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ENGINEERING DIVISION
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Highways Division

March 6, 2013

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OFC. OF ENVIRONMENTAL QUALITY CONTROL

Gary Gill, Acting Director
Office of Environmental Quality Control
State of Hawaii
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR THE PROPOSED KUHUA STREET EXTENSION AND IMPROVEMENTS, LAHAINA, MAUI, HAWAII

Dear Mr. Gill:

With this letter, the County of Maui, Department of Public Works hereby transmit the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFNSI) for the Proposed Kuhua Street Extension and Improvements situated in the Lahaina District on the Island of Maui for publication in the March 23, 2013 edition of the Environmental Notice.

Enclosed is a completed OEQC Publication Form, two (2) copies of the DEA-AFNSI, an Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file by electronic mail to your office.

Should you have any questions, please do not hesitate to contact Colleen Suyama at Munekiyo & Hiraga, Inc. at (808) 244-2015.

Very truly yours,

David Goode
Director of Public Works

DG/NY:gq(ED13-0203)
Enclosures
K:\DATA\KLMC\MillStreet\OEQCtrans.fromDPW.doc

AGENCY ACTIONS
SECTION 343-5(B), HRS
PUBLICATION FORM (JULY 2012 REVISION)

Project Name **Kuhua Street Extension and Improvements**
Island: Maui
District: Lahaina
TMK: Various
Permits: Construction Permits
Proposing/Determination Agency: **Department of Public Works**, 200 South High Street, Wailuku, Hawaii 96793, Contact: Nolly Yagin, (808) 270-7745
Consultant: **Munekiyo & Hiraga, Inc.,** 305 South High Street, Suite 104, Wailuku, Hawaii 96793, Contact: Colleen Suyama, Senior Associate, (808) 244-2015
Status (check one only):

X DEA-AFNSI	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day comment period ensues upon publication in the periodic bulletin.
__FEA-FONSI	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__FEA-EISPN	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day consultation period ensues upon publication in the periodic bulletin.
__Act 172-12 EISPN	Submit the proposing agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqchawaii@doh.hawaii.gov). NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.
__DEIS	The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the DEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.
__FEIS	The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__ Section 11-200-23 Determination	The accepting authority simultaneously transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the proposing agency. No comment period ensues upon publication in the periodic bulletin.
__Section 11-200-27 Determination	The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.
__Withdrawal (explain)	

Summary (Provide proposed action and purpose/need in less than 200 words. Please keep the summary brief and on this one page)**:**

The County of Maui, Department of Public Works (DPW), proposes the development of the Kuhua Street Extension and Improvements Project in Lahaina, Maui, Hawaii. The project will be aligned east (mauka) of and parallel to Honoapiilani Highway and will span approximately two (2) miles from Keawe Street to its southern terminus with Honoapiilani Highway, across from the Front Street intersection.

The proposed roadway alignment is mainly east (mauka) and parallel to the existing Mill Street cane haul road until it nears the Lahaina Recreation Center. The roadway alignment veers around the Lahaina Recreation Center between the park and Na Hale O Wainee housing project and then travels west towards Mill Street and terminates at the Front Street intersection. The project also includes the intersecting streets of Papalaua Street, Lahainaluna Road, Dickenson Street, Shaw Street and Aholo Road. Due to severe grade differences at Honoapiilani Highway, Prison Street is currently not identified as an intersecting street. The proposed project will provide an alternate local transportation corridor parallel to Honoapiilani Highway. The County of Maui will need to obtain funding for land acquisition and construction of the project.

Draft Environmental Assessment

KUHUA STREET EXTENSION AND IMPROVEMENT PROJECT, LAHAINA, MAUI, HAWAII

Prepared for:

County of Maui,
Department of Public Works

March 2013

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MUNEKIYO HIRAGA, INC.

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Appendix F. Acoustic Study
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List of Acronyms

AFNSI	Anticipated Finding of No Significant Impact
AIS	Archaeological Inventory Survey
ALISH	Agricultural Lands of Importance to the State of Hawaii
AM	Morning
AMSL	Above Mean Sea Level
APE	Area of Potential Effect
ATA	Austin Tsutsumi & Associates, Inc.
BMP	Best Management Practices
CATV	Cable Television
CFS	Cubic Feet Per Second
CIA	Cultural Impact Assessment
DA	Department of Army
DEM	Department of Environmental Management
DLNR	Department of Land and Natural Resources
DOE	Department of Education
DOFAW	Division of Forestry and Wildlife
DOT	Department of Transportation
DPW	Department of Public Works
DPWEM	Department of Public Works and Environmental Management
EA	Environmental Assessment
EaA	Ewa Silty Clay Loam
EB	Eastbound
EIS	Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	U.S. Federal Highway Administration
FIRM	Flood Insurance Rate Map
FONSI	Findings of No Significant Impact
HAR	Hawaii Administrative Rules
HCZMP	Hawaii Coastal Zone Management Program
HHFDC	Hawaii Housing Finance and Development Corporation
HRS	Hawaii Revised Statutes
KLMC	Kaanapali Land Management Corp.
KSE	Kuhua Street Extension
LBR	Lahaina Bypass Road
Leq	Equivalent Continuous Noise Level
LID	Low Impact Development
LGM	Lahaina Gateway Mall
LOS	Level of Service
LSB	Land Study Bureau
LT	Left Turn
LWFC	Lahaina Watershed Flood Control
LWWRF	Lahaina Wastewater Reclamation Facility
MECO	Maui Electric Company, Ltd

MG	Million Gallon
MGD	Million Gallons Per Day
MIP	Maui Island Plan
NPDES	National Pollutant Discharge Elimination System
NPS	Non Point Source
NRCS	Natural Resource Conservation Service
OHA	Office of Hawaiian Affairs
OS	Open Space
PDR	Preliminary Drainage Report
PER	Preliminary Engineering Report
PM	Afternoon
PpA	Pulehu Silt Loam
PtB	Pulehu Cobbly Clay Loam
RGB	Rural Growth Boundary
ROW	Right of Way
RT	Right Turn
SB	Southbound
SHPD	State Historic Preservation Division
SIHP	State Inventory of Historic Places
SMA	Special Management Area
STB	Small Town Boundary
STIP	Statewide Transportation Improvement Program
TH	Through
TIAR	Traffic Impact Analysis Report
TMK	Tax Map Key
UH-MC	University of Hawaii – Maui College
UGB	Urban Growth Boundary
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
WB	Westbound
WdB	Wahikuli Very Stony Silty Clay
WWRF	Wastewater Reclamation Facility
WxB	Wainee Very Stony Silty Clay
WyC	Wainee Extremely Stony Silty Clay

Executive Summary

Project Name:	Kuhua Street Extension and Improvement Project
Type of Document:	Draft Environmental Assessment
Legal Authority:	Chapter 343, Hawaii Revised Statutes
Agency Determination:	Anticipated Finding of No Significant Impact (AFNSI)
Applicable Environmental Assessment Review "Trigger":	Use of State and County Lands and Funds
Location:	TMK: 4-5-024; 4-5-025; 4-5-009:007; 4-5-010:005, 006, 008, and 034; 4-5-011:007; 4-5-024:068, 4-6-013:001, and 006; 4-6-014:001; 4-6-015:001 and 004; 4-6-016:004, 005, and 039 Lahaina Maui Island
Applicant:	Department of Public Works County of Maui 200 South High Street Wailuku, Hawaii 96793 Contact: David Goode, Director Phone: (808) 270-7845
Approving Agency:	Department of Public Works County of Maui 200 South High Street Wailuku, Hawaii 96793 Contact: David Goode, Director Phone: (808) 270-7845
Consultant:	Munekiyo & Hiraga, Inc. 305 High Street, Suite 104 Wailuku, Hawaii 96793 Contact: Colleen Suyama, Project Manager Phone: (808) 244-2015
Project Summary:	The County of Maui, Department of Public Works (DPW), proposes the development of the Kuhua Street Extension and Improvement Project in Lahaina, Maui, Hawaii. The lands to be utilized for the project area are primarily owned by the County of Maui and Pioneer Mill Company, Ltd., (a

subsidiary of Kaanapali Land Management Corp. (KLMC)). Specifically, the project will be aligned east (mauka) of and roughly parallel to Honoapiilani Highway and will span approximately two (2) miles in the vicinity of Keawe Street to its southern terminus in the vicinity of Honoapiilani Highway, across from the Front Street intersection.

Heading in a northerly to southerly direction from its northern terminus at Keawe Street, the proposed roadway alignment generally follows the former Pioneer Mill cane haul road, crosses the Kahoma Stream Flood Control Channel, and continues along the existing Kuhua Street until it intersects with Lahainaluna Road. The proposed roadway alignment then continues in a southerly direction, east (mauka) and parallel to the existing Mill Street cane haul road until it nears the Lahaina Recreation Center. The roadway alignment veers around the Lahaina Recreation Center between the park ballfields and Na Hale O Wainee housing project and then travels west towards Mill Street and terminates at the Front Street intersection. In addition, the proposed project improvements include extending and/or improving the following east-west (mauka-makai) roadways between KSE and Honoapiilani Highway: Keawe Street, Papalaua Street, Lahainaluna Road, Dickenson Street, Shaw Street, Aholo Road, and Front Street. The Lahaina Bypass Road will be located to the east (mauka) of the proposed Kuhua Street Extension and Improvement Project.

The proposed project will provide an alternate local transportation corridor parallel to Honoapiilani Highway that will enhance access to the regional roadway network, alleviate existing traffic congestion, and improve circulation, including pedestrian-friendly access by incorporating a landscaped multi-use trail greenway along its entire length. It provides a pedestrian-oriented streetscape and gateway westward for connectivity to Lahaina town. The proposed roadway will also serve as an alternate route in the event of emergencies or during unexpected closures of Honoapiilani Higway. The County of Maui will need to obtain funding for land acquisition and construction of the project.

I. PROJECT OVERVIEW

I. PROJECT OVERVIEW

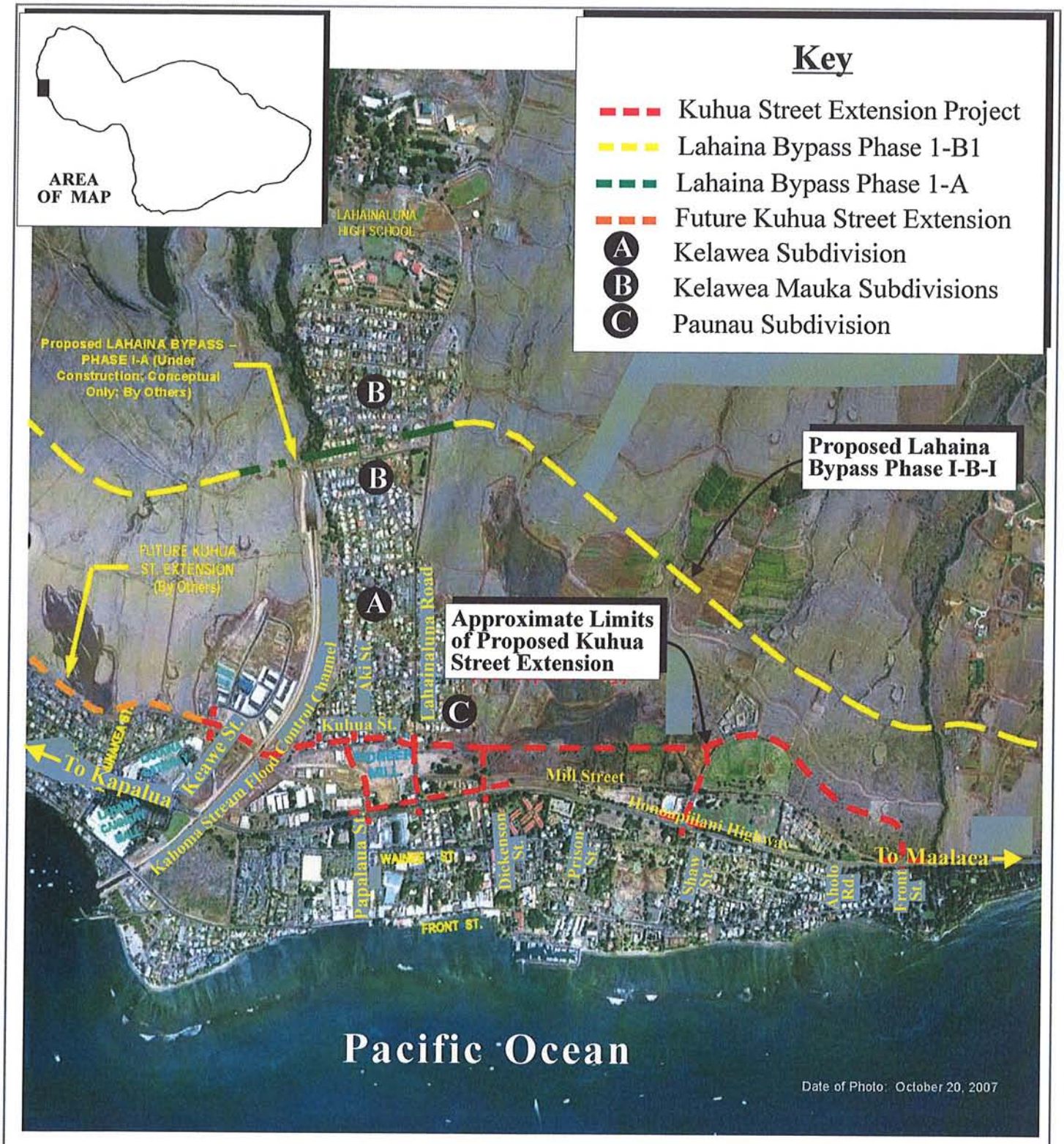
A. PROJECT LOCATION, EXISTING USE, AND OWNERSHIP

The project area for the Kuhua Street Extension and Improvement Project is located in Lahaina, Maui to the east (mauka) of the existing Honoapiilani Highway. See **Figure 1**. The proposed roadway project will extend the existing Kuhua Street in the vicinity of Keawe Street in the north to its southern terminus in the vicinity of Honoapiilani Highway at the Front Street intersection. See **Figure 2**. The proposed alignment for the Kuhua Street Extension and Improvement Project has been designed to integrate with the existing roadway network constraints and seeks to minimize impacts to existing land uses in the vicinity.

In conjunction with the Kuhua Street Extension (KSE), improvements to intersecting roadways, Keawe Street, Papalaua Street, Lahainaluna Road, Dickenson Street, Shaw Street, Aholo Road, and Front Street will need to be coordinated upon construction of the roadway extension. Due to severe grade differences at Honoapiilani Highway, a future connection at Prison Street is not proposed.

The project area from Keawe Street toward Dickenson Street is urbanized while the area south of Dickenson Street is largely vacant and undeveloped, much of which was formerly used for sugarcane cultivation or operations. See **Figure 3** and **Figure 4**. Existing land uses bordering the project area include agricultural, multi-family and single-family residential, park, commercial, and heavy industrial uses. Kuhua Street is an existing County roadway with a right-of-way width of approximately 25 feet with 20 feet of asphalt pavement which intersects with Lahainaluna Road to the south, directly across the Maui Electric Company, Ltd. (MECO) substation. To the north, Kuhua Street terminates at the former cane haul road that crosses the Kahoma Stream Flood Control Channel.

Most of the lands within the project area are owned by the County of Maui and Pioneer Mill Company, Ltd. (a subsidiary of Kaanapali Land Management Corp. (KLMC)). Right-of-way acquisition involving portions of adjacent properties may be required. The proposed KSE corridor will affect the following Tax Map Keys (TMKs) identified in **Table 1**. See **Figure 5**, Affected Tax Map Keys Reference Map.



Source: Warren S. Unemori Engineering, Inc.

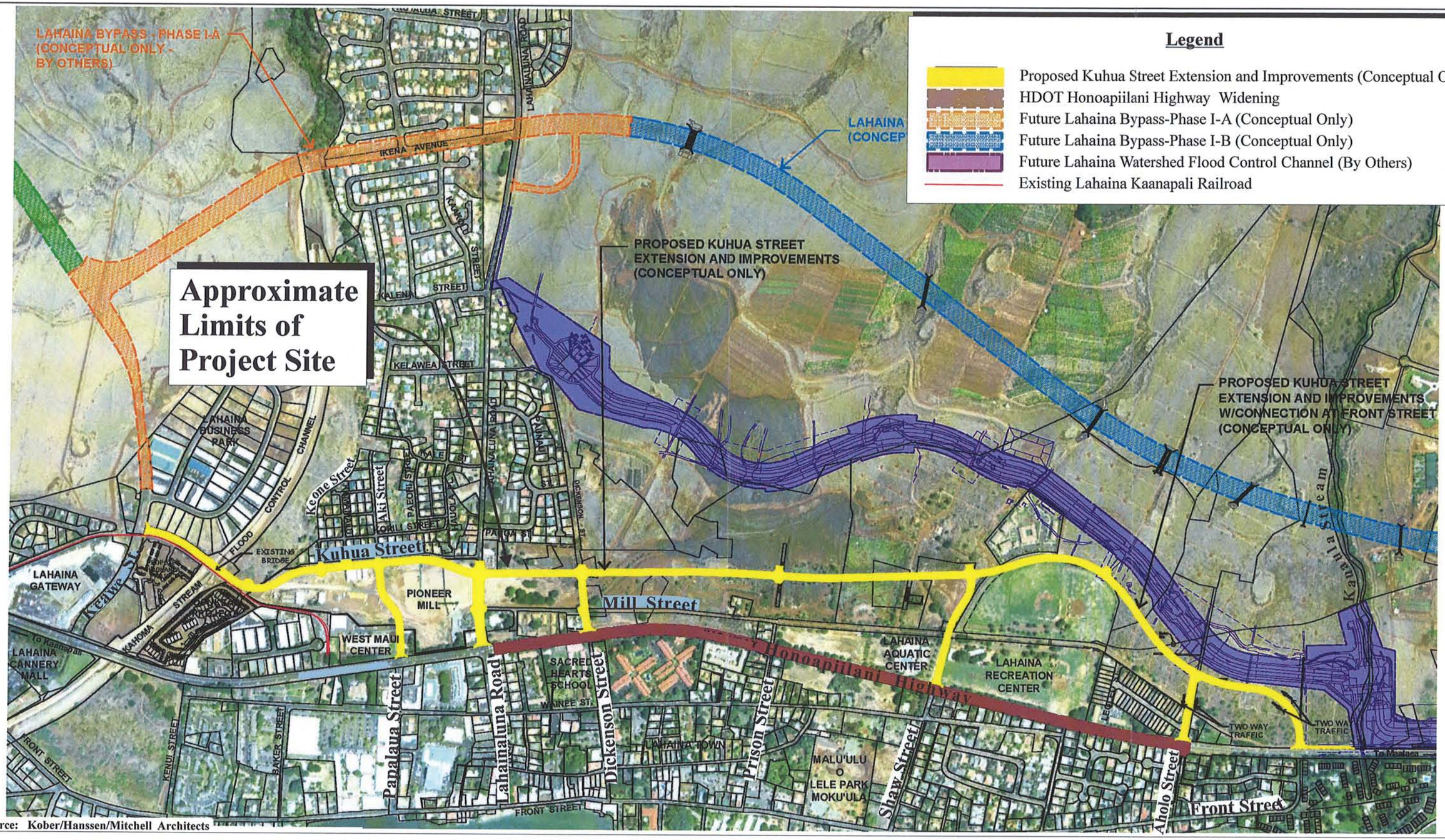
Figure 1 Kuhua Street Extension and Improvement Project
Regional Location Map

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: County of Maui, Department of Public Works

KImc/Millstreet/regloca.DEA



Source: Kober/Hanssen/Mitchell Architects

Figure 2

Kuhua Street Extension and Improvement Project

Proposed Alignment

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: County of Maui, Department of Public Works

KLMC/MillStreet/RevisedProposedAlignment

View at Keawe Street/Kuhua Street Extension Intersection (North Terminus)

View South at Kahoma Stream Flood Control Channel Crossing (Cane Haul Road and LKPR Sugar Cane Train Track)

Source: Munekiyo & Hiraga, Inc.

Figure 3 Kuhua Street Extension and Improvement Project
Site Photos

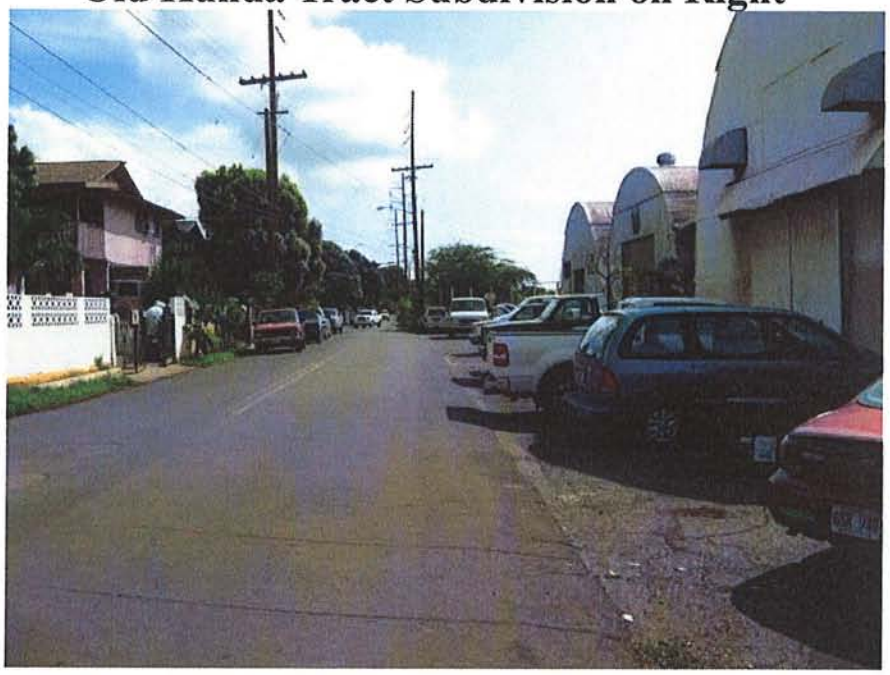
NOT TO SCALE

Prepared for: County of Maui, Department of Public Works

MUNEKIYO & HIRAGA, INC.

KLMC/MillStreet/sitephoto1

View North on Kuhua Street toward Kahoma Stream Flood Control Channel. Pioneer Mill Site on Left and Old Kuhua Tract Subdivision on Right



View South Near Keone Street on Kuhua Street Toward Lahainaluna Road Intersection. Old Kuhua Tract Subdivision on Left and Pioneer Mill Site Quonset Huts on Right

Source: Munekiyo & Hiraga, Inc.

Figure 4 Kuhua Street Extension and Improvement Project

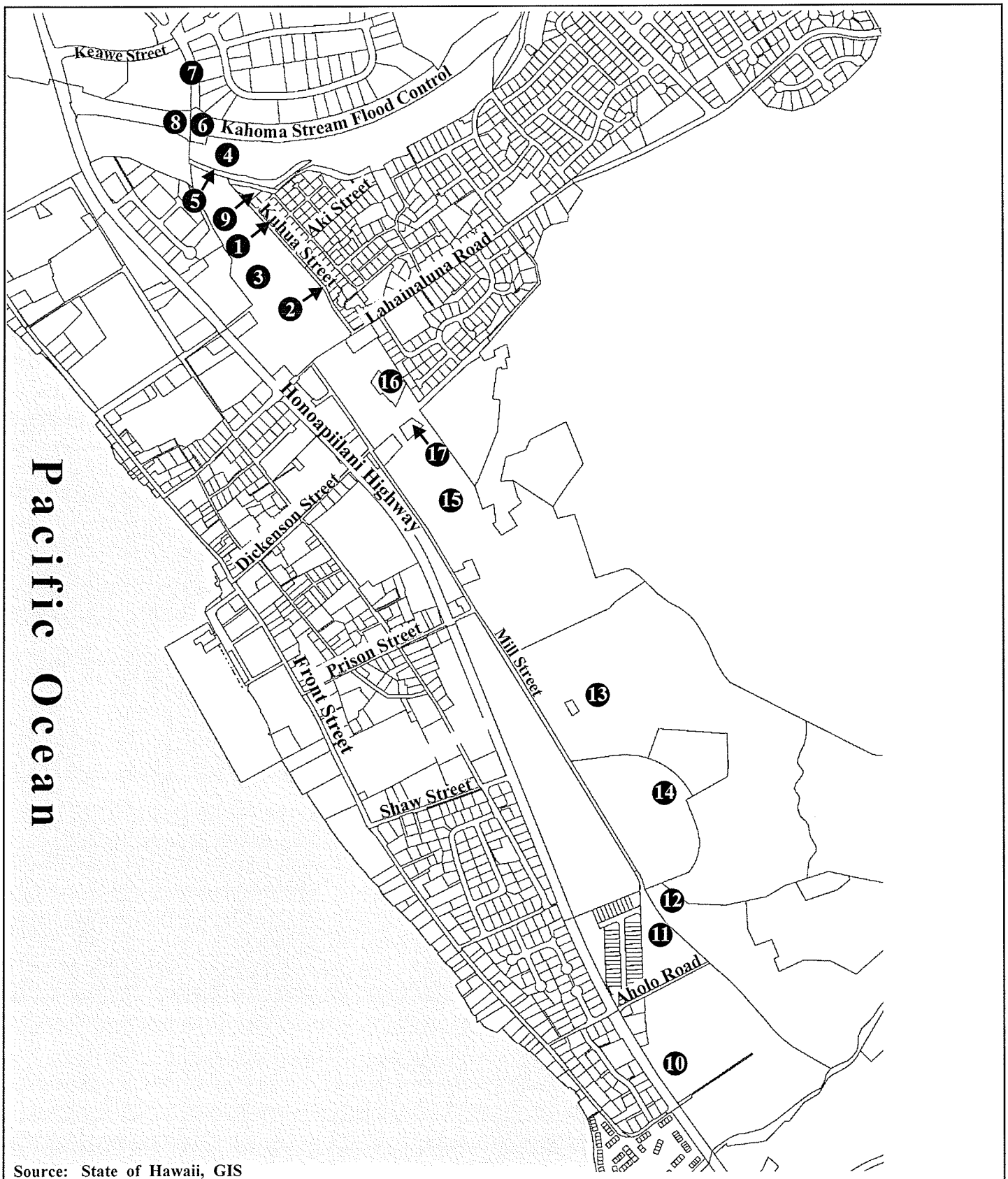
Site Photos

NOT TO SCALE

Prepared for: County of Maui, Department of Public Works

MUNEKIYO & HIRAGA, INC.

KLMC/MillStreet/sitephoto2



Source: State of Hawaii, GIS

Figure 5

Kuhua Street Extension and Improvement Project

Affected Tax Map Keys in Roadway Corridor Reference Map

NOT TO SCALE

Prepared for: County of Maui, Department of Public Works

MUNEKIYO & HIRAGA, INC.

KLMC/MillStreet/Affected TMKs Reference Map

Table 1. Affected Tax Map Keys in KSE Roadway Corridor

Reference No.	Tax Map Keys	Owners
1	(2)4-5-024 (Kuhua Street)	County of Maui
2	(2)4-5-025 (Kuhua Street)	County of Maui
3	(2)4-5-009:007 (Old Mill Site)	Pioneer Mill Company, Ltd.
4	(2)4-5-010:005	Kahoma Residential, LLC
5	(2)4-5-010:006 (Old Kahoma Stream)	County of Maui
6	(2)4-5-010:008 (Kahoma Stream Channel)	Pioneer Mill Company, Ltd.
7	(2)4-5-010:034	West Maui Venture Group
8	(2)4-5-011:007 (Kahoma Stream Channel)	Hawaii Omori Corporation
9	(2)4-5-024:068	Alvin and Teresita Panlasigui
10	(2)4-6-013:001	Pioneer Mill Company, Ltd.
11	(2)4-6-013:006	Pioneer Mill Company, Ltd.
12	(2)4-6-014:001	Pioneer Mill Company, Ltd.
13	(2)4-6-015:001	Pioneer Mill Company, Ltd.
14	(2)4-6-015:004 (Lahaina Recreation Center)	County of Maui
15	(2)4-6-016:001	Pioneer Mill Company, Ltd.
16	(2)4-6-016:005	Pioneer Mill Company, Ltd.
17	(2)4-6-016:039	Pioneer Mill Company, Ltd.
Source: County of Maui, Real Property Tax		

B. BACKGROUND

In 2005, the County of Maui identified the "Mill Street Collector Road" as a possible remedy to disperse traffic from Honoapiilani Highway and provide an alternative route to Lahainaluna Road and the three (3) public schools located along the road.

On February 22, 2005, the Maui Planning Commission granted approval of a Special Management Area Use Permit (SMA) (SM1 2004/0017) and Step 2 Planned Development

Approval (PD 2004/0005) for the Honua Kai Resort project on Lot 4 of the Kaanapali North Beach Subdivision. In granting SMA Permit No. SM1 2004/0017, the Maui Planning Commission acknowledged the applicant's (Maui Beach Resort Limited Partnership) representation that traffic-related improvements totaling $2.5 million may be implemented, as determined by the County of Maui and State Department of Transportation. The "fair share" regional traffic improvements identified included the "Mill Street Collector Road traffic studies and road design fees from Keawe Street to Aholo Road". See **Appendix "A"**.

The "Mill Street Collector Road" would be a future County roadway parallel to Honoapiilani Highway under the jurisdiction of the County of Maui, Department of Public Works. Originally, the collector road was envisioned to follow the existing Mill Street alignment, which is privately owned. Based on technical considerations and input from the community and State and County transportation stakeholders, the alignment of the collector roadway was revised to a more mauka (east) alignment utilizing the existing Kuhua Street. As such, the project was renamed "Kuhua Street Extension".

C. PROJECT NEED

The County of Maui, Department of Public Works (DPW) is proposing the Kuhua Street Extension and Improvement Project to respond to the growing demand for additional roadway capacity in and around Lahaina Town. The proposed project, which incorporates a pedestrian-friendly multi-use trail greenway along its entire alignment, is viewed as an integral part of the regional transportation system for West Maui. In conjunction with the construction of the Lahaina Bypass Road and widening of Honoapiilani Highway from Lahainaluna Road to Aholo Road, the proposed roadway is anticipated to improve traffic circulation for the neighboring communities in the area, reduce increasing traffic congestion on local roadways, and provide a pedestrian-oriented streetscape from Kuhua Street westward for connectivity to Lahaina town. The proposed roadway will also serve as an alternative route in case of emergency, such as during unforeseen closures of Honoapiilani Highway in the area.

D. PROPOSED ACTION

The DPW proposes the development of a new public collector roadway, including an adjacent multi-use trail greenway, which will be aligned east (mauka) of and roughly parallel to Honoapiilani Highway and will span approximately two (2) miles in the vicinity of Keawe Street in the north to its southern terminus in the vicinity of the Front Street/Honoapiilani Highway intersection. The roadway alignment is mainly east (mauka) of and parallel to the

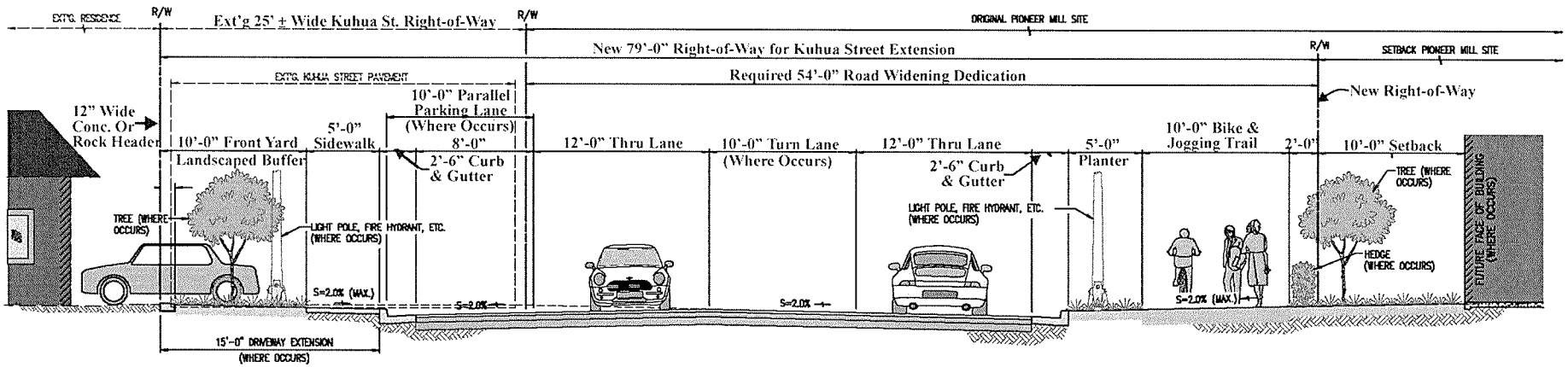
existing Mill Street cane haul road until it nears the Lahaina Recreation Center. The alignment veers around the Lahaina Recreation Center between the park ballfields and Na Hale O Wainee housing project operated by Ka Hale A Ke Ola, and then westward toward Mill Street to its southern terminus at the Front Street intersection. The Lahaina Bypass Road will be located to the east (mauka) of the proposed project. Refer to **Figure 2**.

The proposed roadway will be constructed with two (2) travel lanes (one (1) in each direction) with dedicated right-turn and left-turn storage lanes at major intersections, as required, in accordance with County standards, including curbs, gutters, and sidewalks. See **Figure 6**. It is anticipated that east-west connections between Honoapiilani Highway and the proposed roadway will occur at Keawe Street, Papalaua Street, Lahainaluna Road, Dickenson Street, Shaw Street, Aholo Road, and Front Street. In addition to a landscaped planting strip on both sides of the roadway, a pedestrian-friendly multi-use trail will be incorporated mainly along the west (makai) side of the roadway. See **Figure 7**. The LKPR Sugar Cane Train tracks are located on the makai side of the approximate 48 feet wide Kahoma-Uka cane haul bridge. To eliminate potential traffic conflicts and improve safety, portions of the multi-use trail near the Kahoma Stream Flood Control Channel will cross to the mauka side of the roadway and a new 10 feet wide multi-use trail pedestrian bridge will be constructed across the stream separated and parallel to the existing bridge built in 1988, which will not be structurally altered or widened. New utility lines for sewer and water will be attached to the existing bridge, and upgrades to the bridge are expected to include new railings, pavement, curb and signage. See **Figure 8**.

The proposed KSE roadway improvements include the following:

1. <u>Existing Kuhua Street</u>

- Widen right-of-way from 25 feet to a 79 feet wide right-of-way as a two-lane roadway with a multi-use trail greenway, landscape buffer, and refuge lane
- Construct curbs, gutters and sidewalk, and provisions for residential parking
- Realign the existing intersection with Lahainaluna Road further west of the MECO substation
- Include an auxiliary 10 ft. wide refuge lane along the east edge of the roadway



Source: Warren S. Unemori Engineering, Inc.

Figure 6 Kuhua Street Extension and Improvement Project

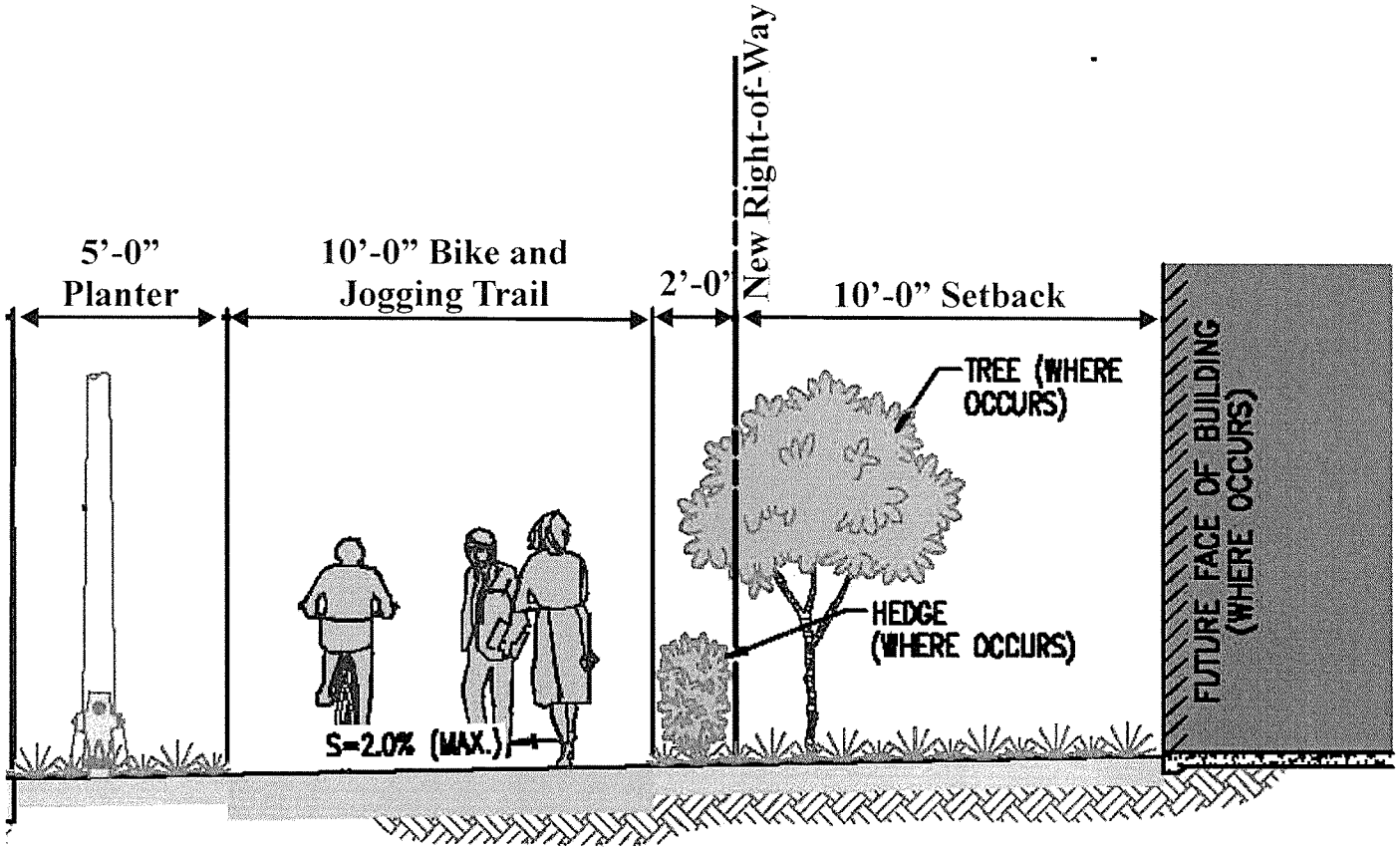
NOT TO SCALE

Typical Roadway Section Between Old Kuhua Tract Subdivision and Pioneer Mill Site

MUNEKIYO & HIRAGA, INC.

Prepared for: County of Maui, Department of Public Works

klmc\millstreet\typicalroadwaysect



Source: Warren S. Unemori Engineering, Inc.

Figure 7 Kuhua Street Extension and Improvement Project

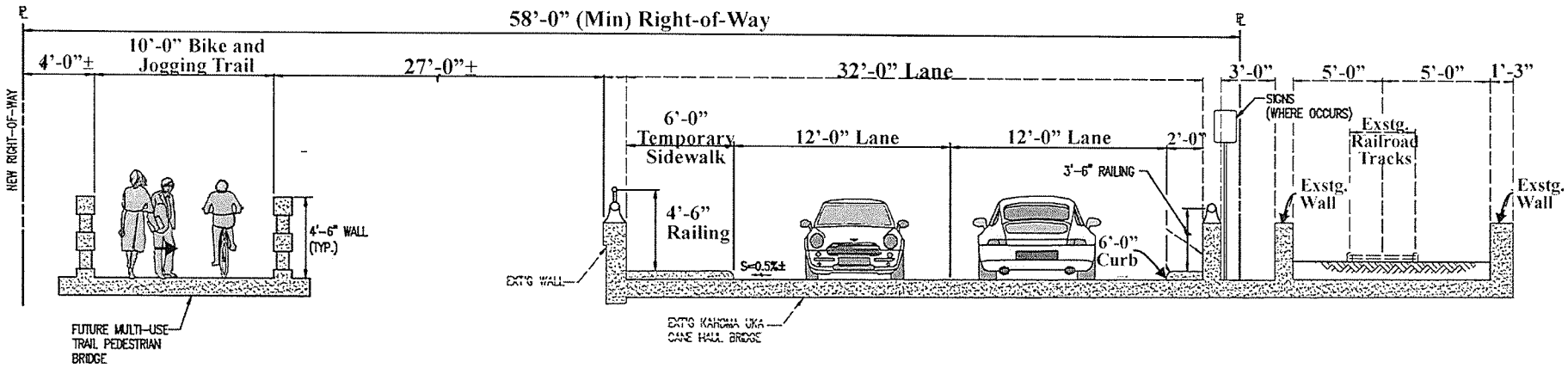
Multi-Use Trail

NOT TO SCALE

Prepared for: County of Maui, Department of Public Works

MUNEKIYO & HIRAGA, INC.

klmc\millstreet\MultiUseTrail



Source: Warren S. Unemori Engineering, Inc.

Figure 8 Kuhua Street Extension and Improvement Project

Kahoma Stream Flood Control Channel Crossing Section

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: County of Maui, Department of Public Works

klmc\millstreet\KahomaStreamFloodControlChannelCrossing

- Landscape both sides of the roadway and add a multi-use trail (pedestrian and bicycles) greenway predominantly along the west side of the roadway

2. **KSE from Keawe Street (north) to Honoapiilani Highway/Front Street intersection**

- Extend Kuhua Street as a two-lane roadway to Keawe Street to the north
- Extend Kuhua Street as a two-lane roadway to the south from Lahainaluna Road to the Honoapiilani Highway/Front Street intersection
- Construct curbs, gutters and sidewalks
- Landscape both sides of the roadway and include a multi-use trail greenway

3. **Papalaua Street Extension from Honoapiilani Highway to Kuhua Street across Aki Street**

- Two-lane roadway extension
- Construct left turning lanes into the KSE, future Mill site, West Maui Center and on Honoapiilani Highway
- Install curbs, gutters, sidewalks, and provisions for a bike lane where feasible
- Install landscaping
- Provide a new access to the corner lot south of the Papalaua Street and Honoapiilani Highway intersection

4. **Lahainaluna Road Intersection With Honoapiilani Highway**

- Widen intersection with additional turning lanes and possible acceleration/deceleration lanes
- Install curbs, gutters and sidewalks
- Traffic signal modificaitons

5. **Dickenson Street Extension to KSE**

- Two-lane roadway extension

- Install curbs, gutters, and sidewalks
- Landscaping

6. **Shaw Street Extension to KSE**

- Two-lane roadway extension
- Install curbs, gutters, and sidewalks
- Landscaping
- Install turning lanes
- Consider a round-a-bout at the KSE and Shaw Street intersection

7. **Aholo Street Extension to KSE**

- Two-lane roadway extension
- Restricted right-turn in and right-turn out at Honoapiilani Highway

8. **Keawe Street Intersection with KSE**

- Install new traffic signal with provisions to integrate the existing signals for the LKPR Sugar Cane Train crossing

9. **Lahainaluna Road Intersection with KSE**

- Install left turning lanes and new traffic signal
- Widen Lahainaluna Road toward Honoapiilani Highway
- Install curbs, gutters, and sidewalks

The area currently lacks a drainage system. The KSE project will include construction of a drainage system to handle existing and post development runoff. See Section III, D.4., Drainage. During the construction design phase, additional roadway improvements, such as, but not limited to, acceleration/deceleration lanes and extension of left storage lanes may be required by the DPW and State Department of Transportation (DOT).

In addition to the roadway and drainage improvements, the KSE Extension and Improvement project will include the following associated work:

- Clearing, grubbing, and grading the existing and proposed roadway corridors
- Retaining walls, railings, fencing, and sound attenuation walls (where required)
- Streetlights along the roadways, pole mounted lighting along the multi-use trail greenway, and appurtenances
- Underground electrical, telephone, cable television (CATV) systems in addition to maintaining existing overhead electrical power transmission lines
- Relocation of existing power poles and reconnections of existing utility services such as water, sewer, electrical, telephone, CATV, etc.
- Temporary modifications to existing railroad tracks during construction

E. CHAPTER 343, HAWAII REVISED STATUTES COMPLIANCE

Current available funding for the project is limited to planning and design. The County will need to obtain funding for land acquisition and construction which may take several years to accomplish. In addition, the proposed project will require connections to a number of existing County and State roadways. Possible funding may include State and County sources. The use of State and County lands and funds are triggers for an environmental impact review pursuant to Chapter 343, Hawaii Revised Statutes (HRS) and Chapter 11-200, Hawaii Administrative Rules (HAR). As such, an Environmental Assessment (EA) is being prepared and processed for the proposed project.

This EA is intended to cover any use of State and County lands and funds for purposes including, but not limited to, any roadway, infrastructure, or utility system or other improvements relating to the project. This would also include, but not be limited to, roadway, infrastructure, utility systems or other improvements to the adjoining roadways of Keawe Street, Papalaua Street, Lahainaluna Road, Dickenson Street, Shaw Street, Aholo Road, and Front Street, as well as offsite locations.

F. PROJECT COST AND IMPLEMENTATION SCHEDULE

The implementation of the proposed Kuhua Street Extension and Improvement Project will commence upon completion of the Chapter 343 EA process, funding allocations, land

acquisition, and acquisition of applicable regulatory permits. It is estimated that the EA preparation and review process will take approximately one (1) year to complete, followed by approximately two (2) years for the preparation and approval of construction plans. Once funding is obtained, land acquisition and site construction will be initiated with an estimated construction duration of approximately one (1) year for each of the proposed two (2) phases, Phase 1 north of Lahainaluna Road and Phase 2 south of Lahainaluna Road. The project is estimated to cost approximately $36 million to construct.

II. ALTERNATIVES ANALYSIS

II. ALTERNATIVES ANALYSIS

To respond to the growing demand for additional roadway capacity in and around Lahaina Town, a Traffic Impact Analysis Report (TIAR) was prepared by Austin, Tsutsumi & Associates, Inc. See Appendix C in **Appendix "B"** of the Draft EA. The preferred alternative was evaluated as an integral part of the regional transportation system for West Maui. The following alternatives were evaluated by the County of Maui during the process of selecting the proposed alignment for the Kuhua Street Extension (KSE) and Improvement Project.

A. PREFERRED ALTERNATIVE (ALTERNATIVE 1)

In conjunction with the construction of the Lahaina Bypass and widening of Honoapiilani Highway from Lahainaluna Road to Aholo Road, the proposed roadway, which incorporates a multi-use trail greenway along its entire alignment, is anticipated to improve local traffic circulation for the neighboring communities in the area and reduce increasing traffic congestion on local roadways. It also provides a pedestrian-oriented streetscape westward from Kuhua Street for connectivity to Lahaina town. The proposed roadway will also serve as an alternative route in case of emergency, such as during unforeseen closure of Honoapiilani Highway in the project vicinity.

