lipoa Street (Signalized)
- Liloa Drive/East Lipoa Street (Signalized)
- Piilani Highway/East Lipoa Street (Signalized)
- Liloa Drive/Lokelani Elementary School Driveway (Unsignalized)
- Liloa Drive/Halekuai Street (Unsignalized)

- South Kihei Road/East Welakahao Road (Signalized)
- East Welakahao Road/Liloa Drive (Unsignalized)
- Piilani Highway/East Welakahao Road (Signalized)
- East Welakahao Road/Akai Street (Unsignalized)
- South Kihei Road/Halekuai Street (Unsignalized)
- Liloa Drive/South Maui Regional Park driveway (Unsignalized)

### 3. EXISTING TRAFFIC CONDITIONS

The existing conditions scenario represents the traffic conditions within the Project area as it currently stands, with no build-out of the Project.

#### 3.1 Roadway System

The following are brief descriptions of the existing roadways studied within the vicinity of the Project:

South Kihei Road is generally a two-way, two-lane, undivided, north-south County roadway that traverses the Kihei coastline. This roadway begins at a T-intersection with North Kihei Road near Maui Veterans Highway and eventually terminates at Okolani Drive in Wailea. South Kihei Road provides local access to shopping centers and visitor accommodations. The posted speed limit along this roadway is 30 miles per hour (mph) with 20 mph school zones that are in effect from 7:00 AM to 6:00 PM on school days.

Liloa Drive is currently a two-way, two-lane, undivided, north-south County road that provides for travel between East Waipuilani Road and South Maui Community Park. Further south, Liloa Drive continues as a short roadway segment that provides access for residential homes and churches between East Welakahao Road and Ehiku Street. The posted speed limit along this roadway is 20 mph except at the roundabout approaches at the Piikea Avenue intersection where the posted speed limit is 15 mph.

Piilani Highway is a north-south State Highway that extends southward from Maui Veterans Highway at its intersection with North Kihei Road and terminates approximately seven (7) miles to the south at Wailea Ike Drive. In the vicinity of the Project, Piilani Highway is a two-way, four-lane, principal arterial that provides regional access to Kihei and Wailea. Exclusive left-turn lanes and right-turn deceleration lanes are provided at all major intersections with the shoulder areas of the highway designated as bicycle lanes. Within the study area, the posted speed limit along this roadway is 40 mph.

Lipoa Street is a generally two-way, two-lane, east-west County roadway that begins at a public beach access west of Uluniu Road and extends eastward beyond Piilani Highway as Lipoa Parkway, ultimately terminating within the Maui Research and Technology Park (MR&TP). The posted speed limit along this roadway is 30 mph with 20 mph school zones that are in effect from 7:00 AM to 6:00 PM on school days.

Halekuai Street is a two-way, two-lane, east-west County roadway that extends from South Kihei Road eastward to Liloa Drive adjacent to Lokelani Intermediate School and South Maui Community Park. The posted speed limit along this roadway is 20 mph.

East Welakahao Road is a two-way, two-lane, east-west, County roadway that begins at a public beach access west of Halama Street and terminates to the east at Piilani Highway. The posted speed limit along this roadway is 20 mph.

### **3.2 Existing Traffic Volumes**

The hourly traffic volume data utilized in this report were collected on Tuesday, May 7, 2019 and Thursday, May 9, 2019. See the traffic count data provided in Appendix A for the existing intersections studied and their corresponding traffic count data. Based on the traffic count data, the weekday AM and PM peak hours of traffic were determined to occur between 7:45 AM and 8:45 AM and between 3:30 PM to 4:30 PM, respectively.

### **3.3 Existing Observations and Intersection Analysis**

Traffic along Piilani Highway is generally higher in the southbound direction in the AM peak hour and higher in the northbound direction in the PM peak hour due to commuter traffic.

South Kihei Road & Lipoa Street – This signalized intersection is coordinated with other signalized intersections along South Kihei Road during the PM peak hour of traffic and currently operates at overall LOS B during the AM and PM peak hours of traffic. All movements currently operate at LOS D or better. No significant delays or queuing were observed at this location during peak hours of traffic.

Liloa Drive & Lipoa Street – This signalized intersection currently operates at overall LOS B or better during the AM and PM peak hours of traffic. All movements currently operate at LOS B or better. Pedestrian traffic was prevalent during the AM peak hour due to parents dropping off children at Kihei Elementary School and Lokelani Intermediate School and students. No other significant delays or queuing were observed at this location during peak hours of traffic.

Piilani Highway & Lipoa Street – This signalized intersection is coordinated with the Piilani Highway/Piikea Avenue intersection and currently operates at overall LOS E and LOS D during the AM and PM peak hours of traffic, respectively. Several minor movements operate at LOS E or F due to coordinated signal timing and long signal cycles, with the mainline through movements operating at LOS D or better during the AM and PM peak hours of traffic. Queues were observed to occur in the northbound left-turn lane during the AM peak hour of traffic from approximately 7:35 to 7:55 AM due to parents dropping off children at Kihei Elementary School and Lokelani Intermediate School. These queues, however, were not observed to spill back into the adjacent through lane on Piilani Highway. Vehicles in the eastbound left-turn/through lane were observed to queue past the Aquatic Center driveway during the AM and PM peak hour of traffic. Based on observations from approximately 7:45AM to 8:30AM, the southbound left-turn lane can queue heavily at or beyond its storage lane, primarily due to traffic generated by the Kihei Charter School. Traffic was observed to sporadically spill back in the through lane, impeding southbound through flow. Long-term intersection widening improvements are planned at this intersection as future infill and development of the adjacent Maui Research and Technology Park occurs. However, specific design improvements, phasing and construction timeframes are as of yet, unknown.

Liloa Drive & Lokelani School Driveway - This unsignalized driveway provides ingress and egress to the Lokelani Intermediate School. All movements currently operate at LOS B or better during the AM and PM peak hours of traffic.

South Kihei Road & Halekuai Street – This T-intersection provides stop-control for the westbound approach. The westbound right-turn and southbound left-turn movements currently operate at LOS C or better during both peak hours of traffic, while the westbound left-turn movement currently operates at LOS E and LOS F during the AM and PM peak hours of traffic, respectively. No significant queuing was observed at this location during the peak hours of traffic. Westbound left-turn queues ranged only from 1-2 vehicles long. Due to signals located further north at Lipoa Street and south at East Welakahao Street, gaps in through traffic occurred along South Kihei Road, which reduced delays for westbound left-turn vehicles. Observations indicated the majority of vehicular delays ranged between 5 seconds and 35 seconds during the heavier PM peak hour of traffic.

Based on the Manual on Uniform Traffic Control Devices (MUTCD), Federal Highway Administration, dated 2009, a signal is currently not warranted for existing 2019 conditions based on the 8-hour and 4-hour warrants. See Appendix D.

Liloa Drive & Halekuai Street – All movements at this all-way stop-controlled (AWSC) intersection currently operate at LOS A during the AM and PM peak hours of traffic. No significant delays or queuing were observed at this location during peak hours of traffic due to limited traffic flow attributed to its close proximity to the southern terminus of Liloa Drive.

South Kihei Road & West Welakahao Road/East Welakahao Road – This signalized intersection is uncoordinated and currently operates at overall LOS B during the AM and PM peak hours of traffic. All movements currently operate at LOS C or better with no significant delays or queuing observed at this location during peak hours of traffic.

East Welakahao Road & Akai Street – This T-intersection provides stop-control for the northbound approach with all movements currently operating at LOS B or better during the AM and PM peak hours of traffic. No significant delays or queuing were observed at this location during peak hours of traffic due to relatively low through traffic along East Welakahao Road, with through movements ranging from only 70-170 vehicles per direction.

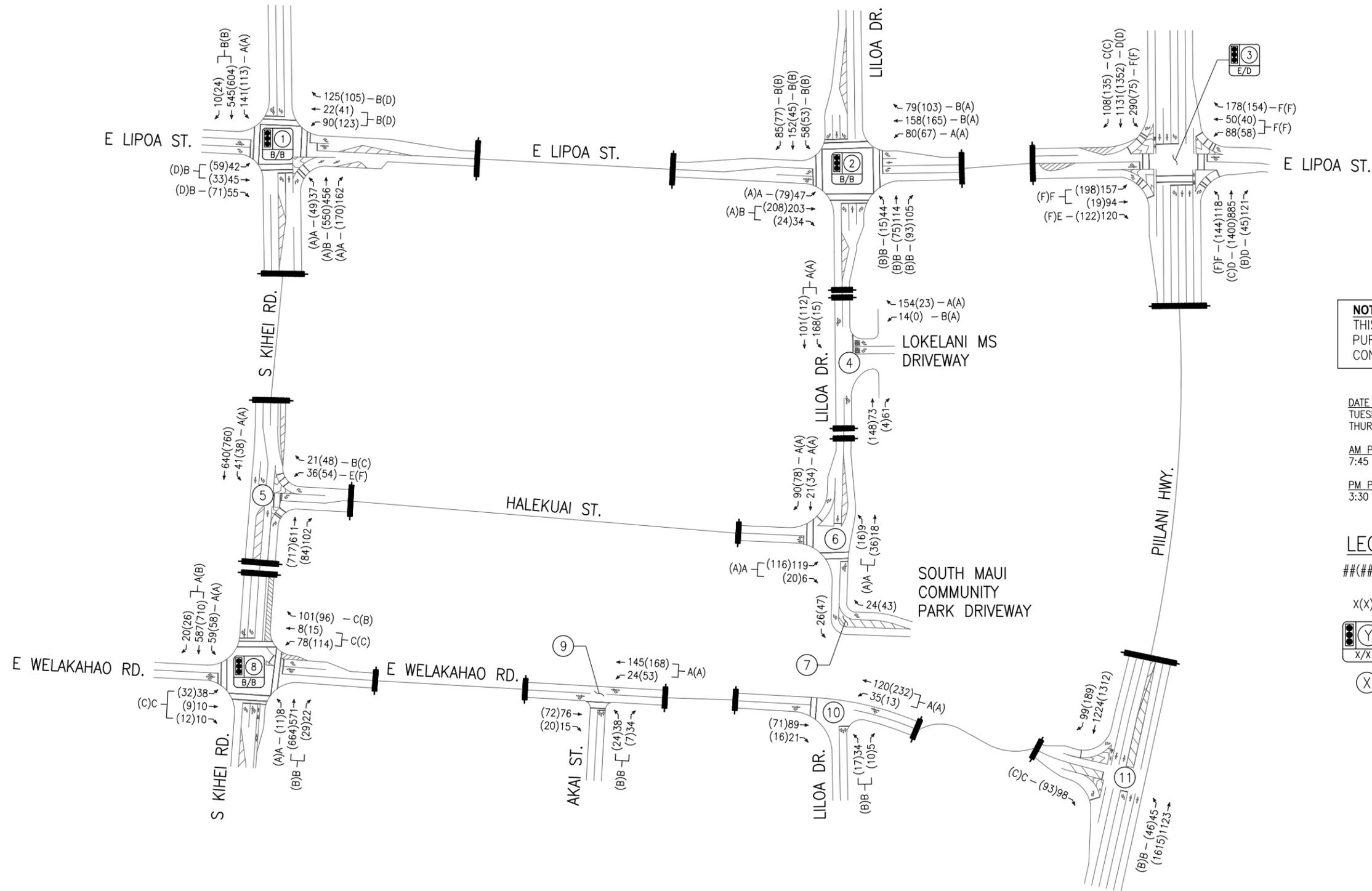
Liloa Drive & East Welakahao Road – This T-intersection provides stop-control for the northbound approach with all movements currently operating at LOS B or better during the AM and PM peak hours of traffic. No significant delays or queuing were observed at this location during peak hours of traffic.

Piilani Highway & East Welakahao Road – This T-intersection provides stop-control for the eastbound right-turn movement with all movements operating at LOS C or better during the AM and PM peak hours of traffic with no significant delays or queuing observed.

Figure 3.1 illustrates the existing lane configuration, existing traffic volumes, and LOS for each study intersection. Table 3.1 summarizes the existing LOS at the study intersections. LOS worksheets are provided in Appendix C.



NOT TO SCALE



**NOTE:**  
THIS DRAWING IS FOR ILLUSTRATIVE PURPOSES ONLY. DO NOT USE FOR CONSTRUCTION.

**DATE OF COUNTS:**  
TUESDAY, MAY 7, 2019  
THURSDAY, MAY 9, 2019

**AM PEAK HOUR:**  
7:45 AM - 8:45 AM

**PM PEAK HOUR:**  
3:30 PM - 4:30 PM

**LEGEND**

- ##(##) - AM(PM) PEAK HOUR OF TRAFFIC VOLUMES
- X(X) - AM(PM) INTERSECTION LEVEL OF SERVICE
- SIGNALIZED INTERSECTION Y, OVERALL AM/PM LOS
- INTERSECTION Y

FIGURE 3.1

EXISTING CONDITIONS, LANE CONFIGURATIONS,  
TRAFFIC VOLUMES AND LOS

Table 3.1: Existing Level of Service Summary

Intersection	Existing Conditions					
	AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
<b>1: S. Kihei Rd &amp; W Lipoa St/E Lipoa St</b>						
NB LT	7.3	0.09	A	6.7	0.10	A
NB TH	11.4	0.59	B	9.9	0.48	A
NB RT	7.8	0.11	A	6.5	0.10	A
EB LT/TH	17.7	0.24	B	42.4	0.34	D
EB RT	16.6	0.03	B	39.5	0.04	D
WB LT/TH	18.2	0.31	B	46.8	0.63	D
WB RT	16.8	0.06	B	39.7	0.05	D
SB LT	6.8	0.29	A	6.3	0.22	A
SB TH/RT	10.7	0.65	B	10.2	0.54	B
<i>Overall</i>	11.4	-	B	15.1	-	B
<b>2: Liloa Drive &amp; E Lipoa St</b>						
NB LT	15.9	0.12	B	14.6	0.04	B
NB TH	13.7	0.22	B	14.6	0.23	B
NB RT	12.8	0.04	B	13.8	0.05	B
EB LT	9.9	0.09	A	6.8	0.13	A
EB TH/RT	13.4	0.40	B	9.5	0.36	A
WB LT	9.9	0.17	A	7.0	0.12	A
WB TH	11.8	0.26	B	9.2	0.26	A
WB RT	10.8	0.06	B	8.5	0.10	A
SB LT	15.4	0.14	B	15.8	0.16	B
SB TH	14.1	0.30	B	14.2	0.14	B
SB RT	12.8	0.03	B	13.8	0.04	B
<i>Overall</i>	12.9	-	B	10.2	-	B
<b>3: Piilani Hwy &amp; E Lipoa St</b>						
NB LT	102.3	0.88	F	114.9	0.91	F
NB TH	48.5	0.63	D	29.9	0.68	C
NB RT	35.4	0.08	D	16.5	0.03	B
EB LT/TH	101.5	0.87	F	124.4	0.89	F
EB RT	74.6	0.16	E	91.3	0.23	F
WB LT/TH	112.4	0.84	F	141.3	0.85	F
WB RT	93.0	0.43	F	110.4	0.34	F
SB LT	100.2	0.94	F	124.1	0.85	F
SB TH	35.2	0.64	D	35.4	0.70	D
SB RT	23.7	0.09	C	21.6	0.11	C
<i>Overall</i>	58.3	-	E	47.9	-	D
<b>4: Liloa Drive &amp; Lokelani Drwy</b>						
WB LT	14.5	0.04	B	0.00	0.00	A
WB RT	9.9	0.19	A	9.2	0.03	A
SB LT	7.9	0.13	A	7.6	0.01	A
<i>Overall</i>	5.4	-	-	1.1	-	-

Table 3.1: Existing Level of Service Summary Cont'd

Intersection	Existing Conditions					
	AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
<b>5: S. Kihei Rd &amp; Halekuai St</b>						
WB LT	45.9	0.31	E	89.1	0.61	F
WB RT	14.0	0.05	B	15.7	0.13	C
SB LT	9.4	0.05	A	9.6	0.05	A
<i>Overall</i>	1.6	-	-	3.5	-	-
<b>6: Liloa Drive &amp; Halekuai St</b>						
NB LT/TH	7.7	0.04	A	7.9	0.07	A
EB U/LT	8.3	0.17	A	8.4	0.18	A
SB TH	7.7	0.03	A	7.9	0.05	A
SB RT	7.4	0.11	A	7.4	0.10	A
<i>Overall</i>	7.9	-	A	8.0	-	A
<b>8: S. Kihei Rd &amp; W Welakahao Rd/E Welakahao Rd</b>						
NB LT	7.1	0.02	A	9.6	0.04	A
NB TH/RT	10.4	0.66	B	13.7	0.80	B
EB LT/TH/RT	24.1	0.19	C	23.0	0.14	C
WB LT/TH	25.2	0.35	C	25.3	0.45	C
WB RT	20.6	0.06	C	19.8	0.06	B
SB LT	7.1	0.14	A	9.8	0.18	A
SB TH/RT	8.6	0.62	A	12.2	0.79	B
<i>Overall</i>	10.9	-	B	14.0	-	B
<b>9: Akai St &amp; E Welakahao Rd</b>						
NB LT/RT	10.1	0.10	B	10.9	0.05	B
WB LT	7.5	0.02	A	7.5	0.04	A
<i>Overall</i>	2.8	-	-	2.1	-	-
<b>10: Liloa Drive &amp; E Welakahao Rd</b>						
NB LT/RT	10.7	0.06	B	10.2	0.04	B
WB LT	7.5	0.03	A	7.4	0.01	A
<i>Overall</i>	2.2	-	-	1.0	-	-
<b>11: Piilani Hwy &amp; E Welakahao Rd</b>						
NB LT	12.7	0.10	B	13.5	0.11	B
EB RT	17.1	0.26	C	18.2	0.27	C
<i>Overall</i>	0.9	-	-	0.7	-	-

\* Denotes overcapacity condition, v/c ≥ 1.0

## 4. BASE YEAR 2022 TRAFFIC CONDITIONS

The Year 2022 was selected to reflect the Project completion year. The Base Year 2022 scenario represents the traffic conditions within the study area without the Project. Traffic projections were formulated by applying a defacto growth rate to the existing 2019 traffic count volumes as well as trips generated by known future developments in the vicinity of the Project.

### 4.1 Defacto Growth Rate

Projections for Base Year 2022 traffic were based upon the Maui Regional Travel Demand Model (MRTDM) growth for forecast years between 2007 and 2035, and nearby developments in the immediate vicinity of the Project. The overall annual growth rate along the studied roadways was approximately 1.3 percent per year.

### 4.2 Traffic Forecasts for Known Developments

By the Year 2022, numerous developments are forecast to be completed within the Project study area. Many of the following known developments were determined to be accounted for in the MRTDM. Other known developments with forecast build-outs beyond Year 2022 were not included. Based on a comparison with existing conditions, it's estimated that regional through traffic along South Kihei Road and Piilani Highway may increase by approximately 15%-20% due to ambient growth and traffic generated by other known developments by Year 2022. The known developments that are projected to be complete by Year 2022 and generate traffic within the Project study area are illustrated in Figures 4.1-4.2 and are listed below based on the available information:

- South Maui Community Park Phase 1-B, 1-C, 2 and 3 – Proposed along the future Liloa Drive Extension (with Phase 3 along East Welakahao Road) and will include construction of a gymnasium, two (2) soccer fields, two (2) baseball/softball fields, six (6) multi-use courts, and a pavilion. A playground, soccer field and softball field are currently constructed as part of the Phase 1 completion of South Maui Community Park.
- Kenolio Apartments – Proposed to construct approximately 186 apartments with access via Liloa Drive.
- Kaiwahine Village – Proposed to construct approximately 120 multi-family dwelling units with access via Kaiwahine Street.
- Kamalani (formerly Kihei Residential) – Proposed to construct approximately 631 single-family & multi-family dwelling units and a 3,000 SF recreational center with access via Kaiwahine Street.
- Ohukai Affordable Housing Project - Proposed to construct 40 multi-family dwelling units at the northwest corner of the Ohukai Road/Kaiola Place intersection
- Alahele Subdivision – Proposed to construct approximately 48 single family dwelling units and up to 48 ohana units with access via Auhana Road.
- Kihei High School – Proposed along the mauka side of Piilani Highway with access via an extension of Kulanihakoi Street and anticipated to initially serve approximately 800 students. Based on the current timeframe for construction of the Kihei High School, only some of the grade levels will likely be open by the 2022-2023 school year.

- Maui Bay Villas (formerly Maui Lu) – Upon full build-out, this project proposes to construct approximately 388 timeshare dwelling units and 12 beach parking stalls with access via Kaonoulu Street. By Year 2022 approximately 131 timeshare units are expected to be developed and occupied.
- Welakahao Village – Proposed to construct approximately 86 single family dwelling units and up to 86 ohana units with access via East Welakahao Road.
- Kalama Kai – Proposed to construct approximately 40 affordable multi-family residential units with access via Kanani Road.
- Kilohana Makai – Proposed to construct 28 single-family dwelling units at the southeast corner of the South Kihei Road/Ala Koa Street intersection.
- Kahoolawe Island Reserve Commission (KIRC) Education & Operations Center – Proposed 23,950 square feet building that will provide educational, administrative exhibition, and office functions.
- Makalii at Wailea (MF-15) – This project proposes to develop 68 multi-family residential units. The project is located on the northeast corner of the Wailea Alanui Drive/Kaukahi Street intersection.
- Wailea Village Center Expansion – This project proposes to expand the existing Wailea Village Center by developing an additional 22,000 square-feet of shopping center use. The project is located to the south of Wailea Ike Drive between Wailea Alanui Drive and Wailea Ike Place.
- Wailea Resort Master Plan Phase I (remaining)
  - Keala O Wailea (MF-11) – This project proposes to develop 70 multi-family units as part of the Wailea Resort. The project is located next to the Wailea Gateway Center on the northwest corner of the Piilani Highway/Wailea Ike Drive intersection.
  - The Ridge at Wailea (MF-19) – This project proposes to develop nine (9) single-family residential units as part of the Wailea Resort. The project is located east of Kalai Waa Street and north of Hotel Wailea.
  - Hotel Ike Project (MF-10) – This project proposes to construct a 110-room hotel at the northeast corner of the Wailea Ike Drive and Wailea Ike Place (North) intersection. Primary access to the site will occur at the Wailea Ike Drive/Wailea Ike Place (North) intersection with the Project access located along Wailea Ike Place (North). The project will also share an internal easement with the adjacent Marriott Residence Inn Hotel to the east, and secondary access may occur at the Wailea Ike Drive/Wailea Ekolu Place intersection.
- Makena Parcel H-1 Ocean Villas Maluaka Development – Construction is ongoing for this project, which proposes to develop 13 single-family residential units and six (6) multi-family condominium units. Parcel H-1 is located south of the former Makena Beach & Golf Resort and is bordered by the Makena Golf Course to the south and west and by Makena Keoneoio Road to the east.

- Makena Resort H-M Development – This project proposes to convert the former 310-room hotel at the Makena Beach & Golf Resort into 65 multi-family resort residential units, including a beach club for residents only.

The forecast trip generation for each of these developments was based on information obtained from submitted TIARs and the Trip Generation Manual published by the Institute of Transportation Engineers (ITE). These vehicle trips are summarized in Table 4.1 and Table 4.2.

Since numerous background developments are residential projects, an increase in school-generated traffic may occur. Based on a comparison of household units to student enrollment in the Central and South Maui districts, it was determined that approximately 15-25% of all exiting AM traffic from these residential developments would be split between the Kihei Elementary School, Lokelani Intermediate School and Kihei Charter School. In total, approximately 113 new vehicle trips were routed to these school accesses during the AM peak hour. A smaller percentage of school generated trips were allocated for the PM peak hour of traffic.

### **4.3 Planned Roadway Improvements**

By Year 2022 without the Project, no major roadway improvements are planned to be constructed in the area. The following two roadway improvements have been identified to by the State and County as future roadway improvements that may be constructed beyond Year 2022 and were therefore, not included in this TIAR.

Liloa Drive Extension - Liloa Drive will ultimately be constructed, in total, from its northern terminus at Kaonoulu Street and extend continuously to its southern terminus at Auhana Road. Based on the current schedule, the County of Maui forecasts the construction of Liloa Drive Extension by Year 2023-2024 at the earliest.

Kihei Mauka North-South Collector Road - Based upon discussion with Maui County officials, this future roadway is not currently planned to be complete by Year 2022.

### **4.4 Base Year 2022 Analysis**

At the Piilani Highway/Lipoa Street intersection, various movements are expected to operate at LOS E/F conditions due to coordinated signal timing and long signal cycles which favors the through movements along the highway. As such, minor streets and mainline left-turn movements typically operate with longer delays and under low LOS conditions.

At the South Kihei Road/Halekuai Street intersection, the westbound left-turn movement is expected to operate at LOS F and over-capacity conditions during the AM and PM peak hours. However, as discussed in Section 3.3, no significant existing queuing was observed at this location during the peak hours of traffic. Existing westbound left-turn queues ranged only from 1-2 vehicles long. Due to signals located further north at Lipoa Street and south at East Welakahao Street, gaps in through traffic occurred along South Kihei Road, which reduced delays for westbound left-turn vehicles. Observations indicated the majority of existing vehicular delays ranged between 5 seconds and 35 seconds during the heavier PM peak hour of traffic. A median refuge lane for westbound left-turn vehicles may be considered by the County, to facilitate westbound left-turn vehicles to cross traffic at one direction at a time. However, the future Liloa Drive extension is expected to help operations at this intersection by reducing through and turning movement volume and improve traffic operations.

At the Piilani Highway/Lipoa Street intersection traffic operations are expected to deteriorate further with multiple movements (including the mainline through movement) anticipated to

operate at low levels-of-service (LOS E/F). Long-term intersection widening improvements are planned at this intersection as future infill and development of the adjacent Maui Research and Technology Park occurs. However, specific design improvements, phasing and construction timeframes are as of yet, unknown.

Figure 4.3 illustrates the Base Year 2022 forecast traffic volumes and LOS for all study intersections. Table 4.3 summarizes the Base Year 2022 LOS at the study intersections with the planned roadway improvements discussed in section 4.3. LOS worksheets are provided in Appendix C.



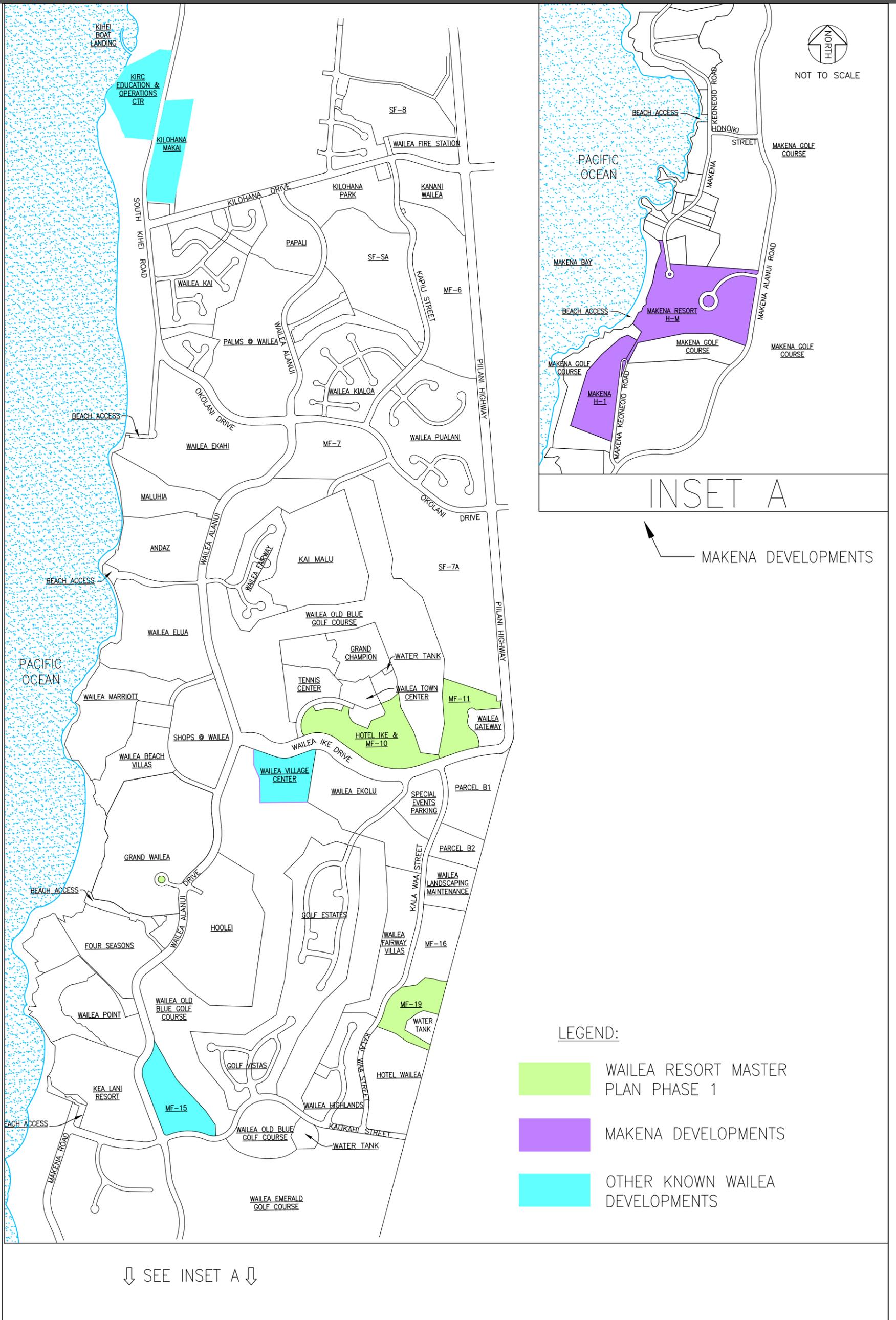


FIGURE 4.2

**Table 4.1: Trips Generated by Known Developments in Kihei<sup>1</sup>**

Project	ITE Code	Independent Variable	AM Peak Hour			PM Peak Hour		
			Enter	Exit	Total	Enter	Exit	Exit
South Maui Community Park	Obtained from Project's TIAR		57	42	99	80	45	125
Kenolio Apartments	Obtained from Project's TIAR		30	73	103	77	50	127
Kaiwahine Village	Obtained from Project's TIAR		19	47	66	49	31	80
Kamalani	Obtained from Project's TIAR		93	290	383	311	178	489
Ohukai Affordable Housing	220	40 DU	5	15	20	17	9	26
Alahele Subdivision	Obtained from Project's TIAR		11	33	44	35	20	55
Kihei High School <sup>2</sup>	Obtained from Project's TIAR		228	108	336	49	55	104
Maui Bay Villas <sup>3</sup>	Obtained from Project's TIAR		110	60	170	210	136	346
Welakahao Village	Obtained from Project's TIAR		33	95	128	109	63	172
Kalama Kai	220	40 DU	5	15	20	17	9	26
Kilohana Makai	210	28 DU	6	19	25	19	11	30
KIRC	Obtained from Project's TIAR		52	6	58	10	55	65

**Notes:**

1. Table 4.1 shows total trips generated by known developments in the vicinity of the Project. Not all traffic generated by these developments travel through the study area of this TIAR, since some traffic will be routed to various roadways and intersections that were not included in this TIAR.
2. Assumes the high school will serve approximately 800 students by the Year 2022. Majority of these trips are existing traffic heading to Maui High School. As a result, only a small fraction of these trips pass through the project study area.
3. Only phase 1 of Maui Bay Villas anticipated to be completed by Year 2022; 131 of 388 total timeshares.

**Table 4.2: Trips Generated by Known Developments in Wailea and Makena**

Project	ITE Code	Independent Variable	AM Peak Hour			PM Peak Hour		
			Enter	Exit	Total	Enter	Exit	Exit
Makalii at Wailea (MF-15)	PB	68 DU	6	9	15	11	12	23
Wailea Village Center Expansion	820	22,000 SF	7	5	12	60	66	126
Keala O Wailea (MF-11)	PB	70 DU	6	25	31	24	13	37
The Ridge at Wailea (MF-19)	PB (SF)	9 DU	2	2	4	2	2	4
Hotel Ike (MF-10)	330	110 Rooms	25	10	35	20	26	46
Makena Parcel H-1	PB	6 MF 13 SF	3	4	7	3	4	7
Makena Resort H-M	210/PB	65 DU	54	25	79	46	47	93

Notes:

1. Table 4.2 shows total trips generated by known developments in the vicinity of the Project. Not all traffic generated by these developments travel through the study area of this TIAR, since some traffic will be routed to various roadways and intersections that were not included in this TIAR.

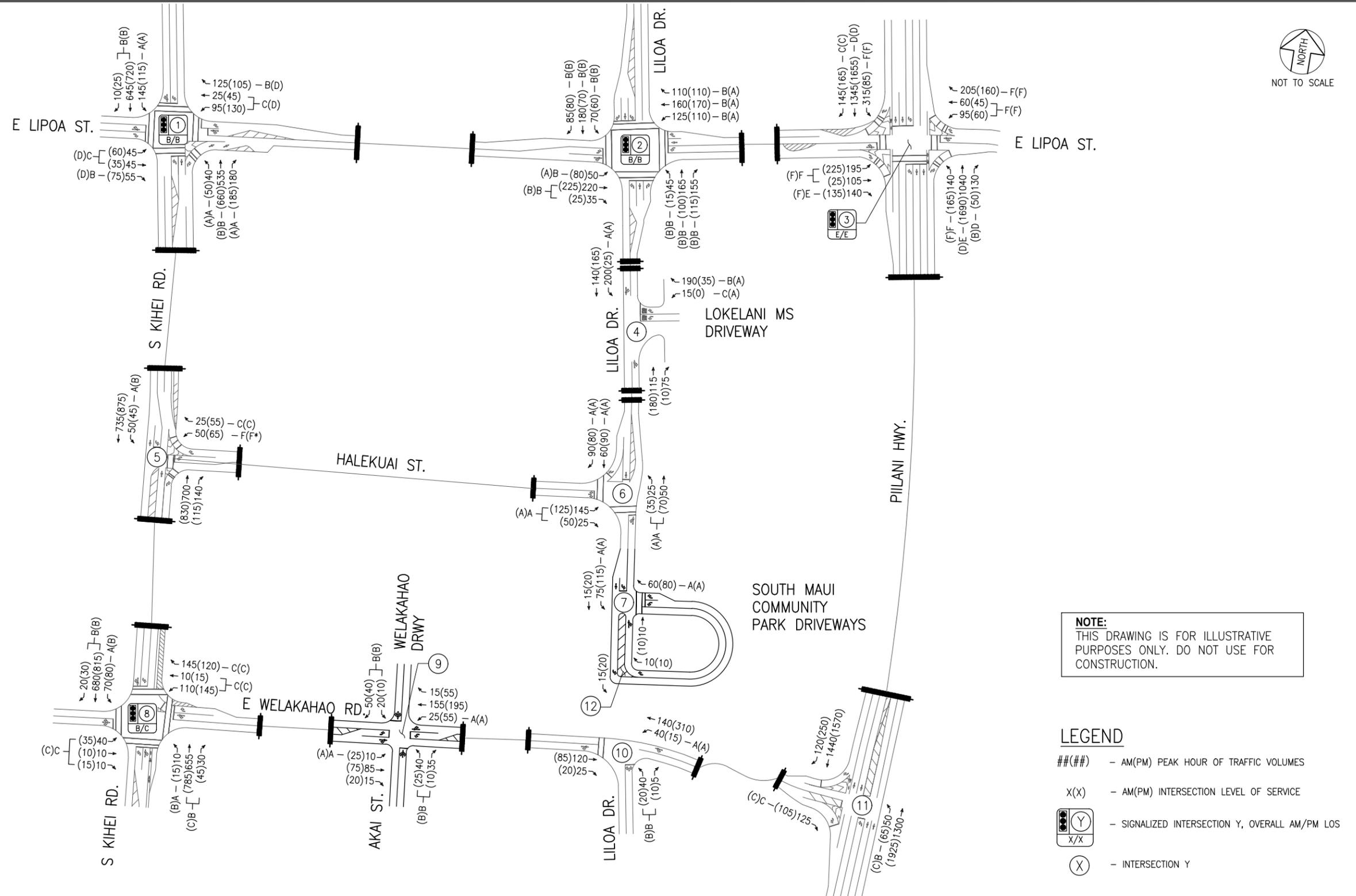


FIGURE 4.3

BASE YEAR 2022 WITHOUT PROJECT , LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS

Table 4.2: Existing and Base Year 2022 Level of Service Summary

Intersection	Existing Conditions						Base Year 2022					
	AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
<b>1: S. Kihei Rd &amp; W Lipoa St/E Lipoa St</b>												
NB LT	7.3	0.09	A	6.7	0.10	A	7.7	0.11	A	8.6	0.13	A
NB TH	11.4	0.59	B	9.9	0.48	A	11.5	0.62	B	11.9	0.58	B
NB RT	7.8	0.11	A	6.5	0.10	A	7.5	0.12	A	6.8	0.11	A
EB LT/TH	17.7	0.24	B	42.4	0.34	D	20.9	0.26	C	41.9	0.34	D
EB RT	16.6	0.03	B	39.5	0.04	D	19.6	0.03	B	38.9	0.04	D
WB LT/TH	18.2	0.31	B	46.8	0.63	D	21.7	0.36	C	46.6	0.65	D
WB RT	16.8	0.06	B	39.7	0.05	D	19.8	0.06	B	39.1	0.06	D
SB LT	6.8	0.29	A	6.3	0.22	A	7.1	0.31	A	7.9	0.26	A
SB TH/RT	10.7	0.65	B	10.2	0.54	B	11.5	0.71	B	12.4	0.65	B
<i>Overall</i>	11.4	-	B	15.1	-	B	12.1	-	B	16.3	-	B
<b>2: Liloa Drive &amp; E Lipoa St</b>												
NB LT	15.9	0.12	B	14.6	0.04	B	16.7	0.12	B	14.9	0.04	B
NB TH	13.7	0.22	B	14.6	0.23	B	14.4	0.31	B	14.8	0.28	B
NB RT	12.8	0.04	B	13.8	0.05	B	13.1	0.07	B	13.8	0.07	B
EB LT	9.9	0.09	A	6.8	0.13	A	10.6	0.09	B	7.5	0.13	A
EB TH/RT	13.4	0.40	B	9.5	0.36	A	14.6	0.45	B	10.9	0.41	B
WB LT	9.9	0.17	A	7.0	0.12	A	10.7	0.26	B	7.6	0.20	A
WB TH	11.8	0.26	B	9.2	0.26	A	12.3	0.26	B	9.7	0.27	A
WB RT	10.8	0.06	B	8.5	0.10	A	11.3	0.08	B	9.0	0.10	A
SB LT	15.4	0.14	B	15.8	0.16	B	16.9	0.19	B	16.3	0.18	B
SB TH	14.1	0.30	B	14.2	0.14	B	14.6	0.34	B	14.4	0.20	B
SB RT	12.8	0.03	B	13.8	0.04	B	12.9	0.04	B	13.7	0.05	B
<i>Overall</i>	12.9	-	B	10.2	-	B	13.7	-	B	11.1	-	B
<b>3: Piilani Hwy &amp; E Lipoa St</b>												
NB LT	102.3	0.88	F	114.9	0.91	F	102.5	0.90	F	118.2	0.92	F
NB TH	48.5	0.63	D	29.9	0.68	C	66.6	0.84	E	43.6	0.86	D
NB RT	35.4	0.08	D	16.5	0.03	B	42.9	0.11	D	19.2	0.03	B
EB LT/TH	101.5	0.87	F	124.4	0.89	F	100.2	0.89	F	125.0	0.91	F
EB RT	74.6	0.16	E	91.3	0.23	F	70.6	0.21	E	88.3	0.27	F
WB LT/TH	112.4	0.84	F	141.3	0.85	F	112.5	0.85	F	142.2	0.86	F
WB RT	93.0	0.43	F	110.4	0.34	F	94.3	0.55	F	111.3	0.41	F
SB LT	100.2	0.94	F	124.1	0.85	F	100.5	0.95	F	123.3	0.86	F
SB TH	35.2	0.64	D	35.4	0.70	D	50.8	0.85	D	53.1	0.91	D
SB RT	23.7	0.09	C	21.6	0.11	C	30.3	0.15	C	26.1	0.15	C
<i>Overall</i>	58.3	-	E	47.9	-	D	69.1	-	E	59.9	-	E
<b>4: Liloa Drive &amp; Lokelani Drwy</b>												
WB LT	14.5	0.04	B	0.0	0.00	A	17.6	0.05	C	0.00	0.00	A
WB RT	9.9	0.19	A	9.2	0.03	A	10.7	0.25	B	9.5	0.05	A
SB LT	7.9	0.13	A	7.6	0.01	A	8.2	0.16	A	7.7	0.02	A
<i>Overall</i>	5.4	-	-	1.1	-	-	5.3	-	-	1.3	-	-

Table 4.2: Existing and Base Year 2022 Level of Service Summary Cont'd

Intersection	Existing Conditions						Base Year 2022					
	AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
<b>5: S. Kihei Rd &amp; Halekuai St</b>												
WB LT	45.9	0.31	E	89.1	0.61	F	91.2	0.60	F	245.7	1.09	F*
WB RT	14.0	0.05	B	15.7	0.13	C	15.4	0.07	C	18.3	0.18	C
SB LT	9.4	0.05	A	9.6	0.05	A	9.8	0.07	A	10.2	0.07	B
<i>Overall</i>	1.6	-	-	3.5	-	-	3.2	-	-	8.8	-	-
<b>6: Liloa Drive &amp; Halekuai St</b>												
NB LT/TH	7.7	0.04	A	7.9	0.07	A	8.3	0.11	A	8.6	0.15	A
EB U/LT	8.3	0.17	A	8.4	0.18	A	9.0	0.24	A	9.1	0.24	A
SB TH	7.7	0.03	A	7.9	0.05	A	8.3	0.09	A	8.6	0.14	A
SB RT	7.4	0.11	A	7.4	0.10	A	7.7	0.12	A	7.6	0.11	A
<i>Overall</i>	7.9	-	A	8.0	-	A	8.4	-	A	8.6	-	A
<b>7: Liloa Drive &amp; S. Maui Comm. Park N Drwy</b>												
WB RT	-	-	-	-	-	-	8.6	0.06	A	8.7	0.08	A
SB LT	-	-	-	-	-	-	7.4	0.05	A	7.4	0.08	A
<i>Overall</i>	-	-	-	-	-	-	6.7	-	-	6.9	-	-
<b>8: S. Kihei Rd &amp; W Welakahao Rd/E Welakahao Rd</b>												
NB LT	7.1	0.02	A	9.6	0.04	A	8.9	0.03	A	12.3	0.07	B
NB TH/RT	10.4	0.66	B	13.7	0.80	B	13.5	0.79	B	22.0	0.89	C
EB LT/TH/RT	24.1	0.19	C	23.0	0.14	C	23.4	0.17	C	27.4	0.15	C
WB LT/TH	25.2	0.35	C	25.3	0.45	C	25.4	0.42	C	31.1	0.54	C
WB RT	20.6	0.06	C	19.8	0.06	B	20.1	0.12	C	23.8	0.13	C
SB LT	7.1	0.14	A	9.8	0.18	A	9.7	0.21	A	14.7	0.32	B
SB TH/RT	8.6	0.62	A	12.2	0.79	B	11.0	0.74	B	17.7	0.85	B
<i>Overall</i>	10.9	-	B	14.0	-	B	13.6	-	B	20.7	-	C
<b>9: Akai St &amp; E Welakahao Rd</b>												
NB LT/TH/RT	10.1	0.10	B	10.9	0.05	B	11.2	0.12	B	12.9	0.08	B
EB LT	-	-	-	-	-	-	7.6	0.01	A	7.8	0.02	A
WB LT	7.5	0.02	A	7.5	0.04	A	7.5	0.02	A	7.5	0.04	A
SB LT/TH/RT	-	-	-	-	-	-	10.4	0.10	B	10.7	0.08	B
<i>Overall</i>	2.8	-	-	2.1	-	-	4.1	-	-	3.1	-	-
<b>10: Liloa Drive &amp; E Welakahao Rd</b>												
NB LT/RT	10.7	0.06	B	10.2	0.04	B	11.4	0.08	B	11.0	0.05	B
WB LT	7.5	0.03	A	7.4	0.01	A	7.6	0.03	A	7.5	0.01	A
<i>Overall</i>	2.2	-	-	1.0	-	-	2.2	-	-	0.9	-	-
<b>11: Piilani Hwy &amp; E Welakahao Rd</b>												
NB LT	12.7	0.10	B	13.5	0.11	B	14.9	0.13	B	17.1	0.19	C
EB RT	17.1	0.26	C	18.2	0.27	C	22.7	0.40	C	24.0	0.38	C
<i>Overall</i>	0.9	-	-	0.7	-	-	1.2	-	-	0.9	-	-

\*Denotes overcapacity condition, v/c ≥ 1.

## 5. FUTURE YEAR 2022 TRAFFIC CONDITIONS

The Future Year 2022 scenario represents the traffic conditions within the Project study area with the full build-out of the Project.

### 5.1 Background

The Project is envisioned to be an affordable housing project which will include approximately 117 rental units for seniors. Vehicular traffic to the Project will be provided primarily by a new Project access along Liloa Drive. The Project is anticipated to be completed by the Year 2022.

### 5.2 Travel Demand Estimations

#### 5.2.1 Trip Generation

The Institute of Transportation Engineers (ITE) publishes a book based on empirical data compiled from a body of more than 4,250 trip generation studies submitted by public agencies, developers, consulting firms, and associations. This publication, titled Trip Generation Manual, 10<sup>th</sup> Edition, provides trip rates and/or formulae based on graphs that correlate vehicular trips with independent variables.

The Project is forecast to generate approximately 24(31) trips during the AM(PM) peak hours of traffic. See Tables 5.1 and 5.2 for Trip Generation formulae and projections for the Project.

Table 5.1: Project Trip Generation Rates

Land Use (ITE Code)	Independent Variable	Weekday AM Peak Hour		Weekday PM Peak Hour	
		Trip Rate	% Enter	Trip Rate	% Enter
Senior Housing - Attached (252)	DU	[a]	35%	[b]	55%

#### Notes

DU= Dwelling Units

[a] = 0.20 (X) – 0.18

[b] = 0.24 (X) + 2.26

Table 5.2: Project-Generated Trips

Land Use Type (ITE Code)	Independent Variable	Weekday AM Peak Hour			Weekday PM Peak Hour		
		Enter (vph)	Exit (vph)	Total (vph)	Enter (vph)	Exit (vph)	Total (vph)
Senior Housing - Attached (252)	117 Units	9	15	24	18	13	31

### 5.2.2 Trip Distribution & Assignment

Trips generated by the Project were assigned throughout the study area generally based upon existing and projected Base Year 2022 travel patterns. The traffic generated by the Project was added to the forecast Base Year 2022 traffic volumes within the vicinity of the Project to constitute the traffic volumes for the Future Year 2022 traffic conditions. Figure 5.1 illustrates the Project-generated trip distribution.

### 5.3 Future Year 2022 Analysis

Upon completion of the Project, all study intersections are forecast to operate with similar LOS as Base Year 2022 traffic conditions. Regionally along Piilani Highway, traffic generated by the Project will increase by approximately 4-6 vehicles in each direction per peak hour, which translates to an average 0.24% increase in traffic. Similarly along South Kihei Road, traffic will only increase by approximately 4-7 vehicles in each direction per peak hour, which translates to only a 0.43% increase in traffic. Due to generally low traffic increases as a result of the Project the majority of movement vehicular delays generally increased minimally by 1-4 seconds.

The Piilani Highway/Lipoa Street intersection is expected to continue operating at low levels-of-service similar to Base Year 2022 conditions. As previously mentioned in Section 4.4, long-term intersection widening improvements are planned at this intersection as future infill and development of the adjacent Maui Research and Technology Park occurs. However, specific design improvements, phasing and construction timeframes are as of yet, unknown. The Project is expected to only add 8 vehicles during the AM and PM peak hours of traffic to the Piilani Highway/Lipoa Street intersection. This minimally constitutes approximately 0.19% of the total traffic at this intersection.

At the Piilani Highway/Welakahao Road intersection, the Project will only add 2(5) AM(PM) eastbound right-turn vehicles onto Piilani Highway and 6(8) AM(PM) southbound right-turn and northbound left-turn vehicles onto Welakahao Road for a total of 21 new Project vehicles. This constitutes approximately 0.29% of the total traffic at this intersection. Based on discussions with HDOT, the Project will provide delineators along the median of Piilani Highway at the start of the northbound left-turn lane at the intersection and extend further south near to the end of the taper of the opposing southbound left-turn lane at the Piilani Highway/Kihei Wastewater Treatment Plant intersection. These delineators will be installed to reduce the occurrence of eastbound right-turners turning into Piilani Highway then making an illegal and immediate U-turn to head north on the highway, which HDOT has determined to be problematic.

Based on the MUTCD Eight-Hour and Four-Hour Vehicular Volume traffic signal warrants, at the South Kihei Road/Halekuai Street intersection, a traffic signal is not anticipated to be warranted by the Future Year 2022 with Project volumes. Signal warrant figures are shown in Appendix D.

An exclusive southbound left-turn lane at the Liloa Drive/Project Driveway intersection is recommended to minimize the impacts of left-turn vehicles along the main thoroughfare. Based on AASHTO guidance, left-turn lanes should be long enough to provide storage space for at least two passenger cars, or approximately 50 feet in length (exclusive of deceleration length).

See Figure 5.2 for the Future Year 2022 with Project traffic volumes and LOS. Table 5.3 summarizes the Existing, Base Year 2022, and Future Year 2022 with Project LOS at the study intersections. LOS worksheets are provided in Appendix C.

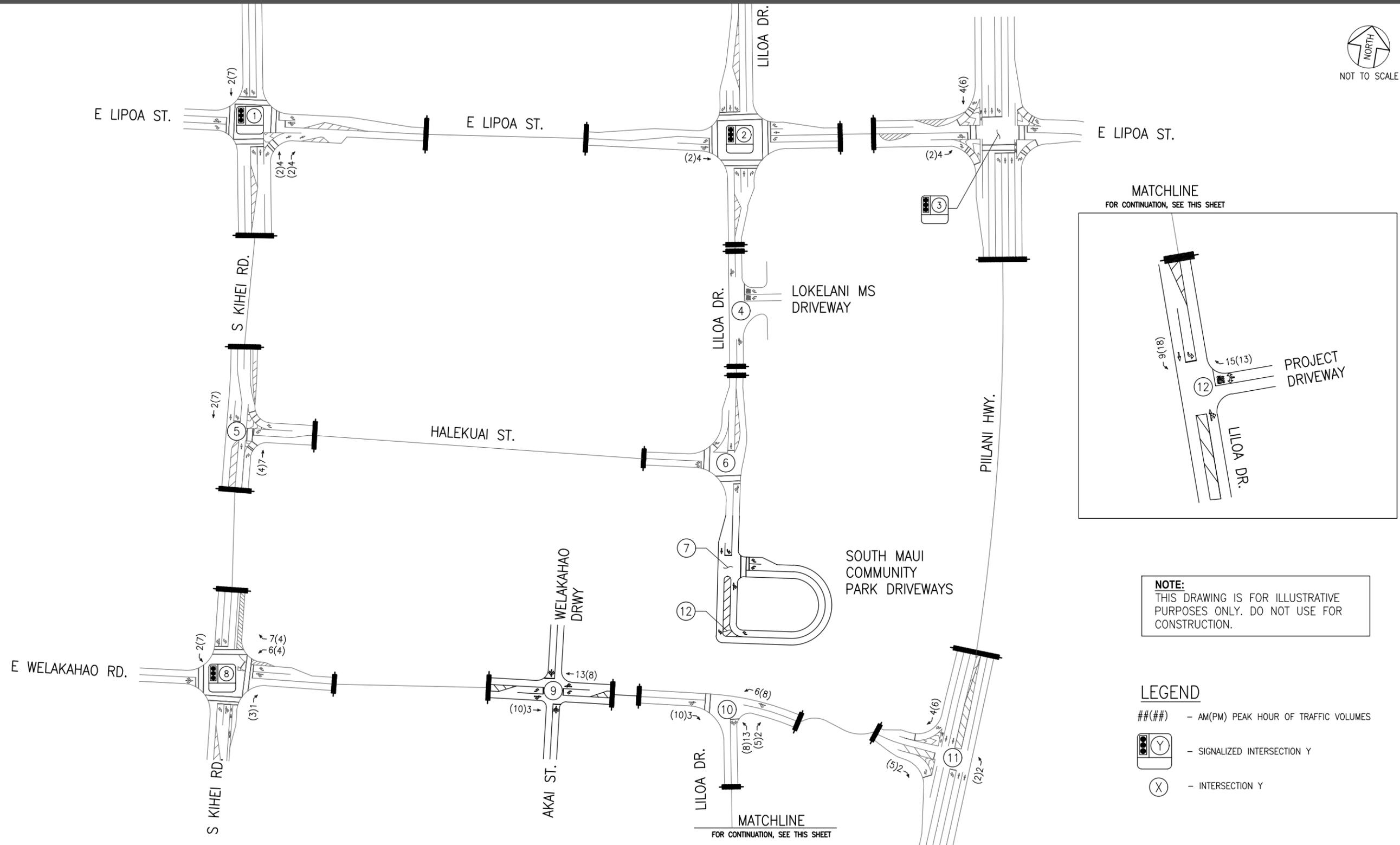


FIGURE 5.1

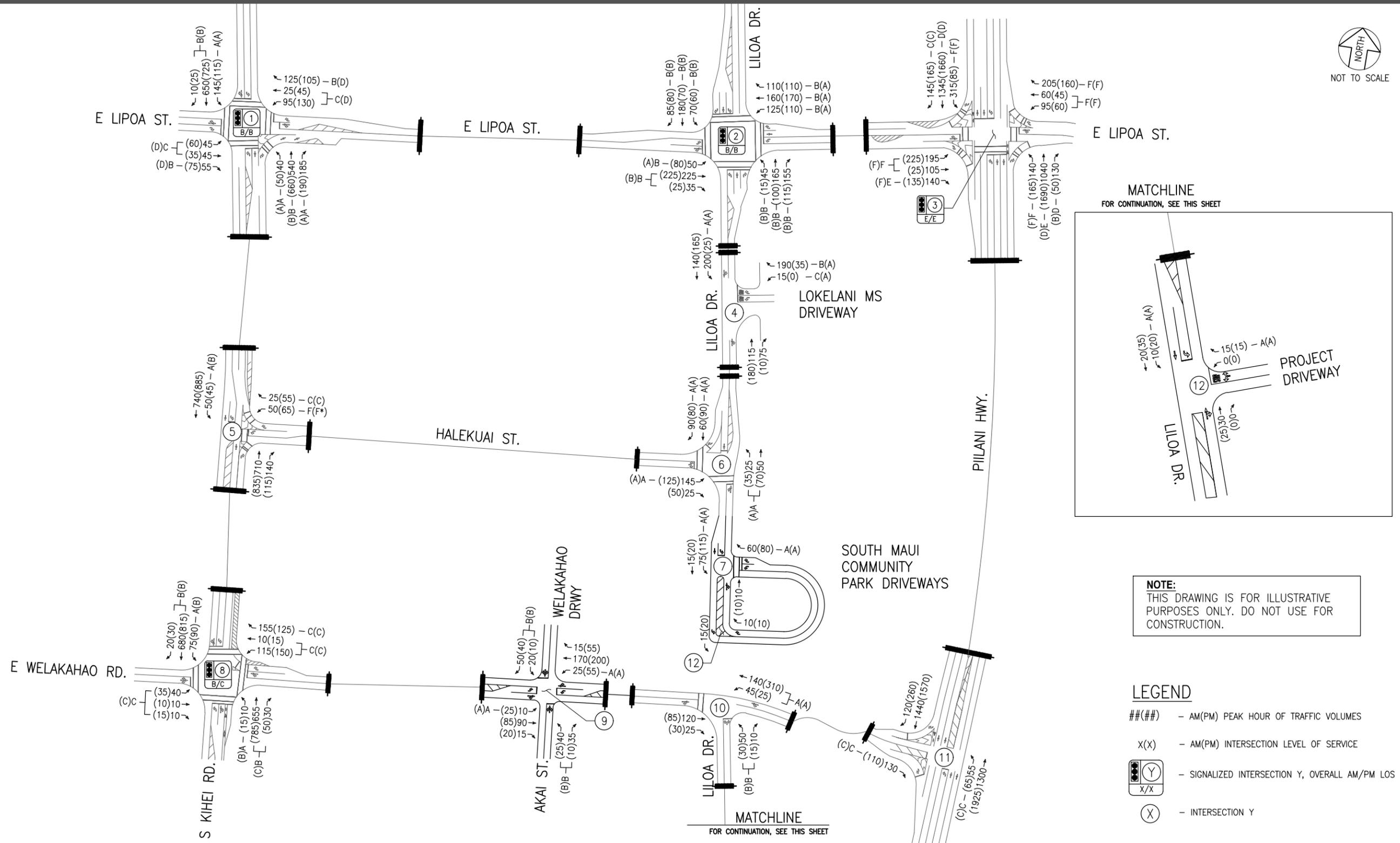


FIGURE 5.2

FUTURE YEAR 2022 WITH PROJECT , LANE CONFIGURATIONS, TRAFFIC VOLUMES AND LOS

Table 5.3: Existing, Base Year 2022 and Future Year 2022 with Project Level of Service Summary

Intersection	Existing Conditions						Base Year 2022						Future Year 2022					
	AM			PM			AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
<b>1: S. Kihei Rd &amp; W Lipoa St/E Lipoa St</b>																		
NB LT	7.3	0.09	A	6.7	0.10	A	7.7	0.11	A	8.6	0.13	A	7.8	0.11	A	8.7	0.13	A
NB TH	11.4	0.59	B	9.9	0.48	A	11.5	0.62	B	11.9	0.58	B	11.5	0.62	B	11.9	0.58	B
NB RT	7.8	0.11	A	6.5	0.10	A	7.5	0.12	A	6.8	0.11	A	7.5	0.12	A	6.9	0.12	A
EB LT/TH	17.7	0.24	B	42.4	0.34	D	20.9	0.26	C	41.9	0.34	D	21.1	0.26	C	41.9	0.34	D
EB RT	16.6	0.03	B	39.5	0.04	D	19.6	0.03	B	38.9	0.04	D	19.8	0.03	B	38.9	0.04	D
WB LT/TH	18.2	0.31	B	46.8	0.63	D	21.7	0.36	C	46.6	0.65	D	21.8	0.36	C	46.6	0.65	D
WB RT	16.8	0.06	B	39.7	0.05	D	19.8	0.06	B	39.1	0.06	D	20.0	0.06	B	39.1	0.06	D
SB LT	6.8	0.29	A	6.3	0.22	A	7.1	0.31	A	7.9	0.26	A	7.2	0.31	A	7.9	0.26	A
SB TH/RT	10.7	0.65	B	10.2	0.54	B	11.5	0.71	B	12.4	0.65	B	11.5	0.71	B	12.5	0.65	B
<i>Overall</i>	11.4	-	B	15.1	-	B	12.1	-	B	16.3	-	B	12.2	-	B	16.3	-	B
<b>2: Liloa Drive &amp; E Lipoa St</b>																		
NB LT	15.9	0.12	B	14.6	0.04	B	16.7	0.12	B	14.9	0.04	B	16.7	0.12	B	14.9	0.04	B
NB TH	13.7	0.22	B	14.6	0.23	B	14.4	0.31	B	14.8	0.28	B	14.4	0.31	B	14.8	0.28	B
NB RT	12.8	0.04	B	13.8	0.05	B	13.1	0.07	B	13.8	0.07	B	13.1	0.07	B	13.8	0.07	B
EB LT	9.9	0.09	A	6.8	0.13	A	10.6	0.09	B	7.5	0.13	A	10.6	0.09	B	7.5	0.13	A
EB TH/RT	13.4	0.40	B	9.5	0.36	A	14.6	0.45	B	10.9	0.41	B	14.7	0.46	B	10.9	0.41	B
WB LT	9.9	0.17	A	7.0	0.12	A	10.7	0.26	B	7.6	0.20	A	10.7	0.27	B	7.6	0.20	A
WB TH	11.8	0.26	B	9.2	0.26	A	12.3	0.26	B	9.7	0.27	A	12.3	0.26	B	9.7	0.27	A
WB RT	10.8	0.06	B	8.5	0.10	A	11.3	0.08	B	9.0	0.10	A	11.3	0.08	B	9.0	0.10	A
SB LT	15.4	0.14	B	15.8	0.16	B	16.9	0.19	B	16.3	0.18	B	16.9	0.19	B	16.3	0.18	B
SB TH	14.1	0.30	B	14.2	0.14	B	14.6	0.34	B	14.4	0.20	B	14.6	0.34	B	14.4	0.20	B
SB RT	12.8	0.03	B	13.8	0.04	B	12.9	0.04	B	13.7	0.05	B	12.9	0.04	B	13.7	0.05	B
<i>Overall</i>	12.9	-	B	10.2	-	B	13.7	-	B	11.1	-	B	13.7	-	B	11.1	-	B
<b>3: Piilani Hwy &amp; E Lipoa St</b>																		
NB LT	102.3	0.88	F	114.9	0.91	F	102.5	0.90	F	118.2	0.92	F	102.5	0.90	F	118.2	0.92	F
NB TH	48.5	0.63	D	29.9	0.68	C	66.6	0.84	E	43.6	0.86	D	66.6	0.84	E	43.6	0.86	D
NB RT	35.4	0.08	D	16.5	0.03	B	42.9	0.11	D	19.2	0.03	B	42.9	0.11	D	19.2	0.03	B
EB LT/TH	101.5	0.87	F	124.4	0.89	F	100.2	0.89	F	125.0	0.91	F	100.2	0.89	F	125.0	0.91	F
EB RT	74.6	0.16	E	91.3	0.23	F	70.6	0.21	E	88.3	0.27	F	70.6	0.21	E	88.3	0.27	F
WB LT/TH	112.4	0.84	F	141.3	0.85	F	112.5	0.85	F	142.2	0.86	F	112.5	0.85	F	142.2	0.86	F
WB RT	93.0	0.43	F	110.4	0.34	F	94.3	0.55	F	111.3	0.41	F	94.3	0.55	F	111.3	0.41	F
SB LT	100.2	0.94	F	124.1	0.85	F	100.5	0.95	F	123.3	0.86	F	100.5	0.95	F	123.3	0.86	F
SB TH	35.2	0.64	D	35.4	0.70	D	50.8	0.85	D	53.1	0.91	D	50.8	0.85	D	53.4	0.91	D
SB RT	23.7	0.09	C	21.6	0.11	C	30.3	0.15	C	26.1	0.15	C	30.3	0.15	C	26.1	0.15	C
<i>Overall</i>	58.3	-	E	47.9	-	D	69.1	-	E	59.9	-	E	69.1	-	E	60.0	-	E
<b>4: Liloa Drive &amp; Lokelani Drwy</b>																		
WB LT	14.5	0.04	B	0.0	0.00	A	17.6	0.05	C	0.0	0.00	A	17.6	0.05	C	0.0	0.00	A
WB RT	9.9	0.19	A	9.2	0.03	A	10.7	0.25	B	9.5	0.05	A	10.7	0.25	B	9.5	0.05	A
SB LT	7.9	0.13	A	7.6	0.01	A	8.2	0.16	A	7.7	0.02	A	8.2	0.16	A	7.7	0.02	A
<i>Overall</i>	5.4	-	-	1.1	-	-	5.3	-	-	1.3	-	-	5.3	-	-	1.3	-	-
<b>5: S. Kihei Rd &amp; Halekuai St</b>																		
WB LT	45.9	0.31	E	89.1	0.61	F	91.2	0.60	F	245.7	1.09	F*	94.9	0.61	F	261.5	1.12	F*
WB RT	14.0	0.05	B	15.7	0.13	C	15.4	0.07	C	18.3	0.18	C	15.6	0.07	C	18.4	0.18	C
SB LT	9.4	0.05	A	9.6	0.05	A	9.8	0.07	A	10.2	0.07	B	9.9	0.07	A	10.2	0.07	B
<i>Overall</i>	1.6	-	-	3.5	-	-	3.2	-	-	8.8	-	-	3.3	-	-	9.2	-	-

Table 5.3: Existing, Base Year 2022 and Future Year 2022 with Project Level of Service Summary Cont'd

Intersection	Existing Conditions						Base Year 2022						Future Year 2022					
	AM			PM			AM			PM			AM			PM		
	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS	HCM Delay	v/c Ratio	LOS
<b>6: Liloa Drive &amp; Halekuai St</b>																		
NB LT/TH	7.7	0.04	A	7.9	0.07	A	8.3	0.11	A	8.6	0.15	A	8.3	0.11	A	8.6	0.15	A
EB LT/RT	8.3	0.17	A	8.4	0.18	A	9.0	0.24	A	9.1	0.24	A	9.0	0.24	A	9.1	0.24	A
SB TH	7.7	0.03	A	7.9	0.05	A	8.3	0.09	A	8.6	0.14	A	8.3	0.09	A	8.6	0.14	A
SB RT	7.4	0.11	A	7.4	0.10	A	7.7	0.12	A	7.6	0.11	A	7.7	0.12	A	7.6	0.11	A
Overall	7.9	-	A	8.0	-	A	8.4	-	A	8.6	-	A	8.4	-	A	8.6	-	A
<b>7: Liloa Drive &amp; S. Maui Comm. Park N Drwy</b>																		
WB RT	-	-	-	-	-	-	8.6	0.06	A	8.7	0.08	A	8.6	0.06	A	8.7	0.08	A
SB LT	-	-	-	-	-	-	7.4	0.05	A	7.4	0.08	A	7.4	0.05	A	7.4	0.08	A
Overall	-	-	-	-	-	-	6.7	-	-	6.9	-	-	6.7	-	-	6.9	-	-
<b>8: S. Kihei Rd &amp; W Welakahao Rd/E Welakahao Rd</b>																		
NB LT	7.1	0.02	A	9.6	0.04	A	8.9	0.03	A	12.3	0.07	B	9.1	0.03	A	12.5	0.07	B
NB TH/RT	10.4	0.66	B	13.7	0.80	B	13.5	0.79	B	22.0	0.89	C	13.9	0.80	B	22.9	0.90	C
EB LT/TH/RT	24.1	0.19	C	23.0	0.14	C	23.4	0.17	C	27.4	0.15	C	23.4	0.17	C	27.6	0.15	C
WB LT/TH	25.2	0.35	C	25.3	0.45	C	25.4	0.42	C	31.1	0.54	C	25.4	0.43	C	31.5	0.55	C
WB RT	20.6	0.06	C	19.8	0.06	B	20.1	0.12	C	23.8	0.13	C	20.2	0.16	C	24.1	0.15	C
SB LT	7.1	0.14	A	9.8	0.18	A	9.7	0.21	A	14.7	0.32	B	10.0	0.23	A	15.3	0.35	B
SB TH/RT	8.6	0.62	A	12.2	0.79	B	11.0	0.74	B	17.7	0.85	B	11.2	0.74	B	18.0	0.85	B
Overall	10.9	-	B	14.0	-	B	13.6	-	B	20.7	-	C	13.9	-	B	21.3	-	C
<b>9: Akai St &amp; E Welakahao Rd</b>																		
NB LT/TH/RT	-	-	-	-	-	-	11.2	0.12	B	12.9	0.08	B	11.4	0.13	B	13.1	0.08	B
NB LT/RT	10.1	0.10	B	10.9	0.05	B	-	-	-	-	-	-	-	-	-	-	-	-
EB LT	-	-	-	-	-	-	7.6	0.01	A	7.8	0.02	A	7.6	0.01	A	7.9	0.02	A
WB LT	7.5	0.02	A	7.5	0.04	A	7.5	0.02	A	7.5	0.04	A	7.5	0.02	A	7.5	0.04	A
SB LT/TH/RT	-	-	-	-	-	-	10.4	0.10	B	10.7	0.08	B	10.6	0.11	B	10.8	0.08	B
Overall	2.8	-	-	2.1	-	-	4.1	-	-	3.1	-	-	4.0	-	-	3.0	-	-
<b>10: Liloa Drive &amp; E Welakahao Rd</b>																		
NB LT/RT	10.7	0.06	B	10.2	0.04	B	11.4	0.08	B	11.0	0.05	B	11.5	0.11	B	11.4	0.08	B
WB LT	7.5	0.03	A	7.4	0.01	A	7.6	0.03	A	7.5	0.01	A	7.6	0.04	A	7.5	0.02	A
Overall	2.2	-	-	1.0	-	-	2.2	-	-	0.9	-	-	2.7	-	-	1.4	-	-
<b>11: Piilani Hwy &amp; E Welakahao Rd</b>																		
NB LT	12.7	0.10	B	13.5	0.11	B	14.9	0.13	B	17.1	0.19	C	15.0	0.14	C	17.1	0.19	C
EB RT	17.1	0.26	C	18.2	0.27	C	22.7	0.40	C	24.0	0.38	C	23.2	0.42	C	24.5	0.40	C
Overall	0.9	-	-	0.7	-	-	1.2	-	-	0.9	-	-	1.3	-	-	1.0	-	-
<b>12: Liloa Drive &amp; Project Drwy</b>																		
WB RT	-	-	-	-	-	-	-	-	-	-	-	-	8.5	0.02	A	8.5	0.02	A
SB LT	-	-	-	-	-	-	-	-	-	-	-	-	7.3	0.01	A	7.3	0.01	A
Overall	-	-	-	-	-	-	-	-	-	-	-	-	2.7	-	-	2.9	-	-

\*Denotes overcapacity condition, v/c ≥ 1.0

## **6. CONCLUSIONS**

The Project is envisioned to be an affordable senior rental housing project which will include approximately 117 senior rental units. Vehicular traffic to the Project will be provided primarily by a new Project access along Liloa Drive. The Project is anticipated to be completed by the Year 2022.

### **6.1 Existing Conditions**

The majority of movements at the study intersections currently operate at overall LOS D or better during the AM and PM peak hours of traffic. Because of the high mainline through volumes along Piilani Highway and long cycle lengths at signalized intersections, some minor street and left-turn movements experienced longer delays.

At the South Kihei Road/Halekuai Street intersection, the westbound left-turn movement currently operates at LOS E and LOS F during the AM and PM peak hours of traffic, respectively. No significant queuing was observed at this location during the peak hours of traffic. Westbound left-turn queues ranged only from 1-2 vehicles long. Due to signals located further north at Lipoa Street and south at East Welakahao Street, gaps in through traffic occurred along South Kihei Road, which reduced delays for westbound left-turn vehicles. Observations indicated the majority of vehicular delays ranged between 5 seconds and 35 seconds during the heavier PM peak hour of traffic.

At the Piilani Highway & Lipoa Street intersection, this signalized intersection is coordinated with the Piilani Highway/Piikea Avenue intersection and currently operates at overall LOS E and LOS D during the AM and PM peak hours of traffic, respectively. Several minor movements operate at LOS E or F due to coordinated signal timing and long signal cycles, with the mainline through movements operating at LOS D or better during the AM and PM peak hours of traffic. Queues were observed to occur in the northbound left-turn lane during the AM peak hour of traffic from approximately 7:35 to 7:55 AM due to parents dropping off children at Kihei Elementary School and Lokelani Intermediate School. These queues, however, were not observed to spill back into the adjacent through lane on Piilani Highway. Vehicles in the eastbound left-turn/through lane were observed to queue past the Aquatic Center driveway during the AM and PM peak hour of traffic. Based on observations from approximately 7:45AM to 8:30AM, the southbound left-turn lane can queue heavily at or beyond its storage lane, primarily due to traffic generated by the Kihei Charter School. Traffic was observed to sporadically spill back in the through lane, impeding southbound through flow. Long-term intersection widening improvements are planned at this intersection as future infill and development of the adjacent Maui Research and Technology Park occurs. However, specific design improvements, phasing and construction timeframes are as of yet, unknown.

### **6.2 Base Year 2022**

Based on a comparison with existing conditions, it's estimated that regional through traffic along South Kihei Road and Piilani Highway may increase by approximately 15% due to ambient growth and traffic generated by other known developments by Year 2022.

At the South Kihei Road/Halekuai Street intersection, the westbound left-turn movement is expected to operate at LOS F and over-capacity conditions during the AM and PM peak hours. However, as discussed in Section 3.3, no significant existing queuing was observed at this location during the peak hours of traffic. Existing westbound left-turn queues ranged only from 1-2 vehicles long. Due to signals located further north at Lipoa Street and south at East

Welakahao Street, gaps in through traffic occurred along South Kihei Road, which reduced delays for westbound left-turn vehicles. Observations indicated the majority of existing vehicular delays ranged between 5 seconds and 35 seconds during the heavier PM peak hour of traffic. A median refuge lane for westbound left-turn vehicles may be considered by the County, to facilitate westbound left-turn vehicles to cross traffic at one direction at a time. However, the future Liloa Drive extension is expected to help operations at this intersection by reducing through and turning movement volume and improve traffic operations.

At the Piilani Highway/Lipoa Street intersection traffic operations are expected to deteriorate further with multiple movements (including the mainline through movement) anticipated to operate at low levels-of-service (LOS E/F). Long-term intersection widening improvements are planned at this intersection as future infill and development of the adjacent Maui Research and Technology Park occurs. However, specific design improvements, phasing and construction timeframes are as of yet, unknown.

### **6.3 Future Year 2022**

The Project is forecast to generate approximately 24(31) trips during the AM(PM) peak hours of traffic.

Upon completion of the Project, all study intersections are forecast to operate with similar LOS as Base Year 2022 traffic conditions. Regionally along Piilani Highway, traffic generated by the Project will increase by approximately 4-6 vehicles in each direction per peak hour, which translates to an average 0.24% increase in traffic. Similarly along South Kihei Road, traffic will only increase by approximately 4-7 vehicles in each direction per peak hour, which translates to only a 0.43% increase in traffic. Due to generally low traffic increases as a result of the Project the majority of movement vehicular delays generally increased minimally by 1-4 seconds.

The Piilani Highway/Lipoa Street intersection is expected to continue operating at low levels-of-service similar to Base Year 2022 conditions. As previously mentioned in Section 4.4, long-term intersection widening improvements are planned at this intersection as future infill and development of the adjacent Maui Research and Technology Park occurs. However, specific design improvements, phasing and construction timeframes are as of yet, unknown. The Project is expected to only add 8 vehicles during the AM and PM peak hours of traffic to the Piilani Highway/Lipoa Street intersection. This minimally constitutes approximately 0.19% of the total traffic at this intersection.

At the Piilani Highway/Welakahao Road intersection, the Project will only add 2(5) AM(PM) eastbound right-turn vehicles onto Piilani Highway and 6(8) AM(PM) southbound right-turn and northbound left-turn vehicles onto Welakahao Road for a total of 21 new Project vehicles. This constitutes approximately 0.29% of the total traffic at this intersection. Based on discussions with HDOT, the Project will provide delineators along the median of Piilani Highway at the start of the northbound left-turn lane at the intersection and extend further south near to the end of the taper of the opposing southbound left-turn lane at the Piilani Highway/Kihei Wastewater Treatment Plant intersection. These delineators will be installed to reduce the occurrence of eastbound right-turners turning into Piilani Highway then making an illegal and immediate U-turn to head north on the highway, which HDOT has determined to be problematic.

Based on the MUTCD Eight-Hour and Four-Hour Vehicular Volume traffic signal warrants, at the South Kihei Road/Halekuai Street intersection, a traffic signal is not anticipated to be warranted by the Future Year 2022 with Project volumes. Signal warrant figures are shown in Appendix D.

An exclusive southbound left-turn lane at the Liloa Drive/Project Driveway intersection is recommended to minimize the impacts of left-turn vehicles along the main thoroughfare. Based on AASHTO guidance, left-turn lanes should be long enough to provide storage space for at least two passenger cars, or approximately 50 feet in length (exclusive of deceleration length).

## **7. RECOMMENDATIONS**

The Project will provide the following improvements:

- At the Piilani Highway/Welakahao Road intersection, provide delineators along the median of Piilani Highway at the start of the northbound left-turn lane at the intersection and extend further south near to the end of the taper of the opposing southbound left-turn lane at the Piilani Highway/Kihei Wastewater Treatment Plant intersection.
- At the proposed Liloa Drive/Project Driveway intersection provide a southbound left-turn lane with a minimum storage space of 50 feet in length (exclusive of deceleration length).

## 8. REFERENCES

1. Federal Highway Administration, Manual on Uniform Traffic Control Devices, 2009.
2. Institute of Transportation Engineers, Trip Generation, 10th Edition, 2017.
3. Phillip Rowell and Associates, Traffic Impact Analysis Report For South Maui Park at Piilani, December 2, 2005.
4. Phillip Rowell and Associates, Traffic Impact Assessment Report for Alahele Subdivision, June 2007.
5. Phillip Rowell and Associates, Traffic Impact Assessment Report for Kenolio Apartments, February 2015.
6. Phillip Rowell & Associates, Traffic Impact Assessment Report for Wailea MF-11, June 22, 2012.
7. Transportation Research Board, Highway Capacity Manual, 6<sup>th</sup> Edition, 2016.
8. Wilson Okamoto Corporation, Traffic Impact Report for Kihei High School, September 2011.



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# APPENDICES

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# APPENDIX A

## TRAFFIC COUNT DATA

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Wailuku, Hawaii 96793

Phone: (808) 224-8044 Fax: (808) 242-9163

File Name : S Kihei Rd - Lipoa St

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	S KIHEI RD SOUTHBOUND				E LIPOA ST WESTBOUND				S KIHEI RD NORTHBOUND				W LIPOA ST EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
06:30	21	75	6	1	4	2	5	3	11	62	21	0	2	4	8	0	225
06:45	11	61	9	10	9	13	11	3	10	67	30	1	5	5	9	3	257
Total	32	136	15	11	13	15	16	6	21	129	51	1	7	9	17	3	482
07:00	25	83	3	3	9	0	17	4	8	80	30	0	3	4	8	1	278
07:15	36	99	2	6	17	2	12	2	5	101	39	0	7	4	6	1	339
07:30	56	119	1	7	13	2	32	8	5	97	43	0	10	8	15	1	417
07:45	48	152	3	4	15	4	27	5	10	108	49	0	9	8	20	4	466
Total	165	453	9	20	54	8	88	19	28	386	161	0	29	24	49	7	1500
08:00	36	135	3	6	20	5	28	7	9	117	31	0	15	14	14	0	440
08:15	32	145	2	2	35	6	38	6	11	101	39	0	5	12	15	2	451
08:30	25	113	2	0	20	7	32	0	7	130	43	0	13	11	6	0	409
08:45	30	112	4	0	22	10	35	0	4	125	58	0	10	6	13	1	430
Total	123	505	11	8	97	28	133	13	31	473	171	0	43	43	48	3	1730
Grand Total	320	1094	35	39	164	51	237	38	80	988	383	1	79	76	114	13	3712
Apprch %	21.5	73.5	2.4	2.6	33.5	10.4	48.4	7.8	5.5	68	26.4	0.1	28	27	40.4	4.6	
Total %	8.6	29.5	0.9	1.1	4.4	1.4	6.4	1	2.2	26.6	10.3	0	2.1	2	3.1	0.4	
Motorcycles	3	27	0	0	4	1	0	0	1	13	2	0	0	0	6	0	57
% Motorcycles	0.9	2.5	0	0	2.4	2	0	0	1.2	1.3	0.5	0	0	0	5.3	0	1.5
Cars & Light Goods	311	1039	33	0	156	48	235	0	77	949	368	0	79	71	98	0	3464
% Cars & Light Goods	97.2	95	94.3	0	95.1	94.1	99.2	0	96.2	96.1	96.1	0	100	93.4	86	0	93.3
Buses	2	4	1	0	2	0	0	0	1	2	4	0	0	2	0	0	18
% Buses	0.6	0.4	2.9	0	1.2	0	0	0	1.2	0.2	1	0	0	2.6	0	0	0.5
Single-Unit Trucks	3	18	1	0	2	1	2	0	0	9	5	0	0	3	3	0	47
% Single-Unit Trucks	0.9	1.6	2.9	0	1.2	2	0.8	0	0	0.9	1.3	0	0	3.9	2.6	0	1.3
Articulated Trucks	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Bicycles on Road	1	6	0	0	0	1	0	0	1	14	4	0	0	0	7	0	34
% Bicycles on Road	0.3	0.5	0	0	0	2	0	0	1.2	1.4	1	0	0	0	6.1	0	0.9
Bicycles on Crosswalk	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4
% Bicycles on Crosswalk	0	0	0	0	0	0	0	10.5	0	0	0	0	0	0	0	0	0.1
Pedestrians	0	0	0	39	0	0	0	34	0	0	0	1	0	0	0	13	87
% Pedestrians	0	0	0	100	0	0	0	89.5	0	0	0	100	0	0	0	100	2.3

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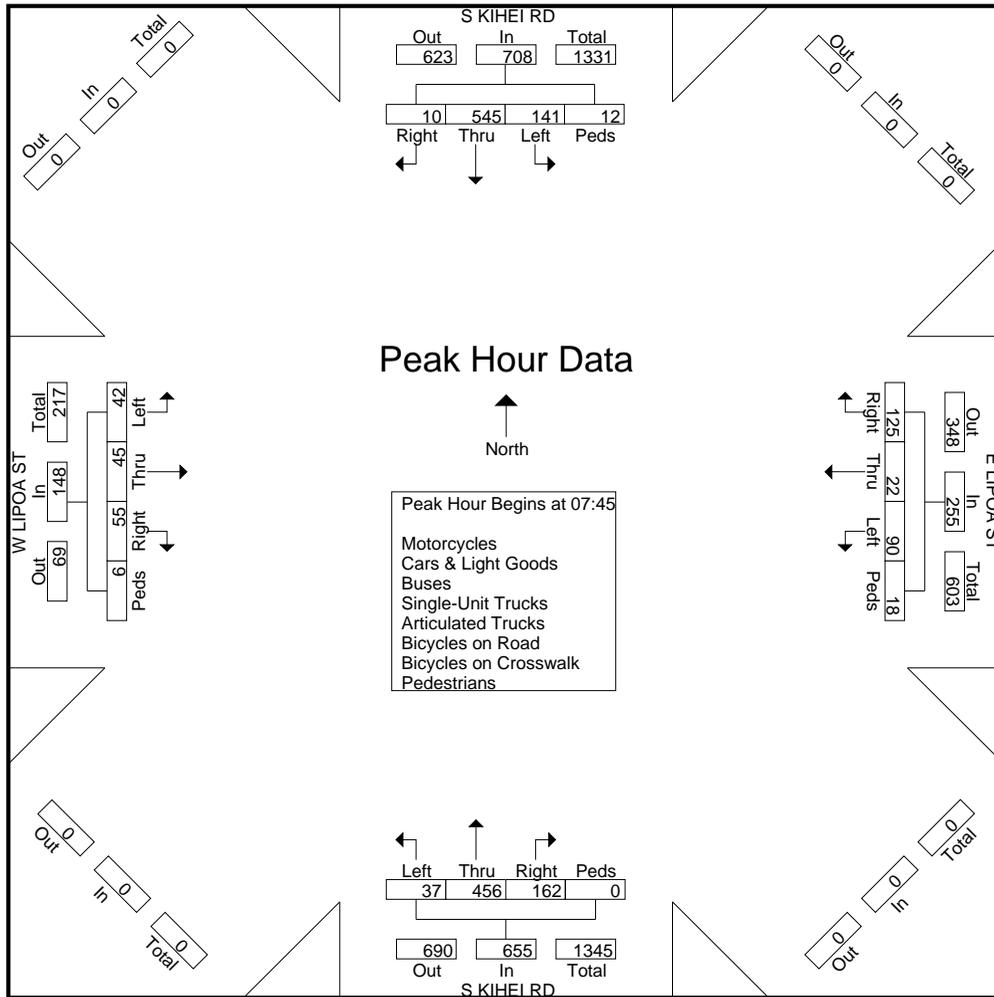
File Name : S Kihei Rd - Lipoa St

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	S KIHEI RD SOUTHBOUND					E LIPOA ST WESTBOUND					S KIHEI RD NORTHBOUND					W LIPOA ST EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:45 to 08:30 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45																					
07:45	48	152	3	4	207	15	4	27	5	51	10	108	49	0	167	9	8	20	4	41	466
08:00	36	135	3	6	180	20	5	28	7	60	9	117	31	0	157	15	14	14	0	43	440
08:15	32	145	2	2	181	35	6	38	6	85	11	101	39	0	151	5	12	15	2	34	451
08:30	25	113	2	0	140	20	7	32	0	59	7	130	43	0	180	13	11	6	0	30	409
Total Volume	141	545	10	12	708	90	22	125	18	255	37	456	162	0	655	42	45	55	6	148	1766
% App. Total	19.9	77	1.4	1.7		35.3	8.6	49	7.1		5.6	69.6	24.7	0		28.4	30.4	37.2	4.1		
PHF	.734	.896	.833	.500	.855	.643	.786	.822	.643	.750	.841	.877	.827	.000	.910	.700	.804	.688	.375	.860	.947



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File Name : S Kihei Rd - Lipoa St

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	S KIHEI RD SOUTHBOUND				E LIPOA ST WESTBOUND				S KIHEI RD NORTHBOUND				W LIPOA ST EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
15:00	34	158	7	6	33	9	44	2	16	134	40	0	20	12	24	1	540
15:15	36	150	1	2	29	14	44	2	20	137	48	0	18	11	13	3	528
15:30	34	128	3	3	25	11	32	0	14	140	38	0	19	10	20	0	477
15:45	24	154	7	3	31	9	27	5	13	128	44	0	14	6	18	2	485
Total	128	590	18	14	118	43	147	9	63	539	170	0	71	39	75	6	2030
16:00	33	166	6	0	32	13	24	3	11	126	47	0	14	6	16	0	497
16:15	22	156	8	2	35	8	22	2	11	156	41	0	12	11	17	1	504
16:30	21	130	2	3	34	11	37	4	12	134	44	2	9	11	23	5	482
16:45	21	143	6	5	21	9	31	2	14	132	46	0	19	9	11	5	474
Total	97	595	22	10	122	41	114	11	48	548	178	2	54	37	67	11	1957
Grand Total	225	1185	40	24	240	84	261	20	111	1087	348	2	125	76	142	17	3987
Apprch %	15.3	80.4	2.7	1.6	39.7	13.9	43.1	3.3	7.2	70.2	22.5	0.1	34.7	21.1	39.4	4.7	
Total %	5.6	29.7	1	0.6	6	2.1	6.5	0.5	2.8	27.3	8.7	0.1	3.1	1.9	3.6	0.4	
Motorcycles	2	19	0	0	7	0	0	0	2	26	2	0	0	0	5	0	63
% Motorcycles	0.9	1.6	0	0	2.9	0	0	0	1.8	2.4	0.6	0	0	0	3.5	0	1.6
Cars & Light Goods	222	1148	39	0	229	82	259	0	108	1042	334	0	123	75	133	0	3794
% Cars & Light Goods	98.7	96.9	97.5	0	95.4	97.6	99.2	0	97.3	95.9	96	0	98.4	98.7	93.7	0	95.2
Buses	0	3	0	0	2	0	0	0	0	2	4	0	0	0	0	0	11
% Buses	0	0.3	0	0	0.8	0	0	0	0	0.2	1.1	0	0	0	0	0	0.3
Single-Unit Trucks	1	1	0	0	1	1	2	0	1	8	4	0	2	1	2	0	24
% Single-Unit Trucks	0.4	0.1	0	0	0.4	1.2	0.8	0	0.9	0.7	1.1	0	1.6	1.3	1.4	0	0.6
Articulated Trucks	0	0	0	0	0	0	0	0	0	2	0	0	0	0	2	0	4
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	1.4	0	0.1
Bicycles on Road	0	14	1	0	1	1	0	0	0	7	4	0	0	0	0	0	28
% Bicycles on Road	0	1.2	2.5	0	0.4	1.2	0	0	0	0.6	1.1	0	0	0	0	0	0.7
Bicycles on Crosswalk	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	1	8
% Bicycles on Crosswalk	0	0	0	0	0	0	0	35	0	0	0	0	0	0	0	5.9	0.2
Pedestrians	0	0	0	24	0	0	0	13	0	0	0	2	0	0	0	16	55
% Pedestrians	0	0	0	100	0	0	0	65	0	0	0	100	0	0	0	94.1	1.4

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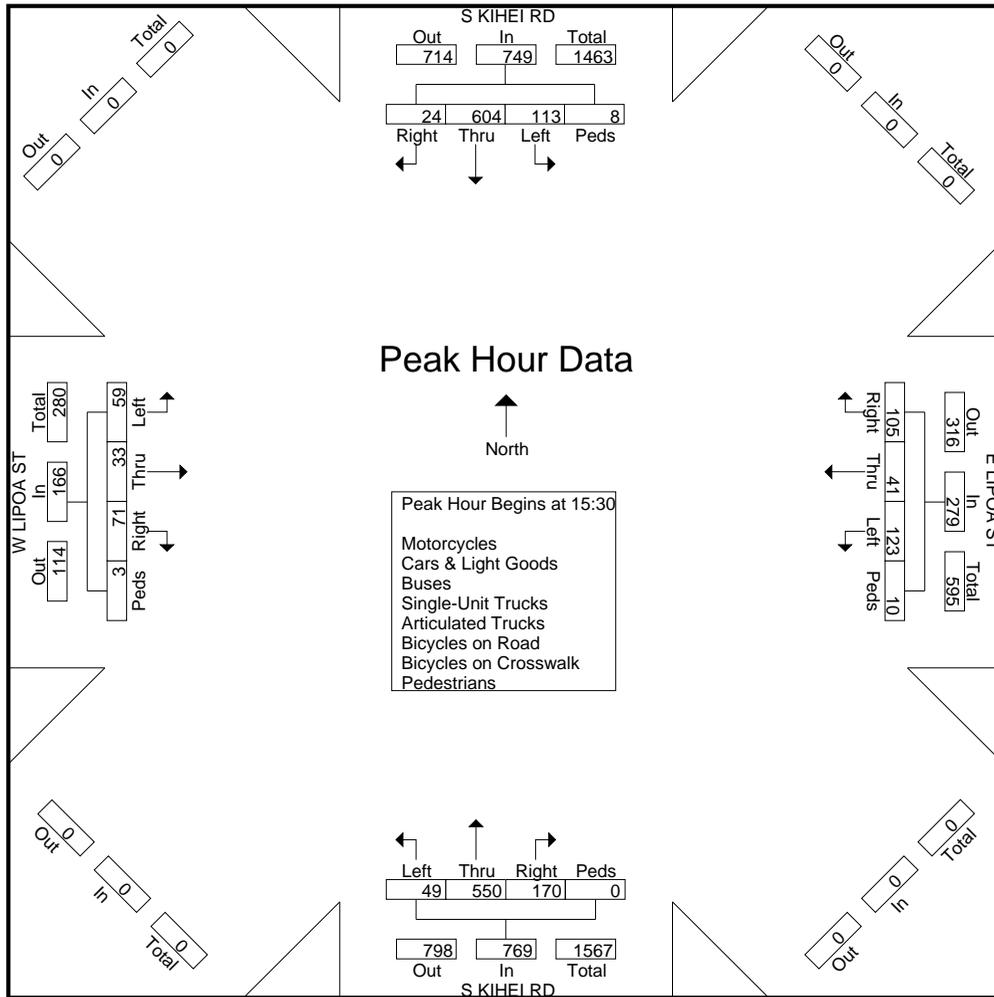
File Name : S Kihei Rd - Lipoa St

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	S KIHEI RD SOUTHBOUND					E LIPOA ST WESTBOUND					S KIHEI RD NORTHBOUND					W LIPOA ST EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	34	128	3	3	168	25	11	32	0	68	14	140	38	0	192	19	10	20	0	49	477
15:45	24	154	7	3	188	31	9	27	5	72	13	128	44	0	185	14	6	18	2	40	485
16:00	33	166	6	0	205	32	13	24	3	72	11	126	47	0	184	14	6	16	0	36	497
16:15	22	156	8	2	188	35	8	22	2	67	11	156	41	0	208	12	11	17	1	41	504
Total Volume	113	604	24	8	749	123	41	105	10	279	49	550	170	0	769	59	33	71	3	166	1963
% App. Total	15.1	80.6	3.2	1.1		44.1	14.7	37.6	3.6		6.4	71.5	22.1	0		35.5	19.9	42.8	1.8		
PHF	.831	.910	.750	.667	.913	.879	.788	.820	.500	.969	.875	.881	.904	.000	.924	.776	.750	.888	.375	.847	.974



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File Name : Liloa Dr - Lipoa St

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	LILOA DR SOUTHBOUND				E LIPOA ST WESTBOUND				LILOA DR NORTHBOUND				E LIPOA ST EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
06:30	6	5	5	0	13	15	2	3	0	1	4	2	2	37	1	3	99
06:45	8	6	14	2	19	16	1	1	1	4	10	1	6	27	2	0	118
Total	14	11	19	2	32	31	3	4	1	5	14	3	8	64	3	3	217
07:00	14	18	10	6	15	21	8	14	1	4	20	7	3	48	7	9	205
07:15	24	33	14	1	19	22	21	9	6	8	17	3	8	47	9	2	243
07:30	22	56	19	0	21	36	29	13	3	17	15	12	12	72	12	7	346
07:45	19	45	32	0	22	42	30	13	11	43	22	5	7	47	6	1	345
Total	79	152	75	7	77	121	88	49	21	72	74	27	30	214	34	19	1139
08:00	19	48	22	0	19	29	10	9	10	27	32	5	14	53	9	3	309
08:15	11	46	18	0	25	39	24	9	18	32	31	1	12	52	9	0	327
08:30	9	13	13	0	14	48	15	0	5	12	20	1	14	51	10	0	225
08:45	8	9	22	0	23	37	5	2	4	6	13	0	15	59	5	1	209
Total	47	116	75	0	81	153	54	20	37	77	96	7	55	215	33	4	1070
Grand Total	140	279	169	9	190	305	145	73	59	154	184	37	93	493	70	26	2426
Apprch %	23.5	46.7	28.3	1.5	26.6	42.8	20.3	10.2	13.6	35.5	42.4	8.5	13.6	72.3	10.3	3.8	
Total %	5.8	11.5	7	0.4	7.8	12.6	6	3	2.4	6.3	7.6	1.5	3.8	20.3	2.9	1.1	
Motorcycles	3	0	3	0	0	2	3	0	1	0	1	0	0	5	0	0	18
% Motorcycles	2.1	0	1.8	0	0	0.7	2.1	0	1.7	0	0.5	0	0	1	0	0	0.7
Cars & Light Goods	136	273	162	0	178	294	140	0	58	147	167	0	90	475	69	0	2189
% Cars & Light Goods	97.1	97.8	95.9	0	93.7	96.4	96.6	0	98.3	95.5	90.8	0	96.8	96.3	98.6	0	90.2
Buses	1	5	2	0	9	0	2	0	0	6	11	0	3	5	1	0	45
% Buses	0.7	1.8	1.2	0	4.7	0	1.4	0	0	3.9	6	0	3.2	1	1.4	0	1.9
Single-Unit Trucks	0	1	2	0	3	7	0	0	0	1	5	0	0	6	0	0	25
% Single-Unit Trucks	0	0.4	1.2	0	1.6	2.3	0	0	0	0.6	2.7	0	0	1.2	0	0	1
Articulated Trucks	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1
% Articulated Trucks	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	1	0	0	0	0	0	0	0	2	0	0	3
% Bicycles on Road	0	0	0	0	0	0.3	0	0	0	0	0	0	0	0.4	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	34	0	0	0	3	0	0	0	7	44
% Bicycles on Crosswalk	0	0	0	0	0	0	0	46.6	0	0	0	8.1	0	0	0	26.9	1.8
Pedestrians	0	0	0	9	0	0	0	39	0	0	0	34	0	0	0	19	101
% Pedestrians	0	0	0	100	0	0	0	53.4	0	0	0	91.9	0	0	0	73.1	4.2

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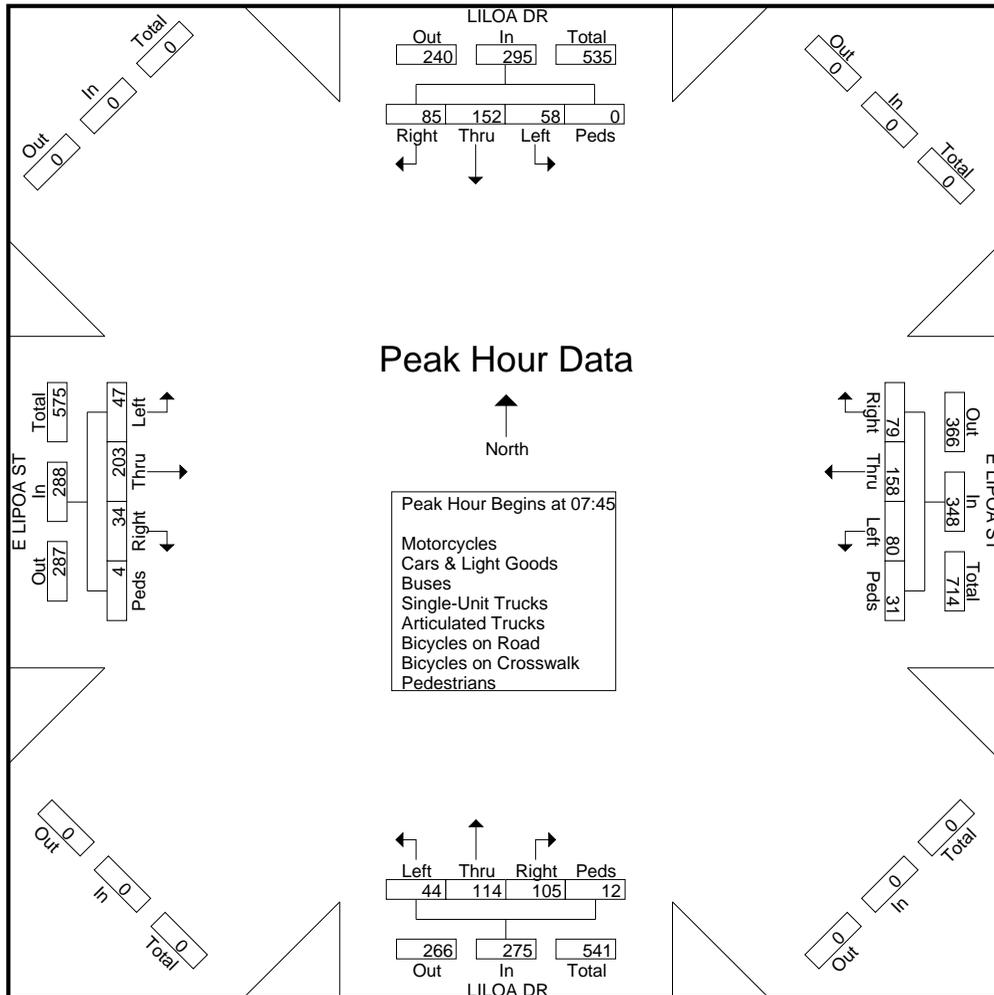
File Name : Liloa Dr - Lipoa St

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	LILOA DR SOUTHBOUND					E LIPOA ST WESTBOUND					LILOA DR NORTHBOUND					E LIPOA ST EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:45 to 08:30 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45																					
07:45	19	45	32	0	96	22	42	30	13	107	11	43	22	5	81	7	47	6	1	61	345
08:00	19	48	22	0	89	19	29	10	9	67	10	27	32	5	74	14	53	9	3	79	309
08:15	11	46	18	0	75	25	39	24	9	97	18	32	31	1	82	12	52	9	0	73	327
08:30	9	13	13	0	35	14	48	15	0	77	5	12	20	1	38	14	51	10	0	75	225
Total Volume	58	152	85	0	295	80	158	79	31	348	44	114	105	12	275	47	203	34	4	288	1206
% App. Total	19.7	51.5	28.8	0		23	45.4	22.7	8.9		16	41.5	38.2	4.4		16.3	70.5	11.8	1.4		
PHF	.763	.792	.664	.000	.768	.800	.823	.658	.596	.813	.611	.663	.820	.600	.838	.839	.958	.850	.333	.911	.874



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File Name : Liloa Dr - Lipoa St

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	LILOA DR SOUTHBOUND				E LIPOA ST WESTBOUND				LILOA DR NORTHBOUND				E LIPOA ST EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
15:00	5	11	26	0	19	52	28	2	9	15	22	2	14	59	3	0	267
15:15	14	5	25	0	20	51	34	0	5	17	22	0	23	67	2	0	285
15:30	14	7	19	0	20	35	27	5	4	14	26	0	22	64	7	1	265
15:45	11	13	19	0	15	45	22	1	3	13	29	1	20	50	7	0	249
Total	44	36	89	0	74	183	111	8	21	59	99	3	79	240	19	1	1066
16:00	13	13	19	1	17	36	35	0	1	24	26	0	16	42	4	3	250
16:15	15	12	20	0	15	49	19	6	7	24	12	1	21	52	6	1	260
16:30	13	21	26	1	10	44	26	8	8	18	30	2	14	66	2	1	290
16:45	10	7	13	0	14	55	26	1	3	9	23	0	23	51	4	0	239
Total	51	53	78	2	56	184	106	15	19	75	91	3	74	211	16	5	1039
Grand Total	95	89	167	2	130	367	217	23	40	134	190	6	153	451	35	6	2105
Apprch %	26.9	25.2	47.3	0.6	17.6	49.8	29.4	3.1	10.8	36.2	51.4	1.6	23.7	69.9	5.4	0.9	
Total %	4.5	4.2	7.9	0.1	6.2	17.4	10.3	1.1	1.9	6.4	9	0.3	7.3	21.4	1.7	0.3	
Motorcycles	2	1	1	0	2	0	1	0	0	1	1	0	3	3	0	0	15
% Motorcycles	2.1	1.1	0.6	0	1.5	0	0.5	0	0	0.7	0.5	0	2	0.7	0	0	0.7
Cars & Light Goods	93	88	161	0	122	365	216	0	39	125	184	0	147	441	35	0	2016
% Cars & Light Goods	97.9	98.9	96.4	0	93.8	99.5	99.5	0	97.5	93.3	96.8	0	96.1	97.8	100	0	95.8
Buses	0	0	2	0	1	0	0	0	0	1	2	0	3	2	0	0	11
% Buses	0	0	1.2	0	0.8	0	0	0	0	0.7	1.1	0	2	0.4	0	0	0.5
Single-Unit Trucks	0	0	2	0	4	2	0	0	1	1	3	0	0	5	0	0	18
% Single-Unit Trucks	0	0	1.2	0	3.1	0.5	0	0	2.5	0.7	1.6	0	0	1.1	0	0	0.9
Articulated Trucks	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
% Articulated Trucks	0	0	0.6	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0.1
Bicycles on Road	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	6
% Bicycles on Road	0	0	0	0	0	0	0	0	0	4.5	0	0	0	0	0	0	0.3
Bicycles on Crosswalk	0	0	0	0	0	0	0	8	0	0	0	2	0	0	0	5	15
% Bicycles on Crosswalk	0	0	0	0	0	0	0	34.8	0	0	0	33.3	0	0	0	83.3	0.7
Pedestrians	0	0	0	2	0	0	0	15	0	0	0	4	0	0	0	1	22
% Pedestrians	0	0	0	100	0	0	0	65.2	0	0	0	66.7	0	0	0	16.7	1

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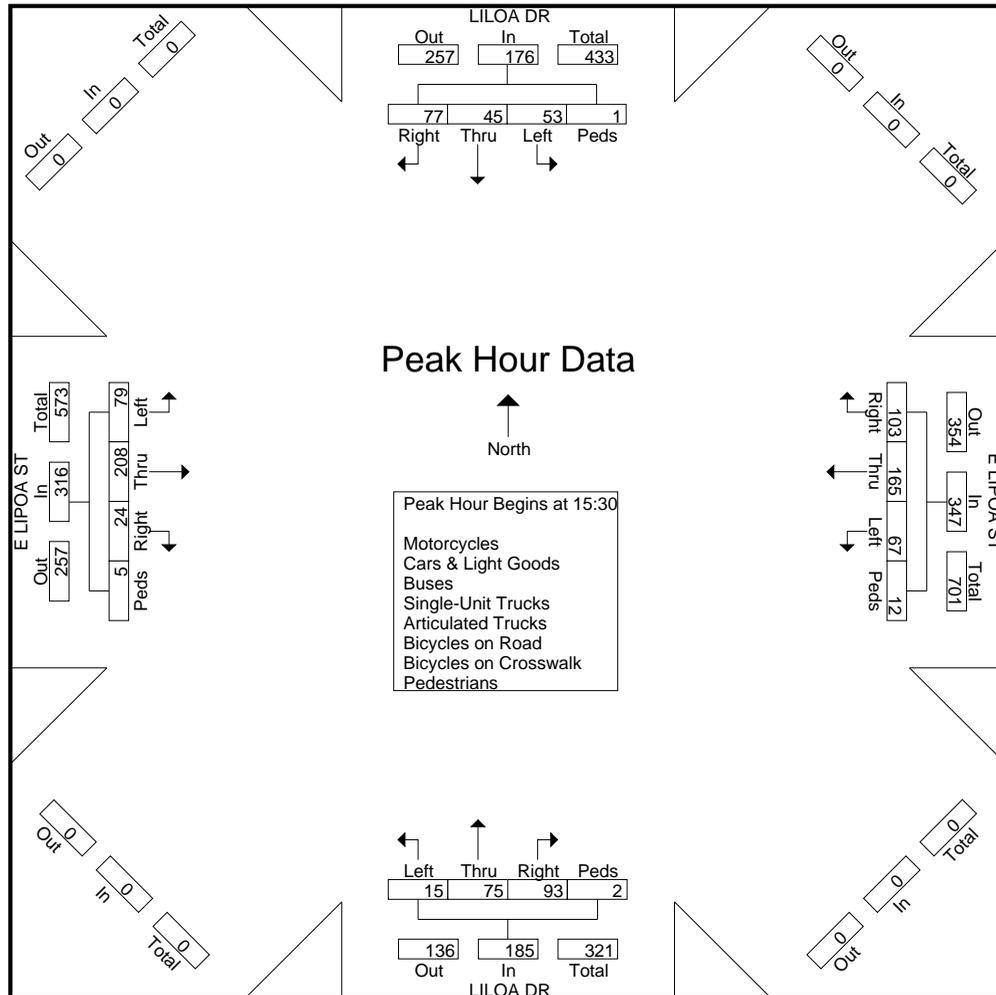
File Name : Liloa Dr - Lipoa St

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	LILOA DR SOUTHBOUND					E LIPOA ST WESTBOUND					LILOA DR NORTHBOUND					E LIPOA ST EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	14	7	19	0	40	20	35	27	5	87	4	14	26	0	44	22	64	7	1	94	265
15:45	11	13	19	0	43	15	45	22	1	83	3	13	29	1	46	20	50	7	0	77	249
16:00	13	13	19	1	46	17	36	35	0	88	1	24	26	0	51	16	42	4	3	65	250
16:15	15	12	20	0	47	15	49	19	6	89	7	24	12	1	44	21	52	6	1	80	260
Total Volume	53	45	77	1	176	67	165	103	12	347	15	75	93	2	185	79	208	24	5	316	1024
% App. Total	30.1	25.6	43.8	0.6		19.3	47.6	29.7	3.5		8.1	40.5	50.3	1.1		25	65.8	7.6	1.6		
PHF	.883	.865	.963	.250	.936	.838	.842	.736	.500	.975	.536	.781	.802	.500	.907	.898	.813	.857	.417	.840	.966