The "preferred" alternative was selected after a thorough evaluation of the other potential alternatives with respect to minimizing economic, social, and environmental impacts, as well as input from the affected residents and the West Maui Community. The preferred alternative is east (mauka) of and parallel to the existing Mill Street cane haul road until it nears the Lahaina Recreation Center. The roadway alignment veers around the Lahaina Recreation Center between the park and Na Hale O Wainee housing project operated by Ka Hale A Ke Ola and then travels west towards Mill Street and terminates at the existing Honoapiilani Highway and Front Street intersection. Refer to **Figure 2**.

This alternative maximizes the separation distance from Honoapiilani Highway, reducing the potential for vehicles to stack beyond the area between the highway and the KSE. This alternative would also have the least impact on the Lahaina Recreation Center and the County's Komohana Hale Housing project in the vicinity of Aholo Road. This alignment will go around the Lahaina Recreation Center and will be further away from the housing project. The underlying lands for the Kuhua Street alignment are owned predominantly by

one (1) major landowner, Pioneer Mill Company, Ltd., which reduces obstacles associated with land acquisition for the future County right-of-way.

B. OTHER ALTERNATIVE ROUTES CONSIDERED

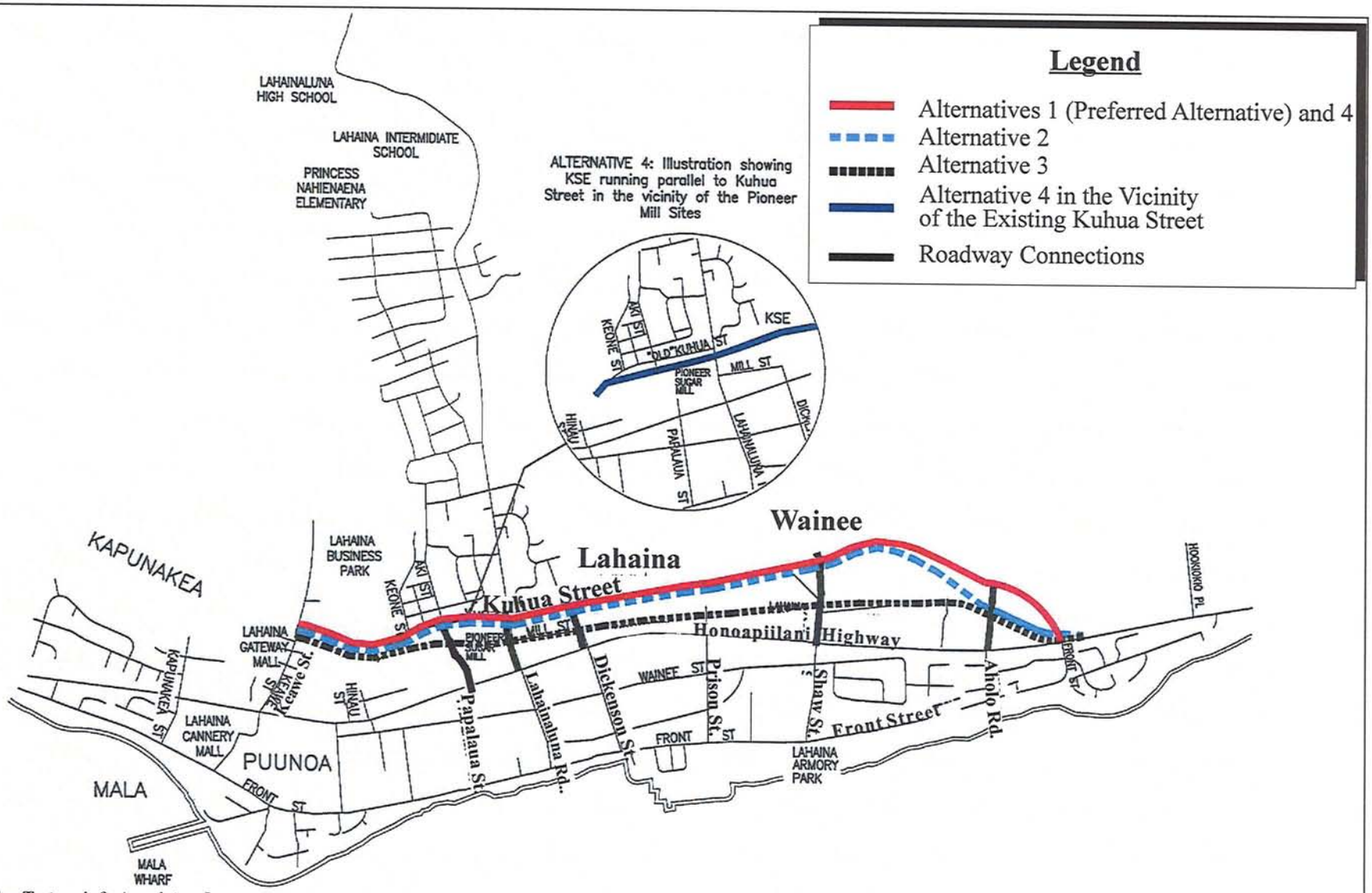
1. Aholo Road Terminus Alternative (Alternative 2)

The alignment is identical to the preferred alternative, except the southernmost terminus is at Aholo Road instead of Front Street. At community meetings conducted by the Department of Public Works, the residents of the County's Komohana Hale Housing located off of Aholo Road expressed a preference that Aholo Road not be used as the southern terminus and that a proposed connection to the KSE from the internal streets of the housing project be deleted. The residents also expressed concerns that the additional traffic would adversely impact the unsignalized Aholo Road intersection with Honoapiilani Highway. See **Figure 9**.

2. Mill Street Alignment Alternative (Alternative 3)

This alignment south of Lahainaluna Road would follow the existing cane haul road alignment of Mill Street. This alignment would bifurcate the existing Lahaina Recreation Center, crossing between the two (2) parking areas for the east and west baseball fields and recreation areas and create potential conflicts between vehicular and pedestrian traffic. Both the County Department of Parks and Recreation and Lahaina Bypass Now requested the roadway extend around the Lahaina Recreation Center so it would not separate the Lahaina Recreation Center and pose a safety concern for park users crossing the roadway. Refer to **Figure 9**.

The close proximity of Mill Street to Honoapiilani Highway lacks adequate separation between intersections and will create longer lines at the Lahainaluna Road intersections at Honoapiilani Highway and Mill Street. The lines have the potential to stack beyond the area between the two (2) intersections.



Source: Austin, Tsutsumi & Associates, Inc.

Figure 9 Kuhua Street Extension and Improvement Project

Alternative Routes

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: County of Maui, Department of Public Works

klmc\millstreet\alternativeroutes

3. Frontage Road Alignment Alternative (Alternative 4)

In the vicinity of the Old Pioneer Mill Site, this alignment would keep Kuhua Street as a frontage road with a new two-lane roadway built parallel to Kuhua Street. Kuhua Street would become "Old Kuhua Street" and maintain its existing physical characteristics with access to the KSE via an extension of Aki Street, however, it would dead end at Lahainaluna Road. Refer to **Figure 9**.

One (1) benefit of this alignment would be the shielding of existing driveways and local traffic from the heavier traffic utilizing the KSE. This benefit would, however, be overshadowed by additional design and safety challenges. The frontage road will increase the number of conflicting traffic movements, create awkward turning movements leading to confusing roadway patterns and separations which can lead to wrong-way entry, limited sight distance and potential for traffic on the frontage road to back up at its intersection with the KSE. The frontage road will create more complex design and traffic control problems. This alternative also will require a wider right-of-way in order to create an additional two (2) travel lanes and a separation median between the frontage road and KSE creating greater land acquisition costs. Refer to inset in **Figure 9**.

C. ROADWAY WIDENING ALTERNATIVES

1. Honoapiilani Highway

The State Department of Transportation (DOT) completed widening Honoapiilani Highway between Lahainaluna Road and Aholo Road from two (2) travel lanes to four (4) travel lanes. Completion of this State DOT project created additional roadway capacity over this particular stretch of Honoapiilani Highway. However, despite these efforts, additional roadway capacity is warranted along a larger portion of Honoapiilani Highway involving widening the highway from Lahaina Town to Maalaea. The State DOT is in the process of preparing an Environmental Impact Statement for the widening and relocation of Honoapiilani Highway between Launiupoko and Maalaea. However, implementation of the project is several years away. The proposed KSE roadway, when built, would temporarily in effect bridge a larger portion of the congested area of Honoapiilani Highway in Lahaina by providing an alternative route to disperse traffic through the area, as well as provide enhanced access to existing residential properties east (mauka) of Honoapiilani

Highway. The mauka residential properties will have another roadway option to exit the area in addition to Honoapiilani Highway and the Lahaina Bypass Road (LBR).

2. Wainee Street and Front Street

Roadway alternatives west (makai) of Honoapiilani Highway would involve either the widening of existing roadways in the vicinity or the acquisition of developed residential and park lands for new roadway development. The existing roadways west of Honoapiilani Highway, such as Wainee Street and Front Street, cannot be widened without significant right-of-way acquisition, which would result in hardships to existing residential and commercial owners and recreational users. Similarly, the acquisition of already developed lands would result in displacement of these owners and lessees. Consequently, alternatives situated to the west of Honoapiilani Highway are not deemed economically or socially feasible.

Further, portions of Wainee Street and Front Street are located within the Lahaina National Historic Landmark District, established by the U.S. Department of Interior and designated as Historic Districts 1 and 2 by the County of Maui. Widening of portions of the roadways will involve land acquisition that will significantly impact historic sites placed on both the National and Hawaii Register of Historic Places, such as Lahaina Prison and Waiola Church and Cemetery on Wainee Street.

D. NO ACTION ALTERNATIVE

The 'no action' or 'no build' alternative would forego the implementation of the proposed project and maintain the status quo. The widening of Honoapiilani Highway to Aholo Road provided some relief but in the absence of the proposed project, access along Honoapiilani Highway through Lahaina is anticipated to eventually deteriorate over time as Maui's population grows and until the highway is widened to Maalaea and the Lahaina Bypass Road is completed beyond Keawe Street. In recent years, travelers have often experienced significant rush hour vehicle queuing along Honoapiilani Highway due to insufficient roadway capacity. Accordingly, the no action alternative is not considered a viable or desirable scenario in light of existing and projected traffic conditions in the area.

E. DEFERRED ALTERNATIVE

The deferred alternative will have the same effect as the No Action Alternative in which current traffic congestion on Honoapiilani Highway will continue until the proposed project is implemented or the highway is widened to Maalaea and the Lahaina Bypass is completed. Further, deferral of the improvements would result in increased costs associated with land acquisition and construction (i.e. labor and materials).

F. CONNECTION STREETS

Construction of the Kuhua Street Extension requires connection to the existing connector streets with Honoapiilani Highway consisting of Papalaua Street, Lahainaluna Road, Dickenson Street, Shaw Street, Aholo Road, and Front Street.

Papalaua Street Extension

Across Papalaua Street on the mauka side of Honoapiilani Highway is an approximate 250 feet long two-way driveway providing access to the West Maui Center to the north and the Prudential Maui Real Estate (Prudential) office to the south which are offset and not directly across from each other and dead ends at the former Pioneer Mill site. The paved driveway access is located on the 25 ft. wide flag portion of the Pioneer Mill property. Also, on the West Maui Center property there is a 25 ft. easement in favor of Pioneer Mill Company.

The Papalaua Street intersection operates at Level of Service (LOS) C in both morning (AM) and afternoon (PM) peak hours of traffic, except for the southbound left-turn at the Lahainaluna Road and Honoapiilani Highway intersection which backs up through Papalaua Street. The eastbound approach shared through and left-turn lane operates at LOS F and over capacity conditions during both the AM and PM peak hours of traffic while the northbound left-turn (AM and PM) and southbound (PM) left-turn operate at LOS E. Refer to Appendix C in **Appendix "B"** of the Draft EA.

The Papalaua Street Extension will provide a new connection between Honoapiilani Highway and Kuhua Street to accommodate future traffic demands. The improvements include widening the westbound approach of Papalaua Street to not only accommodate future traffic demand but also to improve operations at the Papalaua Street/Honoapiilani Highway intersection in conjunction with the Lahainaluna Road/Honoapiilani Highway intersection improvements to improve existing over capacity conditions (LOS F). The improvements will

require reconfiguration of the Prudential site right-of-way (ROW); utilizing the existing access easement along the West Maui Center's property; and reconfiguration and consolidation of the driveways to the West Maui Center and Prudential site. Reconfiguration and consolidation of the driveways are necessary due to increased traffic volumes, proximity to Honoapiilani Highway, and the potential for traffic to block (spillback) the intersection. The proposed configuration of the Papalaua Street Extension maximizes the distance of the driveway locations to Honoapiilani Highway reducing the potential for spillback between the highway and the KSE. Refer to Appendix C in **Appendix "B"** of the Draft EA.

The cessation of operations and demolition of Pioneer Mill provides an opportunity to master plan the area to provide a future connector roadway from Honoapiilani Highway to Kuhua Street in order to improve connectivity within Lahaina Town. The existing access easements total approximately 50 ft. in width. This does not meet County of Maui requirements for a connector street within a commercial/industrial district. To extend Papalaua Street to Kuhua Street, additional land acquisition will be required from the adjacent properties for a ROW between 64 and 76 feet in width. This will allow landscaping, pedestrian-friendly shoulders and bike lanes, where feasible, to be constructed similar to the northern side of Papalaua Street below Honoapiilani Highway creating an inviting, unobstructed view of the ocean for motorist, pedestrians, and bicyclists from the mauka side of Honoapiilani Highway toward Front Street. Refer to Appendix C in **Appendix "B"** of the Draft EA.

The extension of Papalaua Street will bi-furcate the Pioneer Mill site. New access points will be required during future redevelopment of the site. As part of this master plan effort, the Papalaua Street Extension will include future access points to the Pioneer Mill site meeting County of Maui requirements. Also, the driveway accesses to the West Maui Center and Prudential Maui Real Estate office will need to be reconfigured so as not to conflict with future traffic on the Papalaua Street Extension roadway and the Papalaua Street/Honoapiilani Highway intersection.

Lahainaluna Road and Honoapiilani Highway Intersection

Lahainaluna Road is a two-lane roadway while Honoapiilani Highway is a four-lane State highway. The intersection on Honoapiilani Highway is improved with dedicated left-turn pockets, a through lane and a through/right-turn lane. On Lahainaluna Road, the west-bound traffic at the intersection has left-turn, through and right-turn lanes while the east-bound traffic has left-turn and through/right-turn lanes.

The intersection experiences significant congestion during the AM peak hour of traffic during a 20 to 30 minute period which corresponds when parents are dropping off their kids at school and operate at LOS F and over capacity conditions. The southbound left-turn traffic on Honoapiilani Highway was observed to stack as far back as Papalaua Street, while the west-bound traffic on Lahainaluna Road was observed to stack as far back as Ikena Street, roughly 3,700 feet. During the PM peak hour of traffic, the southbound left turn operates at LOS F and over capacity conditions, the northbound left-turn lane at LOS F and the east-bound shared through/right-turn and westbound left-turn lane at LOS F and E, respectively. Refer to Appendix C in **Appendix "B"** of the Draft EA.

To accommodate existing and future traffic demand at the Lahainaluna Road/Honoapiilani Highway intersection, future widening and improvements will be required. Proposed improvements consist of lengthening the west-bound left-turn and right-turn lanes on Lahainaluna Road and providing two (2) east-bound lanes on Lahainaluna Road. This may require modifying the shape location and accesses to the gas station property on the northeast corner of the intersection. Refer to Appendix C in **Appendix "B"** of the Draft EA.

III. EXISTING ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

III. EXISTING ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

A. PHYSICAL SETTING

1. Surrounding Land Uses

a. Existing Conditions

The project area is located in Lahaina town east (mauka) of Honoapiilani Highway, between Keawe Street to the north and Front Street to the south. Near the northern terminus at Keawe Street is the Lahaina Gateway shopping complex, Lahaina Business Park, Hoonanea, and Opukea multi-family project. Along the proposed corridor, single-family residences are located on the mauka side of Kuhua Street with the former Pioneer Mill site located on the west (makai) side of Kuhua Street and commercial-industrial development along Honoapiilani Highway. The area south of the existing Kuhua Street includes the Maui Electric Company substation and West Maui Senior Center mauka of the proposed alignment. Kuhua Street is a substandard County roadway with a right-of-way of approximately 25 feet. Except for the area within Lahaina town, the majority of the project will be located on former agricultural lands which were part of the former Pioneer Mill Company, Ltd. plantation. Near the southern terminus of the roadway alignment is the Lahaina Recreation Center, Na Hale O Wainee housing project, the County's Komohana Hale housing project, and the Puehuehuiki Cemetery. Refer to **Figure 2**.

The Lahaina National Historic Landmark District is bounded to the east by the Mill Street cane haul road from the Lahaina Recreation Center to Lahainaluna Road. The KSE roadway alignment is mauka of Mill Street, except near its southern terminus at the Front Street intersection which is south of the Lahaina Recreation Center and outside of the Lahaina National Historic Landmark District.

The Lahaina Small Boat Harbor is located approximately 0.4 mile to the west of the project area in Lahaina Town. The coastal area of Lahaina, to the west of the project area, includes the visitor oriented commercial areas along Front Street and the commercial core of Lahaina town, which serves the West Maui resident and visitor populations. The Lahaina town area east (mauka) of the proposed project comprises the major residential area of the town and the main education facilities for the West Maui region with Princess Nahienaena Elementary School, Lahaina Intermediate School, and Lahainaluna High School located off of Lahainaluna Road.

b. Potential Impacts and Proposed Mitigation Measures

The surrounding land uses along the proposed roadway corridor are commercial, industrial, public/quasi-public, single-family, multi-family, and agricultural uses. The proposed project is compatible with the surrounding uses and is not anticipated to have an adverse impact on the surrounding land uses.

The proposed project is viewed as an integral part of the regional transportation system for West Maui. In conjunction with the construction of the Lahaina Bypass Road (LBR) and completion of the widening of Honoapiilani Highway from Lahainaluna Road to Aholo Road, the proposed roadway is anticipated to improve traffic circulation for the neighboring communities in the area and lessen increasing traffic congestion on local roadways. The proposed roadway will also serve as an alternative route in case of emergency, such as during unforeseen closures of Honoapiilani Highway in the project vicinity.

2. Climate

a. Existing Conditions

Like most areas of Hawaii, West Maui's climate is relatively uniform year-round. The region's tropical latitude and its position relative to storm tracts, the Pacific anticyclone, and the surrounding ocean combine to produce a stable climate. Variations in climate among the different regions on Maui are largely dependent on local terrain.

In Lahaina (readings taken at Kapalua Airport), annual average high temperature is 82 degrees and the annual average low temperature is 69 degrees. Historically, September is the warmest month and February is the coolest month (County of Maui, Office of Economic Development, 2012).

Rainfall in Lahaina (readings taken at Kapalua Airport) is highly seasonal. Most of the precipitation occurs from December to January when winter storms hit the area. Precipitation data for Lahaina shows that December has historically been the wettest month, with 4.61 inches on average, while only 0.92 inch of precipitation occurred in September, the driest month. The annual average precipitation in Lahaina was 29 inches (County of Maui, Office of Economic Development, 2012).

The winds in the region are also quite seasonal. The northeasterly tradewinds occur 90 percent of the time during the summer and just 50 percent of the time in the winter with average wind speeds of approximately 10 miles per hour. However, wind patterns vary on a daily basis, with tradewinds generally being stronger in the afternoon. During the day, winds blow onshore toward the warmer land mass. In the evening, the reverse occurs, as breezes blow toward the relatively warm ocean (Atlas of Hawaii, 1998).

b. Potential Impacts and Proposed Mitigation Measures

In order to minimize the potential of an elevated heat island profile, a number of landscaping measures are being incorporated into the project design. A landscaped greenway is proposed for the multi-use trail which will include shade trees and landscape vegetation. The KSE will take advantage of the natural cooling effects of shading and the evaporative effects of water from the soil and leaves. It is anticipated that these mitigation measures will serve to offset the potential heat island effect associated with the roadway pavement.

As a result, the proposed action is not anticipated to alter local micro-climates. Also, the proposed roadway project will be relatively at ground level and is not anticipated to alter wind patterns in the area.

3. Topography and Soils

a. Existing Conditions

The project area varies in elevation from 14 feet to approximately 52 feet above mean sea level (amsl) with slopes generally in the easterly to westerly direction. The project area is characterized by a gently sloping topography with longitudinal slopes ranging from 0 to five (5) percent and cross slopes of approximately one (1) to four (4) percent.

Underlying the subject property are soils from the Pulehu-Ewa-Jaucas association. See **Figure 10**. The Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii characterizes the soils of the Pulehu-Ewa-Jaucas association as consisting of deep, nearly level to moderate sloping, well-drained and excessively drained soils that have a moderately fine-textured to coarse-textured subsoils or underlying material.

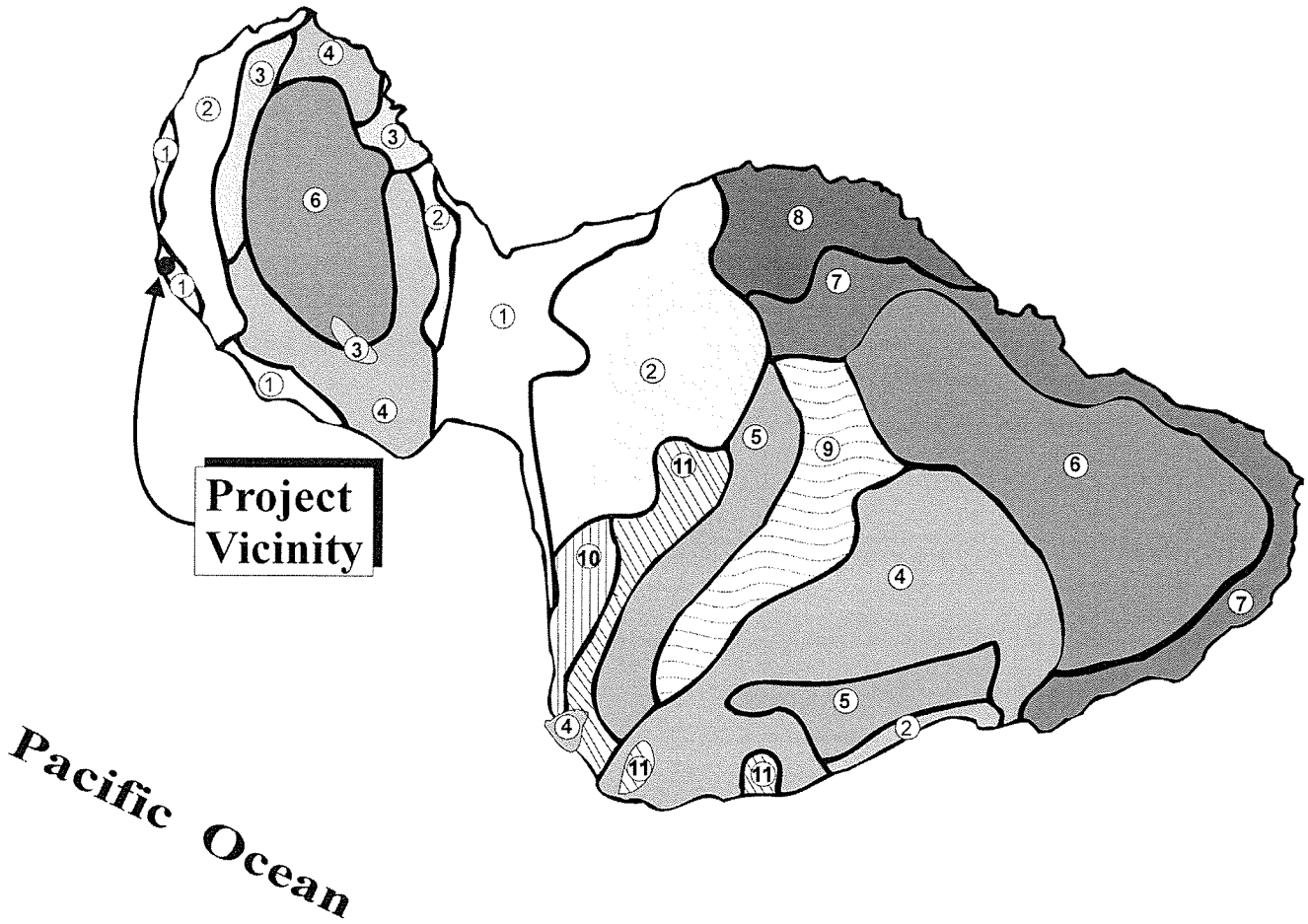
The specific soil type underlying the project area consists almost exclusively of Ewa silty clay loam (EaA), 0 to 3 percent slopes, with small portions of the project area consisting of Wahikuli very stony silty clay (WdB), 3 to 7 percent slopes, Wainee very stony silty clay (WxB), 3 to 7 percent slopes. Wainee extremely stony silty clay (WyC), 7 to 15 percent slopes, Pulehu cobbly clay loam (PtB), 3 to 7 percent slopes, and Pulehu silt loam (PpA), 0 to 3 percent slopes. See **Figure 11**. EaA soils are well-drained in basins and on alluvial fans. Soils are nearly level to moderately sloping and used for sugarcane, truck crops and pasture.

WdB soils are well-drained on uplands derived from weathered basic igneous rock. These soils are mostly used for sugarcane with small portions used for homesites. The natural vegetation consists of bermuda grass, feather finger grass, kiawe and uhaloa.

WxB soils are well-drained, on alluvial fans and are derived from weathered basic igneous rock. Soils are gently to moderately sloping. These soils are mostly used for sugarcane with small portions for pasture and homesites. The natural vegetation is finger grass, kiawe and uhaloa.

LEGEND

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



Map Source: USDA Soil Conservation Service

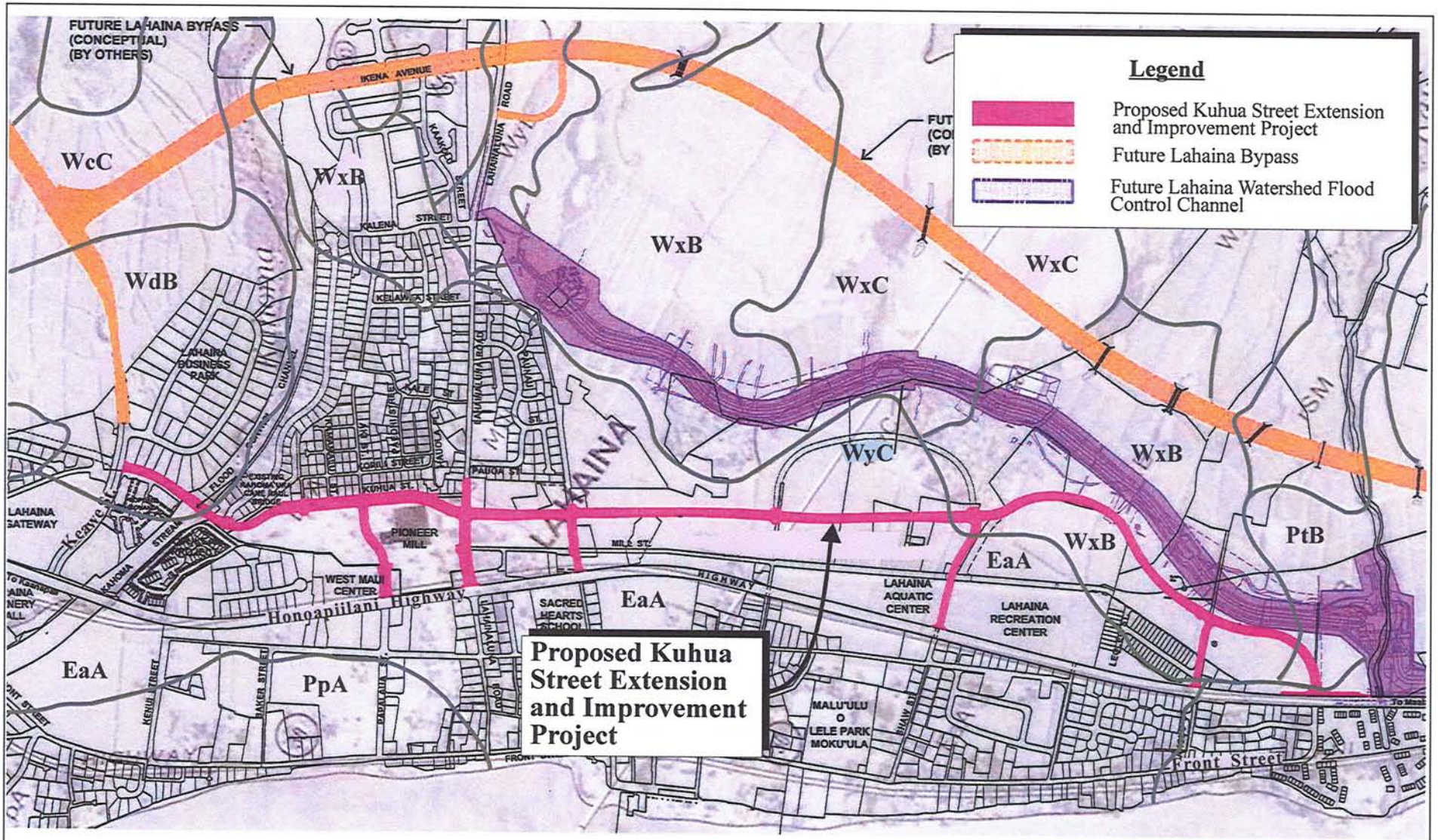
Figure 10 Kuhua Street Extension and Improvement Project
Soil Association Map

NOT TO SCALE

Prepared for: County of Maui, Department of Public Works

MUNEKIYO & HIRAGA, INC.

KLMC/MillStreet/Soils



Source: Warren S. Unemori Engineering, Inc. and U.S. Dept. of Agriculture, Soil Conservation Service

Figure 11 Kuhua Street Extension and Improvement Project

Soil Classification Map

NOT TO SCALE

Prepared for: County of Maui, Department of Public Works

MUNEKIYO & HIRAGA, INC.

klmc\millstreet\FIRM2

WyC soils are well drained on alluvial fans and have a slight to moderate erosion hazard. Gravel, cobblestones and stones make up 30 to 80 percent of the volume. These soils are used mostly for sugarcane with small portions for pasture and homesites.

PtB and PpA soils are well-drained on alluvial fans and stream terraces and in basins and are developed in alluvium washed from basic igneous rock. Soils are nearly level to moderately sloping. These soils are used for sugarcane, truck crops, pasture, homesites, and wildlife habitat. The natural vegetation consists of dry grasslands that is dominated by buffelgrass and scattered trees (Koa haole) and shrubs.

Soils from the Ewa, Wahikuli, Wainee, and Pulehu series exhibit very slow to medium runoff and a slight to moderate erosion hazard. Refer to **Appendix "B"** (Soil Conservation Service, 1972).

b. Potential Impacts and Proposed Mitigation Measures

There are no geologic or soil hazard limitations associated with the project area. As such, the proposed roadway is compatible with its underlying soil characteristics.

4. Agricultural Land Characteristics

a. Existing Conditions

In 1977, the State Department of Agriculture developed a classification system to identify Agricultural Lands of Importance to the State of Hawaii (ALISH), based primarily, though not exclusively, on their soil characteristics. The three (3) classes of ALISH lands are: "Prime", "Unique", and "Other Important" agricultural lands, with the remaining non-classified lands categorized as "Unclassified". When utilized with modern farming methods, "Prime" agricultural lands have a soil quality, growing season, and moisture supply to produce sustained crop yields economically; while "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 those important agricultural lands that have not been designated "Prime" or "Unique". As

reflected by the ALISH map for the Lahaina area, the proposed roadway corridor includes portions of land which have been defined as either "Prime", "Other Lands" and "Unclassified" agricultural lands. See **Figure 12**.

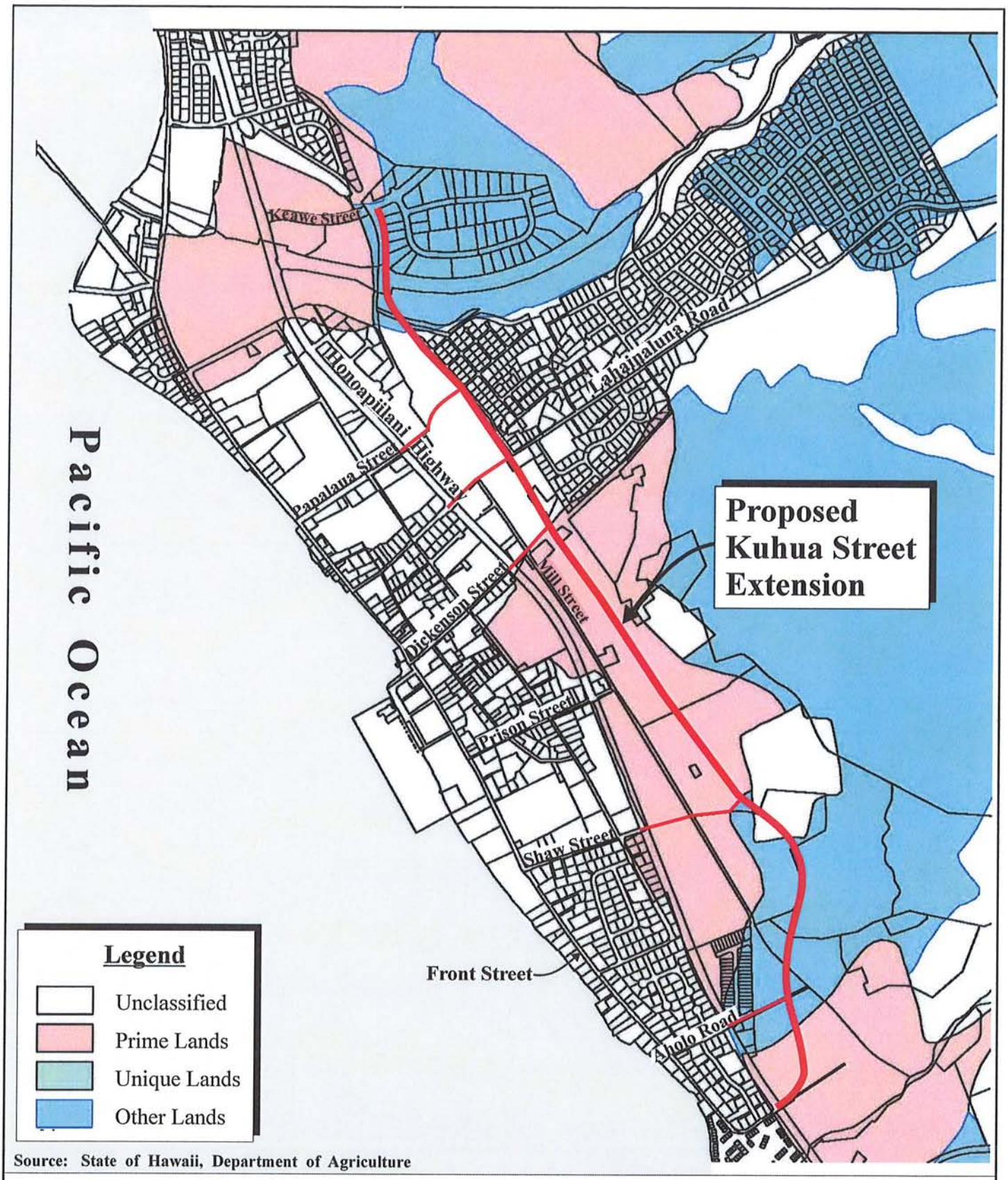
The "Other Lands" identified north of the existing Kuhua Street are currently urbanized with an existing roadway and adjacent multi-family and industrial uses. The lands south of Dickenson Street are identified as "Prime", "Other Lands", and "Unclassified" agricultural lands. Portions of these lands are developed as the Lahaina Recreation Center and West Maui Resource Center, while the remaining areas are vacant, formerly used for sugarcane cultivation.

In addition, the University of Hawaii, Land Study Bureau (LSB) classifies productivity characteristics on a scale of "A" through "E", with lands designated as "A" reflecting the highest productivity and "E" representing lands with the lowest productivity. These letters are followed by numbers which further classify the soil types and convey information such as texture, drainage, and stoniness (University of Hawaii, Land Study Bureau, 1967).

Lands underlying the project area have been classified by the LSB as A7li and B72i. See **Figure 13**. These lands generally have well to moderately suited machine tillability and are primarily used for sugarcane cultivation and grazing. The soil is moderately fine and well-drained (University of Hawaii, Land Study Bureau, 1967).

b. <u>Potential Impacts and Proposed Mitigation Measures</u>

Portions of the roadway alignment lie within the State Agricultural district and are designated "Prime" agricultural lands, the highest classification of important agricultural land, as well as "Other Lands". However, the roadway alignment and immediate surrounding areas are in close proximity to Lahaina Town and are no longer used for agricultural purposes with the closure of Pioneer Mill Company in 1999. The closure of Pioneer Mill Company and Maui Land & Pineapple Company discontinued large-scale agricultural operations in West Maui. This resulted in large acres of vacant agricultural lands, some of which are designated for future developments. Much of the undeveloped surrounding lands along the KSE are contemplated for future residential, commercial, and park development as identified in the Maui Island Plan and West Maui Community Plan.



Source: State of Hawaii, Department of Agriculture

Figure 12 Kuhua Street Extension and Improvement Project

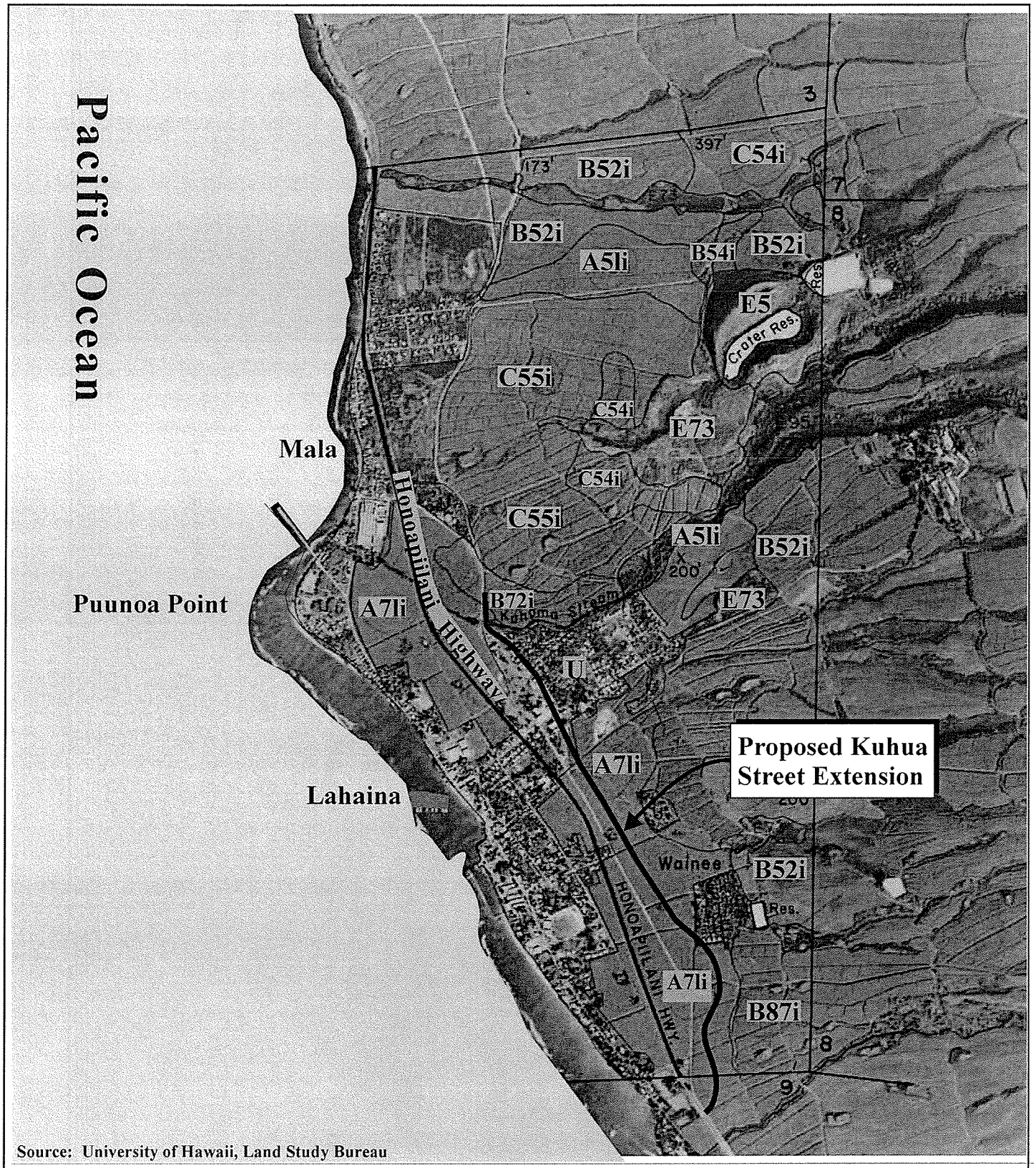
Agricultural Lands of Importance to the State of Hawaii Map

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: County of Maui, Department of Public Works

KLMC/MillStreet/ALISH



Source: University of Hawaii, Land Study Bureau

Figure 13 Kuhua Street Extension and Improvement Project

Land Study Bureau Agricultural Productivity

NOT TO SCALE

Prepared for: County of Maui, Department of Public Works

MUNEKIYO & HIRAGA, INC.

KLMC/MillStreet/LandStudyBureauAgriculturalProductivity

The Kuhua Street Extension (KSE) will have seven (7) connections to Honoapiilani Highway through the existing intersections at Keawe Street, Papalaua Street, Lahainaluna Road, Dickenson Street, Shaw Street, Aholo Road, and Front Street. Dickenson Street, Shaw Street, and Aholo Road currently connect to the existing Mill Street, while Keawe Street and Lahainaluna Road will have future connections to the Lahaina Bypass Road. The KSE will enhance the existing roadway system in Lahaina Town. It will provide another roadway option for local traffic circulation throughout the Lahaina area, especially for the mauka residential neighborhoods below the school sites on Lahainaluna Road. The lower speed pedestrian-friendly roadway with its multi-use trail greenway will serve as an alternate route for residents from the higher speed Honoapiilani Highway and LBR. It will also provide access to future planned developments identified in the Maui Island Plan (MIP) and provide emergency access during times when Honoapiilani Highway may be closed in the vicinity.

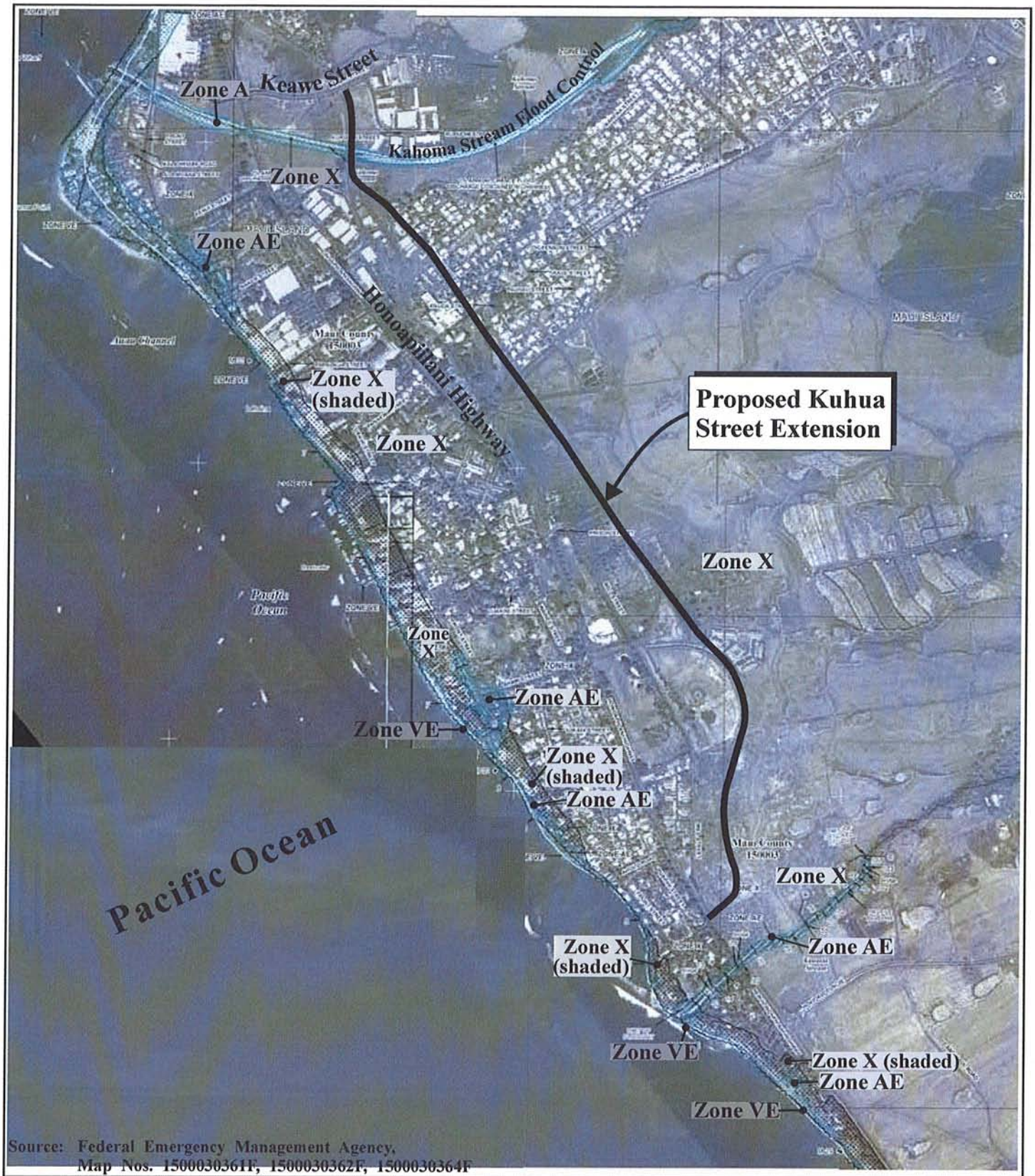
The proposed project's importance to the Lahaina Town roadway network to support and connect various economic, industrial, residential, public, and recreation centers of the community has been weighed against the use of vacant prime agricultural lands for this purpose. The public benefit that will result from project implementation warrants the use of these lands for the proposed project. Moreover, based on the project's location contiguous with existing developed lands, no significant impacts to agriculture are anticipated as a result of project implementation.

5. Flood and Tsunami Hazards

a. Existing Conditions

As indicated by the Flood Insurance Rate Map (FIRM) for the Lahaina area, the project area is located within Zone X (unshaded), denoting areas outside the 0.2 percent chance floodplain and of minimal hazard, except for the bridge crossing the Kahoma Stream Flood Control Channel. See **Figure 14**.

As noted in **Figure 14**, Zone A (denoting areas with a 1 percent annual chance of flooding and a 26 percent chance of flooding over the life of a 30-year mortgage) is contained within the Kahoma Stream Flood Control Channel. The project area is situated outside the tsunami inundation zone as



Source: Federal Emergency Management Agency, Map Nos. 1500030361F, 1500030362F, 1500030364F

Figure 14 Kuhua Street Extension and Improvement Project
Flood Insurance Rate Map

NOT TO SCALE

Prepared for: County of Maui, Department of Public Works

MUNEKIYO & HIRAGA, INC.