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File Name : Piilani Hwy - E Lipoa St  
 Site Code : 19-514 Liloa Sr Housing TIAR  
 Start Date : 5/7/2019  
 Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	PIILANI HWY SOUTHBOUND				LIPOA PKWY WESTBOUND				PIILANI HWY NORTHBOUND				E LIPOA ST EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
06:30	8	305	18	0	2	0	2	0	8	165	1	0	23	5	14	0	551
06:45	34	272	41	0	1	2	3	0	6	180	3	1	28	3	8	1	583
Total	42	577	59	0	3	2	5	0	14	345	4	1	51	8	22	1	1134
07:00	34	230	36	0	1	3	4	0	12	199	5	0	50	10	23	0	607
07:15	44	255	62	0	3	1	18	0	21	231	12	2	49	9	19	1	727
07:30	41	271	66	0	13	5	28	0	24	224	15	1	68	10	22	0	788
07:45	91	320	39	0	14	8	24	0	17	214	30	2	49	26	28	2	864
Total	210	1076	203	0	31	17	74	0	74	868	62	5	216	55	92	3	2986
08:00	83	248	17	0	32	16	58	0	26	185	37	5	35	30	36	0	808
08:15	74	319	24	0	17	13	49	0	45	258	39	7	33	20	30	3	931
08:30	42	244	28	0	25	13	47	0	30	228	15	2	40	18	26	0	758
08:45	26	231	32	0	13	9	25	0	31	215	14	0	45	15	23	0	679
Total	225	1042	101	0	87	51	179	0	132	886	105	14	153	83	115	3	3176
Grand Total	477	2695	363	0	121	70	258	0	220	2099	171	20	420	146	229	7	7296
Apprch %	13.5	76.2	10.3	0	26.9	15.6	57.5	0	8.8	83.6	6.8	0.8	52.4	18.2	28.6	0.9	
Total %	6.5	36.9	5	0	1.7	1	3.5	0	3	28.8	2.3	0.3	5.8	2	3.1	0.1	
Motorcycles	1	5	0	0	0	0	1	0	1	3	1	0	1	5	1	0	19
% Motorcycles	0.2	0.2	0	0	0	0	0.4	0	0.5	0.1	0.6	0	0.2	3.4	0.4	0	0.3
Cars & Light Goods	462	2592	343	0	117	68	250	0	216	2055	165	0	395	141	223	0	7027
% Cars & Light Goods	96.9	96.2	94.5	0	96.7	97.1	96.9	0	98.2	97.9	96.5	0	94	96.6	97.4	0	96.3
Buses	1	13	7	0	0	1	2	0	1	11	0	0	15	0	1	0	52
% Buses	0.2	0.5	1.9	0	0	1.4	0.8	0	0.5	0.5	0	0	3.6	0	0.4	0	0.7
Single-Unit Trucks	10	65	11	0	4	1	4	0	2	22	2	0	9	0	4	0	134
% Single-Unit Trucks	2.1	2.4	3	0	3.3	1.4	1.6	0	0.9	1	1.2	0	2.1	0	1.7	0	1.8
Articulated Trucks	3	16	1	0	0	0	1	0	0	7	1	0	0	0	0	0	29
% Articulated Trucks	0.6	0.6	0.3	0	0	0	0.4	0	0	0.3	0.6	0	0	0	0	0	0.4
Bicycles on Road	0	4	1	0	0	0	0	0	0	1	2	0	0	0	0	0	8
% Bicycles on Road	0	0.1	0.3	0	0	0	0	0	0	0	1.2	0	0	0	0	0	0.1
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	3	13
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0	42.9	0.2
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	4	14
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	50	0	0	0	57.1	0.2

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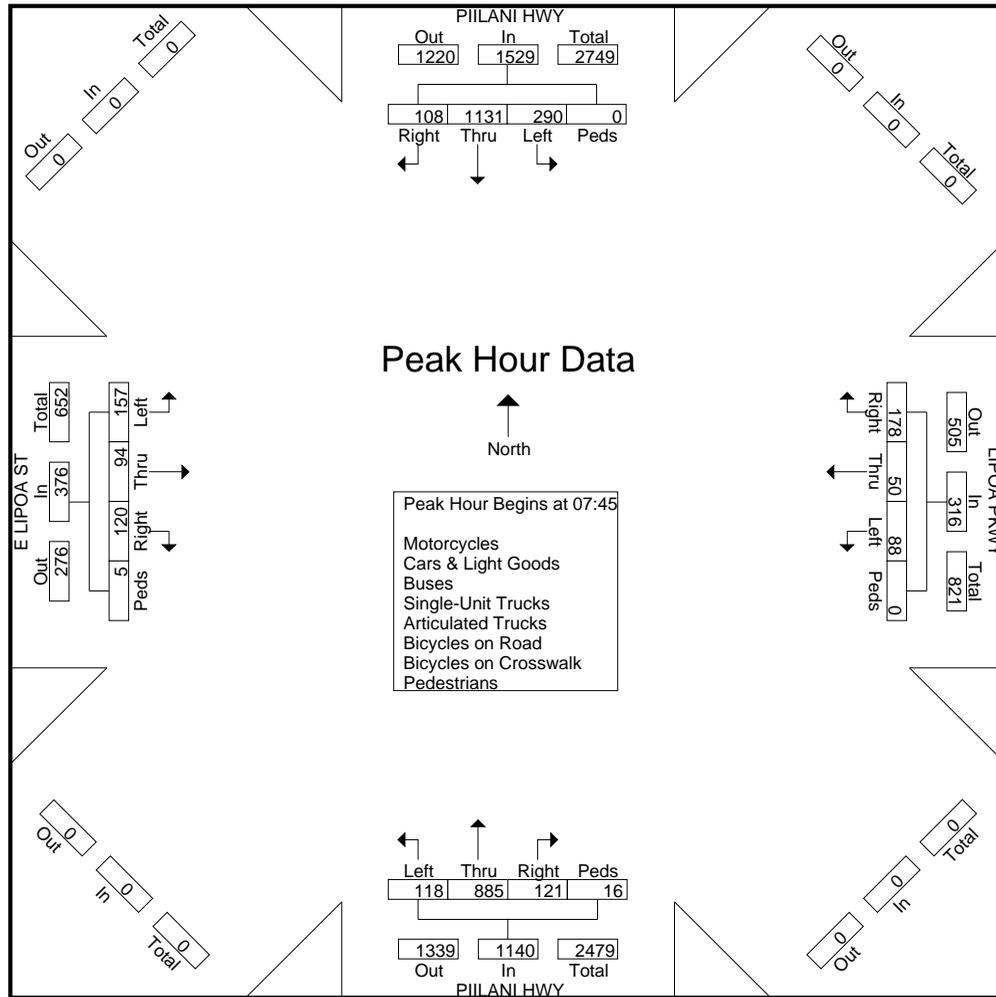
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File Name : Piilani Hwy - E Lipoa St  
 Site Code : 19-514 Liloa Sr Housing TIAR  
 Start Date : 5/7/2019  
 Page No : 2

Start Time	PIILANI HWY SOUTHBOUND					LIPOA PKWY WESTBOUND					PIILANI HWY NORTHBOUND					E LIPOA ST EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:45 to 08:30 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45																					
07:45	91	320	39	0	450	14	8	24	0	46	17	214	30	2	263	49	26	28	2	105	864
08:00	83	248	17	0	348	32	16	58	0	106	26	185	37	5	253	35	30	36	0	101	808
08:15	74	319	24	0	417	17	13	49	0	79	45	258	39	7	349	33	20	30	3	86	931
08:30	42	244	28	0	314	25	13	47	0	85	30	228	15	2	275	40	18	26	0	84	758
Total Volume	290	1131	108	0	1529	88	50	178	0	316	118	885	121	16	1140	157	94	120	5	376	3361
% App. Total	19	74	7.1	0		27.8	15.8	56.3	0		10.4	77.6	10.6	1.4		41.8	25	31.9	1.3		
PHF	.797	.884	.692	.000	.849	.688	.781	.767	.000	.745	.656	.858	.776	.571	.817	.801	.783	.833	.417	.895	.903



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 Site Code : 19-514 Liloa Sr Housing TIAR  
 Start Date : 5/7/2019  
 Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	PIILANI HWY SOUTHBOUND				LIPOA PKWY WESTBOUND				PIILANI HWY NORTHBOUND				E LIPOA ST EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
15:00	19	299	43	0	15	11	63	0	44	288	8	13	50	0	29	10	892
15:15	24	235	29	0	15	13	45	0	50	320	7	2	81	2	34	2	859
15:30	16	359	22	0	12	9	40	0	31	389	10	0	48	7	32	0	975
15:45	28	392	38	0	17	6	33	0	35	333	17	2	48	2	34	2	987
Total	87	1285	132	0	59	39	181	0	160	1330	42	17	227	11	129	14	3713
16:00	14	280	37	0	17	10	42	0	45	321	8	4	49	4	29	1	861
16:15	17	321	38	0	12	15	39	0	33	357	10	1	53	6	27	1	930
16:30	14	306	32	0	14	10	28	0	32	348	7	0	61	5	38	0	895
16:45	19	347	39	0	8	5	36	0	40	305	7	0	45	3	29	0	883
Total	64	1254	146	0	51	40	145	0	150	1331	32	5	208	18	123	2	3569
Grand Total	151	2539	278	0	110	79	326	0	310	2661	74	22	435	29	252	16	7282
Apprch %	5.1	85.5	9.4	0	21.4	15.3	63.3	0	10.1	86.8	2.4	0.7	59.4	4	34.4	2.2	
Total %	2.1	34.9	3.8	0	1.5	1.1	4.5	0	4.3	36.5	1	0.3	6	0.4	3.5	0.2	
Motorcycles	1	9	1	0	1	2	0	0	0	4	0	0	2	0	3	0	23
% Motorcycles	0.7	0.4	0.4	0	0.9	2.5	0	0	0	0.2	0	0	0.5	0	1.2	0	0.3
Cars & Light Goods	148	2500	273	0	108	68	323	0	306	2611	72	0	420	29	247	0	7105
% Cars & Light Goods	98	98.5	98.2	0	98.2	86.1	99.1	0	98.7	98.1	97.3	0	96.6	100	98	0	97.6
Buses	0	17	1	0	0	8	1	0	0	7	0	0	3	0	0	0	37
% Buses	0	0.7	0.4	0	0	10.1	0.3	0	0	0.3	0	0	0.7	0	0	0	0.5
Single-Unit Trucks	2	12	2	0	1	1	2	0	4	35	0	0	10	0	2	0	71
% Single-Unit Trucks	1.3	0.5	0.7	0	0.9	1.3	0.6	0	1.3	1.3	0	0	2.3	0	0.8	0	1
Articulated Trucks	0	1	1	0	0	0	0	0	0	4	0	0	0	0	0	0	6
% Articulated Trucks	0	0	0.4	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0.1
Bicycles on Road	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	2
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	2.7	0	0	0	0	0	0
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	4.5	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	21	0	0	0	16	37
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	95.5	0	0	0	100	0.5

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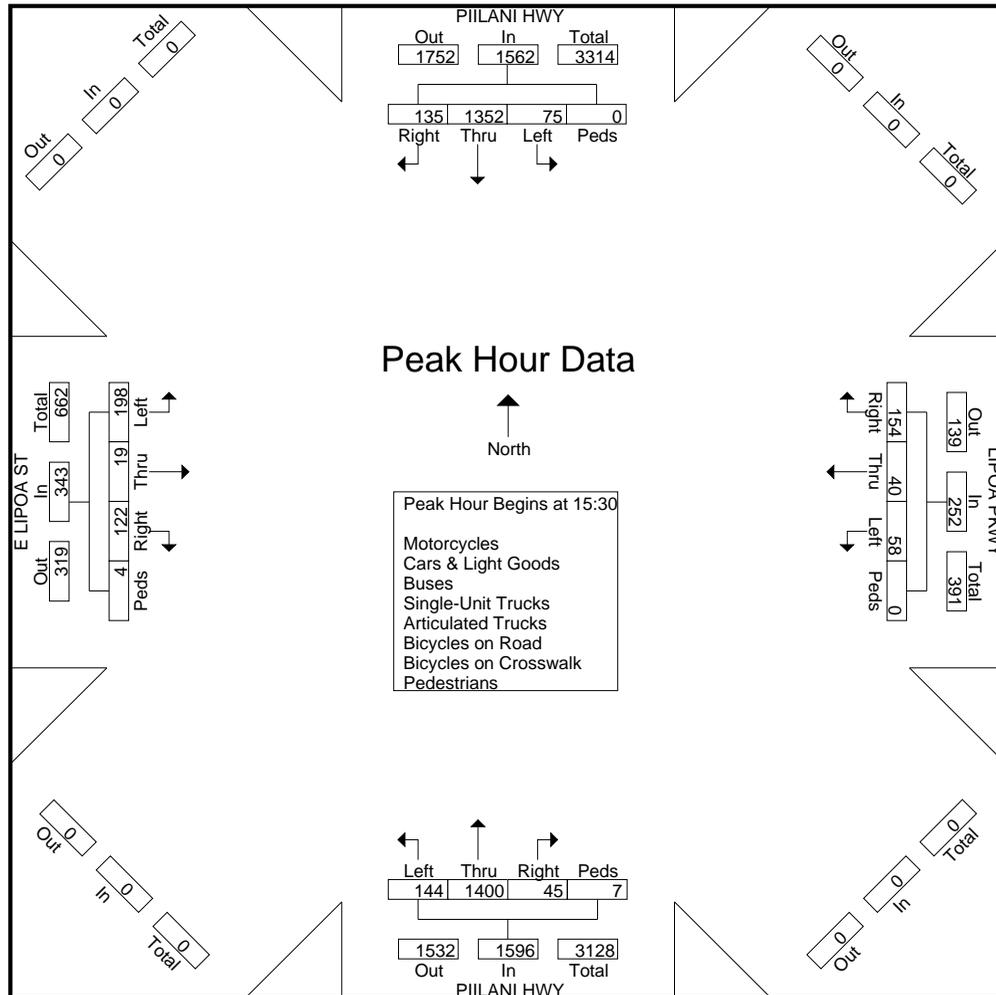
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File Name : Piilani Hwy - E Lipoa St  
 Site Code : 19-514 Liloa Sr Housing TIAR  
 Start Date : 5/7/2019  
 Page No : 2

Start Time	PIILANI HWY SOUTHBOUND					LIPOA PKWY WESTBOUND					PIILANI HWY NORTHBOUND					E LIPOA ST EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 15:00 to 16:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	16	359	22	0	397	12	9	40	0	61	31	<b>389</b>	10	0	<b>430</b>	48	7	32	0	<b>87</b>	975
15:45	<b>28</b>	<b>392</b>	<b>38</b>	0	<b>458</b>	<b>17</b>	6	33	0	56	35	333	<b>17</b>	2	387	48	2	<b>34</b>	<b>2</b>	86	<b>987</b>
16:00	14	280	37	0	331	17	10	<b>42</b>	0	<b>69</b>	<b>45</b>	321	8	4	378	49	4	29	1	83	861
16:15	17	321	38	0	376	12	<b>15</b>	39	0	66	33	357	10	1	401	<b>53</b>	6	27	1	87	930
Total Volume	75	1352	135	0	1562	58	40	154	0	252	144	1400	45	7	1596	198	19	122	4	343	3753
% App. Total	4.8	86.6	8.6	0		23	15.9	61.1	0		9	87.7	2.8	0.4		57.7	5.5	35.6	1.2		
PHF	.670	.862	.888	.000	.853	.853	.667	.917	.000	.913	.800	.900	.662	.438	.928	.934	.679	.897	.500	.986	.951





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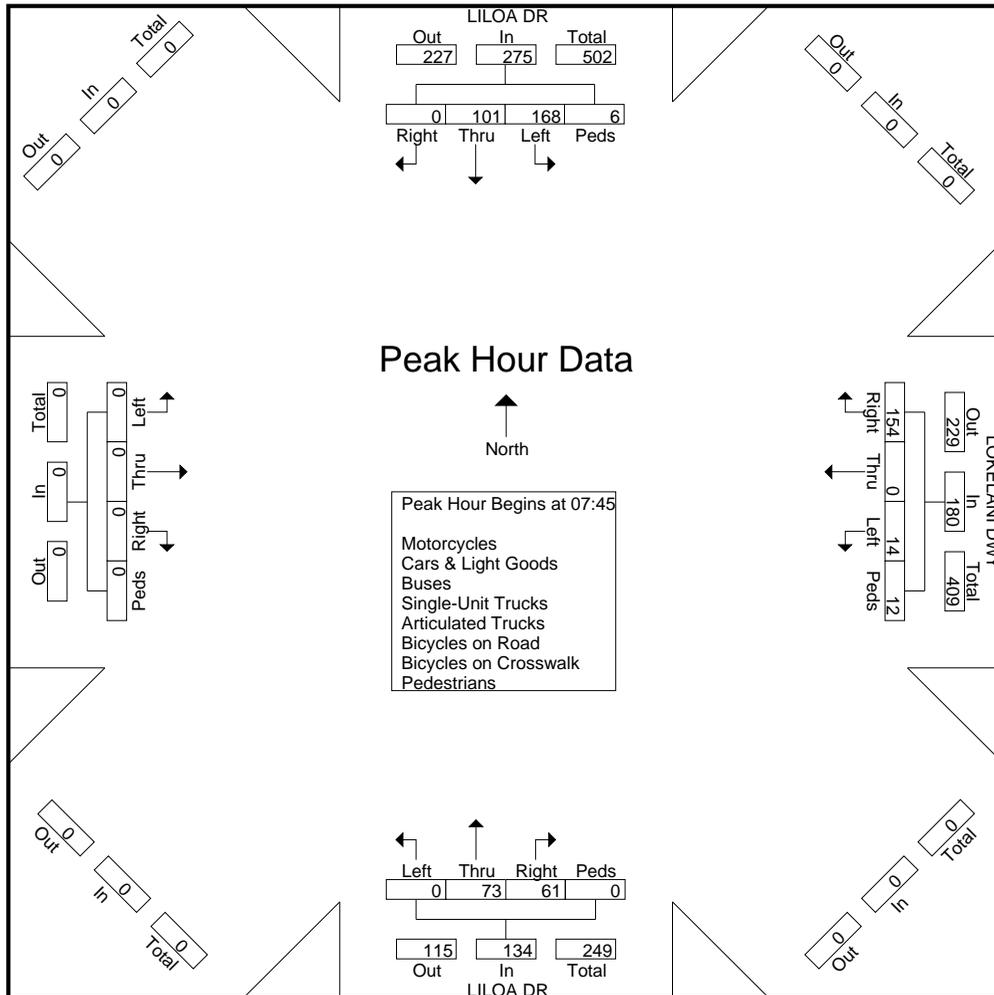
File Name : Liloa Dr - Lokelani Dwy

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	LILOA DR SOUTHBOUND					LOKELANI DWY WESTBOUND					LILOA DR NORTHBOUND					EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:45 to 08:30 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45																					
07:45	49	30	0	5	84	2	0	32	3	37	0	16	16	0	32	0	0	0	0	0	153
08:00	42	29	0	1	72	5	0	41	2	48	0	24	20	0	44	0	0	0	0	0	164
08:15	62	21	0	0	83	7	0	58	5	70	0	18	20	0	38	0	0	0	0	0	191
08:30	15	21	0	0	36	0	0	23	2	25	0	15	5	0	20	0	0	0	0	0	81
Total Volume	168	101	0	6	275	14	0	154	12	180	0	73	61	0	134	0	0	0	0	0	589
% App. Total	61.1	36.7	0	2.2		7.8	0	85.6	6.7		0	54.5	45.5	0		0	0	0	0		
PHF	.677	.842	.000	.300	.818	.500	.000	.664	.600	.643	.000	.760	.763	.000	.761	.000	.000	.000	.000	.000	.771



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File Name : Liloa Dr - Lokelani Dwy  
 Site Code : 19-514 Liloa Sr Housing TIAR  
 Start Date : 5/7/2019  
 Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	LILOA DR SOUTHBOUND				LOKELANI DWY WESTBOUND				LILOA DR NORTHBOUND				EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
15:00	9	25	0	0	1	0	17	2	0	27	3	0	0	0	0	0	84
15:15	3	24	0	1	0	0	10	1	0	27	2	2	0	0	0	0	70
15:30	5	24	0	0	0	0	3	1	0	39	1	0	0	0	0	0	73
15:45	3	31	0	0	0	0	6	1	0	33	2	0	0	0	0	0	76
Total	20	104	0	1	1	0	36	5	0	126	8	2	0	0	0	0	303
16:00	3	30	0	1	0	0	7	0	0	41	0	0	0	0	0	0	82
16:15	4	27	0	0	0	0	7	1	0	35	1	0	0	0	0	0	75
16:30	7	27	0	1	2	0	15	2	0	41	0	0	0	0	0	0	95
16:45	5	18	0	0	1	0	7	0	0	26	1	0	0	0	0	0	58
Total	19	102	0	2	3	0	36	3	0	143	2	0	0	0	0	0	310
Grand Total	39	206	0	3	4	0	72	8	0	269	10	2	0	0	0	0	613
Apprch %	15.7	83.1	0	1.2	4.8	0	85.7	9.5	0	95.7	3.6	0.7	0	0	0	0	
Total %	6.4	33.6	0	0.5	0.7	0	11.7	1.3	0	43.9	1.6	0.3	0	0	0	0	
Motorcycles	0	3	0	0	0	0	0	0	0	3	0	0	0	0	0	0	6
% Motorcycles	0	1.5	0	0	0	0	0	0	0	1.1	0	0	0	0	0	0	1
Cars & Light Goods	39	196	0	0	4	0	72	0	0	255	9	0	0	0	0	0	575
% Cars & Light Goods	100	95.1	0	0	100	0	100	0	0	94.8	90	0	0	0	0	0	93.8
Buses	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
% Buses	0	0	0	0	0	0	0	0	0	0.4	0	0	0	0	0	0	0.2
Single-Unit Trucks	0	6	0	0	0	0	0	0	0	6	0	0	0	0	0	0	12
% Single-Unit Trucks	0	2.9	0	0	0	0	0	0	0	2.2	0	0	0	0	0	0	2
Articulated Trucks	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
% Articulated Trucks	0	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.2
Bicycles on Road	0	0	0	0	0	0	0	0	0	4	1	0	0	0	0	0	5
% Bicycles on Road	0	0	0	0	0	0	0	0	0	1.5	10	0	0	0	0	0	0.8
Bicycles on Crosswalk	0	0	0	1	0	0	0	5	0	0	0	0	0	0	0	0	6
% Bicycles on Crosswalk	0	0	0	33.3	0	0	0	62.5	0	0	0	0	0	0	0	0	1
Pedestrians	0	0	0	2	0	0	0	3	0	0	0	2	0	0	0	0	7
% Pedestrians	0	0	0	66.7	0	0	0	37.5	0	0	0	100	0	0	0	0	1.1

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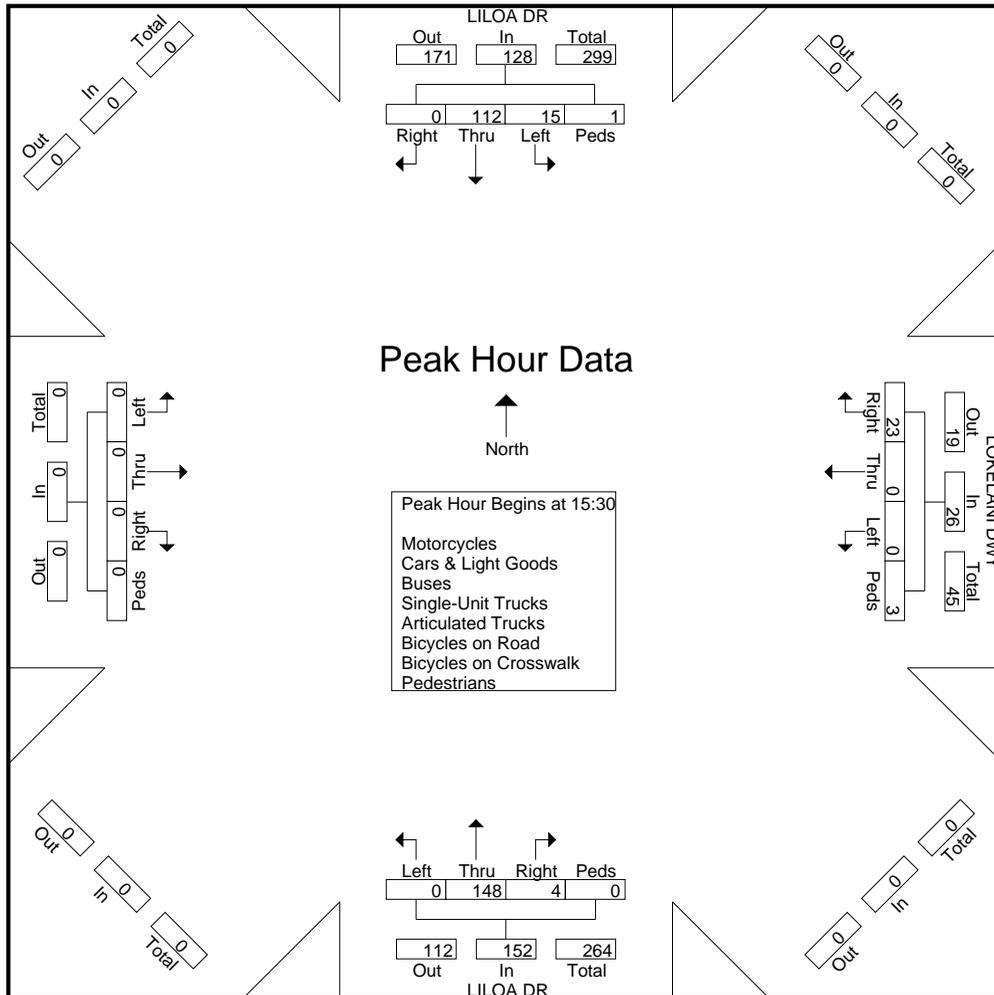
File Name : Liloa Dr - Lokelani Dwy

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	LILOA DR SOUTHBOUND					LOKELANI DWY WESTBOUND					LILOA DR NORTHBOUND					EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	5	24	0	0	29	0	0	3	1	4	0	39	1	0	40	0	0	0	0	0	73
15:45	3	31	0	0	34	0	0	6	1	7	0	33	2	0	35	0	0	0	0	0	76
16:00	3	30	0	1	34	0	0	7	0	7	0	41	0	0	41	0	0	0	0	0	82
16:15	4	27	0	0	31	0	0	7	1	8	0	35	1	0	36	0	0	0	0	0	75
Total Volume	15	112	0	1	128	0	0	23	3	26	0	148	4	0	152	0	0	0	0	0	306
% App. Total	11.7	87.5	0	0.8		0	0	88.5	11.5		0	97.4	2.6	0		0	0	0	0		
PHF	.750	.903	.000	.250	.941	.000	.000	.821	.750	.813	.000	.902	.500	.000	.927	.000	.000	.000	.000	.000	.933





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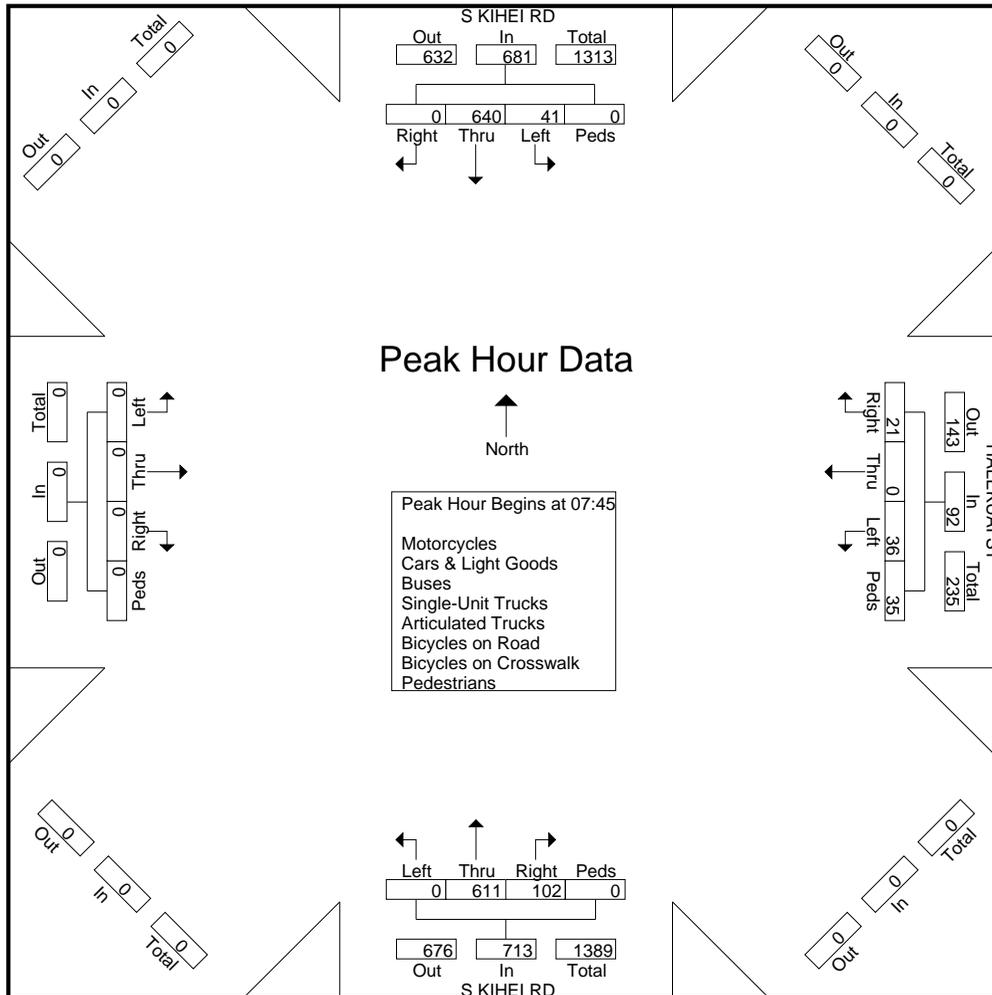
File Name : S Kihei Rd - Halekuai St

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	S KIHEI RD SOUTHBOUND					HALEKUAI ST WESTBOUND					S KIHEI RD NORTHBOUND					EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 06:00 to 08:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45																					
07:45	13	175	0	0	188	6	0	6	6	18	0	157	23	0	180	0	0	0	0	0	386
08:00	9	146	0	0	155	8	0	6	12	26	0	142	32	0	174	0	0	0	0	0	355
08:15	9	173	0	0	182	16	0	7	7	30	0	137	30	0	167	0	0	0	0	0	379
08:30	10	146	0	0	156	6	0	2	10	18	0	175	17	0	192	0	0	0	0	0	366
Total Volume	41	640	0	0	681	36	0	21	35	92	0	611	102	0	713	0	0	0	0	0	1486
% App. Total	6	94	0	0		39.1	0	22.8	38		0	85.7	14.3	0		0	0	0	0		
PHF	.788	.914	.000	.000	.906	.563	.000	.750	.729	.767	.000	.873	.797	.000	.928	.000	.000	.000	.000	.000	.962





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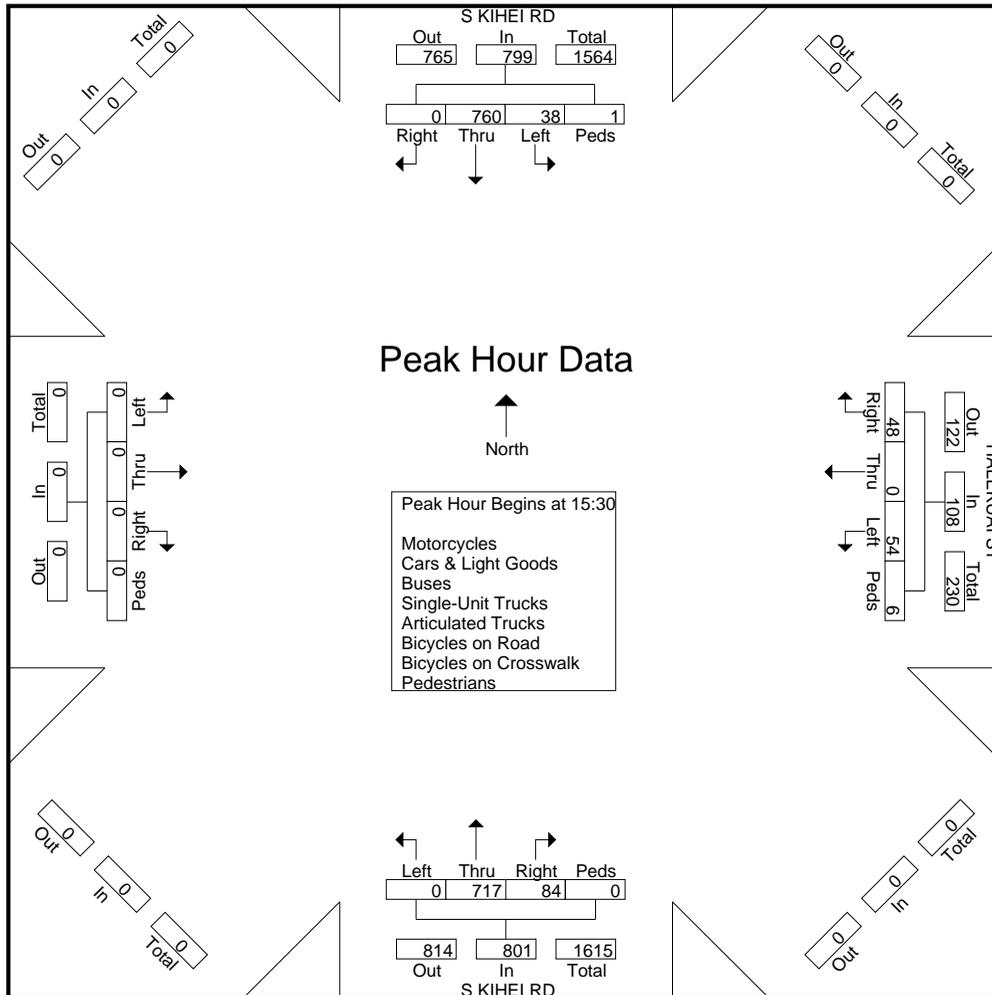
File Name : S Kihei Rd - Halekuai St

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	S KIHEI RD SOUTHBOUND					HALEKUAI ST WESTBOUND					S KIHEI RD NORTHBOUND					EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	15	186	0	0	201	11	0	15	1	27	0	187	17	0	204	0	0	0	0	0	432
15:45	7	160	0	0	167	18	0	10	4	32	0	170	18	0	188	0	0	0	0	0	387
16:00	5	213	0	0	218	15	0	12	0	27	0	166	26	0	192	0	0	0	0	0	437
16:15	11	201	0	1	213	10	0	11	1	22	0	194	23	0	217	0	0	0	0	0	452
Total Volume	38	760	0	1	799	54	0	48	6	108	0	717	84	0	801	0	0	0	0	0	1708
% App. Total	4.8	95.1	0	0.1		50	0	44.4	5.6		0	89.5	10.5	0		0	0	0	0		
PHF	.633	.892	.000	.250	.916	.750	.000	.800	.375	.844	.000	.924	.808	.000	.923	.000	.000	.000	.000	.000	.945



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File Name : S Kihei Rd - Halekuai St

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	S KIHEI RD SOUTHBOUND				HALEKUA I ST WESTBOUND				S KIHEI RD NORTHBOUND				EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
06:00	5	56	0	0	1	0	2	11	0	53	7	0	0	0	0	0	135
06:15	4	71	0	0	3	0	6	5	0	67	4	0	0	0	0	0	160
06:30	2	75	0	1	0	0	2	2	0	95	4	0	0	0	0	0	181
06:45	11	84	0	0	4	0	3	5	0	104	5	0	0	0	0	0	216
Total	22	286	0	1	8	0	13	23	0	319	20	0	0	0	0	0	692
07:00	4	83	0	0	5	0	1	4	0	106	6	0	0	0	0	0	209
07:15	11	103	0	0	4	0	1	8	0	141	20	0	0	0	0	0	288
07:30	16	119	0	0	8	0	5	6	0	147	17	0	0	0	0	0	318
07:45	13	175	0	0	6	0	6	6	0	157	23	0	0	0	0	0	386
Total	44	480	0	0	23	0	13	24	0	551	66	0	0	0	0	0	1201
08:00	9	146	0	0	8	0	6	12	0	142	32	0	0	0	0	0	355
08:15	9	173	0	0	16	0	7	7	0	137	30	0	0	0	0	0	379
08:30	10	146	0	0	6	0	2	10	0	175	17	0	0	0	0	0	366
08:45	10	133	0	0	7	0	13	5	0	173	20	0	0	0	0	0	361
Total	38	598	0	0	37	0	28	34	0	627	99	0	0	0	0	0	1461
09:00	16	157	0	0	9	0	7	12	0	153	13	0	0	0	0	0	367
09:15	8	150	0	0	6	0	8	3	0	165	12	0	0	0	0	0	352
09:30	13	131	0	0	9	0	8	7	0	132	21	0	0	0	0	0	321
09:45	10	166	0	0	13	0	16	9	0	168	20	0	0	0	0	0	402
Total	47	604	0	0	37	0	39	31	0	618	66	0	0	0	0	0	1442
10:00	13	149	0	0	8	0	7	12	0	151	18	0	0	0	0	0	358
10:15	10	154	0	0	11	0	12	5	0	161	19	0	0	0	0	0	372
10:30	11	149	0	1	9	0	14	2	0	151	18	0	0	0	0	0	355
10:45	7	150	0	0	8	0	19	6	0	168	20	0	0	0	0	0	378
Total	41	602	0	1	36	0	52	25	0	631	75	0	0	0	0	0	1463
11:00	14	171	0	0	9	0	13	6	0	168	18	0	0	0	0	0	399
11:15	13	167	0	0	11	0	13	0	0	156	18	0	0	0	0	0	378
11:30	6	134	0	0	11	0	11	0	0	172	20	0	0	0	0	0	354
11:45	11	176	0	0	14	0	17	5	0	183	29	0	0	0	0	0	435
Total	44	648	0	0	45	0	54	11	0	679	85	0	0	0	0	0	1566
12:00	6	173	0	0	13	0	24	2	0	167	12	0	0	0	0	0	397
12:15	12	136	0	0	9	0	16	2	0	177	13	0	0	0	0	0	365
12:30	13	163	0	1	10	0	18	2	0	182	13	0	0	0	0	0	402
12:45	12	154	0	0	10	0	20	4	0	180	32	0	0	0	0	0	412
Total	43	626	0	1	42	0	78	10	0	706	70	0	0	0	0	0	1576
13:00	13	173	0	0	19	0	17	1	0	163	19	0	0	0	0	0	405
13:15	9	167	0	0	5	0	12	2	0	181	12	0	0	0	0	0	388
13:30	9	180	0	0	13	0	21	12	0	173	14	0	0	0	0	0	422
13:45	10	178	0	0	9	0	15	4	0	182	24	0	0	0	0	0	422
Total	41	698	0	0	46	0	65	19	0	699	69	0	0	0	0	0	1637
14:00	14	167	0	0	5	0	13	5	0	180	34	0	0	0	0	0	418
14:15	7	183	0	0	18	0	11	12	0	175	32	0	0	0	0	0	438
14:30	8	181	0	0	13	0	10	4	0	155	18	0	0	0	0	0	389
14:45	8	190	0	0	25	0	22	0	0	192	25	0	0	0	0	0	462
Total	37	721	0	0	61	0	56	21	0	702	109	0	0	0	0	0	1707
15:00	7	199	0	0	10	0	16	1	0	182	14	0	0	0	0	0	429
15:15	3	190	0	0	8	0	15	1	0	189	23	0	0	0	0	0	429



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File Name : S Kihei Rd - Lipoa St

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	S KIHEI RD SOUTHBOUND				E LIPOA ST WESTBOUND				S KIHEI RD NORTHBOUND				W LIPOA ST EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
06:30	21	75	6	1	4	2	5	3	11	62	21	0	2	4	8	0	225
06:45	11	61	9	10	9	13	11	3	10	67	30	1	5	5	9	3	257
Total	32	136	15	11	13	15	16	6	21	129	51	1	7	9	17	3	482
07:00	25	83	3	3	9	0	17	4	8	80	30	0	3	4	8	1	278
07:15	36	99	2	6	17	2	12	2	5	101	39	0	7	4	6	1	339
07:30	56	119	1	7	13	2	32	8	5	97	43	0	10	8	15	1	417
07:45	48	152	3	4	15	4	27	5	10	108	49	0	9	8	20	4	466
Total	165	453	9	20	54	8	88	19	28	386	161	0	29	24	49	7	1500
08:00	36	135	3	6	20	5	28	7	9	117	31	0	15	14	14	0	440
08:15	32	145	2	2	35	6	38	6	11	101	39	0	5	12	15	2	451
08:30	25	113	2	0	20	7	32	0	7	130	43	0	13	11	6	0	409
08:45	30	112	4	0	22	10	35	0	4	125	58	0	10	6	13	1	430
Total	123	505	11	8	97	28	133	13	31	473	171	0	43	43	48	3	1730
Grand Total	320	1094	35	39	164	51	237	38	80	988	383	1	79	76	114	13	3712
Apprch %	21.5	73.5	2.4	2.6	33.5	10.4	48.4	7.8	5.5	68	26.4	0.1	28	27	40.4	4.6	
Total %	8.6	29.5	0.9	1.1	4.4	1.4	6.4	1	2.2	26.6	10.3	0	2.1	2	3.1	0.4	
Motorcycles	3	27	0	0	4	1	0	0	1	13	2	0	0	0	6	0	57
% Motorcycles	0.9	2.5	0	0	2.4	2	0	0	1.2	1.3	0.5	0	0	0	5.3	0	1.5
Cars & Light Goods	311	1039	33	0	156	48	235	0	77	949	368	0	79	71	98	0	3464
% Cars & Light Goods	97.2	95	94.3	0	95.1	94.1	99.2	0	96.2	96.1	96.1	0	100	93.4	86	0	93.3
Buses	2	4	1	0	2	0	0	0	1	2	4	0	0	2	0	0	18
% Buses	0.6	0.4	2.9	0	1.2	0	0	0	1.2	0.2	1	0	0	2.6	0	0	0.5
Single-Unit Trucks	3	18	1	0	2	1	2	0	0	9	5	0	0	3	3	0	47
% Single-Unit Trucks	0.9	1.6	2.9	0	1.2	2	0.8	0	0	0.9	1.3	0	0	3.9	2.6	0	1.3
Articulated Trucks	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Bicycles on Road	1	6	0	0	0	1	0	0	1	14	4	0	0	0	7	0	34
% Bicycles on Road	0.3	0.5	0	0	0	2	0	0	1.2	1.4	1	0	0	0	6.1	0	0.9
Bicycles on Crosswalk	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	4
% Bicycles on Crosswalk	0	0	0	0	0	0	0	10.5	0	0	0	0	0	0	0	0	0.1
Pedestrians	0	0	0	39	0	0	0	34	0	0	0	1	0	0	0	13	87
% Pedestrians	0	0	0	100	0	0	0	89.5	0	0	0	100	0	0	0	100	2.3

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Wailuku, Hawaii 96793

Phone: (808) 224-8044 Fax: (808) 242-9163

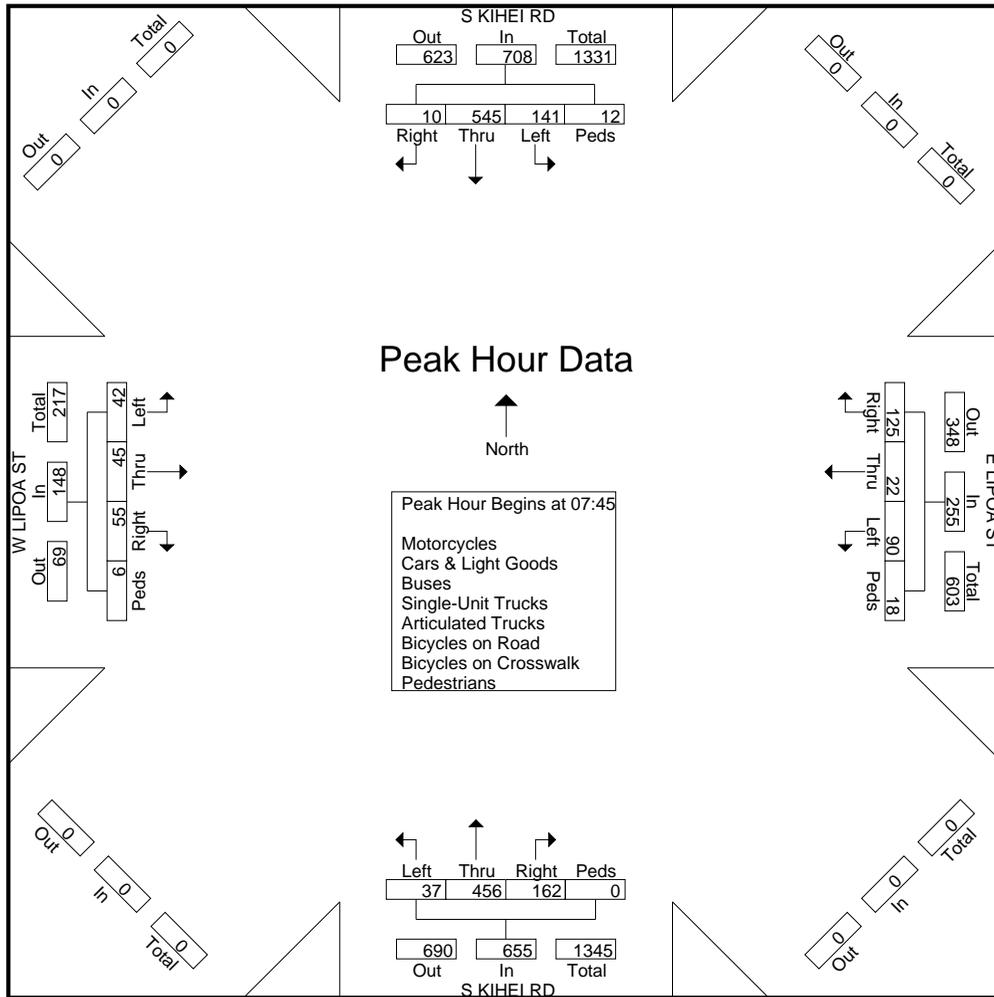
File Name : S Kihei Rd - Lipoa St

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	S KIHEI RD SOUTHBOUND					E LIPOA ST WESTBOUND					S KIHEI RD NORTHBOUND					W LIPOA ST EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:45 to 08:30 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45																					
07:45	48	152	3	4	207	15	4	27	5	51	10	108	49	0	167	9	8	20	4	41	466
08:00	36	135	3	6	180	20	5	28	7	60	9	117	31	0	157	15	14	14	0	43	440
08:15	32	145	2	2	181	35	6	38	6	85	11	101	39	0	151	5	12	15	2	34	451
08:30	25	113	2	0	140	20	7	32	0	59	7	130	43	0	180	13	11	6	0	30	409
Total Volume	141	545	10	12	708	90	22	125	18	255	37	456	162	0	655	42	45	55	6	148	1766
% App. Total	19.9	77	1.4	1.7		35.3	8.6	49	7.1		5.6	69.6	24.7	0		28.4	30.4	37.2	4.1		
PHF	.734	.896	.833	.500	.855	.643	.786	.822	.643	.750	.841	.877	.827	.000	.910	.700	.804	.688	.375	.860	.947



# Austin Tsutsumi & Associates

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Wailuku, Hawaii 96793

Phone: (808) 224-8044 Fax: (808) 242-9163

File Name : Liloa Dr - Halekuai St  
 Site Code : 19-514 Liloa Sr Housing TIAR  
 Start Date : 5/7/2019  
 Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	LILOA DR SOUTHBOUND				WESTBOUND				LILOA DR NORTHBOUND				HALEKUAI ST EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
15:00	0	3	23	0	0	0	0	0	2	5	0	0	24	0	4	1	62
15:15	0	2	22	0	0	0	0	0	2	4	0	0	25	0	2	0	57
15:30	0	3	21	0	0	0	0	0	3	10	0	0	30	0	4	0	71
15:45	0	7	24	0	0	0	0	0	5	7	0	0	28	0	2	0	73
Total	0	15	90	0	0	0	0	0	12	26	0	0	107	0	12	1	263
16:00	0	11	18	0	0	0	0	0	4	7	0	3	36	0	5	0	84
16:15	0	13	15	0	0	0	0	0	4	12	0	0	22	0	9	0	75
16:30	0	6	24	0	0	0	0	0	1	12	0	3	29	0	1	2	78
16:45	0	3	16	0	0	0	0	0	2	3	0	0	23	0	2	0	49
Total	0	33	73	0	0	0	0	0	11	34	0	6	110	0	17	2	286
Grand Total	0	48	163	0	0	0	0	0	23	60	0	6	217	0	29	3	549
Apprch %	0	22.7	77.3	0	0	0	0	0	25.8	67.4	0	6.7	87.1	0	11.6	1.2	
Total %	0	8.7	29.7	0	0	0	0	0	4.2	10.9	0	1.1	39.5	0	5.3	0.5	
Motorcycles	0	0	3	0	0	0	0	0	0	0	0	0	3	0	0	0	6
% Motorcycles	0	0	1.8	0	0	0	0	0	0	0	0	0	1.4	0	0	0	1.1
Cars & Light Goods	0	47	157	0	0	0	0	0	23	57	0	0	206	0	29	0	519
% Cars & Light Goods	0	97.9	96.3	0	0	0	0	0	100	95	0	0	94.9	0	100	0	94.5
Buses	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0.5	0	0	0	0.2
Single-Unit Trucks	0	1	3	0	0	0	0	0	0	2	0	0	3	0	0	0	9
% Single-Unit Trucks	0	2.1	1.8	0	0	0	0	0	0	3.3	0	0	1.4	0	0	0	1.6
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	0	0	0	0	1	0	0	4	0	0	0	5
% Bicycles on Road	0	0	0	0	0	0	0	0	0	1.7	0	0	1.8	0	0	0	0.9
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66.7	0.4
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	1	7
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	33.3	1.3

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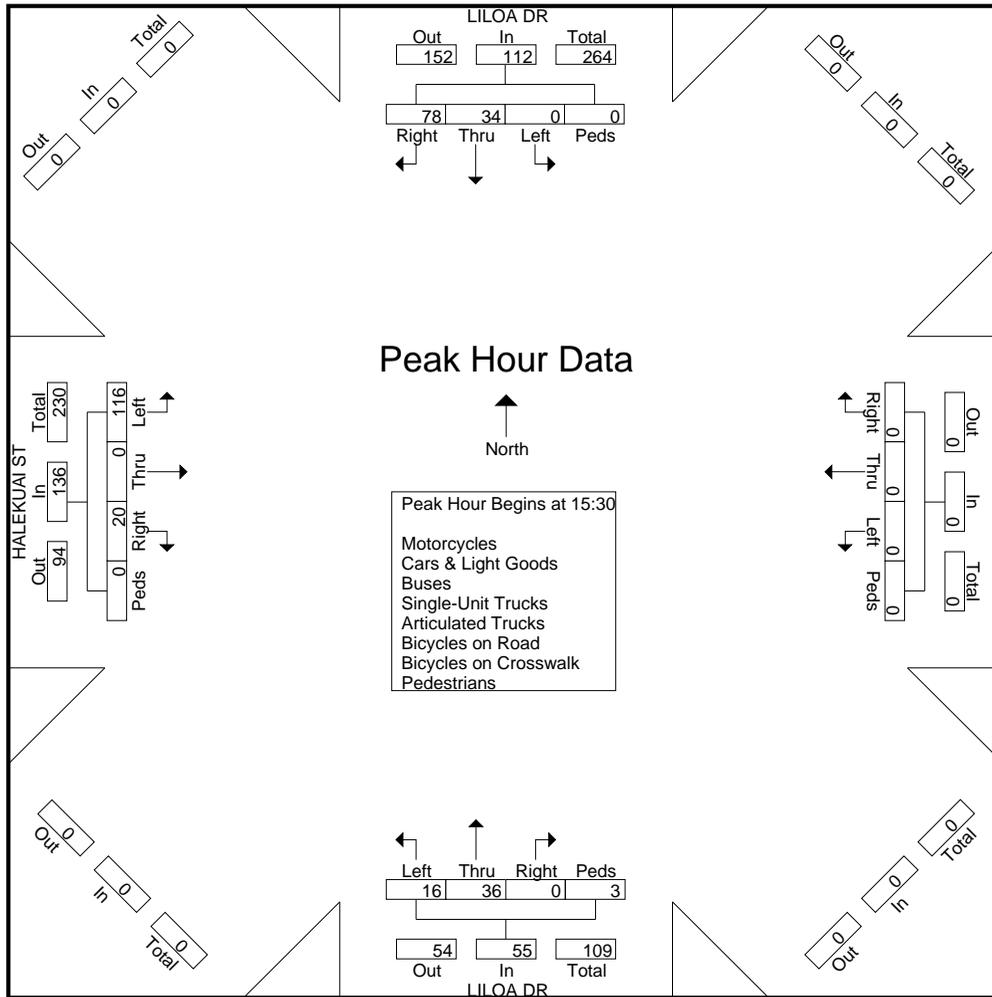
1871 Wili Pa Loop, Suite A

Wailuku, Hawaii 96793

Phone: (808) 224-8044 Fax: (808) 242-9163

File Name : Liloa Dr - Halekuai St  
 Site Code : 19-514 Liloa Sr Housing TIAR  
 Start Date : 5/7/2019  
 Page No : 2

Start Time	LILOA DR SOUTHBOUND					WESTBOUND					LILOA DR NORTHBOUND					HALEKUAI ST EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	0	3	21	0	24	0	0	0	0	0	3	10	0	0	13	30	0	4	0	34	71
15:45	0	7	24	0	31	0	0	0	0	0	5	7	0	0	12	28	0	2	0	30	73
16:00	0	11	18	0	29	0	0	0	0	0	4	7	0	3	14	36	0	5	0	41	84
16:15	0	13	15	0	28	0	0	0	0	0	4	12	0	0	16	22	0	9	0	31	75
Total Volume	0	34	78	0	112	0	0	0	0	0	16	36	0	3	55	116	0	20	0	136	303
% App. Total	0	30.4	69.6	0		0	0	0	0		29.1	65.5	0	5.5		85.3	0	14.7	0		
PHF	.000	.654	.813	.000	.903	.000	.000	.000	.000	.000	.800	.750	.000	.250	.859	.806	.000	.556	.000	.829	.902



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Phone: (808) 224-8044 Fax: (808) 242-9163

File Name : Liloa Dr - S Maui Regional Dwy

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	LILOA DR SOUTHBOUND				S MAUI REGIONAL PK DWY WESTBOUND				NORTHBOUND				EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
06:30	6	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	9
06:45	6	0	0	1	0	0	3	0	0	0	0	0	0	0	0	0	10
<b>Total</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>19</b>
07:00	2	0	0	1	0	0	4	2	0	0	0	0	0	0	0	0	9
07:15	3	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	7
07:30	9	0	0	0	0	0	5	3	0	0	0	0	0	0	0	0	17
07:45	6	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	12
<b>Total</b>	<b>20</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>15</b>	<b>9</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>45</b>
08:00	6	0	0	1	0	0	8	1	0	0	0	0	0	0	0	0	16
08:15	7	0	0	0	0	0	5	3	0	0	0	0	0	0	0	0	15
08:30	7	0	0	0	0	0	5	1	0	0	0	0	0	0	0	0	13
08:45	4	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	10
<b>Total</b>	<b>24</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>54</b>
<b>Grand Total</b>	<b>56</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>43</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>118</b>
Apprch %	94.9	0	0	5.1	0	0	72.9	27.1	0	0	0	0	0	0	0	0	
Total %	47.5	0	0	2.5	0	0	36.4	13.6	0	0	0	0	0	0	0	0	
Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Motorcycles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cars & Light Goods	51	0	0	0	0	0	39	0	0	0	0	0	0	0	0	0	90
% Cars & Light Goods	91.1	0	0	0	0	0	90.7	0	0	0	0	0	0	0	0	0	76.3
Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Buses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Single-Unit Trucks	3	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	6
% Single-Unit Trucks	5.4	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	5.1
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Road	2	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3
% Bicycles on Road	3.6	0	0	0	0	0	2.3	0	0	0	0	0	0	0	0	0	2.5
Bicycles on Crosswalk	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	6
% Bicycles on Crosswalk	0	0	0	0	0	0	0	37.5	0	0	0	0	0	0	0	0	5.1
Pedestrians	0	0	0	3	0	0	0	10	0	0	0	0	0	0	0	0	13
% Pedestrians	0	0	0	100	0	0	0	62.5	0	0	0	0	0	0	0	0	11

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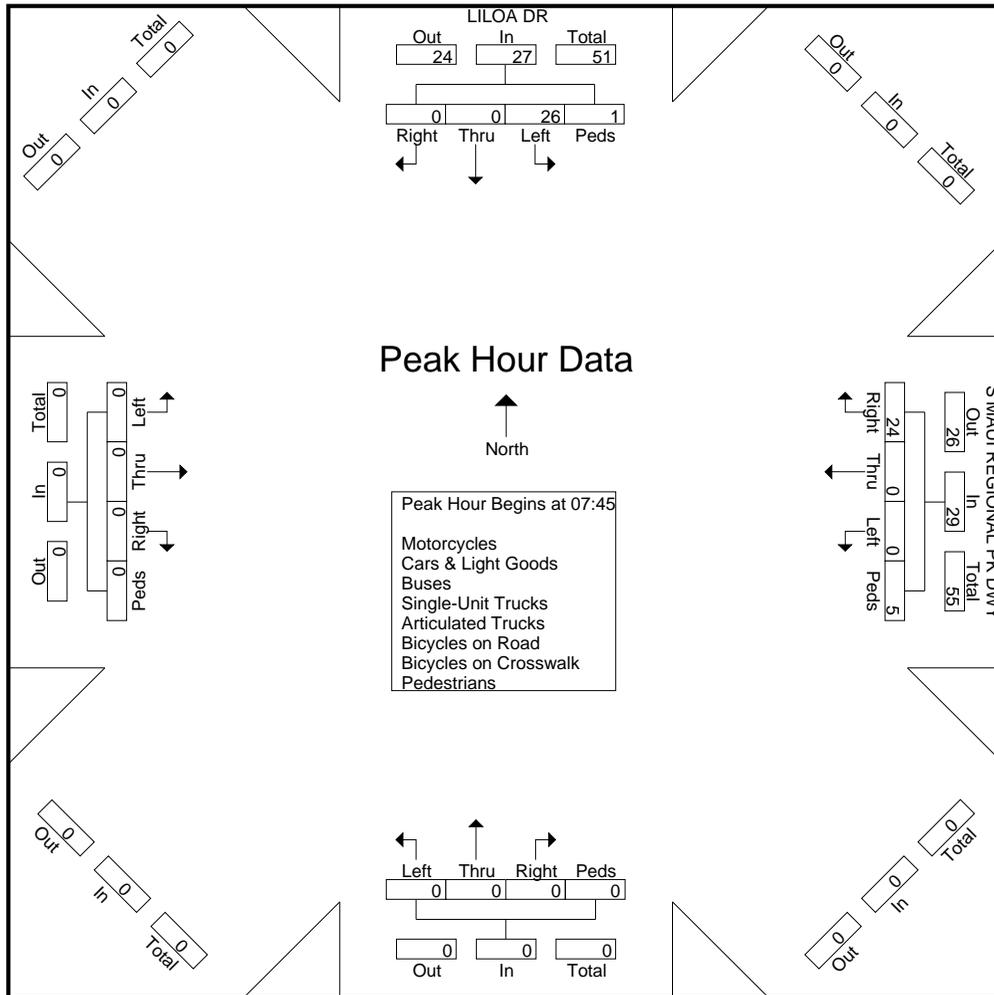
File Name : Liloa Dr - S Maui Regional Dwy

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	LILOA DR SOUTHBOUND					S MAUI REGIONAL PK DWY WESTBOUND					NORTHBOUND					EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:45 to 08:30 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45																					
07:45	6	0	0	0	6	0	0	6	0	6	0	0	0	0	0	0	0	0	0	0	12
08:00	6	0	0	1	7	0	0	8	1	9	0	0	0	0	0	0	0	0	0	0	16
08:15	7	0	0	0	7	0	0	5	3	8	0	0	0	0	0	0	0	0	0	0	15
08:30	7	0	0	0	7	0	0	5	1	6	0	0	0	0	0	0	0	0	0	0	13
Total Volume	26	0	0	1	27	0	0	24	5	29	0	0	0	0	0	0	0	0	0	0	56
% App. Total	96.3	0	0	3.7		0	0	82.8	17.2		0	0	0	0		0	0	0	0		
PHF	.929	.000	.000	.250	.964	.000	.000	.750	.417	.806	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.875





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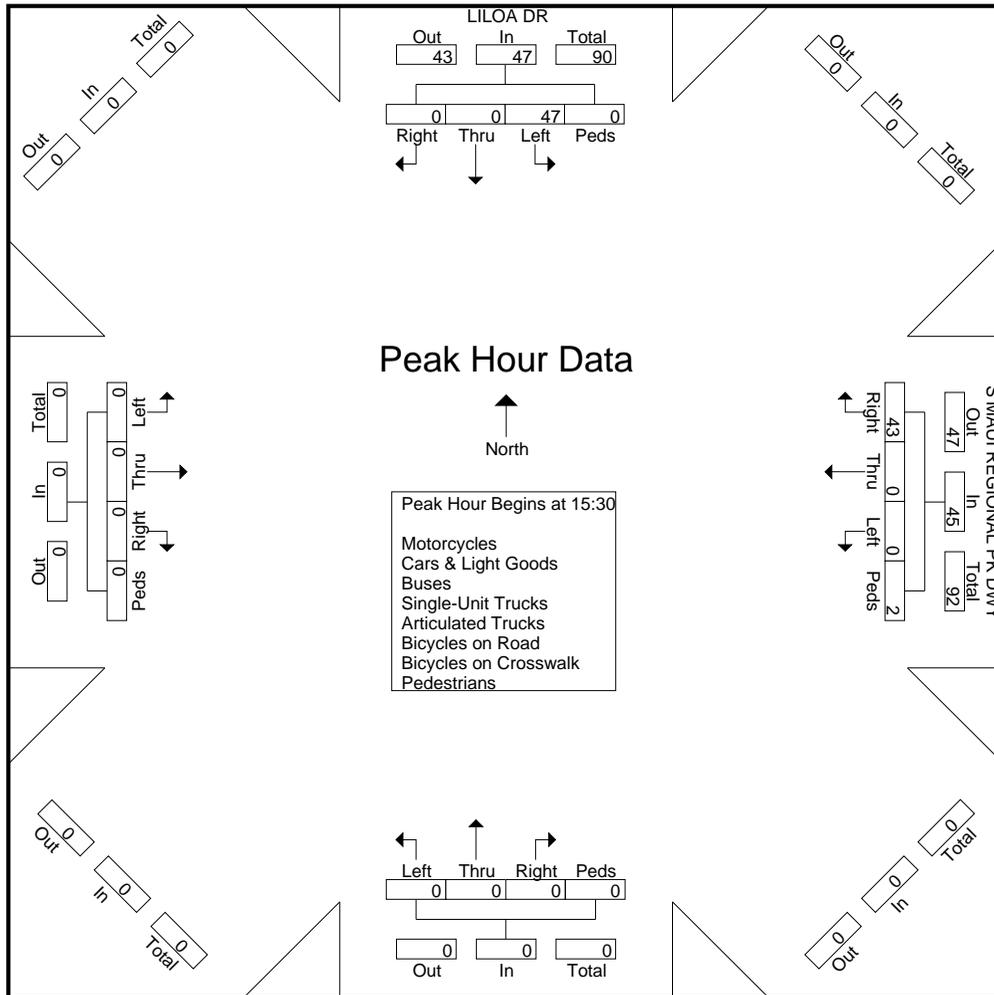
File Name : Liloa Dr - S Maui Regional Dwy

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	LILOA DR SOUTHBOUND					S MAUI REGIONAL PK DWY WESTBOUND					NORTHBOUND					EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	5	0	0	0	5	0	0	10	1	11	0	0	0	0	0	0	0	0	0	0	16
15:45	5	0	0	0	5	0	0	12	0	12	0	0	0	0	0	0	0	0	0	0	17
16:00	18	0	0	0	18	0	0	7	1	8	0	0	0	0	0	0	0	0	0	0	26
16:15	19	0	0	0	19	0	0	14	0	14	0	0	0	0	0	0	0	0	0	0	33
Total Volume	47	0	0	0	47	0	0	43	2	45	0	0	0	0	0	0	0	0	0	0	92
% App. Total	100	0	0	0		0	0	95.6	4.4		0	0	0	0		0	0	0	0		
PHF	.618	.000	.000	.000	.618	.000	.000	.768	.500	.804	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.697



# Austin Tsutsumi & Associates

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Phone: (808) 224-8044 Fax: (808) 242-9163

File Name : S Kihei Rd - E Welakahao Rd

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	S KIHEI RD SOUTHBOUND				E WELAKAHAO RD WESTBOUND				S KIHEI RD NORTHBOUND				W WELAKAHAO RD EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
06:30	5	72	2	0	4	0	17	0	1	70	3	2	3	1	1	3	184
06:45	4	76	3	0	7	3	15	3	1	89	4	0	7	4	2	6	224
Total	9	148	5	0	11	3	32	3	2	159	7	2	10	5	3	9	408
07:00	6	81	2	2	7	2	16	5	0	92	2	1	8	0	3	2	229
07:15	7	100	0	0	16	5	15	0	2	138	3	3	9	2	1	2	303
07:30	6	121	3	0	16	0	20	6	0	128	3	2	11	2	3	0	321
07:45	16	151	6	0	25	2	22	8	2	132	5	0	11	1	4	4	389
Total	35	453	11	2	64	9	73	19	4	490	13	6	39	5	11	8	1242
08:00	14	151	4	1	18	2	32	3	0	150	2	0	4	5	4	3	393
08:15	17	155	9	0	15	2	21	5	3	137	10	0	13	2	2	0	391
08:30	12	130	1	0	20	2	26	2	3	152	5	1	10	2	0	3	369
08:45	13	125	3	0	18	1	21	5	3	144	9	0	14	1	1	2	360
Total	56	561	17	1	71	7	100	15	9	583	26	1	41	10	7	8	1513
Grand Total	100	1162	33	3	146	19	205	37	15	1232	46	9	90	20	21	25	3163
Apprch %	7.7	89.5	2.5	0.2	35.9	4.7	50.4	9.1	1.2	94.6	3.5	0.7	57.7	12.8	13.5	16	
Total %	3.2	36.7	1	0.1	4.6	0.6	6.5	1.2	0.5	39	1.5	0.3	2.8	0.6	0.7	0.8	
Motorcycles	1	21	0	0	0	0	1	0	0	20	0	0	0	0	0	0	43
% Motorcycles	1	1.8	0	0	0	0	0.5	0	0	1.6	0	0	0	0	0	0	1.4
Cars & Light Goods	97	1104	31	0	133	18	196	0	14	1173	43	0	88	19	19	0	2935
% Cars & Light Goods	97	95	93.9	0	91.1	94.7	95.6	0	93.3	95.2	93.5	0	97.8	95	90.5	0	92.8
Buses	1	6	0	0	1	0	2	0	0	7	2	0	0	1	1	0	21
% Buses	1	0.5	0	0	0.7	0	1	0	0	0.6	4.3	0	0	5	4.8	0	0.7
Single-Unit Trucks	1	22	0	0	10	1	2	0	0	10	1	0	2	0	0	0	49
% Single-Unit Trucks	1	1.9	0	0	6.8	5.3	1	0	0	0.8	2.2	0	2.2	0	0	0	1.5
Articulated Trucks	0	3	0	0	2	0	1	0	0	1	0	0	0	0	0	0	7
% Articulated Trucks	0	0.3	0	0	1.4	0	0.5	0	0	0.1	0	0	0	0	0	0	0.2
Bicycles on Road	0	6	2	0	0	0	3	0	1	21	0	0	0	0	1	0	34
% Bicycles on Road	0	0.5	6.1	0	0	0	1.5	0	6.7	1.7	0	0	0	0	4.8	0	1.1
Bicycles on Crosswalk	0	0	0	1	0	0	0	5	0	0	0	0	0	0	0	3	9
% Bicycles on Crosswalk	0	0	0	33.3	0	0	0	13.5	0	0	0	0	0	0	0	12	0.3
Pedestrians	0	0	0	2	0	0	0	32	0	0	0	9	0	0	0	22	65
% Pedestrians	0	0	0	66.7	0	0	0	86.5	0	0	0	100	0	0	0	88	2.1

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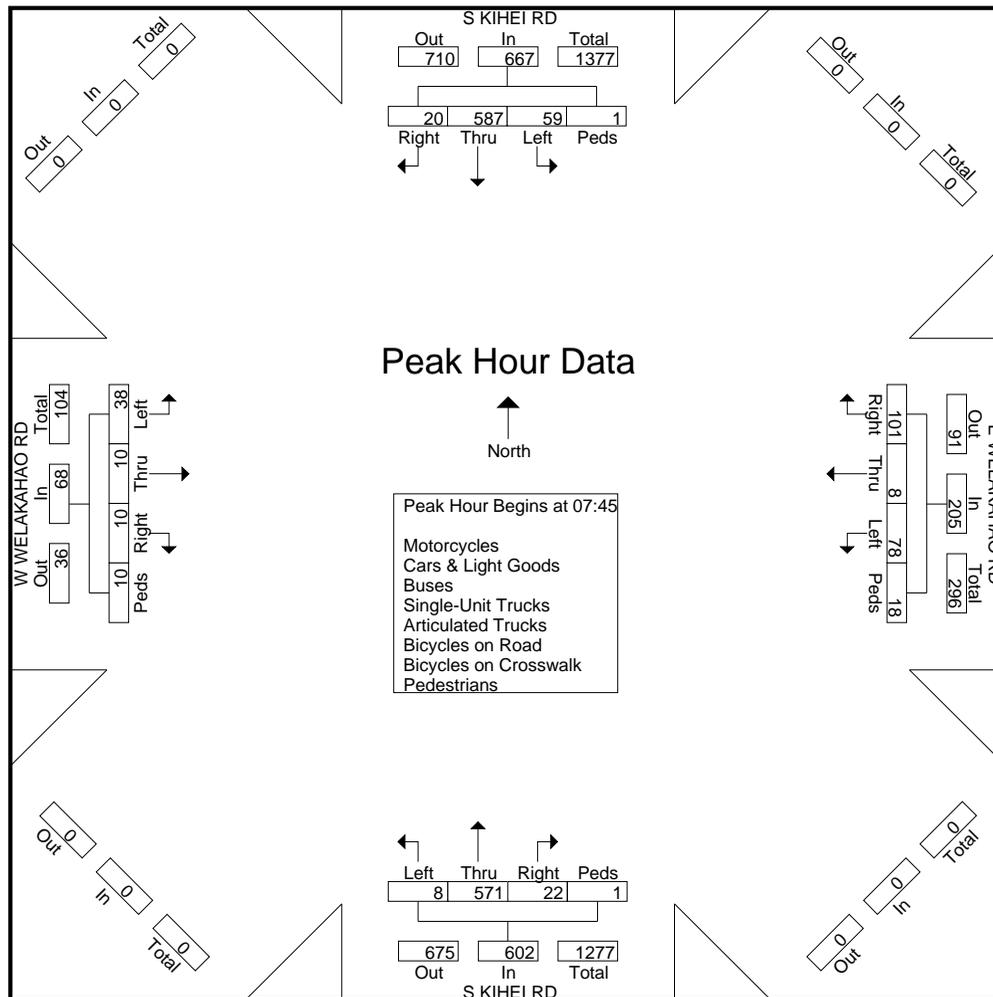
File Name : S Kihei Rd - E Welakahao Rd

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	S KIHEI RD SOUTHBOUND					E WELAKAHAO RD WESTBOUND					S KIHEI RD NORTHBOUND					W WELAKAHAO RD EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 06:30 to 08:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45																					
07:45	16	151	6	0	173	25	2	22	8	57	2	132	5	0	139	11	1	4	4	20	389
08:00	14	151	4	1	170	18	2	32	3	55	0	150	2	0	152	4	5	4	3	16	393
08:15	17	155	9	0	181	15	2	21	5	43	3	137	10	0	150	13	2	2	0	17	391
08:30	12	130	1	0	143	20	2	26	2	50	3	152	5	1	161	10	2	0	3	15	369
Total Volume	59	587	20	1	667	78	8	101	18	205	8	571	22	1	602	38	10	10	10	68	1542
% App. Total	8.8	88	3	0.1		38	3.9	49.3	8.8		1.3	94.9	3.7	0.2		55.9	14.7	14.7	14.7		
PHF	.868	.947	.556	.250	.921	.780	1.00	.789	.563	.899	.667	.939	.550	.250	.935	.731	.500	.625	.625	.850	.981



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File Name : S Kihei Rd - E Welakahao Rd

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	S KIHEI RD SOUTHBOUND				E WELAKAHAO RD WESTBOUND				S KIHEI RD NORTHBOUND				W WELAKAHAO RD EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
15:00	19	177	3	0	10	6	16	1	3	181	15	0	5	1	4	1	442
15:15	17	161	13	0	28	7	28	0	4	164	9	0	11	1	1	0	444
15:30	19	173	4	1	24	5	25	2	3	164	7	0	7	2	4	3	443
15:45	8	155	6	0	27	5	25	1	2	170	10	0	5	2	4	1	421
Total	63	666	26	1	89	23	94	4	12	679	41	0	28	6	13	5	1750
16:00	24	195	7	0	25	2	20	1	5	158	5	0	12	2	3	0	459
16:15	7	187	9	0	38	3	26	1	1	172	7	0	8	3	1	3	466
16:30	11	166	5	0	34	1	20	2	3	161	9	1	4	2	2	2	423
16:45	10	183	2	2	23	6	11	1	2	174	11	0	7	1	3	0	436
Total	52	731	23	2	120	12	77	5	11	665	32	1	31	8	9	5	1784
Grand Total	115	1397	49	3	209	35	171	9	23	1344	73	1	59	14	22	10	3534
Apprch %	7.4	89.3	3.1	0.2	49.3	8.3	40.3	2.1	1.6	93.3	5.1	0.1	56.2	13.3	21	9.5	
Total %	3.3	39.5	1.4	0.1	5.9	1	4.8	0.3	0.7	38	2.1	0	1.7	0.4	0.6	0.3	
Motorcycles	3	36	0	0	2	0	5	0	0	34	0	0	0	0	0	0	80
% Motorcycles	2.6	2.6	0	0	1	0	2.9	0	0	2.5	0	0	0	0	0	0	2.3
Cars & Light Goods	112	1335	48	0	205	35	161	0	22	1280	70	0	57	14	20	0	3359
% Cars & Light Goods	97.4	95.6	98	0	98.1	100	94.2	0	95.7	95.2	95.9	0	96.6	100	90.9	0	95
Buses	0	5	0	0	1	0	3	0	0	6	0	0	2	0	1	0	18
% Buses	0	0.4	0	0	0.5	0	1.8	0	0	0.4	0	0	3.4	0	4.5	0	0.5
Single-Unit Trucks	0	6	0	0	0	0	2	0	1	9	2	0	0	0	0	0	20
% Single-Unit Trucks	0	0.4	0	0	0	0	1.2	0	4.3	0.7	2.7	0	0	0	0	0	0.6
Articulated Trucks	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0.1	0	0	0	0	0	0	0
Bicycles on Road	0	15	1	0	1	0	0	0	0	14	1	0	0	0	1	0	33
% Bicycles on Road	0	1.1	2	0	0.5	0	0	0	0	1	1.4	0	0	0	4.5	0	0.9
Bicycles on Crosswalk	0	0	0	0	0	0	0	5	0	0	0	1	0	0	0	2	8
% Bicycles on Crosswalk	0	0	0	0	0	0	0	55.6	0	0	0	100	0	0	0	20	0.2
Pedestrians	0	0	0	3	0	0	0	4	0	0	0	0	0	0	0	8	15
% Pedestrians	0	0	0	100	0	0	0	44.4	0	0	0	0	0	0	0	80	0.4

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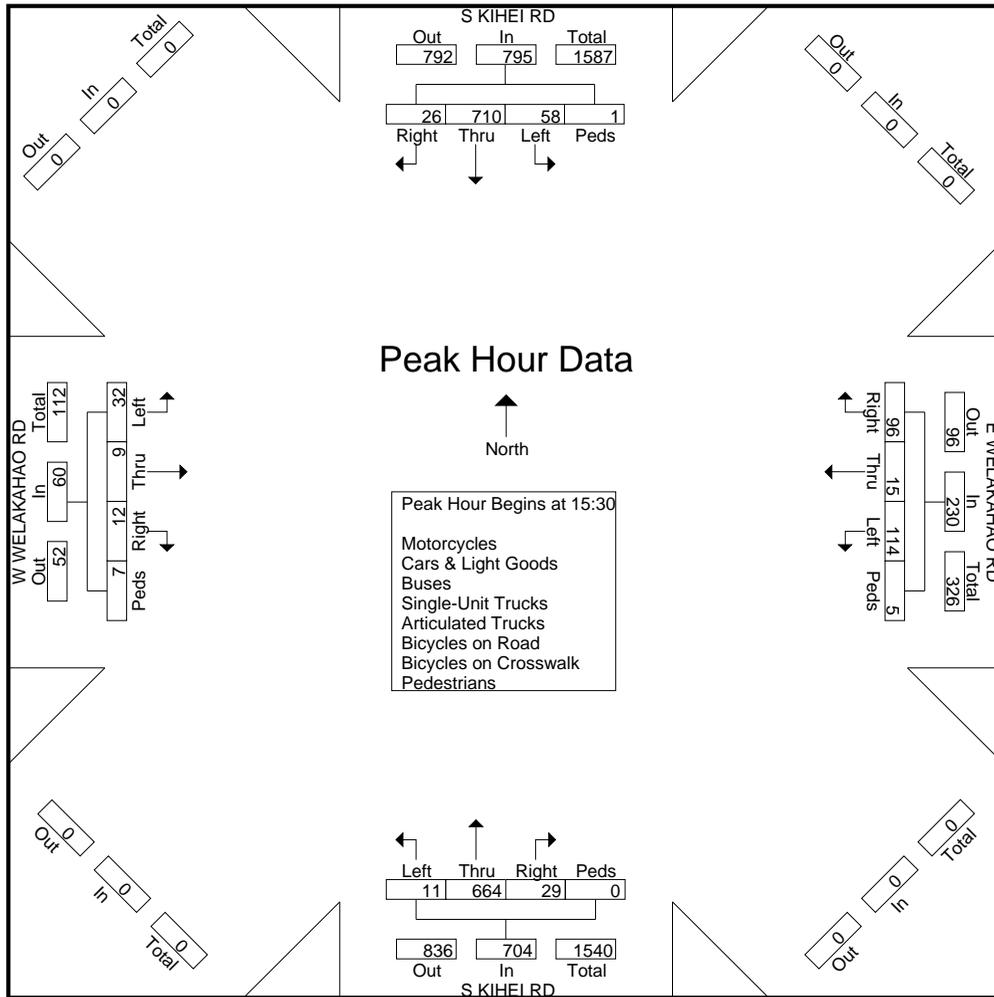
File Name : S Kihei Rd - E Welakahao Rd

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	S KIHEI RD SOUTHBOUND					E WELAKAHAO RD WESTBOUND					S KIHEI RD NORTHBOUND					W WELAKAHAO RD EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 15:00 to 16:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	19	173	4	1	197	24	5	25	2	56	3	164	7	0	174	7	2	4	3	16	443
15:45	8	155	6	0	169	27	5	25	1	58	2	170	10	0	182	5	2	4	1	12	421
16:00	24	195	7	0	226	25	2	20	1	48	5	158	5	0	168	12	2	3	0	17	459
16:15	7	187	9	0	203	38	3	26	1	68	1	172	7	0	180	8	3	1	3	15	466
Total Volume	58	710	26	1	795	114	15	96	5	230	11	664	29	0	704	32	9	12	7	60	1789
% App. Total	7.3	89.3	3.3	0.1		49.6	6.5	41.7	2.2		1.6	94.3	4.1	0		53.3	15	20	11.7		
PHF	.604	.910	.722	.250	.879	.750	.750	.923	.625	.846	.550	.965	.725	.000	.967	.667	.750	.750	.583	.882	.960



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File Name : Akai St - E Welakahao Rd  
 Site Code : 19-514 Liloa Sr Housing TIAR  
 Start Date : 5/7/2019  
 Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	SOUTHBOUND				E WELAKAHAO RD WESTBOUND				AKAI ST NORTHBOUND				E WELAKAHAO RD EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
06:30	0	0	0	0	0	11	0	0	9	0	6	1	0	9	1	0	37
06:45	0	0	0	0	5	14	0	0	7	0	1	1	0	13	0	0	41
Total	0	0	0	0	5	25	0	0	16	0	7	2	0	22	1	0	78
07:00	0	0	0	0	6	17	0	0	7	0	3	1	0	7	0	0	41
07:15	0	0	0	0	2	29	0	0	10	0	6	2	0	12	2	0	63
07:30	0	0	0	0	5	25	0	0	10	0	4	0	0	9	3	0	56
07:45	0	0	0	0	7	33	0	0	14	0	10	0	0	15	2	0	81
Total	0	0	0	0	20	104	0	0	41	0	23	3	0	43	7	0	241
08:00	0	0	0	0	3	38	0	0	13	0	8	0	0	20	2	0	84
08:15	0	0	0	0	4	29	0	0	5	0	7	2	0	21	6	1	75
08:30	0	0	0	0	10	45	0	0	6	0	9	2	0	20	5	0	97
08:45	0	0	0	0	3	26	0	0	10	0	7	0	0	22	0	0	68
Total	0	0	0	0	20	138	0	0	34	0	31	4	0	83	13	1	324
Grand Total	0	0	0	0	45	267	0	0	91	0	61	9	0	148	21	1	643
Apprch %	0	0	0	0	14.4	85.6	0	0	56.5	0	37.9	5.6	0	87.1	12.4	0.6	
Total %	0	0	0	0	7	41.5	0	0	14.2	0	9.5	1.4	0	23	3.3	0.2	
Motorcycles	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	2
% Motorcycles	0	0	0	0	0	0.4	0	0	0	0	0	0	0	0.7	0	0	0.3
Cars & Light Goods	0	0	0	0	43	247	0	0	91	0	61	0	0	143	19	0	604
% Cars & Light Goods	0	0	0	0	95.6	92.5	0	0	100	0	100	0	0	96.6	90.5	0	93.9
Buses	0	0	0	0	0	3	0	0	0	0	0	0	0	2	2	0	7
% Buses	0	0	0	0	0	1.1	0	0	0	0	0	0	0	1.4	9.5	0	1.1
Single-Unit Trucks	0	0	0	0	0	11	0	0	0	0	0	0	0	2	0	0	13
% Single-Unit Trucks	0	0	0	0	0	4.1	0	0	0	0	0	0	0	1.4	0	0	2
Articulated Trucks	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
% Articulated Trucks	0	0	0	0	0	1.1	0	0	0	0	0	0	0	0	0	0	0.5
Bicycles on Road	0	0	0	0	2	2	0	0	0	0	0	0	0	0	0	0	4
% Bicycles on Road	0	0	0	0	4.4	0.7	0	0	0	0	0	0	0	0	0	0	0.6
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	1	10
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	100	1.6

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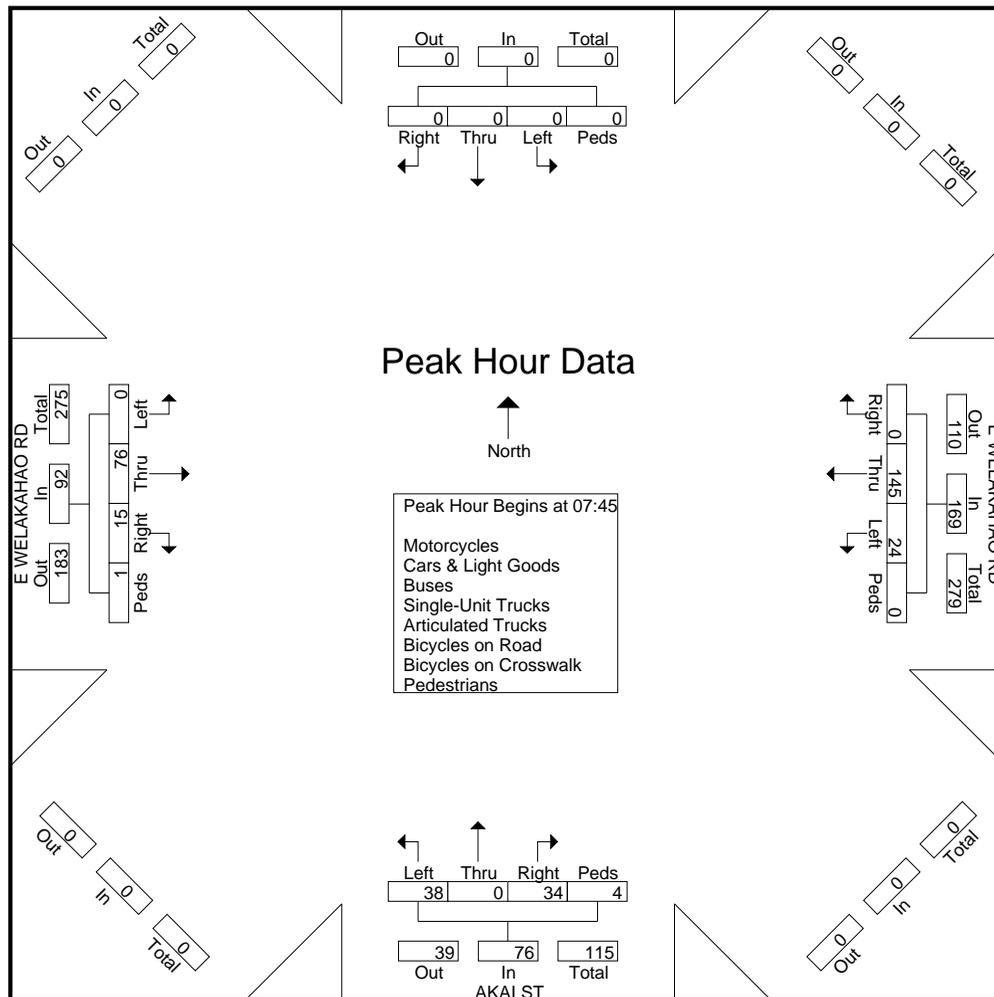
File Name : Akai St - E Welakahao Rd

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	SOUTHBOUND					E WELAKAHAO RD WESTBOUND					AKAI ST NORTHBOUND					E WELAKAHAO RD EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 06:30 to 08:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45																					
07:45	0	0	0	0	0	7	33	0	0	40	14	0	10	0	24	0	15	2	0	17	81
08:00	0	0	0	0	0	3	38	0	0	41	13	0	8	0	21	0	20	2	0	22	84
08:15	0	0	0	0	0	4	29	0	0	33	5	0	7	2	14	0	21	6	1	28	75
08:30	0	0	0	0	0	10	45	0	0	55	6	0	9	2	17	0	20	5	0	25	97
Total Volume	0	0	0	0	0	24	145	0	0	169	38	0	34	4	76	0	76	15	1	92	337
% App. Total	0	0	0	0	0	14.2	85.8	0	0		50	0	44.7	5.3		0	82.6	16.3	1.1		
PHF	.000	.000	.000	.000	.000	.600	.806	.000	.000	.768	.679	.000	.850	.500	.792	.000	.905	.625	.250	.821	.869



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File Name : Akai St - E Welakahao Rd

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/9/2019

Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	SOUTHBOUND				E WELAKAHAO RD WESTBOUND				AKAI ST NORTHBOUND				E WELAKAHAO RD EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
15:00	0	0	0	0	10	35	0	0	6	0	1	2	0	24	3	0	81
15:15	0	0	0	0	14	53	0	0	5	0	4	0	0	15	3	0	94
15:30	0	0	0	0	7	41	0	0	8	0	2	0	0	31	4	0	93
15:45	0	0	0	0	11	47	0	0	5	0	2	0	0	15	5	0	85
Total	0	0	0	0	42	176	0	0	24	0	9	2	0	85	15	0	353
16:00	0	0	0	0	15	32	0	0	5	0	1	0	0	13	6	0	72
16:15	0	0	0	0	20	48	0	0	6	0	2	0	0	13	5	0	94
16:30	0	0	0	0	20	40	0	0	6	0	0	2	0	13	6	0	87
16:45	0	0	0	0	12	42	0	0	6	0	0	2	0	14	1	0	77
Total	0	0	0	0	67	162	0	0	23	0	3	4	0	53	18	0	330
Grand Total	0	0	0	0	109	338	0	0	47	0	12	6	0	138	33	0	683
Apprch %	0	0	0	0	24.4	75.6	0	0	72.3	0	18.5	9.2	0	80.7	19.3	0	
Total %	0	0	0	0	16	49.5	0	0	6.9	0	1.8	0.9	0	20.2	4.8	0	
Motorcycles	0	0	0	0	0	2	0	0	1	0	0	0	0	1	1	0	5
% Motorcycles	0	0	0	0	0	0.6	0	0	2.1	0	0	0	0	0.7	3	0	0.7
Cars & Light Goods	0	0	0	0	109	328	0	0	46	0	12	0	0	135	31	0	661
% Cars & Light Goods	0	0	0	0	100	97	0	0	97.9	0	100	0	0	97.8	93.9	0	96.8
Buses	0	0	0	0	0	2	0	0	0	0	0	0	0	1	1	0	4
% Buses	0	0	0	0	0	0.6	0	0	0	0	0	0	0	0.7	3	0	0.6
Single-Unit Trucks	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	4
% Single-Unit Trucks	0	0	0	0	0	0.9	0	0	0	0	0	0	0	0.7	0	0	0.6
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bicycles on Road	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3
% Bicycles on Road	0	0	0	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0.4
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	6
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	100	0	0	0	0	0.9

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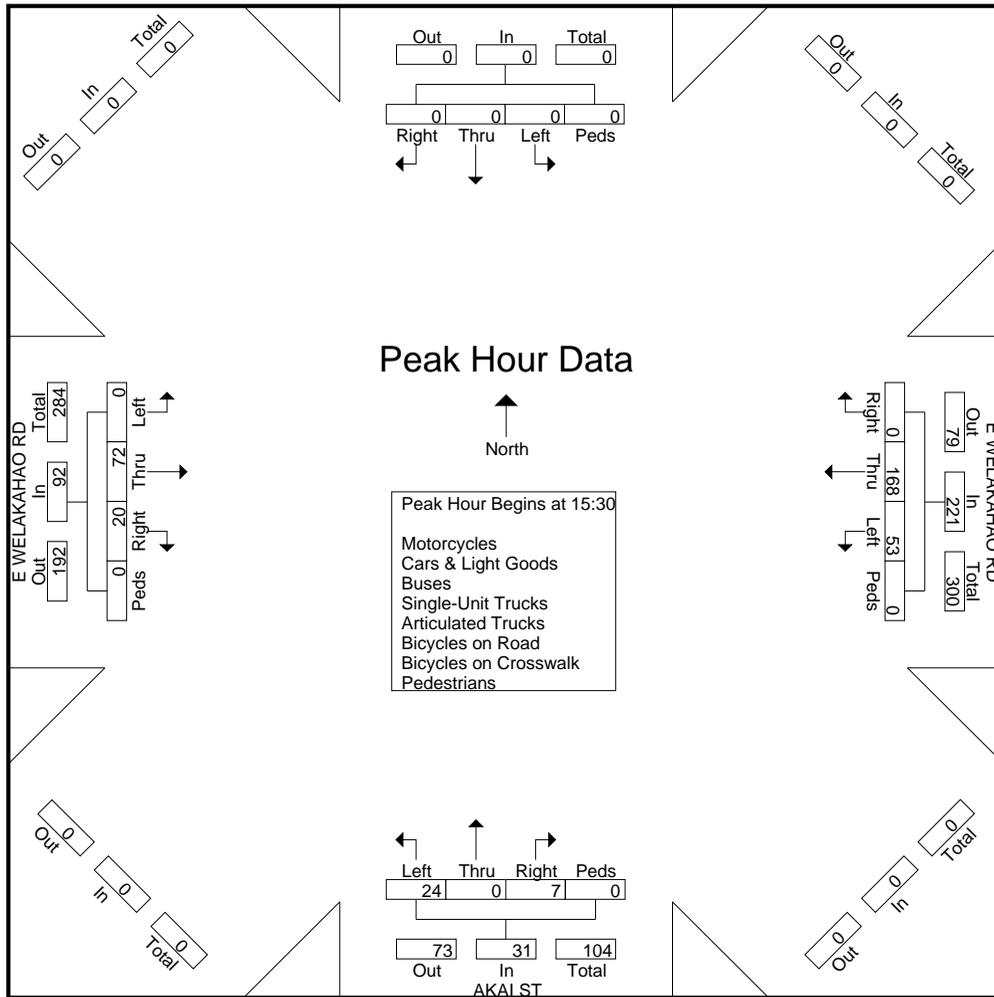
File Name : Akai St - E Welakahao Rd

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/9/2019

Page No : 2

Start Time	SOUTHBOUND					E WELAKAHAO RD WESTBOUND					AKAI ST NORTHBOUND					E WELAKAHAO RD EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	0	0	0	0	0	7	41	0	0	48	8	0	2	0	10	0	31	4	0	35	93
15:45	0	0	0	0	0	11	47	0	0	58	5	0	2	0	7	0	15	5	0	20	85
16:00	0	0	0	0	0	15	32	0	0	47	5	0	1	0	6	0	13	6	0	19	72
16:15	0	0	0	0	0	20	48	0	0	68	6	0	2	0	8	0	13	5	0	18	94
Total Volume	0	0	0	0	0	53	168	0	0	221	24	0	7	0	31	0	72	20	0	92	344
% App. Total	0	0	0	0	0	24	76	0	0		77.4	0	22.6	0		0	78.3	21.7	0		
PHF	.000	.000	.000	.000	.000	.663	.875	.000	.000	.813	.750	.000	.875	.000	.775	.000	.581	.833	.000	.657	.915



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File Name : Liloa Dr - E Welakahao Rd

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	SOUTHBOUND				E WELAKAHAO RD WESTBOUND				LILOA DR NORTHBOUND				E WELAKAHAO RD EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
06:30	0	0	0	0	4	17	0	0	2	0	2	0	0	10	1	0	36
06:45	0	0	0	0	2	17	0	0	3	0	2	0	0	13	0	0	37
Total	0	0	0	0	6	34	0	0	5	0	4	0	0	23	1	0	73
07:00	0	0	0	0	4	27	0	0	1	0	0	0	0	16	3	0	51
07:15	0	0	0	0	1	24	0	0	4	0	2	1	0	11	4	0	47
07:30	0	0	0	0	4	35	0	0	7	0	0	0	0	24	2	0	72
07:45	0	0	0	0	6	28	0	0	7	0	2	0	0	29	3	0	75
Total	0	0	0	0	15	114	0	0	19	0	4	1	0	80	12	0	245
08:00	0	0	0	0	6	28	0	3	10	0	2	0	0	22	4	2	77
08:15	0	0	0	0	8	34	0	0	14	0	0	1	0	21	7	0	85
08:30	0	0	0	0	15	30	0	0	3	0	1	2	0	17	7	1	76
08:45	0	0	0	0	45	26	0	0	10	0	2	0	0	13	13	0	109
Total	0	0	0	0	74	118	0	3	37	0	5	3	0	73	31	3	347
Grand Total	0	0	0	0	95	266	0	3	61	0	13	4	0	176	44	3	665
Apprch %	0	0	0	0	26.1	73.1	0	0.8	78.2	0	16.7	5.1	0	78.9	19.7	1.3	
Total %	0	0	0	0	14.3	40	0	0.5	9.2	0	2	0.6	0	26.5	6.6	0.5	
Motorcycles	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	2
% Motorcycles	0	0	0	0	0	0	0	0	1.6	0	0	0	0	0	2.3	0	0.3
Cars & Light Goods	0	0	0	0	92	255	0	0	51	0	12	0	0	172	40	0	622
% Cars & Light Goods	0	0	0	0	96.8	95.9	0	0	83.6	0	92.3	0	0	97.7	90.9	0	93.5
Buses	0	0	0	0	2	2	0	0	3	0	1	0	0	0	1	0	9
% Buses	0	0	0	0	2.1	0.8	0	0	4.9	0	7.7	0	0	0	2.3	0	1.4
Single-Unit Trucks	0	0	0	0	1	7	0	0	3	0	0	0	0	3	1	0	15
% Single-Unit Trucks	0	0	0	0	1.1	2.6	0	0	4.9	0	0	0	0	1.7	2.3	0	2.3
Articulated Trucks	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
% Articulated Trucks	0	0	0	0	0	0	0	0	1.6	0	0	0	0	0	0	0	0.2
Bicycles on Road	0	0	0	0	0	2	0	0	2	0	0	0	0	1	1	0	6
% Bicycles on Road	0	0	0	0	0	0.8	0	0	3.3	0	0	0	0	0.6	2.3	0	0.9
Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66.7	0.3
Pedestrians	0	0	0	0	0	0	0	3	0	0	0	4	0	0	0	1	8
% Pedestrians	0	0	0	0	0	0	0	100	0	0	0	100	0	0	0	33.3	1.2

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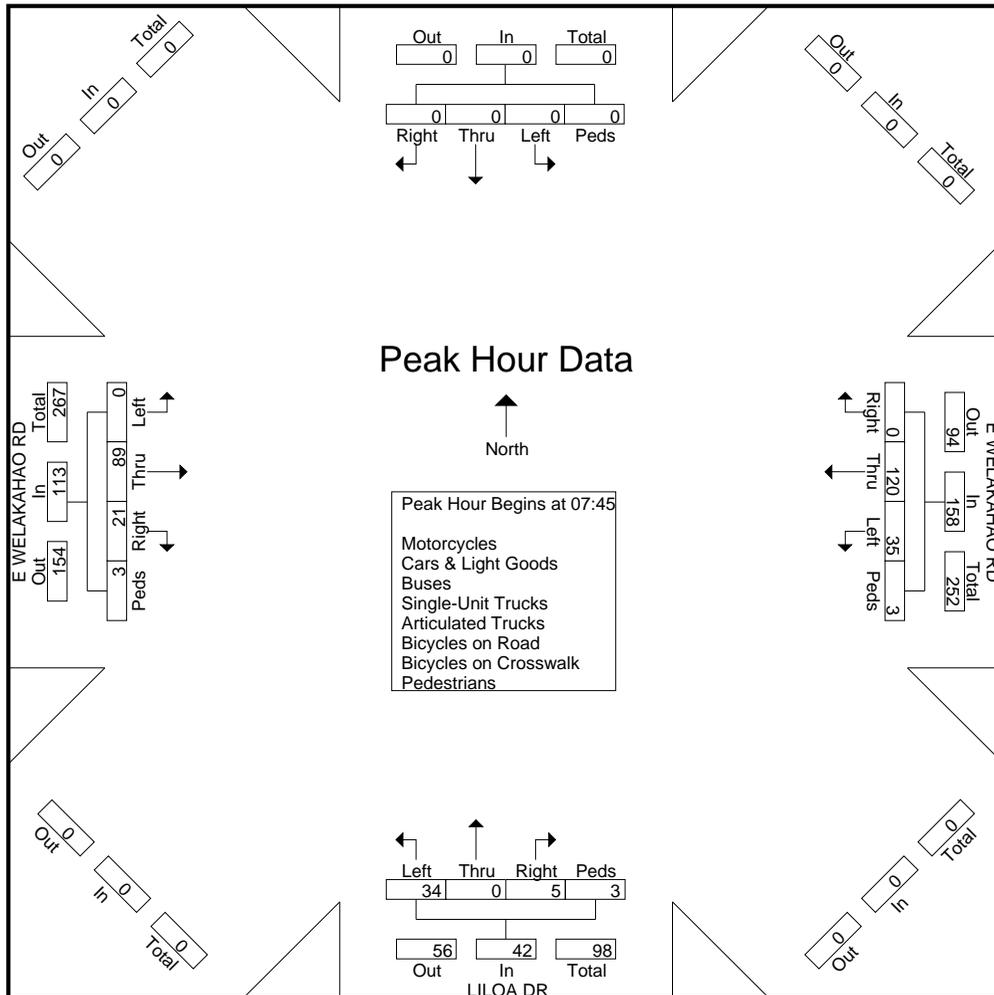
File Name : Liloa Dr - E Welakahao Rd

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	SOUTHBOUND					E WELAKAHAO RD WESTBOUND					LILOA DR NORTHBOUND					E WELAKAHAO RD EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:45 to 08:30 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45																					
07:45	0	0	0	0	0	6	28	0	0	34	7	0	2	0	9	0	29	3	0	32	75
08:00	0	0	0	0	0	6	28	0	3	37	10	0	2	0	12	0	22	4	2	28	77
08:15	0	0	0	0	0	8	34	0	0	42	14	0	0	1	15	0	21	7	0	28	85
08:30	0	0	0	0	0	15	30	0	0	45	3	0	1	2	6	0	17	7	1	25	76
Total Volume	0	0	0	0	0	35	120	0	3	158	34	0	5	3	42	0	89	21	3	113	313
% App. Total	0	0	0	0	0	22.2	75.9	0	1.9		81	0	11.9	7.1		0	78.8	18.6	2.7		
PHF	.000	.000	.000	.000	.000	.583	.882	.000	.250	.878	.607	.000	.625	.375	.700	.000	.767	.750	.375	.883	.921



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File Name : Liloa Dr - E Welakahao Rd

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 1

Groups Printed- Motorcycles - Cars & Light Goods - Buses - Unit Trucks - Articulated Trucks - Bicycles on Road - Bicycles on Crosswalk - Pedestrians

Start Time	SOUTHBOUND				E WELAKAHAO RD WESTBOUND				LILOA DR NORTHBOUND				E WELAKAHAO RD EASTBOUND				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
15:00	0	0	0	0	7	45	0	0	14	0	2	0	0	20	4	1	93
15:15	0	0	0	0	3	51	0	0	6	0	2	0	0	20	3	0	85
15:30	0	0	0	0	5	62	0	0	4	0	4	0	0	27	4	0	106
15:45	0	0	0	0	2	58	0	0	4	0	2	0	0	22	4	0	92
<b>Total</b>	0	0	0	0	17	216	0	0	28	0	10	0	0	89	15	1	376
16:00	0	0	0	0	1	54	0	0	6	0	2	0	0	10	4	0	77
16:15	0	0	0	0	5	58	0	0	3	0	2	0	0	12	4	0	84
16:30	0	0	0	0	11	48	0	0	9	0	5	0	0	14	10	0	97
16:45	0	0	0	0	9	52	0	0	14	0	5	0	0	21	8	1	110
<b>Total</b>	0	0	0	0	26	212	0	0	32	0	14	0	0	57	26	1	368
<b>Grand Total</b>	0	0	0	0	43	428	0	0	60	0	24	0	0	146	41	2	744
Apprch %	0	0	0	0	9.1	90.9	0	0	71.4	0	28.6	0	0	77.2	21.7	1.1	
Total %	0	0	0	0	5.8	57.5	0	0	8.1	0	3.2	0	0	19.6	5.5	0.3	
<b>Motorcycles</b>	0	0	0	0	1	1	0	0	0	0	0	0	0	1	1	0	4
% Motorcycles	0	0	0	0	2.3	0.2	0	0	0	0	0	0	0	0.7	2.4	0	0.5
<b>Cars &amp; Light Goods</b>	0	0	0	0	38	421	0	0	57	0	22	0	0	144	37	0	719
% Cars & Light Goods	0	0	0	0	88.4	98.4	0	0	95	0	91.7	0	0	98.6	90.2	0	96.6
<b>Buses</b>	0	0	0	0	3	0	0	0	2	0	2	0	0	0	0	0	7
% Buses	0	0	0	0	7	0	0	0	3.3	0	8.3	0	0	0	0	0	0.9
<b>Single-Unit Trucks</b>	0	0	0	0	0	6	0	0	1	0	0	0	0	0	2	0	9
% Single-Unit Trucks	0	0	0	0	0	1.4	0	0	1.7	0	0	0	0	0	4.9	0	1.2
<b>Articulated Trucks</b>	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	3
% Articulated Trucks	0	0	0	0	2.3	0	0	0	0	0	0	0	0	0.7	2.4	0	0.4
<b>Bicycles on Road</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Bicycles on Crosswalk</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bicycles on Crosswalk	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Pedestrians</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2
% Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	100	0.3

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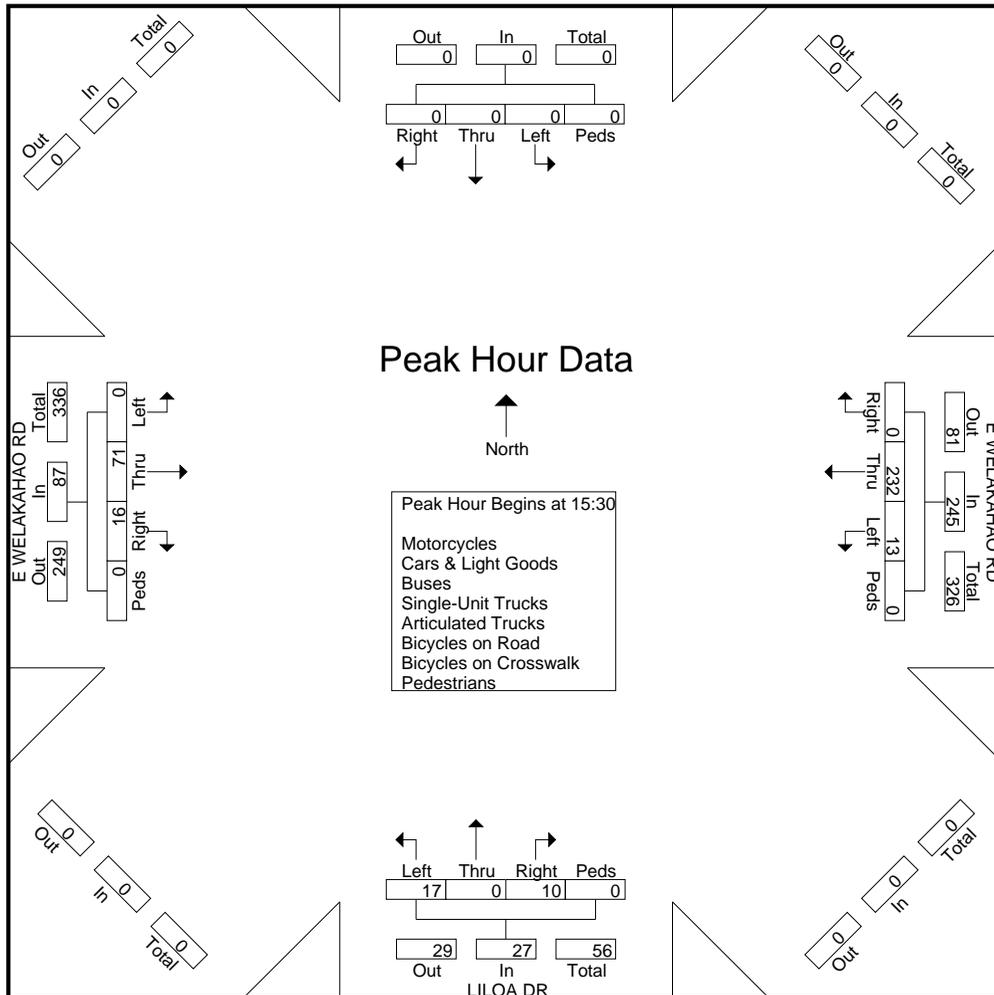
File Name : Liloa Dr - E Welakahao Rd