KLMC/MillStreet/FIRM

identified by the VE Zone along the shoreline. In Lahaina Town, the tsunami evacuation zone is essentially makai of Honoapiilani Highway until near the Front Street intersection where it is slightly mauka of the highway, south of Aholo Road.

b. Potential Impacts and Proposed Mitigation Measures

There are no restrictions on development as it pertains to the Zone X (unshaded) designation. The proposed roadway will traverse the Kahoma Stream Flood Control Channel by means of an existing concrete bridge crossing. New water and sewerlines will be attached to the existing bridge. As such, the KSE will be unaffected by the channel's Zone A designation. A separate new multi-use trail bridge for pedestrians and bicycles will be constructed east and parallel to the existing bridge crossing, which will require compliance with the applicable Flood Hazard requirements of the County of Maui. Refer to **Figure 8**. Moreover, because the project area is located outside of the tsunami inundation area, there are no threats to the surrounding areas from coastal wave action. Therefore, the KSE will provide another evacuation route from the low lying areas of Lahaina Town located in the tsunami evacuation zone.

6. Flora and Fauna

a. Existing Conditions

A Biological Resources Survey of the project area was conducted by Robert Hobdy, Environmental Consultant, in April 2010. See **Appendix "C"**. The study noted that the area had been intensively cultivated for agricultural crops during the Hawaiian Government period in the mid 1800s, and has since been repeatedly plowed, planted, burned, and harvested by Pioneer Mill Company until its sugar operations ceased in the project area in 1999. Since that time, dry grassland and shrub species have grown in this arid area.

Buffelgrass was the only species of vegetation listed as abundant within the project area and best defined the botanical landscape of the property. Spiny amaranth and koa haole were also common onsite. Only three (3) native plants (uhaloa, ilima, and aalii) were found within the project area, all of

which are common indigenous plants and widespread on Maui. No endangered or threatened plant species were identified within the project area.

Avifauna and mammals expected to be common to the project area and surrounding areas are typical of species found near other developed areas in Lahaina. It is likely that rats, mice, mongoose, cats and dogs frequent the area given its proximity to domestic habitation. A special effort was made to look for the endangered Hawaiian hoary bat at the subject properties. Observations were made at four (4) locations along the roadway corridor. Bat activity was only detected at the southernmost areas of the corridor, mauka of the Front Street intersection. Periodic modulated echolocation "calls" indicated the possible presence of two (2) or more bats in the area.

There was good bird diversity in the area with 14 species of non-native birds observed consisting of 13 resident species and one (1) migratory specie. No native insects were identified. However, an endangered specie of native moth, the Blackburn's sphinx moth (*manduca blackburn*), could occur in this type of habitat. Four (4) of its host plant, the non-native tree tobacco (*Nicotiana glauca*) were found along the corridor. The plants were carefully examined and no Blackburn's sphinx moths or their larvae were detected.

b. <u>Potential Impacts and Proposed Mitigation Measures</u>

According to the Biological Resources Survey, except for bat activity detected at the southernmost areas of the corridor, the flora and fauna encountered within the project area were generally limited to non-native, abundant species. With the implementation of appropriate mitigation measures, the proposed project is not anticipated to have a significant adverse impact on biological resources in the region.

The Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW) noted that a sediment basin near the Lahaina Aquatic Center located approximately 400 feet west or makai of the KSE attracts the endangered nene (*Branta Sandvicensis*). Also, the U.S. Fish and Wildlife Service (USFWS) has noted in early consultation comments that the threatened Newell's shearwater (*Puffinus auricularis newelli*) and endangered Hawaiian petrel (*Pterodroma phaeopygia sandwichensis*) (collectively referred to as seabirds), endangered Hawaiian coot (*Fulica americana alai*)

and endangered Hawaiian stilt (*Himantopus mexicanus knudseni*) (collectively referred to as waterbirds), endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) and endangered Hawaiian goose (*Branta sandvicensis*) are known to occur in the vicinity of the project area. However, except for the possible Hawaiian hoary bat activity, none of these species were encountered during the biological survey. These species are prone to collisions with objects in artificially lighted areas and such impacts can be minimized by shielding outdoor lights throughout the construction period and during operation of the roadway.

The USFWS also cautioned that the project may also affect endangered plants, such as *Pauoa (Ctenitis squamigera)*, *Diellia, aspenium-leaved (Diellia erecta), Gouania hillebrandii, Hesperomannia arbuscula, Maui Remya (Remya mauiensis), Spermolepis hawaiiensis, Pamakani (Tetramolopium capillare), and Tetramolopium remyi,* as well as designated critical habitat for plants, such as *mahoe (Alectryon micrococcus), Kawila (Colubrina oppositifolia), Pauoa (Ctenitis squamigera), Haha (Cyanea glabra and Cyanea lobata), Haiwale (cyrtandra munroi), Gouania vitifolia, Hesperomannia arbuscula,* and *Maui Remya (Remya mauiensis).* In the biological survey conducted by Robert W. Hobdy, none of these endangered plant species were observed in the proposed roadway corridor.

In early consultation, the USFWS recommended several mitigation measures. The DPW will consider incorporating the following recommended measures:

- *Potential impacts to seabirds could be minimized by shielding outdoor lights in the project footprint throughout the construction and post-construction period so the bulb can only be seen from below, by avoiding use of lights at night during the peak fallout period of September 15 through December 15, and by providing all project staff and residents with information about seabird fallout.*

- *Potential impacts to the Hawaiian stilts include harm and harassment associated with vegetation clearing. In order to minimize or avoid vehicle and machinery impacts to nesting stilts, vegetation clearing in the vicinity of ponds and streams could be limited to periods when biological surveys indicate the area is free of waterbird nests.*

- *Information about Hawaiian hoary bat use of the project is incomplete. Because bat pups are found in nursery trees during the April through August breeding season, it is particularly important to avoid disturbance to trees during this period in areas where bats occur. Bat surveys could be conducted in areas where cutting or removal of trees is proposed. If Hawaiian hoary bats are found in the project area, you should contact our office for additional information about how to address potential impacts to this species.*

- *Hawaiian geese may be attracted to ditches and mowed grass areas in the road shoulder area, increasing their vulnerability to collision with vehicles. If Hawaiian geese are found in the project area, you should contact our office for additional information about how to address potential impacts to this species.*

- *Measures to minimize fire risk should be incorporated into your project. The West Maui Fire Task Force has formed to support efforts to coordinate development of area firebreaks, a system of fire suppression helicopter dip-sites, and fire prevention materials to minimize impacts of fires associated with increases in the West Maui area population.*

- *To minimize erosion, sedimentation, and other adverse impacts to aquatic fish and wildlife resources and nearby coral reef ecosystems, we recommend that applicable measures identified in the enclosed list of Standard Best Management Practices (BMP) for fish and wildlife be incorporated into the project's BMP Plan.*

Since bat activity was detected at the southern terminus of the KSE, the Department of Public Works (DPW) will coordinate with the USFWS and implement appropriate measures to protect the endangered Hawaiian hoary bat. Further, to protect seabirds, the DPW will initiate the following measures:

- Lighting will be appropriately down-shielded

- The project will be scheduled so night construction work will cease during the peak seabird fallout period of September 15 through December 15

- Information on seabird fallout will be provided to all workers

In addition, the DPW shall notify and seek guidance from the USFWS if waterbird nests, Hawaiian hoary bats, or Hawaiian geese are found in the project area during construction and the DPW will coordinate the project with the West Maui Fire Task Force.

7. Streams, Wetlands, and Reservoirs

a. Existing Conditions

Kahoma Stream originates in the West Maui Mountains at Puu Kukui and flows towards the ocean. Kahoma Stream intersects with Kanaha Stream near the Honokohau Ditch approximately one (1) mile upstream from its mouth near Mala Wharf. The lower portion of Kahoma Stream was channelized in the 1970s as a flood control project by the U.S. Army Corps of Engineers. The existing Kahoma-Uka Bridge for the former cane haul road crosses the Kahoma Stream Flood Control Channel. The Kahoma Stream Flood Control Channel cuts perpendicularly across the northern portion of the project area. Refer to **Figure 2**. Aside from moderate to heavy rains, there is no active flow in the Kahoma Stream Flood Control Channel. There are no other streams, wetlands, or reservoirs within the project area.

b. Potential Impacts and Proposed Mitigation Measures

The project roadway alignment is situated below the flood area attributable to the Kahoma Stream Flood Control Channel. The drainage characteristics within the channel are not expected to be adversely altered by the proposed project. Mitigation measures, such as Best Management Practices (BMPs) for erosion and sediment control, will be implemented during construction to ensure that the functional integrity of the Kahoma Stream Flood Control Channel is not affected. See Section III.D.4., Drainage, in this document.

The existing bridge across the Kahoma Stream Flood Control Channel will not be expanded or structurally altered and will be utilized for the KSE and utility lines. On the mauka side of the Kahoma-Uka bridge, a new multi-use trail bridge for pedestrians and bicycles will be constructed, separated, and parallel to the existing Kahoma-Uka bridge structure. The new multi-use trail

bridge will need to comply with Section 404 of the Clean Water Act and applicable State and County Permits.

8. Archaeological Resources

a. Existing Conditions

An Archaeological Inventory Survey (AIS) was prepared by Cultural Surveys Hawaii, Inc. See **Appendix "D"**. The AIS found that the project area was previously affected by past large-scale sugarcane agriculture and smaller private agricultural activities. Further modifications to the ground in the area include construction of stormwater retention basins, soil erosion control berms, and residential and commercial buildings.

Eight (8) sites were identified in the project area consisting of seven (7) post-contact features and one (1) possible pre-contact site. The eight (8) sites include 12 component features consisting of five (5) water control features, three (3) shelter/storage features, two (2) transportation retaining wall features (Features A and C), a property boundary wall (Feature B) and a previously disturbed pre-contact human burial feature. Refer to **Appendix "D"**.

Of the five (5) water control features, State Inventory of Historic Places (SIHP) site -7103 is a segment of ditch that was constructed from cut basalt boulders and concrete, probably associated with the mid-plantation era while the other features were irrigation pipes. The shelter/storage features consist of three (3) quonset huts located along the southwest-side of the existing Kuhua Street associated with World War II. The two (2) transportation retaining walls and boundary wall (SIHP site-7101) consist of a retaining wall that extends from the northeast side of Honoapiilani Highway to along the southeast side of Lahainaluna Road to the southwest side of Mill Street (Feature A); a wall extending from Feature A (Feature B) and a partially destroyed wall along the southeast side of Lahainaluna Road between Mill Street and Kuhua Street (Feature C). The previously unidentified and disturbed human burial site (SIHP 50-50-03-7102) was identified and documented. Refer to **Appendix "D"**.

b. Potential Impacts and Proposed Mitigation Measures

The AIS noted that two (2) human burials (SIHP-5239 and -6473) were encountered during previous subsurface testing associated with two (2) inventory surveys conducted by Xamanek Researches LLC. (E. M. Fredericksen and Fredericksen, 2003) and identified within the area of potential effect (APE). The AIS confirmed that SIHP-6473 was within the project right of way (ROW) which prompted a realignment of the southern portion of the corridor. The ROW at the southern portion was adjusted to create a 50 ft. buffer between the location of the burials and the limits of the construction activity, placing SIHP-6473 outside of the proposed County ROW.

The eight (8) historic properties within the APE for the proposed project have been documented. Seven (7) post-contact sites out of the eight (8) historic properties were recommended as significant only for their information content (Criterion D) while SIHP-7102, the previously unidentified and disturbed human burial, was recommended as significant under multiple criteria (Criterion D and E).

Cultural Surveys Hawaii, Inc. recommended no further historic preservation work for the proposed action at seven (7) of the historic properties. Under Criterion D the information available from these properties through location documentation, written descriptions, photographs, plan view maps to scale, and oblique view renderings have been completed.

With regard to SIHP-7102, the previously disturbed pre-contact burial find, Cultural Surveys Hawaii, Inc. recommended preservation in place and avoidance. Therefore, a Burial Treatment Plan written in accordance with HAR 13-300-33 would need to be prepared for review and determination by the Maui/Lanai Islands Burial Council prior to initiation of any ground altering work.

In accordance with Section 6E-43.6, Hawaii Revised Statutes (HRS) and Chapter 13-300, Hawaii Administrative Rules (HAR), if any significant cultural deposits or human skeletal remains are encountered during ground altering activities, work will stop in the immediate vicinity of the find and the State Historic Preservation Division (SHPD) and the Office of Hawaiian

Affairs (OHA) will be contacted to identify the appropriate level of mitigation.

9. Cultural Assessment

a. Existing Conditions

A Cultural Impact Assessment (CIA) was prepared by Cultural Surveys Hawaii, Inc. See **Appendix "E"**.

Mythological and Traditional Accounts

The name Lahaina traditionally refers to the "cruel sun", possibly associated with the drought that has impacted the surrounding area from time to time. (Pukui, et al, 1974) Mythological accounts relevant to the study area are those associated with *moo*, or serpent/lizard like gods. Considered guardians or *aumakua*, Kamehameha worshiped the most famous *moo*, Kihawahine who lived at Loko o Mokuhinia, the pond surrounding Mokuula in Lahaina.

Early Historic Period

The Lahaina District was considered to be a favorite place by high chiefs because of its climate, natural resource qualities and its proximity to Lanai and Molokai. Lahaina served as the center of government for the Kingdom of Hawaii until the 1840's when the government moved to Oahu (Handy etal, 1991).

Historical accounts document Lahaina as an important population center. Such accounts note the continued presence of agriculture through the early 1800's. Crops included taro, potatoes, yams, and sugarcane.

With the decline of the whaling industry, which brought a new populace to Lahaina, the sugar industry began to evolve. The sugar industry was developed in the mid-1800's and, over the next few years, further developed with the eventual consolidation of multiple smaller mills into what was known today as Pioneer Mill Company, Ltd. As with other sugar plantation communities, the late 1800's and early 1900's saw the rapid expansion and growth of the Pioneer Mill Company.

1900s to Modern Era

In the early part of the 20th century, Pioneer Mill Company expanded its cane enterprise as far as Ukumehame to the southeast with the acquisition of the Olowalu Sugar Company (Conde and Best, 1973). The Pioneer Mill Company thrived until faced with foreign competition, which had lower land and labor cost, and the company closed in 1999. Today the fields are fallow, only the smoke stack remains of the Mill and a six-mile segment of railroad track remains that is used by the LKPR Sugar Cane Train as a tourist attraction.

In addition to sugar, pineapple was established as a viable commercial crop in West Maui. Baldwin Packers opened a cannery in Lahaina in 1919 to provide the product-processing component of the pineapple industry. Pineapple cultivation lands are generally delineated from Honokowai to Honokohau.

The historic significance of Lahaina Town itself is well documented. Lahaina was the home of Kahekili until his death in 1794. It became the home of Kamehameha I and was the designated capital of the Hawaiian Kingdom until 1843. Evidence of this historic era is apparent today and includes remnants of Kamehameha's Brick Palace, which was built at Lahaina Harbor in 1803. Today, Lahaina is designated as a National Historic Landmark District.

b. Potential Impacts and Proposed Mitigation Measures

The project area has been heavily impacted by the historical agricultural activities related to sugar cultivation since the 1800's. As a result, there is little, if any, evidence of surface cultural sites within the project area. Moreover, much of the proposed roadway alignment is parallel to the former cane haul road used by the Pioneer Mill Company and located in the former sugarcane fields.

According to the CIA, the area was used extensively for traditional habitation and agriculture. Cultural interviews with persons familiar with the area described *loi* cultivation which took place, and continues to take place, on *kalo* lands located east of the project area in the Kahoma and Kauaula Valleys as well as in Lahaina Town. Although surrounded by sugarcane, the Opunui

property at the corner of Aholo Road and Honoapiilani Highway grew *kalo* on their property. Also, several persons explained that medicinal herbs such as *uhuloa* and popolo berry could be found on the lands of the proposed project area.

The Opunui property was also the home of well-known *kumu hula*, Mrs. Rebecca Kauhai Likua, who taught many including the late *kumu hula* Mrs. Emma (Farden) Sharpe. Mrs. Likua secretly taught the *hula* in the cane fields mauka of Lahaina Town. An enduring hula tradition continues to be perpetuated by her students.

Informants of the group Polanui Hiu consisting of fishermen, kupuna and other community members voiced concerns relating to potential construction runoff and the effects of such runoff on the nearshore fisheries that the Polanui Hiu is managing and working to restore. According to Polanui Hiu one of the main factors for the decline in the areas "keystone" species of marine life involves sediment runoff.

The CIA prepared for the Lahaina Bypass Modified Alignment (2009) indicated that individuals interviewed for that study described a continual traversing from coastal Lahaina *ahupuaa* to obtain marine resources, to *mauka ahupuaa* located in Kahoma and Kanaha Stream Valleys for the purpose of cultivating and harvesting their family *loi* plots as well as maintaining homes in these valleys. Individuals described walking into the valleys on a weekly basis to farm their family *loi*, while fishing, squidding or gathering *limu* when at their ocean home (Dagan, et al, 2009). Their paths would have crossed the proposed roadway alignment.

The Kapu family live and farm taro in Kauaula Valley, mauka of Wainee and the current project area. They presently access their home through Shaw Street, which crosses the proposed project area and then connects to the old Kauaula Road, located at the end of the baseball field at Lahaina Recreation Center. The Lahaina Bypass constructed a tunnel under a section of the Bypass to allow the family to access their home and farm. Accommodation will be necessary to ensure that the Kapu Family continues to have access to their home and farm.

Traditional cultural practices were identified as having existed, or as ongoing practices within the study area. These practices may be impacted by the construction of the proposed KSE. The CIA recommended the following mitigation measures:

1. Avoid adverse impacts to traditional subsistence fishing practices of Lahaina resulting from damage caused by the siltation of Lahaina's reef ecosystem. It is recommended that runoff generated from the proposed roadway construction be contained in retention basins or as BMPs mandate. The Polanui Hiu requests continued consultation with their group as the planning of such measures continues.

2. Individuals consulted continue to access mauka lands by crossing the route of the proposed KSE. Also, individuals access the area due to the regeneration of traditional medicinal plants now growing in the fallow fields to practice the traditional *la`au lapa`au*. To maintain routes that cross the proposed roadway corridor, it is recommended that access routes to mauka lands be developed with the involvement of Lahaina families and community members.

3. Caution should be taken during all phases of ground disturbing activities to minimize potential for encountering previously unidentified human burials. If human burials are inadvertently discovered, personnel on-site shall contact the SHPD.

4. The Maui/Lanai Burial Council also recommended that a burial treatment plan be completed for the burial find discovered during the AIS. Close consultation with the Lahaina community is recommended for the development of this plan.

The DPW will incorporate the recommended mitigation measures during implementation of the KSE and Improvements project.

10. Air and Noise Quality

a. Existing Conditions

The air quality of the Lahaina area is considered good with existing airborne pollutants attributed primarily to automobile exhaust from the region's roadways. There are no point sources of airborne emissions in the immediate vicinity of the project area. Other sources of airborne emissions may include construction activities at various sites around Lahaina town. These sources are intermittent, however, and prevailing tradewinds quickly disperse any particulates which are generated.

An Acoustic Study for the KSE was prepared by Y. Ebisu & Associates in July 2012. See **Appendix "F"**. The study measured existing traffic and background ambient noise levels at 18 locations in the project area near existing and future noise sensitive residences along the proposed KSE, as well as at locations in the vicinity of Honoapiilani Highway. Existing background noise levels at locations removed from Honoapiilani Highway and Lahainaluna Road are controlled by local traffic, distant traffic, aircraft noise, birds, and foliage moving with the wind. Along Honoapiilani Highway, existing noise levels are controlled entirely by traffic along the highway.

Existing background noise levels along the proposed KSE do not exceed the U.S. Federal Highway Administration (FHWA) and State DOT, Highways Division noise abatement criteria. Noise levels do not exceed the State DOT 66 Leq (Equivalent Continuous Noise Level) noise abatement criteria at noise sensitive receptor locations or the State DOT 71 Leq noise abatement criteria at commercial/industrial receptor locations. Existing noise levels along Honoapiilani Highway are relatively high and exceed the State DOT 66 Leq noise abatement criteria at 110 feet from the highway centerline.

b. Potential Impacts and Proposed Mitigation Measures

The primary potential short-term air quality impact of the project will occur from the emission of fugitive dust during construction. Site work, such as clearing, grubbing and grading, and construction, will generate airborne particulates. In addition to regular watering and sprinkling, the following measures will be implemented, as required, by the applicant's contractor

during construction activities to minimize the proliferation of fugitive dust, in accordance with Hawaii Administrative Rules (HAR), Chapter 11-60.1, Air Pollution Control:

- The use of wind screens and/or limiting the area that is disturbed at any given time will help to contain fugitive dust emissions.
- Wind erosion of inactive areas of the site that have been disturbed will be controlled by mulching, as soon as practicable. Trucks hauling soil material will be covered to mitigate dust.
- A routine road cleaning and tire washing program will help reduce fugitive dust emissions from trucks and vehicles tracking dirt onto nearby paved roadways.
- Installation of landscaping, as soon as practicable, early in the construction schedule will also help to control dust.
- Completed graded and grubbed areas will be vegetated or otherwise stabilized to mitigate dust-generated impacts.

Future development in Lahaina Town will increase traffic. The KSE is not a generator of traffic but is expected to alleviate traffic congestion. The KSE will provide an alternative route between Honoapiilani Highway and the Lahaina Bypass Road. It is expected to disperse traffic in Lahaina Town and improve ambient air quality along the Honoapiilani Highway corridor. In the long term, the proposed project is not expected to adversely impact local and regional ambient air quality.

The Acoustic Study evaluated future traffic noise levels in the immediate vicinity of the proposed KSE with and without the project in the year 2020. The analysis of the noise conditions with the proposed project was conducted with two (2) scenarios based on the posted speed limit along Kuhua Street. The posted speed limits used in the analysis are shown in **Table 2** below.

Table 2. Posted Speed Limit With and Without Speed Reduction

	Without Speed Reduction	With Speed Reduction
Keawe Street to Lahainaluna Road	25 mph	20 mph
Lahainaluna Road to Shaw Street	35 mph	30 mph
Shaw Street to Honoapiilani Highway	25 mph	20 mph

The analysis was conducted with respect to the State DOT "66 Leq" noise abatement criteria for noise sensitive receptors, State DOT "77 Leq" noise abatement criteria for commercial/industrial receptors, and the "15 dBA increase" noise abatement criteria. Future traffic noise levels are not expected to exceed these noise abatement criteria in 2020 with the proposed project if the "With Speed Reduction" scenario of posted speed limits is used along the KSE. However, the analysis concluded that certain segments of the KSE could operate at the higher "Without Speed Reduction" scenario. **Table 3** summarizes the recommendations presented in the Acoustic Study regarding appropriate posted speed levels to ensure that noise abatement criteria are not exceeded.

Table 3. Recommended Speed Limit for Noise Mitigation

	Recommended Posted Speed Limit	Notes
Keawe Street to Lahainaluna Road	20 mph	Reduced speed limit required to avoid HDOT "66 Leq" or "15 dBA increase" criteria
Lahainaluna Road to Shaw Street	30 mph or 35 mph	No exceedances of HDOT criteria under either speed limit
Shaw Street to Aholo Road	20 mph or 25-30 mph	A 25-30 mph speed limit may be used if a memorandum of understanding is executed with Lahaina Recreation Center regarding noise levels at two (2) ball fields
Aholo Road to Honoapiilani Highway	30 mph	No exceedances of HDOT criteria under this speed limit
Source: Y. Ebisu & Associates, 2012.		

The Acoustic Study concluded that the use of lowered posted speed limits at locations where existing noise sensitive receptors are relatively close to the Kuhua Street right-of-way may be more effective in meeting the State DOT's noise abatement criteria than would sound attenuating walls. This is particularly true along the existing section of Kuhua Street between the Kahoma Channel and Lahainaluna Road, where the need to provide openings for driveways will negate the sound attenuation effectiveness of walls. As such, the use of lowered posted speed limits in appropriate areas is the recommended noise mitigation measure for the project. It is anticipated that potential noise impacts at any new noise sensitive or commercial establishments located along the KSE may be mitigated through the inclusion of noise abatement measures that would be incorporated into the planning of these future projects. Examples of mitigation measures could include installation of air conditioning, adequate setbacks, or sound attenuating walls or berms.

Construction of the proposed project will result in short-term noise impacts along the Kuhua Street Extension corridor, predominantly from heavy construction equipment, such as bulldozers, front-end loaders, and material-transport vehicles. The State Department of Health regulates noise from construction activities through the Community Noise Permit System as set forth in HAR, Chapter 11-46. Under current procedures, noisy construction activities are restricted to Monday through Friday, 7:00 AM to 6:00 PM. Noisy construction on Saturdays is limited to 9:00 AM to 6:00 PM; noisy construction is not permitted on Sundays or holidays. Construction noise may also be mitigated through the use of quieted portable engine generators and diesel equipment within 500 feet of noise sensitive properties. Heavy truck and equipment staging areas should be located beyond 500 feet of noise sensitive properties whenever possible. Truck routes should avoid residential communities when possible.

11. Scenic and Open Space Resources

a. Existing Conditions

The project area is located mauka of Honoapiilani Highway with the West Maui Mountains visible to the east and the island of Lanai visible to the west

along sections of the corridor surrounded by vacant agricultural land. The project area is not located within a designated scenic view corridor.

b. Potential Impacts and Proposed Mitigation Measures

The proposed roadway will be developed to integrate with the neighboring residential and commercial areas. The KSE and Improvement Project will include a pedestrian-friendly landscaped, multi-use trail greenway along its entire length creating a scenic and open space resource. Landscaping along existing uses will be established as part of the roadway improvements to provide visual buffering and softening of the built landscape. Refer to **Figure 5**. Vertical construction is expected to include light poles and traffic signals. Significant adverse impacts to scenic and open space resources resulting from the project are not anticipated.

B. SOCIO-ECONOMIC SETTING

1. Land Use and Community Character

a. Existing Conditions

The vast majority of lands in West Maui are either State designated "Conservation" or "Agricultural". Generally, "Conservation" lands occupy the higher elevations, while the "Agricultural" district spans the middle ground. Major exceptions to this trend are the Honolua Stream and Pohakupule Gulch areas north of Kapalua, where the "Conservation" district extends down to sea level.

"Urban" designated lands, then, are left to occupy the lower elevations along the coast. Lahaina Town encompasses a diverse mix of land uses, including residential, business, light and heavy industrial, recreational, and agricultural uses. The town of Lahaina is the commercial center of West Maui. The town contains several shopping centers and retail business areas, and serves as a hub for the region's residential housing. To the east (mauka) of the Pioneer Mill smokestack in Lahaina, there exists a multitude of single-family homes for island residents.

West Maui's attraction can be attributed to its year-round dry and warm climate, complemented by its many white-sand beaches and scenic

landscapes. Visitor accommodations are located in Lahaina and the resort communities of Kaanapali, Kahana, Napili, and Kapalua. The State of Hawaii's Kapalua-West Maui Airport at Mahinahina links the region to Oahu and other neighbor islands.

Diversified agriculture and vacant formerly cultivated land occupy much of the remaining land in the West Maui region.

b. Potential Impacts and Proposed Mitigation Measures

The project area within Lahaina town is located adjacent to existing developed areas of Lahaina and is, therefore, consistent with land uses present in the region. The regional character of the Lahaina area will not be adversely impacted by implementation of the proposed roadway project. In the context of the burgeoning traffic congestion in West Maui, the project's location, situated in the vicinity of residential, commercial, and recreational uses of Lahaina and future growth areas, presents an opportunity to master plan a new collector roadway. The new roadway can be properly aligned with existing and future development, alleviate traffic congestion and improve traffic circulation and connectivity within Lahaina Town.

2. Population and Demography

a. Existing Conditions

The population of the County of Maui has exhibited relatively strong growth over the past decade. The resident population of the County of Maui in 2010 was 154,834 and is projected to increase to approximately 174,450 by 2020 and 199,550 by 2030 (County of Maui, Planning Department, June 2006).

The subject property is located near the western coast of Maui, within the West Maui region. Just as the County's population has grown, the resident population of the West Maui region has also increased. The population of Lahaina in 2000 was 17,967 (County of Maui, Office of Economic Development, 2012), which comprised 15 percent of the island's population. The resident population in 2010 was 22,156 people (U.S. Census, 2010). The projection of the resident population for this region is estimated to be 25,096 persons in 2020 and 28,903 in 2030 (County of Maui, Planning Department, June 2006).

b. Potential Impacts and Proposed Mitigation Measures

The proposed project is not considered a population generator. As such, the proposed project is not anticipated to adversely affect population parameters of the region.

3. Economy

a. Existing Conditions

As of December 2012, the unemployment rate for Maui County and the island of Maui were 5.2 percent and 5.0 percent, respectively. The County of Maui and island of Maui experienced a 1.9 percent decrease in unemployment from December 2011 (State Department of Labor and Industrial Relations, January 2013).

Approximately 40 percent of West Maui workers are employed in the service industry, indicating a heavy dependence on the visitor industry. Less than two (2) percent of workers are employed in the agricultural industry (County of Maui, Planning Department, June 2006).

The lower percentage of agricultural jobs in West Maui is reflective of the end of sugarcane cultivation by Pioneer Mill Company, Ltd. in September 1999. The agricultural operations of Pioneer Mill Company, Ltd in the past was a vital component of the West Maui economy. The cessation of sugarcane cultivation left most of its former 6,700 acres of sugarcane fields fallow. KLMC, the successor to Pioneer Mill Company, Ltd. is in the process of diversifying its agricultural operations by utilizing portions of its lands for coffee production. Also, in November 2009, Maui Land & Pineapple Company, Inc. ceased its pineapple operations in West Maui.

b. Potential Impacts and Proposed Mitigation Measures

In the short term, the project will have a beneficial impact on the local economy during the period of construction. In the long term, the project is not anticipated to affect the labor market and no significant negative impacts on labor conditions are anticipated.

From a long-term perspective, the proposed project will provide an alternative route which will help to relieve traffic on Honoapiilani Highway, as well as provide enhanced access to residential, economic, and employment centers. The proposed project is anticipated to have economic benefits associated with increased mobility for goods and services, especially with easier access to the commercial and industrial uses along Keawe Street.

4. Housing

a. Existing Conditions

The project area is located in Lahaina, the commercial and residential center of West Maui. A range of housing types and conditions exists within the area, from owner-occupied homes to luxury condominiums for part-time residents.

West Maui is presently experiencing an acute shortage of housing. In Lahaina Town, the average median sales price of a single-family home and a condominium unit in 2011 was $450,000.00 and $295,000.00, respectively. In December, 2012 the median sales price for a single-family home was $1,871,250.00 and $410,000.00 for a condominium unit, which was a substantial increase from the average median sales price in 2011. Under current conditions, the demand for home ownership exceeds the supply in West Maui (Realtors Association of Maui, Inc., January 2013).

b. Potential Impacts and Proposed Mitigation Measures

The proposed project is not anticipated to significantly affect housing conditions in the region although it will provide another transportation route for existing and future housing developments.

C. PUBLIC SERVICES

1. Recreational Facilities

a. Existing Conditions

West Maui has numerous recreational facilities offering diverse opportunities for the region's residents. There are seventeen (17) County parks and three

(3) State beach parks in West Maui. Approximately one-third of the County parks are situated along the shoreline and offer excellent swimming, diving, and snorkeling areas. In addition, Kaanapali and Kapalua Resorts operate world-class golf courses available for public use.

Recreational facilities in Lahaina town include the Lahaina Aquatic Center, a skatepark, the West Maui Boys and Girls Club, and the Lahaina Recreation Center located mauka of Honoapiilani Highway with access from Shaw Street. The Lahaina Aquatic Center contains an Olympic-size swimming pool, a children's wading pool, a paved parking lot, office, meeting and conference rooms, storage space, as well as shower, restroom, and changing room facilities. The Lahaina Maui Skatepark is located adjacent to the aquatic center. The 15-acre Wainee Park expansion to the east of the Lahaina Recreation Center includes new fields, parking, and washroom facilities. The West Maui Boys and Girls Club, located adjacent to the Lahaina Recreation Center, has a recently renovated building for youth activities, as well as paved parking, an outdoor playground, and a basketball court. The Lahaina Recreation Center, south of the Aquatic Center, has baseball fields and other playfields for soccer and football, as well as basketball and gateball courts, restrooms and paved parking facilities.

The clear ocean waters and well-developed reef systems along the Lahaina coast offer many recreational opportunities for residents. Fishing, by shorecasting and netting, is practiced in the waters near the outlet of Kauaula Stream and Makila Point. Edible seaweed collecting, octopus diving, and spearfishing occur on the adjacent reef flat.

b. <u>Potential Impacts and Proposed Mitigation Measures</u>

To minimize impacts to the Lahaina Recreation Center, a roadway alignment mauka of the park site was selected rather than the existing Mill Street alignment which would separate the park site. The proposed alignment for the project is not anticipated to adversely impact recreational resources of the region. The project includes a pedestrian-friendly, multi-use trail greenway along its entire length which is expected to enhance access to the existing recreational facilities. Continued coordination with the Department of Parks and Recreation will be undertaken as the project progresses to minimize

impacts to public park resources in the vicinity resulting from implementation of the roadway extension.

2. Police and Fire Protection

a. Existing Conditions

The project area is located within the Lahaina Police Station service area, which includes the entire Lahaina district. The Lahaina Station, built in the early 1970's, is located in the Lahaina Civic Center complex at Wahikuli.

Fire prevention, suppression, and protection services for the Lahaina District are provided by personnel assigned to the Lahaina Fire Station, also located in the Lahaina Civic Center, and the Napili Fire Station, located about nine (9) miles to the north of the project area.

b. Potential Impacts and Proposed Mitigation Measures

The proposed project is not expected to create a need for additional police and fire protection. The KSE will be utilized by police patrols and emergency vehicles but is not expected to increase the need for additional patrols or emergency personnel. The service area for emergency response for both police and fire will not be significantly increased by the proposed action. Implementation of the proposed project will provide an alternate method of access to Lahaina in the event of an unforeseen closure of Honoapiilani Highway in the area.

3. Solid Waste

a. Existing Conditions

Single-family residential solid waste collection is provided in Lahaina by the County of Maui on a weekly basis. Residential solid waste collected by County crews is disposed of at the County's Central Maui Landfill in Puunene, located four (4) miles southeast of the Kahului Airport. Private refuse collectors provide solid waste disposal services for certain multi-family, commercial, and institutional accounts.

A refuse transfer station at Olowalu accepts household and green wastes, as well as used oil, for transport to the Central Maui Landfill. The disposal of commercial and institutional refuse is not permitted at the Olowalu transfer station.

b. Potential Impacts and Proposed Mitigation Measures

Construction waste will be disposed of according to a construction waste disposal, recycling, and reuse plan, which will be addressed during the construction plans preparation phase of the project. In the long term, the proposed project will not generate solid waste and is not anticipated to adversely impact the County solid waste disposal capacity.

4. Medical Facilities

a. Existing Conditions

The only major medical facility on the island is Maui Memorial Medical Center, located midway between Wailuku and Kahului. This 231-bed facility provides general, acute, and emergency care services (Maui Memorial Medical Center, 2012). A West Maui Hospital is currently being planned in the Kaanapali area.

Private medical offices in West Maui include the Maui Medical Group, Lahaina Physicians, West Maui Healthcare Center, and Kaiser Permanente Lahaina Clinic.

b. Potential Impacts and Proposed Mitigation Measures

The proposed project is not anticipated to adversely affect the service capabilities of emergency medical or general care operations. The project will benefit emergency responders through the provision of an alternative access route to the Lahaina area in the event of an unforeseen closure of Honoapiilani Highway.

5. Educational Facilities

a. Existing Conditions

The West Maui region is served by four (4) public schools (Lahainaluna High School, Lahaina Intermediate School, Princess Nahienaena Elementary School, and Kamehameha III Elementary School) operated by the State of Hawaii, Department of Education (DOE) and two (2) smaller private schools (Sacred Hearts School and Maui Preparatory Academy). All four (4) of the public schools are located within Lahaina town and three (3) of these schools are located off of Lahainaluna Road, mauka of Honoapiilani Highway. The enrollments in the four (4) public schools have grown in concert with the expansion of residential development in the area. See **Table 4**.

Table 4. Actual Enrollments at Department of Education Schools

School	SY 10-11	SY 11-12
Lahainaluna High School	1,027	1,057
Lahaina Intermediate	653	651
Kamehameha III Elementary	733	760
Princess Nahienaena Elementary	607	643
Source: Department of Education, 2012.		

University of Hawaii - Maui College (UH-MC), which is located in Kahului, is part of the University of Hawaii system. There is a UH-MC Lahaina Education Center in Lahaina that opened in Fall 2007. UH-MC is the primary higher education institution serving Maui.

b. Potential Impacts and Proposed Mitigation Measures

The proposed project is not anticipated to adversely impact educational resources and opportunities in the region. The proposed project will provide another roadway option in addition to Honoapiilani Highway and the Lahaina Bypass Road to access the three (3) schools located along Lahainaluna Road.

D. INFRASTRUCTURE

1. Roadways

a. Existing Conditions

A Traffic Impact Analysis Report (TIAR) was prepared by Austin, Tsutsumi & Associates, Inc. (ATA) and included as an appendix in the Preliminary Engineering Synopsis. Refer to Appendix C in **Appendix "B"** of the Draft EA. The TIAR identified the roadways within the project area. Access to the Lahaina region is provided by Honoapiilani Highway from Central (Wailuku/Kahului) and South (Kihei/Wailea) Maui. The following is a summary of the major roadways in the vicinity of the project area. Refer to **Figure 1**.

Honoapiilani Highway

Honoapiilani Highway is a principal arterial roadway, owned by the State of Hawaii, and provides north-south regional mobility and access to communities in the region. For most of its length, Honoapiilani Highway is a two-lane, two-way arterial roadway with median left-turn lanes provided at major intersections. From Lahaina town (at north of Dickenson Street) to the Honokowai Stream bridge, Honoapiilani Highway functions as a four-lane arterial roadway. Honoapiilani Highway between Lahainaluna Road and Aholo Road was recently widened to four (4) lanes.

Keawe Street

Keawe Street is a local roadway owned by the County of Maui, that currently terminates at the Lahaina Cannery Mall at its western terminus. Eventually, this four-lane, two-way roadway will connect to Ikena Street as part of the first phase of the Lahaina Bypass Road. Currently, from the Lahaina Cannery Mall, Keawe Street crosses Honoapiilani Highway at a signalized intersection and serves the Lahaina Gateway Mall, Lahaina Business Park, Opukea and Hoonanea Condominiums, and Walgreens located east (mauka) of Honoapiilani Highway.

With the development of the Lahaina Gateway Mall and Walgreens near the intersection with Honoapiilani Highway, traffic has increased significantly along this road, causing difficulty in making the westbound left-turn onto Honoapiilani Highway during the morning (7:00 a.m. to 8:00 a.m.) and afternoon (3:30 p.m. to 4:30 p.m.) peak hours of traffic.

Papalaua Street

Papalaua Street is an east-west, two-way, two-lane County roadway crossing Honoapiilani Highway and terminating in the east at the former Pioneer Mill site and to the west at Front Street. The existing segment of Papalaua Street west (makai) of Honoapiilani Highway is improved with a wide, landscaped, pedestrian-friendly shoulder along its north side. The eastern portion is a driveway access and does not meet current County standards for commercial streets (i.e., right-of-way, pavement width, curbs, gutters and sidewalks).

Aki Street

Aki Street is an east-west, narrow substandard two-way, two-lane County residential roadway connected to the existing Kuhua Street providing access to residences in the area. Travel through Aki Street is hindered by parked vehicles on both sides of the street that narrows the roadway to one (1) narrow lane of traffic. Aki Street does not meet current County standards for residential streets (i.e., right-of-way width, pavement width, curbs, gutters and sidewalks).

Lahainaluna Road

Lahainaluna Road is a County collector roadway that provides east-west circulation for mauka residential areas to Honoapiilani Highway, as well as the commercial areas of Lahaina. There are three (3) public schools, (Princess Nahienaena Elementary, Lahaina Intermediate, and Lahainaluna High School) located off of this two-lane, two-way collector roadway. The former Pioneer Mill Company facility and MECO substation are located off of Lahainaluna Road between Honoapiilani Highway and Kuhua Street. The intersection of Lahainaluna Road and Honoapiilani Highway is signalized. The eastern portion of the roadway near the existing Kuhua Street narrows with insufficient right-of-way, curbs, gutters and sidewalks.

According to the TIAR, Lahainaluna Road experiences heavy congestion due to its narrow roadway widths and sole provision of access to Lahaina residents and three (3) of the four (4) existing public schools within West Maui. Congestion is heaviest during the morning (AM) peak hour when schools are in-session. During this period, the southbound left-turn from and westbound approach onto Honoapiilani Highway, in general, experiences severe overcapacity conditions. During the busiest 30 minutes, the southbound left-turn traffic on Honoapiilani Highway was observed to queue as far back as Papalaua Street, while the westbound approach on Lahainaluna Road was observed to queue back to Ikena Street, roughly 3,700 feet east of the intersection.

During the afternoon (PM) peak hour, the southbound left-turn traffic on Honoapiilani Highway experiences over capacity conditions.

Dickenson Street

Dickenson Street is an east-west, two-way, two-lane County roadway crossing Honoapiilani Highway and providing access to a gas station before connecting to Mill Street approximately 150 feet from Honoapiilani Highway and to the west terminating at Front Street. The eastern portion of Dickenson Street is a driveway access to the gas station and does not meet County standards for a commercial street.

Shaw Street

Shaw Street is an east-west, two-way, two-lane County roadway crossing Honoapiilani Highway. To the east of the highway crossing, Shaw Street provides access to the Lahaina Aquatic Center, Lahaina Maui Skatepark, West Maui Boys and Girls Club and Ball Field, Lahaina Resource Center and the Lahaina Recreation Center, and Na Hale O Wainee housing project. To the west, it provides access to the Lahaina Baptist Church, makai residential and business areas and terminates at Front Street.

Aholo Road

Aholo Road is an east-west, two-way, two-lane County residential roadway providing access to the County's Komohana Hale housing project on the

mauka side of Honoapiilani Highway and to residences on the makai side of the highway. To the east, the roadway dead ends at the housing project before the cane haul road, while to the west it terminates at Front Street.

Front Street

Front Street is a two-lane, two-way County collector roadway which stretches the entire span of Lahaina town from Puamana in the south to Wahikuli in the north. A multitude of apparel stores, restaurants, curio shops, and art galleries dot the Front Street landscape. Front Street generally parallels Honoapiilani Highway throughout its length. Residential neighborhoods bracket the commercial core of Front Street to the north and the south.

Mill Street

Mill Street is a north-south, two-way, two-lane private roadway aligned west (mauka) of and parallel to Honoapiilani Highway. This former cane haul road originates at Keawe Street to the north, continues across Kahoma Stream, through the Pioneer Mill site, crosses Lahainaluna Road, continuing south where it veers toward Honoapiilani Highway after the Lahaina Recreation Center and continues as a former cane haul road parallel to the highway towards Olowalu.

Kuhua Street

Kuhua Street is a north-south, two-way, two-lane substandard County roadway. Kuhua Street has a right-of-way of approximately 25 feet with 20 feet of asphalt pavement which does not meet current County standards for residential streets. There are no existing curbs, gutters, or sidewalks. The adjacent residences utilize this substandard street as parking. Access to Kuhua Street is from Lahainaluna Road at its southern terminus. To the north, Kuhua Street dead ends before Kahoma Stream at the last residential lot.

After the 2008 traffic counts, updated counts were taken in 2009, 2010, and 2011. The new counts had a relatively small change in traffic and ATA determined the 2008 data provided in the TIAR remains valid. See **Appendix "B-1"**. The TIAR identified the existing Level of Service (LOS)

at the various intersections in the vicinity of the proposed KSE and Improvement Project. The existing roadways operate at adequate LOS during the AM and PM peak hours, except for the movements identified in **Table 5**.

Table 5. Level of Service Summary, Existing Conditions

	AM LOS	PM LOS
Front Street & Honoapiilani Highway		
EB LT/RT	C	E
Aholo Street & Honoapiilani Highway		
EB LT/TH/RT	F	E
WB LT/TH	D	D
WB RT	D	D
Shaw Street & Honoapiilani Highway		
EB LT/TH	E	E
EB RT	E	E
WB LT/TH	E	E
WB RT	E	D
Dickenson Street & Honoapiilani Highway		
EB LT/TH/RT	E	E
WB LT/TH/RT	E	E
NB LT	E	E
SB LT	E	E
Lahainaluna Road & Honoapiilani Highway		
EB/LT	D	D
EB TH/RT	F	F
WB LT	F*	E
WB TH	F	D
WB RT	F*	C
NB LT	E	F
SB LT	F	F*
Overall	F*	D

Table 5. Level of Service Summary, Existing Conditions
(continue)

	AM LOS	PM LOS
Papalaua & Honoapiilani Highway		
EB LT/TH	F*	F*
EB RT	D	D
WB LT/TH/RT	D	D
NB LT	E	E
NB TH/RT	B	B
SB LT	D	E
SB TH/RT	B	B
Overall	**C**	**C**
Keawe Street & Honoapiilani Highway		
EB LT/TH	E	D
EB RT	E	C
WB LT/TH	E	E
WB RT	E	D
NB LT	F	E
NB TH	A	A
NB RT	A	A
SB LT	F	F*
SB TH/RT	A	A
Overall	**B**	**B**
Mill Street & Lahainaluna Road		
WB LT/TH	A	A
NB LT/RT	F	C
Kuhua Street & Lahainaluna Road		
EB LT/TH	A	A
SB LT	F	D
SB RT	F*	B

Note: *= Over Capacity Conditions
EB = Eastbound RT = Right Turn
WB = Westbound LT = Left Turn
SB = Southbound TH = Through
Source: Austin, Tsutsumi & Associates, Inc.

b. Potential Impacts and Proposed Mitigation Measures

The TIAR assumes that by the Year 2020, within Lahaina Town, the Wainee Residential Community, the Pioneer Mill sites, the Kahoma Residential Housing, although recently denied is under reconsideration by the State Land Use Commission, and the Hawaii Housing Finance and Development Corporation (HHFDC) Villages of Leialii developments will be built, necessitating new collector roads and connectivity to Honoapiilani Highway to accommodate their respective traffic demands. In addition, planned projects north of Lahaina Town will increase traffic on Honoapiilani Highway. By Year 2020 Phase 1A and 1B1 of the Lahaina Bypass Road (LBR) will be constructed. The Keawe Street Extension to the LBR will be constructed as part of Phase 1A.

Construction of the LBR will allow school traffic from the north, who currently utilize Lahainaluna Road, to access the schools with an alternative access. Hence, the LBR will relieve traffic at the Lahainaluna Road/Honoapiilani Highway intersection. The LBR will also increase traffic on Keawe Street, especially at the Keawe Street/Honoapiilani Highway intersection. On October 2010, improvements to this intersection were completed to allow traffic exiting the Lahaina Gateway Mall to use a dedicated left-turn lane with a green arrow to make an unobstructed left turn heading south onto Honoapiilani Highway (Lahaina Bypass Now, October 2010).