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	SOUTHBOUND					E WELAKAHAO RD WESTBOUND					LILOA DR NORTHBOUND					E WELAKAHAO RD EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 15:30 to 16:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	0	0	0	0	0	5	62	0	0	67	4	0	4	0	8	0	27	4	0	31	106
15:45	0	0	0	0	0	2	58	0	0	60	4	0	2	0	6	0	22	4	0	26	92
16:00	0	0	0	0	0	1	54	0	0	55	6	0	2	0	8	0	10	4	0	14	77
16:15	0	0	0	0	0	5	58	0	0	63	3	0	2	0	5	0	12	4	0	16	84
Total Volume	0	0	0	0	0	13	232	0	0	245	17	0	10	0	27	0	71	16	0	87	359
% App. Total	0	0	0	0	0	5.3	94.7	0	0		63	0	37	0		0	81.6	18.4	0		
PHF	.000	.000	.000	.000	.000	.650	.935	.000	.000	.914	.708	.000	.625	.000	.844	.000	.657	1.00	.000	.702	.847





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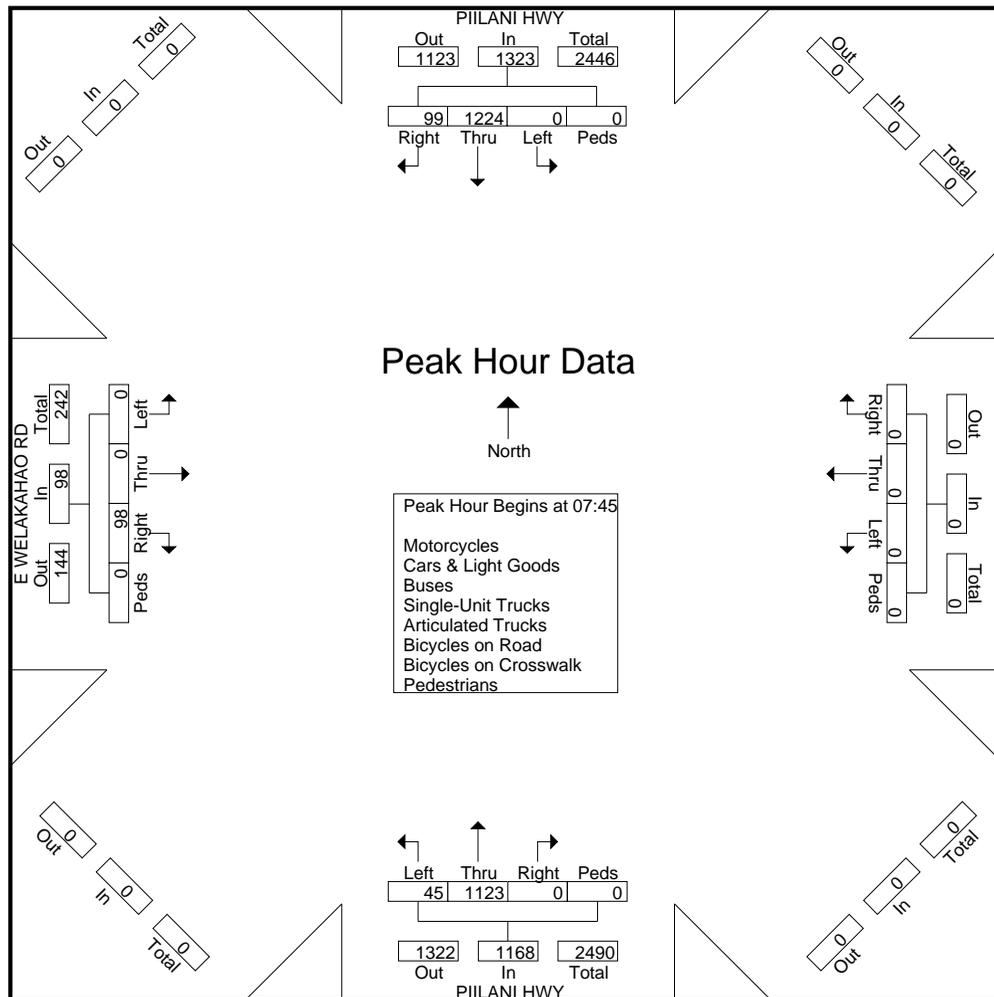
File Name : Piilani Hwy - E Welakahao Rd

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	PIILANI HWY SOUTHBOUND					WESTBOUND					PIILANI HWY NORTHBOUND					E WELAKAHAO RD EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 06:30 to 08:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45																					
07:45	0	335	29	0	364	0	0	0	0	0	11	236	0	0	247	0	0	24	0	24	635
08:00	0	276	21	0	297	0	0	0	0	0	13	270	0	0	283	0	0	27	0	27	607
08:15	0	341	23	0	364	0	0	0	0	0	11	311	0	0	322	0	0	27	0	27	713
08:30	0	272	26	0	298	0	0	0	0	0	10	306	0	0	316	0	0	20	0	20	634
Total Volume	0	1224	99	0	1323	0	0	0	0	0	45	1123	0	0	1168	0	0	98	0	98	2589
% App. Total	0	92.5	7.5	0		0	0	0	0		3.9	96.1	0	0		0	0	100	0		
PHF	.000	.897	.853	.000	.909	.000	.000	.000	.000	.000	.865	.903	.000	.000	.907	.000	.000	.907	.000	.907	.908





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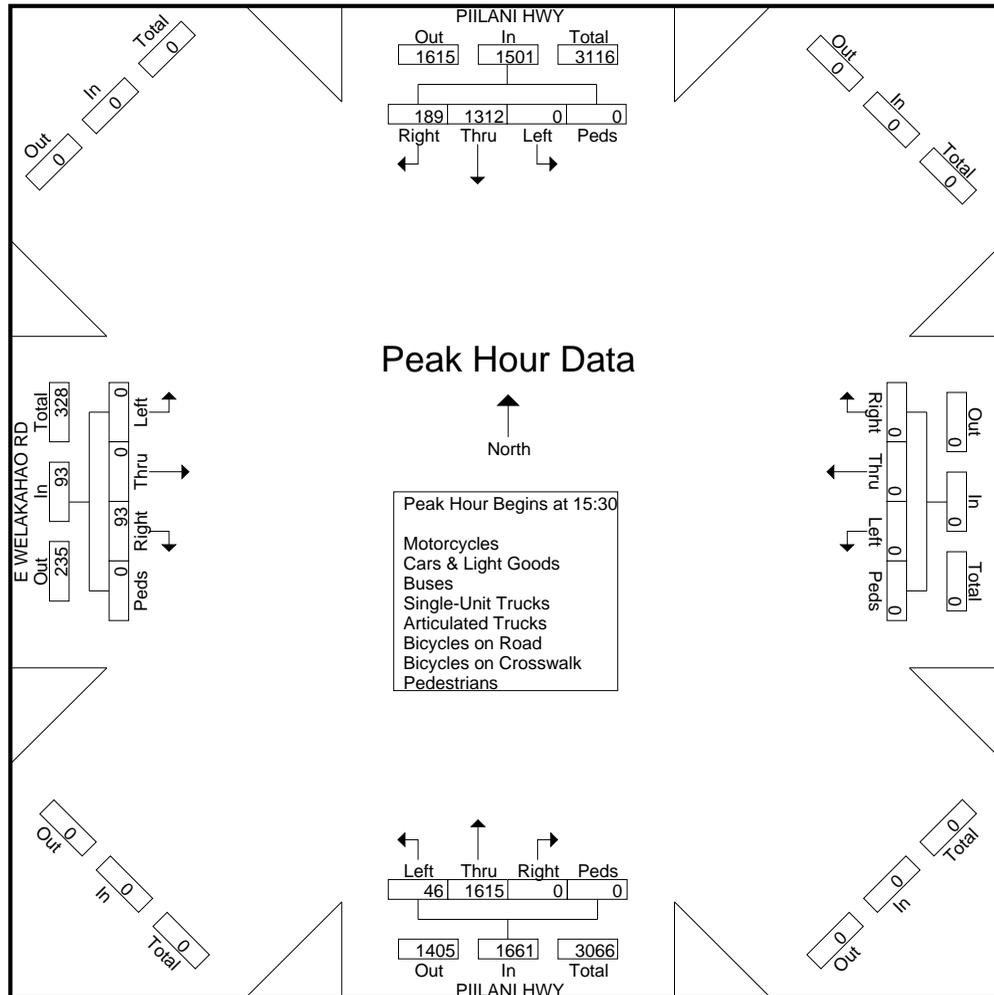
File Name : Piilani Hwy - E Welakahao Rd

Site Code : 19-514 Liloa Sr Housing TIAR

Start Date : 5/7/2019

Page No : 2

Start Time	PIILANI HWY SOUTHBOUND					WESTBOUND					PIILANI HWY NORTHBOUND					E WELAKAHAO RD EASTBOUND					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 15:00 to 16:45 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 15:30																					
15:30	0	312	39	0	351	0	0	0	0	0	12	405	0	0	417	0	0	21	0	21	789
15:45	0	<b>380</b>	<b>59</b>	0	<b>439</b>	0	0	0	0	0	13	413	0	0	426	0	0	<b>33</b>	0	<b>33</b>	<b>898</b>
16:00	0	328	53	0	381	0	0	0	0	0	6	367	0	0	373	0	0	27	0	27	781
16:15	0	292	38	0	330	0	0	0	0	0	<b>15</b>	<b>430</b>	0	0	<b>445</b>	0	0	12	0	12	787
Total Volume	0	1312	189	0	1501	0	0	0	0	0	46	1615	0	0	1661	0	0	93	0	93	3255
% App. Total	0	87.4	12.6	0		0	0	0	0		2.8	97.2	0	0		0	0	100	0		
PHF	.000	.863	.801	.000	.855	.000	.000	.000	.000	.000	.767	.939	.000	.000	.933	.000	.000	.705	.000	.705	.906





# **APPENDIX B**

## **LEVEL OF SERVICE CRITERIA**

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## APPENDIX B – LEVEL OF SERVICE (LOS) CRITERIA

### VEHICULAR LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS (HCM 6<sup>th</sup> EDITION)

Level of service for vehicles at signalized intersections is directly related to delay values and is assigned on that basis. Level of Service is a measure of the acceptability of delay values to motorists at a given intersection. The criteria are given in the table below.

Level-of Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (sec./veh.)
A	< 10.0
B	>10.0 and ≤ 20.0
C	>20.0 and ≤ 35.0
D	>35.0 and ≤ 55.0
E	>55.0 and ≤ 80.0
F	> 80.0

Delay is a complex measure, and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group or approach in question.

### VEHICULAR LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS (HCM 6<sup>th</sup> EDITION)

The level of service criteria for vehicles at unsignalized intersections is defined as the average control delay, in seconds per vehicle.

LOS delay threshold values are lower for two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections than those of signalized intersections. This is because more vehicles pass through signalized intersections, and therefore, drivers expect and tolerate greater delays. While the criteria for level of service for TWSC and AWSC intersections are the same, procedures to calculate the average total delay may differ.

Level of Service Criteria for Two-Way Stop-Controlled Intersections

Level of Service	Average Control Delay (sec/veh)
A	≤ 10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	> 50



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# APPENDIX C

## LEVEL OF SERVICE CALCULATIONS

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## **APPENDIX C**

### **LEVEL OF SERVICE CALCULATIONS**

- Existing AM Conditions
- 
-

HCM 6th Signalized Intersection Summary  
 1: S. Kihei Rd & W Lipoa St/E Lipoa St

Liloa Sr Housing TIAR  
 06/04/2019

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	42	45	55	90	22	125	37	456	162	141	545	10
Future Volume (veh/h)	42	45	55	90	22	125	37	456	162	141	545	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.96	0.97		0.96	0.99		0.98	0.99		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	46	49	7	98	24	16	40	496	77	153	592	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	212	184	258	324	65	258	433	836	694	534	905	17
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.17	0.04	0.45	0.45	0.09	0.49	0.49
Sat Flow, veh/h	591	1090	1529	1113	386	1529	1781	1870	1553	1781	1830	34
Grp Volume(v), veh/h	95	0	7	122	0	16	40	496	77	153	0	603
Grp Sat Flow(s),veh/h/ln	1681	0	1529	1500	0	1529	1781	1870	1553	1781	0	1863
Q Serve(g_s), s	0.0	0.0	0.2	1.0	0.0	0.4	0.6	9.5	1.4	2.0	0.0	11.5
Cycle Q Clear(g_c), s	2.1	0.0	0.2	3.2	0.0	0.4	0.6	9.5	1.4	2.0	0.0	11.5
Prop In Lane	0.48		1.00	0.80		1.00	1.00		1.00	1.00		0.02
Lane Grp Cap(c), veh/h	395	0	258	389	0	258	433	836	694	534	0	922
V/C Ratio(X)	0.24	0.00	0.03	0.31	0.00	0.06	0.09	0.59	0.11	0.29	0.00	0.65
Avail Cap(c_a), veh/h	955	0	801	886	0	801	767	2156	1791	783	0	2148
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.4	0.0	16.6	17.7	0.0	16.7	7.3	9.9	7.7	6.6	0.0	9.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.5	0.0	0.1	0.0	1.4	0.1	0.1	0.0	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.9	0.0	0.1	1.1	0.0	0.1	0.2	3.5	0.4	0.6	0.0	4.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	17.7	0.0	16.6	18.2	0.0	16.8	7.3	11.4	7.8	6.8	0.0	10.7
LnGrp LOS	B	A	B	B	A	B	A	B	A	A	A	B
Approach Vol, veh/h		102			138			613			756	
Approach Delay, s/veh		17.6			18.0			10.7			9.9	
Approach LOS		B			B			B			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.3	26.3		13.0	6.1	28.6		13.0				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	11.0	55.0		25.0	11.0	55.0		25.0				
Max Q Clear Time (g_c+I1), s	4.0	11.5		4.1	2.6	13.5		5.2				
Green Ext Time (p_c), s	0.1	8.5		0.5	0.0	10.1		0.7				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				11.4								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary  
 2: Liloa Drive & E Lipoa St

Liloa Sr Housing TIAR  
 06/04/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	47	203	34	80	158	79	44	114	105	58	152	85
Future Volume (veh/h)	47	203	34	80	158	79	44	114	105	58	152	85
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.98	0.96		0.95	0.96		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	51	221	29	87	172	33	48	124	18	63	165	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	582	549	72	527	671	559	411	558	448	443	558	448
Arrive On Green	0.05	0.34	0.34	0.07	0.36	0.36	0.30	0.30	0.30	0.30	0.30	0.30
Sat Flow, veh/h	1781	1616	212	1781	1870	1559	1176	1870	1503	1216	1870	1503
Grp Volume(v), veh/h	51	0	250	87	172	33	48	124	18	63	165	15
Grp Sat Flow(s),veh/h/ln	1781	0	1828	1781	1870	1559	1176	1870	1503	1216	1870	1503
Q Serve(g_s), s	0.9	0.0	5.4	1.6	3.3	0.7	1.7	2.6	0.4	2.1	3.5	0.4
Cycle Q Clear(g_c), s	0.9	0.0	5.4	1.6	3.3	0.7	5.2	2.6	0.4	4.7	3.5	0.4
Prop In Lane	1.00		0.12	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	582	0	621	527	671	559	411	558	448	443	558	448
V/C Ratio(X)	0.09	0.00	0.40	0.17	0.26	0.06	0.12	0.22	0.04	0.14	0.30	0.03
Avail Cap(c_a), veh/h	666	0	1249	751	1461	1217	750	1096	880	792	1096	880
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	9.9	0.0	12.9	9.7	11.6	10.8	15.8	13.5	12.8	15.3	13.8	12.7
Incr Delay (d2), s/veh	0.1	0.0	0.4	0.1	0.2	0.0	0.1	0.2	0.0	0.1	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	2.0	0.5	1.3	0.2	0.4	1.0	0.1	0.5	1.4	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.9	0.0	13.4	9.9	11.8	10.8	15.9	13.7	12.8	15.4	14.1	12.8
LnGrp LOS	A	A	B	A	B	B	B	B	B	B	B	B
Approach Vol, veh/h		301			292			190			243	
Approach Delay, s/veh		12.8			11.1			14.2			14.4	
Approach LOS		B			B			B			B	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		20.3	8.5	22.4		20.3	7.6	23.4				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		30.0	10.0	35.0		30.0	5.0	40.0				
Max Q Clear Time (g_c+I1), s		7.2	3.6	7.4		6.7	2.9	5.3				
Green Ext Time (p_c), s		0.9	0.1	1.6		1.2	0.0	1.2				

Intersection Summary

HCM 6th Ctrl Delay	12.9
HCM 6th LOS	B

HCM 6th Signalized Intersection Summary  
 3: Piilani Hwy & E Lipoa St

Liloa Sr Housing TIAR  
 06/04/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↖	↕	↗	↖	↕	↗
Traffic Volume (veh/h)	157	94	120	88	50	178	118	885	121	290	1131	108
Future Volume (veh/h)	157	94	120	88	50	178	118	885	121	290	1131	108
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.97	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	171	102	43	96	54	67	128	962	55	315	1229	77
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	196	117	265	115	64	157	145	1534	684	335	1913	849
Arrive On Green	0.17	0.17	0.17	0.10	0.10	0.10	0.08	0.43	0.43	0.19	0.54	0.54
Sat Flow, veh/h	1136	678	1541	1160	652	1585	1781	3554	1585	1781	3554	1578
Grp Volume(v), veh/h	273	0	43	150	0	67	128	962	55	315	1229	77
Grp Sat Flow(s),veh/h/ln	1814	0	1541	1812	0	1585	1781	1777	1585	1781	1777	1578
Q Serve(g_s), s	30.8	0.0	5.0	17.1	0.0	8.4	14.9	44.3	4.3	36.6	51.3	5.0
Cycle Q Clear(g_c), s	30.8	0.0	5.0	17.1	0.0	8.4	14.9	44.3	4.3	36.6	51.3	5.0
Prop In Lane	0.63		1.00	0.64		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	312	0	265	179	0	157	145	1534	684	335	1913	849
V/C Ratio(X)	0.87	0.00	0.16	0.84	0.00	0.43	0.88	0.63	0.08	0.94	0.64	0.09
Avail Cap(c_a), veh/h	466	0	396	293	0	257	297	1534	684	467	1913	849
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.98	0.00	0.98	1.00	0.00	1.00	1.00	1.00	1.00	0.61	0.61	0.61
Uniform Delay (d), s/veh	84.7	0.0	74.0	93.0	0.0	89.0	95.5	46.5	35.1	84.1	34.2	23.5
Incr Delay (d2), s/veh	16.8	0.0	0.6	19.5	0.0	3.9	6.8	2.0	0.2	16.1	1.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	16.1	0.0	2.1	9.1	0.0	3.7	7.2	19.9	1.7	18.3	22.2	1.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	101.5	0.0	74.6	112.4	0.0	93.0	102.3	48.5	35.4	100.2	35.2	23.7
LnGrp LOS	F	A	E	F	A	F	F	D	D	F	D	C
Approach Vol, veh/h		316			217			1145			1621	
Approach Delay, s/veh		97.8			106.4			53.8			47.3	
Approach LOS		F			F			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	44.4	96.7		26.7	22.1	119.0		42.2				
Change Period (Y+Rc), s	5.0	6.0		6.0	5.0	6.0		6.0				
Max Green Setting (Gmax), s	55.0	44.0		34.0	35.0	64.0		54.0				
Max Q Clear Time (g_c+R), s	39.6	46.3		19.1	16.9	53.3		32.8				
Green Ext Time (p_c), s	0.8	0.0		1.7	0.1	6.0		3.4				

Intersection Summary

HCM 6th Ctrl Delay	58.3
HCM 6th LOS	E

Intersection						
Int Delay, s/veh	5.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	14	154	73	61	168	101
Future Vol, veh/h	14	154	73	61	168	101
Conflicting Peds, #/hr	0	6	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	167	79	66	183	110

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	600	130	0	0	157	0
Stage 1	124	-	-	-	-	-
Stage 2	476	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	464	920	-	-	1423	-
Stage 1	902	-	-	-	-	-
Stage 2	625	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	395	904	-	-	1407	-
Mov Cap-2 Maneuver	395	-	-	-	-	-
Stage 1	769	-	-	-	-	-
Stage 2	625	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.3	0	5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	395	904	1407	-
HCM Lane V/C Ratio	-	-	0.039	0.185	0.13	-
HCM Control Delay (s)	-	-	14.5	9.9	7.9	0
HCM Lane LOS	-	-	B	A	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.7	0.4	-

Intersection						
Int Delay, s/veh	1.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	36	21	611	102	41	640
Future Vol, veh/h	36	21	611	102	41	640
Conflicting Peds, #/hr	0	0	0	35	35	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	100	0	-	115	40	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	39	23	664	111	45	696

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1485	699	0	0	699
Stage 1	699	-	-	-	-
Stage 2	786	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	137	440	-	-	898
Stage 1	493	-	-	-	-
Stage 2	449	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	126	425	-	-	868
Mov Cap-2 Maneuver	126	-	-	-	-
Stage 1	452	-	-	-	-
Stage 2	449	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	34.1	0	0.6
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	126	425	868
HCM Lane V/C Ratio	-	-	0.311	0.054	0.051
HCM Control Delay (s)	-	-	45.9	14	9.4
HCM Lane LOS	-	-	E	B	A
HCM 95th %tile Q(veh)	-	-	1.2	0.2	0.2

Intersection	
Intersection Delay, s/veh	7.9
Intersection LOS	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			↑	↑	↑
Traffic Vol, veh/h	119	6	9	18	21	90
Future Vol, veh/h	119	6	9	18	21	90
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	129	7	10	20	23	98
Number of Lanes	1	0	0	1	1	1

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	2	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	1
HCM Control Delay	8.3	7.7	7.5
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	SBLn1	SBLn2
Vol Left, %	33%	95%	0%	0%
Vol Thru, %	67%	0%	100%	0%
Vol Right, %	0%	5%	0%	100%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	27	125	21	90
LT Vol	9	119	0	0
Through Vol	18	0	21	0
RT Vol	0	6	0	90
Lane Flow Rate	29	136	23	98
Geometry Grp	5	2	7	7
Degree of Util (X)	0.037	0.164	0.03	0.111
Departure Headway (Hd)	4.55	4.347	4.79	4.089
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	792	815	738	863
Service Time	2.55	2.43	2.584	1.881
HCM Lane V/C Ratio	0.037	0.167	0.031	0.114
HCM Control Delay	7.7	8.3	7.7	7.4
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.1	0.6	0.1	0.4

HCM 6th Signalized Intersection Summary  
 8: S. Kihei Rd & W Welakahao Rd/E Welakahao Rd

Liloa Sr Housing TIAR  
 06/04/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕	↕	↕		↕	↕	
Traffic Volume (veh/h)	38	10	10	78	8	101	8	571	22	59	587	20
Future Volume (veh/h)	38	10	10	78	8	101	8	571	22	59	587	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	41	11	1	85	9	14	9	621	23	64	638	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	223	48	3	255	14	242	410	948	35	446	1032	34
Arrive On Green	0.10	0.10	0.10	0.10	0.10	0.10	0.01	0.53	0.53	0.06	0.57	0.57
Sat Flow, veh/h	1142	498	32	1383	146	1577	1781	1791	66	1781	1799	59
Grp Volume(v), veh/h	53	0	0	94	0	14	9	0	644	64	0	659
Grp Sat Flow(s),veh/h/ln	1671	0	0	1529	0	1577	1781	0	1857	1781	0	1859
Q Serve(g_s), s	0.0	0.0	0.0	1.7	0.0	0.4	0.1	0.0	14.2	0.9	0.0	13.3
Cycle Q Clear(g_c), s	1.5	0.0	0.0	3.2	0.0	0.4	0.1	0.0	14.2	0.9	0.0	13.3
Prop In Lane	0.77		0.02	0.90		1.00	1.00		0.04	1.00		0.03
Lane Grp Cap(c), veh/h	275	0	0	269	0	242	410	0	983	446	0	1066
V/C Ratio(X)	0.19	0.00	0.00	0.35	0.00	0.06	0.02	0.00	0.66	0.14	0.00	0.62
Avail Cap(c_a), veh/h	758	0	0	736	0	757	672	0	1606	629	0	1607
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.8	0.0	0.0	24.5	0.0	20.5	7.0	0.0	9.6	7.0	0.0	8.0
Incr Delay (d2), s/veh	0.3	0.0	0.0	0.8	0.0	0.1	0.0	0.0	0.7	0.1	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.0	1.2	0.0	0.2	0.0	0.0	4.9	0.3	0.0	4.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	24.1	0.0	0.0	25.2	0.0	20.6	7.1	0.0	10.4	7.1	0.0	8.6
LnGrp LOS	C	A	A	C	A	C	A	A	B	A	A	A
Approach Vol, veh/h		53			108			653			723	
Approach Delay, s/veh		24.1			24.6			10.3			8.4	
Approach LOS		C			C			B			A	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.2	36.0		11.5	6.7	38.5		11.5				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	49.0			24.0	9.0	49.0		24.0				
Max Q Clear Time (g_c+I), s	16.2			3.5	2.1	15.3		5.2				
Green Ext Time (p_c), s	0.1	5.4		0.2	0.0	5.6		0.5				

Intersection Summary

HCM 6th Ctrl Delay	10.9
HCM 6th LOS	B

Intersection						
Int Delay, s/veh	2.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	76	15	24	145	38	34
Future Vol, veh/h	76	15	24	145	38	34
Conflicting Peds, #/hr	0	4	4	0	1	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	83	16	26	158	41	37

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	103	0	306 95
Stage 1	-	-	-	-	95 -
Stage 2	-	-	-	-	211 -
Critical Hdwy	-	-	4.12	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	2.218	-	3.518 3.318
Pot Cap-1 Maneuver	-	-	1489	-	686 962
Stage 1	-	-	-	-	929 -
Stage 2	-	-	-	-	824 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1483	-	670 958
Mov Cap-2 Maneuver	-	-	-	-	670 -
Stage 1	-	-	-	-	908 -
Stage 2	-	-	-	-	823 -

Approach	EB	WB	NB
HCM Control Delay, s	0	1.1	10.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	781	-	-	1483	-
HCM Lane V/C Ratio	0.1	-	-	0.018	-
HCM Control Delay (s)	10.1	-	-	7.5	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-

Intersection						
Int Delay, s/veh	2.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	89	21	35	120	34	5
Future Vol, veh/h	89	21	35	120	34	5
Conflicting Peds, #/hr	0	3	3	0	3	3
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	97	23	38	130	37	5

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	123	0	321 115
Stage 1	-	-	-	-	112 -
Stage 2	-	-	-	-	209 -
Critical Hdwy	-	-	4.12	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	2.218	-	3.518 3.318
Pot Cap-1 Maneuver	-	-	1464	-	673 937
Stage 1	-	-	-	-	913 -
Stage 2	-	-	-	-	826 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1460	-	650 932
Mov Cap-2 Maneuver	-	-	-	-	650 -
Stage 1	-	-	-	-	885 -
Stage 2	-	-	-	-	824 -

Approach	EB	WB	NB
HCM Control Delay, s	0	1.7	10.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	676	-	-	1460	-
HCM Lane V/C Ratio	0.063	-	-	0.026	-
HCM Control Delay (s)	10.7	-	-	7.5	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↘	↕	↕	↗
Traffic Vol, veh/h	0	98	45	1123	1224	99
Future Vol, veh/h	0	98	45	1123	1224	99
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	425	-	-	300
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	107	49	1221	1330	108

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	-	665	1330	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	403	515	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	403	515	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	17.1	0.5	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	515	-	403	-	-
HCM Lane V/C Ratio	0.095	-	0.264	-	-
HCM Control Delay (s)	12.7	-	17.1	-	-
HCM Lane LOS	B	-	C	-	-
HCM 95th %tile Q(veh)	0.3	-	1	-	-



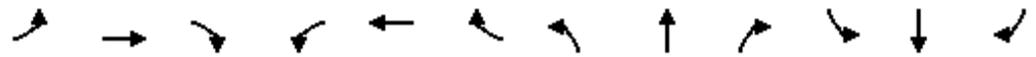
## **APPENDIX C**

### **LEVEL OF SERVICE CALCULATIONS**

- Existing PM Conditions
- 
-

HCM 6th Signalized Intersection Summary  
 1: S. Kihei Rd & W Lipoa St/E Lipoa St

Liloa Sr Housing TIAR  
 06/04/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Traffic Volume (veh/h)	59	33	71	123	41	105	49	550	170	113	604	24
Future Volume (veh/h)	59	33	71	123	41	105	49	550	170	113	604	24
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.97	0.98		0.97	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	64	36	9	134	45	13	53	598	110	123	657	25
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	195	99	240	228	57	240	506	1258	1059	570	1218	46
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.04	0.67	0.67	0.04	0.68	0.68
Sat Flow, veh/h	911	636	1544	1100	369	1544	1781	1870	1573	1781	1789	68
Grp Volume(v), veh/h	100	0	9	179	0	13	53	598	110	123	0	682
Grp Sat Flow(s),veh/h/ln	1547	0	1544	1469	0	1544	1781	1870	1573	1781	0	1858
Q Serve(g_s), s	0.0	0.0	0.5	6.6	0.0	0.8	1.0	16.9	2.7	2.3	0.0	20.4
Cycle Q Clear(g_c), s	6.2	0.0	0.5	12.8	0.0	0.8	1.0	16.9	2.7	2.3	0.0	20.4
Prop In Lane	0.64		1.00	0.75		1.00	1.00		1.00	1.00		0.04
Lane Grp Cap(c), veh/h	294	0	240	286	0	240	506	1258	1059	570	0	1265
V/C Ratio(X)	0.34	0.00	0.04	0.63	0.00	0.05	0.10	0.48	0.10	0.22	0.00	0.54
Avail Cap(c_a), veh/h	469	0	421	455	0	421	668	1258	1059	718	0	1265
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.99	0.00	0.99	1.00	1.00	1.00	0.81	0.00	0.81
Uniform Delay (d), s/veh	41.8	0.0	39.5	44.6	0.0	39.6	6.6	8.7	6.3	6.3	0.0	8.9
Incr Delay (d2), s/veh	0.7	0.0	0.1	2.2	0.0	0.1	0.0	1.3	0.2	0.1	0.0	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	0.0	0.2	4.9	0.0	0.3	0.3	6.9	0.9	0.8	0.0	8.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	42.4	0.0	39.5	46.8	0.0	39.7	6.7	9.9	6.5	6.3	0.0	10.2
LnGrp LOS	D	A	D	D	A	D	A	A	A	A	A	B
Approach Vol, veh/h		109			192			761				805
Approach Delay, s/veh		42.2			46.3			9.2				9.6
Approach LOS		D			D			A				A
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.9	79.0		22.1	8.0	79.9		22.1				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	14.0	52.0		30.0	14.0	52.0		30.0				
Max Q Clear Time (g_c+I1), s	4.3	18.9		8.2	3.0	22.4		14.8				
Green Ext Time (p_c), s	0.1	10.4		0.5	0.0	10.7		0.9				

Intersection Summary		
HCM 6th Ctrl Delay		15.1
HCM 6th LOS		B

HCM 6th Signalized Intersection Summary  
 2: Liloa Drive & E Lipoa St

Liloa Sr Housing TIAR  
 06/04/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖	↖	↗	↖	↖	↗	↖
Traffic Volume (veh/h)	79	208	24	67	165	103	15	75	93	53	45	77
Future Volume (veh/h)	79	208	24	67	165	103	15	75	93	53	45	77
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.97		0.97	0.97		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	86	226	23	73	179	57	16	82	15	58	49	12
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	679	634	65	617	697	589	392	350	287	367	350	287
Arrive On Green	0.08	0.38	0.38	0.07	0.37	0.37	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	1781	1669	170	1781	1870	1581	1318	1870	1534	1282	1870	1534
Grp Volume(v), veh/h	86	0	249	73	179	57	16	82	15	58	49	12
Grp Sat Flow(s),veh/h/ln	1781	0	1839	1781	1870	1581	1318	1870	1534	1282	1870	1534
Q Serve(g_s), s	1.2	0.0	4.0	1.0	2.7	1.0	0.4	1.5	0.3	1.7	0.9	0.3
Cycle Q Clear(g_c), s	1.2	0.0	4.0	1.0	2.7	1.0	1.3	1.5	0.3	3.2	0.9	0.3
Prop In Lane	1.00		0.09	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	679	0	699	617	697	589	392	350	287	367	350	287
V/C Ratio(X)	0.13	0.00	0.36	0.12	0.26	0.10	0.04	0.23	0.05	0.16	0.14	0.04
Avail Cap(c_a), veh/h	1841	0	1340	1792	1363	1152	1106	1363	1118	1061	1363	1118
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.7	0.0	9.2	6.9	9.0	8.4	14.5	14.2	13.7	15.6	14.0	13.7
Incr Delay (d2), s/veh	0.1	0.0	0.3	0.1	0.2	0.1	0.0	0.3	0.1	0.2	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	1.3	0.3	0.9	0.3	0.1	0.6	0.1	0.5	0.4	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	6.8	0.0	9.5	7.0	9.2	8.5	14.6	14.6	13.8	15.8	14.2	13.8
LnGrp LOS	A	A	A	A	A	A	B	B	B	B	B	B
Approach Vol, veh/h		335			309			113			119	
Approach Delay, s/veh		8.8			8.5			14.5			14.9	
Approach LOS		A			A			B			B	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		12.7	7.8	20.6		12.7	8.1	20.3				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		30.0	30.0	30.0		30.0	30.0	30.0				
Max Q Clear Time (g_c+I1), s		3.5	3.0	6.0		5.2	3.2	4.7				
Green Ext Time (p_c), s		0.5	0.2	1.5		0.4	0.2	1.2				

Intersection Summary

HCM 6th Ctrl Delay	10.2
HCM 6th LOS	B

HCM 6th Signalized Intersection Summary  
 3: Piilani Hwy & E Lipoa St

Liloa Sr Housing TIAR  
 06/04/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↖	↕	↗	↖	↕	↗
Traffic Volume (veh/h)	198	19	122	58	40	154	144	1400	45	75	1352	135
Future Volume (veh/h)	198	19	122	58	40	154	144	1400	45	75	1352	135
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	215	21	53	63	43	37	157	1522	27	82	1470	105
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	241	24	231	74	51	109	172	2250	1004	97	2101	934
Arrive On Green	0.15	0.15	0.15	0.07	0.07	0.07	0.10	0.63	0.63	0.05	0.59	0.59
Sat Flow, veh/h	1630	159	1563	1080	737	1585	1781	3554	1585	1781	3554	1580
Grp Volume(v), veh/h	236	0	53	106	0	37	157	1522	27	82	1470	105
Grp Sat Flow(s),veh/h/ln	1789	0	1563	1816	0	1585	1781	1777	1585	1781	1777	1580
Q Serve(g_s), s	31.1	0.0	7.2	13.9	0.0	5.3	21.0	65.9	1.5	11.0	69.2	7.0
Cycle Q Clear(g_c), s	31.1	0.0	7.2	13.9	0.0	5.3	21.0	65.9	1.5	11.0	69.2	7.0
Prop In Lane	0.91		1.00	0.59		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	264	0	231	125	0	109	172	2250	1004	97	2101	934
V/C Ratio(X)	0.89	0.00	0.23	0.85	0.00	0.34	0.91	0.68	0.03	0.85	0.70	0.11
Avail Cap(c_a), veh/h	350	0	306	182	0	159	334	2250	1004	223	2101	934
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.98	0.00	0.98	1.00	0.00	1.00	1.00	1.00	1.00	0.61	0.61	0.61
Uniform Delay (d), s/veh	100.4	0.0	90.2	110.5	0.0	106.5	107.4	28.2	16.4	112.5	34.2	21.5
Incr Delay (d2), s/veh	24.0	0.0	1.0	30.7	0.0	3.9	7.5	1.7	0.0	11.6	1.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	16.5	0.0	3.0	7.8	0.0	2.4	10.1	28.3	0.6	5.4	30.1	2.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	124.4	0.0	91.3	141.3	0.0	110.4	114.9	29.9	16.5	124.1	35.4	21.6
LnGrp LOS	F	A	F	F	A	F	F	C	B	F	D	C
Approach Vol, veh/h		289			143			1706			1657	
Approach Delay, s/veh		118.4			133.3			37.5			38.9	
Approach LOS		F			F			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	18.0	158.0		22.5	28.1	147.9		41.5				
Change Period (Y+Rc), s	5.0	6.0		6.0	5.0	6.0		6.0				
Max Green Setting (Gmax), s	30.0	116.0		24.0	45.0	101.0		47.0				
Max Q Clear Time (g_c+11), s	11.0	67.9		15.9	23.0	71.2		33.1				
Green Ext Time (p_c), s	0.1	30.7		0.7	0.2	13.2		2.4				

Intersection Summary

HCM 6th Ctrl Delay	47.9
HCM 6th LOS	D

Intersection						
Int Delay, s/veh	1.1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	23	148	4	15	112
Future Vol, veh/h	0	23	148	4	15	112
Conflicting Peds, #/hr	0	1	0	3	3	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	25	161	4	16	122

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	320	167	0	0	168
Stage 1	166	-	-	-	-
Stage 2	154	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	673	877	-	-	1410
Stage 1	863	-	-	-	-
Stage 2	874	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	663	874	-	-	1406
Mov Cap-2 Maneuver	663	-	-	-	-
Stage 1	850	-	-	-	-
Stage 2	874	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.2	0	0.9
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	874	1406
HCM Lane V/C Ratio	-	-	0.029	0.012
HCM Control Delay (s)	-	-	0	9.2
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0

Intersection						
Int Delay, s/veh	3.5					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	54	48	717	84	38	760
Future Vol, veh/h	54	48	717	84	38	760
Conflicting Peds, #/hr	0	1	0	6	6	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	100	0	-	115	40	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	59	52	779	91	41	826

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1693	786	0	0	785
Stage 1	785	-	-	-	-
Stage 2	908	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	102	392	-	-	834
Stage 1	449	-	-	-	-
Stage 2	393	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	96	389	-	-	829
Mov Cap-2 Maneuver	96	-	-	-	-
Stage 1	424	-	-	-	-
Stage 2	393	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	54.6	0	0.5
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	96	389	829	-
HCM Lane V/C Ratio	-	-	0.611	0.134	0.05	-
HCM Control Delay (s)	-	-	89.1	15.7	9.6	-
HCM Lane LOS	-	-	F	C	A	-
HCM 95th %tile Q(veh)	-	-	2.9	0.5	0.2	-

Intersection	
Intersection Delay, s/veh	8
Intersection LOS	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			↑	↑	↑
Traffic Vol, veh/h	116	20	16	36	34	78
Future Vol, veh/h	116	20	16	36	34	78
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	126	22	17	39	37	85
Number of Lanes	1	0	0	1	1	1

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	2	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	1
HCM Control Delay	8.4	7.9	7.6
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	SBLn1	SBLn2
Vol Left, %	31%	85%	0%	0%
Vol Thru, %	69%	0%	100%	0%
Vol Right, %	0%	15%	0%	100%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	52	136	34	78
LT Vol	16	116	0	0
Through Vol	36	0	34	0
RT Vol	0	20	0	78
Lane Flow Rate	57	148	37	85
Geometry Grp	5	2	7	7
Degree of Util (X)	0.072	0.181	0.051	0.1
Departure Headway (Hd)	4.576	4.419	4.932	4.229
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	786	815	729	850
Service Time	2.587	2.43	2.641	1.938
HCM Lane V/C Ratio	0.073	0.182	0.051	0.1
HCM Control Delay	7.9	8.4	7.9	7.4
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.7	0.2	0.3

HCM 6th Signalized Intersection Summary  
 8: S. Kihei Rd & W Welakahao Rd/E Welakahao Rd

Liloa Sr Housing TIAR  
 06/04/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕	↕	↕		↕	↕	
Traffic Volume (veh/h)	32	9	12	114	15	96	11	664	29	58	710	26
Future Volume (veh/h)	32	9	12	114	15	96	11	664	29	58	710	26
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	35	10	1	124	16	18	12	722	31	63	772	27
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	263	64	5	292	23	297	289	904	39	341	983	34
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.02	0.51	0.51	0.05	0.55	0.55
Sat Flow, veh/h	1173	480	37	1327	171	1579	1781	1780	76	1781	1796	63
Grp Volume(v), veh/h	46	0	0	140	0	18	12	0	753	63	0	799
Grp Sat Flow(s),veh/h/ln1690	0	0	0	1498	0	1579	1781	0	1856	1781	0	1859
Q Serve(g_s), s	0.0	0.0	0.0	3.8	0.0	0.6	0.2	0.0	19.9	0.9	0.0	20.2
Cycle Q Clear(g_c), s	1.3	0.0	0.0	5.2	0.0	0.6	0.2	0.0	19.9	0.9	0.0	20.2
Prop In Lane	0.76		0.02	0.89		1.00	1.00		0.04	1.00		0.03
Lane Grp Cap(c), veh/h	332	0	0	314	0	297	289	0	942	341	0	1017
V/C Ratio(X)	0.14	0.00	0.00	0.45	0.00	0.06	0.04	0.00	0.80	0.18	0.00	0.79
Avail Cap(c_a), veh/h	736	0	0	708	0	728	533	0	1539	515	0	1541
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	22.8	0.0	0.0	24.3	0.0	19.7	9.5	0.0	12.0	9.5	0.0	10.6
Incr Delay (d2), s/veh	0.2	0.0	0.0	1.0	0.0	0.1	0.1	0.0	1.6	0.3	0.0	1.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.0	1.9	0.0	0.2	0.1	0.0	7.3	0.3	0.0	7.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.0	0.0	0.0	25.3	0.0	19.8	9.6	0.0	13.7	9.8	0.0	12.2
LnGrp LOS	C	A	A	C	A	B	A	A	B	A	A	B
Approach Vol, veh/h		46			158			765			862	
Approach Delay, s/veh		23.0			24.7			13.6			12.0	
Approach LOS		C			C			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.2	36.0		13.9	6.9	38.3		13.9				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	49.0			24.0	9.0	49.0		24.0				
Max Q Clear Time (g_c+1), s	21.9			3.3	2.2	22.2		7.2				
Green Ext Time (p_c), s	0.0	6.5		0.2	0.0	7.0		0.7				

Intersection Summary

HCM 6th Ctrl Delay	14.0
HCM 6th LOS	B

Intersection						
Int Delay, s/veh	2.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	72	20	53	168	24	7
Future Vol, veh/h	72	20	53	168	24	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	78	22	58	183	26	8

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	100	0	388 89
Stage 1	-	-	-	-	89 -
Stage 2	-	-	-	-	299 -
Critical Hdwy	-	-	4.12	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	2.218	-	3.518 3.318
Pot Cap-1 Maneuver	-	-	1493	-	616 969
Stage 1	-	-	-	-	934 -
Stage 2	-	-	-	-	752 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1493	-	590 969
Mov Cap-2 Maneuver	-	-	-	-	590 -
Stage 1	-	-	-	-	894 -
Stage 2	-	-	-	-	752 -

Approach	EB	WB	NB
HCM Control Delay, s	0	1.8	10.9
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	647	-	-	1493	-
HCM Lane V/C Ratio	0.052	-	-	0.039	-
HCM Control Delay (s)	10.9	-	-	7.5	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

Intersection						
Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	71	16	13	232	17	10
Future Vol, veh/h	71	16	13	232	17	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	77	17	14	252	18	11

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	94	0	366 86
Stage 1	-	-	-	-	86 -
Stage 2	-	-	-	-	280 -
Critical Hdwy	-	-	4.12	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	2.218	-	3.518 3.318
Pot Cap-1 Maneuver	-	-	1500	-	634 973
Stage 1	-	-	-	-	937 -
Stage 2	-	-	-	-	767 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1500	-	627 973
Mov Cap-2 Maneuver	-	-	-	-	627 -
Stage 1	-	-	-	-	927 -
Stage 2	-	-	-	-	767 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.4	10.2
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	722	-	-	1500	-
HCM Lane V/C Ratio	0.041	-	-	0.009	-
HCM Control Delay (s)	10.2	-	-	7.4	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

Intersection						
Int Delay, s/veh	0.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↘	↑↑	↑↑	↗
Traffic Vol, veh/h	0	93	46	1615	1312	189
Future Vol, veh/h	0	93	46	1615	1312	189
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	425	-	-	300
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	101	50	1755	1426	205

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	-	713	1426	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	374	473	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	374	473	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	18.2	0.4	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	473	-	374	-	-
HCM Lane V/C Ratio	0.106	-	0.27	-	-
HCM Control Delay (s)	13.5	-	18.2	-	-
HCM Lane LOS	B	-	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.1	-	-



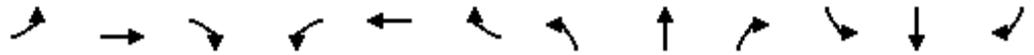
## **APPENDIX C**

### **LEVEL OF SERVICE CALCULATIONS**

- Base Year 2022 without Project AM Peak Conditions
- 
-

HCM 6th Signalized Intersection Summary  
 1: S. Kihei Rd & W Lipoa St/E Lipoa St

Liloa Sr. Housing TIAR  
 06/17/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Traffic Volume (veh/h)	45	45	55	95	25	125	40	535	180	145	645	10
Future Volume (veh/h)	45	45	55	95	25	125	40	535	180	145	645	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.96	0.97		0.96	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	49	49	7	103	27	15	43	582	93	158	701	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	203	171	252	299	66	252	396	941	783	505	993	16
Arrive On Green	0.17	0.17	0.17	0.17	0.17	0.17	0.04	0.50	0.50	0.08	0.54	0.54
Sat Flow, veh/h	646	1035	1527	1112	398	1527	1781	1870	1557	1781	1836	29
Grp Volume(v), veh/h	98	0	7	130	0	15	43	582	93	158	0	712
Grp Sat Flow(s),veh/h/ln	1681	0	1527	1509	0	1527	1781	1870	1557	1781	0	1865
Q Serve(g_s), s	0.0	0.0	0.2	1.4	0.0	0.5	0.6	12.6	1.8	2.2	0.0	15.9
Cycle Q Clear(g_c), s	2.6	0.0	0.2	4.0	0.0	0.5	0.6	12.6	1.8	2.2	0.0	15.9
Prop In Lane	0.50		1.00	0.79		1.00	1.00		1.00	1.00		0.02
Lane Grp Cap(c), veh/h	374	0	252	365	0	252	396	941	783	505	0	1009
V/C Ratio(X)	0.26	0.00	0.03	0.36	0.00	0.06	0.11	0.62	0.12	0.31	0.00	0.71
Avail Cap(c_a), veh/h	815	0	683	760	0	683	668	1839	1531	710	0	1833
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.6	0.0	19.6	21.1	0.0	19.7	7.7	10.0	7.4	7.0	0.0	9.5
Incr Delay (d2), s/veh	0.4	0.0	0.0	0.6	0.0	0.1	0.0	1.4	0.1	0.1	0.0	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	0.1	1.5	0.0	0.2	0.2	4.7	0.5	0.7	0.0	5.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.9	0.0	19.6	21.7	0.0	19.8	7.7	11.5	7.5	7.1	0.0	11.5
LnGrp LOS	C	A	B	C	A	B	A	B	A	A	A	B
Approach Vol, veh/h		105			145			718				870
Approach Delay, s/veh		20.9			21.5			10.7				10.7
Approach LOS		C			C			B				B
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.6	33.1		14.2	6.4	35.3		14.2				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	11.0	55.0		25.0	11.0	55.0		25.0				
Max Q Clear Time (g_c+I1), s	4.2	14.6		4.6	2.6	17.9		6.0				
Green Ext Time (p_c), s	0.1	10.5		0.5	0.0	12.4		0.7				

Intersection Summary

HCM 6th Ctrl Delay	12.1
HCM 6th LOS	B

HCM 6th Signalized Intersection Summary  
2: Liloa Drive & E Lipoa St

Liloa Sr. Housing TIAR  
06/17/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	50	220	35	125	160	110	45	165	155	70	180	85
Future Volume (veh/h)	50	220	35	125	160	110	45	165	155	70	180	85
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.98	0.97		0.95	0.97		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	54	239	31	136	174	47	49	179	32	76	196	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	577	532	69	514	670	559	396	576	463	408	576	463
Arrive On Green	0.05	0.33	0.33	0.08	0.36	0.36	0.31	0.31	0.31	0.31	0.31	0.31
Sat Flow, veh/h	1781	1618	210	1781	1870	1559	1147	1870	1505	1164	1870	1505
Grp Volume(v), veh/h	54	0	270	136	174	47	49	179	32	76	196	18
Grp Sat Flow(s),veh/h/ln	1781	0	1828	1781	1870	1559	1147	1870	1505	1164	1870	1505
Q Serve(g_s), s	1.0	0.0	6.2	2.6	3.5	1.1	1.8	3.9	0.8	2.8	4.3	0.4
Cycle Q Clear(g_c), s	1.0	0.0	6.2	2.6	3.5	1.1	6.1	3.9	0.8	6.7	4.3	0.4
Prop In Lane	1.00		0.11	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	577	0	601	514	670	559	396	576	463	408	576	463
V/C Ratio(X)	0.09	0.00	0.45	0.26	0.26	0.08	0.12	0.31	0.07	0.19	0.34	0.04
Avail Cap(c_a), veh/h	652	0	1203	703	1407	1172	690	1055	849	707	1055	849
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	10.6	0.0	14.1	10.4	12.1	11.3	16.6	14.1	13.0	16.7	14.2	12.9
Incr Delay (d2), s/veh	0.1	0.0	0.5	0.3	0.2	0.1	0.1	0.3	0.1	0.2	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	2.4	0.9	1.3	0.3	0.5	1.5	0.3	0.7	1.7	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.6	0.0	14.6	10.7	12.3	11.3	16.7	14.4	13.1	16.9	14.6	12.9
LnGrp LOS	B	A	B	B	B	B	B	B	B	B	B	B
Approach Vol, veh/h		324			357			260			290	
Approach Delay, s/veh		13.9			11.6			14.7			15.1	
Approach LOS		B			B			B			B	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		21.4	9.3	22.5		21.4	7.7	24.1				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		30.0	10.0	35.0		30.0	5.0	40.0				
Max Q Clear Time (g_c+I1), s		8.1	4.6	8.2		8.7	3.0	5.5				
Green Ext Time (p_c), s		1.3	0.1	1.7		1.5	0.0	1.3				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay											13.7	
HCM 6th LOS											B	

HCM 6th Signalized Intersection Summary  
 3: Piilani Hwy & E Lipoa St

Liloa Sr. Housing TIAR  
 06/17/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↖	↕	↗	↖	↕	↗
Traffic Volume (veh/h)	195	105	140	95	60	205	140	1040	130	315	1345	145
Future Volume (veh/h)	195	105	140	95	60	205	140	1040	130	315	1345	145
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	212	114	67	103	65	95	152	1130	65	342	1462	113
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	238	128	312	122	77	173	169	1338	597	361	1722	764
Arrive On Green	0.20	0.20	0.20	0.11	0.11	0.11	0.09	0.38	0.38	0.20	0.48	0.48
Sat Flow, veh/h	1178	633	1547	1113	702	1585	1781	3554	1585	1781	3554	1577
Grp Volume(v), veh/h	326	0	67	168	0	95	152	1130	65	342	1462	113
Grp Sat Flow(s),veh/h/ln	1811	0	1547	1815	0	1585	1781	1777	1585	1781	1777	1577
Q Serve(g_s), s	36.8	0.0	7.6	19.1	0.0	11.9	17.7	61.1	5.6	39.8	75.7	8.4
Cycle Q Clear(g_c), s	36.8	0.0	7.6	19.1	0.0	11.9	17.7	61.1	5.6	39.8	75.7	8.4
Prop In Lane	0.65		1.00	0.61		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	366	0	312	199	0	173	169	1338	597	361	1722	764
V/C Ratio(X)	0.89	0.00	0.21	0.85	0.00	0.55	0.90	0.84	0.11	0.95	0.85	0.15
Avail Cap(c_a), veh/h	466	0	398	294	0	257	297	1338	597	467	1722	764
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.94	0.00	0.94	1.00	0.00	1.00	1.00	1.00	1.00	0.61	0.61	0.61
Uniform Delay (d), s/veh	81.6	0.0	69.9	91.8	0.0	88.6	94.1	59.9	42.6	82.6	47.4	30.1
Incr Delay (d2), s/veh	18.7	0.0	0.7	20.7	0.0	5.7	8.4	6.7	0.4	17.9	3.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	19.3	0.0	3.1	10.3	0.0	5.3	8.6	28.4	2.3	20.0	33.8	3.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	100.2	0.0	70.6	112.5	0.0	94.3	102.5	66.6	42.9	100.5	50.8	30.3
LnGrp LOS	F	A	E	F	A	F	F	E	D	F	D	C
Approach Vol, veh/h		393			263			1347			1917	
Approach Delay, s/veh		95.2			105.9			69.5			58.5	
Approach LOS		F			F			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	47.6	85.0		29.0	24.9	107.8		48.4				
Change Period (Y+Rc), s	5.0	6.0		6.0	5.0	6.0		6.0				
Max Green Setting (Gmax), s	55.0	44.0		34.0	35.0	64.0		54.0				
Max Q Clear Time (g_c+Rt), s	41.8	63.1		21.1	19.7	77.7		38.8				
Green Ext Time (p_c), s	0.8	0.0		1.9	0.2	0.0		3.6				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				69.1								
HCM 6th LOS				E								

Intersection						
Int Delay, s/veh	5.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↵	↵	↵			↵
Traffic Vol, veh/h	15	190	115	75	200	140
Future Vol, veh/h	15	190	115	75	200	140
Conflicting Peds, #/hr	0	6	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	207	125	82	217	152

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	764	184	0	0	219	0
Stage 1	178	-	-	-	-	-
Stage 2	586	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	372	858	-	-	1350	-
Stage 1	853	-	-	-	-	-
Stage 2	556	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	302	843	-	-	1335	-
Mov Cap-2 Maneuver	302	-	-	-	-	-
Stage 1	844	-	-	-	-	-
Stage 2	457	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.2	0	4.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT	
Capacity (veh/h)	-	-	302	843	1335	-
HCM Lane V/C Ratio	-	-	0.054	0.245	0.163	-
HCM Control Delay (s)	-	-	17.6	10.7	8.2	0
HCM Lane LOS	-	-	C	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	1	0.6	-

Intersection						
Int Delay, s/veh	3.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	50	25	700	140	50	735
Future Vol, veh/h	50	25	700	140	50	735
Conflicting Peds, #/hr	0	0	0	35	35	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	100	0	-	115	40	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	54	27	761	152	54	799

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1703	796	0	0	796	0
Stage 1	796	-	-	-	-	-
Stage 2	907	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	101	387	-	-	826	-
Stage 1	444	-	-	-	-	-
Stage 2	394	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	91	374	-	-	798	-
Mov Cap-2 Maneuver	91	-	-	-	-	-
Stage 1	429	-	-	-	-	-
Stage 2	367	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	65.9	0	0.6
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	91	374	798	-
HCM Lane V/C Ratio	-	-	0.597	0.073	0.068	-
HCM Control Delay (s)	-	-	91.2	15.4	9.8	-
HCM Lane LOS	-	-	F	C	A	-
HCM 95th %tile Q(veh)	-	-	2.8	0.2	0.2	-

Intersection	
Intersection Delay, s/veh	8.4
Intersection LOS	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			↑	↑	↑
Traffic Vol, veh/h	145	25	25	50	60	90
Future Vol, veh/h	145	25	25	50	60	90
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	158	27	27	54	65	98
Number of Lanes	1	0	0	1	1	1

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	2	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	1
HCM Control Delay	9	8.3	7.9
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	SBLn1	SBLn2
Vol Left, %	33%	85%	0%	0%
Vol Thru, %	67%	0%	100%	0%
Vol Right, %	0%	15%	0%	100%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	75	170	60	90
LT Vol	25	145	0	0
Through Vol	50	0	60	0
RT Vol	0	25	0	90
Lane Flow Rate	82	185	65	98
Geometry Grp	5	2	7	7
Degree of Util (X)	0.107	0.235	0.092	0.118
Departure Headway (Hd)	4.73	4.575	5.057	4.353
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	759	787	710	825
Service Time	2.753	2.594	2.776	2.072
HCM Lane V/C Ratio	0.108	0.235	0.092	0.119
HCM Control Delay	8.3	9	8.3	7.7
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.4	0.9	0.3	0.4

Intersection						
Int Delay, s/veh	6.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙	↗	↖		↙	↗
Traffic Vol, veh/h	0	60	10	0	75	15
Future Vol, veh/h	0	60	10	0	75	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	75	0	-	-	75	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	65	11	0	82	16

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	191	11	0	0	11	0
Stage 1	11	-	-	-	-	-
Stage 2	180	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	798	1070	-	-	1608	-
Stage 1	1012	-	-	-	-	-
Stage 2	851	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	757	1070	-	-	1608	-
Mov Cap-2 Maneuver	757	-	-	-	-	-
Stage 1	1012	-	-	-	-	-
Stage 2	808	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.6	0	6.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	1070	1608
HCM Lane V/C Ratio	-	-	0.061	0.051
HCM Control Delay (s)	-	-	0	8.6
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.2

HCM 6th Signalized Intersection Summary  
 8: S. Kihei Rd & W Welakahao Rd/E Welakahao Rd

Liloa Sr. Housing TIAR  
 06/17/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔		↔	↔	
Traffic Volume (veh/h)	40	10	10	110	10	145	10	655	30	70	680	20
Future Volume (veh/h)	40	10	10	110	10	145	10	655	30	70	680	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	43	11	1	120	11	35	11	712	32	76	739	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	263	57	4	293	16	298	319	900	40	356	1001	28
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.01	0.51	0.51	0.06	0.55	0.55
Sat Flow, veh/h	1209	444	31	1377	126	1579	1781	1775	80	1781	1809	51
Grp Volume(v), veh/h	55	0	0	131	0	35	11	0	744	76	0	760
Grp Sat Flow(s),veh/h/ln	1683	0	0	1503	0	1579	1781	0	1854	1781	0	1860
Q Serve(g_s), s	0.0	0.0	0.0	3.2	0.0	1.1	0.2	0.0	19.5	1.1	0.0	18.2
Cycle Q Clear(g_c), s	1.6	0.0	0.0	4.8	0.0	1.1	0.2	0.0	19.5	1.1	0.0	18.2
Prop In Lane	0.78		0.02	0.92		1.00	1.00		0.04	1.00		0.03
Lane Grp Cap(c), veh/h	324	0	0	309	0	298	319	0	941	356	0	1030
V/C Ratio(X)	0.17	0.00	0.00	0.42	0.00	0.12	0.03	0.00	0.79	0.21	0.00	0.74
Avail Cap(c_a), veh/h	734	0	0	706	0	736	566	0	1537	519	0	1541
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.2	0.0	0.0	24.4	0.0	19.9	8.9	0.0	12.0	9.4	0.0	10.0
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.9	0.0	0.2	0.0	0.0	1.5	0.3	0.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.0	1.7	0.0	0.4	0.1	0.0	7.2	0.4	0.0	6.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.4	0.0	0.0	25.4	0.0	20.1	8.9	0.0	13.5	9.7	0.0	11.0
LnGrp LOS	C	A	A	C	A	C	A	A	B	A	A	B
Approach Vol, veh/h		55			166			755				836
Approach Delay, s/veh		23.4			24.3			13.5				10.9
Approach LOS		C			C			B				B
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.6	36.0		13.6	6.8	38.7		13.6				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	9.0	49.0		24.0	9.0	49.0		24.0				
Max Q Clear Time (g_c+I1), s	3.1	21.5		3.6	2.2	20.2		6.8				
Green Ext Time (p_c), s	0.1	6.4		0.2	0.0	6.6		0.7				

Intersection Summary

HCM 6th Ctrl Delay	13.6
HCM 6th LOS	B

Intersection												
Int Delay, s/veh	4.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷			↕			↕	
Traffic Vol, veh/h	10	85	15	25	155	15	40	0	35	20	0	50
Future Vol, veh/h	10	85	15	25	155	15	40	0	35	20	0	50
Conflicting Peds, #/hr	0	0	4	4	0	0	1	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	92	16	27	168	16	43	0	38	22	0	54

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	184	0	0	112	0	0	384	364	104	371	364	177
Stage 1	-	-	-	-	-	-	126	126	-	230	230	-
Stage 2	-	-	-	-	-	-	258	238	-	141	134	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1391	-	-	1478	-	-	574	564	951	586	564	866
Stage 1	-	-	-	-	-	-	878	792	-	773	714	-
Stage 2	-	-	-	-	-	-	747	708	-	862	785	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1391	-	-	1472	-	-	525	547	947	551	547	865
Mov Cap-2 Maneuver	-	-	-	-	-	-	525	547	-	551	547	-
Stage 1	-	-	-	-	-	-	867	782	-	767	701	-
Stage 2	-	-	-	-	-	-	687	695	-	821	776	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.7	1	11.2	10.4
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	663	1391	-	-	1472	-	-	744
HCM Lane V/C Ratio	0.123	0.008	-	-	0.018	-	-	0.102
HCM Control Delay (s)	11.2	7.6	-	-	7.5	-	-	10.4
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-	0.3

Intersection						
Int Delay, s/veh	2.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	120	25	40	140	40	5
Future Vol, veh/h	120	25	40	140	40	5
Conflicting Peds, #/hr	0	3	3	0	3	3
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	130	27	43	152	43	5

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	160	0	388 150
Stage 1	-	-	-	-	147 -
Stage 2	-	-	-	-	241 -
Critical Hdwy	-	-	4.12	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	2.218	-	3.518 3.318
Pot Cap-1 Maneuver	-	-	1419	-	616 896
Stage 1	-	-	-	-	880 -
Stage 2	-	-	-	-	799 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1415	-	592 891
Mov Cap-2 Maneuver	-	-	-	-	592 -
Stage 1	-	-	-	-	877 -
Stage 2	-	-	-	-	770 -

Approach	EB	WB	NB
HCM Control Delay, s	0	1.7	11.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	615	-	-	1415	-
HCM Lane V/C Ratio	0.08	-	-	0.031	-
HCM Control Delay (s)	11.4	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-

Intersection						
Int Delay, s/veh	1.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↘	↑↑	↑↑	↗
Traffic Vol, veh/h	0	125	50	1300	1440	120
Future Vol, veh/h	0	125	50	1300	1440	120
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	425	-	-	300
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	136	54	1413	1565	130

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	-	783	1565	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	337	418	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	337	418	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	22.7	0.6	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	418	-	337	-	-
HCM Lane V/C Ratio	0.13	-	0.403	-	-
HCM Control Delay (s)	14.9	-	22.7	-	-
HCM Lane LOS	B	-	C	-	-
HCM 95th %tile Q(veh)	0.4	-	1.9	-	-



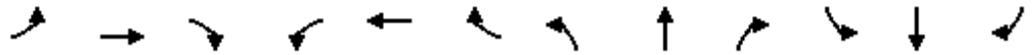
## **APPENDIX C**

### **LEVEL OF SERVICE CALCULATIONS**

- Base Year 2022 without Project PM Peak Conditions
- 
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HCM 6th Signalized Intersection Summary  
 1: S. Kihei Rd & W Lipoa St/E Lipoa St

Liloa Sr. Housing TIAR  
 06/17/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Traffic Volume (veh/h)	60	35	75	130	45	105	50	660	185	115	720	25
Future Volume (veh/h)	60	35	75	130	45	105	50	660	185	115	720	25
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.98		0.98	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	65	38	10	141	49	14	54	717	117	125	783	26
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	199	105	250	233	61	250	416	1246	1048	482	1213	40
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.04	0.67	0.67	0.04	0.67	0.67
Sat Flow, veh/h	896	647	1546	1087	378	1546	1781	1870	1573	1781	1799	60
Grp Volume(v), veh/h	103	0	10	190	0	14	54	717	117	125	0	809
Grp Sat Flow(s),veh/h/ln	1543	0	1546	1465	0	1546	1781	1870	1573	1781	0	1859
Q Serve(g_s), s	0.0	0.0	0.6	7.3	0.0	0.8	1.0	22.8	2.9	2.4	0.0	27.6
Cycle Q Clear(g_c), s	6.4	0.0	0.6	13.7	0.0	0.8	1.0	22.8	2.9	2.4	0.0	27.6
Prop In Lane	0.63		1.00	0.74		1.00	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	303	0	250	294	0	250	416	1246	1048	482	0	1253
V/C Ratio(X)	0.34	0.00	0.04	0.65	0.00	0.06	0.13	0.58	0.11	0.26	0.00	0.65
Avail Cap(c_a), veh/h	469	0	422	455	0	422	577	1246	1048	629	0	1253
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.98	0.00	0.98	1.00	1.00	1.00	0.81	0.00	0.81
Uniform Delay (d), s/veh	41.2	0.0	38.9	44.3	0.0	39.0	8.5	9.9	6.6	7.8	0.0	10.3
Incr Delay (d2), s/veh	0.7	0.0	0.1	2.3	0.0	0.1	0.1	1.9	0.2	0.1	0.0	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	0.0	0.2	5.2	0.0	0.3	0.4	9.5	1.0	0.8	0.0	11.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	41.9	0.0	38.9	46.6	0.0	39.1	8.6	11.9	6.8	7.9	0.0	12.4
LnGrp LOS	D	A	D	D	A	D	A	B	A	A	A	B
Approach Vol, veh/h		113			204			888				934
Approach Delay, s/veh		41.6			46.1			11.0				11.8
Approach LOS		D			D			B				B
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.9	78.3		22.8	8.0	79.1		22.8				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	14.0	52.0		30.0	14.0	52.0		30.0				
Max Q Clear Time (g_c+I1), s	4.4	24.8		8.4	3.0	29.6		15.7				
Green Ext Time (p_c), s	0.1	11.9		0.5	0.0	11.5		0.9				

Intersection Summary												
HCM 6th Ctrl Delay				16.3								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary  
 2: Liloa Drive & E Lipoa St

Liloa Sr. Housing TIAR  
 06/17/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	80	225	25	110	170	110	15	100	115	60	70	80
Future Volume (veh/h)	80	225	25	110	170	110	15	100	115	60	70	80
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.98		0.97	0.98		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	87	245	24	120	185	59	16	109	23	65	76	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	660	597	58	597	691	584	392	388	319	366	388	319
Arrive On Green	0.08	0.36	0.36	0.09	0.37	0.37	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1781	1676	164	1781	1870	1581	1292	1870	1539	1256	1870	1539
Grp Volume(v), veh/h	87	0	269	120	185	59	16	109	23	65	76	16
Grp Sat Flow(s),veh/h/ln	1781	0	1840	1781	1870	1581	1292	1870	1539	1256	1870	1539
Q Serve(g_s), s	1.3	0.0	4.8	1.7	3.0	1.1	0.4	2.1	0.5	2.0	1.4	0.4
Cycle Q Clear(g_c), s	1.3	0.0	4.8	1.7	3.0	1.1	1.9	2.1	0.5	4.1	1.4	0.4
Prop In Lane	1.00		0.09	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	660	0	656	597	691	584	392	388	319	366	388	319
V/C Ratio(X)	0.13	0.00	0.41	0.20	0.27	0.10	0.04	0.28	0.07	0.18	0.20	0.05
Avail Cap(c_a), veh/h	1766	0	1280	1679	1301	1100	1022	1301	1071	979	1301	1071
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	7.4	0.0	10.5	7.4	9.5	8.9	14.9	14.4	13.7	16.1	14.1	13.7
Incr Delay (d2), s/veh	0.1	0.0	0.4	0.2	0.2	0.1	0.0	0.4	0.1	0.2	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	1.7	0.5	1.0	0.3	0.1	0.8	0.2	0.5	0.6	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.5	0.0	10.9	7.6	9.7	9.0	14.9	14.8	13.8	16.3	14.4	13.7
LnGrp LOS	A	A	B	A	A	A	B	B	B	B	B	B
Approach Vol, veh/h		356			364			148			157	
Approach Delay, s/veh		10.0			8.9			14.6			15.1	
Approach LOS		B			A			B			B	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		13.9	8.8	20.4		13.9	8.2	20.9				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		30.0	30.0	30.0		30.0	30.0	30.0				
Max Q Clear Time (g_c+I1), s		4.1	3.7	6.8		6.1	3.3	5.0				
Green Ext Time (p_c), s		0.7	0.3	1.7		0.6	0.2	1.3				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay											11.1	
HCM 6th LOS											B	

HCM 6th Signalized Intersection Summary  
 3: Piilani Hwy & E Lipoa St

Liloa Sr. Housing TIAR  
 06/17/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↖	↕	↗	↖	↕	↗
Traffic Volume (veh/h)	225	25	135	60	45	160	165	1690	50	85	1655	165
Future Volume (veh/h)	225	25	135	60	45	160	165	1690	50	85	1655	165
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	245	27	70	65	49	48	179	1837	29	92	1799	134
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	269	30	261	76	57	116	194	2147	958	107	1974	877
Arrive On Green	0.17	0.17	0.17	0.07	0.07	0.07	0.11	0.60	0.60	0.06	0.56	0.56
Sat Flow, veh/h	1612	178	1565	1037	782	1585	1781	3554	1585	1781	3554	1579
Grp Volume(v), veh/h	272	0	70	114	0	48	179	1837	29	92	1799	134
Grp Sat Flow(s),veh/h/ln	1790	0	1565	1819	0	1585	1781	1777	1585	1781	1777	1579
Q Serve(g_s), s	35.8	0.0	9.4	14.9	0.0	6.9	23.9	101.7	1.8	12.3	109.4	9.9
Cycle Q Clear(g_c), s	35.8	0.0	9.4	14.9	0.0	6.9	23.9	101.7	1.8	12.3	109.4	9.9
Prop In Lane	0.90		1.00	0.57		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	299	0	261	133	0	116	194	2147	958	107	1974	877
V/C Ratio(X)	0.91	0.00	0.27	0.86	0.00	0.41	0.92	0.86	0.03	0.86	0.91	0.15
Avail Cap(c_a), veh/h	350	0	306	182	0	159	334	2147	958	223	1974	877
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.95	0.00	0.95	1.00	0.00	1.00	1.00	1.00	1.00	0.61	0.61	0.61
Uniform Delay (d), s/veh	98.2	0.0	87.2	110.0	0.0	106.3	106.0	38.9	19.2	111.8	48.0	25.9
Incr Delay (d2), s/veh	26.7	0.0	1.1	32.3	0.0	5.0	12.2	4.6	0.1	11.5	5.1	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	19.2	0.0	4.0	8.4	0.0	3.1	11.8	44.8	0.7	6.1	48.9	3.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	125.0	0.0	88.3	142.2	0.0	111.3	118.2	43.6	19.2	123.3	53.1	26.1
LnGrp LOS	F	A	F	F	A	F	F	D	B	F	D	C
Approach Vol, veh/h		342			162			2045			2025	
Approach Delay, s/veh		117.5			133.1			49.8			54.5	
Approach LOS		F			F			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	19.4	151.0		23.6	31.1	139.3		46.0				
Change Period (Y+Rc), s	5.0	6.0		6.0	5.0	6.0		6.0				
Max Green Setting (Gmax), s	30.0	116.0		24.0	45.0	101.0		47.0				
Max Q Clear Time (g_c+1/3), s	11.3	103.7		16.9	25.9	111.4		37.8				
Green Ext Time (p_c), s	0.2	11.3		0.7	0.2	0.0		2.2				

Intersection Summary

HCM 6th Ctrl Delay	59.9
HCM 6th LOS	E

Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	35	180	10	25	165
Future Vol, veh/h	0	35	180	10	25	165
Conflicting Peds, #/hr	0	1	0	3	3	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	38	196	11	27	179

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	438	206	0	0	210	0
Stage 1	205	-	-	-	-	-
Stage 2	233	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	576	835	-	-	1361	-
Stage 1	829	-	-	-	-	-
Stage 2	806	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	562	832	-	-	1357	-
Mov Cap-2 Maneuver	562	-	-	-	-	-
Stage 1	827	-	-	-	-	-
Stage 2	788	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.5	0	1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	832	1357
HCM Lane V/C Ratio	-	-	0.046	0.02
HCM Control Delay (s)	-	-	0	9.5
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1

Intersection						
Int Delay, s/veh	8.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	65	55	830	115	45	875
Future Vol, veh/h	65	55	830	115	45	875
Conflicting Peds, #/hr	0	1	0	6	6	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	100	0	-	115	40	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	71	60	902	125	49	951

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1957	909	0	0	908
Stage 1	908	-	-	-	-
Stage 2	1049	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	~ 70	333	-	-	750
Stage 1	393	-	-	-	-
Stage 2	337	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	~ 65	331	-	-	746
Mov Cap-2 Maneuver	~ 65	-	-	-	-
Stage 1	391	-	-	-	-
Stage 2	315	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	141.5	0	0.5
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	65	331	746	-
HCM Lane V/C Ratio	-	-	1.087	0.181	0.066	-
HCM Control Delay (s)	-	-	245.7	18.3	10.2	-
HCM Lane LOS	-	-	F	C	B	-
HCM 95th %tile Q(veh)	-	-	5.5	0.6	0.2	-

Notes  
 -: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

Intersection	
Intersection Delay, s/veh	8.6
Intersection LOS	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			←	↑	↗
Traffic Vol, veh/h	125	50	35	70	90	80
Future Vol, veh/h	125	50	35	70	90	80
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	136	54	38	76	98	87
Number of Lanes	1	0	0	1	1	1

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	2	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	1
HCM Control Delay	9.1	8.6	8.1
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	SBLn1	SBLn2
Vol Left, %	33%	71%	0%	0%
Vol Thru, %	67%	0%	100%	0%
Vol Right, %	0%	29%	0%	100%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	105	175	90	80
LT Vol	35	125	0	0
Through Vol	70	0	90	0
RT Vol	0	50	0	80
Lane Flow Rate	114	190	98	87
Geometry Grp	5	2	7	7
Degree of Util (X)	0.151	0.243	0.139	0.106
Departure Headway (Hd)	4.768	4.593	5.097	4.393
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	752	782	704	816
Service Time	2.798	2.619	2.824	2.12
HCM Lane V/C Ratio	0.152	0.243	0.139	0.107
HCM Control Delay	8.6	9.1	8.6	7.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.5	1	0.5	0.4

Intersection						
Int Delay, s/veh	6.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	80	10	0	115	20
Future Vol, veh/h	0	80	10	0	115	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	75	0	-	-	75	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	87	11	0	125	22

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	283	11	0	0	11	0
Stage 1	11	-	-	-	-	-
Stage 2	272	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	707	1070	-	-	1608	-
Stage 1	1012	-	-	-	-	-
Stage 2	774	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	652	1070	-	-	1608	-
Mov Cap-2 Maneuver	652	-	-	-	-	-
Stage 1	1012	-	-	-	-	-
Stage 2	714	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.7	0	6.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	1070	1608
HCM Lane V/C Ratio	-	-	0.081	0.078
HCM Control Delay (s)	-	-	0	8.7
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.3

HCM 6th Signalized Intersection Summary  
 8: S. Kihei Rd & W Welakahao Rd/E Welakahao Rd

Liloa Sr. Housing TIAR  
 06/17/2019



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔		↔	↔	
Traffic Volume (veh/h)	35	10	15	145	15	120	15	785	45	80	815	30
Future Volume (veh/h)	35	10	15	145	15	120	15	785	45	80	815	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	38	11	3	158	16	44	16	853	47	87	886	32
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	259	68	15	300	21	331	239	958	53	271	1046	38
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.02	0.55	0.55	0.06	0.58	0.58
Sat Flow, veh/h	1140	444	97	1351	137	1580	1781	1755	97	1781	1793	65
Grp Volume(v), veh/h	52	0	0	174	0	44	16	0	900	87	0	918
Grp Sat Flow(s),veh/h/ln	1682	0	0	1488	0	1580	1781	0	1852	1781	0	1858
Q Serve(g_s), s	0.0	0.0	0.0	6.2	0.0	1.7	0.3	0.0	31.6	1.5	0.0	29.9
Cycle Q Clear(g_c), s	1.9	0.0	0.0	8.1	0.0	1.7	0.3	0.0	31.6	1.5	0.0	29.9
Prop In Lane	0.73		0.06	0.91		1.00	1.00		0.05	1.00		0.03
Lane Grp Cap(c), veh/h	342	0	0	321	0	331	239	0	1011	271	0	1084
V/C Ratio(X)	0.15	0.00	0.00	0.54	0.00	0.13	0.07	0.00	0.89	0.32	0.00	0.85
Avail Cap(c_a), veh/h	599	0	0	569	0	605	423	0	1234	388	0	1238
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.2	0.0	0.0	29.6	0.0	23.6	12.2	0.0	14.8	14.0	0.0	12.6
Incr Delay (d2), s/veh	0.2	0.0	0.0	1.4	0.0	0.2	0.1	0.0	7.3	0.7	0.0	5.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	0.0	3.0	0.0	0.6	0.1	0.0	13.6	0.7	0.0	12.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.4	0.0	0.0	31.1	0.0	23.8	12.3	0.0	22.0	14.7	0.0	17.7
LnGrp LOS	C	A	A	C	A	C	B	A	C	B	A	B
Approach Vol, veh/h		52			218			916			1005	
Approach Delay, s/veh		27.4			29.6			21.8			17.4	
Approach LOS		C			C			C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.2	46.1		17.2	7.4	48.9		17.2				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	9.0	49.0		24.0	9.0	49.0		24.0				
Max Q Clear Time (g_c+I1), s	3.5	33.6		3.9	2.3	31.9		10.1				
Green Ext Time (p_c), s	0.1	6.6		0.2	0.0	7.1		0.9				

Intersection Summary												
HCM 6th Ctrl Delay				20.7								
HCM 6th LOS				C								

Intersection												
Int Delay, s/veh	3.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷			↕			↕	
Traffic Vol, veh/h	25	75	20	55	195	55	25	0	10	10	0	40
Future Vol, veh/h	25	75	20	55	195	55	25	0	10	10	0	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	82	22	60	212	60	27	0	11	11	0	43

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	272	0	0	104	0	0	531	539	93	515	520	242
Stage 1	-	-	-	-	-	-	147	147	-	362	362	-
Stage 2	-	-	-	-	-	-	384	392	-	153	158	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1291	-	-	1488	-	-	459	449	964	470	461	797
Stage 1	-	-	-	-	-	-	856	775	-	657	625	-
Stage 2	-	-	-	-	-	-	639	606	-	849	767	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1291	-	-	1488	-	-	414	422	964	443	433	797
Mov Cap-2 Maneuver	-	-	-	-	-	-	414	422	-	443	433	-
Stage 1	-	-	-	-	-	-	838	759	-	643	600	-
Stage 2	-	-	-	-	-	-	580	582	-	822	751	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.6			1.4			12.9			10.7		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	495	1291	-	-	1488	-	-	687
HCM Lane V/C Ratio	0.077	0.021	-	-	0.04	-	-	0.079
HCM Control Delay (s)	12.9	7.8	-	-	7.5	-	-	10.7
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.2	0.1	-	-	0.1	-	-	0.3

Intersection						
Int Delay, s/veh	0.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	85	20	15	310	20	10
Future Vol, veh/h	85	20	15	310	20	10
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	92	22	16	337	22	11

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	114	0	472 103
Stage 1	-	-	-	-	103 -
Stage 2	-	-	-	-	369 -
Critical Hdwy	-	-	4.12	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	2.218	-	3.518 3.318
Pot Cap-1 Maneuver	-	-	1475	-	551 952
Stage 1	-	-	-	-	921 -
Stage 2	-	-	-	-	699 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1475	-	544 952
Mov Cap-2 Maneuver	-	-	-	-	544 -
Stage 1	-	-	-	-	921 -
Stage 2	-	-	-	-	690 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	11
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	635	-	-	1475	-
HCM Lane V/C Ratio	0.051	-	-	0.011	-
HCM Control Delay (s)	11	-	-	7.5	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

Intersection						
Int Delay, s/veh	0.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↘	↕	↕	↗
Traffic Vol, veh/h	0	105	65	1925	1570	250
Future Vol, veh/h	0	105	65	1925	1570	250
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	425	-	-	300
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	114	71	2092	1707	272

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	-	854	1707	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	302	368	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	302	368	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24	0.6	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	368	-	302	-	-
HCM Lane V/C Ratio	0.192	-	0.378	-	-
HCM Control Delay (s)	17.1	-	24	-	-
HCM Lane LOS	C	-	C	-	-
HCM 95th %tile Q(veh)	0.7	-	1.7	-	-



## **APPENDIX C**

### LEVEL OF SERVICE CALCULATIONS

- Future Year 2022 with Project AM Peak Conditions
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HCM 6th Signalized Intersection Summary  
 1: S. Kihei Rd & W Lipoa St/E Lipoa St

Liloa Sr. Housing TIAR  
 02/27/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	45	45	55	95	25	125	40	540	185	145	650	10
Future Volume (veh/h)	45	45	55	95	25	125	40	540	185	145	650	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.97		0.96	0.97		0.96	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	49	49	7	103	27	15	43	587	96	158	707	11
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	202	170	252	298	65	252	394	946	787	503	998	16
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.04	0.51	0.51	0.08	0.54	0.54
Sat Flow, veh/h	647	1034	1527	1112	397	1527	1781	1870	1557	1781	1836	29
Grp Volume(v), veh/h	98	0	7	130	0	15	43	587	96	158	0	718
Grp Sat Flow(s),veh/h/ln	1681	0	1527	1510	0	1527	1781	1870	1557	1781	0	1865
Q Serve(g_s), s	0.0	0.0	0.2	1.4	0.0	0.5	0.6	12.7	1.8	2.3	0.0	16.1
Cycle Q Clear(g_c), s	2.6	0.0	0.2	4.0	0.0	0.5	0.6	12.7	1.8	2.3	0.0	16.1
Prop In Lane	0.50		1.00	0.79		1.00	1.00		1.00	1.00		0.02
Lane Grp Cap(c), veh/h	373	0	252	363	0	252	394	946	787	503	0	1013
V/C Ratio(X)	0.26	0.00	0.03	0.36	0.00	0.06	0.11	0.62	0.12	0.31	0.00	0.71
Avail Cap(c_a), veh/h	809	0	677	754	0	677	664	1825	1519	706	0	1819
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.8	0.0	19.8	21.2	0.0	19.9	7.7	10.0	7.3	7.0	0.0	9.6
Incr Delay (d2), s/veh	0.4	0.0	0.0	0.6	0.0	0.1	0.0	1.4	0.1	0.1	0.0	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	0.0	0.1	1.5	0.0	0.2	0.2	4.7	0.6	0.7	0.0	5.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	21.1	0.0	19.8	21.8	0.0	20.0	7.8	11.5	7.5	7.2	0.0	11.5
LnGrp LOS	C	A	B	C	A	B	A	B	A	A	A	B
Approach Vol, veh/h		105			145			726			876	
Approach Delay, s/veh		21.0			21.7			10.7			10.7	
Approach LOS		C			C			B			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.6	33.5		14.3	6.5	35.6		14.3				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	11.0	55.0		25.0	11.0	55.0		25.0				
Max Q Clear Time (g_c+I1), s	4.3	14.7		4.6	2.6	18.1		6.0				
Green Ext Time (p_c), s	0.1	10.6		0.5	0.0	12.5		0.7				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				12.2								
HCM 6th LOS				B								

HCM 6th Signalized Intersection Summary  
 2: Liloa Drive & E Lipoa St

Liloa Sr. Housing TIAR  
 02/27/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖	↖	↗	↖	↖	↗	↖
Traffic Volume (veh/h)	50	225	35	125	160	110	45	165	155	70	180	85
Future Volume (veh/h)	50	225	35	125	160	110	45	165	155	70	180	85
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.98	0.97		0.95	0.97		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No										
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	54	245	31	136	174	47	49	179	32	76	196	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	577	534	68	509	670	559	396	576	463	408	576	463
Arrive On Green	0.05	0.33	0.33	0.08	0.36	0.36	0.31	0.31	0.31	0.31	0.31	0.31
Sat Flow, veh/h	1781	1623	205	1781	1870	1559	1147	1870	1505	1164	1870	1505
Grp Volume(v), veh/h	54	0	276	136	174	47	49	179	32	76	196	18
Grp Sat Flow(s),veh/h/ln	1781	0	1829	1781	1870	1559	1147	1870	1505	1164	1870	1505
Q Serve(g_s), s	1.0	0.0	6.3	2.6	3.5	1.1	1.8	3.9	0.8	2.8	4.3	0.4
Cycle Q Clear(g_c), s	1.0	0.0	6.3	2.6	3.5	1.1	6.1	3.9	0.8	6.7	4.3	0.4
Prop In Lane	1.00		0.11	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	577	0	601	509	670	559	396	576	463	408	576	463
V/C Ratio(X)	0.09	0.00	0.46	0.27	0.26	0.08	0.12	0.31	0.07	0.19	0.34	0.04
Avail Cap(c_a), veh/h	652	0	1204	699	1407	1172	690	1055	849	707	1055	849
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	10.6	0.0	14.1	10.4	12.1	11.3	16.6	14.1	13.0	16.7	14.2	12.9
Incr Delay (d2), s/veh	0.1	0.0	0.5	0.3	0.2	0.1	0.1	0.3	0.1	0.2	0.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	2.4	0.9	1.3	0.3	0.5	1.5	0.3	0.7	1.7	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.6	0.0	14.7	10.7	12.3	11.3	16.7	14.4	13.1	16.9	14.6	12.9
LnGrp LOS	B	A	B	B	B	B	B	B	B	B	B	B
Approach Vol, veh/h		330			357			260			290	
Approach Delay, s/veh		14.0			11.6			14.7			15.1	
Approach LOS		B			B			B			B	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		21.4	9.3	22.5		21.4	7.7	24.1				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		30.0	10.0	35.0		30.0	5.0	40.0				
Max Q Clear Time (g_c+I1), s		8.1	4.6	8.3		8.7	3.0	5.5				
Green Ext Time (p_c), s		1.3	0.1	1.8		1.5	0.0	1.3				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay											13.7	
HCM 6th LOS											B	

HCM 6th Signalized Intersection Summary  
 3: Piilani Hwy & E Lipoa St

Liloa Sr. Housing TIAR  
 02/27/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↖	↕	↗	↖	↕	↗
Traffic Volume (veh/h)	195	105	140	95	60	205	140	1040	130	315	1345	145
Future Volume (veh/h)	195	105	140	95	60	205	140	1040	130	315	1345	145
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.98	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	212	114	67	103	65	95	152	1130	65	342	1462	113
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	238	128	312	122	77	173	169	1338	597	361	1722	764
Arrive On Green	0.20	0.20	0.20	0.11	0.11	0.11	0.09	0.38	0.38	0.20	0.48	0.48
Sat Flow, veh/h	1178	633	1547	1113	702	1585	1781	3554	1585	1781	3554	1577
Grp Volume(v), veh/h	326	0	67	168	0	95	152	1130	65	342	1462	113
Grp Sat Flow(s),veh/h/ln	1811	0	1547	1815	0	1585	1781	1777	1585	1781	1777	1577
Q Serve(g_s), s	36.8	0.0	7.6	19.1	0.0	11.9	17.7	61.1	5.6	39.8	75.7	8.4
Cycle Q Clear(g_c), s	36.8	0.0	7.6	19.1	0.0	11.9	17.7	61.1	5.6	39.8	75.7	8.4
Prop In Lane	0.65		1.00	0.61		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	366	0	312	199	0	173	169	1338	597	361	1722	764
V/C Ratio(X)	0.89	0.00	0.21	0.85	0.00	0.55	0.90	0.84	0.11	0.95	0.85	0.15
Avail Cap(c_a), veh/h	466	0	398	294	0	257	297	1338	597	467	1722	764
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.94	0.00	0.94	1.00	0.00	1.00	1.00	1.00	1.00	0.61	0.61	0.61
Uniform Delay (d), s/veh	81.6	0.0	69.9	91.8	0.0	88.6	94.1	59.9	42.6	82.6	47.4	30.1
Incr Delay (d2), s/veh	18.7	0.0	0.7	20.7	0.0	5.7	8.4	6.7	0.4	17.9	3.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	19.3	0.0	3.1	10.3	0.0	5.3	8.6	28.4	2.3	20.0	33.8	3.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	100.2	0.0	70.6	112.5	0.0	94.3	102.5	66.6	42.9	100.5	50.8	30.3
LnGrp LOS	F	A	E	F	A	F	F	E	D	F	D	C
Approach Vol, veh/h		393			263			1347			1917	
Approach Delay, s/veh		95.2			105.9			69.5			58.5	
Approach LOS		F			F			E			E	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	47.6	85.0		29.0	24.9	107.8		48.4				
Change Period (Y+Rc), s	5.0	6.0		6.0	5.0	6.0		6.0				
Max Green Setting (Gmax), s	55.0	44.0		34.0	35.0	64.0		54.0				
Max Q Clear Time (g_c+Rt), s	41.8	63.1		21.1	19.7	77.7		38.8				
Green Ext Time (p_c), s	0.8	0.0		1.9	0.2	0.0		3.6				

Intersection Summary

HCM 6th Ctrl Delay	69.1
HCM 6th LOS	E

Intersection						
Int Delay, s/veh	5.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↷	↶			↷
Traffic Vol, veh/h	15	190	115	75	200	140
Future Vol, veh/h	15	190	115	75	200	140
Conflicting Peds, #/hr	0	6	0	12	12	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	207	125	82	217	152

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	764	184	0	0	219	0
Stage 1	178	-	-	-	-	-
Stage 2	586	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	372	858	-	-	1350	-
Stage 1	853	-	-	-	-	-
Stage 2	556	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	302	843	-	-	1335	-
Mov Cap-2 Maneuver	302	-	-	-	-	-
Stage 1	693	-	-	-	-	-
Stage 2	556	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.2	0	4.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	302	843	1335	-
HCM Lane V/C Ratio	-	-	0.054	0.245	0.163	-
HCM Control Delay (s)	-	-	17.6	10.7	8.2	0
HCM Lane LOS	-	-	C	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	1	0.6	-

Intersection						
Int Delay, s/veh	3.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	50	25	710	140	50	740
Future Vol, veh/h	50	25	710	140	50	740
Conflicting Peds, #/hr	0	0	0	35	35	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	100	0	-	115	40	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	54	27	772	152	54	804

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	1719	807	0	0	807	0
Stage 1	807	-	-	-	-	-
Stage 2	912	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	99	381	-	-	818	-
Stage 1	439	-	-	-	-	-
Stage 2	392	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	89	368	-	-	791	-
Mov Cap-2 Maneuver	89	-	-	-	-	-
Stage 1	396	-	-	-	-	-
Stage 2	392	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	68.5	0	0.6
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	89	368	791
HCM Lane V/C Ratio	-	-	0.611	0.074	0.069
HCM Control Delay (s)	-	-	94.9	15.6	9.9
HCM Lane LOS	-	-	F	C	A
HCM 95th %tile Q(veh)	-	-	2.8	0.2	0.2

Intersection	
Intersection Delay, s/veh	8.4
Intersection LOS	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			↑	↑	↑
Traffic Vol, veh/h	145	25	25	50	60	90
Future Vol, veh/h	145	25	25	50	60	90
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	158	27	27	54	65	98
Number of Lanes	1	0	0	1	1	1

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	2	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	1
HCM Control Delay	9	8.3	7.9
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	SBLn1	SBLn2
Vol Left, %	33%	85%	0%	0%
Vol Thru, %	67%	0%	100%	0%
Vol Right, %	0%	15%	0%	100%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	75	170	60	90
LT Vol	25	145	0	0
Through Vol	50	0	60	0
RT Vol	0	25	0	90
Lane Flow Rate	82	185	65	98
Geometry Grp	5	2	7	7
Degree of Util (X)	0.107	0.235	0.092	0.118
Departure Headway (Hd)	4.73	4.575	5.057	4.353
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	759	787	710	825
Service Time	2.753	2.594	2.776	2.072
HCM Lane V/C Ratio	0.108	0.235	0.092	0.119
HCM Control Delay	8.3	9	8.3	7.7
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.4	0.9	0.3	0.4

**Intersection**

Int Delay, s/veh 6.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙	↗	↖		↙	↗
Traffic Vol, veh/h	0	60	10	0	75	15
Future Vol, veh/h	0	60	10	0	75	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	75	0	-	-	75	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	65	11	0	82	16

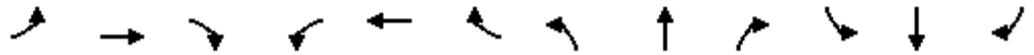
Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	191	11	0
Stage 1	11	-	-
Stage 2	180	-	-
Critical Hdwy	6.42	6.22	-
Critical Hdwy Stg 1	5.42	-	-
Critical Hdwy Stg 2	5.42	-	-
Follow-up Hdwy	3.518	3.318	-
Pot Cap-1 Maneuver	798	1070	-
Stage 1	1012	-	-
Stage 2	851	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	757	1070	-
Mov Cap-2 Maneuver	757	-	-
Stage 1	960	-	-
Stage 2	851	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.6	0	6.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	1070	1608
HCM Lane V/C Ratio	-	-	0.061	0.051
HCM Control Delay (s)	-	-	0	8.6
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.2

HCM 6th Signalized Intersection Summary  
 8: S. Kihei Rd & W Welakahao Rd/E Welakahao Rd

Liloa Sr. Housing TIAR  
 02/27/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕	↕	↕		↕	↕	
Traffic Volume (veh/h)	40	10	10	115	10	155	10	655	30	75	680	20
Future Volume (veh/h)	40	10	10	115	10	155	10	655	30	75	680	20
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	43	11	2	125	11	50	11	712	32	82	739	21
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	264	58	8	299	16	309	316	893	40	353	997	28
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.01	0.50	0.50	0.06	0.55	0.55
Sat Flow, veh/h	1185	439	60	1378	121	1579	1781	1775	80	1781	1809	51
Grp Volume(v), veh/h	56	0	0	136	0	50	11	0	744	82	0	760
Grp Sat Flow(s),veh/h/ln	1684	0	0	1500	0	1579	1781	0	1854	1781	0	1860
Q Serve(g_s), s	0.0	0.0	0.0	3.4	0.0	1.6	0.2	0.0	19.9	1.3	0.0	18.5
Cycle Q Clear(g_c), s	1.6	0.0	0.0	5.0	0.0	1.6	0.2	0.0	19.9	1.3	0.0	18.5
Prop In Lane	0.77		0.04	0.92		1.00	1.00		0.04	1.00		0.03
Lane Grp Cap(c), veh/h	331	0	0	315	0	309	316	0	933	353	0	1025
V/C Ratio(X)	0.17	0.00	0.00	0.43	0.00	0.16	0.03	0.00	0.80	0.23	0.00	0.74
Avail Cap(c_a), veh/h	729	0	0	699	0	734	559	0	1523	511	0	1528
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.1	0.0	0.0	24.5	0.0	19.9	9.1	0.0	12.3	9.6	0.0	10.2
Incr Delay (d2), s/veh	0.2	0.0	0.0	0.9	0.0	0.2	0.0	0.0	1.6	0.3	0.0	1.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	0.0	1.8	0.0	0.6	0.1	0.0	7.3	0.4	0.0	6.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.4	0.0	0.0	25.4	0.0	20.2	9.1	0.0	13.9	10.0	0.0	11.2
LnGrp LOS	C	A	A	C	A	C	A	A	B	A	A	B
Approach Vol, veh/h		56			186			755				842
Approach Delay, s/veh		23.4			24.0			13.9				11.1
Approach LOS		C			C			B				B
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	9.7	36.0		13.9	6.8	38.9		13.9				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	9.0	49.0		24.0	9.0	49.0		24.0				
Max Q Clear Time (g_c+I1), s	3.3	21.9		3.6	2.2	20.5		7.0				
Green Ext Time (p_c), s	0.1	6.3		0.2	0.0	6.6		0.8				

Intersection Summary												
HCM 6th Ctrl Delay				13.9								
HCM 6th LOS				B								

Intersection												
Int Delay, s/veh	4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷			↕			↕	
Traffic Vol, veh/h	10	90	15	25	170	15	40	0	35	20	0	50
Future Vol, veh/h	10	90	15	25	170	15	40	0	35	20	0	50
Conflicting Peds, #/hr	0	0	4	4	0	0	1	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	98	16	27	185	16	43	0	38	22	0	54

Major/Minor	Major1		Major2		Minor1		Minor2					
Conflicting Flow All	201	0	0	118	0	0	407	387	110	394	387	194
Stage 1	-	-	-	-	-	-	132	132	-	247	247	-
Stage 2	-	-	-	-	-	-	275	255	-	147	140	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1371	-	-	1470	-	-	555	547	943	566	547	847
Stage 1	-	-	-	-	-	-	871	787	-	757	702	-
Stage 2	-	-	-	-	-	-	731	696	-	856	781	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1371	-	-	1464	-	-	507	531	939	532	531	846
Mov Cap-2 Maneuver	-	-	-	-	-	-	507	531	-	532	531	-
Stage 1	-	-	-	-	-	-	861	778	-	751	689	-
Stage 2	-	-	-	-	-	-	671	683	-	815	772	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	0.7		0.9		11.4		10.6	
HCM LOS					B		B	

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	646	1371	-	-	1464	-	-	724
HCM Lane V/C Ratio	0.126	0.008	-	-	0.019	-	-	0.105
HCM Control Delay (s)	11.4	7.6	-	-	7.5	-	-	10.6
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.4	0	-	-	0.1	-	-	0.4

Intersection						
Int Delay, s/veh	2.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	120	25	45	140	50	10
Future Vol, veh/h	120	25	45	140	50	10
Conflicting Peds, #/hr	0	3	3	0	3	3
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	130	27	49	152	54	11

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	160	0	400 150
Stage 1	-	-	-	-	147 -
Stage 2	-	-	-	-	253 -
Critical Hdwy	-	-	4.12	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	2.218	-	3.518 3.318
Pot Cap-1 Maneuver	-	-	1419	-	606 896
Stage 1	-	-	-	-	880 -
Stage 2	-	-	-	-	789 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1415	-	579 891
Mov Cap-2 Maneuver	-	-	-	-	579 -
Stage 1	-	-	-	-	844 -
Stage 2	-	-	-	-	787 -

Approach	EB	WB	NB
HCM Control Delay, s	0	1.9	11.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	615	-	-	1415	-
HCM Lane V/C Ratio	0.106	-	-	0.035	-
HCM Control Delay (s)	11.5	-	-	7.6	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↘	↕	↕	↗
Traffic Vol, veh/h	0	130	55	1300	1440	120
Future Vol, veh/h	0	130	55	1300	1440	120
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	425	-	-	300
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	141	60	1413	1565	130

Major/Minor	Minor2	Major1	Major2		
Conflicting Flow All	-	783	1565	0	0
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-
Critical Hdwy Stg 1	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-
Pot Cap-1 Maneuver	0	337	418	-	-
Stage 1	0	-	-	-	-
Stage 2	0	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	-	337	418	-	-
Mov Cap-2 Maneuver	-	-	-	-	-
Stage 1	-	-	-	-	-
Stage 2	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	23.2	0.6	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	418	-	337	-	-
HCM Lane V/C Ratio	0.143	-	0.419	-	-
HCM Control Delay (s)	15	-	23.2	-	-
HCM Lane LOS	C	-	C	-	-
HCM 95th %tile Q(veh)	0.5	-	2	-	-

Intersection						
Int Delay, s/veh	2.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	15	30	0	10	20
Future Vol, veh/h	0	15	30	0	10	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	140	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	16	33	0	11	22

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	77	33	0	0	33	0
Stage 1	33	-	-	-	-	-
Stage 2	44	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	926	1041	-	-	1579	-
Stage 1	989	-	-	-	-	-
Stage 2	978	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	920	1041	-	-	1579	-
Mov Cap-2 Maneuver	920	-	-	-	-	-
Stage 1	982	-	-	-	-	-
Stage 2	978	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.5	0	2.4
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	1041	1579
HCM Lane V/C Ratio	-	-	0.016	0.007
HCM Control Delay (s)	-	-	8.5	7.3
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0



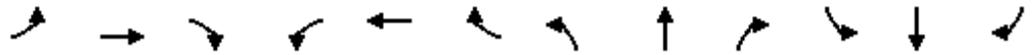
## **APPENDIX C**

### LEVEL OF SERVICE CALCULATIONS

- Future Year 2022 with Project PM Peak Conditions
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HCM 6th Signalized Intersection Summary  
 1: S. Kihei Rd & W Lipoa St/E Lipoa St

Liloa Sr Housing TIAR  
 02/27/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Traffic Volume (veh/h)	60	35	75	130	45	105	50	660	190	115	725	25
Future Volume (veh/h)	60	35	75	130	45	105	50	660	190	115	725	25
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.98		0.98	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	65	38	10	141	49	14	54	717	121	125	788	26
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	199	105	250	233	61	250	413	1246	1048	482	1213	40
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.04	0.67	0.67	0.04	0.67	0.67
Sat Flow, veh/h	896	647	1546	1087	378	1546	1781	1870	1573	1781	1800	59
Grp Volume(v), veh/h	103	0	10	190	0	14	54	717	121	125	0	814
Grp Sat Flow(s),veh/h/ln	1543	0	1546	1465	0	1546	1781	1870	1573	1781	0	1859
Q Serve(g_s), s	0.0	0.0	0.6	7.3	0.0	0.8	1.0	22.8	3.1	2.4	0.0	27.9
Cycle Q Clear(g_c), s	6.4	0.0	0.6	13.7	0.0	0.8	1.0	22.8	3.1	2.4	0.0	27.9
Prop In Lane	0.63		1.00	0.74		1.00	1.00		1.00	1.00		0.03
Lane Grp Cap(c), veh/h	303	0	250	294	0	250	413	1246	1048	482	0	1253
V/C Ratio(X)	0.34	0.00	0.04	0.65	0.00	0.06	0.13	0.58	0.12	0.26	0.00	0.65
Avail Cap(c_a), veh/h	469	0	422	455	0	422	574	1246	1048	629	0	1253
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	0.98	0.00	0.98	1.00	1.00	1.00	0.81	0.00	0.81
Uniform Delay (d), s/veh	41.2	0.0	38.9	44.3	0.0	39.0	8.6	9.9	6.6	7.8	0.0	10.4
Incr Delay (d2), s/veh	0.7	0.0	0.1	2.3	0.0	0.1	0.1	1.9	0.2	0.1	0.0	2.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.6	0.0	0.2	5.2	0.0	0.3	0.4	9.5	1.1	0.8	0.0	11.3
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	41.9	0.0	38.9	46.6	0.0	39.1	8.7	11.9	6.9	7.9	0.0	12.5
LnGrp LOS	D	A	D	D	A	D	A	B	A	A	A	B
Approach Vol, veh/h		113			204			892				939
Approach Delay, s/veh		41.6			46.1			11.0				11.9
Approach LOS		D			D			B				B
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.9	78.3		22.8	8.0	79.1		22.8				
Change Period (Y+Rc), s	4.0	5.0		5.0	4.0	5.0		5.0				
Max Green Setting (Gmax), s	14.0	52.0		30.0	14.0	52.0		30.0				
Max Q Clear Time (g_c+I1), s	4.4	24.8		8.4	3.0	29.9		15.7				
Green Ext Time (p_c), s	0.1	12.0		0.5	0.0	11.5		0.9				

Intersection Summary

HCM 6th Ctrl Delay	16.3
HCM 6th LOS	B

HCM 6th Signalized Intersection Summary  
2: Liloa Drive & E Lipoa St

Liloa Sr Housing TIAR  
02/27/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↖	↖	↗	↖	↖	↗	↖
Traffic Volume (veh/h)	80	225	25	110	170	110	15	100	115	60	70	80
Future Volume (veh/h)	80	225	25	110	170	110	15	100	115	60	70	80
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	0.98		0.97	0.98		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	87	245	24	120	185	59	16	109	23	65	76	16
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	660	597	58	597	691	584	392	388	319	366	388	319
Arrive On Green	0.08	0.36	0.36	0.09	0.37	0.37	0.21	0.21	0.21	0.21	0.21	0.21
Sat Flow, veh/h	1781	1676	164	1781	1870	1581	1292	1870	1539	1256	1870	1539
Grp Volume(v), veh/h	87	0	269	120	185	59	16	109	23	65	76	16
Grp Sat Flow(s),veh/h/ln	1781	0	1840	1781	1870	1581	1292	1870	1539	1256	1870	1539
Q Serve(g_s), s	1.3	0.0	4.8	1.7	3.0	1.1	0.4	2.1	0.5	2.0	1.4	0.4
Cycle Q Clear(g_c), s	1.3	0.0	4.8	1.7	3.0	1.1	1.9	2.1	0.5	4.1	1.4	0.4
Prop In Lane	1.00		0.09	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	660	0	656	597	691	584	392	388	319	366	388	319
V/C Ratio(X)	0.13	0.00	0.41	0.20	0.27	0.10	0.04	0.28	0.07	0.18	0.20	0.05
Avail Cap(c_a), veh/h	1766	0	1280	1679	1301	1100	1022	1301	1071	979	1301	1071
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	7.4	0.0	10.5	7.4	9.5	8.9	14.9	14.4	13.7	16.1	14.1	13.7
Incr Delay (d2), s/veh	0.1	0.0	0.4	0.2	0.2	0.1	0.0	0.4	0.1	0.2	0.2	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.0	1.7	0.5	1.0	0.3	0.1	0.8	0.2	0.5	0.6	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	7.5	0.0	10.9	7.6	9.7	9.0	14.9	14.8	13.8	16.3	14.4	13.7
LnGrp LOS	A	A	B	A	A	A	B	B	B	B	B	B
Approach Vol, veh/h		356			364			148			157	
Approach Delay, s/veh		10.0			8.9			14.6			15.1	
Approach LOS		B			A			B			B	
Timer - Assigned Phs		2	3	4		6	7	8				
Phs Duration (G+Y+Rc), s		13.9	8.8	20.4		13.9	8.2	20.9				
Change Period (Y+Rc), s		5.0	5.0	5.0		5.0	5.0	5.0				
Max Green Setting (Gmax), s		30.0	30.0	30.0		30.0	30.0	30.0				
Max Q Clear Time (g_c+I1), s		4.1	3.7	6.8		6.1	3.3	5.0				
Green Ext Time (p_c), s		0.7	0.3	1.7		0.6	0.2	1.3				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay											11.1	
HCM 6th LOS											B	