With construction of Phase 1B1 of the LBR, vehicles traveling northbound along Honoapiilani Highway will be able to access the LBR at its south connection with Honoapiilani Highway at the Hokiokio Place connection which will relieve some of the traffic congestion along Honoapiilani Highway.

The TIAR assumes the following roadway improvements implemented by the State and County will be completed by Year 2020:

- Phase 1A and 1B1 of the LBR are constructed.
- In Phase 1A Keawe Street is extended to the LBR.

- In Phase 1A, the intersection of Keawe Street and Honoapiilani Highway will be improved to provide on the westbound approach exclusive left-turn, through and right-turn lanes. (Note: as of October 2010 the exclusive left-turn lane has been completed.)

Even with the above improvements, Honoapiilani Highway is expected to continue to operate with long delays. Phases 1A and 1B1 of the LBR is projected to accommodate approximately 20 percent of the projected traffic on Honoapiilani Highway, while 80 percent of the projected traffic will continue to use Honoapiilani Highway. Despite all of the roadway improvements assumed for Base Year 2020, many movements to intersections along Honoapiilani Highway will continue to experience LOS F and overcapacity conditions as a result of the projected increase in traffic throughout the corridor due to the lack of regional capacity, which is currently served primarily by Honoapiilani Highway.

Phases 1A and 1B1 of the LBR will allow school traffic to access Lahainaluna Road and relieve traffic at its intersection with Honoapiilani Highway. The improvements will result in a reduction of trips along Honoapiilani Highway while increasing trips on the southbound left-turn lane and westbound right-turn movements at the Keawe Street/Honoapiilani Highway intersection. Keawe Street will become the interim terminal connection to the LBR and, as such, traffic will continue to increase until new outlets to the LBR are constructed. An approximate 187 percent increase in traffic is projected by 2020 along Keawe Street. To accommodate this increase in traffic, the following improvements are recommended in conjunction with the LBR, which are not within the scope of the KSE and Improvement project:

Honoapiilani Highway/Keawe Street

Southbound Approach: widen to provide two (2) left-turn lanes. This will likely require ROW acquisition.

Eastbound Approach: widen to provide dedicated left-turn and through lane. This will likely require ROW acquisition.

Westbound Approach: re-stripe to provide a dedicated left-turn, a shared left-turn/through/right-turn lane, and dedicated right-turn lane. This requires the construction of a larger-radius channelized island at the northeast corner, which will likely require ROW acquisition.

Crosswalk: remove eastbound crosswalk (south side).

The widening of Honoapiilani Highway to Aholo Road provides additional capacity to the highway and will improve through movement operation while the side streets at the unsignalized intersections will experience longer delays. Despite the widening, a bottleneck will still occur at the Honoapiilani Highway intersections with Lahainaluna Road and Papalaua Street. Northbound traffic along Honoapiilani Highway will likely experience long queues that could affect operations at Dickenson Street, Shaw Street, Aholo Road, and Front Street during the morning and afternoon peak hours of traffic.

An approximate 50 percent increase in traffic is projected by 2020 for southbound traffic along Honoapiilani Highway. It is likely bottlenecks will begin to occur south of Aholo Road, where the highway narrows to two (2) lanes, and where it intersects Hookiokio Place, which will serve as the southern terminus of the LBR.

The lack of regional capacity has resulted in traffic congestion on Honoapiilani Highway. According to the TIAR, the following State highway improvements are necessary to increase regional capacity to accommodate the projected regional traffic:

1. Extension of the LBR further northward beyond Keawe Street increasing access and diversion to the LBR.

2. Widening of Honoapiilani Highway to four (4) lanes between Maalaea and Aholo Road to reduce the bottlenecks and long lines that would be caused by merging down to two (2) lanes.

Although the State of Hawaii has begun the Environmental Impact Statement (EIS) preparation for the widening and relocation of Honoapiilani Highway from Maalaea to Launiupoko, the timing of the implementation of this

improvement will depend on the availability of Federal funding. Similarly, the timing of future phases of the LBR is dependent on the availability of funding and it is considered unlikely to occur before Year 2020.

Resolving the overall regional traffic issues within the Lahaina area are ongoing and is anticipated to involve a coordinated effort between the State, County, and private entities for the funding and construction of improvements. The proposed project is viewed as a short-term solution which may be implemented in an earlier time frame than the overall regional roadway improvements. Construction of the KSE and Improvement project will provide a mitigation measure for local traffic congestion in the Lahaina area. A discussion of the proposed project follows.

KSE:

The KSE and Improvement Project will improve localized access for circulation within the Lahaina community and improve accessibility for pedestrians and bicyclists. The community benefit of the KSE and Improvement Project will be the following:

1. Improve north-south corridor capacity between Keawe Street and Front Street, providing another route for the transport of people and goods within Lahaina Town.

2. Provide improved local access for Lahaina residents, employees, and patrons originating from/destined for Lahaina areas mauka of Honoapiilani Highway.

3. Improve pedestrian and bicycle accessibility, connectivity, and safety through the provision of a separated pedestrian/bicycle multi-use trail greenway connecting the residential areas of Lahaina Town with the commercial, industrial, and park areas.

4. Reduce traffic on Honoapiilani Highway and the number of turning movements onto and off of the highway, thus reducing traffic delays.

In conjunction with the KSE and Improvement project, the following intersection improvements are proposed:

KSE and Keawe Street Intersection

Signalize and design so vehicle stacking does not obstruct the path of the LKPR Sugar Cane Train. See **Figure 15**.

Papalaua Street Extension

Extend Papalaua Street eastward to connect with the KSE and provide accesses to the bifurcated Pioneer Mill Site 1 and Site 2. See **Figure 16**.

Honoapiilani Highway/Papalaua Street

Westbound Approach: Widen to provide a dedicated left-turn lane, a dedicated through lane, and a dedicated right-turn lane; provide two (2) receiving lanes in the eastbound direction. This will require ROW acquisition. Refer to **Figure 16**.

Honoapiilani Highway/Lahainaluna Road

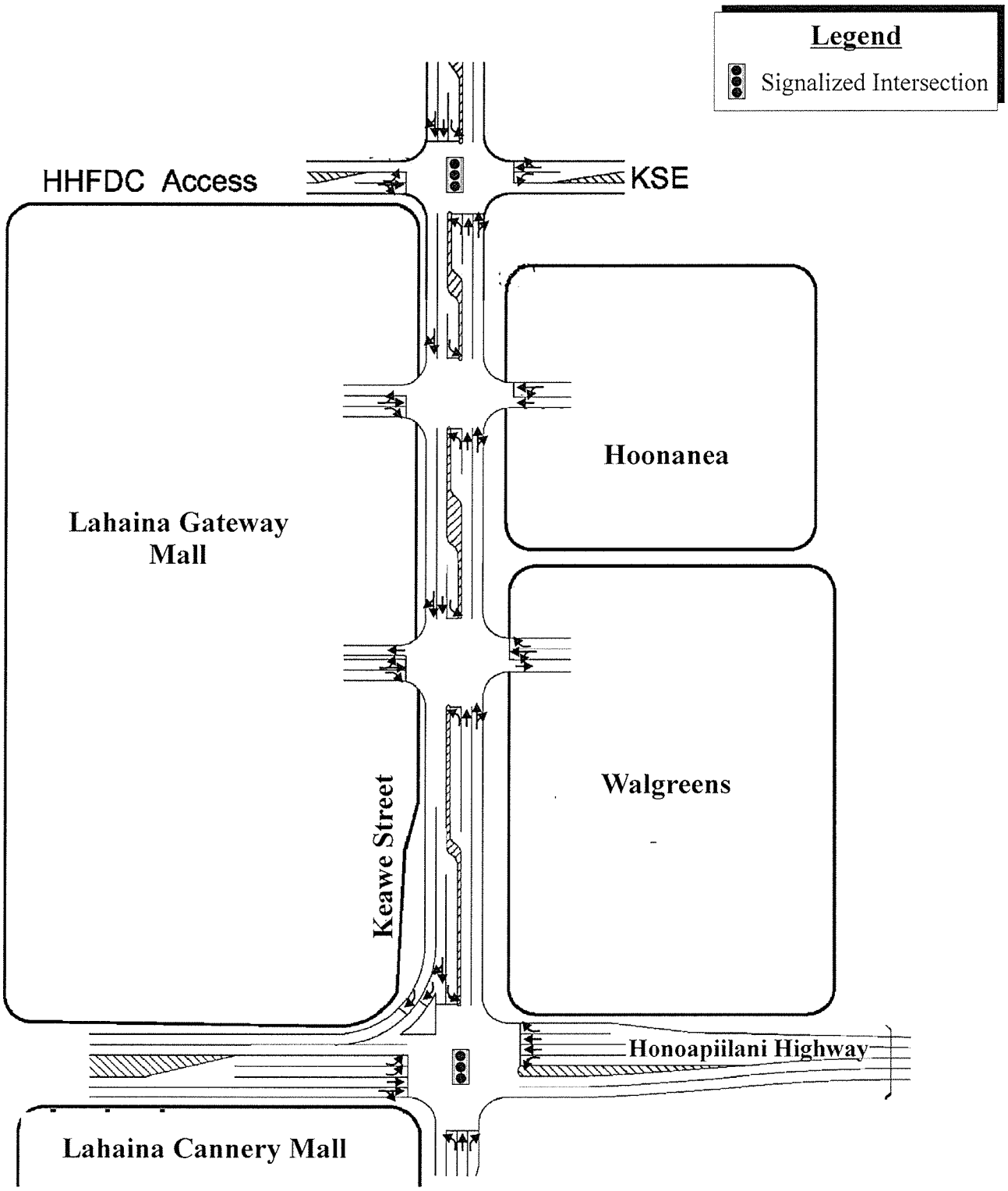
Westbound Approach: Lengthen the westbound left-turn and right-turn lanes and provide two (2) eastbound lanes on Lahainaluna Road mauka of Honoapiilani Highway. This will require ROW acquisition. Refer to **Figure 16**.

Honoapiilani Highway/Aholo Road

Extend Aholo Road to connect with the KSE and restrict Aholo Road access to right-in/right-out from and onto Honoapiilani Highway due to provision of signalized access via Front Street and heavier conflicting volume along Honoapiilani Highway. See **Figure 17**.

Honoapiilani Highway/Front Street

Honoapiilani Highway: Widen to four (4) lanes between Aholo Road and Front Street including a transition to the existing two (2) lanes south of the intersection.



Source: Austin, Tsutsumi & Associates, Inc.

Figure 15 Kuhua Street Extension and Improvement Project

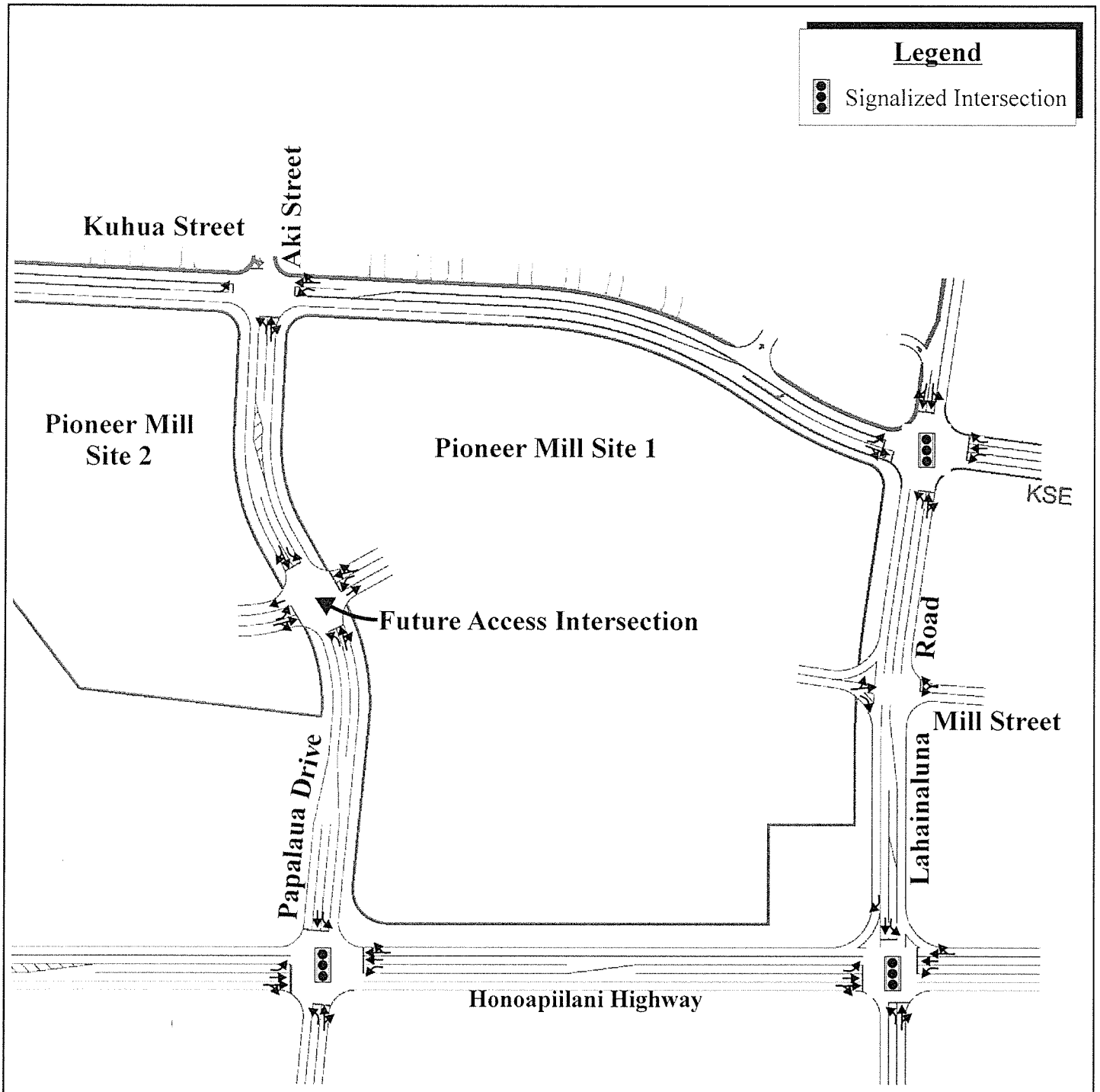
Keawe Street Configuration

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: County of Maui, Department of Public Works

KLMC/MillStreet/Keawe St Configuration



Source: Austin, Tsutsumi & Associates, Inc.

Figure 16 Kuhua Street Extension and Improvement Project

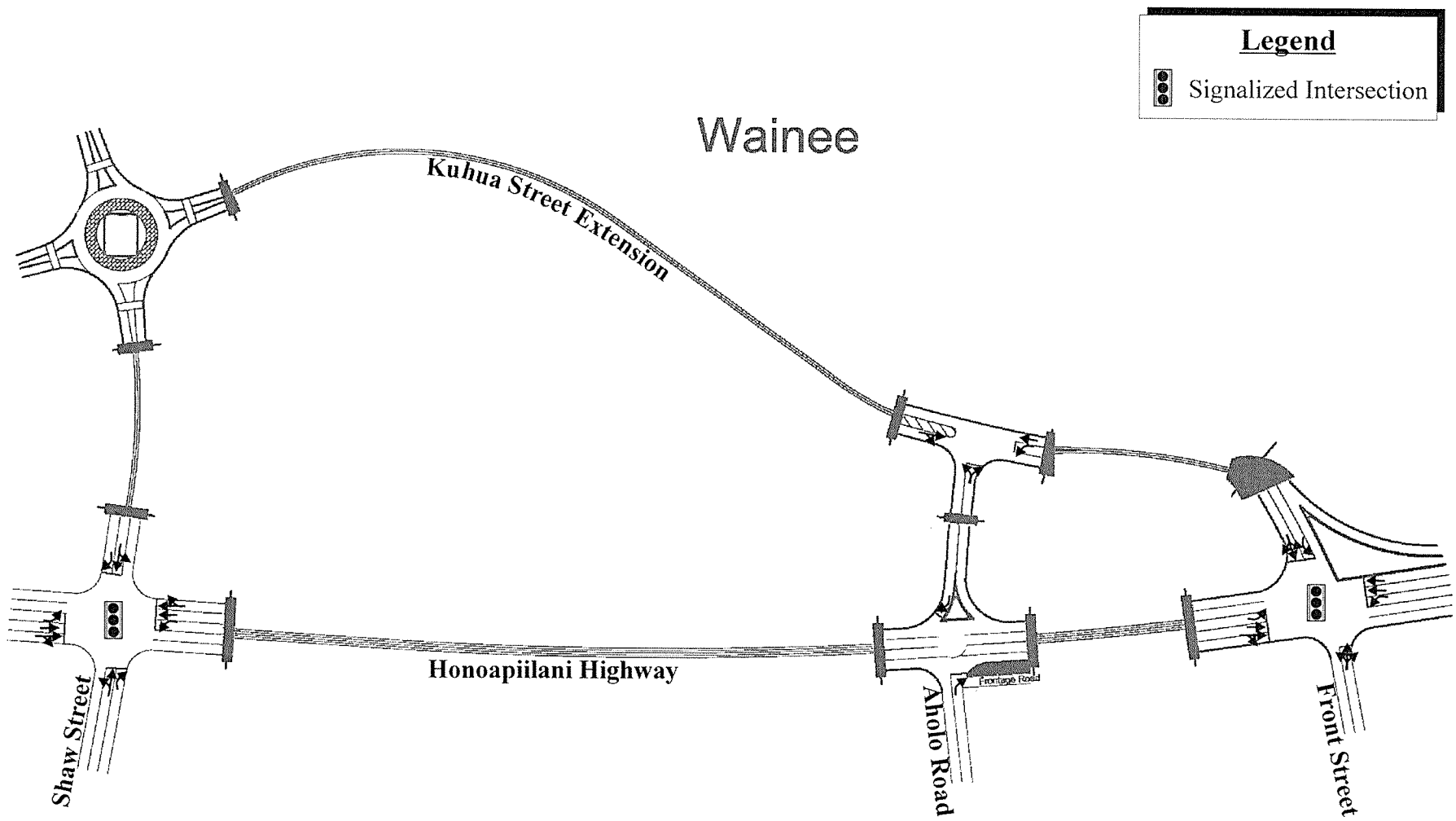
Papalaua Street and Lahainaluna Road Configuration

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: County of Maui, Department of Public Works

KLMC/MillStreet/papalaua config



Source: Austin, Tsutsumi & Associates, Inc.

Figure 17 Kuhua Street Extension and Improvement Project

Shaw Street Through Front Street Configuration

NOT TO SCALE

Prepared for: County of Maui, Department of Public Works

MUNEKIYO & HIRAGA, INC.

Klmc\millstreet\Shaw St Config

Northbound Approach: Construct a dedicated right-turn deceleration lane. This will require ROW acquisition.

Westbound Approach: Construct a dedicated westbound left-turn lane and a shared left-turn/through/right-turn lane. This will require ROW acquisition.

Traffic Signal Warrant: A traffic signal is recommended at this intersection. Refer to **Figure 17**.

KSE Intersections

Provide two (2) lanes with median left-turn lanes at its intersections. It is recommended that all intersections along the KSE be two-way stop controlled, with the following exceptions:

- Keawe Street/HHFDC Access/KSE – Signalize and design so vehicle stacking does not obstruct the path of the LKPR Sugar Cane Train
- Lahainaluna Road/KSE – Signalize
- Shaw Street/KSE – Roundabout feasibility and impacts of a roundabout will be considered
- Honoapiilani Highway/KSE/Front Street - Signalize

Roundabouts and Traffic Calming Measures

A roundabout is being considered at the Shaw Street/KSE intersection as a means of calming traffic near the Lahaina Recreation Center and Lahaina Aquatic Center. Refer to **Figure 17**. Roundabouts were not considered at the other intersections due to the following reasons:

- Relatively light minor movement volume
- Potential for queue spillback from neighboring intersections or parking lot operations
- Limited right-of-way

During the civil design phase of the project speed limits will be determined which will consider the recommended limits in the Acoustic Study. Also, to address residents' concerns regarding the potential for speeding along the KSE, the following traffic calming measures will be considered:

- Narrower Lanes – While maintaining the existing 34-foot pavement width, stripe the travel lanes to be 10 feet wide in either direction, with 14-foot left-turn/median lane.

- Bulbouts – Raised curbs to physically narrow the travel widths at key locations.

- Passive Speed Control Monitoring Devices – Devices installed to monitor speed, police would be notified when speeding occurs.

The KSE and Improvement project will provide a new north-south two-lane roadway with median turning lanes at its intersection. Whereas the LBR will improve regional mobility, the KSE and Improvement project will improve localized access for circulation within the Lahaina community, while also improving accessibility for pedestrians and bicyclists.

2. Wastewater Systems

a. Existing Conditions

The Department of Environmental Management's (DEM) Wastewater Reclamation Division provides sanitary sewer service for the West Maui region.

Wastewater from the Kaanapali and Lahaina areas is treated at the County's Lahaina Wastewater Reclamation Facility (LWWRF) located approximately five (5) miles north of the project area on the mauka side of Honoapiilani Highway.

According to the County's Wastewater Reclamation Division, the current LWWRF is capable of treating approximately 7.0 million gallons per day (mgd) while the rated regulatory capacity is 9.0 MG since a section of the WWRF is not in service. Stage 1A upgrade improvements (including new

step screens in the headworks, refurbishing of the headworks channel, and the installation of new bio-reactor return pumps) have been recently completed.

There are existing 8-inch sewerlines along Keawe Street, Lahainaluna Road, Dickenson Street, Shaw Street, Aholo Road, and Front Street. Sewerlines (from 10-inch to 27-inch diameter) exist along portions of Honoapiilani Highway. An existing 8-inch collector sewerline along Kuhua Street serves the existing Kuhua Tract Subdivision residences along the easterly (mauka) side of Kuhua Street and continues downstream through the former Pioneer Mill site and then down Papalaua Street to Front Street. From there the wastewater is conveyed north along Front Street, routed east along the south edge of the Kahoma Stream Flood Control Channel along a 14-inch force main that connects to a 27-inch gravity sewerline that runs north along Honoapiilani Highway and eventually connects to the LWWRF.

b. Potential Impacts and Proposed Mitigation Measures

A Preliminary Engineering Report (PER) has been completed for the proposed project by Warren S. Unemori Engineering, Inc. Refer to **Appendix "B"**. Wherever practicable, to minimize the disruption to the community and traffic, sewerlines are expected to be installed in conjunction with the construction of the KSE and Improvement project in coordination with adjacent planned developments. However, the KSE and Improvement project in itself (excluding any existing or proposed adjoining developments), is not expected to generate any additional wastewater demand and is not anticipated to adversely impact the County wastewater system.

3. Water

a. Existing Conditions

The West Maui region is served by the County's Department of Water Supply domestic water system. The County West Maui water system services the coastal areas from Launiupoko to Kaanapali and from Honokowai to Napili. The County's system includes both surface and groundwater sources.

The sources of water for Lahaina are four (4) deepwells located above Alaeloa and referred to as Napili Wells 1, 2, and 3 and Honokohau Well A. These wells are supplemented by water treatment plants above Honokowai

and Lahainaluna High School that draws surface water from the Honolua Ditch and Kanaha Valley. Several miles of 12- and 16-inch lines and two (2) in-line booster stations convey water from these sources to consumers in Lahaina. Storage is provided by a 1.5 million gallon (MG) storage tank above Wahikuli and a 1.0 MG and a 0.5 MG tank on Lahainaluna Road.

Eight-inch and 12-inch transmission waterlines exist along portions of Honoapiilani Highway. A 12-inch waterline was recently installed along Keawe Street (from Honoapiilani Highway to just above the existing LKPR Sugar Cane Train tracks). Existing 8-inch waterlines are also located along Lahainaluna Road, Shaw Street, Aholo Road, and Front Street.

b. <u>Potential Impacts and Proposed Mitigation Measures</u>

According to the PER, wherever practicable, to minimize the disruption to the community and traffic, waterlines are expected to be installed in conjunction with the construction of the KSE in coordination with adjacent planned developments. However, the KSE and improvement project in itself (excluding any existing or proposed adjoining developments), is not expected to generate any additional water demand, except for the incidental water necessary for landscaping irrigation. The KSE is not anticipated to adversely impact the County water system.

Regarding measures to reduce the use of potable water for non-potable use, the DPW will explore the availability of non-drinking water sources in the region and opportunities to utilize suitable non-potable or recycled water for irrigation, where appropriate, in consultation with the DEM staff during the civil design phase of the project.

The information on "Maui County Planting Plan – Plant Zone 3" from the Department of Water Supply, will be utilized, as applicable, to select and place plants in landscaping, which will also help to conserve water and protect the watershed from degradation.

4. Drainage

a. Existing Conditions

The project area is largely undeveloped, at present, and is vegetated by grasses, weeds, shrubs, and trees. The property gently slopes in a westerly direction and varies in elevation from approximately 14 feet amsl to approximately 52 feet amsl.

The proposed project is situated within the limits of the approximately 5,250-acre Lahaina Watershed which is made up of three (3) subwatersheds and includes both Kahoma Stream and Kauaula Stream. The Lahaina subwatershed covers an area of approximately 2,140 acres; the Kauaula subwatershed covers an area of approximately 2,780 acres; and the subwatershed draining into the second channel where it crosses under Honoapiilani Highway and into the ocean covers an area of approximately 330 acres (USDA and DPWEM, 2003).

The proposed project is located in the Lahaina subwatershed which rises from the Pacific Ocean to an elevation of approximately 2,561 feet amsl. The coastal area of the subwatershed is relatively flat and has been developed for residential and commercial uses. The area above the developed flatland is gently sloping to about the 1,400 feet elevation and was formerly utilized for growing sugarcane. The remaining upper area of the Lahaina subwatershed is steep, rising to an elevation of approximately 2,561 feet amsl and was previously utilized for sugarcane cultivation or pasturing. There are no streams or large well- defined drainageways in the Lahaina subwatershed (USDA and DPWEM, 2003).

Runoff generated in the former sugarcane fields above Lahaina town is conveyed by numerous small gullies through the former sugarcane fields and cane haul roads, through undersized culverts in Honoapiilani Highway, and into Lahaina town where it drains into the ocean or ponds in low spots and dissipates through infiltration or evaporation. The storm drainage system within Lahaina town consists of short, limited capacity culverts which outlet into the ocean.

The existing Natural Resource Conservation Service (NRCS) diversion channel and detention basin are located above (mauka) the proposed roadway alignment between the Dickenson Street Extension and Shaw Street. The drainage area above the proposed project from Lahainaluna Road to south of Kauaula Stream will be improved by the Lahaina Watershed Flood Control (LWFC) Channel Project. Refer to **Figure 2**. Completion of the flood control improvements will minimize flooding within the coastal low-lying areas of Lahaina Town.

A Preliminary Drainage Report (PDR) was prepared by Warren S. Unemori Engineering, Inc. and included as an appendix in the Preliminary Engineering Synopsis. (See Appendix B in **Appendix "B"** of the Draft EA) According to the report, based on a 50-year, one (1) hour storm event, a total of approximately 27.5 cubic feet per second (cfs) of onsite surface runoff is currently generated by the linear project site. The existing runoff from the project site and adjacent areas generally sheet flow in a westerly (makai) direction towards Honoapiilani Highway.

The existing stormwater runoff is identified in the following three (3) roadway sections:

Section 1 - Keawe Street to Kahoma Channel: Approximately 3.7 cfs of offsite runoff from the mauka Lahaina Business Park currently sheet flows in a westerly direction through the project site. The onsite runoff from this section of the project site is approximately 0.8 cfs which sheet flows westward toward an existing berm and is conveyed toward Keawe Street. The total existing runoff is approximately 4.5 cfs.

Section 2 – Kahoma Channel to Lahainaluna Road: The existing Kuhua Street Subdivision mauka of the project site contains no drainage system and currently approximately 108.1 cfs of offsite runoff from the entire area sheet flows downstream across Kuhua Street into the Pioneer Mill site where it ponds in an existing sump and potentially overflows onto Honoapiilani Highway. The onsite runoff from this section of the project site is approximately 9.3 cfs. The total existing runoff is approximately 117.4 cfs.

Existing offsite runoff from the mauka Kelawea and Kelawea Mauka Subdivisions sheet flows onto and down Lahainaluna Road, across Honoapiilani Highway and continues down Lahainaluna Road.

Section 3 – Lahainaluna Road to Honoapiilani Highway/Front Street Intersection: Phase 1B1 of the LBR project is expected to be constructed prior to the proposed KSE. Refer to **Figure 2**. According to the PDR for Phase 1B1 after the highway is constructed, the runoff discharge from culverts beneath the highway will range from approximately 27 to 3,174 cfs based on a 50-year recurrence interval storm.

Also being constructed is the LWFC Channel, which is located approximately 700 feet mauka (east) of the KSE. Refer to **Figure 2**. This diversion channel will run roughly parallel to the KSE and is designed to handle a 100-year storm event. The LWFC Channel is expected to handle the runoff mauka of the channel and is expected to be completed prior to the construction of this section of the proposed KSE.

Approximately 400 feet mauka of the proposed KSE is an existing Interim NRCS Diversion Channel constructed by the West Maui Soil and Water Conservation District. This interim drainage facility consists of diversion berms and two (2) detention basins. The berms and basins have limited capacity and overflow flows downstream to the existing Mill Street. The proposed alignment of the KSE runs through the western portion of the basins. The interim basins will be abandoned once the LWFC Channel improvements are completed and prior to the anticipated construction of this section of the KSE.

The offsite runoff from this section of the roadway is approximately 87.6 cfs while the onsite runoff is approximately 18.7 cfs based on a 50-year recurrence interval, 1-hour duration storm. Total runoff is approximately 106.3 cfs.

b. <u>Potential Impacts and Proposed Mitigation Measures</u>

According to the PDR, the total onsite surface runoff to be generated by the project site, including the connecting roadway extensions, would be approximately 69.7 cfs, a potential increase of approximately 42.2 cfs.

However, a combination of drywells, offsite detention basins and subsurface detention systems will be implemented to limit the onsite runoff being discharged to pre-development levels. Based on a 50-year recurrence interval, there will be no net increase in onsite surface runoff. (Refer to Appendix B in **Appendix "B"** of the Draft EA.)

The following improvements are proposed for the three (3) sections of the KSE:

Section 1 - Keawe Street to Kahoma Channel: The approximate 3.7 cfs of offsite runoff will be captured by new curb inlet catch basins located along the KSE and will be discharged into the existing Keawe Street drainage system, as it is presently doing via a new underground drainage system. Approximately 3.9 cfs of runoff is estimated to be generated by this section of the KSE. The approximately 3.1 cfs increase in potential runoff will be handled by approximately three (3) new drywells to be located near the KSE terminus at Keawe Street. A portion of the current runoff will continue to flow downstream into the Keawe Street drainage system at a rate no greater than pre-development conditions.

Section 2 – Kahoma Channel to Lahainaluna Road: The runoff estimated to be generated by this section of the roadway is approximately 24.0 cfs, an estimated increase of approximately 14.7 cfs of runoff from pre-development conditions. To handle the increased runoff, new drainage system improvements proposed for this section of the roadway include new curb and gutters, intercepted by curb-inlet type catch basins conveyed to new drywells and subsurface drainage systems through underground pipes, such that the runoff discharging downstream is no greater than the pre-development conditions.

The potential increase in onsite runoff is proposed to be collected and conveyed to a new subsurface drainage system. This subsurface drainage system will then release runoff to a new drainage system beneath Lahainaluna Road at a rate no greater than pre-development conditions. The potential increase in onsite runoff generated by the improvements is proposed to be mitigated by a total of approximately 450 ft. of new subsurface drainage systems, and the existing runoff will be released toward Kahoma Stream Flood Control Channel (KSFC). The increase in runoff generated by the

improvements on Lahainaluna Road will be mitigated by approximately six (6) new drywells beneath Lahainaluna Road. The potential increase in runoff generated by the improvements along Papalaua Street will be mitigated by approximately two (2) new dry wells and an approximately 200 ft. long subsurface drainage system.

Pursuant to the "Lahaina Town Drainage Master Plan", the long-term mitigation plan for this area was originally envisioned to install a 10-ft. by 6-ft. box culvert down Lahainaluna Road to convey the mauka runoff to the ocean. However, Lahainaluna Road is a very narrow roadway within a 30-ft. wide right-of-way, and is typically encumbered by a congestion of existing underground utilities and numerous older commercial buildings that were built right up to the right-of-way. At the time the "Lahaina Town Drainage Master Plan" was originally developed, the KSE project was not yet envisioned and potential drainage solutions were constrained by the then existing Pioneer Mill. Since then Pioneer Mill has ceased operation and been demolished and, with the proposed construction of KSE and its proposed system of drain inlets and underground drainage system, the preferred drainage plan will be to intercept the runoff from the old Kuhua Tract Subdivision currently sheet flowing onto the project site and convey it to the KSFC Channel.

Based on a 50-year recurrence interval, 1-hour duration storm, the offsite surface runoff consists of approximately 108.1 cfs, primarily from the existing Kuhua Tract Subdivision. In an effort to alleviate the existing overburdened drainage systems makai of Kuhua Street (including but not limited to the existing drainage systems beneath Honoapiilani Highway, Papalaua Street, and Lahainaluna Road) and help mitigate some of the flooding issues in Lahaina town, approximately 132 cfs of stormwater is proposed to be conveyed to the KSFC Channel via a new underground drainline that will run through the Pioneer Mill site and discharge immediately downstream (makai) of the existing Kahoma Uka Bridge. The KSE, a portion of the Papalaua Street Extension, and their adjoining fringe areas will be handled by this drainage system and conveyed to the KSFC Channel.

According to the PDR, given the relationship of the drainage characteristics of the relatively small tributary area for this conveyed runoff compared to the

large watershed for the KSFC Channel, the respective peak flows are not expected to coincide. Therefore, the proposed conveyance is not expected to adversely impact the hydrologic and hydraulic characteristics of the KSFC Channel.

A secondary, less desirable, alternate drainage plan is to convey the runoff in this area through a new drainage system down Papalaua Street (in lieu of Lahainaluna Road) and outlet to the ocean. This will consist of either replacing and upsizing the existing double pipe drainline with a new culvert or installing an additional box culvert adjacent to the existing double-pipe drainline generally consistent with the proposed long-term mitigation plan noted in the "Lahaina Town Drainage Master Plan".

The existing offsite runoff from the remainder of the Kelawea and Kelawea Mauka Subdivisions (refer to **Figure 1**) will continue to be released downstream onto and down Lahainaluna Road where it crosses Honoapiilani Highway and continues on down Lahainaluna Road as it is presently doing. The increase in runoff generated by the Lahainaluna Road widening and improvements will be mitigated by drywells and subsurface drain. Additional dry wells may be installed based on the actual capacity determined from field permeability tests. A portion of the existing 30-inch drainline that cuts through the southeastern corner of Pioneer Mill site from the Paunau Subdivision (refer to **Figure 1**) will need to be relocated to run beneath Lahainaluna Road and Honoapiilani Highway, where it will reconnect to the existing drainline beneath the highway. Please note that no additional runoff is expected to be added to the relocated drainline.

It is our understanding that the future Kahoma Residential Subdivision, located east (mauka) of the KSE and immediately north of the existing Old Kuhua Tract and Kelawea subdivisions, will detain their additional runoff onsite through a detention basin that will have an emergency overflow into the Kahoma Stream Flood Control Channel upstream (mauka) of the existing Kahoma-Uka Bridge. Therefore, in accordance with the County drainage standards, this development should not adversely affect the KSE project.

Section 3 –Lahainaluna Road to Front Street: Offsite runoff for this section of the roadway will be from the areas makai of the future LWFC Channel and is estimated to be approximately 87.6 cfs. This offsite runoff

will be allowed to pass through the KSE, via multiple underground culverts located beneath the roadway, and continue to sheet flow downstream. The onsite surface runoff that could potentially be generated from this section of the roadway is estimated as approximately 44.2 cfs. This potential increase of 25.2 cfs in surface runoff is proposed to be mitigated by three (3) new detention basins, totaling approximately 2.75 acre-feet in storage volume and a new approximately 250 feet long subsurface drainage system. To the extent feasible, the drainage basins will be coordinated with the proposed adjacent Wainee Village project.

The increase in runoff due to improvements to Shaw Street will be mitigated by approximately four (4) new drywells and any remaining capacity within the existing subsurface drainage system previously installed by the Na Hale O Wainee project. Increased runoff from improvements to Dickenson Street will be mitigated by approximately four (4) new drywells and the increase in runoff generated by improvements to Aholo Road will be mitigated by approximately two (2) new drywells.

On November 9, 2012 the County of Maui Department of Public Works (DPW) adopted *Rules for the Design of Storm Water Treatment Best Management Practices*. In accordance with the DPW's *Rules for the Design of Storm Drainage Facilities* and *Rules for the Design of Storm Water Treatment Best Management Practices*, all drainage improvements will comply with the foregoing drainage rules. Further, a stormwater quality management plan (with design details identifying feasible Low Impact Development features incorporated into the final site design) will be prepared and submitted in conjunction with the detailed design development for the project.

During construction, the following BMPs will be considered for erosion and sediment control:

- Construction of temporary sedimentation basins to minimize the quantity of sediment leaving the site
- Staging construction
- Protection of natural vegetation

- Stockpiling topsoil, and covering or stabilizing of the soil stockpiles
- Using wind erosion control measures
- Intercepting runoff above disturbed slopes
- Constructing of benches, terraces, or ditches at regular intervals to intercept runoff on long or man-made slopes
- Providing linings or other methods to prevent erosion of storm channels
- Using seeding and fertilizing or other soil erosion control measures
- Providing vehicle wheel wash-down facilities
- Using stabilized construction entrances
- Using vegetated filter strips

Greater detail of the design information for the proposed drainage and erosion control plan will be provided when the project progresses to the engineering design phase of development.

The USFWS, in its early consultation, recommended additional BMPs to minimize degradation of water quality and impacts to fish and wildlife resources. The DPW, during the design phase, will consider the following recommended BMPs:

- *Turbidity and siltation from project-related work should be minimized and contained within the vicinity of the site through the appropriate use of effective silt containment devices and the curtailment of works during adverse weather conditions.*
- *No project-related materials (fill, revetment rock, pipe, etc.) should be stockpiled in the water (stream channels, wetlands, etc.).*
- *No contamination (trash or debris disposal, alien species introductions, etc.) of adjacent aquatic environments (stream channels, wetlands, etc.) should result from project-related activities.*
- *Fueling of project-related vehicles and equipment should take place away from the water and a contingency plan to control petroleum*

products accidentally spilled during the project should be developed. Absorbent pads and containment booms shall be stored onsite, if appropriate, to facilitate the clean-up of accidental petroleum releases.

- *Any under-layer fills used in the project should be protected from erosion with (rock, core-loc units, etc.) as soon after placement as practicable.*

- *Any soil exposed near water as part of the project should be protected from erosion (with plastic sheeting, filter fabric, etc.) after exposure and stabilized as soon as practicable (with vegetation matting, hydroseeding, etc.).*

In summary, despite the increase in impervious surfaces, such as paved roadways and concrete walkways, storm runoff to downstream properties from the project area will not increase above pre-development levels due to construction of drywells, new subsurface drainage storage systems and new detention basins. Further, BMPs, such as construction sedimentation basins and the implementation of soil erosion control measures will reduce the potential for sediments contained in the runoff from entering the ocean. As a result, the proposed project is not anticipated to result in any significant drainage impacts to downstream properties.

5. Electrical, Telephone, and CATV Service

a. Existing Conditions

Electrical, telephone, and cable television (CATV) services for the West Maui region are provided by Maui Electric Company, Ltd. (MECO), Hawaiian Telcom, and Oceanic Time Warner Cable Company, respectively.

b. Potential Impacts and Proposed Mitigation Measures

The applicant has been in early consultation with MECO to provide services for the proposed project. MECO did not note significant issues in providing service, considering they already serve the adjacent developed areas. The applicant will consult with MECO, Hawaiian Telcom and Oceanic Time Warner Cable Company during the design phase of the project to ensure there are no adverse impacts to electrical, telephone, or CATV services.

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. Secondary impacts, on the other hand, 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 drainage projects, for example, can occur because they can induce development by removing one of the impediments to growth.

The construction of the KSE and Improvement project will improve the north-south corridor capacity between Keawe Street and Front Street. As identified in the Maui Island Plan (MIP) and the Proposed Roadway Development Program, prepared by the Maui Planning Department for the MIP, the KSE and Improvement project will improve access to the surrounding vacant lands identified for future growth in the Urban Growth Boundary for West Maui, such as the Kahoma Residential, Pioneer Mill site, and Wainee Village Residential. Improved access in the area coordinated with the construction of the LBR and LWFC Channel project will remove two (2) of the impediments to growth (transportation and drainage) in the Lahaina Town area. These projects are dependent on the availability of public funding sources or opportunities for public-private partnerships. The lack of known funding will delay completion of these improvements which are anticipated to take several years. For the KSE and Improvement project, funding is currently available only to prepare studies and designs for the project.

In the context of the County of Maui's General Plan, the MIP establishes urban and rural growth boundaries defining future development potential in the Lahaina region. The MIP directed growth map for Lahaina Town includes future urbanization of the agricultural lands for Wainee Village Residential west (makai) of the LWFC Channel project and north of Kauaula Stream. The KSE will provide future access to this area as part of the directed growth strategy of the MIP. The existing vacant lands along the KSE roadway corridor provide an opportunity for the DPW to master plan the roadway alignment and connections to the existing roadway system.

Planning for such areas would need to consider land planning integration opportunities. With the completion of the General Plan Update, the respective community plans, including the West Maui Community Plan, will be updated. Although, the timeframe for the overall completion of updating the community plans has not yet been established. The Maui County

Council has established a preliminary order for the updates. The West Maui Community Plan is proposed to be the next plan to be updated after the Lanai Community Plan and Molokai Community Plan updates. The overall timeframe for the General Plan covers a planning horizon up to the year 2030. The DPW acknowledges the possibility that future regional growth opportunities in surrounding lands in the Lahaina region may be possible. Specifically, the proposed roadway provides opportunity for connection to areas beyond the corridor itself into future growth areas, to the east of the project area.

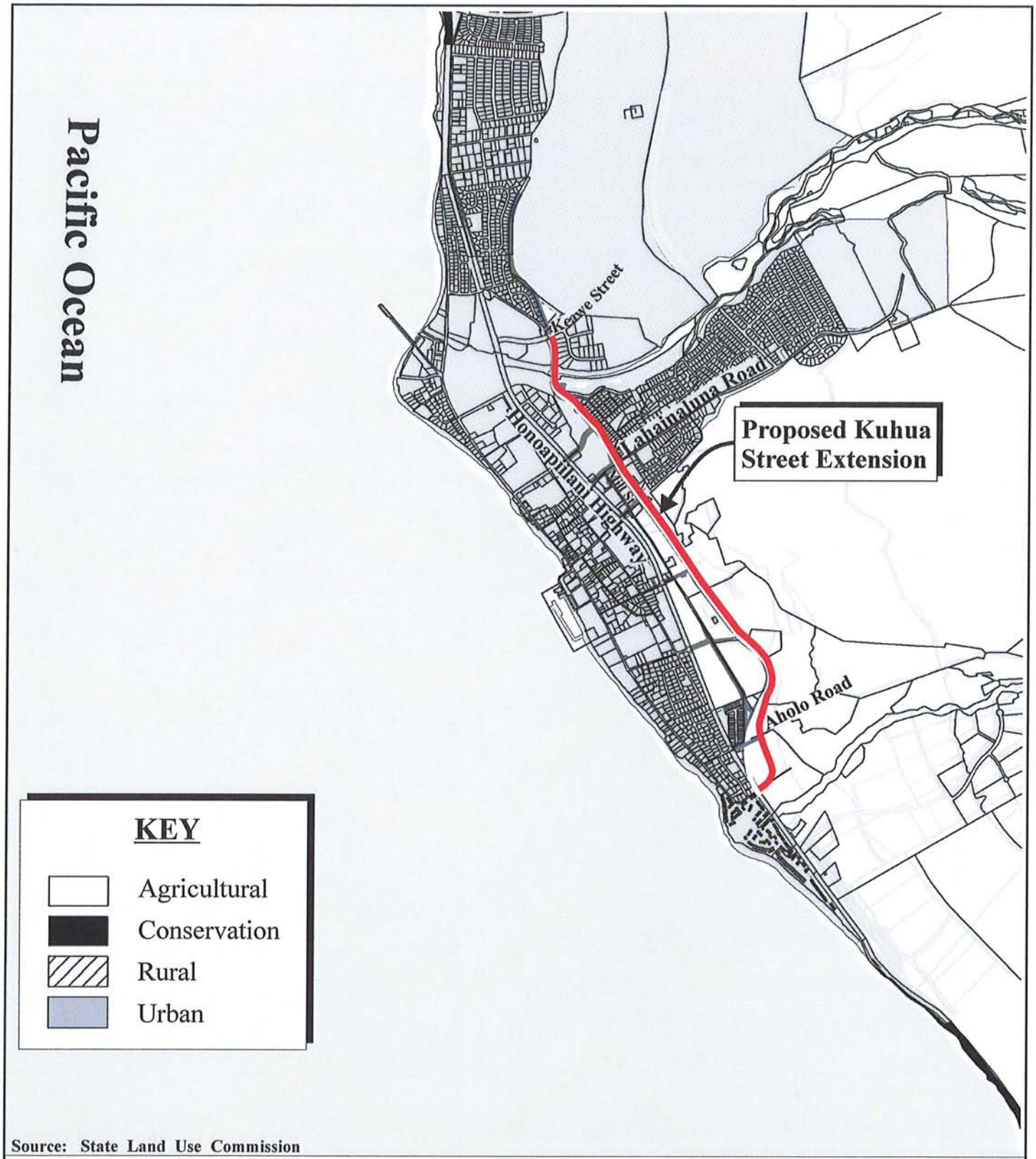
IV. RELATIONSHIP TO GOVERNMENT PLANS, POLICIES, AND CONTROLS

IV. RELATIONSHIP TO GOVERNMENT PLANS, POLICIES, AND CONTROLS

A. STATE LAND USE DISTRICTS

Chapter 205, Hawaii Revised Statutes (HRS), relating to the Land Use Commission, establishes four (4) major land use districts in which all lands in the State are placed. These districts are designated as "Urban", "Rural", "Agricultural", and "Conservation". The project area is located within lands designated as "Agricultural" and "Urban" districts. See **Figure 18**.

The following **Table 6** identifies the State Land Use designations of the affected properties within the KSE roadway corridor. Refer to **Figure 5**.



Source: State Land Use Commission

Figure 18 Kuhua Street Extension and Improvement Project

State Land Use District Classifications Map

NOT TO SCALE

Prepared for: County of Maui, Department of Public Works

MUNEKIYO & HIRAGA, INC.

KLMC/MillStreet/SLUD

Table 6. State Land Use Designations of Affected Properties in KSE Roadway Corridor

Reference No.	Tax Map Keys	State Land Use District
1	(2)4-5-024 (Kuhua Street)	Urban
2	(2)4-5-025 (Kuhua Street)	Urban
3	(2)4-5-009:007 (Old Mill Site)	Urban
4	(2)4-5-010:005	Agricultural
5	(2)4-5-010:006 (Old Kahoma Stream)	Agricultural
6	(2)4-5-010:008 (Kahoma Stream Channel)	Agricultural
7	(2)4-5-010:034	Urban
8	(2)4-5-011:007 (Kahoma Stream Channel)	Urban
9	(2)4-5-024:068	Urban
10	(2)4-6-013:001	Agricultural
11	(2)4-6-013:006	Agricultural
12	(2)4-6-014:001	Agricultural
13	(2)4-6-015:001	Agricultural
14	(2)4-6-015:004 (Lahaina Recreation Center)	Agricultural
15	(2)4-6-016:004	Agricultural
16	(2)4-6-016:005	Urban
17	(2)4-6-016:039	Agricultural
Source: Maui Planning Department		

Roadway and related improvements are permitted uses within both the "Agricultural" and "Urban" land use designations.

B. HAWAII STATE PLAN

Chapter 226, HRS, also known as the Hawaii 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. Examples of State objectives and policies relevant to the proposed project are as follows:

Section 226-14 Objective and policies for facility systems--in general. In planning for the State's facility systems it is the State objective to direct it towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives. To meet this objective, it shall be the State's policy to:

a. Accommodate the needs of Hawaii's people through coordination of facility systems and capital improvement priorities in consonance with state and county plans.

b. Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.

c. Ensure that required facility systems can be supported within resource capacities and at reasonable cost to the user.

Section 226-17 Objectives and policies for facility systems--transportation. It is the State's objective for an integrated multi-modal transportation system that services statewide needs and promotes the efficient, economical, safe, and convenient movement of people and goods. To meet this objective, it shall be the State's policy to:

a. Design, program, and develop a multi-modal system in conformance with desired growth and physical development as stated in this chapter.

b. Encourage a reasonable distribution of financial responsibilities for transportation among participating government and private parties.

c. Encourage transportation systems that serve to accommodate present and future development needs of communities.

d. Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawaii's natural environment.

e. Encourage safe and convenient use of low-cost, energy-efficient, non-polluting means of transportation.

The State Functional Plans define actions for implementation of the Hawaii State Plan through the identification of needs, problems and issues, and recommendations on policies and priority actions which address the identified areas of concern. The proposed project is consistent with the following State Functional Plans:

1. State Transportation Functional Plan

The Hawaii State Plan addresses the vital role of transportation, particularly in light of population increases and community growth. The State Functional Plan for transportation calls for a statewide transportation system consistent with planned growth objectives throughout the State. The proposed KSE and Improvement Project will be developed to be consistent with the objectives of the State Transportation Functional Plan.

2. State Historic Preservation Functional Plan

The State Historic Preservation Functional Plan deals with the preservation of historic properties, the collection and preservation of historic records, artifacts and oral histories, and the provision of public information and education on the ethnic and cultural heritages and history of Hawaii. An Archaeological Inventory Survey report has been completed for the project by Cultural Surveys Hawaii, Inc. in compliance with applicable historic preservation requirements. Refer to **Appendix "D"**. The proposed project is, therefore, consistent with the objectives outlined under the State Historic Preservation Functional Plan.

C. 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 within the county; shall address the unique problems and needs of each island and region within the county; shall explain the 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, 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 effective March 24, 2010, while the Maui Island Plan (MIP), which

delineates areas for further urban and rural growth as part of a Directed Growth Strategy, was adopted as Ordinance No. 4004 effective December 28, 2012.

The following sections identify pertinent objectives, policies, implementing actions and related provisions set forth in the Countywide Policy Plan and the MIP. It is recognized that both documents are comprehensive in nature and address a number of functional planning areas which apply to all programs, plans, and projects. However, for purposes of addressing General Plan compliance requirements, policy considerations which are deemed most relevant in terms of compatibility and consistency are addressed in this report section.

1. Countywide Policy Plan

With regard to the Countywide Policy Plan, Section 2.80B.030 of the Maui County Code 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 KSE and Improvement Project, the following goals, objectives, policies and implementing actions are illustrative of the project's compliance with the Countywide Policy Plan:

Diversify Transportation Options

Goal: *Maui County will have an efficient, economical, and environmentally sensitive means of moving people and goods.*

Objective: *Provide an effective, affordable, and convenient ground-transportation system that is environmentally sustainable.*

Policies: Execute planning strategies to reduce traffic congestion.

Plan for the efficient relocation of roadways for the public benefit.

Support the use of alternative roadway designs, such as traffic-calming techniques and modern roundabouts.

Increase route and mode options in the ground-transportation network.

Ensure that roadway systems are safe, efficient, and maintained in good condition.

Preserve roadway corridors that have historic, scenic, or unique physical attributes that enhance the character and scenic resources of communities.

Design new roads and roadway improvements to retain and enhance the existing character and scenic resources of the communities through which they pass.

Develop and expand an attractive, island-appropriate, and efficient public transportation system.

Objective: *Reduce the reliance on the automobile and fossil fuels by encouraging walking, bicycling, and other energy-efficient and safe alternative modes of transportation.*

Policies: *Make walking and bicycling transportation safe and easy between and within communities.*

Design new and retrofit existing rights-of-way with adequate sidewalks, bicycle lanes, or separated multi-use transit corridors.

Objective: *Improve and expand the planning and management of transportation systems.*

In summary, the KSE and Improvement 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 2.80B, 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. As such, the implementation program component of the MIP will require adoption prior to December 28, 2013.

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 urban growth boundaries (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.

The proposed KSE and Improvement project is located within the UGB for the West Maui region. In this regard, KSE and Improvement project is consistent with the directed growth strategy defined via growth maps adopted in the MIP.

In addition, the proposed KSE and Improvement 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:

1. **Population**

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

2. **Heritage Resources**

Cultural, Historical, and Archaeological Resources Issues

Goal: *Our community respects and protects archaeological and cultural resources while perpetuating diverse cultural identities and traditions.*

Policy: *Ensure traditional public access routes, including native Hawaiian trails, are maintained for public use.*

Ensure that cultural, historic, and archaeological resources are protected for the benefit of present and future generations.

Watersheds, Streams and Wetlands Issues

Objective: *Decreased NPS and point source pollution.*

Policies: *Enforce water pollution related standards and codes.*

Support the use of LID Techniques such as those described in the State of Hawaii LID Practitioner's Guide (June 2006), as amended.

Objective: *Greater preservation of native flora and fauna biodiversity to protect native species.*

Wildlife and Natural Area Issues

Goal: *Maui's natural areas and indigenous flora and fauna will be protected.*

Policies: *Identify and inventory the following:*

(1) Natural, recreational, and open space resources;
(2) Flora and fauna with medium, high, and very high concentrations of threatened or endangered species; and
(3) Location and extent of invasive species.

Require flora and fauna assessment and protection plans for development in areas with concentrations of indigenous flora and fauna; development shall comply with the assessment and protection plan and shall use the avoidance, minimization, and mitigation approach respectively, with an emphasis on avoidance.

Objective: *Greater protection of sensitive lands, indigenous habitat, and native flora and fauna.*

Scenic Resources Issues

Objective: *A greater level of protection for scenic resources.*

Policies: *Protect "night sky" resources by encouraging the implementation of ambient light ordinances and encouraging conversion of all sources that create excessive light pollution, affecting our ability to view the stars.*

Protect scenic resources along Maui's scenic roadway corridors.

3. Natural Hazards

Goal: Maui will be disaster resilient.

Objective: *Greater protection of life and property.*

4. Economic Development

Objective: *Increase activities that support principles of sustainability*

5. Housing

Objective: *Provide infrastructure in a more timely manner to support the development of affordable housing.*

6. Infrastructure and Public Facilities

Maui's roadway network assessment in the *Proposed Roadway Development Program* referenced in the MIP identifies the KSE (formerly Mill Street Extension) as one of the highway improvements proposed for West Maui to improve Maui's roadway network.

Transportation

Goal: *An interconnected, efficient, and well-maintained, multimodal transportation system.*

Objective: *Safe, interconnected transit, roadway, bicycle, equestrian, and pedestrian network.*

Policies: *Plan for an integrated multi-modal transportation system comprised of public transit, bicycle, pedestrian, automobile, and other transportation modes.*

Ensure that the roadway and transit alignments respect the natural environment and scenic views.

Implementing Action: Implement pedestrian and bikeway plans.

Parks

Goal: *Maui will have a diverse range of active and passive recreational parks, wilderness areas, and other natural-resource areas linked, where feasible, by a network of greenways, bikeways, pathways, and roads that are accessible to all.*

Objective: *An expanded network of greenways, trails, pathways, and bikeways.*

Policies: *Link existing and future park sites, natural areas, the shoreline, and residential areas with a network of bikeways, pedestrian paths, trails, and greenways.*

Support the implementation of plans and programs that facilitate pedestrian mobility and access to active and passive recreation areas and sites.

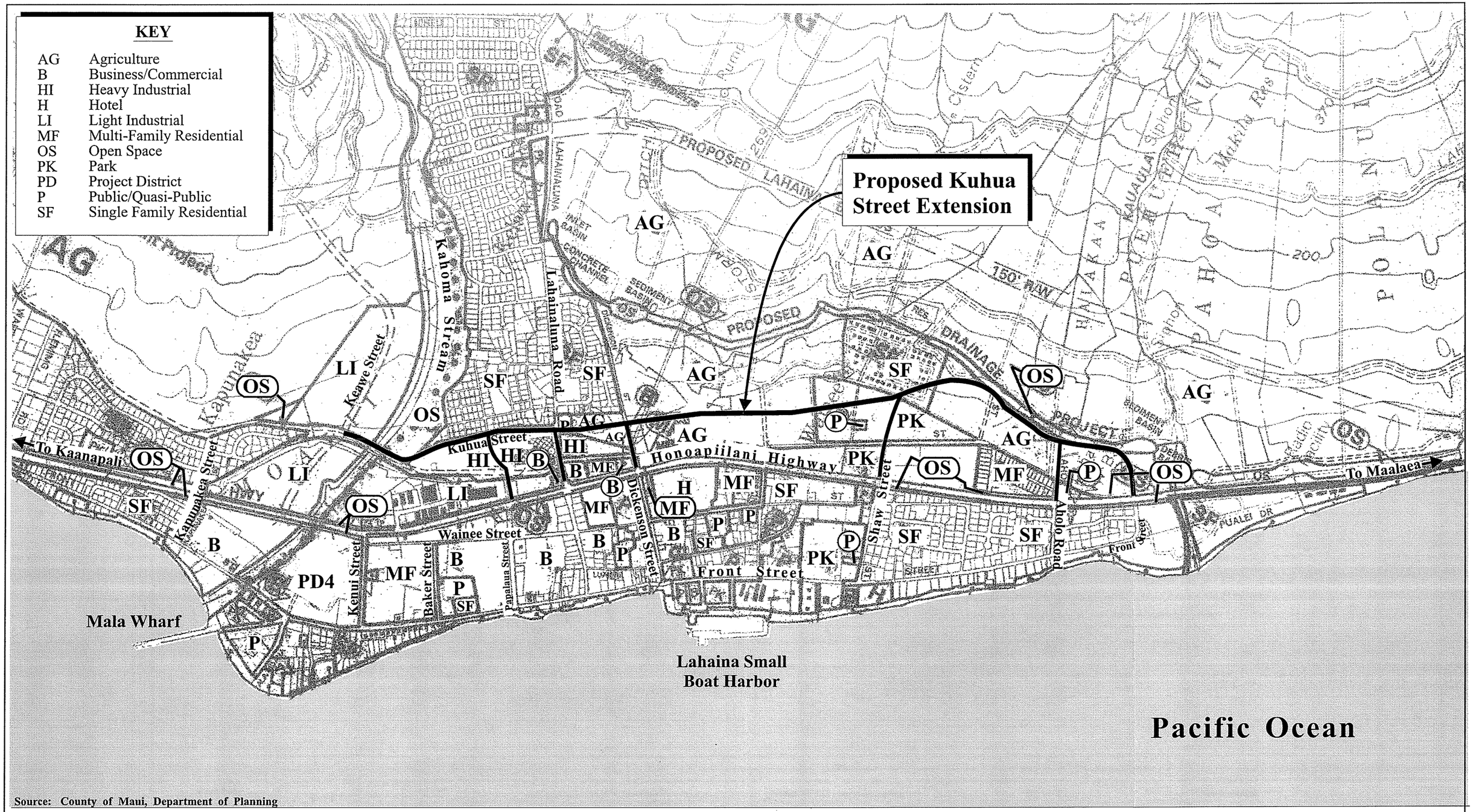
7. Land Use

According to the MIP, mobility and circulation within and between Maui's urban areas are important components of promoting rich urban design and human-scale form. Further, providing for efficient movement of all levels of transportation – automobile, public transit, bike, and pedestrian – is essential to assuring the livability of a community. The KSE and Improvement project will provide a new roadway, pedestrian-friendly, multi-use trail greenway and increased mobility and circulation within Lahaina Town.

D. WEST MAUI COMMUNITY PLAN

Within Maui County, there are nine (9) community plan regions. From a General Plan implementation standpoint, each region is governed by a community plan which sets forth desired land use patterns, as well as goals, objectives, policies, and implementing actions for a number of functional areas including infrastructure-related parameters.

The proposed project is located within the West Maui Community plan region. See **Figure 19**. The West Maui Community plan identified inadequate infrastructure and the failure of existing infrastructural systems as a major problem for the region. The extension of Kuhua Street from Keawe Street to its southern terminus at the Front Street intersection (parallel to Honoapiilani Highway) will enhance the existing transportation system by improving traffic circulation for the neighboring communities in the area and reduce increasing traffic congestion on local roadways. The community plan designations of the properties affected by the proposed alignment for the KSE roadway corridor are shown in **Table 7**. Refer to **Figure 5**.



Source: County of Maui, Department of Planning

Figure 19

Kuhua Street Extension and Improvement Project

West Maui Community Plan Map

NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

Prepared for: County of Maui, Department of Public Works

Klmc/millstreet/CPLUD

Table 7. Community Plan Designations of Affected Properties in KSE Roadway Corridor

Reference No.	Tax Map Keys	West Maui Community Plan
1	(2)4-5-024 (Kuhua Street)	None*
2	(2)4-5-025 (Kuhua Street)	None*
3	(2)4-5-009:007 (Old Mill Site)	Heavy and Light Industrial
4	(2)4-5-010:005	Open Space
5	(2)4-5-010:006 (Old Kahoma Stream)	Open Space
6	(2)4-5-010:008 (Kahoma Stream Channel)	Open Space
7	(2)4-5-010:034	Light Industrial and Agriculture
8	(2)4-5-011:007 (Kahoma Stream Channel)	Light Industrial and Agriculture
9	(2)4-5-024:068	Single Family
10	(2)4-6-013:001	Agriculture and Open Space
11	(2)4-6-013:006	Agriculture and Open Space
12	(2)4-6-014:001	Agriculture
13	(2)4-6-015:001	Agriculture, Single Family, Park and Open Space
14	(2)4-6-015:004 (Lahaina Recreation Center)	Agriculture, Single Family and Park
15	(2)4-6-016:004	Agriculture
16	(2)4-6-016:005	Agriculture
17	(2)4-6-016:039	Agriculture

* Existing roadways are not designated as a land use
Source: County of Maui Planning Department

Roadway and related improvements are permitted uses within the above-noted community plan designations.

The proposed project is in keeping with, among others, the following goals, objectives, and policies of the West Maui Community Plan.

LAND USE

Goal

An attractive, well-planned community with a mixture of compatible land uses in appropriate areas to accommodate the future needs of residents and visitors in a manner that provides for the stable social and economic well-being of residents and the preservation and enhancement of the region's open space areas and natural environmental resources.

Objectives and Policies

- *Preserve and enhance the mountain and coastal scenic vistas and the open space areas of the region.*

ENVIRONMENT

Goal

A clean and attractive physical, natural and marine environment in which man-made developments on or alterations to the natural and marine environment are based on sound environmental and ecological practices, and important scenic and open space resources area preserved and protected for public use and enjoyment.

Objectives and Policies

- *Promote the planting of trees and other landscape planting to enhance streetscapes and the built environment.*

- *Promote drainage and stormwater management practices that prevent flooding and protect coastal water quality.*

CULTURAL RESOURCE

Policy

Preserve and protect significant archaeological, historical and cultural resources that are unique in the State of Hawaii and Island of Maui.

URBAN DESIGN

Goal

An attractive and functionally integrated urban environment that enhances neighborhood character, promotes quality design at the resort destinations of Kaanapali and Kapalua, defines a unified landscape planting and beautification theme along major public roads and highways, watercourses, and at major public facilities, and recognizes the historic importance and traditions of the region.

Objectives and Policies

- *Enhance the appearance of major public roads and highways in the region.*
- *Improve pedestrian and bicycle access within the region.*
- *Promote a unified street tree planting scheme along major highways and streets. Hedge planting should be spaced and limited in height, in order to provide vistas to the shoreline and mountains.*
- *Maintain shrubs and trees at street intersections for adequate sight distance.*
- *Use native plants for landscape planting in public projects to the extent practicable.*
- *Existing and future public rights-of-way along roads and parks shall be planted with appropriate trees, turfgrass and ground covers.*
- *Encourage neighborhoods and community organizations to upgrade and maintain streets and parks in accordance with the Maui County Planting Plan.*

INFRASTRUCTURE

Goal

Timely and environmentally sound planning, development, and maintenance of infrastructure systems which serve to protect and preserve the safety and health of the region's residents, commuters, and visitors through the provision of clean water, effective waste disposal, and efficient transportation systems which meet the needs of the community.

Policies (Transportation)

- *Support construction of the planned Lahaina Bypass Road in such a way as to promote safe, efficient travel across the region without encouraging further urbanization or impeding agricultural operations.*

- *Support improvements for the safe and convenient movement of people and goods, pedestrians and bicyclists in the Lahaina region particularly along Honoapiilani Highway, Front Street and Lower Honoapiilani Road and seek to establish a regional network of bikeways and pedestrian paths.*

- *Support ridesharing, programs to promote safe bicycle and pedestrian travel, alternative work schedules, traffic signal synchronization, and other transportation demand management strategies.*

Implementing Action

- *Provide a roadway for ingress and egress between Kelawea Mauka and Honoapiilani Highway, located in the vicinity of Kuhua Street and Hinau Street.*

- *Construct left turn lanes on the Lahainaluna Road at its intersection with Honoapiilani Highway.*

- *Establish major recreation ways for pedestrians and bicycles from the pali to Lahaina town and to Kapalua along the coastal highways, including Honoapiilani Highway and Lower Honoapiilani Road, and along the southern side of Kahoma Stream and other major drainage channels.*

- *Study, design and implement measures for safe pedestrian access connecting Lahaina town with its mauka pool and park, including consideration of pedestrian overpasses.*

Objectives and Policies (Drainage)

- *Construct necessary drainage improvements in flood-prone areas, incorporating landscaped swales and unlined channels to provide open space continuity. Urge the use of landscaped/green belt drainage channels as opposed to concrete-lined channels or culverts.*

- *Insure that new developments will not result in adverse flooding conditions for downstream properties by requiring onsite retention facilities for stormwater run-off generated by the development.*

GOVERNMENT

Goal

Government that demonstrates the highest standards of fairness, responsiveness to the needs of the community, fiscal integrity, effectiveness in planning, and implementing programs and projects to accommodate a stable social and economic well-being for residents, a fair and equitable approach to taxation, and efficient and results-oriented management.

Objectives and Policies

- *Coordinate and direct future public and private development, including capital improvement projects, consistent with the Community Plan and the island-wide directed and managed growth plan required by the General Plan.*

- *Insure that adequate infrastructure is or will be available to accommodate planned development.*

- *Support public and private partnerships to fund the planning and construction of infrastructure, subject to advanced public notification.*

E. COUNTY ZONING

The lands underlying the proposed KSE roadway corridor are zoned by the County of Maui as shown in **Table 8**. Refer to **Figure 5**.

Table 8. Zoning Designations of Affected Properties in KSE Roadway Corridor

Reference No.	Tax Map Keys	Zoning Designation
1	(2)4-5-024 (Kuhua Street)	Varies*
2	(2)4-5-025 (Kuhua Street)	Varies*
3	(2)4-5-009:007 (Old Mill Site)	M-2 Heavy Industrial
4	(2)4-5-010:005	Agricultural
5	(2)4-5-010:006 (Old Kahoma Stream)	Agricultural
6	(2)4-5-010:008 (Kahoma Stream Channel)	Agricultural
7	(2)4-5-010:034	M-1 Light Industrial
8	(2)4-5-011:007 (Kahoma Stream Channel)	M-1 Light Industrial
9	(2)4-5-024:068	R-1 Residential
10	(2)4-6-013:001	Agricultural
11	(2)4-6-013:006	Agricultural
12	(2)4-6-014:001	Agricultural
13	(2)4-6-015:001	Agricultural
14	(2)4-6-015:004 (Lahaina Recreation Center)	Agricultural
15	(2)4-6-016:004	Agricultural
16	(2)4-6-016:005	Agricultural
17	(2)4-6-016:039	Agricultural

* Roads from centerline are zoned the adjacent zoning district. Kuhua Street is adjacent to various zoning districts.
Source: County of Maui Planning Department

As with the community plan land use designation, the roadway and related improvements are permitted uses within these zoning districts.

During the design phase of the project, if improvements are required along Papalaua Street, Lahainaluna Road, Dickenson Street and Shaw Street within the Lahaina Historic Districts, the necessary permit will be obtained.

F. COASTAL ZONE MANAGEMENT/SPECIAL MANAGEMENT AREA

The Hawaii 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 Hawaii's coastal zone. The landward boundary of the County of Maui's Special Management Area (SMA) in this area is the makai boundary of the Honoapiilani Highway ROW. The proposed KSE and Improvement project is located mauka of the Honoapiilani Highway ROW and is not within the County of Maui's SMA and will not require processing of a SMA Use Permit. However, in the event that the ultimate design requirements mandated by State and/or County agencies require improvements west (makai) of the Honoapiilani Highway ROW, then appropriate SMA permits will be obtained prior to construction. See **Figure 20**. As such, the coastal zone objectives and policies have been evaluated as part of this document.

As set forth in Chapter 205A, HRS, this section addresses the project's relationship to applicable coastal zone management considerations.

1. Recreational Resources

Objective

Provide coastal recreational opportunities accessible to the public.

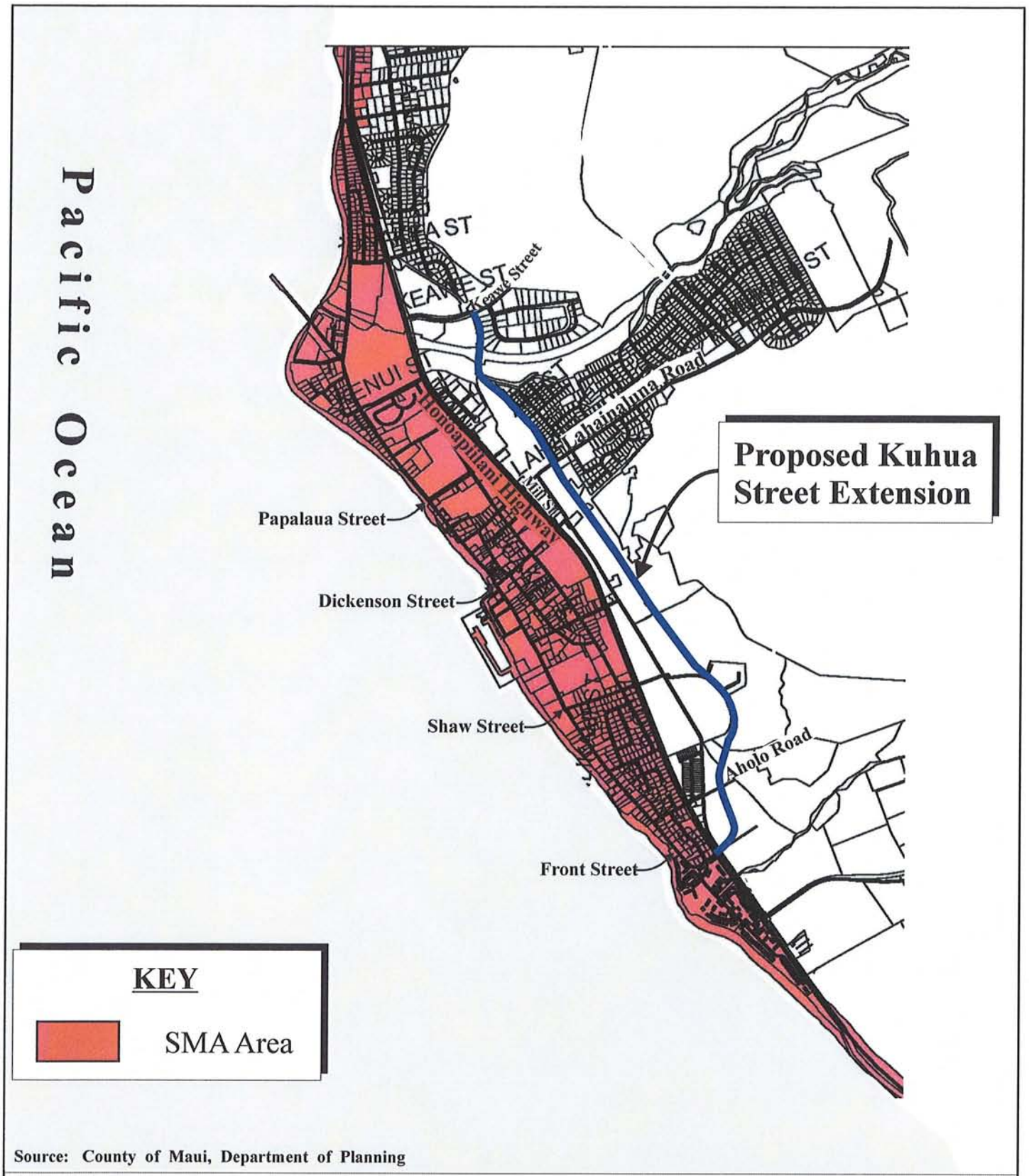
Policies

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, Department of Planning

Figure 20 Kuhua Street Extension and Improvement Project

Special Management Area (SMA) Map

NOT TO SCALE

Prepared for: County of Maui, Department of Public Works

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KLMC/MillStreet/SMA

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

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

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

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

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, HRS.*

Response: The project area is located away from the shoreline east of Honoapiilani Highway. With implementation of a BMP program, adverse impacts to coastal recreational resources are not anticipated to result from the project.

2. Historic 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: An AIS was undertaken by Cultural Surveys Hawaii, Inc. in order to identify, protect, and preserve historic resources. The archaeological investigation found the project area to have been previously affected by past sugarcane cultivation, drainage improvements and urban development.

Human burial site SIHP-6473 was found to be within the project right-of-way which prompted the realignment of the southern portion of the KSE corridor. This created a 50 ft. buffer between the burial and the limits of construction activity. A second human burial site SIHP-7102 was identified, documented, and recommended for preservation in place and avoidance. A Burial Treatment Plan will need to be prepared for review and determination by the Maui/Lanai Islands Burial council prior to initiation of ground altering work. Refer to **Appendix "D"**.

Should historic finds be uncovered during construction activities, work will cease in the vicinity of the find and SHPD/OHA contacted to determine the appropriate level of mitigation.

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 which are not coastal dependent to locate in inland areas.*

Response: The project area is located along the lower slopes of the West Maui Mountains above Honoapiilani Highway and the Lahaina town business area from approximately 14 feet amsl rising to approximately 52 feet amsl. The proposed roadway will be buffered with landscaped areas to enhance open space resources in the area. The roadway extension project does not include vertical structures that would have the potential to adversely impact views to the shoreline or mountains.

4. Coastal Ecosystems

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: With implementation of BMPs and the proposed drainage improvements (to detain all project-related increases in storm water runoff), the proposed project is anticipated to have minimal long-term adverse effects on downstream coastal ecosystems. Appropriate BMPs and erosion-control measures will be implemented to ensure that coastal ecosystems are not adversely impacted by construction activities.

During the design phase, if associated drainage improvements are required to outlet to the ocean, the DPW in the context of required permits shall include appropriate mitigation measures in the project to ensure coastal ecosystems are not adversely impacted.

5. Economic Uses

Objective

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

Policies

a. *Concentrate coastal dependent development in appropriate areas;*

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

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

   i. *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 located at or near the coastline and will not, therefore, involve coastal development. The proposed action does not contravene the objective and policies for economic uses.

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 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 proposed project will not be located within environmentally sensitive areas that are subject to natural hazards. Although a small portion of the Front Street terminus is located in the tsunami inundation zone, the KSE and Improvement project will provide an alternative route for emergencies. Appropriate technical measures will be designed and implemented to address stormwater management requirements for the proposed project. The plans will be designed in accordance with the State Department of Health West Maui Watershed owners manual and the Drainage Standards, Rules for the Design of Storm Drainage Facilities and Rules for the Design of Storm Water Treatment Best Management Practices of the County of Maui, as applicable, to ensure that the project will not adversely affect downstream and adjoining properties.

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 laws effectively to the maximum extent possible in managing present and future coastal zone development;*

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

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

Response: Opportunities for the public to provide input on the proposed project are available during processing of the EA in accordance with the Chapter 343, HRS, notice and public review provisions. All aspects of development will be conducted in accordance with applicable Federal, State, and County standards.

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: As previously mentioned, the EA document will be processed in accordance with Chapter 343, HRS, and opportunity for comment by agencies and the public will be provided as part of this process. Public meetings were held on October 9, 2009 with Lahaina Bypass Now, November 16, 17, and 24, 2009 with the affected property owners along the proposed roadway alignment, and on December 1, 2009 with the West Maui Community. See **Appendix "G"**.

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; and*

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

Response: During construction, the proposed project will implement appropriate BMPs to manage overall drainage for the project area. In the long term, drainage improvements along the proposed roadway extension will retain all project-related increases in runoff and will help protect beach resources from flood damage. A Stormwater Quality Management Plan will be prepared during the design phase of the project to reduce the adverse impact to recreation caused from sedimentation in stormwater.

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 in order 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: Appropriate BMPs and soil erosion control measures will be implemented to protect marine and coastal ecosystems so that they are not adversely impacted by construction activities. Further, a Stormwater Quality Management Plan shall be prepared and submitted in conjunction with the detailed design development for the project.

During the design phase, if associated drainage improvements are required to outlet to the ocean, the DPW in the context of required permits shall include appropriate mitigation measures in the project to ensure marine resources are not adversely impacted.

In addition to the foregoing objectives and policies, SMA permit review criteria pursuant to Act 224 (2005) 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

Response: The proposed project is not located on or near the shoreline, and as such, there will not be any lights directed towards the shoreline and ocean waters. However, the preliminary lighting plan for the project will be designed so that lighting is not directed across property boundaries.

G. OTHER REGULATORY APPROVALS

The proposed project may involve alterations to the adjacent Kahoma Stream Flood Control Channel or drainage improvements that outlet to the ocean. As such, coordination will be undertaken with the Department of Army (DA) and other relevant agencies to identify applicable DA permitting, Section 401 Water Quality Certification, Stream Channel Alteration Permit, and Coastal Zone Management Consistency review requirements for the proposed action.

V. SUMMARY OF ADVERSE ENVIRONMENTAL IMPACTS WHICH ARE UNAVOIDABLE

V. SUMMARY OF ADVERSE ENVIRONMENTAL IMPACTS WHICH ARE UNAVOIDABLE

The proposed project will result in certain unavoidable construction-related environmental impacts as outlined in Chapter III.

In the short term, construction associated with the proposed project will generate temporary noise impacts. These impacts will be limited to the immediate vicinity of the project construction areas. Sound attenuating construction equipment will be used, where practicable, to mitigate noise impacts caused by construction. Noise levels will increase but at acceptable levels within the threshold established by the FHWA and State DOT.

Unavoidable air quality impacts will also arise as a result of construction activities, such as the generation of dust and other airborne pollutants. Appropriate BMPs will be incorporated in the construction process to mitigate adverse impacts such as frequent watering of exposed surfaces, implementation of dust mitigation measures, and regular maintenance of construction equipment to minimize construction-related impacts.

The project will commit agricultural land formerly used for sugarcane cultivation south of Lahainaluna Road to a roadway. The production of sugarcane on these lands ceased in 1999 and the land has been fallow since then.

The visual resources of the project area will be maintained as view corridors between the mountains and the ocean will not be blocked by the proposed project improvements which will essentially be at grade, except for light poles, traffic signals and shade trees interpersed along the roadway corridor. Conceptual design of the roadway includes landscaping details with buffer zones to minimize visual impacts associated with the extension of the roadway. During design of the construction plans, detailed drawings of the landscaping and buffer zones will be prepared.

The KSE will provide for local traffic circulation that will benefit the Lahaina community by providing additional north-south roadway capacity from Keawe Street to Front Street. The additional roadway capacity will improve the transport of people and goods within the Lahaina Town

area and reduce traffic congestion on Honoapiilani Highway, as well as accommodate a portion of the anticipated increase in traffic associated with localized population growth in the area.

However, as the regional population growth continues in West Maui, the addition of regional roadway capacity is essential in the form of extending the LBR northward of Keawe Street and improving Honoapiilani Highway to four (4) lanes from Maalaea to Lahaina Town. These regional transportation improvements will have additional impacts on agricultural lands, historic and cultural resources and the environment which cannot be identified and mitigated at this time, as well as commit additional resources in the form of land and funding.

VI. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

VI. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The development of the proposed project would involve the commitment of both lands and funds. The major landowner of the underlying lands for the proposed alignment is KLMC. The County of Maui will need to negotiate land acquisition for the ROW with KLMC and other landowners. In addition, labor and material resources would be expended as part of the project's construction phase. Commitment of these resources are considered irreversible and irretrievable. This commitment, however, is also considered appropriate in the context of providing a much needed new collector roadway for residents of and visitors to West Maui and improving the land with transportation infrastructure for the region. Addressing land use development issues and market needs up front from a comprehensive planning perspective provides an efficient and effective means of developing and implementing infrastructure components.

VII. SIGNIFICANCE CRITERIA ASSESSMENT

VII. SIGNIFICANCE CRITERIA ASSESSMENT

The "Significance Criteria", Section 12 of the Administrative Rules, Title 11, Chapter 200, "Environmental Impact Statement Rules", were reviewed and analyzed to determine whether the proposed project will have significant impacts on the environment. The following criteria and analysis are provided:

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

   According to the Biological Resources Survey, except for the Hawaiian Hoary Bat activity near the southern terminus of the proposed roadway, the flora and fauna encountered were generally limited to non-native, abundant species. Recommendations of the Biological Study and USFWS will be implemented to mitigate any potential impacts on the endangered Hawaiian Hoary Bat. Further, in accordance with the recommendation of the USFWS, outdoor lighting for the roadway will be properly shielded throughout the construction period and during operation of the roadway to minimize impacts on seabirds such as the threatened Newell's shearwater and endangered Hawaiian petrel.

   As mentioned in Chapter III of this document, an AIS and CIA were prepared for the project. The AIS identified two (2) burials near the Lahaina Recreation Center. The roadway was realigned to protect one (1) of the burial sites in-situ which was located in the proposed ROW and to establish a 50 feet buffer from the ROW while the other burial is not affected by the ROW. Coordination with the SHPD will continue relative to implementing a Burial Treatment Plan. According to the CIA, ongoing cultural practices related to traditional subsistence fishing practices and access to the mauka lands should be protected. BMPs to mitigate runoff and associated sediments shall be implemented and access routes to mauka lands shall be developed. Archaeological monitoring of all ground altering activities will be implemented. If burials are inadvertently discovered, work in the area will cease and the SHPD notified and appropriate action taken. Refer to **Appendix "D"** and **Appendix "E"**.

2. **Curtails the range of beneficial uses of the environment.**

The proposed project will not curtail the range of beneficial uses of the environment. Development of site specific plans will allow for the identification of applicable BMPs to minimize any construction-related impacts.

3. **Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.**

The proposed project does not conflict with the State's Environmental Policy and Guidelines as set forth in Chapter 344, HRS. The proposed action is in consonance with the following policies and guidelines:

Environmental Policy:

Enhance the quality of life by:

(A) Establishing communities which provide a sense of identity, wise use of land, efficient transportation, and aesthetic and social satisfaction in harmony with the natural environment which is uniquely Hawaiian.

Guidelines:

Transportation

(A) Encourage transportation systems in harmony with the lifestyle of the people and environment of the State.

4. **Substantially affects the economic welfare, social welfare, and cultural practices of the community or State.**

The proposed project will directly benefit the local economy by providing construction and construction-related employment. In the long term, the project will have a beneficial effect upon the socio-economic fabric of the community by providing for the safe, convenient, and efficient movement of people and goods in Lahaina Town. By improving roadway conditions, the proposed project will promote the public welfare by increasing roadway capacity and providing an alternate route during emergencies.

5. **Substantially affects public health.**

The proposed project is consistent with the public health goals of the State Department of Health. Construction plans will specify timely disposal of construction waste. BMPs will be implemented to minimize air quality and noise impacts during construction. Consequently, the proposed project is not anticipated to have a significant detrimental effect on public health. The construction of a new north-south corridor will provide an alternate route for emergency vehicles and emergency evacuations, as well as during times when Honoapiilani Highway is closed in the vicinity of Lahaina Town.

6. **Involves substantial secondary impacts, such as population changes or effects on public facilities.**

The DPW is in the process of coordinating with State and other County agencies to ensure that all services and facilities requirements for the proposed project are addressed. No significant population changes are anticipated as a result of the proposed project. The project involves the provision of additional roadway capacity between Keawe Street and Front Street which should relieve some of the traffic congestion on Honoapiilani Highway.

Secondary impacts are associated with the removal of impediments to development relating to transportation and the traffic congestion on Honoapiilani Highway and drainage. The construction of a new north-south roadway in conjunction with the LBR and future improvement of Honoapiilani Highway to four (4) lanes from Maalaea to Lahaina town will provide the regional capacity to accommodate existing and future development in West Maui. The KSE and Improvement Project will also provide localized access to surrounding vacant agricultural lands which have been designated for future urban development (i.e., Wainee Village Residential) in the MIP. The associated drainage improvements will be designed to accommodate runoff from the project area.

7. **Involves a substantial degradation of environmental quality.**

Construction activities will create temporary short-term nuisances related to noise and dust. Appropriate dust control and noise mitigation measures will be implemented to ensure that fugitive dust and noise generated in connection with construction is minimized.

Regional impacts to the natural environment from drainage in Lahaina town is being addressed through construction of the LWFC Channel project. Specific drainage impacts associated with the construction of the KSE and Improvement Project are being addressed through a combination of land planning and engineering design measures. For example, the project limits have been designed to avoid the 100-year flood limits of the KSFC Channel and to limit development over the flood control project by utilizing the existing bridge and construction of a separated pedestrian/bicycle bridge. In addition, drainage improvements for the proposed project will be designed to reduce post-development flows from the project to current levels as well as implement measures to improve water quality of stormwater runoff. Refer to **Appendix "B"**. The drainage improvements for the project will also include drainage infrastructure for the existing subdivisions east (mauka) of the KSE which currently sheet flows downstream and minimize some of the potential flooding impacts along Honoapiilani Highway and in the Lahaina town area.

8. <u>Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions.</u>

The proposed project is part of a long-range transportation plan to improve traffic in the West Maui region. While the impacts assessed in this document are based on the entire action, the design of the project considers long-range planning opportunities as discussed in the "Cumulative and Secondary Impacts" Section III.E. herein.

9. <u>Substantially affects a rare, threatened, or endangered species, or its habitat.</u>

As reported in the Biological Resources Survey, the project area is generally limited to non-native, abundant species of flora and fauna, except for Hawaiian hoary bat activity encountered near the southern terminus of the roadway. Refer to **Appendix "C"**. Also, the USFWS and DOFAW noted sitings of nene in the area and that endangered and threatened seabird are known to traverse the project area.

Recommendations of the Biological Study and the USFWS will be implemented to mitigate any impacts on the endangered Hawaiian hoary bat. Further, in accordance with the recommendation of the USFWS, BMPs will be implemented and outdoor lighting for the roadway will be properly shielded throughout the construction period and during operation of the roadway to minimize impacts on seabirds, such as the threatened Newell's shearwater and endangered Hawaiian petrel.

10. Detrimentally affects air or water quality or ambient noise levels.

Construction activities will result in short-term air quality and noise impacts. Dust control measures, such as regular watering and sprinkling, and installation of dust screens, will be implemented to minimize wind-blown emissions. Noise impacts will occur primarily from construction equipment. Equipment mufflers or other noise attenuating equipment, as well as proper equipment and vehicle maintenance, will be used during construction activities. Construction noise will be managed to ensure compliance with the applicable provisions of the State of Hawaii, Department of Health Administrative Rules Title 11, Chapter 46, "Community Noise Control". These rules require a noise permit if the noise levels from construction activities are expected to exceed the allowable levels set forth in the Chapter 46 rules.

In the long term, traffic noise levels will increase as a result of increased traffic along the project corridor, especially the roadway segment along the existing Kuhua Street. This increase in traffic noise can be mitigated by sound attenuation measures or by lowering the posted speed limit at locations where existing noise sensitive receptors are relatively close to the Kuhua Street ROW. Also, air quality in the area will be impacted from vehicle emissions. However, impacts to air quality will be minimized with the free-flow of traffic that reduces vehicles idling on the roadway and by linear landscaping buffers along the roadway alignment.

11. Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters.

Except the bridge crossing at the KSFC Channel, the project area is situated within Flood Zone X (unshaded), an area of minimal flooding. Additionally, site drainage improvements will be implemented to ensure that there is no net increase in drainage flows to downstream properties as a result of project development. Further, the majority of the project area is located outside of the tsunami inundation evacuation zone, except for an area in the vicinity of the Front Street/Honoapiilani Highway intersection. No other foreseeable environmental effects attributed to environmentally sensitive areas are anticipated in conjunction with the proposed project.

12. **Substantially affects scenic vistas and viewplanes identified in county or state plans or studies.**

The proposed KSE and Improvement Project will be a low-profile on-grade roadway and will not affect any previously identified scenic vistas or viewplanes. The proposed project will be separated from the neighboring urban land uses through the use of landscaped buffer areas, as appropriate.

13. **Requires substantial energy consumption.**

The proposed project will involve the commitment of fuel for construction equipment, vehicles, and machinery during construction and maintenance activities. However, this use is short term and is not anticipated to result in a substantial consumption of energy resources.

Coordination with MECO will be undertaken during the electrical plans preparation phase of work to ensure all operational parameters are addressed for the proposed project.

Based on the foregoing analysis, it is concluded that the proposed action is not anticipated to result in any significant impact. Accordingly, this Draft Environmental Assessment is being processed as an Anticipated Finding of No Significant Impact (AFNSI) by the DPW.

VIII. LIST OF PERMITS AND APPROVALS

VIII. LIST OF PERMITS AND APPROVALS

The following list of permits and approvals are anticipated to be needed for project implementation:

1. **Federal**

   A. Department of Army Permit, as applicable

2. **State of Hawaii**

   A. Chapter 343, Hawaii Revised Statutes (HRS) Environmental Review

   B. Department of Health Section 401 Water Quality Certification, as applicable

   C. Department of Land and Natural Resources Stream Alteration Permit, as applicable

   D. Coastal Zone Management Consistency Review, as applicable

   E. National Pollutant Discharge Elimination System (NPDES) Permit, as applicable

   F. Noise Permits, as applicable

   G. Work to Perform Within State ROW, as applicable

3. **County of Maui**

   A. Flood Hazard District Permit

   B. Special Management Area Use Permit, as applicable

   C. Historic District Permit, as applicable

   D. Construction Permits

IX. PARTIES CONSULTED IN THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT; LETTERS RECEIVED; AND RESPONSES TO SUBSTANTIVE COMMENTS

IX. PARTIES CONSULTED IN THE PREPARATION OF THE DRAFT ENVIRONMENTAL ASSESSMENT; LETTERS RECEIVED; AND RESPONSES TO SUBSTANTIVE COMMENTS

The following agencies were consulted during the preparation of the Draft Environmental Assessment (EA). Agency comments and responses to substantive comments are included herein.

Federal Agencies

1. Ranae Ganske-Cerizo, Soil Conservationist
   Natural Resources Conservation Service
   U.S. Department of Agriculture
   210 Imi Kala Street, Suite 209
   Wailuku, Hawaii 96793-2100

2. George Young
   Chief, Regulatory Branch
   U.S. Department of the Army
   U.S. Army Engineer District, Honolulu
   Regulatory Branch
   Building 230
   Fort Shafter, Hawaii 96858-5440

3. Gordan Furutani, Field Office Director
   U. S. Department of Housing and Urban Development
   500 Ala Moana Boulevard, Suite 3A
   Honolulu, Hawaii 96813-4918

4. Patrick Leonard
   Field Supervisor
   U. S. Fish and Wildlife Service
   300 Ala Moana Blvd., Rm. 3-122
   Box 50088
   Honolulu, Hawaii 96813

State Agencies

5. Dan Davidson, Executive Director
   Hawaii Housing Finance and Development Corporation
   677 Queen Street
   Honolulu, Hawaii 96813

6. Sandra Lee Kunimoto, Chair
   Department of Agriculture
   1428 South King Street
   Honolulu, Hawaii 96814-2512

7. Theodore E. Liu, Director
   State of Hawaii
   Department of Business, Economic Development & Tourism
   P.O. Box 2359
   Honolulu, Hawaii 96804

8. Patricia Hamamoto, Superintendent
   State of Hawaii
   Department of Education
   P.O. Box 2360
   Honolulu, Hawaii 96804

9. Ron Okamura, Complex Area Superintendent
   State of Hawaii
   Department of Education
   54 High Street, 4th Floor
   Wailuku, Hawaii 96793

10. Alec Wong, P.E., Chief
Clean Water Branch
State of Hawaii
Department of Health
919 Ala Moana Blvd., Room 300
Honolulu, Hawaii 96814

11. Herbert Matsubayashi
District Environmental Health
Program Chief
State of Hawaii
Department of Health
54 High Street
Wailuku, Hawaii 96793

12. Laura H. Thielen, Interim Chairperson
State of Hawaii
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

13. Dr. Puaalaokalani Aiu, Administrator
State of Hawaii
Department of Land and Natural Resources
State Historic Preservation Division
601 Kamokila Blvd., Room 555
Kapolei, Hawaii 96707

14. Brennon Morioka, Interim Director
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

cc: Fred Cajigal

15. Dan Davidson, Executive Officer
State of Hawaii
State Land Use Commission
P.O. Box 2359
Honolulu, Hawaii 96804

16. Rosalyn H. Baker, Senator
Hawaii State Senate
Hawaii State Capitol, Room 210
415 S. Beretania Street
Honolulu, Hawaii 96813

17. Angus L.K. McKelvey, Representative
House of Representatives
Hawaii State Capitol, Room 315
415 S. Beretania Street
Honolulu, Hawaii 96813

18. Katherine Kealoha, Director
Office Of Environmental Quality Control
235 S. Beretania Street, Suite 702
Honolulu, Hawaii 96813

19. Clyde Namuo
Office of Hawaiian Affairs
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20. Abbey Seth Mayer, Director
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Office of Planning
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Honolulu, Hawaii 96804

County Agencies

21. Charmaine Tavares, Mayor
County of Maui
200 South High Street
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22. Gen Iinuma, Administrator
Maui Civil Defense Agency
200 South High Street
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23. Jeffrey Murray, Chief
County of Maui
Department of Fire and Public Safety
200 Dairy Road
Kahului, Hawaii 96732

24. Lori Tsuhako, Director
County of Maui
Department of Housing and Human Concerns
200 South High Street
Wailuku, Hawaii 96793

25. Tamara Horcajo, Director
County of Maui
Department of Parks and Recreation
700 Halia Nakoa Street, Unit 2
Wailuku, Hawaii 96793

26. Jeffrey Hunt, Director
County of Maui
Department of Planning
250 South High Street
Wailuku, Hawaii 96793

27. Gary Yabuta, Chief
County of Maui
Police Department
55 Mahalani Street
Wailuku, Hawaii 96793

28. Milton Arakawa, Director
County of Maui
Department of Public Works
200 South High Street
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29. Cheryl Okuma, Director
County of Maui
Department of Environmental Management
200 South High Street
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30. Donald Medeiros, Director
County of Maui
Department of Transportation
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Wailuku, Hawaii 96793

31. Jeffrey Eng, Director
County of Maui
Department of Water Supply
200 South High Street
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32. Councilmember Sol Kahoohalahala
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

33. Danny Mateo, Council Chair
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

34. Councilmember Wayne Nishiki
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

35. Councilmember Gladys Baisa
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

36. Councilmember Jo Anne Johnson
Maui County Council
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Wailuku, Hawaii 96793

37. Councilmember Bill Medeiros
Maui County Council
200 South High Street
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38. Councilmember Michael J. Molina
Maui County Council
200 South High Street
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39. Councilmember Joseph Pontanilla
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

40. Councilmember Mike Victorino
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

Community Organizations

41. Norma Barton, Executive Director
Lahaina Bypass Now
505 Front Street, Suite 202
Lahaina, Hawaii 96761

42. Theo Morrison, Executive Director
Lahaina Restoration Foundation
120 Dickenson Street
Lahaina, Hawaii 96761

43. **Lahaina Town Action Committee**
648 Wharf Street, Suite 102
Lahaina, Hawaii 96761

44. Joe Pluta, President
West Maui Improvement Foundation
P. O. Box 10338
Lahaina, Hawaii 96761

45. Zeke Kalua, Executive Director
West Maui Taxpayers Association
P.O. Box 10338
Lahaina, Hawaii 96761

46. May Fujiwara
Lahaina-Honolua Senior Citizens Club
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Lahaina, Hawaii 96761

47. **Ka Hale Ake Ola Homeless Resource Centers, Inc.**
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15 Ipu Aumakua Lane
Lahaina, Hawaii 96761

AUG 0 4 2009

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

REPLY TO
ATTENTION OF:

July 30, 2009

Regulatory Branch

File Number: POH 2008-00023

Ms. Colleen Suyama
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Ms. Suyama:

This is in response to your letter dated December 26, 2007 requesting Department of the Army (DA) comments on the Mill Street Extension Roadway Project proposed by the Kaanapali Land Management Corporation in Lahaina, Maui. Your proposed project was reviewed pursuant to Section 404 of the Clean Water Act. Section 404 of the Clean Water Act requires that a DA permit be obtained for the placement or discharge of dredged and/or fill material into waters of the U.S., including wetlands, prior to conducting the work (33 U.S.C. 1344).