HCM 6th Signalized Intersection Summary  
3: Piilani Hwy & E Lipoa St

Liloa Sr Housing TIAR  
02/27/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↖	↕	↗	↖	↕	↗
Traffic Volume (veh/h)	225	25	135	60	45	160	165	1690	50	85	1660	165
Future Volume (veh/h)	225	25	135	60	45	160	165	1690	50	85	1660	165
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	245	27	70	65	49	48	179	1837	29	92	1804	134
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	269	30	261	76	57	116	194	2147	958	107	1974	877
Arrive On Green	0.17	0.17	0.17	0.07	0.07	0.07	0.11	0.60	0.60	0.06	0.56	0.56
Sat Flow, veh/h	1612	178	1565	1037	782	1585	1781	3554	1585	1781	3554	1579
Grp Volume(v), veh/h	272	0	70	114	0	48	179	1837	29	92	1804	134
Grp Sat Flow(s),veh/h/ln	1790	0	1565	1819	0	1585	1781	1777	1585	1781	1777	1579
Q Serve(g_s), s	35.8	0.0	9.4	14.9	0.0	6.9	23.9	101.7	1.8	12.3	110.0	9.9
Cycle Q Clear(g_c), s	35.8	0.0	9.4	14.9	0.0	6.9	23.9	101.7	1.8	12.3	110.0	9.9
Prop In Lane	0.90		1.00	0.57		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	299	0	261	133	0	116	194	2147	958	107	1974	877
V/C Ratio(X)	0.91	0.00	0.27	0.86	0.00	0.41	0.92	0.86	0.03	0.86	0.91	0.15
Avail Cap(c_a), veh/h	350	0	306	182	0	159	334	2147	958	223	1974	877
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.95	0.00	0.95	1.00	0.00	1.00	1.00	1.00	1.00	0.61	0.61	0.61
Uniform Delay (d), s/veh	98.2	0.0	87.2	110.0	0.0	106.3	106.0	38.9	19.2	111.8	48.2	25.9
Incr Delay (d2), s/veh	26.7	0.0	1.1	32.3	0.0	5.0	12.2	4.6	0.1	11.5	5.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	19.2	0.0	4.0	8.4	0.0	3.1	11.8	44.8	0.7	6.1	49.2	3.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	125.0	0.0	88.3	142.2	0.0	111.3	118.2	43.6	19.2	123.3	53.4	26.1
LnGrp LOS	F	A	F	F	A	F	F	D	B	F	D	C
Approach Vol, veh/h		342			162			2045			2030	
Approach Delay, s/veh		117.5			133.1			49.8			54.7	
Approach LOS		F			F			D			D	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	19.4	151.0		23.6	31.1	139.3		46.0				
Change Period (Y+Rc), s	5.0	6.0		6.0	5.0	6.0		6.0				
Max Green Setting (Gmax), s	30.0	116.0		24.0	45.0	101.0		47.0				
Max Q Clear Time (g_c+1/3), s	11.3	103.7		16.9	25.9	112.0		37.8				
Green Ext Time (p_c), s	0.2	11.3		0.7	0.2	0.0		2.2				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				60.0								
HCM 6th LOS				E								

Intersection						
Int Delay, s/veh	1.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	35	180	10	25	165
Future Vol, veh/h	0	35	180	10	25	165
Conflicting Peds, #/hr	0	1	0	3	3	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	38	196	11	27	179

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	438	206	0	0	210
Stage 1	205	-	-	-	-
Stage 2	233	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	576	835	-	-	1361
Stage 1	829	-	-	-	-
Stage 2	806	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	562	832	-	-	1357
Mov Cap-2 Maneuver	562	-	-	-	-
Stage 1	808	-	-	-	-
Stage 2	806	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.5	0	1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	832	1357
HCM Lane V/C Ratio	-	-	0.046	0.02
HCM Control Delay (s)	-	-	0	9.5
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.1	0.1

Intersection						
Int Delay, s/veh	9.2					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↑	↗	↘	↑
Traffic Vol, veh/h	65	55	835	115	45	885
Future Vol, veh/h	65	55	835	115	45	885
Conflicting Peds, #/hr	0	1	0	6	6	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Stop	-	Yield	-	None
Storage Length	100	0	-	115	40	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	71	60	908	125	49	962

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1974	915	0	0	914
Stage 1	914	-	-	-	-
Stage 2	1060	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12
Critical Hdwy Stg 1	5.42	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218
Pot Cap-1 Maneuver	~ 68	331	-	-	746
Stage 1	391	-	-	-	-
Stage 2	333	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	~ 63	329	-	-	742
Mov Cap-2 Maneuver	~ 63	-	-	-	-
Stage 1	363	-	-	-	-
Stage 2	333	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	150.1	0	0.5
HCM LOS	F		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	63	329	742	-
HCM Lane V/C Ratio	-	-	1.121	0.182	0.066	-
HCM Control Delay (s)	-	-	261.5	18.4	10.2	-
HCM Lane LOS	-	-	F	C	B	-
HCM 95th %tile Q(veh)	-	-	5.6	0.7	0.2	-

Notes  
 -: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon

Intersection	
Intersection Delay, s/veh	8.6
Intersection LOS	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W			←	↑	↗
Traffic Vol, veh/h	125	50	35	70	90	80
Future Vol, veh/h	125	50	35	70	90	80
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	136	54	38	76	98	87
Number of Lanes	1	0	0	1	1	1

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	2	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	2	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	1
HCM Control Delay	9.1	8.6	8.1
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	SBLn1	SBLn2
Vol Left, %	33%	71%	0%	0%
Vol Thru, %	67%	0%	100%	0%
Vol Right, %	0%	29%	0%	100%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	105	175	90	80
LT Vol	35	125	0	0
Through Vol	70	0	90	0
RT Vol	0	50	0	80
Lane Flow Rate	114	190	98	87
Geometry Grp	5	2	7	7
Degree of Util (X)	0.151	0.243	0.139	0.106
Departure Headway (Hd)	4.768	4.593	5.097	4.393
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	752	782	704	816
Service Time	2.798	2.619	2.824	2.12
HCM Lane V/C Ratio	0.152	0.243	0.139	0.107
HCM Control Delay	8.6	9.1	8.6	7.6
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.5	1	0.5	0.4

Intersection						
Int Delay, s/veh	6.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↙	↗	↖		↙	↗
Traffic Vol, veh/h	0	80	10	0	115	20
Future Vol, veh/h	0	80	10	0	115	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	75	0	-	-	75	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	87	11	0	125	22

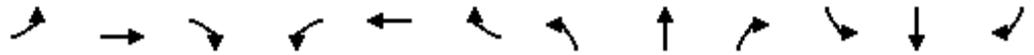
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	283	11	0	0	11	0
Stage 1	11	-	-	-	-	-
Stage 2	272	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	707	1070	-	-	1608	-
Stage 1	1012	-	-	-	-	-
Stage 2	774	-	-	-	-	-
Platoon blocked, %			-	-		
Mov Cap-1 Maneuver	652	1070	-	-	1608	-
Mov Cap-2 Maneuver	652	-	-	-	-	-
Stage 1	933	-	-	-	-	-
Stage 2	774	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.7	0	6.3
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1WBLn2	SBL	SBT
Capacity (veh/h)	-	-	1070	1608
HCM Lane V/C Ratio	-	-	0.081	0.078
HCM Control Delay (s)	-	-	0	8.7
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.3

HCM 6th Signalized Intersection Summary  
 8: S. Kihei Rd & W Welakahao Rd/E Welakahao Rd

Liloa Sr Housing TIAR  
 02/27/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔		↔	↔	
Traffic Volume (veh/h)	35	10	15	150	15	125	15	785	50	85	815	30
Future Volume (veh/h)	35	10	15	150	15	125	15	785	50	85	815	30
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	38	11	3	163	16	50	16	853	52	92	886	32
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	262	69	15	303	21	337	238	953	58	267	1048	38
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.02	0.55	0.55	0.06	0.58	0.58
Sat Flow, veh/h	1145	441	97	1353	133	1580	1781	1744	106	1781	1793	65
Grp Volume(v), veh/h	52	0	0	179	0	50	16	0	905	92	0	918
Grp Sat Flow(s),veh/h/ln	1684	0	0	1486	0	1580	1781	0	1850	1781	0	1858
Q Serve(g_s), s	0.0	0.0	0.0	6.6	0.0	1.9	0.3	0.0	32.5	1.6	0.0	30.4
Cycle Q Clear(g_c), s	1.9	0.0	0.0	8.5	0.0	1.9	0.3	0.0	32.5	1.6	0.0	30.4
Prop In Lane	0.73		0.06	0.91		1.00	1.00		0.06	1.00		0.03
Lane Grp Cap(c), veh/h	346	0	0	324	0	337	238	0	1011	267	0	1086
V/C Ratio(X)	0.15	0.00	0.00	0.55	0.00	0.15	0.07	0.00	0.90	0.35	0.00	0.85
Avail Cap(c_a), veh/h	591	0	0	559	0	597	419	0	1212	379	0	1217
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	27.4	0.0	0.0	30.1	0.0	23.9	12.3	0.0	15.1	14.5	0.0	12.8
Incr Delay (d2), s/veh	0.2	0.0	0.0	1.5	0.0	0.2	0.1	0.0	7.9	0.8	0.0	5.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.0	0.0	3.2	0.0	0.7	0.1	0.0	14.2	0.7	0.0	12.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	27.6	0.0	0.0	31.5	0.0	24.1	12.5	0.0	22.9	15.3	0.0	18.0
LnGrp LOS	C	A	A	C	A	C	B	A	C	B	A	B
Approach Vol, veh/h		52			229			921			1010	
Approach Delay, s/veh		27.6			29.9			22.8			17.7	
Approach LOS		C			C			C			B	
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.3	46.9		17.7	7.4	49.7		17.7				
Change Period (Y+Rc), s	6.0	6.0		6.0	6.0	6.0		6.0				
Max Green Setting (Gmax), s	9.0	49.0		24.0	9.0	49.0		24.0				
Max Q Clear Time (g_c+I1), s	3.6	34.5		3.9	2.3	32.4		10.5				
Green Ext Time (p_c), s	0.1	6.4		0.2	0.0	7.0		1.0				

Intersection Summary												
HCM 6th Ctrl Delay				21.3								
HCM 6th LOS				C								

Intersection												
Int Delay, s/veh	3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↵	↵		↵	↵			↕			↕	
Traffic Vol, veh/h	25	85	20	55	200	55	25	0	10	10	0	40
Future Vol, veh/h	25	85	20	55	200	55	25	0	10	10	0	40
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None									
Storage Length	100	-	-	100	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	27	92	22	60	217	60	27	0	11	11	0	43

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	277	0	0	114	0	0	546	554	103	530	535	247
Stage 1	-	-	-	-	-	-	157	157	-	367	367	-
Stage 2	-	-	-	-	-	-	389	397	-	163	168	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1286	-	-	1475	-	-	448	440	952	460	452	792
Stage 1	-	-	-	-	-	-	845	768	-	653	622	-
Stage 2	-	-	-	-	-	-	635	603	-	839	759	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1286	-	-	1475	-	-	404	413	952	434	424	792
Mov Cap-2 Maneuver	-	-	-	-	-	-	404	413	-	434	424	-
Stage 1	-	-	-	-	-	-	827	752	-	639	596	-
Stage 2	-	-	-	-	-	-	576	578	-	812	743	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	1.5			1.3			13.1			10.8		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	484	1286	-	-	1475	-	-	680
HCM Lane V/C Ratio	0.079	0.021	-	-	0.041	-	-	0.08
HCM Control Delay (s)	13.1	7.9	-	-	7.5	-	-	10.8
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0.3	0.1	-	-	0.1	-	-	0.3

Intersection						
Int Delay, s/veh	1.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	85	30	25	310	30	15
Future Vol, veh/h	85	30	25	310	30	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	92	33	27	337	33	16

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	125	0	500
Stage 1	-	-	-	-	109
Stage 2	-	-	-	-	391
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1462	-	530
Stage 1	-	-	-	-	916
Stage 2	-	-	-	-	683
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1462	-	518
Mov Cap-2 Maneuver	-	-	-	-	518
Stage 1	-	-	-	-	895
Stage 2	-	-	-	-	683

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	11.4
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	610	-	-	1462	-
HCM Lane V/C Ratio	0.08	-	-	0.019	-
HCM Control Delay (s)	11.4	-	-	7.5	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-

Intersection						
Int Delay, s/veh	1					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗	↘	↕	↕	↗
Traffic Vol, veh/h	0	110	65	1925	1570	260
Future Vol, veh/h	0	110	65	1925	1570	260
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	Yield	-	None	-	Yield
Storage Length	-	-	425	-	-	300
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	120	71	2092	1707	283

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	-	854	1707	0	-	0
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	6.94	4.14	-	-	-
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	0	302	368	-	-	-
Stage 1	0	-	-	-	-	-
Stage 2	0	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	-	302	368	-	-	-
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	24.5	0.6	0
HCM LOS	C		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	368	-	302	-	-
HCM Lane V/C Ratio	0.192	-	0.396	-	-
HCM Control Delay (s)	17.1	-	24.5	-	-
HCM Lane LOS	C	-	C	-	-
HCM 95th %tile Q(veh)	0.7	-	1.8	-	-

Intersection						
Int Delay, s/veh	2.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T		T	T
Traffic Vol, veh/h	0	15	25	0	20	35
Future Vol, veh/h	0	15	25	0	20	35
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	140	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	16	27	0	22	38

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	109	27	0	0	27	0
Stage 1	27	-	-	-	-	-
Stage 2	82	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	888	1048	-	-	1587	-
Stage 1	996	-	-	-	-	-
Stage 2	941	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	876	1048	-	-	1587	-
Mov Cap-2 Maneuver	876	-	-	-	-	-
Stage 1	982	-	-	-	-	-
Stage 2	941	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.5	0	2.7
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	1048	1587
HCM Lane V/C Ratio	-	-	0.016	0.014
HCM Control Delay (s)	-	-	8.5	7.3
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0



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# APPENDIX D

## TRAFFIC SIGNAL WARRANTS

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Figure D1

**Warrant 1: Eight-Hour Vehicular Volume - South Kihei Road & Halekuai Street - Existing Conditions**

Condition A - Minimum volume									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% *	80%	70% **	56%	100% *	80%	70% **	56%
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% *	80%	70% **	56%	100% *	80%	70% **	56%
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

\* Basic Minimum Hourly Volume

\*\* May be used when the major street speed exceeds 40 mph, or in an isolated community with a population of less than 10,000.

Including Mainline Left-Turn

INTERSECTION INFORMATION		Condition A Vol	Condition B Vol	Condition A+B
# Major St. Lanes	1	500	750	600
# Minor St. Lanes	1	150	75	120
Major St. Speed	20			
Percentile Column	100%			

WARRANT MET?

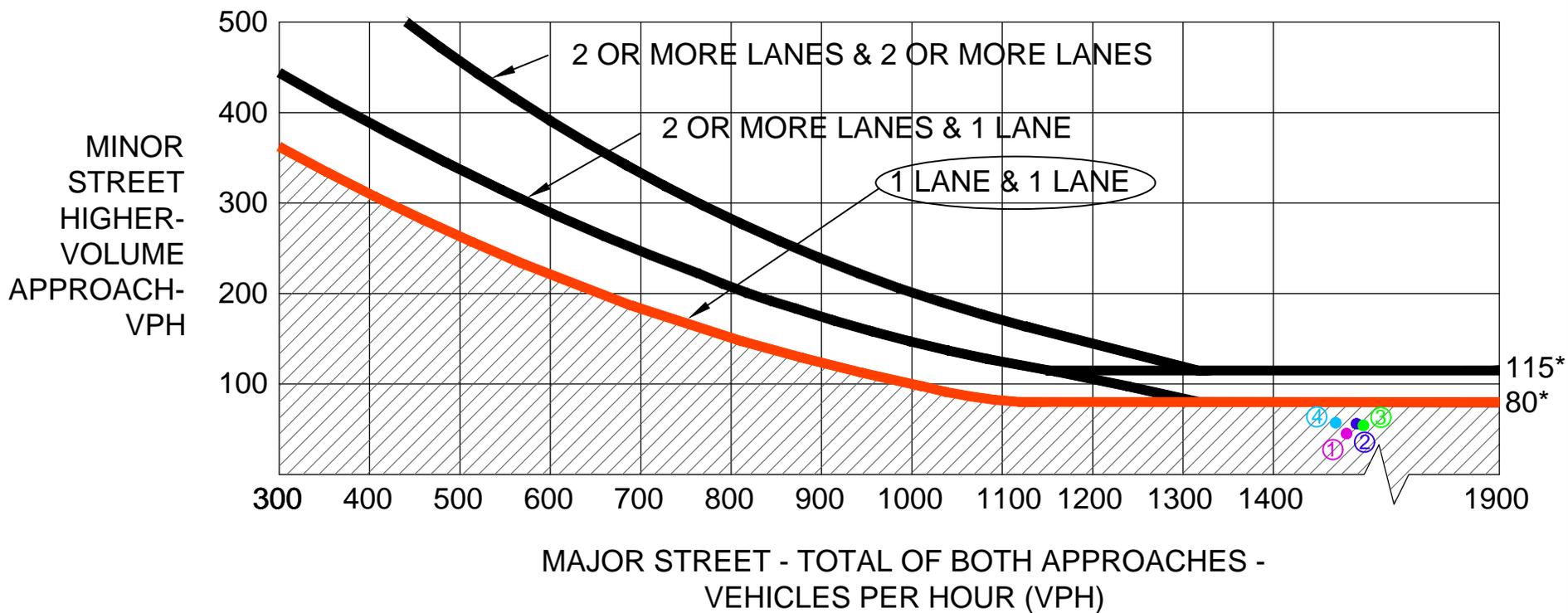
**NO**

Hours

0

TIME	MAJOR STREET		MINOR STREET		TOTAL	HIGHEST MINOR	CONDITION		
	NB	SB		WB LT			A	B	A + B
6:00 AM	339	308		8	647	8	NO	NO	NO
6:15 AM	391	334		12	725	12	NO	NO	NO
6:30 AM	481	373		13	854	13	NO	NO	NO
6:45 AM	546	431		21	977	21	NO	NO	NO
7:00 AM	617	524		23	1141	23	NO	NO	NO
7:15 AM	679	592		26	1271	26	NO	NO	NO
7:30 AM	685	660		38	1345	38	NO	NO	NO
7:45 AM	713	681		36	1394	36	NO	NO	NO
8:00 AM	726	636		37	1362	37	NO	NO	NO
8:15 AM	718	654		38	1372	38	NO	NO	NO
8:30 AM	728	630		28	1358	28	NO	NO	NO
8:45 AM	689	618		31	1307	31	NO	NO	NO
9:00 AM	684	651		37	1335	37	NO	NO	NO
9:15 AM	687	640		36	1327	36	NO	NO	NO
9:30 AM	690	646		41	1336	41	NO	NO	NO
9:45 AM	706	662		41	1368	41	NO	NO	NO
10:00 AM	706	643		36	1349	36	NO	NO	NO
10:15 AM	723	666		37	1389	37	NO	NO	NO
10:30 AM	717	682		37	1399	37	NO	NO	NO
10:45 AM	740	662		39	1402	39	NO	NO	NO
11:00 AM	764	692		45	1456	45	NO	NO	NO
11:15 AM	757	686		49	1443	49	NO	NO	NO
11:30 AM	773	654		47	1427	47	NO	NO	NO
11:45 AM	776	690		46	1466	46	NO	NO	NO
12:00 PM	776	669		42	1445	42	NO	NO	NO
12:15 PM	779	676		48	1455	48	NO	NO	NO
12:30 PM	782	704		44	1486	44	NO	NO	NO
12:45 PM	774	717		47	1491	47	NO	NO	NO
1:00 PM	768	739		46	1507	46	NO	NO	NO
1:15 PM	800	734		32	1534	32	NO	NO	NO
1:30 PM	814	748		45	1562	45	NO	NO	NO
1:45 PM	800	748		45	1548	45	NO	NO	NO
2:00 PM	811	758		61	1569	61	NO	NO	NO
2:15 PM	793	783		66	1576	66	NO	NO	NO
2:30 PM	798	786		56	1584	56	NO	NO	NO
2:45 PM	829	798		54	1627	54	NO	NO	NO
3:00 PM	800	767		47	1567	47	NO	NO	NO
3:15 PM	796	779		52	1575	52	NO	NO	NO
3:30 PM	801	798		54	1599	54	NO	NO	NO
3:45 PM	785	778		60	1563	60	NO	NO	NO
4:00 PM	791	808		55	1599	55	NO	NO	NO
4:15 PM	810	760		54	1570	54	NO	NO	NO
4:30 PM	794	744		57	1538	57	NO	NO	NO
4:45 PM	606	563		40	1169	40	NO	NO	NO
5:00 PM	412	366		27	778	27	NO	NO	NO
5:15 PM	201	196		13	397	13	NO	NO	NO
5:30 PM				0	0	0	NO	NO	NO
5:45 PM				0	0	0	NO	NO	NO
6:00 PM				0	0	0	NO	NO	NO

### Warrant 2, Four-Hour Vehicular Volume



\*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

- ① (1:30 PM to 2:30 PM), (1562, 45)
- ② (2:30 PM to 3:30 PM), (1584, 56)
- ③ (3:30 PM to 4:30 PM), (1599, 54)
- ④ (4:30 PM to 5:30 PM), (1538, 57)

LILoa SENIOR HOUSING - TIAR

**ATA** AUSTIN, TSUTSUMI & ASSOCIATES, INC.  
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

EXISTING CONDITIONS - FOUR HOUR TRAFFIC SIGNAL WARRANT FOR SOUTH KIHEI ROAD/HALEKUI STREET INTERSECTION

FIGURE

**D2**

Figure D3

**Warrant 1: Eight-Hour Vehicular Volume - South Kihei Road & Halekuai Street - FY 2022 Conditions**

Condition A - Minimum volume									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% *	80%	70% **	56%	100% *	80%	70% **	56%
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B - Interruption of Continuous Traffic									
Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100% *	80%	70% **	56%	100% *	80%	70% **	56%
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

\* Basic Minimum Hourly Volume

\*\* May be used when the major street speed exceeds 40 mph, or in an isolated community with a population of less than 10,000.

Including Mainline Left-Turn

INTERSECTION INFORMATION		Condition A Vol	Condition B Vol	Condition A+B
# Major St. Lanes	1	500	750	600
# Minor St. Lanes	1	150	75	120
Major St. Speed	20			
Percentile Column	100%			

WARRANT MET?

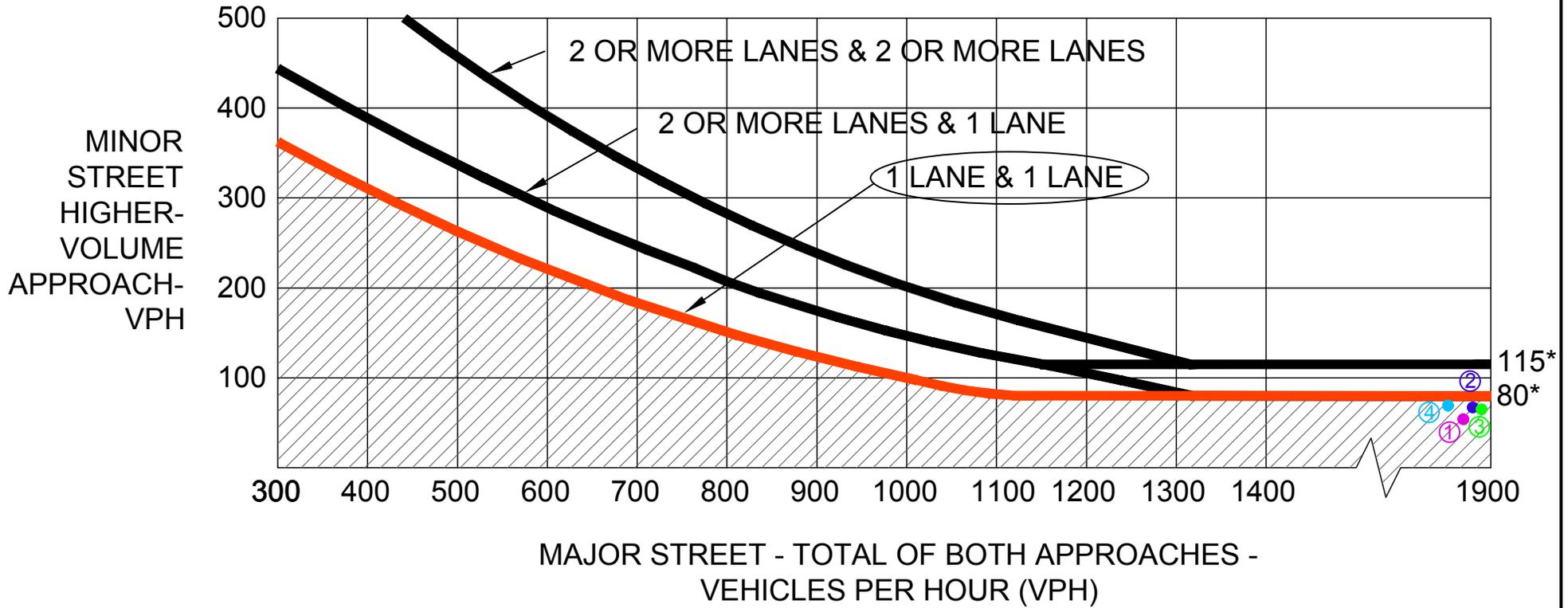
**NO**

Hours

1

TIME	MAJOR STREET		MINOR STREET		TOTAL	HIGHEST MINOR	CONDITION		
	NB	SB		WB LT			A	B	A + B
6:00 AM	399	359		10	758	10	NO	NO	NO
6:15 AM	459	389		14	849	14	NO	NO	NO
6:30 AM	567	435		16	1002	16	NO	NO	NO
6:45 AM	646	503		25	1148	25	NO	NO	NO
7:00 AM	732	611		28	1343	28	NO	NO	NO
7:15 AM	810	690		31	1500	31	NO	NO	NO
7:30 AM	819	769		46	1588	46	NO	NO	NO
7:45 AM	850	790		50	1640	50	NO	NO	NO
8:00 AM	866	741		45	1607	45	NO	NO	NO
8:15 AM	853	762		46	1615	46	NO	NO	NO
8:30 AM	860	734		34	1595	34	NO	NO	NO
8:45 AM	816	721		37	1536	37	NO	NO	NO
9:00 AM	810	759		45	1569	45	NO	NO	NO
9:15 AM	815	746		43	1561	43	NO	NO	NO
9:30 AM	820	753		49	1573	49	NO	NO	NO
9:45 AM	838	772		49	1609	49	NO	NO	NO
10:00 AM	838	750		43	1587	43	NO	NO	NO
10:15 AM	857	776		45	1634	45	NO	NO	NO
10:30 AM	850	795		45	1645	45	NO	NO	NO
10:45 AM	877	772		47	1649	47	NO	NO	NO
11:00 AM	907	807		54	1714	54	NO	NO	NO
11:15 AM	898	800		59	1697	59	NO	NO	NO
11:30 AM	915	762		57	1678	57	NO	NO	NO
11:45 AM	917	804		55	1722	55	NO	NO	NO
12:00 PM	918	780		51	1698	51	NO	NO	NO
12:15 PM	923	788		58	1711	58	NO	NO	NO
12:30 PM	926	821		53	1747	53	NO	NO	NO
12:45 PM	917	836		57	1753	57	NO	NO	NO
1:00 PM	909	861		55	1770	55	NO	NO	NO
1:15 PM	949	856		39	1804	39	NO	NO	NO
1:30 PM	969	872		54	1841	54	NO	NO	NO
1:45 PM	954	872		54	1826	54	NO	NO	NO
2:00 PM	967	883		73	1850	73	NO	NO	NO
2:15 PM	942	912		79	1854	79	NO	YES	NO
2:30 PM	946	916		67	1861	67	NO	N/A	NO
2:45 PM	982	930		65	1911	65	NO	N/A	NO
3:00 PM	946	894		57	1840	57	NO	N/A	NO
3:15 PM	944	908		63	1852	63	NO	NO	NO
3:30 PM	950	930		65	1880	65	NO	NO	NO
3:45 PM	933	907		72	1839	72	NO	NO	NO
4:00 PM	939	942		66	1881	66	NO	NO	NO
4:15 PM	959	886		65	1845	65	NO	NO	NO
4:30 PM	939	867		69	1806	69	NO	NO	NO
4:45 PM	715	656		48	1371	48	NO	NO	NO
5:00 PM	487	426		33	913	33	NO	NO	NO
5:15 PM	238	228		16	466	16	NO	NO	NO
5:30 PM	0	0		0	0	0	NO	NO	NO
5:45 PM	0	0		0	0	0	NO	NO	NO
6:00 PM	0	0		0	0	0	NO	NO	NO

## Warrant 2, Four-Hour Vehicular Volume



\*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

- ① (1:30 PM to 2:30 PM), (1841, 54)
- ② (2:30 PM to 3:30 PM), (1861, 67)
- ③ (3:30 PM to 4:30 PM), (1880, 65)
- ④ (4:30 PM to 5:30 PM), (1806, 69)



AUSTIN, TSUTSUMI & ASSOCIATES, INC.  
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

LILOA SENIOR HOUSING - TIAR

**FUTURE YEAR 2022 CONDITIONS - FOUR HOUR TRAFFIC SIGNAL WARRANT FOR SOUTH KIHEI ROAD/HALEKUI STREET INTERSECTION**

FIGURE

**D4**



PRELIMINARY ENGINEERING  
REPORT PREPARED BY  
OTOMO ENGINEERING, INC.

APPENDIX

H



**PRELIMINARY ENGINEERING REPORT**

**FOR**

**LILOA HALE**

**Kihei, Maui, Hawaii**

**T.M.K.: (2) 2-2-002: 072 (por.)**

**Prepared for:**

**Highridge Costa Development Company, LLC  
330 West Victoria Street  
Gardena, California 90248**



*Ashley N. M. Otomo*

**Prepared by:**



CONSULTING CIVIL ENGINEERS  
305 SOUTH HIGH STREET, SUITE 102  
WAILUKU, MAUI, HAWAII 96793  
PHONE: (808) 242-0032

**March 2020**

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**PRELIMINARY ENGINEERING REPORT  
FOR  
LILOA HALE  
T.M.K.: (2) 2-2-002: 072 (por.)**

**1.0 INTRODUCTION**

The purpose of this report is to provide information on the existing infrastructure, which will be servicing the proposed project and to also evaluate the adequacy of the existing infrastructure and anticipated improvements, which may be required for the proposed project.

The subject parcel is identified as T.M.K.: (2) 2-2-002: 072, which encompasses an area of approximately 17.879 acres. The parcel is bordered by East Welakahao Road to the north, Welakahao Road to the south, Liloa Drive to the west, and Piilani Highway to the east.

A portion of the property is developed with three (3) existing buildings and parking for Hope Chapel. The proposed project includes the CPR of the property into two units—the Hope Chapel site and the Liloa Hale site—and the construction of the Liloa Hale senior affordable housing project. Liloa Hale will consist of 117 affordable senior apartments (101 one-bedroom and 16 two-bedroom units) in a three-story building. The Liloa Hale site encompasses approximately 4.896 acres with the proposed limits of work being confined to approximately 3.61 acres. Associated improvements include grading, driveways, paved parking, utility connections, and landscaping.

**2.0 EXISTING INFRASTRUCTURE**

**2.1 ROADWAYS**

The major roadways into the Kihei-Makena area are Maui Veterans Highway and North Kihei Road.

Piilani Highway is the primary road linking Kihei, Wailea, and Makena. Piilani Highway is a four-lane highway, which is owned and

maintained by the State and runs in a north-south direction.

South Kihei Road is generally a two-lane, two-way, County-owned roadway, which runs in a north-south direction, traversing the Kihei coastline. South Kihei Road serves most of the commercial and residential communities in the Kihei region.

Liloa Drive is currently a two-lane, two-way, County-owned roadway, which runs in a north-south direction that provides access between East Waipuilani Road and the South Maui Community Park. Further south, Liloa Drive continues between East Welakahao Road and Ehiku Street.

Lipoa Street, Halekuai Street, and Welakahao Road are two-lane, two-way, County-owned roadways within the project vicinity, which run in an east-west direction.

## 2.2 DRAINAGE

For the purposes of the drainage study, the study area will be limited to the Liloa Hale project site (Unit 2 of the proposed CPR), which encompasses approximately 4.896 acres. The elevation on the site ranges from approximately 66 feet above mean sea level at the project site's northwesterly corner to approximately 89 feet above mean sea level at the project site's northeasterly corner. The project site generally slopes in an east to west direction toward Liloa Drive, averaging approximately 4%.

According to Panel Number 150003 0588G of the Flood Insurance Rate Map, revised November 4, 2015, prepared by the United States Federal Emergency Management Agency, the majority of the parcel is situated in Flood Zone X, which represents areas that are outside of the 0.2% annual chance flood plain. A small portion is situated in Flood Zone A, which represents areas within the 1% annual chance flood plain, where no base flood elevation (BFE) has been

determined. No improvements are planned within Flood Zone A.

According to the Soil Survey Geographic Database for the Island of Maui, State of Hawaii (September 2014), prepared by the United States Department of Agriculture, Natural Resources Conservation Service, the soils within the project site are classified as Puuone sand, 7 to 30 percent slopes (PZUE) and Waiakoa extremely stony silty clay loam, 3 to 25 percent slopes, eroded (WID2). PZUE is characterized as having slow runoff, rapid permeability above the cemented layer, and moderate to severe wind erosion hazard. WID2 is characterized as having medium runoff and severe erosion hazard.

Onsite runoff generally sheet flows in an east to west direction across the property toward Liloa Drive. It is estimated that the existing 50-year, 1-hour storm runoff from the project site is 5.101 cfs, corresponding to a runoff volume of 6,121 cf.

### 2.3 SEWER

There is an existing 8-inch sewerline along Liloa Drive that terminates at Hope Chapel. Wastewater collected from the Kihei area is transported to the Kihei Wastewater Reclamation Facility (KWRF) located above Piilani Highway and south of the Maui Nui Golf Course.

According to the Wastewater Reclamation Division, County of Maui, as of August 23, 2019, the KWRF has a capacity of 8.0 million gallons per day (mgd). The average flow into the KWRF is approximately 3.8 mgd, and the allocated capacity is 5.23 mgd. The remaining capacity is approximately 2.77 mgd.

### 2.4 WATER

Domestic water and fire flow are provided by the County's water system. There are existing 18-inch and 30-inch waterlines fronting

the property along Liloa Drive, as well as an existing 12-inch reclaimed water line. There are existing fire hydrants on the makai side of Liloa Drive fronting the project site, including one near its intersection with Old Welakahao Road. There are currently two (2) water meters assigned to this parcel—a 2” domestic water meter and a 2” reclaimed water meter for irrigation purposes. The meters are currently servicing the Hope Chapel development.

Domestic water and fire flow for this area are serviced from the 2.0 M.G. Piilani Tank. The source for the water system is the Mokuhau wells located in Happy Valley at approximately 360 feet above mean sea level.

## 2.5 ELECTRIC, TELEPHONE, AND CABLE TV

There are existing overhead electrical, cable, and telephone lines along Liloa Drive that service the area.

## 3.0 **ANTICIPATED INFRASTRUCTURE IMPROVEMENTS**

### 3.1 ROADWAYS

Access for the proposed project will be from a new driveway on Liloa Drive.

The following are the recommendations from the Traffic Impact Analysis Report prepared by Austin, Tsutsumi & Associates, Inc. dated March 9, 2020:

- At the Piilani Highway/Welakahao Road intersection, provide delineators along the median of Piilani Highway at the start of the northbound left-turn lane at the intersection and extend further south to the end of the taper of the southbound left-turn lane at the Piilani Highway/Kihei Wastewater Treatment Plant intersection.

- At the proposed Liloa Drive/Project Driveway intersection, provide a southbound left-turn lane with a minimum storage space of 50 feet in length (exclusive of deceleration length).

### 3.2 DRAINAGE

After the development of the proposed project, it is estimated that the 50-year, 1-hour storm runoff will be 15.057 cfs, corresponding to a runoff volume of 14,907 cf. The increase in runoff will be 9.956 cfs, with an increase in runoff volume of 8,786 cf (14,907 cf - 6,121 cf) (See Appendix A). Onsite runoff will be intercepted by catch basins located within the paved parking area and conveyed to a subsurface drainage system. The subsurface drainage system will consist of a perforated drainline embedded in crushed rock, which will be wrapped with a layer of filter fabric. Surface runoff entering the perforated pipe will be allowed to infiltrate into the ground. Overflow from the subsurface drainage system will be piped into an onsite retention basin. The drainage system will be designed to accommodate the increase in surface runoff volume from a 50-year, 1-hour storm for the proposed project.

The design intent of the development plan will be to utilize the existing topography to the greatest extent practicable and to limit the need for extensive grading. Development of the project will include the implementation of site-specific best management practices (BMPs) during the construction to provide erosion control and minimize impacts to downstream properties. BMPs may include:

1. Prevention of cement products, oil, fuel, and other toxic substances from falling or leaching into the water;
2. Prompt and proper disposal of all loosened and excavated soil and debris material from drainage structure work;
3. Retention of existing ground cover until the last possible date;
4. Stabilization of denuded areas by sodding or planting as soon as possible;

5. Implementation of sediment trapping measures and basins;
6. Control of access and vehicular movement across disturbed areas;
7. Early construction of drainage features; and
8. Minimization of construction time.

The project will also include post-construction BMPs, which will improve the quality of storm water runoff from the proposed development.

The drainage design criteria will be to minimize any alterations to the natural pattern of the existing onsite surface runoff. The proposed drainage plan will meet the requirements of Chapter 4, "Rules for the Design of Storm Drainage Facilities in the County of Maui" and Chapter 111, "Rules for the Design of Storm Water Treatment Best Management Practices".

### 3.3 SEWER

The proposed project will generate approximately 29,835 gallons of wastewater daily (See Appendix C). The onsite sewerage collection system will be designed to accommodate this flow. Offsite improvements will include extending the existing 8-inch sewerline along Liloa Drive approximately 900 feet fronting the project site.

According to the Wastewater Reclamation Division, County of Maui, as of August 23, 2019, the KWRF has a capacity of 8.0 million gallons per day (mgd). The average flow into the KWRF is approximately 3.8 mgd, and the allocated capacity is 5.23 mgd. The remaining capacity is approximately 2.77 mgd. The wastewater generated from the project will continue to be transported to the Kihei Wastewater Treatment Plant. At the present time, the treatment plant has sufficient capacity to accommodate the additional wastewater generated from the proposed project.

### 3.4 WATER

In accordance with the Department of Water Supply's Domestic Consumption Guidelines for commercial development, the average daily demand for the project is approximately 65,520 gallons per day (See Appendix B). Fire flow demand for multi-family development is 2,000 gallons per minute for a 2-hour duration. There are existing fire hydrants on the makai side of Liloa Drive fronting the project site, including one near its intersection with Old Welakahao Road. Fire hydrants will be installed with a maximum spacing of 250 feet.

Domestic water and fire flow calculations will be prepared and submitted during the building permit process. Water meter and fire protection improvements will be made as necessary to meet the requirements of the Department of Water Supply and Fire Department. The developer plans to use reclaimed water for irrigation if possible.

### 3.5 ELECTRIC, TELEPHONE, AND CABLE TV

The proposed electrical, telephone, and cable TV distribution systems for the residences will be installed from the existing overhead facilities on Liloa Drive that currently service the area. Within the project site, the electric and telephone systems will be installed in accordance with the utility companies' rules and regulations. Interior project lighting shall be provided as approved by the Planning Department.

## **APPENDIX A**

### **HYDROLOGIC CALCULATIONS**

## DRAINAGE SYSTEM ANALYSIS AND DESIGN

Project: **Liloa Hale**  
 T.M.K.: **(2) 2-2-002: 072**  
 Location: **Kihei, Maui, Hawaii**  
 Project No.: **2019-26**

### I. Determine Runoff Coefficients

#### Landscaped / Unimproved Runoff Coefficient:

Infiltration:	Medium	0.07
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	Good (10-50%)	0.03
Development Type:	Landscape	0.15
		Composite Runoff Coefficient, C= 0.25

#### Roof Runoff Coefficient:

C= 0.95

#### Pavement Runoff Coefficient:

C= 0.95

### II. Determine pre- and post-development runoff

Area: 4.896 acres

	Existing	Developed	Δ
Roof	0	0.851	
Pavement	0	1.550	
Landscape	4.896	2.495	
C	0.25	0.59	
Tc (min)	20	11	
I (in/hr)	4.167	5.183	
Q (cfs)	5.101	15.057	<b>9.956</b>
V (cf)	6,121	14,907	<b>8,786</b>

## **APPENDIX B**

### **WATER DEMAND CALCULATIONS**

## WATER DEMAND CALCULATIONS

Project Data:

Multi-family Residential:

- 117 Units
- 4.896 acres

Daily Consumption Guidelines (per 2002 Water System Standards):

Multi-family Low Rise: 560 gallons/unit or 5,000 gallons/acre

Average Daily Demand (ADD):

Multi-family Residential:

$$\text{ADD} = 560 \text{ gallons/unit} \times 117 \text{ units} = \mathbf{65,520 \text{ gallons}}$$

$$\text{ADD} = 5,000 \text{ gallons/acre} \times 4.896 \text{ acres} = 24,480 \text{ gallons}$$

**Average Daily Demand is 65,520 gallons**

## **APPENDIX C**

### **WASTEWATER CALCULATIONS**

## WASTEWATER CALCULATIONS

Project Data:

Multi-family Residential:

- 117 Units

Daily Contribution Guidelines (per the 1993 Wastewater Flow Standards):

Multi-family Residential: 255 gallons/unit/day

Daily Contribution:

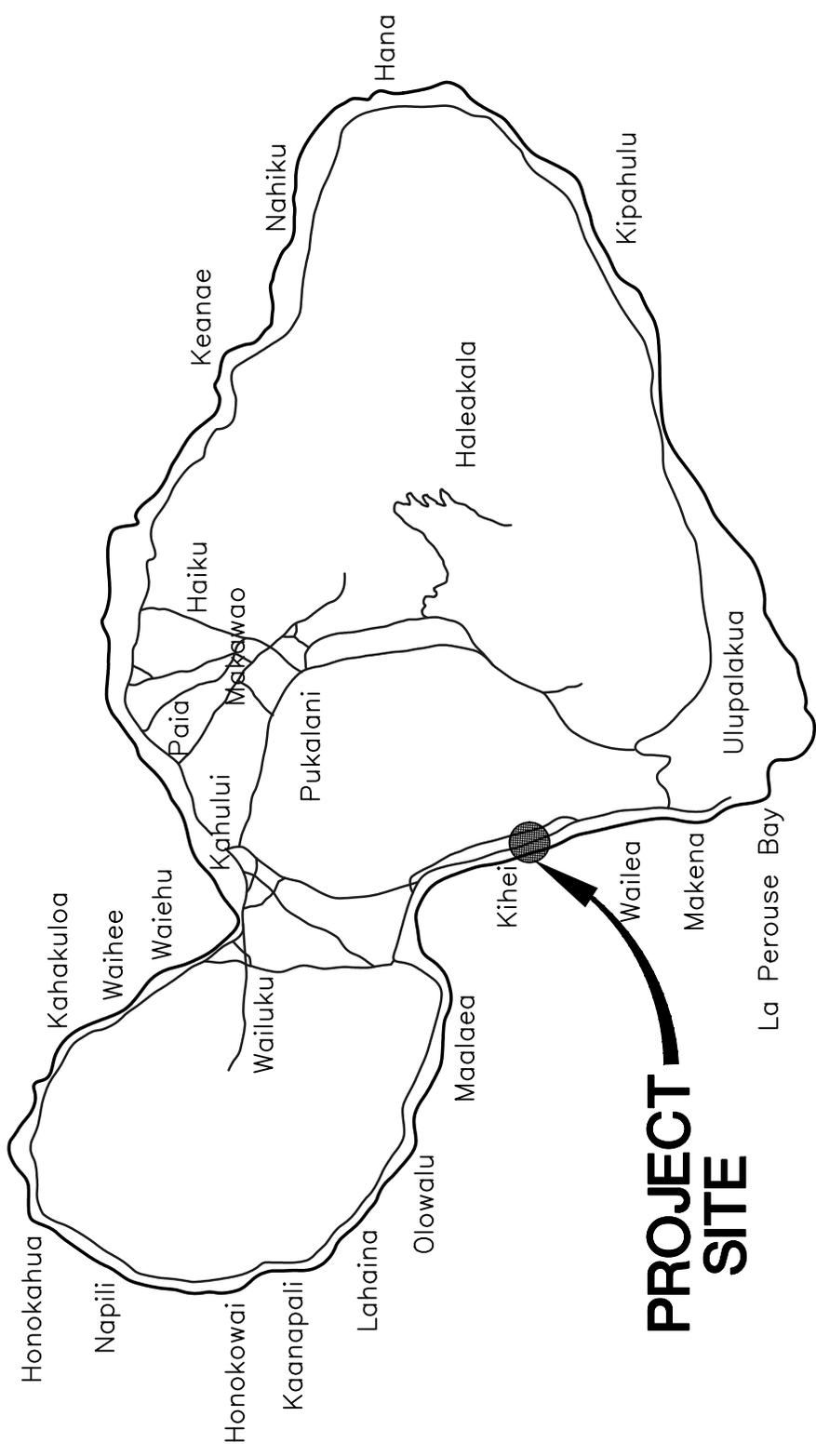
Multi-family Residential:

Contribution = 255 gallons/unit/day x 117 units = 29,835 gpd

**Total daily contribution is 29,835 gpd**

## **EXHIBITS**

- 1 Location Map**
- 2 Vicinity Map**
- 3 Soil Survey Map**
- 4 Flood Insurance Rate Map**
- 5 Preliminary Grading & Drainage Plan**

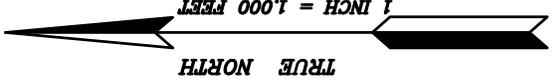
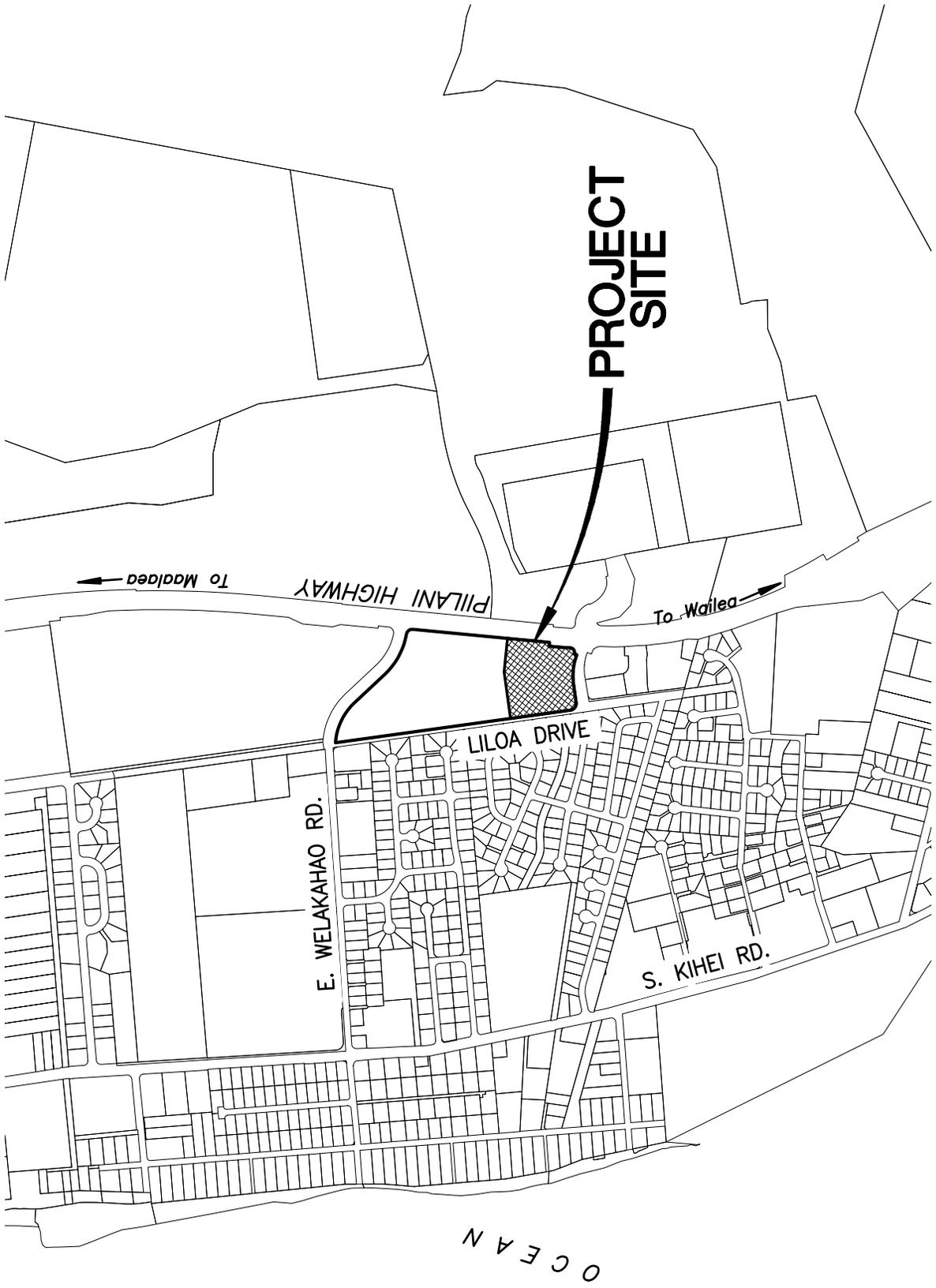


**PROJECT  
SITE**

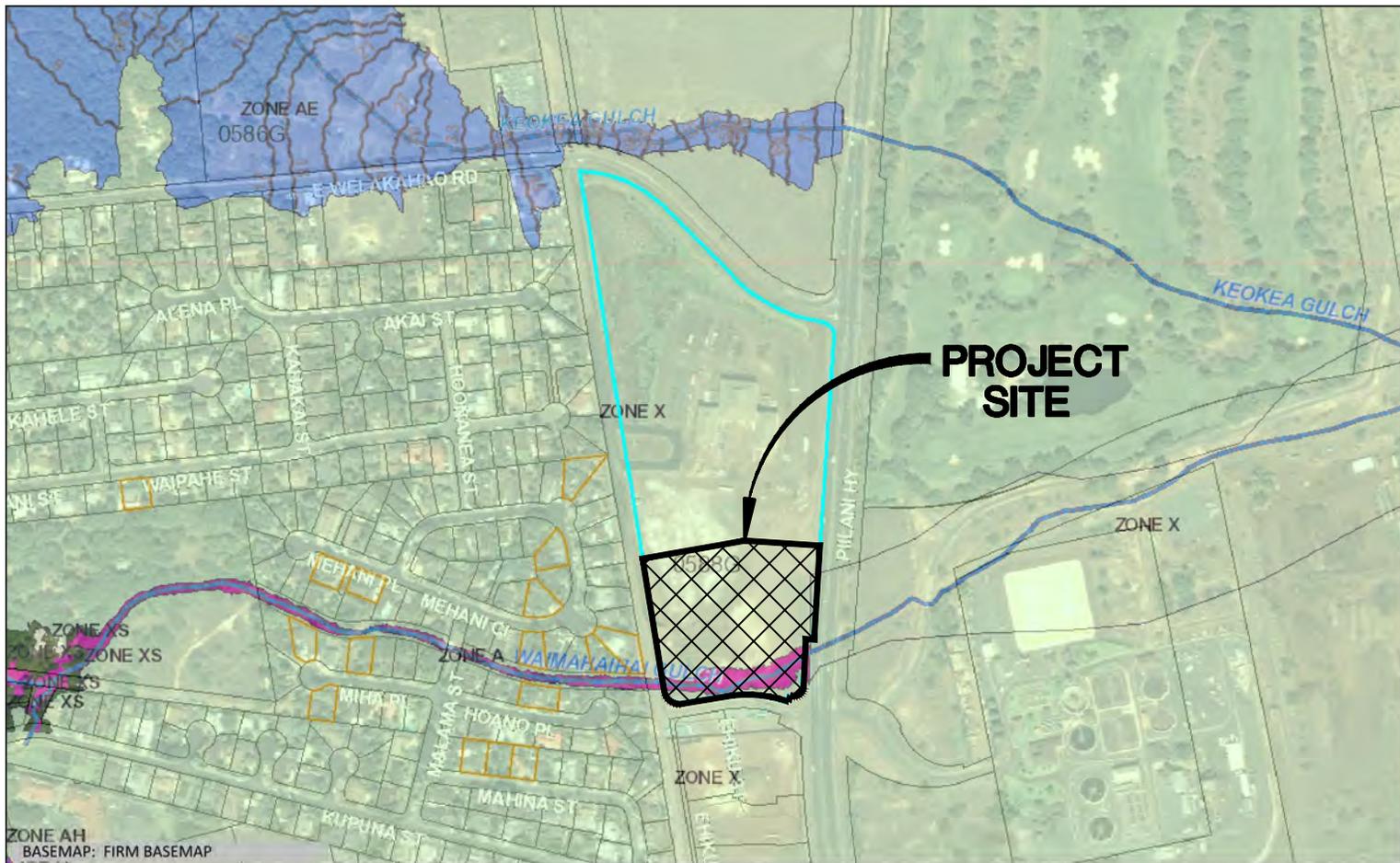


**ISLAND OF MAUI**  
NOT TO SCALE

VICINITY MAP  
EXHIBIT 2







# Flood Hazard Assessment Report

www.hawaiiifip.org

## Property Information

COUNTY: MAUI  
 TMK NO: (2) 2-2-002:072  
 WATERSHED: HAPAPA  
 PARCEL ADDRESS: UNKNOWN ADDRESS  
 KIHEI, HI 96753

## Notes:

## Flood Hazard Information

FIRM INDEX DATE: NOVEMBER 04, 2015  
 LETTER OF MAP CHANGE(S): NONE  
 FEMA FIRM PANEL - EFFECTIVE DATE: 1500030586G - NOVEMBER 04, 2015  
 1500030588G - NOVEMBER 04, 2015

THIS PROPERTY IS WITHIN A TSUNAMI EVACUATION ZONE: NO  
 FOR MORE INFO, VISIT: <http://www.scd.hawaii.gov/>

THIS PROPERTY IS WITHIN A DAM EVACUATION ZONE: NO  
 FOR MORE INFO, VISIT: <http://dlnreng.hawaii.gov/dam/>



*Disclaimer: The Hawaii Department of Land and Natural Resources (DLNR) assumes no responsibility arising from the use, accuracy, completeness, and timeliness of any information contained in this report. Viewers/Users are responsible for verifying the accuracy of the information and agree to indemnify the DLNR, its officers, and employees from any liability which may arise from its use of its data or information.*

*If this map has been identified as 'PRELIMINARY', please note that it is being provided for informational purposes and is not to be used for flood insurance rating. Contact your county floodplain manager for flood zone determinations to be used for compliance with local floodplain management regulations.*

### FLOOD HAZARD ASSESSMENT TOOL LAYER LEGEND

(Note: legend does not correspond with NFHL)

**SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD** - The 1% annual chance flood (100-year), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. SFHAs include Zone A, AE, AH, AO, V, and VE. The Base Flood Elevation (BFE) is the water surface elevation of the 1% annual chance flood. Mandatory flood insurance purchase applies in these zones:

	<b>Zone A:</b> No BFE determined.
	<b>Zone AE:</b> BFE determined.
	<b>Zone AH:</b> Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
	<b>Zone AO:</b> Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
	<b>Zone V:</b> Coastal flood zone with velocity hazard (wave action); no BFE determined.
	<b>Zone VE:</b> Coastal flood zone with velocity hazard (wave action); BFE determined.
	<b>Zone AEF:</b> Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

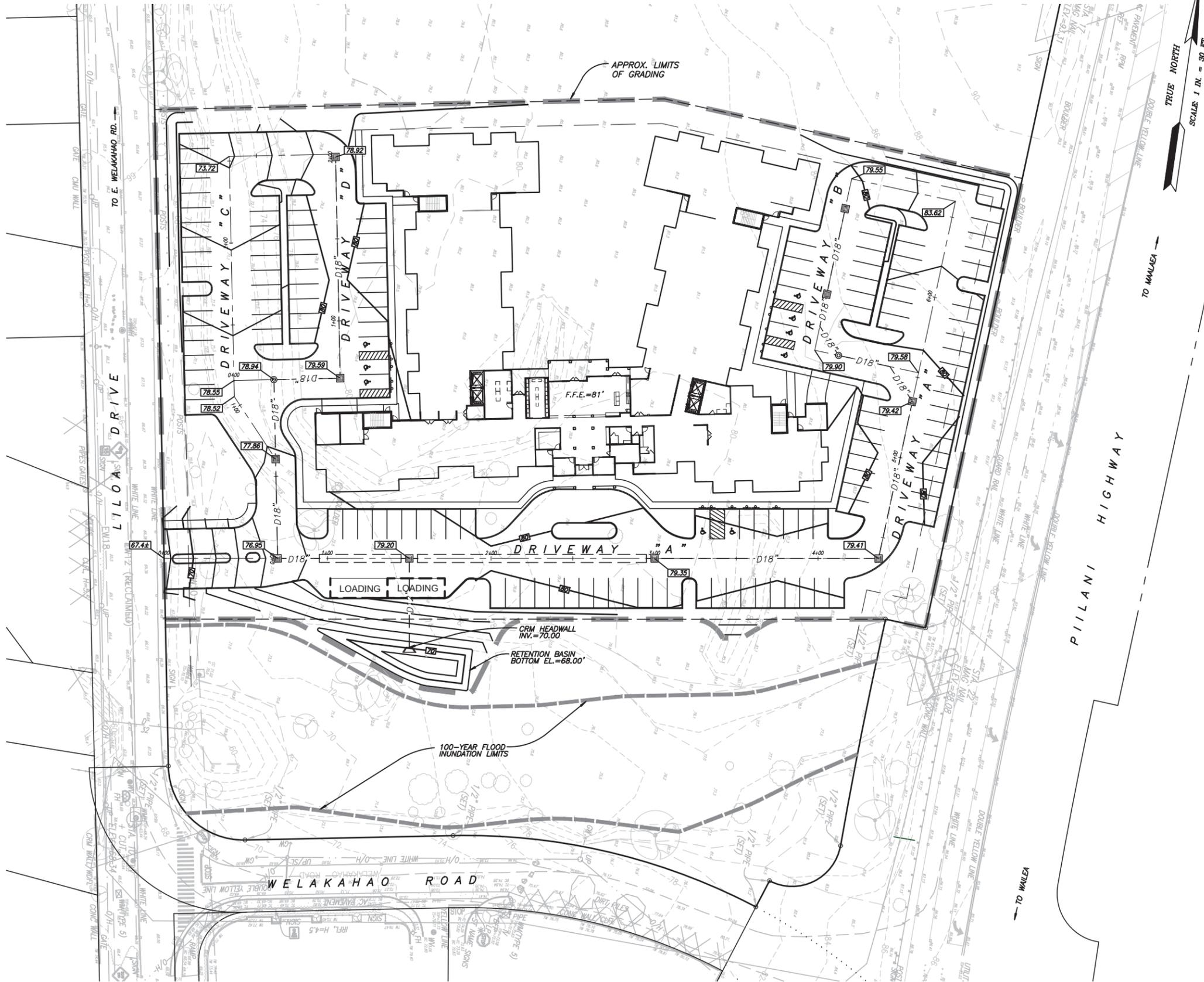
**NON-SPECIAL FLOOD HAZARD AREA** - An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

	<b>Zone XS (X shaded):</b> Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
	<b>Zone X:</b> Areas determined to be outside the 0.2% annual chance floodplain.