Based on the limited amount of information submitted, we are unable to determine if the roadway extension will impact waters of the U.S. We would like the opportunity to review the draft Environmental Assessment in order to render a determination on whether a DA permit will be required. We advise that the draft Environmental Assessment describe all drainage ways, streams, ditches or wetlands that are located within the alignment corridor, in addition to describing any project features or ground-disturbing activities proposed in those features.

Should you have any questions regarding this letter of comment, please contact Ms. Jessie Ann Pa'ahana of my staff at 438-9258 or by e-mail at *jessie.k.paahana@usace.army.mil* and reference the Corps File No. POH-2008-023 in all future correspondence related to this project. Please be advised you can provide comments on your experience with the Honolulu District Regulatory Branch by accessing our web-based customer survey form at *http://per2.nwp.usace.army.mil/survey.html*.

Sincerely,

George P. Young, P.E.
Chief, Regulatory Branch

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
PRESIDENT

KARLYNN FUKUDA
EXECUTIVE VICE PRESIDENT

GWEN OHASHI HIRAGA
SENIOR VICE PRESIDENT

MITSURU "MICH" HIRANO
SENIOR VICE PRESIDENT

MARK ALEXANDER ROY
VICE PRESIDENT

March 7, 2013

George P. Young, P.E.
Chief, Regulatory Branch
Department of Army
U.S. Army Corps of Engineers
Honolulu District
Fort Shafter, Hawaii 96858-5440

SUBJECT: Proposed Kuhua (Formerly Mill) Street Extension Roadway Project at Lahaina, Maui, Hawaii (POH 2008-00023)

Dear Mr. Young:

We are writing to you on behalf of the County of Maui, Department of Public Works (DPW) to thank you for your office's letter dated July 30, 2009, regarding the proposed Kuhua Street Extension Roadway project in Lahaina, Maui, Hawaii. Your letter noted that the proposed project was reviewed pursuant to Section 404 of the Clean Water Act and your agency was unable to determine if the project will impact waters of the U.S.

As requested, a copy of the Draft Environmental Assessment (EA) will be provided to you for review and comment. Further, the Draft EA will describe drainageways, streams, ditches, or wetlands that are located within the proposed alignment corridor.

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Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Colleen Suyama
Senior Associate

CS:tn
cc: David Goode, Director, Department of Public Works
Clifford Mukai, Warren S. Unemori Engineering, Inc.
K:\DATA\KLMC\MillStreet\Response Letters\Army response.ltr.doc

JAN 2 5 2008

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

In Reply Refer To:
2008-TA-0100
2008-FA-0050

JAN 2 4 2008

Mr. Kyle Ginoza
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Subject: Request for Technical Assistance for Proposed Ka'anapali Land Management Corporation Mill Street Extension Roadway Project, Lahaina, Maui, Hawaii

Dear Mr. Ginoza:

Thank you for your December 26, 2007, letter indicating that you are compiling information that will be incorporated into an Environmental Assessment for the development of a road between Front Street and Keawe Street, Lahaina, Maui. We received your request on December 28, 2007. Based on the project information you provided and information in our files including data compiled by the Hawaii Biodiversity and Mapping Program, threatened Newell's shearwater (*Puffinus auricularis newelli*) and endangered Hawaiian petrel (*Pterodroma phaeopygia sandwichensis*) (collectively referred to as seabirds), endangered Hawaiian coot (*Fulica americana alai*), and endangered Hawaiian stilt (*Himantopus mexicanus knudseni*) (collectively referred to as waterbirds), endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), and endangered Hawaiian goose (*Branta sandvicensis*) are known to occur in the project vicinity. The proposed project is located on the dry leeward side of West Maui where wildland fires interdependent with the proposed project may also affect endangered *Ctenitis squamigera*, *Diellia erecta*, *Gouania hillebrandii*, *Hesperomannia arbuscula*, *Remya mauiensis*, *Spermolepis hawaiiensis*, *Tetramolopium capillare*, and *Tetramolopium remyi* as well as designated critical habitat for *Alectryon micrococcus*, *Colubrina oppositifolia*, *Ctenitis squamigera*, *Cyanea glabra*, *Cyanea lobata*, *Cyrtandra munroi*, *Gouania vitifolia*, *Hesperomannia arbuscula*, and *Remya mauiensis*.

We recommend you address potential direct and indirect project impacts to these listed species and critical habitat areas and include measures to minimize project impacts in your environmental review document. The following recommendations are provided to assist you in your plan development:

- Potential impacts to seabirds could be minimized by shielding outdoor lights in the project footprint throughout the construction period and within the completed subdivision

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so the bulb can only be seen from below, by avoiding use of lights at night during the peak fallout period of September 15 through December 15, and by providing all project staff and residents with information about seabird fallout.

- Potential impacts to the Hawaiian stilt include harm and harassment associated with vegetation clearing. In order to minimize or avoid vehicle and machinery impacts to nesting stilts, vegetation clearing in the vicinity of ponds and streams could be limited to periods when biological surveys indicate the area is free of waterbird nests.

- Information about Hawaiian hoary bat use of the project area is incomplete. Because bat pups are found in nursery trees during the April through August breeding season, it is particularly important to avoid disturbance to trees during this period in areas where bats occur. Bat surveys could be conducted in areas where cutting or removal of trees is proposed. If Hawaiian hoary bats are found in the project area, you should contact our office for additional information about how to address potential impacts to this species.

- Hawaiian geese may be attracted to ditches and mowed grass areas in the road shoulder area, increasing their vulnerability to collision with vehicles. If Hawaiian geese are found in the project area, you should contact our office for additional information about how to address potential impacts to this species.

- Measures to minimize fire risk should be incorporated into your project. The West Maui Fire Task Force has formed to support efforts to coordinate development of area firebreaks, a system of fire suppression helicopter dip-sites, and fire prevention materials to minimize impacts of fires associated with increases in the West Maui area population.

- To minimize erosion, sedimentation, and other adverse impacts to aquatic fish and wildlife resources and nearby coral reef ecosystems, we recommend that applicable measures identified in the enclosed list of Standard Best Management Practices (BMP) for fish and wildlife be incorporated into the project's BMP Plan.

If, as project planning progresses, you determine the proposed subdivision may adversely impact federally listed species or critical habitats, please contact our office for further assistance. If you have questions or would like additional information, please contact Consultation and Technical Assistance Program Fish and Wildlife Biologist Dawn Greenlee (phone: 808-792-9400; fax: 808-792-9581).

Sincerely,

Ron Holden for

Patrick Leonard
Field Supervisor

Enclosure

Enclosure

US Fish and Wildlife Service
Recommended Standard Best Management Practices

The Fish and Wildlife Service recommends that the following measures be incorporated into projects to minimize the degradation of water quality and impacts to fish and wildlife resources:

a. Turbidity and siltation from project-related work shall be minimized and contained to within the vicinity of the site through the appropriate use of effective silt containment devices and the curtailment of work during adverse weather conditions;

b. dredging and filling in the aquatic environment shall be designed to avoid or minimize the loss special aquatic site habitat (pool/riffle areas, wetlands, etc.) and the unavoidable loss of such habitat shall be compensated for;

c. all project-related materials and equipment (dredges, barges, backhoes etc) to be placed in the water shall be cleaned of pollutants prior to use;

d. no project-related materials (fill, revetment rock, pipe etc.) should be stockpiled in the water (stream channels, wetlands etc.);

e. all debris removed from the aquatic environment shall be disposed of at an approved upland or ocean dumping site;

f. no contamination (trash or debris disposal, alien species introductions etc.) of adjacent aquatic environments (stream channels, wetlands etc.) shall result from project-related activities;

g. fueling of project-related vehicles and equipment should take place away from the water and a contingency plan to control petroleum products accidentally spilled during the project shall be developed. Absorbent pads and containment booms shall be stored on-site, if appropriate, to facilitate the clean-up of accidental petroleum releases;

h. any under-layer fills used in the project shall be protected from erosion with (rock, core-loc units, etc) as soon after placement as practicable; and

i. any soil exposed near water as part of the project shall be protected from erosion (with plastic sheeting, filter fabric etc.) after exposure and stabilized as soon as practicable (with vegetation matting, hydroseeding, etc.).

The Fish and Wildlife Service believes that incorporation of these measures into projects will greatly minimize the potential for project-related adverse impacts to fish and wildlife resources.

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
PRESIDENT

KARLYNN FUKUDA
EXECUTIVE VICE PRESIDENT

GWEN OHASHI HIRAGA
SENIOR VICE PRESIDENT

MITSURU "MICH" HIRANO
SENIOR VICE PRESIDENT

MARK ALEXANDER ROY
VICE PRESIDENT

March 7, 2013

Loyal Merhoff, Field Supervisor
United States Fish and Wildlife Service
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96813

SUBJECT: Proposed Kuhua (formerly Mill) Street Extension and Improvement Project at Lahaina, Maui, Hawaii (2008-TA-0100, 2008-FA, 0050)

Dear Mr. Merhoff:

We are writing to you on behalf of the County of Maui, Department of Public Works (DPW) to thank you for your department's letter dated January 24, 2008 (reference 2008-TA-0100 and 2008-FA-0050), regarding the proposed Kuhua Street Extension and Improvement project in Lahaina, Maui, Hawaii. We offer the following comments in response to your remarks:

- We note your comment that several endangered and threatened species of avifauna are known to occur in the project vicinity. A Biological Resources Survey was completed for the project and will be included in the Draft Environmental Assessment (EA). It was noted in the survey that a special effort was made to look for the Hawaiian hoary bat. At the southernmost areas of the corridor, mauka of the Front Street intersection, bat activity was detected. The DPW will coordinate with the U.S. Fish and Wildlife Service to implement appropriate measures to protect the endangered Hawaiian hoary bat.

- The DPW acknowledges that seabirds are prone to collisions with objects in artificially lighted areas. As such, lights mounted in the project area, throughout the construction period, and along the completed roadway, will be appropriately down-shielded to reduce any potential impacts on seabirds.

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- Night work will cease during the peak seabird fallout period of September 15 through December 15.

- Information dissemination about seabird fallout will be provided to all staff working onsite prior to initiation of work. Please provide relevant information regarding seabird fallout for distribution to staff working on the project.

- The DPW will notify your office if waterbird nests, Hawaiian hoary bats, or Hawaiian geese are found in the project area during construction.

- The DPW will coordinate with the West Maui Fire Task Force, as applicable, to minimize fire risks along the completed roadway.

- The list of Standard Best Management Practices (BMP) for fish and wildlife you provided will be forwarded to the project's civil engineer for incorporation into the project plans, as applicable.

We appreciate the input we received from your office. A copy of the Draft EA will be provided for your review and comment.

Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Colleen Suyama
Senior Associate

CS:tn
cc: David Goode, Director, Department of Public Works
Clifford Mukai, Warren S. Unemori Engineering, Inc.
Robert Hobdy, Biologist
K:\DATA\KLMC\MillStreet\Response Letters\USFWSresp.ltr.doc

JAN 2 2 2008

LINDA LINGLE
GOVERNOR

PATRICIA HAMAMOTO
SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF SCHOOL FACILITIES AND SUPPORT SERVICES

[redacted]

January 17, 2008

Mr. Kyle Ginoza, Project Manager
Munekiyo & Hiraga, Inc.
305 High Street
Wailuku, Hawaii 96793

Dear Mr. Ginoza:

Subject: Early Consultation Request for Mill Street Extension Roadway Project, Lahaina, Maui, Hawaii

The Department of Education has reviewed your request for early consultation on the proposed extension of Mill Street.

The proposed extension will intersect with Lahainaluna Road. Lahaianaluna Road is the only access road to Lahainaluna High School, Lahaina Intermediate School, and Princess Nahienaena Elementary School from points makai of the proposed Mill Street extension. We are concerned that the new intersection may cause delays to parents and students accessing these schools in the morning or late afternoon. Please include a detailed description and illustration of the intersection design in the traffic analysis of the Environmental Assessment.

Thank you for the opportunity to review this document. If you have any questions, please call George Casen of our Facilities Development Branch at (808) 377-8301.

Sincerely yours,

Duane Y. Kashiwai
Public Works Administrator
Facilities Development Branch

DYK:jmb

c: Randolph Moore, Assistant Superintendent, OSFSS
Ron Okamura, CAS, Hana/Lahaina/Lanai/Molokai Complex Areas

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
PRESIDENT

KARLYNN FUKUDA
EXECUTIVE VICE PRESIDENT

GWEN OHASHI HIRAGA
SENIOR VICE PRESIDENT

MITSURU "MICH" HIRANO
SENIOR VICE PRESIDENT

MARK ALEXANDER ROY
VICE PRESIDENT

March 7, 2013

Duane Y. Kashiwai
Public Works Administrator
Attention: George Casen
Department of Education
P.O. Box 2360
Honolulu, Hawaii 96804

SUBJECT: Proposed Kuhua (formerly Mill) Street Extension and Improvement Project at Lahaina, Maui, Hawaii

Dear Mr. Kashiwai:

We are writing to you on behalf of the County of Maui, Department of Public Works (DPW) to thank you for your letter dated January 17, 2008, regarding the proposed Kuhua Street Extension (KSE) and Improvement project in Lahaina, Maui, Hawaii. We offer the following comments in response to your remarks:

- We are aware of the three (3) schools located on Lahainaluna Road. It is anticipated that Phases 1A and 1B1 of the Lahaina Bypass Road should be completed prior to construction of the KSE, which will provide another access point to Lahainaluna Road and the schools. This should disperse traffic in the area and alleviate the traffic congestion on Lahainaluna Road. Also, part of the proposed KSE improvements is to widen Lahainaluna Road from Kuhua Street to Honoapiilani Highway and to improve the Lahainaluna Road/Honoapiilani Highway Intersection. These improvements will help to alleviate traffic congestion at the intersection.

- The Draft Environmental Assessment (EA) will contain a Traffic Impact Assessment Report, which will include a conceptual description and illustration of the KSE/Lahainaluna Road intersection design.

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We appreciate the input we received from your office. A copy of the Draft EA will be provided to the DOE for review and comment.

Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Colleen Suyama
Senior Associate

CS:tn
cc: David Goode, Director, Department of Public Works
Keith Niiya, Austin Tsutsumi & Associates, Inc.
Clifford Mukai, Warren S. Unemori Engineering, Inc.
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MAR 0 6 2008

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
EMD / CWB

03002PKP.08

March 3, 2008

Mr. Kyle Ginoza
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Ginoza:

Subject: Early Consultation Request for Mill Street Extension Roadway Project Lahaina, Maui, Hawaii

The Department of Health, Clean Water Branch (CWB), has reviewed the subject document and offers these comments on your project. Please note that our review is based solely on the information provided in the subject document and its compliance with Hawaii Administrative Rules (HAR), Chapters 11-54 and 11-55. You may be responsible for fulfilling additional requirements related to our program. We recommend that you also read our standard comments on our website at http://www.hawaii.gov/health/environmental/env-planning/landuse/CWB-standardcomment.pdf.

1. Any project and its potential impacts to State waters must meet the following criteria:

   a. Antidegradation policy (HAR, Section 11-54-1.1), which requires that the existing uses and the level of water quality necessary to protect the existing uses of the receiving State water be maintained and protected.

   b. Designated uses (HAR, Section 11-54-3), as determined by the classification of the receiving State waters.

   c. Water quality criteria (HAR, Sections 11-54-4 through 11-54-8).

2. You are required to obtain a National Pollutant Discharge Elimination System (NPDES) permit for discharges of wastewater, including storm water runoff, into State surface waters

12

(HAR, Chapter 11-55). For the following types of discharges into Class A or Class 2 State waters, you may apply for NPDES general permit coverage by submitting a Notice of Intent (NOI) form:

a. Storm water associated with construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (1) acre of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. An NPDES permit is required before the start of the construction activities.

b. Hydrotesting water.

c. Construction dewatering effluent.

You must submit a separate NOI form for each type of discharge at least 30 calendar days prior to the start of the discharge activity, except when applying for coverage for discharges of storm water associated with construction activity. For this type of discharge, the NOI must be submitted 30 calendar days before to the start of construction activities. The NOI forms may be picked up at our office or downloaded from our website at http://www.hawaii.gov/health/environmental/water/cleanwater/forms/genl-index.html.

3. You must also submit a copy of the NOI or NPDES permit application to the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD), or demonstrate to the satisfaction of the CWB that SHPD has or is in the process of evaluating your project. Please submit a copy of your request for review by SHPD or SHPD's determination letter for the project along with your NOI or NPDES permit application, as applicable.

4. Please note that all discharges related to the project construction or operation activities, whether or not NPDES permit coverage and/or Section 401 Water Quality Certification are required, must comply with the State's Water Quality Standards. Noncompliance with water quality requirements contained in HAR, Chapter 11-54, and/or permitting requirements, specified in HAR, Chapter 11-55, may be subject to penalties of $25,000 per day per violation.

If you have any questions, please visit our website at http://www.hawaii.gov/health/environmental/water/cleanwater/index.html, or contact the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

ALEC WONG, P.E., CHIEF
Clean Water Branch

KP:np

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
PRESIDENT

KARLYNN FUKUDA
EXECUTIVE VICE PRESIDENT

GWEN OHASHI HIRAGA
SENIOR VICE PRESIDENT

MITSURU "MICH" HIRANO
SENIOR VICE PRESIDENT

MARK ALEXANDER ROY
VICE PRESIDENT

March 7, 2013

Alec Wong, P.E., Chief
Clean Water Branch
Department of Health
P.O. Box 3378
Honolulu, Hawaii 96801-3378

SUBJECT: Proposed Kuhua (formerly Mill) Street Extension and Improvement Project at Lahaina, Maui, Hawaii (EMD/CWB 03002PKP.08)

Dear Mr. Wong:

We are writing to you on behalf of the County of Maui, Department of Public Works (DPW) to thank you for your letter dated March 3, 2008, regarding the proposed Kuhua Street Extension and Improvement project in Lahaina, Maui, Hawaii. We offer the following comments in response to your remarks:

- The DPW will review the Clean Water Branch's standard comments for applicability to this project.

- The project's civil engineer will evaluate potential impacts to State waters to determine whether or not specific sections of Hawai`i Administrative Rules (HAR), Chapter 11-54 are applicable. All discharges related to project construction or operation activities will comply with relevant State Water Quality Standards. The potential for discharges will be minimized through the implementation of engineering Best Management Practices (BMPs).

- The project's civil engineer will coordinate with the Clean Water Branch to address applicable National Pollutant Discharge Elimination System (NPDES) permit requirements for the project, including the possible submittal of a Notice of Intent (NOI) for general permit coverage.

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- As applicable, the NOI will be submitted for review by the State Historic Preservation Division of the Department of Land and Natural Resources. The DPW will submit a copy of its request for review by SHPD or SHPD's determination letter for the project along with the NOI or NPDES permit application, as applicable.

- All discharges related to project construction or operation activities will comply with the applicable State Water Quality Standards as specified in HAR, Chapter 11-54 and/or permitting requirements as specified in HAR, Chapter 11-55. Discharges will be kept to a minimum through the application of engineering BMPs.

We appreciate the input we received from your office. A copy of the Draft Environmental Assessment (EA) will be provided to you for review and comment.

Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Colleen Suyama
Senior Associate

CS:tn
cc: David Goode, Director, Department of Public Works
Clifford Mukai, Warren S. Unemori Engineering, Inc.
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JAN 3 0 2008

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M. D.
DIRECTOR OF HEALTH

LORRIN W. PANG, M. D., M. P. H.
DISTRICT HEALTH OFFICER

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, MAUI, HAWAII 96793-2102

January 29, 2008

Mr. Kyle Ginoza
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawai`i 96793

Dear Mr. Ginoza:

Subject: **Early Consultation Request for Mill Street Extension Roadway Project Lahaina, Maui, Hawai`i**

Thank you for the opportunity to participate in the early consultation process for the proposed Mill Street Extension Roadway Project. The following comments are offered:

> The noise created during the construction phase of the project may exceed the maximum allowable levels as set forth in Hawaii Administrative Rules (HAR), Chapter 11-46, "Community Noise Control". A noise permit may be required and should be obtained before the commencement of work.

It strongly recommended that the Standard Comments found at the Department's website: www.state.hi.us/health/environmental/env-planning/landuse/landuse.html be reviewed, and any comments specifically applicable to this project should be adhered to.

Should you have any questions, please call me at 808 984-8230.

Sincerely,

Herbert S. Matsubayashi
District Environmental Health Program Chief

17

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
PRESIDENT

KARLYNN FUKUDA
EXECUTIVE VICE PRESIDENT

GWEN OHASHI HIRAGA
SENIOR VICE PRESIDENT

MITSURU "MICH" HIRANO
SENIOR VICE PRESIDENT

MARK ALEXANDER ROY
VICE PRESIDENT

March 7, 2013

Patti Kitkowski, District Environmental
Health Program Chief
Maui District Health Office
Department of Health
54 High Street
Wailuku, Hawaii 96793-2102

SUBJECT: Proposed Kuhua (formerly Mill) Street Extension and Improvement Project at Lahaina, Maui, Hawaii

Dear Ms. Kitkowski:

We are writing to you on behalf of the County of Maui, Department of Public Works (DPW) to thank you for your department's letter dated January 29, 2008, regarding the proposed Kuhua Street Extension and Improvement project in Lahaina, Maui, Hawaii. We offer the following comments in response to your remarks:

- The planning, design, and construction of the project will be undertaken in accordance with the maximum allowable sound levels as set forth by Hawaii Administrative Rules (HAR), Chapter 11-46, "Community Noise Control". Pursuant to HAR, Chapter 11-46, a noise permit will be secured prior to commencement of construction, as applicable.

- The DPW will review the Department of Health's standard comments and will adhere to comments specifically applicable to this project.

We appreciate the input we received from your office. A copy of the Draft Environmental Assessment (EA) will be provided to you for review and comment.

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Should you have any questions, please do not hesitate to contact me at 244-2015.

Very truly yours,

Colleen Suyama
Senior Associate

CS:tn
cc: David Goode, Director, Department of Public Works
Clifford Mukai, Warren S. Unemori Engineering, Inc.
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MAY 2 1 2008

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 19, 2008

Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

Attention: Mr. Kyle Ginoza

Dear Mr. Ginoza:

SUBJECT: Early Consultation for Mill Street Extension Roadway Project

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are additional comments from the Maui District office of the Land Division on the subject matter. Should you have any questions, please feel free to call my office at 587-0433. Thank you.

Sincerely,

Charlene E. Unoki

for Morris M. Atta
Administrator

Enclosure

20

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

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December 28, 2007

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
x Div. of Boating & Ocean Recreation
x Engineering Division
x Div. of Forestry & Wildlife
x ~~Div. of State Parks~~
x Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division – Maui District

RECEIVED
LAND DIVISION
2008 JAN 15 P 3:34
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

FROM: for Morris M. Atta Charlene
SUBJECT: Early Consultation for Mill Street Extension Roadway Project
LOCATION: Lahaina, Maui
APPLICANT: Munekiyo & Hiraga, Inc.

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by January 15, 2008.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: W. Paty-Fonseca
Date: 1/10/08

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON

MEREDITH J. CHING
JAMES A. FRAZIER
NEAL S. FUJIWARA
CHIYOME L. FUKINO, M.D.
DONNA FAY K. KIYOSAKI, P.E.
LAWRENCE H. MIIKE, M.D., J.D.

KEN C. KAWAHARA, P.E.
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

January 14, 2008

REF:

TO: Morris Atta, Acting Administrator
Land Division

FROM: Ken C. Kawahara, P.E., Deputy Director
Commission on Water Resource Management

SUBJECT: Early Consultation for Mill Street Extension Roadway Project
Lahaina, Maui

FILE NO.:

Thank you for the opportunity to review the subject document. The Commission on Water Resource Management (CWRM) is the agency responsible for administering the State Water Code (Code). Under the Code, all waters of the State are held in trust for the benefit of the citizens of the State, therefore, all water use is subject to legally protected water rights. CWRM strongly promotes the efficient use of Hawaii's water resources through conservation measures and appropriate resource management. For more information, please refer to the State Water Code, Chapter 174C, Hawaii Revised Statutes, and Hawaii Administrative Rules, Chapters 13-167 to 13-171. These documents are available via the Internet at *http://www.hawaii.gov/dlnr/cwrm.*

Our comments related to water resources are checked off below.

☐ 1. We recommend coordination with the county to incorporate this project into the county's Water Use and Development Plan. Please contact the respective Planning Department and/or Department of Water Supply for further information.

☐ 2. We recommend coordination with the Engineering Division of the State Department of Land and Natural Resources to incorporate this project into the State Water Projects Plan.

☐ 3. There may be the potential for ground or surface water degradation/contamination and recommend that approvals for this project be conditioned upon a review by the State Department of Health and the developer's acceptance of any resulting requirements related to water quality.

Permits required by CWRM: Additional information and forms are available at *www.hawaii.gov/dlnr/cwrm/forms.htm.*

☐ 4. The proposed water supply source for the project is located in a designated ground-water management area, and a Water Use Permit is required prior to use of ground water.

☐ 5. A Well Construction Permit(s) is (are) required before the commencement of any well construction work.

☐ 6. A Pump Installation Permit(s) is (are) required before ground water is developed as a source of supply for the project.

☐ 7. There is (are) well(s) located on or adjacent to this project. If wells are not planned to be used and will be affected by any new construction, they must be properly abandoned and sealed. A permit for well abandonment must be obtained.

☐ 8. Ground-water withdrawals from this project may affect streamflows, which may require an instream flow standard amendment.

☒ 9. A Stream Channel Alteration Permit(s) is (are) required before any alteration can be made to the bed and/or banks of a stream channel.

☐ 10. A Stream Diversion Works Permit(s) is (are) required before any stream diversion works is constructed or altered.

☐ 11. A Petition to Amend the Interim Instream Flow Standard is required for any new or expanded diversion(s) of surface water.

☐ 12. The planned source of water for this project has not been identified in this report. Therefore, we cannot determine what permits or petitions are required from our office, or whether there are potential impacts to water resources.

☐ 13. We recommend that the report identify feasible alternative non-potable water resources, including reclaimed wastewater.

☐ OTHER:

If there are any questions, please contact Ed Sakoda at 587-0234.

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION
2008 JAN 14 P 3:48

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

'07 DEC 31 AM 10:52 ENGINEERING

December 28, 2007

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
x Div. of Boating & Ocean Recreation
x Engineering Division
x Div. of Forestry & Wildlife
x Div. of State Parks
x Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division – Maui District

FROM: for Morris M. Atta
SUBJECT: Early Consultation for Mill Street Extension Roadway Project
LOCATION: Lahaina, Maui
APPLICANT: Munekiyo & Hiraga, Inc.

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by January 15, 2008.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(X) Comments are attached.

Signed: _____
Date: 1/14/08

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/MorrisAtta
Ref.: EarlyConsMillStExtension
Maui.387

COMMENTS

( ) We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ___.

(X) Please take note that according to the maps that you provided, it appears that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone C. The National Flood Insurance Program does not have any regulations for developments within Zone C.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

( ) Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

( ) Mr. Robert Sumitomo at (808) 768-8097 or Mr. Mario Siu Li at (808) 768-8098 of the City and County of Honolulu, Department of Planning and Permitting.
( ) Mr. Kelly Gomes at (808) 961-8327 (Hilo) or Mr. Kiran Emler at (808) 327-3530 (Kona) of the County of Hawaii, Department of Public Works.
( ) Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.
( ) Mr. Mario Antonio at (808) 241-6620 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

( ) The applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update.

( ) Additional Comments:_____

( ) Other:_____

Should you have any questions, please call Ms. Suzie S. Agraan of the Planning Branch at 587-0258.

Signed: Eric T. Hirano

ERIC T. HIRANO, CHIEF ENGINEER

Date: 11/4/08

Division of Forestry & Wildlife

1151 Punchbowl Street, Rm. 325 • Honolulu, HI 96813 • (808) 587-0166 • Fax: (808) 587-0160

January 9, 2008

MEMORANDUM

TO: Morris M. Atta, Administrator
Land Division

FROM: Paul J. Conry, Administrator
Division of Forestry and Wildlife

SUBJECT: Request for Comments: Early Consultation for Mill Street Extension Roadway Project, Lahaina, Maui by Munekiyo & Hiraga, Inc.

DOFAW has reviewed the subject project request for comments and provide the following for your consideration. The Mill Street Extension alignment on the mauka and northerly direction from the Lahaina Aquatic Center contains a sediment basin area that attracts the endangered nene in the area. Please call John Medeiros, Maui wildlife staff at (808) 873-3510 to provide specific comments to this pre-consultation recommendation to this project. Thank you for the opportunity to address the issues for this project.

C: John Cumming, Maui Branch Manager
John Medeiros, Wildlife Biologist, Maui DOFAW

RECEIVED
LAND DIVISION
2008 JAN 11 A 9: 22
DEPT OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 28, 2007

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
x Div. of Boating & Ocean Recreation
x Engineering Division
x Div. of Forestry & Wildlife
x Div. of State Parks
x Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division – Maui District

RECEIVED
LAND DIVISION
2008 JAN -8 P 4:27
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

FROM: for Morris M. Atta
SUBJECT: Early Consultation for Mill Street Extension Roadway Project
LOCATION: Lahaina, Maui
APPLICANT: Munekiyo & Hiraga, Inc.

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by January 15, 2008.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

(X) We have no objections.
( ) We have no comments.
( ) Comments are attached.

Signed:
Date: 1/7/08

DEC31'07AM10:59BOR DIV

51022

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
STATE PARKS DIV.
'08 JAN -3 A8:33
DEPT OF LAND & NATURAL RESOURCES

December 28, 2007

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
x Div. of Boating & Ocean Recreation
x Engineering Division
x ~~Div. of Forestry~~ & Wildlife
x Div. of State Parks
x Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division – Maui District

FROM: for Morris M. Atta
SUBJECT: Early Consultation for Mill Street Extension Roadway Project
LOCATION: Lahaina, Maui
APPLICANT: Munekiyo & Hiraga, Inc.

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by January 15, 2008.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: [signature]
Date: 1/3/08

28

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. E. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 28, 2007

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
x Div. of Boating & Ocean Recreation
x Engineering Division
x Div. of Forestry & Wildlife
x Div. of State Parks
x Commission on Water Resource Management
x Office of Conservation & Coastal Lands
x Land Division – Maui District

RECEIVED
LAND DIVISION
2008 MAY -6 A 9:21
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

FROM: for Morris M. Atta
SUBJECT: Early Consultation for Mill Street Extension Roadway Project
LOCATION: Lahaina, Maui
APPLICANT: Munekiyo & Hiraga, Inc.

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by January 15, 2008.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact my office at 587-0433. Thank you.

Attachments

( ) We have no objections.
(✓) We have no comments.
( ) Comments are attached.

Signed: _____
Date: 5/1/08

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
PRESIDENT

KARLYNN FUKUDA
EXECUTIVE VICE PRESIDENT

GWEN OHASHI HIRAGA
SENIOR VICE PRESIDENT

MITSURU "MIGH" HIRANO
SENIOR VICE PRESIDENT

MARK ALEXANDER ROY
VICE PRESIDENT

March 7, 2013

Russell Tsuji, Administrator
Department of Land and Natural Resources
Land Division
P.O. Box 621
Honolulu, Hawaii 96809

SUBJECT: Proposed Kuhua (formerly Mill) Street Extension and Improvement Project at Lahaina, Maui, Hawaii

Dear Mr. Tsuji:

We are writing to you on behalf of the County of Maui, Department of Public Works (DPW) to thank you for your office's letter dated May 19, 2008, regarding the proposed Kuhua Street Extension and Improvement project in Lahaina, Maui, Hawaii. We offer the following in response to your Department's comments:

Commission on Water Resource Management

- We acknowledge any alteration to the Kahoma Stream Channel will require a Stream Channel Alteration Permit.

Enginering Division

- In September 2012, the Federal Flood Insurance Rate Maps were revised and the project site is located in Zone X, an area of minimal flooding.

Division of Forestry and Wildlife

- We acknowledge that the sediment basin near the Lahaina Aquatic Center may attract the endangered nene.

The Division of Boating and Ocean Recreation, Division of State Parks and Land Division–Maui Office had no objections or comments.

MAUI
305 High St., Suite 104 Wailuku, Hawaii 96793
PH: (808)244-2015 FAX: (808)244-8729
OAHU
735 Bishop St., Suite 238 Honolulu, Hawaii 96813 | PH: (808)983-1233
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A copy of the Draft Environmental Assessment (EA) will be provided to you for review and comment.

Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Colleen Suyama
Senior Associate

CS:tn
cc: David Goode, Director, Department of Public Works
Clifford Mukai, Warren S. Unemori Engineering, Inc.
Robert Hobdy, Biologist
K:\DATA\KLMC\MillStreet\Response Letters\DLNRresponse.doc

DEC 2 9 2008

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
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

December 22, 2008

Mr. Kyle Ginoza
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawai'i 96793

LOG NO: 2008.0224
DOC NO: 0812JP21
Archaeology

Dear Mr. Ginoza:

SUBJECT: Chapter 6E- Historic Preservation Review [County/Planning/DSA/State] – Consultation Request for Mill Street Extension Roadway Project Various Ahupua'a, Lahaina District, Maui Island TMK: (2) 4-Various

Thank you for the opportunity to comment on the proposed Mill Street extension roadway project. Our review is based on reports, maps, and aerial photographs maintained at the State Historic Preservation Division (SHPD). We apologize for the delayed response. Please consider the following comments and recommendations for the project area.

Our records indicate there has been no archaeological inventory survey conducted for this specific project area. There have been archaeological investigations on some adjacent areas. The area was once the location of ancient traditional Hawaiian agricultural, habitation, and ceremonial sites. The area was also extensively utilized throughout the historic plantation era.

In order to determine the effect of the proposed extension on historic properties, we recommend that no construction activities occur until an archaeological assessment/inventory survey has been accepted by our office. If significant historic properties are identified, then proposed mitigation in consultation with this office shall be submitted for review and approval. Please direct any archaeological concerns or questions about this review to Jenny Pickett at the Maui section of the SHPD at (808) 243-4641. The Maui section may also be contacted at (808) 243-1285 or (808) 243-4640.

Aloha,

Nancy A. McMahon

Nancy McMahon
Historic Preservation Manager
State Historic Preservation Division

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
PRESIDENT

KARLYNN FUKUDA
EXECUTIVE VICE PRESIDENT

GWEN OHASHI HIRAGA
SENIOR VICE PRESIDENT

MITSURU "MICH" HIRANO
SENIOR VICE PRESIDENT

MARK ALEXANDER ROY
VICE PRESIDENT

March 7, 2013

Puaalaokalani Aiu, Administrator
Department of Land and
Natural Resources
State Historic Preservation Division
601 Kamokila Boulevard, Room 555
Kapolei, Hawaii 96707

SUBJECT: Proposed Kuhua (Formerly Mill) Street Extension and Improvement Project at Lahaina, Maui, Hawaii (Log No: 2008.0224, Doc No: 0812JP21)

Dear Ms. Aiu:

We are writing to you on behalf of the County of Maui, Department of Public Works (DPW) to thank you for your office's letter dated December 22, 2008, regarding the proposed Kuhua Street Extension and Improvement project in Lahaina, Maui, Hawaii. As recommended, an archaeological inventory survey was conducted for the project site and will be included in the Draft Environmental Assessment (EA).

A copy of the Draft EA will be provided to you for review and comment.

Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Colleen Suyama
Senior Associate

CS:tn
cc: David Goode, Director, Department of Public Works
Hallett Hammatt, Cultural Surveys Hawaii, Inc.
K:\DATA\KLMC\MillStreet\Response Letters\SHPDresponse.doc

MAUI
305 High St., Suite 104 Wailuku, Hawaii 96793
PH: (808)244-2015 FAX: (808)244-8729
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FEB 0 7 2008

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
INTERIM DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

STP 8.2760

February 6, 2008

Mr. Kyle Ginoza, Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Ginoza:

Subject: Early Consultation Mill Street Extension Roadway Project
Lahaina, Maui Hawaii

Thank you for requesting the State Department of Transportation's (DOT) review of the subject project.

DOT's comments are as follows:

1. Coordination of this project will be done through the Highways Division. The developer/landowner should contact the Highways Division, Highways Planning Branch and Maui District Office to discuss any matter that may involve traffic in the area.

2. A traffic assessment report should be prepared by the developer/landowner and submitted as part of the project's environmental assessment. The traffic report should evaluate traffic conditions with and without the proposed project improvements for further discussion with the Highways Division.

3. We request that DOT be provided four (4) copies of the project's environmental assessment.

We appreciate the opportunity to provide comments.

Very truly yours,

Francis Paul Keeno

for BRENNON T. MORIOKA, PH.D., P.E.
Interim Director of Transportation

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
PRESIDENT

KARLYNN FUKUDA
EXECUTIVE VICE PRESIDENT

GWEN OHASHI HIRAGA
SENIOR VICE PRESIDENT

MITSURU "MICH" HIRANO
SENIOR VICE PRESIDENT

MARK ALEXANDER ROY
VICE PRESIDENT

March 7, 2013

Glenn Okimoto, Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawai`i 96813-5097

SUBJECT: Proposed Kuhua (formerly Mill) Street Extension and Improvement Project at Lahaina, Maui, Hawaii (STP 8.2760)

Dear Mr. Okimoto:

We are writing to you on behalf of the County of Maui, Department of Public Works (DPW) to thank you for your department's letter dated February 6, 2008 (reference STP 8.2760), regarding the proposed Kuhua Street Extension and Improvement project in Lahaina, Maui, Hawaii. We offer the following information in response to your comments:

- The DPW will coordinate with your department's Highways Division, Highways Planning Branch, and the Maui District Office regarding matters that involve traffic in the area.

- A Traffic Impact Assessment Report has been prepared for the project and will be included in the Draft EA. The report evaluates traffic conditions with and without the proposed project improvements for review by the Highways Division.

- As you requested, four (4) copies of the Draft EA will be provided to your department for review and comment.

MAUI
305 High St., Suite 104 Wailuku, Hawaii 96793
PH: (808)244-2015 FAX: (808)244-8729
OAHU
735 Bishop St., Suite 238 Honolulu, Hawaii 96813 | PH: (808)983-1233
WWW.MHPLANNING.COM

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We appreciate the input we received from your department. Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Colleen Suyama
Senior Associate

CS:tn
cc: David Goode, Director, Department of Public Works
Clifford Mukai, Warren S. Unemori Engineering, Inc.
Keith Niiya, Austin Tsutsumi & Associates, Inc.
K:\DATA\KLMC\MillStreet\Response Letters\SDOTresponse.ltr.doc

JAN 2 5 2008

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD07/3458

January 23, 2008

Munekiyo & Hiraga, Inc.
Attn: Kyle Ginoza
305 High Street, Suite 104
Wailuku, Hawai'i 96793

RE: Early Consultation Request for Mill Street Extension Roadway Project, Lahaina, Maui, Hawai'i

Aloha nō e Mr. Ginoza,

The Office of Hawaiian Affairs ("OHA") is in receipt of your December 26, 2007 letter seeking early consultation concerning the above-referenced project, and offers the following comments:

As you may know, the Hawai'i State Constitution mandates the protection and preservation of Native Hawaiian cultural assets and sites, burials and funerary objects, traditional practices and access rights, among other things. This mandate constitutes one of OHA's primary kuleana.

An Environmental Assessment ("EA"), in accordance with Chapter 343 of the Hawaii Revised Statues, should include a Cultural Impact Assessment ("CIA"). In accordance with the requirement of Act 50, Session Laws of Hawaii 2000, a CIA shall include information relating to the practices and beliefs of the Native Hawaiians who once inhabited the area(s), and it is recommended that community involvement be included in this assessment. We refer you to Thelma Shimaoka, Cultural Resource Coordinator in OHA's Maui office, who can be reached at (808) 873-3364, to further assist you in this project area. The Maui office of the State Historic Preservation Division ("SHPD") should also be consulted.

OHA asks that, in accordance with Section 6E-46.6, HRS and Chapter 13-300, Hawaii Administrative Rules, if the project moves forward, and if any significant cultural deposits or

human skeletal remains are encountered, work shall stop in the immediate vicinity and SHPD shall be contacted. OHA would also like to be notified.

Upon completion of this segment to the project, OHA thanks you in advance and respectfully requests a hardcopy of the draft EA, addressed to my attention. OHA hopes to be consulted on this matter in the future as more information becomes available and the project progresses.

Thank you for the opportunity to comment. If you have any further questions and/or concerns, please contact Jerome Yasuhara, Policy Advocate in the Native Rights, Land and Culture Hale, at (808) 594-0239 or via email at jeromey@oha.org.

'O wau iho nō, me ka ha'aha'a,

Clyde W. Nāmu'o
Administrator

C: Thelma Shimaoka, OHA—Maui Office

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
PRESIDENT

KARLYNN FUKUDA
EXECUTIVE VICE PRESIDENT

GWEN OHASHI HIRAGA
SENIOR VICE PRESIDENT

MITSURU "MICH" HIRANO
SENIOR VICE PRESIDENT

MARK ALEXANDER ROY
VICE PRESIDENT

March 7, 2013

Dr. Kamana`opono Crabbe, Chief Executive Officer
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

SUBJECT: Proposed Kuhua (formerly Mill) Street Extension and Improvement Project at Lahaina, Maui, Hawaii

Dear Dr. Crabbe:

We are writing to you on behalf of the County of Maui, Department of Public Works (DPW) to thank you for your office's letter dated January 23, 2008, regarding the proposed Kuhua Street Extension and Improvement project in Lahaina, Maui, Hawaii. We offer the following comments in response to your remarks:

- A Cultural Impact Assessment has been prepared for the project and will be included in the Draft Environmental Assessment (EA).

- We note that, in accordance with Section 6E-43.6, Hawaii Revised Statutes and Chapter 13-300, Hawaii Administrative Rules, if any significant cultural deposits or human skeletal remains are encountered, work will stop in the immediate vicinity and the State Historic Preservation Division (SHPD) and your office will be contacted.

We appreciate the input we received from your office. A copy of the Draft EA will be provided to you for review and comment.

MAUI
305 High St., Suite 104 Wailuku, Hawaii 96793
PH: (808)244-2015 FAX: (808)244-8729
OAHU
735 Bishop St., Suite 238 Honolulu, Hawaii 96813 | PH: (808)983-1233
WWW.MHPLANNING.COM

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Should you have any questions, please do not hesitate to contact me at (808) 244-2015.

Very truly yours,

Colleen Suyama
Senior Associate

CS:tn
cc: David Goode, Director, Department of Public Works
Clifford Mukai, Warren S. Unemori Engineering, Inc.
Hallett Hammatt, Cultural Surveys Hawaii
F:\DATA\KLMC\MillStreet\OHAresponse.ltr.doc

JAN 1 5 2008

CHARMAINE TAVARES
Mayor

TAMARA HORCAJO
Director

ZACHARY Z. HELM
Deputy Director

(808) 270-7230
Fax (808) 270-7934

DEPARTMENT OF PARKS & RECREATION

700 Hali'a Nakoa Street, Unit 2 , Wailuku, Hawaii 96793

January 7, 2008

Munekiyo & Hiraga, Inc.
Attention: Kyle Ginoza
305 High Street, Suite 104
Wailuku, Hawaii 96793

SUBJECT: Early Consultation Request for Mill Street Extension Roadway Project, Lahaina, Maui, Hawai'i

Dear Mr. Ginoza:

The Parks Department's primary concern is the impact on park access. We will continue to work with you to ensure a seamless transition during the construction phase.

Thank you for the opportunity to review and comment on this matter. Please feel free to contact me or Mr. Baron Sumida, CIP Coordinator Parks Planning and Development, at 270-6173 should you have any other questions.

Sincerely,

TAMARA HORCAJO
Director

xc: Patrick Matsui, Chief of Parks Planning & Development
Baron Sumida, CIP Coordinator Parks Planning & Development

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
PRESIDENT

KARLYNN FUKUDA
EXECUTIVE VICE PRESIDENT

GWEN OHASHI HIRAGA
SENIOR VICE PRESIDENT

MITSURU "MICH" HIRANO
SENIOR VICE PRESIDENT

MARK ALEXANDER ROY
VICE PRESIDENT

March 7, 2013

Glenn Correa, Director
Department of Parks and Recreation
700 Halia Nakoa Street, Unit 2
Wailuku, Hawaii 96793

SUBJECT: Proposed Kuhua (formerly Mill) Street Extension and Improvement Project at Lahaina, Maui, Hawaii

Dear Mr. Correa:

We are writing to you on behalf of the County of Maui, Department of Public Works to thank you for your department's letter dated January 7, 2008, regarding the proposed Kuhua Street Extension and Improvement project in Lahaina, Maui, Hawaii. We will continue to coordinate the proposed roadway project with your department to minimize and mitigate impacts that may result from the proposed alignment.

We appreciate the input we received from your office. A copy of the Draft Environmental Assessment will be provided to you for review and comment.

Should you have any questions, please do not hesitate to contact me at 244-2015.

Very truly yours,

Colleen Suyama
Senior Associate

CS:tn
cc: David Goode, Director, Department of Public Works
Clifford Mukai, Warren S. Unemori Engineering, Inc.
Keith Niiya, Austin, Tsutsumi & Associates, Inc.
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Mayor

JEFFREY S. HUNT
Director

COLLEEN M. SUYAMA
Deputy Director

FEB 0 7 2008

COUNTY OF MAUI
DEPARTMENT OF PLANNING

February 5, 2008

Mr. Kyle Ginoza
Munekiyo and Hiraga, Inc.
305 High Street, Suite 105
Wailuku, Hawaii 96793

Dear Mr. Ginoza:

SUBJECT: PRE-CONSULTATION COMMENTS REGARDING THE PROPOSED MILL STREET EXTENSION ROADWAY PROJECT, LAHAINA, MAUI, HAWAII (EAC 2008/0001)

The Maui Department of Planning (Department) has reviewed your letter dated December 26, 2007, requesting pre-consultation and provides the following comments in preparation of the Draft Environmental Assessment (EA).

1. As an agency action, we expect that the accepting authority will be the Maui County Department of Public Works. However, please confirm this with them since, as you indicate, state lands and/or funds may also be involved. The Department of Planning will serve as a commenting agency.

2. Topics To Be Addressed: For the sake of reference in this letter, we will temporarily assume that the topics to be addressed would be generally similar to those covered in the recent Final Environmental Assessment prepared in support of the West Maui Medical Facility proposed on lands currently owned by the Ka'anapali Land Management Corporation.

3. Land Use Entitlements: Please check and confirm if any of the work will be conducted within the Special Management Area. This may or may not be the case for the connection to Honoapiilani Highway.

4. Land Uses: The proposed roadway will provide improved local and regional access as an alternate route to Honoapiilani Highway. However, it will also provide improved local access to the lands adjoining it and nearby. Please address how this may facilitate secondary impacts of the conversion of adjoining and nearby undeveloped or open space lands to developed urban land uses, what types of developed land uses would be most likely to be

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facilitated, and whether or not these would be consistent with adopted zoning and land use designations in the applicable West Maui Community Plan.

5. Agricultural Productivity Considerations: Please address conversion from productive or potentially productive agricultural use and/or agricultural land use designations which would occur within the proposed roadway right-of-way as well as the secondary impacts of additional conversion due to the roadway's facilitation of land use changes to developed urban uses.

6. Flora and Fauna: Research conducted by the Department of Planning in support of the preparation of the Maui Island Plan shows some wetland resources adjoining and/or within the roadway alignment south of Lahainaluna Road. Please address direct and/or secondary impacts upon any such resources.

7. Noise Characteristics: The proposed general alignment appears to adjoin and/or is otherwise nearby some existing residences and lands currently having residential land use designations in the West Maui Community Plan. Noise impacts upon such current and planned future sensitive land uses needs to be addressed and measures to mitigate possible impacts need to be identified along with feasible means for their implementation.

8. Community Character: Please address how the proposed roadway project will be designed so as to not clash with or otherwise negatively impact the character and residents' use of the neighborhoods through which it would pass. This should particularly be addressed where the proposed roadway might replace a local residential street which currently has only very limited local traffic, such as Kuhua Street.

9. Population, Employment and Housing: Please address if, and if so how, the improved regional and local access to be offered by the proposed roadway would be likely to induce population, employment and housing growth in the West Maui region.

10. Police and Fire Protection Services, and Health Facilities: Please address if, and if so how, the improved regional and local access to be offered by the proposed roadway would be likely to impact and/or improve the delivery of police and fire protection services, as well as access to health facilities.

11. Recreational Facilities: The southerly end of the roadway alignment appears to run between the Lahaina Aquatic/Recreation Center and the area of the two baseball fields directly to the west. These

bisected facilities currently seem to operate independently. However, please still address if this break in the contiguity of these recreational facilities will negatively impact the current and/or otherwise anticipated operations and aesthetics of the recreation facilities. Also please address how this roadway might improve access to and use of current and otherwise planned recreational facilities.

12. Roadway Infrastructure: Please prepare a traffic report which, among other things, addresses the proposed roadway's impact upon the local and regional road network.

13. Other Transportation Infrastructure: Please address the potential and any plans for the implementation of other modes of transportation infrastructure to be developed along with the roadway improvements, particularly trails for bicycle and pedestrian use, and accommodation of public transit. Even if these opportunities may not yet be addressed in existing infrastructure plans for such modes, still address if and how such modes could be beneficially accommodated within the context of the roadway project.

14. Other Non-transportation Infrastructure: Please address how the roadway and/or its right-of-way could be designed to facilitate the solutions to identified or anticipated needs for other types of infrastructure, such as utilities which might be able to share the right-of-way.

15. Relationship To Land Use and Infrastructure Plans, Policies And Controls: Please address how development of the proposed roadway would relate to existing land use and infrastructure plans, policies and controls, including the following measures from the West Maui Community Plan:

    Environment Policy 13. "Promote the planting of trees and other landscape planting to enhance streetscapes and the built environment."

    Environment Policy 15. "Promote drainage and storm water management practices that prevent flooding and protect coastal water quality."

    Cultural Resource Policy 1. "Preserve and protect significant archaeological, historical and cultural resources that are unique in the State of Hawaii and Island of Maui."

Urban Design Policy 1. "Enhance the appearance of major public roads and highways in the region."

Urban Design Policy 6. "Promote a unified street tree planting scheme along major highways and streets. Hedge planting should be spaced and limited in height, in order to provide vistas to the shoreline and mountains."

Urban Design Policy 11. "Use native plants for landscape planting in public projects to the extent practicable."

Urban Design Policy 12. "Existing and future public rights-of-way along roads and parks shall be planted with appropriate trees, turfgrass and ground covers."

Transportation Policy 1. "Support construction of the planned Lahaina Bypass Road in such a way as to promote safe, efficient travel across the region without encouraging further urbanization or impeding agricultural operations."

Transportation Policy 3. "Support improvements for the safe and convenient movement of people and goods, pedestrians and bicyclists in the Lahaina region particularly along Honoapiilani Highway, Front Street and Lower Honoapiilani Road and seek to establish a regional network of bikeways and pedestrian paths."

Transportation Policy 4. "Support ridesharing, programs to promote safe bicycle and pedestrian travel, alternative work schedules, traffic signal synchronization, and other transportation demand management strategies."

Transportation Implementing Action 2. "Construct left turn lanes on the Lahainaluna Road at its intersection with Honoapiilani Highway."

Transportation Implementing Action 5. "Establish major recreation ways for pedestrians and bicycles from the pali to Lahaina town and to Kapalua along the coastal highways, including Honoapiilani Highway and Lower Honoapiilani Road, and along the southern side of Kahoma Stream and other major drainage channels."

Transportation Implementing Action 12. "Study, design and implement measures for safe pedestrian access connecting Lahaina town with its mauka pool and park, including consideration of pedestrian overpasses."

16. Alterntatives: Please address siting alternatives for the roadway and any alternatives to the general alignment which might still serve the major purpose of relieving congestion on Honoapiilani Highway.

Thank you for your cooperation. If you require further clarification, please contact Staff Planner Jeffrey Dack, AICP, at jeffrey.dack@mauicounty.gov or at 270-6275.

Sincerely,

CLAYTON I. YOSHIDA, AICP
Planning Program Administrator

xc: Jeffrey P. Dack, Staff Planner
Michael Miyamoto, Deputy Public Works Director

CIY:JPD:bv

EAC File
General File

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MUNEKIYO & HIRAGA, INC.

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PRESIDENT

KARLYNN FUKUDA
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SENIOR VICE PRESIDENT

MITSURU "MICH" HIRANO
SENIOR VICE PRESIDENT

MARK ALEXANDER ROY
VICE PRESIDENT

March 7, 2013

William Spence, Director
Department of Planning
250 South High Street
Wailuku, Hawaii 96793

SUBJECT: Proposed Kuhua (formerly Mill) Street Extension and Improvement Project at Lahaina, Maui, Hawaii

Dear Mr. Spence:

We are writing to you on behalf of the County of Maui Department of Public Works (DPW), to thank you for your department's letter dated February 5, 2008, regarding the proposed Kuhua Street Extension and Improvement project in Lahaina, Maui, Hawaii. We offer the following comments in response to your remarks:

1. Although the County of Maui may seek future State lands and funding, such commitments have yet to be determined. As a County-initiated project, the approving agency for the Environmental Assessment (EA) will be the DPW.
2. The Final Environmental Assessment prepared for the West Maui Medical Facility will be used as a reference document in the preparation of the Draft EA.
3. Zoning Confirmation Forms have been obtained for the subject properties within the proposed alignment of the Kuhua Street extension and have been determined to be outside of the Special Management Area (SMA). The connections to Honoapiilani Highway are anticipated to be limited to within the mauka boundary of the existing right-of-way and outside of the SMA.
4. The Draft EA will address secondary impacts resulting from improved access to adjoining and nearby undeveloped lands which are primarily designated for future residential use and commercial industrial use.
5. The Draft EA will address the community benefits of the roadway in relationship to the removal of vacant agricultural lands and secondary impacts due to facilitation of land use changes to developed urban uses.

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6. A Flora and Fauna Study was prepared for the subject roadway alignment. The results and recommendations of the study will be included in the Draft EA. The study did not find any wetland conditions adjacent to the proposed roadway alignment.
7. An Acoustic Study was prepared for the project and the analysis and recommendation will be included in the Draft EA.
8. The Draft EA will address the impacts on community character, especially on the residences on Kuhua Street.
9. The Draft EA will address potential impacts on population, employment and housing.
10. The Draft EA will address police and fire protection services, as well as health facilities. The construction of another north-south roadway will provide an alternate route in Lahaina Town during emergencies when Honoapiilani Highway is temporarily closed.
11. The DPW will coordinate the roadway alignment with the Department of Parks and Recreation (DPR) to minimize impacts on the Lahaina Recreation Center access and facilities located near the southern terminus of the roadway.
12. As requested, a Traffic Impact Analysis Report (TIAR) has been prepared by Austin, Tsutsumi & Associates, Inc. and will be included in the Draft EA.
13. The conceptual design for the roadway includes a separated multi-use trail greenway and will be included in the Draft EA.
14. The right-of-way width will be wide enough to accommodate other utilities such as, electrical, water, and sewer. Such improvements can be coordinated with the roadway improvements once the DPW initiate the design phase of the project.
15. The Draft EA will address the various goals, objectives, and policies of the various land use and transportation plans. As may be appropriate, your comments on the West Maui Community plan will be included in the Draft EA.
16. Siting alternatives for the roadway were studied in the TIAR, as well as road widening of existing collector roadways. An analysis of each alternative and the reasons for selection of the preferred alternative will be included in the Draft EA.

We appreciate the input we received from your office. A copy of the Draft EA will be provided to you for review and comment.

Should you have any questions, please do not hesitate to contact me at 244-2015.

Very truly yours,

Colleen Suyama
Senior Associate

CS:tn
cc: David Goode, Director, Department of Public Works
Robert Hobdy, Biologist
Yoichi Ebisu, Ebisu & Associates, Inc.
Clifford Mukai, Warren S. Unemori Engineering, Inc.
Keith Niiya, Austin, Tsutsumi & Associates, Inc.
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JAN 2 2 2008

CHARMAINE TAVARES
Mayor

MILTON M. ARAKAWA, A.I.C.P.
Director

MICHAEL M. MIYAMOTO
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

RALPH NAGAMINE, L.S., P.E.
Development Services Administration

CARY YAMASHITA, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

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

January 16, 2008

Mr. Kyle Ginoza
MUNEKIYO & HIRAGA, INC.
305 High Street, Suite 104
Wailuku, Maui, Hawaii 96793

Dear Mr. Ginoza:

SUBJECT: EARLY CONSULTATION REQUEST FOR MILL STREET EXTENSION ROADWAY PROJECT LAHAINA, MAUI

We reviewed the subject application and have the following comments:

1. Suggest renaming the street. Mill Street is already in use in Wailuku. (Mill Place in use in Hana.)

2. Provide access to both sides of Kahoma Stream Flood Control channel for maintenance by construction equipment and trucks.

3. Provide connections to Dickenson Street, Shaw Street, Prison Street and Aholo Road.

4. Need to review how proposed road will affect proposed Lahaina Watershed (Lahainaluna Road to Launiupoko) drainage project and include mitigative measures.

Please call Michael Miyamoto at 270-7845 if you have any questions regarding this letter.

Sincerely,

MILTON M. ARAKAWA, A.I.C.P.
Director of Public Works

MMA:MMM:ls
xc: Highways Division
Engineering Division
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MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
PRESIDENT

KARLYNN FUKUDA
EXECUTIVE VICE PRESIDENT

GWEN OHASHI HIRAGA
SENIOR VICE PRESIDENT

MITSURU "MICH" HIRANO
SENIOR VICE PRESIDENT

MARK ALEXANDER ROY
VICE PRESIDENT

March 7, 2013

David Goode, Director
Department of Public Works
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: Proposed Kuhua (formerly Mill) Street Extension and Improvement Project at Lahaina, Maui, Hawaii

Dear Mr. Goode:

In response to your department's letter dated January 16, 2008, regarding the proposed Kuhua Street Extension and Improvement project in Lahaina, Maui, Hawaii, we offer the following information in response to your department's remarks:

- As suggested, the project has been renamed Kuhua Street Extension (KSE) and Improvement Project.

- If necessary, access to the Kahoma Stream Flood Control Channel will need to be obtained from adjacent properties such as the proposed Kahoma Residential property to the south and via Keawe Street to the north.

- Roadway connections to the proposed KSE roadway will be provided at Keawe Street, Papalaua Street, Lahainaluna Road, Dickenson Street, Shaw Street, Aholo Road, and Front Street. Although shown on the conceptual plans, connection to Prison Street will adversely impact the existing adjacent dwellings. Due to severe grade differences between the Honoapiilani Highway intersection and the existing adjacent dwellings on this portion of Prison Street, providing access to the dwellings will require relocation of driveways and construction of retaining walls which may not be acceptable to the owners.

- During the design phase of the KSE and Improvement Project, if necessary, measures will be included to reduce or minimize potential impacts on the Lahaina Watershed Drainage Project.

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Should you have any questions, please do not hesitate to contact me at 244-2015.

Very truly yours,

Colleen Suyama
Senior Associate

CS:tn
cc: Clifford Mukai, Warren S. Unemori Engineering, Inc.
Keith Niiya, Austin, Tsutsumi & Associates, Inc.
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APR 1 4 2008

CHARMAINE TAVARES
Mayor

CHERYL K. OKUMA, Esq.
Director

GREGG KRESGE
Deputy Director

TRACY TAKAMINE, P.E.
Solid Waste Division

DAVID TAYLOR, P.E.
Wastewater Reclamation
Division

COUNTY OF MAUI
DEPARTMENT OF
ENVIRONMENTAL MANAGEMENT
2200 MAIN STREET, SUITE 175
WAILUKU, MAUI, HAWAII 96793

April 9, 2008

Mr. Kyle Ginoza
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

SUBJECT: MILL STREET EXTENSION ROADWAY EXTENSION PROJECT EARLY CONSULTATION LAHAINA, MAUI, HAWAII

Dear Mr. Ginoza,

We reviewed the subject project as a pre-application consultation and have the following comments:

1. Solid Waste Division comments

   a. None.

2. Wastewater Reclamation Division comments:

   a. None.

If you have any questions regarding this memorandum, please contact Gregg Kresge at 270-8230.

Sincerely,

Cheryl K. Okuma

Cheryl Okuma, Director

54

#1233 KLMC / Mill St.

JAN 0 4 2008

CHARMAINE TAVARES
MAYOR

DON A. MEDEIROS
Director
WAYNE A. BOTEILHO
Deputy Director
Telephone (808) 270-7511
Facsimile (808) 270-7505

DEPARTMENT OF TRANSPORTATION

COUNTY OF MAUI
200 South High Street
Wailuku, Hawaii, USA 96793-2155

December 31, 2007

Mr. Kyle Ginoza
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

Subject: Mill Street extension roadway Project

Dear Mr. Ginoza:

Thank you for the opportunity to comment on this project. We have no comments to make at this time regarding this project.

Please feel free to contact me at 270-7511 if you have any questions.

Sincerely,

Don Medeiros
Director

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FEB 1 9 2008

Council Chair
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Vice-Chair
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Director of Council Services
Ken Fukuoka

COUNTY COUNCIL
COUNTY OF MAUI
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www.mauicounty.gov/council

February 8, 2008

Mr. Kyle Ginoza
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawaii 96793

Dear Mr. Ginoza:

SUBJECT: **EARLY CONSULTATION REQUEST FOR MILL STREET EXTENSION ROADWAY PROJECT**

I share with you a copy of a letter from Milton M. Arakawa, Director of Public Works regarding the above subject matter which I had requested comments.

Should you have any questions, please feel free to contact me.

Sincerely yours,

RIKI HOKAMA
Council Chair

GRH: cmy

Attachments

56

CHARMAINE TAVARES
Mayor

MILTON M. ARAKAWA, A.I.C.P.
Director

MICHAEL M. MIYAMOTO
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

RALPH NAGAMINE, L.S., P.E.
Development Services Administration

CARY YAMASHITA, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

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

January 22, 2008

Honorable Charmaine Tavares
Mayor, County of Maui
200 South High Street
Wailuku, Maui, Hawaii 96793

Charmaine Tavares 01-28-08

For Transmittal to:

Honorable G. Riki Hokama, Chair
Maui County Council
200 South High Street
Wailuku, Maui, Hawaii 96793

Dear Chair Hokama:

SUBJECT: EARLY CONSULTATION REQUEST FOR MILL STREET EXTENSION ROADWAY PROJECT

Thank you for your January 3, 2008 letter requesting our Department's comments on the proposed Mill Street Extension Roadway Project in Lahaina. Our Department has supported the project concept in environmental documents, public hearings, and permit applications for resort projects in the Kaanapali North Beach area, which were approved by the Maui Planning Commission. One of the conditions of approval required planning and design services for the Mill Street Extension project. As a result, an environmental assessment for the road project has been initiated and early consultation comments are being requested.

The Mill Street Extension Roadway Project has the potential to provide additional roadway capacity through the congested Lahaina Town area, which would improve levels of service at nearby intersections. However, the project could also create some unwanted impacts, such as increased noise and possible traffic congestion due to the relative close proximity of the new Mill Street-Lahainaluna Road intersection to the Honoapiilani Highway-Lahainaluna Road intersection. These issues, as well as land

acquisition and bridge capacity issues, will need to be addressed in the environmental assessment.

Thank you for the opportunity to comment on this matter. If you have any questions, please feel free to call me at Ext. 7845.

Sincerely,

MILTON M. ARAKAWA
Director of Public Works

xc: Charmaine Tavares, Mayor

MMA:jso

s:\milton\transmittals\grhokama_mill street extension project

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
PRESIDENT

KARLYNN FUKUDA
EXECUTIVE VICE PRESIDENT

GWEN OHASHI HIRAGA
SENIOR VICE PRESIDENT

MITSURU "MICH" HIRANO
SENIOR VICE PRESIDENT

MARK ALEXANDER ROY
VICE PRESIDENT

March 7, 2013

Honorable Riki Hokama
Maui County Council
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: Proposed Kuhua (formerly Mill) Street Extension and Improvement Project at Lahaina, Maui, Hawaii

Dear Councilmember Hokama:

We are writing to you on behalf of the County of Maui, Department of Public Works (DPW) to thank you for your letter dated February 8, 2008, regarding the proposed Kuhua Street Extension and Improvement project in Lahaina, Maui, Hawaii.

We confirm that the proposed roadway will provide additional roadway capacity through the Lahaina town area. The purpose of the Environmental Assessment (EA) we are preparing is to evaluate potential impacts, including effects on traffic conditions, as well as mitigation measures to minimize such impacts.

A copy of the Draft EA will be provided to the Maui County Council for review and comment.

Should you have any questions, please do not hesitate to contact me at 244-2015.

Very truly yours,

Colleen Suyama
Senior Associate

CS:tn
cc: Council Chair Gladys Baisa, Maui County Council
David Goode, Director, Department of Public Works
Clifford Mukai, Warren S. Unemori Engineering, Inc.
Keith Niiya, Austin, Tsutsumi & Associates, Inc.
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Let's get it built!

January 30, 2008

Munekiyo & Hiraga, Inc.
Attention: Kyle Ginoza
305 High Street, Suite 104
Wailuku, HI 96793

RE: Early Consultation Request for Mill Street Extension Roadway Project

Dear Mr. Ginoza,

Lahaina Bypass Now is a community based non-profit which is working to develop transportation solutions for Maui. We strongly support the construction of the Mill Street Extension.

Mill Street was one of the four projects discussed at the four day Lahaina Transportation Design Workshop held January 9 – 12, 2007. This workshop gathered people from the community as well as State DOT, Maui County officials, landowners and others involved in the planning and design of upcoming transportation projects.

At this workshop, the participants worked together to plan "Great Streets" that not only move traffic but also are in character with their environment.

The specific recommendations formulated at the workshop for the Mill Street Extension are:

- Mill Street should be a two lane local street with 10' travel lanes.
- There should be continuous safe pedestrian access along the entire length of Mill Street.
- A 5' wide sidewalk or 10' wide multi-use path is recommended
- There should be a landscape buffer between the sidewalk and the street
- Allow on street parking on one side of street as space allows.
- The North bound connection of Mill Street should come off the highway at an angle similar to a slip ramp off a highway. This connection would be just North of the intersection of Front St. (at Puamana) and the Highway. (see attached map)

505 Front Street, Suite 202 · Lahaina, HI 96761
Telephone: 808-667-2516, Fax: 808-661-2058
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60

MUNEKIYO & HIRAGA, INC.

MICHAEL T. MUNEKIYO
PRESIDENT

KARLYNN FUKUDA
EXECUTIVE VICE PRESIDENT

GWEN OHASHI HIRAGA
SENIOR VICE PRESIDENT

MITSURU "MICH" HIRANO
SENIOR VICE PRESIDENT

MARK ALEXANDER ROY
VICE PRESIDENT

March 7, 2013

Bob Pure, President
Lahaina Bypass Now
P.O. Box 11205
Lahaina, Hawaii 96761

SUBJECT: Proposed Kuhua (formerly Mill) Street Extension and Improvement Project at Lahaina, Maui, Hawaii

Dear Mr. Pure:

We are writing to you on behalf of the County of Maui, Department of Public Works (DPW) to thank you for your organization's letter dated January 30, 2008 and support for the project.

The roadway improvement has been renamed to the Kuhua Street Extension. The preferred alignment of the roadway, as recommended in the Traffic Impact Analysis Report prepared by Austin, Tsutsumi & Associates, Inc., aligns with the existing Kuhua Street adjacent to the Pioneer Mill site and is further mauka of Mill Street. In response to your specific recommendations, we offer the following information:

- The proposed roadway will include two (2) travel lanes with provisions for a refuge lane between the shoulder and traffic lane, potential parking, a five (5) feet wide sidewalk, a ten (10) feet wide separated multi-use trail greenway for pedestrians and bicycles on one side of the roadway, and, as appropriate, a landscape buffer within the street right-of-way.

- The proposed northbound connection from Honoapiilani Highway will be near the Front Street intersection and will include a slip ramp off of the highway. The Front Street intersection will be signalized.

- The southbound terminus will be at Front Street and not at Aholo Road, due to concerns raised by the Aholo Road residents regarding increased traffic congestion that will occur if their street is used as the southern terminus. Aholo Road intersection will be reconfigured to limit the access as a right-turn in and

MAUI
305 High St., Suite 104 Wailuku, Hawaii 96793
PH: (808)244-2015 FAX: (808)244-8729
OAHU
735 Bishop St., Suite 238 Honolulu, Hawaii 96813 | PH: (808)983-1233
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right-turn out.

- Although recommended by Lahaina Bypass Now, the construction of the widening of Honoapiilani Highway between Lahainaluna Road and Aholo Road did not require use of Mill Street as a detour roadway.

- Pursuant to comments from Lahaina Bypass Now and the Department of Parks and Recreation, the alignment of the roadway has been routed, around (mauka of) the Lahaina Recreation Center.

We appreciate the input we received from your organization and will continue to work collaboratively with Lahaina Bypass Now. A copy of the Draft Environmental Assessment (EA) will be provided to you for review and comment.

Should you have any questions, please do not hesitate to contact me at 244-2015.

Very truly yours,

Colleen Suyama
Senior Associate

CS:tn
cc: David Goode, Director, Department of Public Works
Clifford Mukai, Warren S. Unemori Engineering, Inc.
Keith Niiya, Austin, Tsutsumi & Associates, Inc.
IK:\DATA\KLMC\MillStreet\Response Letters\Lahainabypassnowresp.ltr.doc

AUG 31 2010

August 30, 2010

Colleen Suyama
Munekiyo & Hiraga, Inc.
305 High Street
Suite 104
Wailuku, Hi 96793

Re: Kahua Street Extension and Improvements (formerly Mill Street Extension)
Project concerns & request for public opinion prior to approval

Dear Colleen,

Thank you for the return call regarding Mill Street extension in Lahaina. I was surprised to hear of the project name change to "Kahua Street Extension and Improvements".

As a West Maui resident and business owner (870 Honoapiilani Hwy at Papalaua Street) I am making written request to be on record to be, "notified in advance" and to join "owner be notified" for any public meetings and updates regarding 'Kahua Street Extension and Improvements'.

I have concerns and questions regarding the regional plan and intersection connections at Dickenson, Shaw & Papalua Street to be discussed prior to approval of the plan.

In June, I wrote to Milton Arakawa, Director of Public Works requesting information on the project and community meetings. Leilani from your office called me soon after and said I would be notified by mail of any meetings. There was a meeting shortly thereafter but I didn't receive notice.

Much of the West Maui community is unfamiliar with this project which will have a major impact on its residents. Allowing proper notice with time to review, ask questions and express concerns prior to approval of the plan would be prudent.

Thank You for your cooperation and timely attention to this very important matter.

Best Regards,

John Skenderian
870 Honoapiilani Hwy (at Papalua Street)
Lahaina, HI. 96761

cc: Angus McKelvey. Roz Baker. JoAnne Johnson. Milton Arakawa
Mayor Arakaki. Brian Hashiro. Kathleen Ross Aoki. Uremoli Enseneche
Jiro Sumada

63

NOV 03 2010

November 2, 2010

Colleen Suyama
Munekiyo & Hiraga, Inc.
305 High Street
Suite 104
Wailuku, Hi 96793

Re: Draft Environmental Assessment
Kahua Street Extension

Colleen,

As per my August 21, 2010 letter, as owners of 256 Papalua Street we were not included in the public hearings regarding the Kahua Street Extension.

Since then, after several discussions with and at the suggestion of Maui County; *Director of Public Works*, Milton Arakara and, *Deputy of Public Works* Michael Miyamoto, it was recommended that we provide input in formulating alternative impacts to include during the process and before the draft Environment Assessment (EA) comes out.

Please reply as soon as possible if you are available to meet with the affected and interested parties and appropriate consultants to work it out.

Thank you for your cooperation and attention to this very important matter.

Best Regards,

John Skenderian

cc: Milton Arakawa
Michael Miyamoto

ALAN M. ARAKAWA
Mayor

DAVID C. GOODE
Director

ROWENA M. DAGDAG-ANDAYA
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
200 SOUTH HIGH STREET, ROOM NO. 434
WAILUKU, MAUI, HAWAII 96793

Development Services Administration

CARY YAMASHITA, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

March 7, 2013

Mr. John Skenderian
145 Pihaa Street
Lahaina, Hawaii 96761

Dear Mr. Skenderian:

SUBJECT: PROPOSED KUHUA (FORMERLY MILL) STREET EXTENSION AND IMPROVEMENT PROJECT AT LAHAINA, MAUI, HAWAII

Thank you for your letters dated August 30, 2010 and November 2, 2010, regarding the Kuhua Street Extension (KSE) and Improvement project in Lahaina, Maui, Hawaii. Several community meetings were held prior to receipt of your letters regarding the proposed project in 2009. Public notification included letters notifying adjacent property owners of the KSE alignment, as well as public notification in the *Lahaina News*. My Department is considering another community meeting in Lahaina, during the 45-day comment period for the Draft Environmental Assessment (EA). Public notification of a community meeting will be given.

Further, in response to your concerns, I understand several meetings were held between the then Public Works Director Milton Arakawa, the Department's staff, our consultants, and yourself and Mrs. Skendarian. Subsequently, additional meetings were held with me, my staff, and consultants.

A copy of your letter will be included in the Draft EA for the project. A copy of the Draft EA will be forwarded to you for your review and comment and hopefully the document will provide you with additional information that addresses any outstanding concerns you may have.

Thank you for your comments. Should you have any questions, please do not hesitate to contact Ms. Colleen Suyama, Senior Associate, Munekiyo & Hiraga, Inc. at 244-2015.

Sincerely,

DAVID C. GOODE
Director of Public Works

DCG:jso
xc: Colleen Suyama, Munekiyo & Hiraga, Inc.
Clifford Mukai, Warren S. Unemori Engineering, Inc.
Keith Niiya, Austin, Tsutsumi & Associates, Inc.
s:\david2\john skenderian_prop kuhua st ext and imp proj

X. REFERENCES

X. REFERENCES

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APPENDIX A.

Special Management Area and Step 2 Planned Development Approval Letter Dated February 25, 2005

ALAN M. ARAKAWA
Mayor

MICHAEL W. FOLEY
Director

WAYNE A. BOTEILHO
Deputy Director

FEB 28 2005
File Intra
809

COUNTY OF MAUI
DEPARTMENT OF PLANNING

February 25, 2005

Mr. Steve Sewall
Intrawest
999 West Hastings Street, Suite 900
Vancouver, BC, Canada
V6C 2W2

Dear Mr. Sewall:

RE: Special Management Area Use Permit and Step 2 Planned Development Applications for the Proposed Honua Kai Resort, North Beach Park and Related Improvements at TMK: 4-4-014:006 and 008 and 4-4-001:010, Kaanapali, Lahaina, Maui, Hawaii (SM1 2004/0017) (PD2 2004/0005)

At its regular meeting on February 22, 2005 the Maui Planning Commission (Commission) acknowledged the withdrawal of the Petitions to Intervene and the submittal of the Settlement Agreements. After due deliberation, the Commission voted to grant Step 2 Planned Development approval, and approval of the following "other mitigation measures" as fulfillment of Condition No. 7 of the 1988 SMA/SSV Approval and Condition No. cc of the 1996 SMA approval:

As represented by the applicant, the following traffic related improvements totaling $2.5 million may be implemented, as determined by the County of Maui and State Department of Transportation, in conjunction with the Honua Kai Resort project:

1. Sequencing to existing traffic signals on Honoapiilani Highway through the Lahaina corridor as determined by a traffic study to model traffic flow and as approved by the Department of Transportation.

2. Regional roadway improvements for "fair share" contribution towards the following:

   a. Left turn lane from Lower Honoapiilani Road to the North park access and right turn lane out from the park access to the Lower Honoapiilani Road.

b. Right turn lane from Lower Honoapiilani Road to Honoapiilani Highway with acceleration lane.

3. Mill Street Collector Road traffic studies and road design fees from Keawe Street to Aholo Road.

Further, the Commission voted to bifurcate the Special Management Area Use Permit application. The Commission deferred the portion of the development affected by the land use changes for the North Beach Park (mauka portion), and approved the unaffected portions of the development, including the access roadway to the North Beach Park, subject to the following conditions:

STANDARD CONDITION:

1. That construction of the proposed project shall be initiated by **February 28, 2007**. Initiation of construction shall be determined as construction of offsite improvements or issuance of a grading, foundation or building permit and construction of the improvements, whichever occurs first. Failure to comply within this two (2) year period will automatically terminate this Special Management Area Use Permit unless a time extension is requested no later than ninety (90) days prior to the expiration of said two (2) year period. The Planning Director shall review and approve a time extension request but may forward said request to the Planning Commission for review and approval.

2. That the construction of the project shall be completed within eight (8) years after the date of its initiation. Failure to complete construction of this project will automatically terminate the subject Special Management Area Use Permit. A time extension shall be requested no later than ninety (90) days prior to the completion deadline. The Planning Director shall review and approve a time-extension request but may forward said request to the Planning Commission for review and approval.

3. The permit holder or any aggrieved person may appeal to the Planning Commission any action taken by the Planning Director on the subject permit no later than ten (10) days from the date the Director's action is reported to the Commission.

4. That final construction shall be in accordance with preliminary plans received on **June 16, 2004** and revised plans received on **February 4, 2005**.

5. That appropriate measures shall be taken during construction to mitigate the short term impacts of the project relative to soil erosion from wind and water, ambient noise levels, traffic disruptions, and construction waste.

6. That the subject Special Management Area Use Permit shall not be transferred without prior written approval in accordance with §12-202-17(d) of the Special Management Area Rules of the Maui Planning Commission. However, in the event that a contested case hearing preceded issuance of said Special Management Area Use Permit, a public hearing shall be held upon due published notice, including actual written notice to the last known addresses of parties to said contested case and their counsel.

7. That the applicant, its successors and permitted assigns shall exercise reasonable due care as to third parties with respect to all areas affected by subject Special Management Area Use Permit and shall procure at its own cost and expense, and shall maintain during the entire period of this Special Management Area Use Permit, a policy or policies of comprehensive liability insurance in the minimum amount of ONE MILLION AND NO/100 DOLLARS (1,000,000.00) naming the County of Maui as an additional named insured, insuring and defending the applicant and County of Maui against any and all claims or demands for property damage, personal injury and/or death arising out of this permit, including but not limited to: (1) claims from any accident in connection with the permitted use, or occasioned by any act or nuisance made or suffered in connection with the permitted use in the exercise by the applicant of said rights; and (2) all actions, suits, damages and claims by whomsoever brought or made by reason of the non-observance or non-performance of any of the terms and conditions of this permit. Proof of a policy naming County of Maui as an additional named insured shall be submitted to the Department within ninety (90) calendar days from the date of transmittal of the decision and order.

8. That full compliance with all applicable governmental requirements shall be rendered.

9. That the applicant shall submit plans regarding the location of any construction related structures such as, but not limited to trailers, sheds, equipment and storage areas and fencing to be used during the construction phase to the Maui Planning Department for review and approval.

10. That the applicant shall submit to the Planning Department five (5) copies of a detailed report addressing its compliance with the conditions established with the subject Special Management Area Use Permit. A preliminary report shall be reviewed and approved by the Planning Department prior to issuance of the grading, building or foundation permit, whichever occurs first. A final compliance report shall be submitted to the Planning Department for review and approval prior to issuance of a Certificate of Occupancy for each phase of the development .

11. That the applicant shall develop the property in substantial compliance with the representations made to the Commission in obtaining the Special Management Area Use Permit. Failure to so develop the property may result in the revocation of the permit.

12. That appropriate energy conservation measures shall be incorporated into the project, which may include but not limited to, energy conserving building materials, solar water heaters, heat conversion systems, state of the art air conditioning systems, photo voltaic systems, etc.

PROJECT SPECIFIC CONDITIONS:

13. That the applicant shall be responsible for all required infrastructural improvements, as required by Maui County Code, and rules and regulations, including but not limited to water source and system improvements for both domestic and fire protection, drainage improvements, traffic related improvements, wastewater system improvements, and utility upgrades. Said improvements may be phased and constructed concurrently with each phase of the development and shall be completed prior to issuance of a certificate of occupancy for each phase of construction, unless improvements are bonded by the developer.

14. That the proposed pump station and all on-site wastewater facilities for the development shall be privately owned and maintained. (Recommended by DPWEM)

15. That the final drainage plan shall be in accordance with the Drainage Master Plan for Kaanapali North Beach Subdivision, the County of Maui drainage standards and the West Maui Watershed Owner's Manual prepared by the West Maui Watershed Management Advisory Committee. The plan shall accommodate the overflow from Honokowai Stream which could send water through the Lahaina Highways Baseyard and Lahaina Wastewater Reclamation Facility. Further, all onsite and offsite retention and detention basins shall be privately owned and maintained. (Recommended by DPWEM and NRCS)

16. As represented, the applicant shall be responsible for regional traffic mitigation measures within the West Maui Community Plan region to fulfill previous SMA conditions. Said measures shall be reviewed and approved by the County of Maui Department of Public Works and Environmental Management and the State Department of Transportation.

17. That the applicant shall initiate a supplemental or updated Traffic Impact Analysis Report (TIAR) after completion of Phase A (ph I + II, South Building and 24 townhouses) of the development for review and approval by the Department of Transportation (DOT) and the Department of Public Works and Environmental Management (DPWEM). Recommended mitigation measures as determined by the DOT and DPWEM shall be incorporated into the project development. (Recommended by DOT)

18. That during all ground altering construction activities archaeological monitoring shall be conducted in accordance with the approved archaeological monitoring plan reviewed and approved by the State Historic Preservation Division (SHPD).

19. That the applicant shall use "best practices" in Crime Prevention Through Environmental Design (CPTED), whenever possible, in developing the project. In CPTED the design and building of structures, landscaping, and lighting are interwoven to increase surveillance, limit accessibility, and increase opportunities for apprehension resulting in a decrease in the likelihood of crime. (Recommended by Police)

20. That a copy of the approved National Pollutant Discharge Elimination System (NPDES) permit shall be filed with the Planning Department and the Department of Public Works and Environmental Management prior to approval of the grading permit.

21. That an appropriate Best Management Practices (BMPs) plan shall be reviewed and approved by the Department of Public Works and Environmental Management. Said plan shall address impacts associated with erosion, contaminants, and construction waste. The approved plan shall be filed with the Maui Planning Department.

22. That should a Noise permit be required by the Department of Health, a copy of said permit shall be remitted to the Planning Department to be kept on file.

23. That the Applicant shall comply fully with the Department of Health standards regarding dust control and rodent control.

24. That the project shall connect to and utilize the County's reclaimed water system once it becomes available.

25. As represented, the applicant shall contributed $2.34 million of which $1.2 to $1.4 million has been granted to Maui Economic Concerns of the Community, Inc. in order to provide affordable housing as agreed with the Department of Housing and Human Concerns. (Recommended by DHHC)

26. That a coastal management plan shall be developed for the dune areas with some discussion of management of the dunes and coastal system. Said plan shall be developed in coordination with the Department of Land and Natural Resources (DLNR) and the University of Hawaii Sea Grant Program (UH, HSGP). A copy of the management plan shall be filed with the Department of Planning, DLNR and UH, HSGP.

27. That the applicant shall participate with other North Beach Subdivision developers in the bi-annual water quality monitoring surveys for construction projects in the North Beach Subdivision. Said bi-annual surveys shall continue until 18 months after the completion of construction.

28. As represented, the applicant shall participate in a Hawksbill and Green Turtle monitoring program with the U.S. Fish and Wildlife Service.

29. That the applicant shall construct the North Beach Park and public lateral access walkway within the 150 ft. shoreline setback area concurrent with the Honua Kai Resort development. Said improvements shall be privately owned and maintained but shall be open to the public and shall be completed prior to issuance of the Certificate of Occupancy for Phase 1 of the development, unless said improvements are bonded.

30. Condition No.(s) 24, 28, and 29 shall run with the land and shall be set forth in an unilateral agreement recorded by the applicant with the Bureau of Conveyances within 60 days from the date of receipt of this decision. A copy of the recorded unilateral agreement shall be filed with the Director of Planning and the Director of Public Works and Environmental Management within 10 days of recordation.

31. That as represented, 100 parking stalls shall be reserved for employee parking (As amended by Commission).

32. That an annual report shall be filed with the Maui Planning Commission on the disbursement of the funds in the Settlement Agreements for their information. (As amended by Commission)

Further, the Commission adopted the Department Report and Recommendation prepared for the November 9, 2004 and February 22, 2005 meeting as its Decision and Order. Parties to proceedings before the commission may obtain judicial review of decision and orders issued by the commission in the manner set forth in Chapter 91-14, Hawaii Revised Statutes.

Thank you for your cooperation. If additional clarification is required, please contact Ms. Colleen Suyama, Staff Planner, of my office at 270-7735.

Sincerely,

Mike Foley

MICHAEL W. FOLEY
Planning Director

MWF:CMS:lar

cc: Clayton Yoshida, AICP, Planning Program Administrator
Aaron Shinmoto, P.E., Planning Program Administrator (2)
John Summers, Planning Program Administrator
Colleen Suyama, Staff Planner
Development Services Administration (2)
Gwen Ohashi Hiraga, Munekiyo & Hiraga, Inc.
Isaac Hall, Esq.
B. Martin Luna, Esq.
Charles D. Fox III
Alice Lee, Director, Department of Housing and Human Concerns
Glenn Correa, Director, Department of Parks and Recreation
Thomas Phillips, Chief, Maui Police Department
Rodney Hiraga, Department of Transportation
Peter T. Young, Department of Land and Natural Resources
Ed Matsubayashi, Department of Health, Maui
U.S. Fish and Wildlife Service
Project File
General File
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APPENDIX B.

Preliminary Engineering Synopsis

Established 1969

Preliminary Engineering Synopsis

KUHUA STREET EXTENSION (Vicinity of Keawe Street to Vicinity of Front Street)

Lahaina, Maui, Hawaii

TMK (2) 4-05-009, 4-05-010, 4-05-011, 4-06-012, 4-06-013 and 4-06-16

Prepared For:

Engineering Division
Department of Public Works
County of Maui
Wailuku, Maui, Hawaii

CLIFFORD N. MUKAI
LICENSED PROFESSIONAL ENGINEER
NO. 6667-C
HAWAII, U.S.A.

License Expires April 30, 2014

Warren S. Unemori Engineering, Inc.
Civil and Structural Engineers - Land Surveyors
Wells Street Professional Center
2145 Wells Street, Suite 403
Wailuku, Maui, Hawaii

Date: March 7, 2013

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B. General Plan
C. Scope of Alternatives Analysis
D. Typical Sections
E. Conceptual Plan and Profiles
F. Soil Survey Map
G. Flood Insurance Rate Map

APPENDICES:

A. Geotechnical Investigation Report
B. Preliminary Drainage Report
C. Traffic Impact Analysis Report

FIGURES:

1.1. Four Distinct Areas of Major Focus Addressed by 2007 Lahaina Transportation Design Workshop
1.2. Typical Conceptual Section for Kuhua Street Extension from 2007 Lahaina Transportation Design Workshop
1.3. Existing Attractive, Landscaped, Pedestrian-Friendly Shoulders Along Northerly Side of Papalaua St. with Unobstructed View to Ocean Beyond Font St.
2.1. Location of New Signalized Intersection at Northerly Keawe St. Terminus of KSE with Provisions for Integrating Existing Lahaina-Kaanapali Railroad Crossing
2.2. Location of New Signalized Intersection at the Existing Intersection of Honoapiilani Highway and Front St.
2.3. Prison Street's Abrupt Grade Drop on the westerly side of Honoapiilani Highway
2.4. Proposed Enhancements to Existing Segment of Kuhua Street Abutting Existing Kuhua Tract Subdivision

I. INTRODUCTION

A. OBJECTIVE:

This treatise has been prepared as a brief evaluation and summary of the history of the Kuhua Street Extension (KSE) project, and both the existing infrastructure in the vicinity of the project site and the anticipated project improvements.

KSE was formerly referred to as Mill Street Extension, since it was originally conceived to generally traverse portions of the old Pioneer Mill Cane Haul Road (Mill St.).

A preliminary Geotechnical Investigation Report is contained in Appendix “A”, a Preliminary Drainage Report is contained in Appendix “B”, and a Traffic Impact Analysis Report is contained in Appendix “C”.

B. SITE LOCATION:

Lahaina, on the island of Maui, is located on the southwestern slope, along the leeward side, of the West Maui Mountains, an eroded shield volcano rising up to approximately 5,800 feet above mean sea level (M.S.L.).

KSE, is located near the easterly (mauka) perimeter of Lahaina Town (see EXHIBIT “A” - Location Map), and is proposed to consist of an approximately 10,000 ft. long segment of a new two-lane roadway aligned generally in a north-south direction, parallel to and between Honoapiilani Highway and the proposed Lahaina Bypass Phases I-A and I-B (see EXHIBIT “B” - General Plan). KSE is located to the west (makai) of, and generally parallel to, the proposed Lahaina Watershed Flood Control Project.

- It’s northerly terminus is at Keawe St., approximately 1,000 feet east (mauka) of Honoapiilani Highway, just east (mauka) of the existing Lahaina-Kaanapali Railroad Crossing.
- The southerly terminus is at the existing intersection of Honoapiilani Highway and Front St.
- Heading in a northerly to southerly direction from its northerly terminus at Keawe St. (see EXHIBIT “B” - General Plan):

    - KSE is located generally along the former Cane Haul Road up to the existing Kahoma Stream Flood Control Channel;
    - KSE then crosses the Kahoma Stream Flood Control Channel using the existing Kahoma Uka Cane Haul Bridge;
    - KSE then continues across portions of the former Pioneer Mill site and existing Kuhua St. (along the westerly or makai edge of the existing Kuhua

Tract Subdivision), to intersect Lahainaluna Road;

- KSE then deflects to hug the westerly (makai) edge of the existing Maui Electric Sub-Station and continues in a southerly direction across lands that were formerly used by Pioneer Mill for sugarcane cultivation to the vicinity of Shaw Street, where it deflects around and between the easterly (mauka) edge of the existing County Lahaina Recreation Center (ballfields) and the West Maui Resource Center (Na Hale O Wainee);
- KSE then continues across lands that were formerly used by Pioneer Mill for sugarcane cultivation to the vicinity of the existing intersection of Honoapiilani Highway and Front St.

KSE is aligned approximately 1,000 to 2,400 feet inland and varies in elevation from approximately 14 feet to approximately 52 feet M.S.L. With the exception of its southerly terminus at the Honoapiilani Highway / Front St. intersection, it is located approximately 400 to 1,200 ft. east (mauka) of the highway.

C. PROJECT BACKGROUND AND DESCRIPTION:

Originally envisioned as an alternate route parallel to Honoapiilani Highway along the existing cane haul road previously used by Pioneer Mill, and thus formerly called Mill St. Extension, significant progress and refinements were achieved through the four day Lahaina Transportation Design Workshop (LTDW), sponsored by Lahaina Bypass Now, in 2007.

Four distinct areas of major focus were addressed (see Figure 1.1) through the four days of community input and design charrettes attended by State, County, and Community stakeholders:

- Lahaina Bypass Phase I-A, which is intended to be a limited access expressway. The extension of Keawe Street (from Honoapiilani Hwy. to the Lahaina Bypass) was also considered in conjunction.