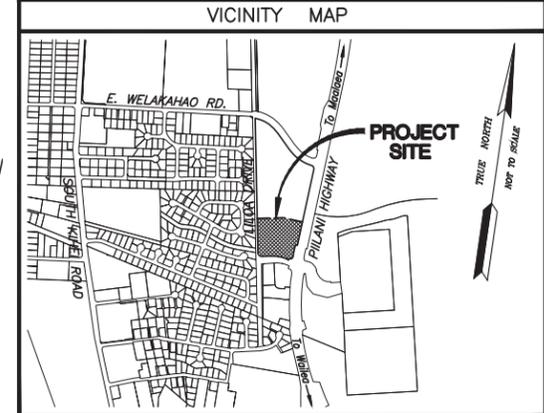
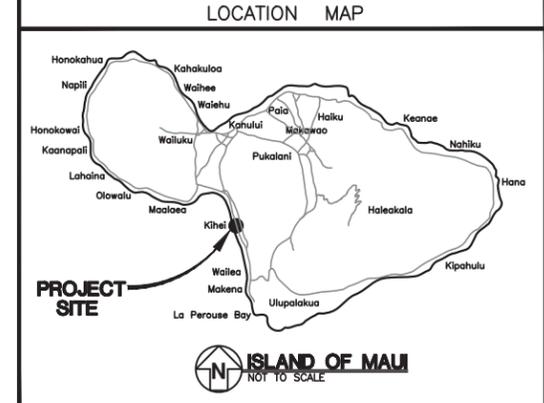
### OTHER FLOOD AREAS

	<b>Zone D:</b> Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase apply, but coverage is available in participating communities.
--	---

C:\2019 PROJECTS\2019-26 (Liloa Hale)\CONSTRUCTION PLANS\GRAD-00.dwg Mar. 12, 2020 - 2:36pm



**PRELIMINARY GRADING & DRAINAGE PLAN**  
SCALE: 1 IN. = 30 FT.



**OTOMO**  
ENGINEERING, INC.  
CONSULTING CIVIL ENGINEERS  
305 S. HIGH STREET, STE. 102  
WAILUKU, MAUI, HAWAII 96793  
PHONE: (808) 242-0032

ASHLEY N. M. OTOMO  
LICENSED PROFESSIONAL ENGINEER  
No. 16286-C  
HAWAII, U.S.A.

LICENSE EXPIRES: 4-30-20  
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION, POSSESSION OF CONSTRUCTION AS DEFINED UNDER SECTION 18-115-2 OF THE HAWAII ADMINISTRATIVE RULES. PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS, AND LANDSCAPE ARCHITECTS

SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_  
NOTE: THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AT THE JOB SITE BEFORE PROCEEDING WITH THE WORK.

**REDUCED COPY  
NOT TO SCALE**

**NOT FOR CONSTRUCTION**

**APPROXIMATE EARTHWORK QUANTITIES**  
THE EARTHWORK QUANTITIES SHOWN HEREIN ARE FOR SECURING THE GRADING PERMIT ONLY. THE CONTRACTOR SHALL VERIFY THE QUANTITIES AND COMPLETE THE GRADING AS SHOWN ON THE PLAN.

CLEARING AND GRUBBING = 3.6 ACRES±  
EMBANKMENT = 6,593 C.Y.  
EXCAVATION = 5,553 C.Y.

REVISION	DATE	NOTE

DESIGNED BY: A.N.M.O.  
DRAWN BY: L.C.O.  
PROJECT NO.: 2019-26  
DRAWING NAME: GRAD-00  
DATE: 3-11-20

SHEET NO.  
**C-1**  
OF SHEETS



ZONING AND FLOOD  
CONFIRMATION FORM

APPENDIX

I





RECEIVED

JUN 03 2019

COUNTY OF MAUI  
DEPARTMENT OF PLANNING

**ZONING AND FLOOD CONFIRMATION FORM**

(This section to be completed by the Applicant)

APPLICANT NAME Munekiyo Hiraga (YU) TELEPHONE 244-2015  
PROJECT NAME General Request E-MAIL planning@munekiyohiraga.com  
PROPERTY ADDRESS \_\_\_\_\_ TAX MAP KEY (2)2-2-002:072 (por.)

Yes  No Will this Zoning & Flood Confirmation Form be used with a Subdivision Application?  
IF YES, answer questions A and B below and comply with instructions 2 & 3 below:  
A)  Yes  No Will it be processed under a consistency exemption from Section 18.04.030(B), MCC?  
IF YES, which exemption? (No. 1, 2, 3, 4 or 5) \_\_\_\_\_  
B) State the purpose of subdivision and the proposed land uses (ie 1-lot into 2-lots for all land uses allowed by law):

- INSTRUCTIONS:
- 1) Please use a separate Zoning & Flood Confirmation Form for each Tax Map Key (TMK) number.
  - 2) If this will be used with a subdivision application AND the subject property contains multiple districts/designations of (1) State Land Use Districts, (2) Maui Island Plan Growth Boundaries, (3) Community Plan Designations, or (4) County Zoning Districts; submit a signed and dated Land Use Designations Map, prepared by a licensed surveyor, showing the metes & bounds of the subject parcel and of each district/designation including any subdistricts.
  - 3) If this will be used with a subdivision application AND the subject property contains multiple State Land Use Districts; submit an approved District Boundary Interpretation from the State Land Use Commission.

(This section to be completed by ZAED)

LAND USE DISTRICTS/DESIGNATIONS (LUD) AND OTHER INFORMATION: <sup>1</sup>

STATE DISTRICT:  Urban  Rural  Agriculture  Conservation  (SMA) Special Management Area

MAUI ISLAND PLAN Growth Boundary:  Urban  Small Town  Rural  Planned Growth Area  Outside Growth Boundaries

Protected Area:  Preservation  Park  Greenbelt  Greenway  Sensitive Land  Outside Protected Areas

COMMUNITY PLAN: <sup>2</sup> Project District

COUNTY ZONING: Project District 5 (Piilani Village) Residential Single-Family

OTHER/COMMENTS: Zoning based on portion of parcel. Map attached

FEMA FLOOD INFORMATION: <sup>3</sup> A Flood Development Permit is required if any portion of a parcel is designated V, VE, A, AO, AE, AH, D, or Floodway, and the project is on that portion.

FLOOD HAZARD AREA ZONES <sup>3</sup> Zone X & BASE FLOOD ELEVATIONS:

FEMA DESIGNATED FLOODWAY For Flood Zone AO, FLOOD DEPTH: \_\_\_\_\_

(PD) Planned Development  
 (PH) Project District  
 See Additional Comments (Pg.2)  
 See Attached LUD Map

SUBDIVISION LAND USE CONSISTENCY:  Not Consistent, (LUDs appear to have NO permitted uses in common).  
 Not Applicable, (Due to processing under consistency exemption No. 1, 2, 3, 4, 5).  
 Interim Zoning, (The parcel or portion of the parcel that is zoned interim shall not be subdivided).  
 <sup>4</sup> Consistent, (LUDs appear to have ALL permitted uses in common).  
 <sup>4</sup> Consistent, upon obtaining an SMA, PD, or PH subdivision approval from Planning.  
 <sup>4</sup> Consistent, upon recording a permissible uses unilateral agreement processed by Public Works (See Pg.2).

NOTES:

- 1 The conditions and/or representations made in the approval of a State District Boundary Amendment, Community Plan Amendment, County Change In Zoning, SMA Permit, Planned Development, Project District and/or a previous subdivision, may affect building permits, subdivisions, and uses on the land.
- 2 Please review the Maui Island Plan and the Community Plan document for any goals, objectives, policies or actions that may affect this parcel.
- 3 Flood development permits might be required in zones X and XS for any work done in streams, gulches, low-lying areas, or any type of drainageway; Flood development permits are required for work in all other zones. Subdivisions that include/adjoin streams, gulches, low-lying areas, or any type of drainageway might require the following designations to be shown on the subdivision map: 100-year flood inundation limits; base flood elevations, drainage reserves.
- 4 Subdivisions will be further reviewed during the subdivision application process to verify consistency, unilateral agreement requirements, and the conditions associated with a Unilateral agreement [Section 18.04.030.D, Maui County Code].

REVIEWED & CONFIRMED BY:

Sheilana Kagawa (Signature) 6/4/19 (Date)  
For: Nichole Chouteau McLean, Planning Director

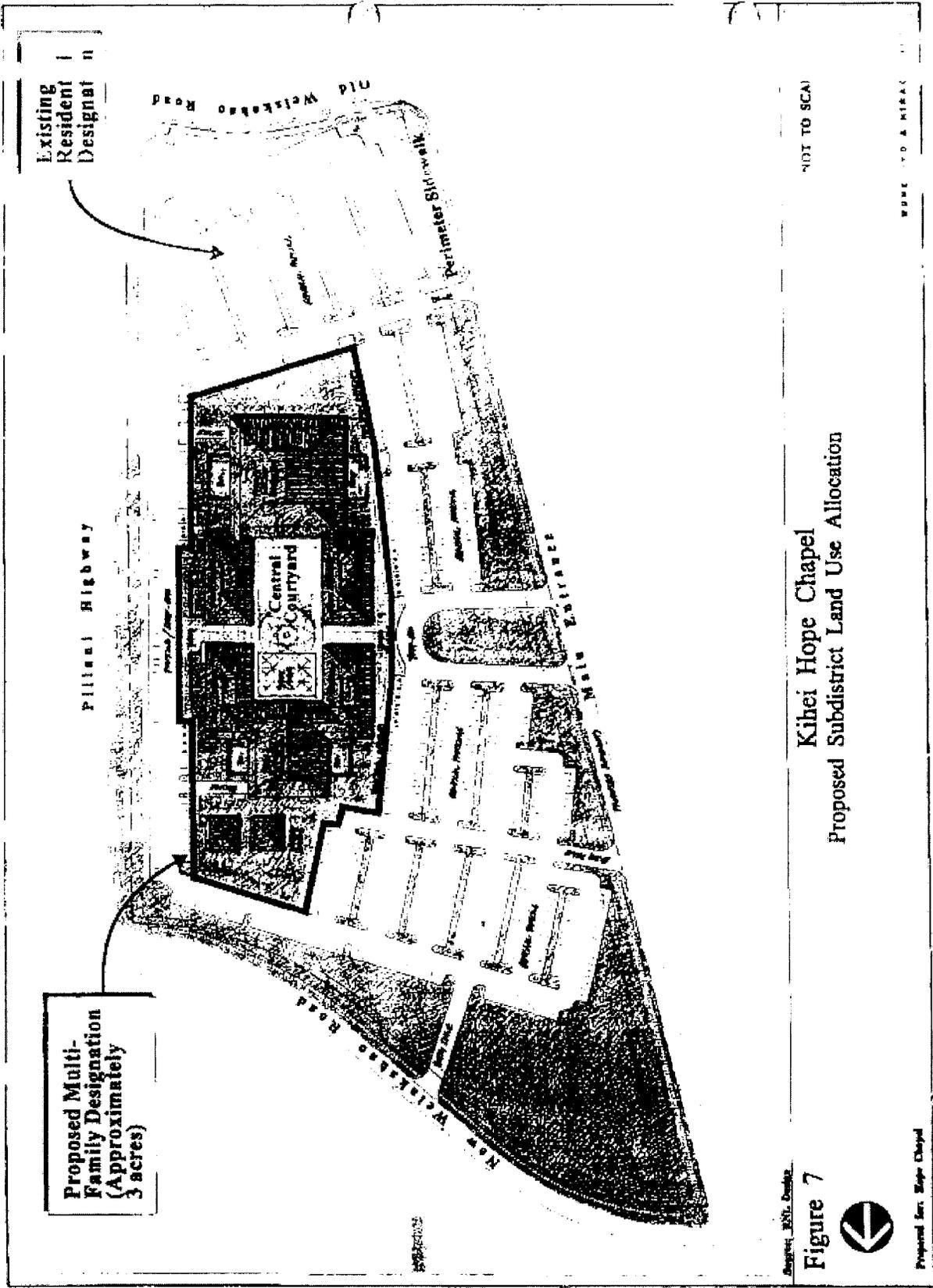


Maui County Assessor			
Parcel: 220020720000 Acres: 17.88			
Name	HOPE CHAPEL	Land Value	\$16,121,300.0
Site	300 E WELAKAHO RD	Building Value	\$11,353,000.0
Sale		Misc Value	\$0.00
Mail	HOPE CHAPEL- C FRANKS	Just Value	\$0.00
	300 E WELAKAHO RD	Assessed Value	\$27,474,300.0
	KIHEI HI 96753	Exempt Value	\$27,474,300.0
		Taxable Value	\$0.00



The Maui County Assessor's Office makes every effort to produce the most accurate information possible. No warranties, expressed or implied, are provided for the data herein, its use or interpretation. The assessment information is from the last certified taxroll. All data is subject to change before the next certified taxroll. PLEASE NOTE THAT THE PROPERTY APPRAISER MAPS ARE FOR ASSESSMENT PURPOSES ONLY NEITHER MAUI COUNTY NOR ITS EMPLOYEES ASSUME RESPONSIBILITY FOR ERRORS OR OMISSIONS ---THIS IS NOT A SURVEY---

Date printed: 05/31/19 : 21:50:58



NOT TO SCALE

Kihei Hope Chapel  
Proposed Subdistrict Land Use Allocation

Project: 2010-0000

Figure 7

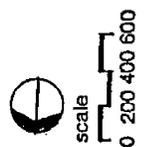
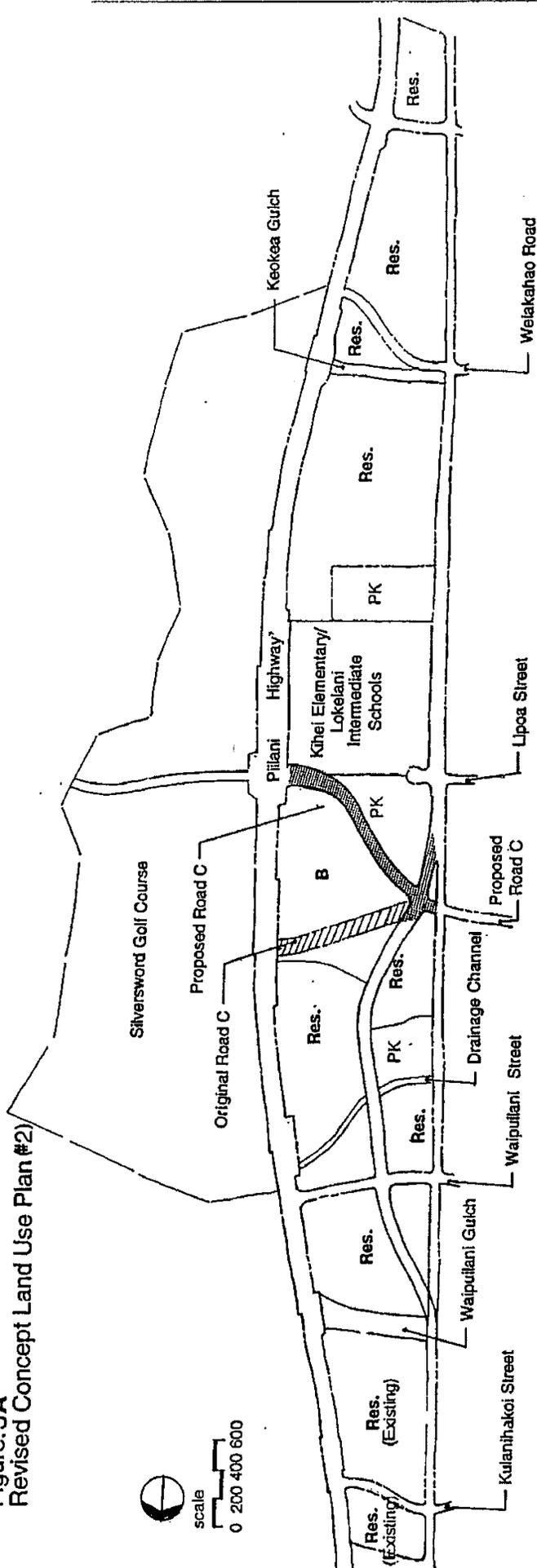


Prepared for: Kihei Chapel

WONG & MIRAK

**EXHIBIT 2**

Figure:3A  
Revised Concept Land Use Plan #2)



Note: Proposed Road C and realigned collector road section



Original Road C



**LAND USE ACREAGES**

•Residential (Res.)	145.1 acres
•Single-Family Residential (109.1 ac)	
•Multi-Family Residential (36.0 ac)	
•Business/ Commercial (B)	15.0 acres
•Park/ Open Space Landscape Buffer	27.7 acres
<b>total</b>	<b>187.8 acres</b>



KIHEI COMMUNITY  
ASSOCIATION MEETING  
SUMMARIES

APPENDIX

J-1



## Liloa Hale – Meeting with Kihei Community Association 11/11/19

Development Team Representatives Present:

**Developer: Highridge Costa (HC):** Monte Heaton

**Developer and Property Manager: Hale Mahaolu (HM):** Grant Chun

**Entitlement Consultant: Munekiyo Hiraga (MH):** Mark Roy

---

### General Project Description:

- 4-story, elevator served
- 150 one and two-bedroom on 4.9-acre parcel
- Located near 300 E Welakahao Rd. in Kihei, south of Hope Chapel
- (site plan and tabulation shared with members of KCA)

### General Q&A

- Will the project allow Mainland Residence?
  - HC: Yes- Due to Fair Housing rules, the owner cannot discriminate between current residents of Hawaii and those who live on the mainland.
- When can prospective residents begin the application process?
  - HC: During construction, the development team will create an interest list for the project. Because income verification for tenant qualification is only valid for 90 days, pre-leasing will begin 90 days prior to the project being placed in service.
- What is the project's distance to Pi'ilani Highway?
  - HC: The majority of the building will be roughly 150 ft from Pi'ilani Highway. A small portion of the building juts out another ~60 ft, putting it roughly 90 ft from the highway.
- What is the project's Height?
  - HC: Approximately 60 ft.
- Where will access to the property be located?
  - HM: Property will be accessed on the southern portion of the site from Liloa Drive

### Entitlement

- Description of entitlement process by MH:
  - Liloa Hale will be entitled through the county's new chapter 2.97 process (passed in 2018) which allows for various exemptions and waivers for affordable housing projects. This project will be among the first to be approved under this program. The development team has met with the Mayor's office and all major approving agencies in order to determine most expedient path to approval. Due to location on Pi'ilani, an SMA use permit will also be required. Development team plans to submit both applications early 2020.

### Site Layout and General Comments/Questions

- General concern with 4-story design

- HC: We will examine potential ramifications of reducing height and verify whether or not we can achieve similar density at 3 stories.
- Will project increase traffic significantly in area?
  - MH: The developer has commissioned a traffic study that concluded that, given the target population's age, it is unlikely that the project will significantly increase traffic at peak hours. This population typically does not drive during peak hours as often as the general population.
- General approval of affordability, noting great need in the community
- Possible to have shades over windows?
  - HC: We believe we can incorporate this in the design.
- Given tenant population, is it possible site is overparked?
  - HM: Projects operated by Hale Mahaolu in the area feature similar parking ratios. It is our experience that parking is always at a premium in these projects. As such, we do not believe reducing the parking would result in an optimal parking count.
- Concern that, as corridors are closed, project will get excessively hot. Would it be possible to provide open corridors with front-facing windows? This would allow for cross-breeze and reduce resident use of air conditioning in hot summer months.
  - HC: In initial design, we opted for closed corridors due to their efficiency and the attractiveness of the design. All corridors will be ventilated and all units will contain window air conditioning units. With that said, we will examine closer the possibility for open corridors and front facing windows prior to making a final determination

## **Liloa Hale – Meeting with Kihei Community Association 1/14/20**

Development Team Representatives Present:

**Developer: Highridge Costa (HC)-** Mohannad H. Mohanna; Monte Heaton

**Developer and Property Manager: Hale Mahaolu (HM)-** Grant Chun

**Entitlement Consultant: Munekiyo Hiraga (MH)-** Mark Roy

**Architect: Design Partners Incorporated (DPI):** Lena Tamashiro

**Civil Engineer: Otomo Engineering (OE):** Ashley Otomo

---

### Project Review

- 4-story, elevator served
- 150 one and two-bedroom on 4.9-acre parcel
- Located near 300 E Welakahao Rd. in Kihei, south of Hope Chapel
- Generally 150 ft setbacks, at lowest, ~90 ft
- Display of new 3D renderings of project

### Notes from Development Team on benefits of current design:

- HC: Project will contain 10,000 sq ft. green courtyard area located in central area
- DPI: Enlarging footprint to reduce height would require seniors to walk longer distances to common area amenity spaces
- HC: Mailboxes and laundry centralized to encourage interaction between the seniors and allow management to see them regularly
  - If resident is not seen for extended period, manager knows to check on them
- DPI: Pedestrian treatment will ultimately allow easy access to Hope Chapel instead of along Liloa, a much longer and more indirect path.
- OE: Liloa Drive will be improved with curbs and sidewalks from drainage basis to the project's property line on Liloa side

### Discussion of Previous KCA Comment: Implementation of Low Impact Design

- DPI: Project feature LED lighting, low impact fixtures, green insulation, reclaimed water, dual glazed windows, drought tolerant landscape, and recycled finishes
- HC: Units will have ceiling fans in addition to A/C units
- Building will be stubbed for future integration of solar panels, but will not feature such panels upon completion.

### Discussion of Previous KCA Comment: Open Corridors

- DPI: Development team thoroughly researched options with regard to open corridors
  - Code does not allow open corridors to be loaded with units including front facing windows on each side, so incorporating this would require us to do single-loaded

corridors, a far less efficient design that would also greatly increase our building footprint and yield significantly less green open space than currently shown.

#### Funding and Application Discussion

- Description of competitive process for financing via the Hawaii Housing Finance and Development Corporation (HHFDC)
  - HHFDC is the issuing agency of tax credits and tax-exempt bonds in the state of Hawaii.
  - HHFDC also issues the largest soft financing program for affordable housing in the state of Hawaii: the Rental Housing Revolving Fund (RHRF)
    - Competitiveness for RHRF hinges greatly upon how much funding is being requested. Financing requested is driven by project cost. As such, design elements that increase cost reduce the probability that a project receives an allocation of financing and therefore can be built.
      - Development team ran financing model for 3-story building on this site and concluded the application would not be competitive in terms of RHRF request per unit

#### General Discussion – Questions/Concerns

- Based on site plan, concern raised that courtyard is too cramped
  - HC: Courtyard will be total of ~10,000 sq ft and have connectivity with existing open space with Hope Chapel.
  - DPI: the Courtyard will allow shade during hot Kihei summers and also buffer excessive wind from three sides.
- Height- KCA notes that building will be tallest structure on Pi'ilani Highway and set negative precedent.
  - HC: We understand this concern and have included significant setbacks to alleviate this concern. We do feel that future support for structures of similar height can be easily conditioned on said structures providing 100% affordable housing.
- Questions raised about elevators in event of power outage
  - HC: all elevators will be equipped with backup generators in the event of an emergency. Fire dept. has reviewed concepts and confirmed that project meets code requirements including fire truck access and fire sprinklers.
- Number of units per floor?
  - DPI: 39 units
- Will pets be allowed?
  - HC: Small pets will be allowed. Depending on prevalence, we may plan to have small fenced "bark park" to allow animals off leash

#### General notes

- Community space has a/c
- Picnic tables and benches will be included in landscaped courtyard
- Drainage area will be green and landscaped. Development team will do research into allowable other uses for this space.



COMMENT LETTERS FROM  
AND RESPONSE LETTERS  
TO KIHEI COMMUNITY  
ASSOCIATION

APPENDIX

J-2





Kihei Community Association

"e mālama pono"...dedicated to protecting,  
sustaining and enhancing our 'āina, kai and 'ohana

November 19, 2019

Mark Roy, Munekiyo & Hiraga  
Monte Heaton, Highridge Costa  
Grant Chun, Hale Mahaolu

Dear Mark, Grant and Monte,

Thank you very much for presenting your project, Liloa Hale, to the Kihei Community Association Design Review Committee. We very much appreciate seeing the project in the early design stage as it affords us time to make comments that can be considered by you and your design team.

We see a great need for more infill affordable housing in Kihei. Please see below for some suggestions that we see would enhance your project and make it a quality place for people to rent.

1. A 4 story structure would be out of character with the surrounding neighborhood and will cause an unattractive view from the highway and would expose residents to highway traffic sounds and view. There is no other structure along the Pi'ilani Highway that is the height of your proposed project. The adjacent Hale Mahaolu is 3 stories tall and is set at least 1 story lower than the highway thereby making it blend in nicely with the environment. In visiting this site, the land appears to be level or higher than the highway. It is difficult for us to assess with only plans, so we would like to see a cross section through Pi'ilani Highway down to Liloa Street. The section would enable us to see the height of the proposed Liloa Hale in relationship to the highway.
2. An interior courtyard is the only green space on the site except for the small perimeter edging outside the parking and close up to the building. The opening in the courtyard is facing north and there are 4 story walls surrounding the courtyard. Consequently, the sun will not shine in the courtyard and it will be difficult for plants to grow. If the building were lower, 2 or 3 stories, instead of 4 this would give a much nicer proportion to the courtyard. If the building were reoriented to have the courtyard open to the south, this would allow sunlight into the area, especially in winter when the sun is lower in the sky. There can still be walking paths to the adjacent property. This orientation would also allow the driveway entrance to be located farther from the secondary Welakahao Road.
3. We would like to see more green space on the site. The building is sitting in a huge parking lot with little relief. This will cause a heat island effect. If the height were lowered, the parking could be greatly reduced and would allow for more green areas, such as a wide green space on the Liloa Street side of the lot as well as along the highway. The environment would be cooler and more pleasing aesthetically. It would provide more area for "green streets" design. KCA is a strong proponent of ecologically friendly use of "LID", Low Impact Design, which filters and purifies runoff on site by providing green areas to receive the parking lot and building runoff. Please see <http://www.ecosoldesigns.com> for examples of these principles.

4. The units in the building have ventilation only on one side of each apartment. This does not allow for cross ventilation. Since you stated that only wall air conditioning units would be available, we see a great need for excellent cross ventilation to take advantage of the trade winds. Maui has had record heat waves this year with no end in sight. KCA supports decreased energy usage by using natural air circulation and proper shading for windows. Please consider making the corridors of the building open to the environment with closable shutters for storms. It would make it possible to have windows on both sides of the units. We understand that on the mainland this is unusual except for motels, however in our sub-tropical environment this feature can be very attractive and far more comfortable. It will also cut down on costs for climate control in the corridors. The common rooms on the ground floor can be separately climate controlled. Additionally, please provide shade for windows on all levels. See example below of nearby project.



5. You mentioned that seniors often do not use cars as much as other demographics. We would like to see a smaller car to unit ratio, thus opening up more green space. The retention basin shown beside the gulch appears unnatural in the way it juts out into the gulch. It would be better if there could be alternative retention as mentioned in #3.

6. We ask what road improvements will be made as Liloa Street is the Greenway "Collector Road". Do you propose improvements including curbs and sidewalks and any other contributions to the Collector Road? KCA is requesting that developers provide such improvements and not be exempt from them. At the very least, proper sidewalks should be installed along the perimeter as well as throughout the site.

We understand that there are financial reasons that you are trying to maximize the number of units on the land. Unfortunately, this site is not conducive to such a high density. We need affordable senior housing, however the design as presented makes evident some very serious challenges that must be considered in order to create a pleasant environment for seniors to live in. The long term sustainability and quality of our community is very important in our review. Thank you for reviewing these comments and for considering incorporating them into your final design.

Mahalo,

Randy Wagner, AIA, LEED AP  
Chair Design Review Committee  
Kihei Community Association



Randy Wagner, AIA, LEED AP, Chair

Design Review Committee

Kihei Community Association

P.O. Box 662

Kihei, HI 96753

**Re: Liloa Hale 100% Affordable Senior Housing Project**

Dear Ms. Wagner and members of the Design Review Committee,

On behalf of the development team for Liloa Hale, I would like to extend our thanks for not only providing your comments on the design of our project, but also extending your hospitality to us a second time so that we could provide information in response to the concerns raised by your organization. The acceptance of our project by the Kihei Community and the County of Maui as a whole is of utmost importance to us, so your taking the time to review our project is greatly appreciated. While we reviewed many of the KCA team's questions and concerns during our latest meeting on January 15<sup>th</sup>, 2020, the team felt it would be worthwhile to memorialize our response to your November 19, 2019 letter in writing now that we have provided clarification and explanation on those issues.

1. The development team notes your comment regarding the four-story design of the project and its proximity to the Piilani Highway corridor. While the project's feasibility hinges upon the current proposed density, we have taken multiple steps in the design of the plans to alleviate this potential concern. The vast majority of the project is set back approximately 150 feet from both Liloa Drive and Pi'ilani Highway and the entirety of the site will be fenced with attractive trees on the perimeter to maintain an attractive view along the highway corridor. It is our hope that the renderings provided at our recent meeting will help bring confidence to the committee that our project will create a place-appropriate senior housing facility that will be consistent with the overall feel and character of the surrounding Kihei community.
2. The next concern raised was related to the amount of green space provided under the existing site plan. As noted in our latest meeting, the project will include a 10,000 square foot landscaped courtyard area for the residents to enjoy. In addition, we have added additional trees and greenery to our landscaping plan to add shade and attractive greenery to the parking lot areas. Given Kihei's hot climate, we do not feel that the shade in the plaza created by the surrounding building will be a negative feature for the residents. Additionally, it is the opinion of our architect that altering the orientation of the building to face south will not yield a significant change in the amount of sunlight allowed into the courtyard.

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3. Per the KCA's recommendation, the development team has conducted additional research into options that will make Liloa Hale more sustainable. Assuming the county has the capacity, the project will connect to and utilize reclaimed water for irrigation. We will also be installing catch basin filter inserts that are designed to remove silt, sediment, and hydrocarbons prior to entering the subsurface drainage system. Additionally, the project will feature a variety of other sustainable features including, but not limited to Energy Star Appliances, LED lighting, Low Flow Plumbing Fixtures, dual pane windows with low-e coating, recycled materials, drought tolerant native landscaping, and low VOC products. We will also build the project to allow us to install solar panels in the future in the event that funding becomes available.
4. Members of the KCA raised the concern that, as the corridors of the building will not be open, there may be a lack of cross breeze into the units. This led to a discussion of general heat management within the project. As noted in our first meeting, units will contain window air conditioning units and all corridors will be ventilated. The development team subsequently conducted additional research into the potential ramifications of including open corridors at Liloa Hale. We discovered that, in order to meet code requirements, open corridors (with front-facing windows to allow for cross-breeze) cannot be double loaded. In order to single-load the corridors, the project footprint would need to be greatly increased, which would not only create problems with parking, but also lead to a minimization of green space and limited project setbacks from the highway. In our latest meeting it was noted that the project's current design may lead to an increased use in air conditioning and that this could be a financial burden on the residents. As noted in the meeting, however, senior affordable housing projects require that the charged "affordable" rent is either net of utilities (thus utilities are paid by the owner) or net of a published "utility allowance" that is based on statistical utility usage in the market area. As such, the development team does not feel that the current site plan would lead to an undue burden on the residents.
5. In our first meeting, the potential to reduce parking and increase green space was discussed. The development team thoroughly reviewed parking usage in similar senior housing projects on Maui, particularly those managed by Hale Mahaolu, to explore this option. We discovered that, in projects parked similarly to our current plan, parking is consistently at a premium. Especially keeping in mind that a portion of our residents may continue to work, we feel that it would be imprudent to reduce the parking count of the project.
6. The development team plans to install sidewalk and curb improvements along Liloa Drive up until the property line of our project site. As the project will exist within a Condominium Property Regime with Hope Chapel, the County would typically require improvements along the entire tax map key frontage, which would include areas of Hope Chapel the partnership does not own. We will be seeking a partial exemption from this requirement as part of the 2.97 application process so that we are only required to provide improvements along the property we own.

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We would like to reiterate our sincere appreciation that the KCA was willing to meet with us and discuss this exciting opportunity to bring new, quality affordable senior housing to the Kihei community. We are currently finalizing our 2.97 and Special Management Area (SMA) applications and expect to be filing them shortly with the County for processing.

Should you have any further questions regarding the project, please feel free to reach out to me directly anytime or contact our planning consultant, Mark Roy of Munekiyo Hiraga at 244-2015.

Respectfully,

A handwritten signature in blue ink, appearing to read 'Mohanna', is written over a light blue horizontal line.

Mohannad H. Mohanna

President

Highridge Costa Development Company

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February 7, 2020

Mohannad H. Mohanna, President  
Highridge Costa Development Co.  
330 West Victoria Street  
Gardena, CA 90248

Via email: to Mark Roy, Munekiyo & Hiraga  
for further email distribution to:  
Monte Heaton, Highridge Costa  
Grant Chun, Hale Mahaolu

Dear Mo, Mark, Grant and Monte;

Thank you very much for returning to the KCA Design Review Committee with your project, Liloa Hale, for a second review. We see a great need for more infill affordable housing in Kihei, and we appreciate your effort to provide that.

The paragraphs below reference the paragraphs in our comments to you in the letter of November 19, 2020.

1. We still are convinced that the 4 story structure would be out of character with the surrounding neighborhood and would cause an obstruction to the view corridor from the highway. We revisited the highway and further believe that it would be most detrimental to the growth of Kihei to begin allowing tall structures in this context. The panorama rendering that you presented shows a distant view of the project from above the highway that would be as a bird might fly. The true impact to the thousands who drive the highway and who live adjacently would be completely different. The building would loom even if it is 150' from the highway. We now have a project in Kihei under construction that is three stories and is set below the highway. Even that is obstructive. The proposed building would be much more so from both mauka and makai viewpoints.

2. We appreciate your effort to add more trees to the courtyard and that you say you will have many trees along the highway. The rendering in view 1 still appears to be a massive amount of hardscape including building and parking that creates a heat island effect upon the environment in general.

3 & 4. We agree that the sustainable features you describe are inherently beneficial to all projects, especially using Low Impact Design civil engineering principles, using energy saving products and environmentally friendly materials. These items do not address the fundamental design of the building such as proper shading and ventilation. There are no shades on the windows that could possibly lessen the heat gain in the individual units. There is no option for cross ventilation, and every unit will need to use the wall air conditioner since there are windows on only one side. Despite the individual cost limits you mention for residents this causes an overall heat gain in the environment.

5&6. It is understandable that experience leads you to feel you must have the amount of parking you provide. This would not be such an issue if not for the hardscape heat gain factor of this highly dense project. Our goal is to encourage use of multi model transport, so we ask that developers encourage the use of carpooling, van sharing, public transit and walking. One way this can be done is by developing options within the complex and by providing less parking similar to what is done at other senior housing complexes such as Kalama Heights. We appreciate the extent of sidewalk that you will extend on your property, but would like to see it extend the entire TMK. We assume you will also be requesting an exemption for the Liloa Drive improvements at your property.

The long term sustainability and quality of our community is very important in our review. There are many obstacles that still exist before this can be a truly beneficial project in Kihei. The density required to make this financially viable may or may not limit the solutions to these problems. We admire your effort to provide affordable senior housing, however the impacts this project would have if built would set a poor precedent for the mission of Kihei Community Association: *"e mālama pono"...**dedicated to protecting, sustaining and enhancing our 'āina, kai and 'ohana.*

Mahalo,

Randy Wagner, AIA, LEED AP  
Chair Design Review Committee  
Kihei Community Association



Randy Wagner, AIA, LEED AP, Chair

Design Review Committee

Kihei Community Association  
P.O. Box 662  
Kihei, HI 96753

**Re: Liloa Hale 100% Affordable Senior Housing Project**

Dear Ms. Wagner and members of the Design Review Committee,

On behalf of the development team for Liloa Hale, I would once again like to extend our thanks for providing comments on the design of our project and reiterate how important the acceptance of our project by the Kihei Community and the County of Maui is to us. Due to multiple factors including the KCA's concerns with the height of the project, as well as changes in the immediate availability of our desired financing options, we have elected to redesign the project as a three-story apartment community with 117 units total.

Speed of delivery of new affordable units to communities most in need is always at the forefront of Highridge Costa's development plans. After reevaluating Liloa Hale's funding options, the development team has concluded that a smaller, less dense version of the project could potentially be competitive under the state's 9% tax credit program. While this program is very competitive, its structure would allow us to build a successful, self-sufficient project while accelerating the timeline to delivery and simultaneously allowing us to be sensitive to the concerns of the project's neighbors.

The KCA in our meetings and prior communications has primarily focused its areas of concern on height and green space for both aesthetic and heat concerns. The reduced density of the re-imagined Liloa Hale will allow for a reduction in parking count. This area can now be utilized for additional green space that will improve the project's aesthetics and reduce concerns of the "heat-island" effect. Enclosed with this letter is an updated site plan and unit elevations.

We hope that, given these changes, we can count on the KCA's support for Liloa Hale. If you have any questions, or would like to discuss further, please feel free to reach out to me anytime at (424) 258-2906 or by email at [moe.mohanna@housingpartners.com](mailto:moe.mohanna@housingpartners.com).

Sincerely,

Mohannad H. Mohanna  
President  
Highridge Costa Development Company



**TREE LEGEND**

- Large Monkey Pod Tree
- Rainbow Shower (2" cal., 6'-0" trunk ht.)
- Medium Shade Canopy (Parking Areas) (2" cal., 6'-0" trunk ht.)
  - Milo,
  - Fern Tree
  - Geiger Tree
- Small Accent Tree
  - Singapore Plumeria (6-ft. planted ht.)
  - Jatropha (6-ft. planted ht.)
- Naio Hedge
- Fruit Trees
  - Citrus (Valencia Orange, Dancy Tangerine, Meyer's Lemon)
  - Wurtz - Little Cado 'A' Avocado
  - "B" Type Dwarf (i.e. Don Gillogly)
  - Papaya

**PROJECT AREA**  
3.61 ACRES

**Liloa Hale - SENIOR HOUSING**  
HIGHRIDGE COSTA  
DESIGN PARTNERS INCORPORATED

**CONCEPTUAL LANDSCAPE PLAN**  
KIHEI, HAWAII



March 09, 2020





NORTH SIDE ELEVATION



EAST SIDE ELEVATION

Liloa Hale - SENIOR HOUSING  
HIGHRISE COSTA

DESIGN PARTNERS INCORPORATED

DRAFT COLORED ELEVATIONS

KIHEI, HAWAII

March 09, 2020



SOUTH SIDE ELEVATION



WEST SIDE ELEVATION

Liloa Hale - SENIOR HOUSING  
HIGHRIIDGE COSTA

DESIGN PARTNERS INCORPORATED

KIHEI, HAWAII

March 09, 2020

DRAFT COLORED ELEVATIONS

 DESIGN PARTNERS  
INCORPORATED



WEST SIDE COURTYARD ELEVATION



EAST COURTYARD SIDE ELEVATION



April 2, 2020

Mohannad H. Mohanna, President  
Highridge Costa Development Company  
330 West Victoria Street  
Gardena, CA 90248

Dear Mr. Mohanna,

Thank you for sharing your revisions to the Liloa Hale Senior Housing project. We applaud that you are reducing the density of the project and allowing for more green areas on site. It is exciting that you have found a way to reduce the cost through the state's 9% tax credit program. Does this program require that an Energy Model be created for the project as do most state or federally supported projects?

If that is the case, I believe you will find that natural ventilation and increased air flow will be necessary to meet the requirements. We are still very concerned that your design does not allow for cross ventilation within the units. This could possibly be achieved with operable high transom windows along the rooms that front the corridors and with secure screen doors at each unit. Of course the corridors would also need to be well ventilated and there should be ceiling fans within the units. Solar shading on all the windows would also be required to reduce glare and heat gain. The elevations you have shown display shades on only some of the windows. These measures may already be embedded in the current code requirements even without an Energy Model.

It is my understanding that Hawaii Energy is looking for projects this year where they will contribute \$5k to energy modeling and will offer other incentives such as reduced electricity rates. The person to contact at Hawaii Energy is Edmundo Ramos, [edmundo.l.ramos@leidos.com](mailto:edmundo.l.ramos@leidos.com).

We are assuming that you have not changed the site plan yet to reduce the parking because there appear to be 141 car spaces for 117 units. Where have stalls been removed? Where is the additional green space you speak of in your letter? You mentioned in our first meeting that you have found in your experience that there is less need for extensive parking in senior residential projects. Our research agrees with your findings, especially if the housing is located within a half mile of services as this project is. It is a shame that there is no existing sidewalk system that would allow safe passage to the Kihei Town Center. We appreciate that you mentioned you will be adding sidewalks and encourage you to include the length of Liloa between Welakahao and Ehiku Loop. Ultimately a small van service to shopping would really help remove the need for cars.

Your project with reduced parking, more green space, proper natural ventilation, and good sidewalks would be an excellent project that we would support. Ideally if you would design a substantial landscaped berm along the highway then the view of the parking would be eliminated from the highway. The entire site would be much quieter and more pleasant for those who live there. With more green space there could be room for a community garden that has proven to be healthy and very popular with seniors.

Mohannad Mohanna

April 2, 2020

Page 2

We really want to work with you to make this an excellent place for people to live. We want it to be affordable and of high quality where people are happy to stay. These suggested ideas may not be that expensive to include, some could even reduce the cost of construction such as reduced parking.

In summary, please see important points that we feel are necessary:

1. Cross ventilation within all units. This may be achieved with operable clerestory windows and secure screen doors. Ceiling fans should be standard.
2. Cross ventilation throughout the corridors. This may require some new openings into hallways on the south and east elevations.
3. Shading on all windows. May be required by code.
4. Less parking to allow more green space. A berm on the highway side is ideal to reduce the impact of the parking lot, reduce the scale of the building, and provide tranquility to the site.

Please see this article from Smart Growth America.

[https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill\\_id=201520160AB744](https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201520160AB744)

Thank you for your continued cooperation with our Design Review Committee.

Sincerely,

Randy Wagner, AIA, LEED AP  
Chair, Design Review Committee



Randy Wagner, AIA, LEED AP, Chair

Design Review Committee

Kihei Community Association

P.O. Box 662

Kihei, HI 96753

**Re: Liloa Hale 100% Affordable Senior Housing Project**

Dear Ms. Wagner and members of the Design Review Committee,

On behalf of the development team, I would like to extend our thanks for providing comments on the design of our project and once again emphasize the importance of our project's acceptance by the Kihei Community and the County of Maui.

We understand that green space and the reduction of parking has been a primary concern of the KCA and would like to clarify features in the updated site plan included in our previous letter. The original four-story design totaled 176 parking stalls, which has been reduced to 143 total stalls in the three-story plan. Removing 33 stalls allowed us to include additional green space in areas that would seclude and to shade the parking lot, making it both more aesthetically pleasing and cooler. The development team determined that this was the maximum number of stalls that could be removed while adequately serving its residents.

With regard to KCA's concern with sidewalks, I would like to reiterate that we will be constructing curb improvements and sidewalks down the line of our property along Liloa Drive. Additionally, it is likely that when Hope Chapel receives approval for its planned expansion, they will be required to complete the remaining desired improvements down their property line. This would complete the sidewalk down the length of Liloa Drive between Hope Chapel's northern property line and our southern property line.

Lastly, regarding the KCA's concerns with cross ventilation and shading under the double-loaded design concept, I assure you that Liloa Hale will meet all requirements for a state and federally supported project. Highridge Costa has extensive experience building this product type with federal financing and has no concerns that financing awards will be withheld based on this issue. Per Section 1017.4 of the 2006 International Building Code (IBC), corridors shall not serve as supply, return, exhaust, relief or ventilation air ducts. This means that we cannot have openings in a double-loaded corridor that allow for cross ventilation of the units. In order to maintain the density required for project feasibility under an alternative single-loaded corridor design scenario, it would not be possible to maintain the current site plan's central green plaza and would greatly reduce residents' ability to enjoy the green space we provide. As mentioned previously, all units will contain window air conditioning units and all corridors will

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be ventilated. We will also be incorporating additional shading into the project that will reduce glare and heat gain.

The development team shares your commitment to sustainable building practices and has designed Liloa Hale to meet a LEED Silver equivalent of energy efficiency and sustainability.

We are greatly appreciative of the in-depth review the KCA has provided for our project during its design phase. Your insight has helped create a project that will harmonize with the Kihei Community while delivering much needed affordable units. We are excited to become a part of the community and hope that we can count on the KCA's support through the rest of the development process.

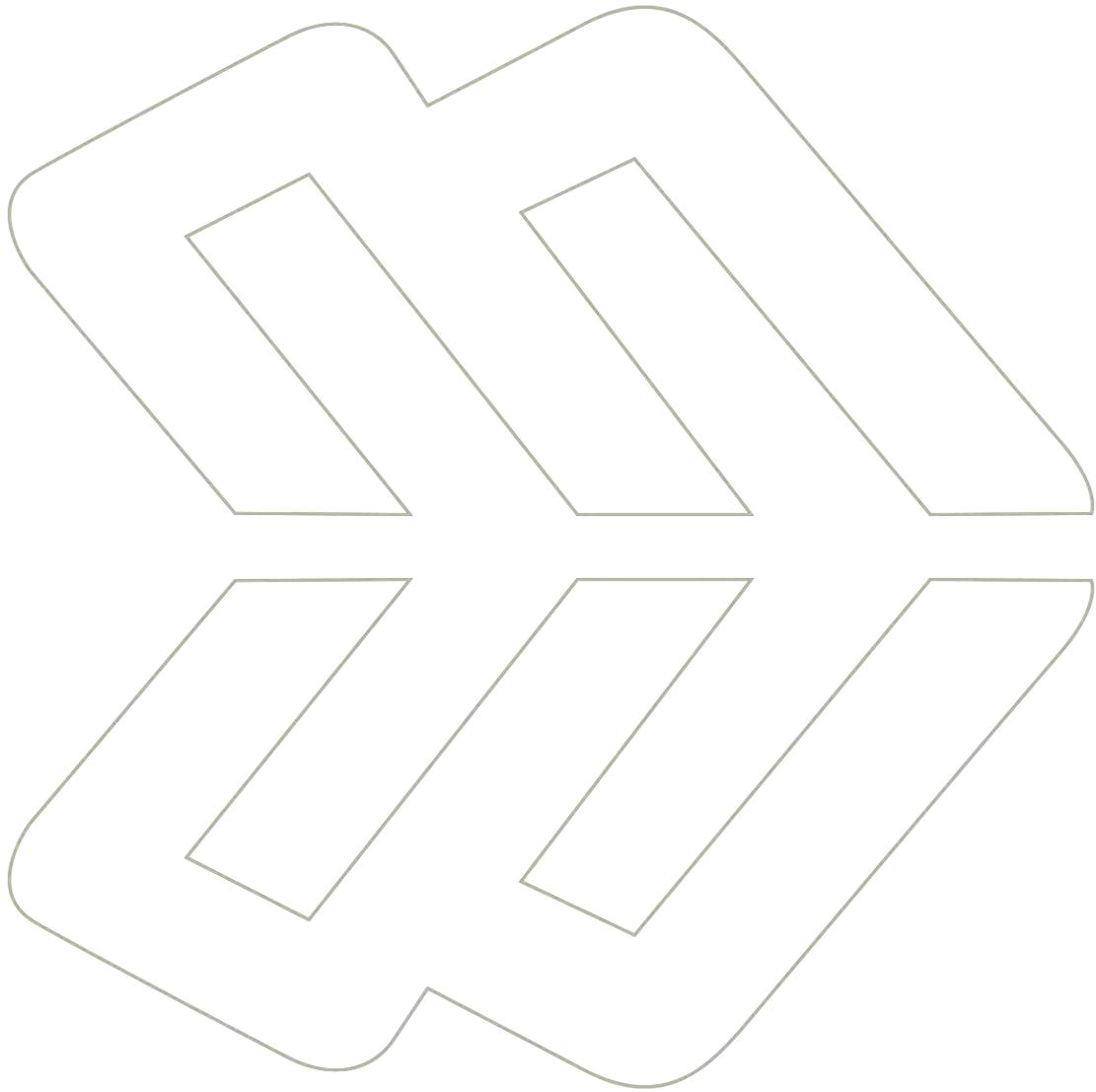
Respectfully,

A handwritten signature in blue ink, appearing to read 'Mohanna', is written over a light blue circular stamp.

Mohannad H. Mohanna

President

Highridge Costa Development Company



**MUNEKIYO HIRAGA**

Planning. Project Management. Sustainable Solutions.