- Honoapiilani 4-Lane Highway Widening (Aholo St. to Lahainaluna Road), which is a four-lane highway intended to convey a high volume of vehicles.

- Lahaina Watershed Flood Control Project, which consists of an approximately 7,000 ft.

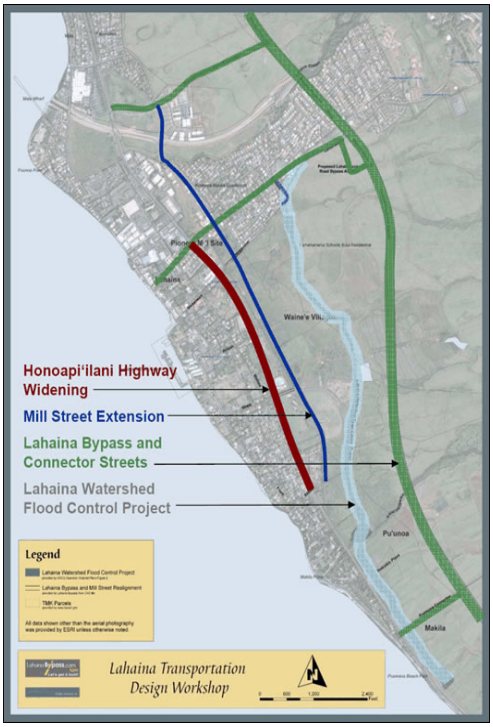

Figure 1.1: Four Distinct Areas of Major Focus Addressed by 2007 Lahaina Transportation Design Workshop

long flood water diversion channel extending from Lahainaluna Road to Kauaula Stream and a debris basin at Kauaula Stream to enhance flood protection to the agricultural, residential, commercial, and historic areas of the lower Lahaina Watershed and reduce potential sediment discharge to the ocean.

- Mill Street Extension (vicinity of Aholo St. to Keawe Rd.) (MSE), which through four days of extensive input from State, County and community stakeholders, and active participation in design charrettes, defined MSE/KSE as a community oriented, pedestrian friendly, two-lane road that will enhance access to the regional roadway network and improve circulation, including pedestrian-friendly access to nearby recreational facilities, shopping, eating attractions, schools, and other community-oriented destinations. MSE/KSE was clearly identified as a key component of local circulation needs.

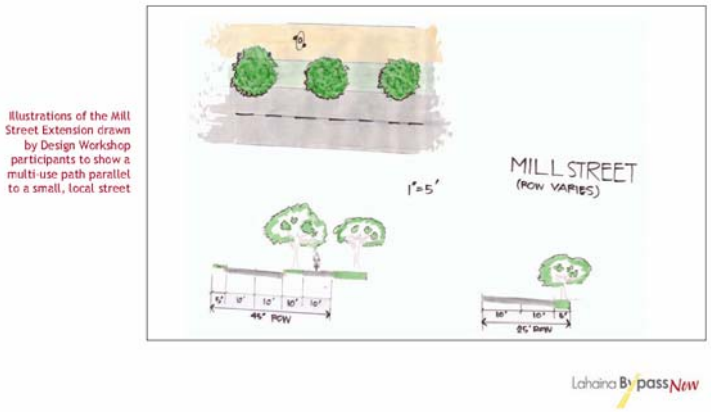

Figure 1.2: Typical Conceptual Section for Kuhua Street Extension from 2007 Lahaina Transportation Design Workshop

Thus, the conceptual typical section developed through the LTDW envisioned KSE as a two-lane road incorporating a pedestrian-friendly, landscaped multi-use trail (or greenway) along its entire length (see Figure 1.2), including a pedestrian friendly connection to Front Street and the heart of Lahaina, town through Papalaua St., which uniquely has:

- A wide, attractive, landscaped, pedestrian-friendly shoulder along its northerly (Kaanapali) side down to Front St. (see Figure 1.3);

Figure 1.3: Existing Attractive, Landscaped, Pedestrian-Friendly Shoulders Along Northerly Side of Papalaua St. with Unobstructed View to Ocean Beyond Front St.

- An inviting, unobstructed view of the ocean, for pedestrians walking down from KSE, across Honoapiilani Highway, and then down to Front St. (see Figure 1.3);

- Opportunities for improvements to the roadway's southerly shoulder as existing properties abutting the southerly side of Papalaua St. re-develop in the future (see Figure 1.3).

  In 1997, Front Street underwent a major $11 million facelift that provided wider, pedestrian-friendly, landscaped sidewalks and placing portions of the overhead electrical utilities underground.

At the conclusion of the four-day LTDW workshop, Lahaina Bypass Now upheld fully supporting expediting the KSE Project with the following conditions:

- KSE be developed as a community oriented, pedestrian friendly, two-lane local street, integrating a landscaped multi-use trail (or greenway) along its entire length (see Figure 1.2).

- Explore the possibility of realigning KSE easterly (mauka) of the Lahaina Recreation Center.

- Explore the possibility of extending KSE south of Aholo Rd., subject to the constraints of the proposed Lahaina Watershed Flood Control Channel project.

The workshop also concluded by issuing the following statements for KSE:

- Consider private and/or impact fee funding to expedite the project.

- Timing of KSE should be independent of and not affect the timing of the other projects (Honoapiilani Highway Four-Lane Widening or Lahaina Bypass).

The proposed alignment, scope, and connections between KSE and Honoapiilani Highway, as well as its relation to the other regional projects in the vicinity (e.g., Lahaina Bypass Phases I-A and I-B, Keawe Street Extension, Lahaina Watershed Flood Control Channel, and Honoapiilani Highway 4-Lane Widening) are shown on EXHIBIT "B" - General Plan.

The engineering study limits for the alternative alignment analysis is shown on EXHIBIT "C" - Scope of Alternatives Analysis.

The representative typical roadway sections are depicted on Exhibit "D" - Typical Sections. Wherever possible, master-planned permitted future access locations between major intersections are conceptually identified along the roadway corridors

(all permitted accesses are subject to approval by the Dept. of Public Works, County of Maui).

The proposed KSE horizontal alignment and infrastructure will attempt to anticipate and coordinate (to the extent reasonably possible) with other projects that are being planned in this area such as the future Kahoma Residential Subdivision project, the

Lahaina Watershed Flood Control Channel, the master planning of the future Wainee Village project, etc.

Wherever practicable, to minimize the disruption to the community and traffic, underground utilities for basic services (e.g., drainage, wastewater, and potable water) are expected to be installed in conjunction with the construction of KSE. Typical anticipated infrastructure improvements generally consist of:

- Clearing, grubbing, and grading the existing and proposed roadway corridor.

- Roadway improvements consisting of: asphalt concrete pavement, concrete curb and gutters, concrete driveway aprons and curb cut wheelchair ramps, concrete sidewalks, and signage & striping.

- Roadway and sidewalk improvements, hanging utilities, and retrofitting existing railings on the existing Kahoma Uka Cane Haul Bridge. Proposed Pedestrian Bridge parallel to the existing Cane Haul Bridge.

- Asphalt concrete paved multi-use trail (greenway).

- Retaining walls, railing, fencing and sound walls (where required).

- Streetlights along the roadways, pole mounted lighting along the multi-use trail (greenway), and appurtenances.

- Underground electrical, telephone, cable television systems (including streetlights, parking area lights, pathway lights, underground ducts, transformers, handholes and manholes, ground mounted cabinets, and appurtenances; where required). Existing overhead electrical power transmission lines are expected to remain overhead.

- Relocations of existing power poles and reconnections of existing utility services (including water, sewer, electrical, CATV, Tel, etc.).

- Feasibility of reconfiguration of existing Maui Electric Company, Ltd. Substation along Lahainaluna Rd. will be assessed.

- Traffic signal system and appurtenances at applicable intersections, which will be improved, as required, to accommodate any connections through existing or proposed east-west (mauka-makai) roadways.

- Culvert crossings (with inlet and outlet structures), drain inlets, manholes, underground drainage system (including drainlines, box culverts, etc.), at-grade detention basins, dry wells, subsurface drainage (detention) systems, and appurtenances

- Temporary modifications to existing railroad during construction.

- Underground water transmission or distribution mains (for potable water and fire protection), and appurtenances where applicable.

- Underground wastewater collection and transmission systems, where applicable.

- Landscaping and irrigation.

Temporary construction-phase measures are expected to be implemented from the inception of any ground disturbing activities, and maintained as required for erosion and sedimentation mitigation (e.g., dust fences, silt fences, filtration berms, temporary sedimentation basins, etc), pursuant to applicable provisions of:

- Chapter 20.08 of the Maui County Code, “Soil Erosion and Sedimentation Control”;

- Construction Best Management Practices (BMPs) for the County of Maui (dated May 2001);

- The recently adopted, Title MC-15, Subtitle 01, Chapter 111, “Rules for the Design of Storm Water Treatment Best Management Practices (adopted November 9, 2012); and,

- The conditions and requirements of the project-specific National Pollutant Discharge Elimination System (NPDES) Permit.

All sitework construction is expected to conform to the recommendations and requirements of the Soils Engineer (who will be a professional engineer licensed to practice in the State of Hawai’i) and the applicable requirements fo the Maui County code. The Owner is expected to retain the Soils Engineer to provide all construction phase monitoring and testing in accordance with the recommendations of the Soils Report and requirements of the County of Maui.

II. ROADWAY IMPROVEMENTS AND TRAFFIC ASSESSMENT

A. EXISTING CONDITIONS:

Lahaina Bypass Phase I-A, the first segment of what is intended to be a limited access expressway, is expected to open in late fourth quarter 2012. Phase I-B-1 is expected to open in late first quarter 2013.

Existing Honoapiilani Highway, a high-volume, congested highway, was recently widened to four lanes between Aholo Road and Lahainaluna Road.

- To the north of Lahainaluna Road (in the Kaanapali direction), Honoapiilani Highway continues as a four-lane undivided highway.

- To the south of Aholo Road (in the Maalaea direction), Honoapiilani Highway continues as a two-lane undivided highway.

The existing Kuhua St. is located along the westerly (makai) edge of the existing Kuhua Tract Subdivision, which dates back to the 1950's, and consists of a narrow paved roadway (approximately 22 ft. wide within a 25 ft. wide right-of-way) parallel to Honoapiilani Highway that begins at Lahainaluna Road as its southerly (Maalaea end) terminus, and continues northerly (towards Kaanapali) for approximately 1,300 ft.

Existing roadways aligned in an east (mauka) to west (makai) direction that could potentially provide access between Honoapiilani Highway and proposed KSE include:

- Keawe Street (which is the northerly terminus of KSE) extends easterly (mauka) from its signalized intersection with Honoapiilani Highway for approximately 1,300 ft., where it abruptly terminates at its intersection with Kupuohi St. (entrance to Lahaina Business Park). Keawe St. Extension is currently under construction, and is expected to link the existing segment of Keawe St. to the nearly completed northerly terminus of Lahaina Bypass Phase I-A.

- Papalaua Street begins at its intersection with Front St., extends easterly (mauka) up through its signalized intersection with Honoapiilani Highway, then continues only approximately 250 ft. east (mauka), past the signalized intersection, as a two-lane driveway.

- Lahainaluna Road begins at its intersection at Front St., extends easterly (mauka), crossing Honoapiilani Highway at a signalized intersection, and continues easterly (mauka) for another approximately 4,500 ft., to Lahainaluna High School.

- Dickenson Street begins at its intersection at Front St., extends easterly (mauka), crossing Honoapiilani Highway at a signalized intersection, and continues easterly (mauka) for another approximately 200 ft. where it continues northward (towards Kaanapali) as Mill St. (towards Lahainaluna Road).

- Prison Street begins at its intersection at Front St., extends easterly (mauka), crossing Honoapiilani Highway, encounters an abrupt drop in grade from the easterly (mauka) shoulder of Honoapiilani Highway, and continues easterly (mauka) for another approximately 150 ft. as a narrow paved driveway, stopping short of the abandoned Pioneer Mill Cane Haul Road.

- Shaw Street begins at its intersection at Front St., extends easterly (mauka), crossing Honoapiilani Highway at a signalized intersection, and continues easterly (mauka) for another approximately 200 ft. through the Lahaina recreational facilities (consisting of the Lahaina Aquatic Center, the Lahaina Recreation Center, the Boys & Girls Clubs of Maui - Lahaina), where it continues as Ipu Aumakua Lane, a curved two-lane roadway that extends in an easterly direction, providing access to the Na Hale O Wainee Homeless Resource Center.

- Aholo Rd. begins at its intersection at Front St., extends easterly (mauka), crossing Honoapiilani Highway, and continues easterly (mauka) for another 250 ft. through the Aholo Subdivision, where it abruptly terminates, stopping short of the abandoned Pioneer Mill Cane Haul Road.

- Existing Honoapiilani Highway / Front St. intersection (which is the southerly terminus of KSE), which also serves as the southerly (Maalaea end) terminus of Front St.

B. PRELIMINARY TRAFFIC ASSESSMENT:

A preliminary traffic assessment has been conducted for the proposed project by Austin Tsutsumi & Associates, Inc. (see Appendix “C” - Traffic Impact Analysis Report). Existing conditions, alternatives considered, and recommended roadway and traffic improvements (both project-specific and regionally) are identified and discussed in more detail therein.

C. PROPOSED ROADWAY IMPROVEMENTS:

Pursuant to the findings and recommendations from the four-day Lahaina Transportation Design Workshop sponsored by Lahaina Bypass Now in 2007, KSE is proposed to be a community oriented, pedestrian friendly, two-lane road that will enhance access to the regional roadway network and improve circulation, including

pedestrian-friendly access to nearby recreational facilities, shopping, eating attractions, schools, and other community-oriented destinations.

KSE is thus proposed to be a two-lane road incorporating a pedestrian-friendly, landscaped multi-use trail (or greenway) along its entire length (see EXHIBIT "D" - Typical Sections, and EXHIBIT "E" - Conceptual Plan and Profiles).

KSE will also include provisions for extending this community oriented, pedestrian friendly connectivity towards Front Street and the heart of Lahaina Town. With the cessation of operations at, and recent demolition of, Pioneer Mill, an opportunity exists to set aside roadway and pedestrian corridors or right-of-ways up front, prior to any future transfer of ownership or development. Thus, Papalaua St. Extension, extends this theme from the proposed KSE in a westerly (makai) direction, down towards the existing segment of Papalaua St. below (west or makai of) Honoapiilani Highway [see EXHIBIT "D" - Typical Sections (9 of 9)].

Papalaua St. Extension will incorporate landscaped, pedestrian friendly shoulders and provisions for a bike lane where feasible and required by Dept. of Public Works, and will provide the community with an inviting, unobstructed view of the ocean for pedestrians and potential bicyclists commuting down this corridor to Front St. and Lahaina Town (see Figure 1.2). Wide, attractive, landscaped, pedestrian-friendly shoulders already exist along the northerly (Kaanapali) side of the existing segment of Papalaua St. down to Front St. (see Figure 1.3).

In addition, enhanced circulation and access will be provided between KSE and Honoapiilani Highway and downtown Lahaina by extending and/or improving the following east-west (mauka-makai) roadways between KSE and Honoapiilani Highway where adjoining properties are yet undeveloped and where existing right-of-way constraints allow.

New signalized intersections are proposed at the following new intersections:

- A new signalized intersection is proposed at the northerly (Kaanapali end) terminus of KSE at Keawe Street, with provisions for integrating the existing Lahaina Kaanapali Railroad Crossing (see Figure 2.1).

Figure 2.1: Location of New Signalized Intersection at Northerly Keawe St. Terminus of KSE with Provisions for Integrating Existing Lahaina - Kaanapali Railroad Crossing

- A new signalized intersection is proposed at the intersection of KSE and Lahainaluna Road. Existing Lahainaluna Road is proposed to be widened and improved with curb-and-gutters, sidewalks and additional turning lanes.

- A new signalized intersection is proposed at the southerly (Olowalu end) terminus of KSE at the existing intersection of Honoapiilani Highway and Front St. (see Figure 2.2).

Figure 2.2: Location of New Signalized Intersection at the Existing Intersection of Honoapiilani Highway and Front St.

The feasibility and impacts of a Roundabout option will also be considered at the proposed intersection of KSE and Shaw Street, pursuant to the recommendations of the TIAR during the Design Phase [see EXHIBIT "D" (5 of 9); and, EXHIBIT "E" (4 of 6)].

Access to/from existing east-west (mauka-makai) roads and new un-signalized intersections (with extensions of existing east-west roads where required) are proposed at the following locations:

- KSE / Papalaua St. Extension.

- KSE / Dickenson St. Extension.

- KSE / Shaw St. Extension.

- In addition, access to KSE will be provided to the existing residents at the vicinity of Aholo Rd. With enhanced access and circulation in the vicinity at the other nearby intersections, the Honoapiilani Hwy. / Aholo Rd. intersection will be restricted to right turns in and out only.

Figure 2.3: Prison Street's Abrupt Grade Drop on the westerly side of Honoapiilani Highway

An extension of existing Prison St. (between Honoapiilani Hwy and proposed KSE) will not be made in

conjunction with this project due to the abrupt grade drop at the westerly (mauka) edge of the existing Honoapiilani Highway shoulder at the existing paved driveway (see Figure 2.3). However, provisions will be made along KSE for a future connection to KSE at the projection of the existing Prison St. intersection.

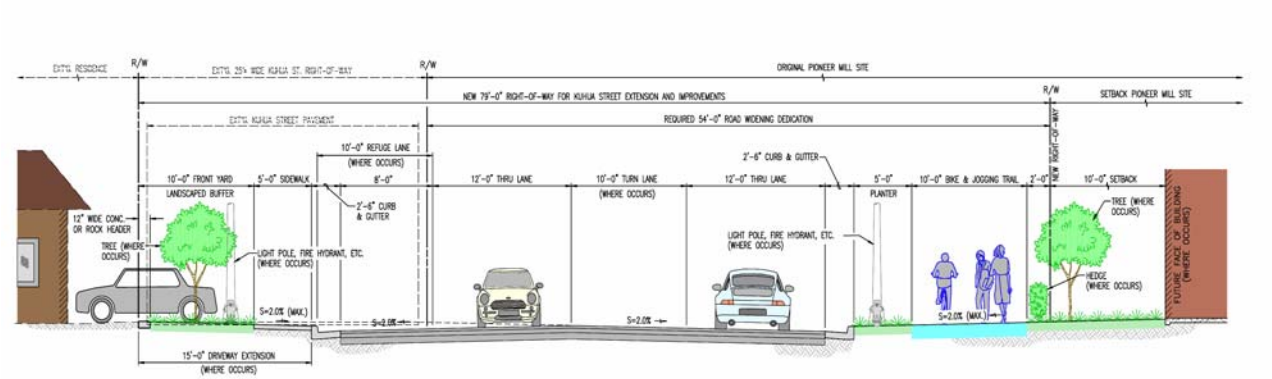

Figure 2.4: Proposed Enhancements to Existing Segment of Kuhua Street Abutting Existing Kuhua Tract Subdivision

The existing Kuhua St. right-of-way is only 25 ft. wide and abuts the existing residences within the old Kuhua Tract Subdivision. To enhance access, circulation, and provide an attractive, landscaped pedestrian-friendly experience through this older neighborhood, the existing Kuhua St. is proposed to be improved as depicted in Figure 2.4. Since many homes currently abut the narrow, existing roadway, a deeper, grassed front yard and a generous roadway shoulder will be provided along the east (mauka) shoulder, with curb, gutter, sidewalk, and extended driveways with driveway aprons. In addition, a 10 ft. wide auxiliary refuge lane will be provided along the east (mauka) edge of the enhanced roadway, abutting the existing Kuhua Tract residences to facilitate ingress and egress to and from the existing residential driveways. A landscaped, pedestrian-friendly multi-use trail (greenway) will be incorporated into the west (makai) shoulder.

Wherever possible, master-planned permitted future access locations between major intersections are conceptually identified along the roadway corridors (all permitted accesses are subject to approval by the Dept. of Public Works, County of Maui).

III. DRAINAGE SYSTEM:

A. TOPOGRAPHY AND EXISTING SITE CONDITIONS:

The approximately 10,200± ft. (1.9miles) long KSE corridor is aligned generally in a north-south direction, and varies in elevation from approximately 14 feet to approximately 52 feet M.S.L., with prevailing slopes in the easterly to westerly (mauka to makai) direction.

From its northerly (Kaanapali end) terminus at Keawe Street, the KSE alignment extends in a southerly direction along the former Pioneer Mill Cane Haul Road (which is still used as a bypass by local traffic between Keawe Street and Lahainaluna Road), and utilizes the existing Kahoma Uka Cane Haul Bridge to cross the Kahoma Stream Flood Control Channel. It incorporates and expands the existing Kuhua Street and continues in a southerly (Maalaea) direction to Lahainaluna Road.

The majority of the KSE alignment to the south of Lahainaluna Road is currently undeveloped, and traverses agricultural land that was previously cultivated for sugar cane by Pioneer Mill.

The land surrounding the project site is characterized by a gently sloping topography with longitudinal slopes ranging from 0 to 5%, and cross slopes of approximately 1 to 4%.

According to the *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* (see EXHIBIT "F" - Soil Survey Map), underlying the proposed KSE project site are soils of the Pulehu-Ewa-Jaucas Wahikuli-Wainee association, and are characterized as having deep, nearly level to moderate sloping, well-drained and excessively drained soils that have a moderately fine textured to coarse-textured subsoils or underlying material.

The specific soils types are as follows: Ewa (EaA) silty clay loam with 0 to 3 percent slopes; Wahikuli (WdB) very stony silty clay with 3 to 7 percent slopes; Wainee (WxB) very stony silt clay with 3 to 7 percent slopes; Pulehu (PpA) silt loam with 0 to 3 percent slopes; and Pulehu (PtB) cobbly clay loam with 3 to 7 percent slopes (See EXHIBIT F). Ewa soils are characterized as having a very slow runoff and a slight erosion hazard. Wahikuli soils are characterized as having a slow runoff and a light erosion hazard. Wainee soils are characterized as having a slow to medium runoff and a slight erosion hazard. Pulehu soils are characterized as having a slow runoff and a no more than a slight erosion hazard.

Typical vegetation along the unimproved portions of the project site corridor consists of dry grasslands dominated by buffel grass and some 'uhaloa (the density of which varies seasonally and with rainfall) with scattered trees and brush which include shrubby koa haole trees. Upon completion of the proposed grading and improvements, all disturbed areas that are still exposed (and not paved or otherwise landscaped) will be grassed as required to minimize soil erosion.

According to Panels 0361F, 0362F and 0364F, of the Flood Insurance Rate Map, dated September 19, 2012, prepared by the United States Federal Emergency Managements Agency, Federal Insurance Administration, the project site is situated in an area designated as Zone "X", which is designated as an area outside the 0.2% chance flood plain and of minimal flood hazard (see EXHIBIT "G" - Flood Insurance Rate Map).

The project site is not located within a tsunami zone.

A Preliminary Drainage Study and Report has been undertaken for the proposed project by Warren S. Unemori Engineering, Inc. (and is contained in APPENDIX “B” - Preliminary Drainage Report).

A total of approximately 27.5 cfs (50 year - 1 hour storm) of onsite surface runoff is currently generated by the linear project site.

The existing runoff from the project site and in the adjacent areas generally flow in a westerly (makai) direction towards Honoapiilani Highway. Due to limitations in the existing drainage facilities in the area, runoff typically flows along existing roadways and/or generally overland to the ocean or ponds in low-lying areas that dissipate over time through infiltration and evaporation.

An existing Interim NRCS Diversion Channel and existing NRCS Detention Basins are located east (mauka) of the proposed alignment of KSE between Dickenson Street Extension and Shaw Street (see EXHIBIT “B” - General Plan).

The Engineering Division, Department of Public Works, has initiated the phased construction of the Lahaina Watershed Flood Control Channel Project (LWFCC) (see EXHIBIT “B” - General Plan), and all proposed KSE improvements will be closely coordinated with the LWFCC Project. It is assumed that construction of the southerly (Maalaea) half of the KSE project, from (but not including) Lahainaluna Road, will not precede the completion of the LWFCC Project improvements.

B. PROPOSED DRAINAGE IMPROVEMENTS:

All drainage improvements are expected to be implemented pursuant to the current County of Maui's "Rules for the Design of Storm Drainage Facilities", and the recently adopted "Rules for the Design of Storm Water Treatment Best Management Practices" (adopted 11/09/2012).

Wherever practicable, to minimize the disruption to the community and traffic, anticipated drainlines and drainage culverts are expected to be installed in conjunction with the construction of KSE.

In the absence of any onsite subsurface detention, the total onsite surface runoff generated after developing the project site (50 year - 1 hour runoff) would have been expected to be approximately 69.7 cfs. However, a combination of drywells (similar to what was recently implemented in the nearby Honoapiilani Highway Widening project), detention basins, and subsurface detention systems, will be implemented to limit the peak onsite runoff being discharged to pre-development levels. Accordingly, there will generally be no net increase in onsite peak surface runoff, based on a 50-year recurrence interval.

1. KSE - Keawe Street to Kahoma Stream Flood Control Channel:

   The segment of KSE from Keawe Street to Kahoma Stream Flood Control Channel will include underground drainage improvements to intercept, mitigate and convey the existing offsite surface runoff from Lahaina Business Park to the existing drainage system along Keawe St.

2. KSE - Kahoma Stream Flood Control Channel to Lahainaluna Road:

   Presently, surface runoff from the existing, plantation-era Kuhua Tract Subdivision, which has no drainage system, currently sheetflows through the subdivision downstream, over and across the project site, continues onto Honoapiilani Highway and into Lahaina Town. The KSE project provides the County with an excellent, unprecedented opportunity to intercept and mitigate this existing condition and also help mitigate some of the potential flooding issues along Honoapiilani Highway and in the Lahaina Town area.

   According to the "Lahaina Town Drainage Master Plan", prepared in March 2005 by Belt Collins Hawaii Ltd., due to a number of constraints existing at that time, the long term mitigation plan for this area envisioned the existing Kuhua St. and the old Kuhua Tract Subdivision to drain around the then existing Pioneer Mill, then down Lahainaluna Road through a proposed future 10'x6' box culvert to the ocean. However, Lahainaluna Road is a very narrow roadway within a very narrow 30 ft. wide right-of-way, and is typically encumbered by a congestion of existing underground utilities and numerous older commercial buildings that were built right up to the right-of-way. In addition, although this was classified as a high priority in the Drainage Master Plan due to existing flooding problems in the area, any future implementation of this conceptual solution is dependent on the availability of County funding.

   At the time the “Lahaina Town Drainage Master Plan” was originally developed, the Kuhua St. Extension project was not yet envisioned and potential drainage solutions were constrained by the then existing Pioneer Mill. The old Pioneer Mill has since then been demolished and, with the proposed construction of KSE and its proposed drainage improvements, this portion of the “Lahaina Town Drainage Master Plan” may now be refined and updated to reflect taking advantage of these opportunities to implement the proposed preferred drainage solution. This will provide a more direct, cost effective drainage management plan for this area by intercepting the runoff from the old Kuhua Tract Subdivision currently sheet flowing onto the project site, and conveying it to the Kahoma Stream Flood Control Channel. This preferred drainage plan is not expected to adversely impact the hydrologic and hydraulic characteristics or capacity of Kahoma Stream Flood Control Channel, and will relieve the existing, overburdened downstream drainage systems and help mitigate some of the potential flooding issues in the Lahaina Town area.

3. KSE - Lahainaluna Road to Front Street:

   Due to the large watershed upstream of the project site, and the location and limited capacity of the existing downstream drainage facilities, this portion of the Kuhua Street Extension Project will not be constructed until the Lahaina Watershed Flood Control Channel (LWFCC) is completed. With the LWFCC fully constructed, it is assumed that the existing Interim NRCS Diversion Channel will no longer be necessary and will be removed (by others). The LWFCC, which was designed to accommodate a 100 year storm event, intercepts the runoff from the mauka watershed, preventing it from flowing through the project site. The offsite runoff expected in this section will be allowed to pass through the KSE, via multiple underground culverts strategically located beneath the roadway, and sheet flow downstream as it is presently doing.

A more detailed discussion of each region of proposed drainage improvements are contained in APPENDIX “B” - Drainage Report.

All improvements are proposed outside of or above (e.g., at the Kahoma Stream Flood Control Channel) any 100-year inundation limits of existing drainage ways.

IV. WASTEWATER SYSTEM

A. EXISTING CONDITIONS:

The County's wastewater facilities generally collect wastewater from the Lahaina area and convey it through a series of gravity sewerlines and pumping stations with force mains along Front Street and Honoapiilani Highway to the Lahaina Wastewater Reclamation Facility (WWRF) in Honokowai.

According to the County's Wastewater Reclamation Division, the current Lahaina WWRF is capable of treating approximately 7.0 million gallons per day. Although a section of the Wastewater Reclamation Facility (WWRF) is still not in service (and thus the full rated regulatory capacity of 9.0 MGD is not realized), Stage 1A upgrade improvements (including new step screens in the headworks, refurbishing of the headworks channel, and the installation of new bio-reactor return pumps) have been recently completed.

There are existing 8" sewerlines along Keawe St., Lahainaluna Road, Dickenson St., Shaw St., Aholo Rd., and Front St. Sewerlines (from 10" to 27" in diameter) exist along portions of Honoapiilani Highway.

The existing 8" collector sewerlines along Kuhua St. serving existing Kuhua Tract Subdivision residences along the easterly (mauka) side of existing Kuhua St. continue downstream through the former Pioneer Mill site and then down Papalaua Street to Front Street. From there the wastewater is conveyed north along Front

Street, routed east along the south edge of the Kahoma Stream Flood Control Channel along a 14" force main that connects to a 27" gravity sewerline that runs north along Honoapiilani Highway and eventually connects to the Lahaina WWRF.

B. PROPOSED WASTEWATER IMPROVEMENTS:

Wherever practicable, to minimize the disruption to the community and traffic, sewerlines are expected to be installed in conjunction with the construction of KSE.

An 8" sewerline is expected to be extended along proposed KSE from Keawe St. to the proposed Kahoma Residential Subdivision project (by others). Any other sewerlines along KSE required to service existing properties in the vicinity will also be installed with KSE.

An 8" sewerline is expected to be installed along the proposed KSE to replace a portion of the existing 8" sewerline that services the existing Kuhua Subdivision. The existing 8" sewerline that runs through the former Pioneer Mill site will be rerouted within the proposed Papalaua Street Extension and will connect to an existing sewer manhole immediately mauka of the Honoapiilani Highway. From there, an existing 8" sewerline conveys wastewater downstream along existing Papalaua Street, then along Front St., then along Honoapiilani Highway, and eventually to the Lahaina WWRF in Honokowai. The existing residences along Kuhua St. will be reconnected to this rerouted system.

C. ANTICIPATED WASTEWATER DEMAND:

The KSE project in itself (excluding any existing or proposed adjoining developments), is not expected to generate any significant additional wastewater demand.

V. WATER SYSTEM:

A. EXISTING CONDITIONS:

The County's potable water system services the Lahaina area typically through surface (stream) and ground (well) sources, with storage being provided by three existing water tanks. These water tanks include:

- The 1.0 million gallon and 0.5 million gallon water tanks on Lahainaluna Road at elevations 257 feet and 474 feet, respectively.

- The 1.5 million gallon Wahikuli tank at elevation 257 feet.

8" and 12" transmission waterlines exist along portions of Honoapiilani Highway. A 12" waterline was recently installed along Keawe St. (from Honoapiilani Highway

to just above the existing Lahaina-Kaanapali Railroad tracks). 8" waterlines exist along Lahainaluna Road, Shaw Street, Aholo Road, and Front Street.

B. PROPOSED WATER IMPROVEMENTS:

Wherever practicable, to minimize the disruption to the community and traffic, distribution waterlines are expected to be installed in conjunction with the construction of KSE.

A new 12" waterline is expected to be installed along proposed KSE, from the existing 12" waterline along Keawe St., to the proposed Kahoma Residential Subdivision project (by others). Additional segments of 12" waterline along KSE are expected to be installed from the proposed Kahoma Residential Subdivision, and extended and interconnected to the existing 8" waterline along Lahainaluna Road. Similarly, any required segments of waterline will be installed along the balance of KSE extending southerly (Maalaea direction) to the southerly (Maalaea end) terminus at the Honoapiilani Highway / Front St. intersection.

In accordance with current water system standards, fire hydrants will be installed with a maximum spacing of 350 feet along the existing residential Kuhua Tract Subdivision area.

C. ANTICIPATED DOMESTIC AND IRRIGATION WATER DEMANDS:

The KSE project in itself (excluding any existing or proposed adjoining developments), is not expected to generate any significant additional water demand, other than that for incidental landscape irrigation and minor amenities such as drinking fountains along the proposed adjoining multi-use trail (or greenway).

Based on preliminary projections provided by the Landscape Architect, anticipated average daily landscape irrigation demands, for the linear landscaping along the proposed KSE corridor (approximately 1.9 miles) is expected to range from approximately 160 gpd to 300 gpd per 1,000 l.f. of corridor, for a total average of approximately 2,400 gpd. Anticipated average daily landscape irrigation demands, for the linear landscaping along the proposed east-west (mauka-makai) connections between KSE and Honoapiilani Hwy. (totaling approximately 0.7 miles) is expected to be approximately 120 gpd per 1,000 l.f. or corridor, for a total of approximately 500 gpd. Water service for landscape irrigation is expected to be provided by new, strategically located 2" water meter service laterals since the peak irrigation water demand is not expected to exceed 60 to 80 gpm for any given service area.

Domestic water service for the drinking fountains would be expected to be provided by new 5/8" standard water meter service laterals.

VI. ELECTRICAL, TELEPHONE AND CATV SERVICE

A. EXISTING CONDITIONS:

Maui Electric Company, Ltd.'s overhead transmission line is generally located along or in the vicinity of the old Pioneer Mill Cane Haul Road, and along the existing Kuhua Street, with overhead service connections to the existing Kuhua Tract Subdivision residences along Kuhua St.

The Hawaiian Telcom telephone and Oceanic Time Warner Cable cable television distribution systems are also generally located along this alignment.

B. PROPOSED IMPROVEMENTS:

Existing overhead transmission line power poles affected by KSE will be relocated as required, with overhead lines remaining overhead. Existing overhead service connections to the existing Kuhua Tract Subdivision residences along Kuhua St. will be reconnected to the relocated infrastructure.

Streetlights are expected to be installed along KSE, supplemented by pole-mounted lights for the adjoining multi-use trail.

All new electrical, telephone and cable televisions distribution systems within the project are expected to be placed underground.

VII. ANTICIPATED CONSTRUCTION COSTS:

Order-of-magnitude probable construction costs are estimated to be as follows:

- KSE - From North (Kaanapali end) Terminus at Keawe St. up to and including Lahainaluna Road: $ 17 million.
    - In the event that additional drainage improvements are required down existing segments of Papalaua St. (west or makai of Honoapiilani Highway) to Front St., an additional approximately $3 million may be required.
    - KSE - From (but not including) Lahainaluna Road to the South Terminus at the existing Intersection of Honoapiilani Highway / Front Street: approximately $19 million.

EXHIBIT "A": LOCATION MAP

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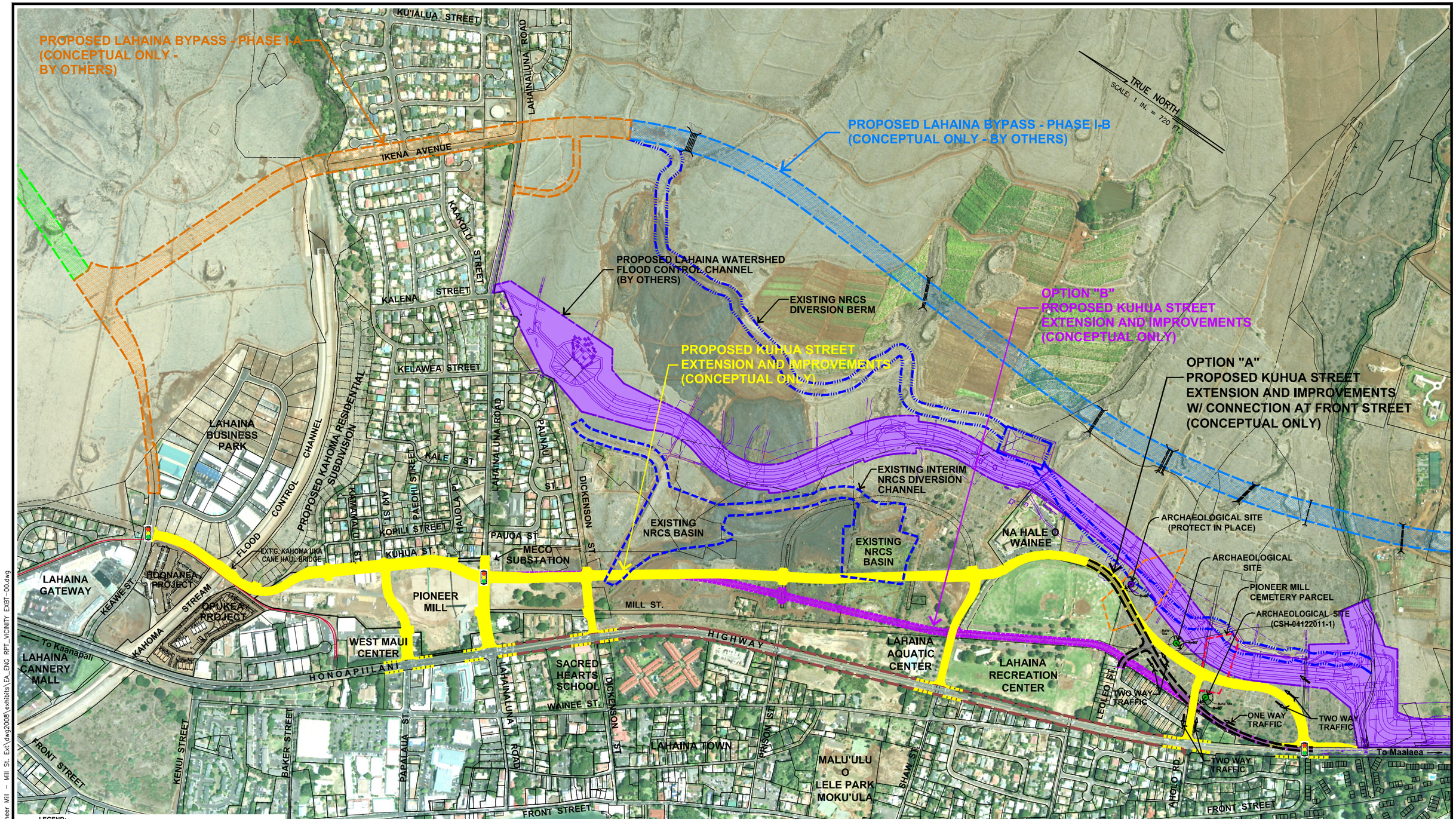
December 19, 2012

EXHIBIT "B" - GENERAL PLAN



LEGEND:

- PROPOSED KUHUA STREET EXTENSION AND IMPROVEMENTS (CONCEPTUAL ONLY)
- OPTION "A" - PROPOSED KUHUA STREET EXTENSION AND IMPROVEMENTS WITH CONNECTION AT FRONT STREET (CONCEPTUAL ONLY)
- OPTION "B" - PROPOSED KUHUA STREET EXTENSION AND IMPROVEMENTS (CONCEPTUAL ONLY)
- LIMITS OF HDOT HONOAPIILANI HIGHWAY WIDENING PROJECT
- LAHAINA BYPASS - PHASE I-A (CONCEPTUAL ONLY)
- PROPOSED LAHAINA BYPASS - PHASE I-B (CONCEPTUAL ONLY)
- PROPOSED LAHAINA WATERSHED FLOOD CONTROL CHANNEL (BY OTHERS)
- EXISTING INTERIM NRCS DIVERSION CHANNEL
- EXISTING NRCS DIVERSION BERM
- EXISTING LAHAINA KAANAPALI RAILROAD
- PROPOSED TRAFFIC SIGNAL

PROPOSED KUHUA STREET EXTENSION AND IMPROVEMENTS
(FROM VICINITY OF KEAWE STREET TO FRONT STREET)

0 1000 2000 3000 4000

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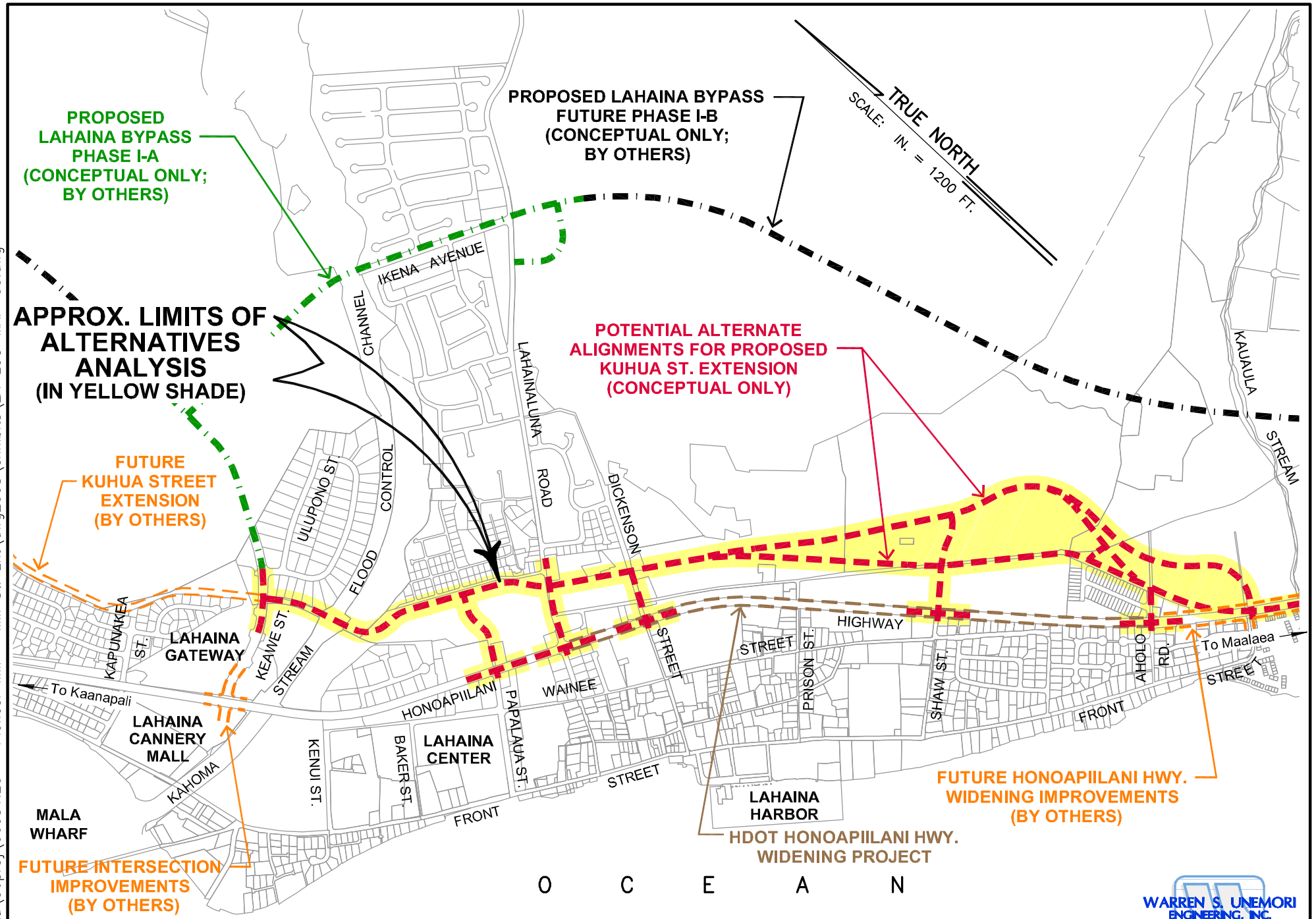

EXHIBIT "C" - SCOPE OF ALTERNATIVES ANALYSIS

SCALE: 1 IN. = 1200 FT.

October 3, 2012

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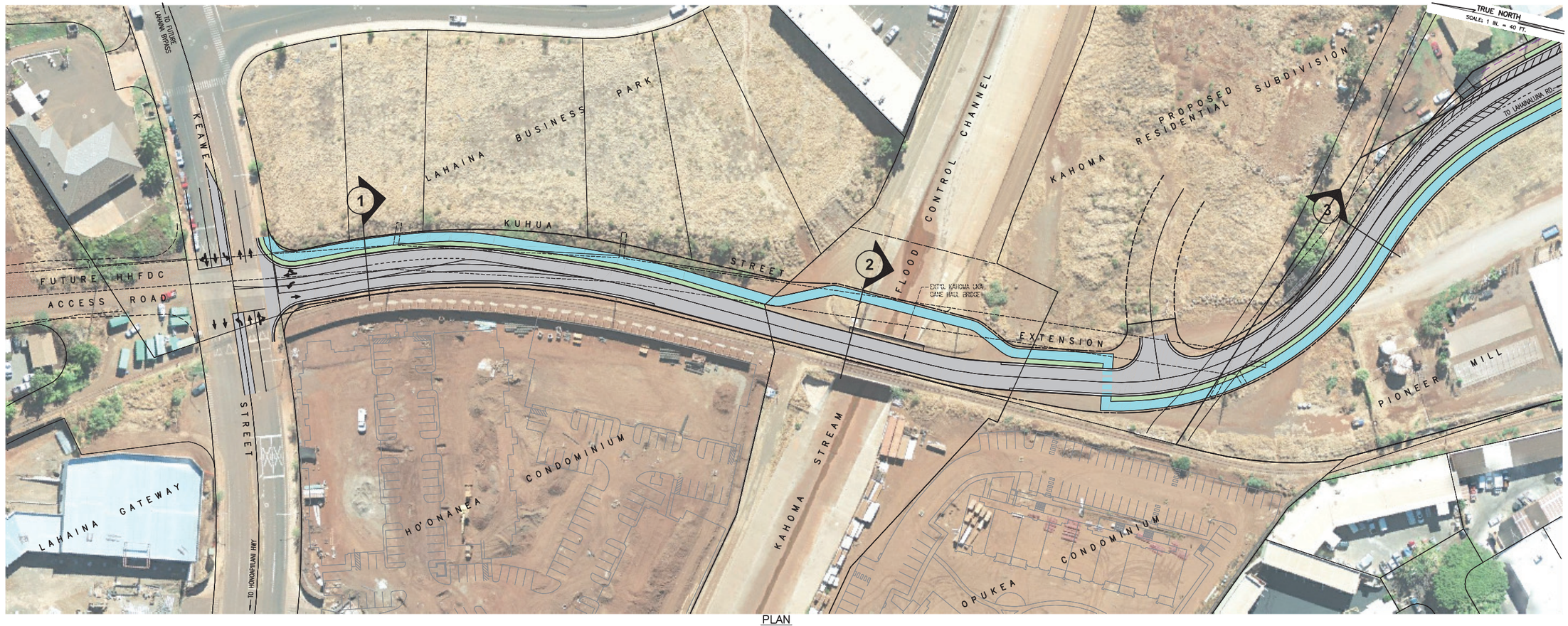
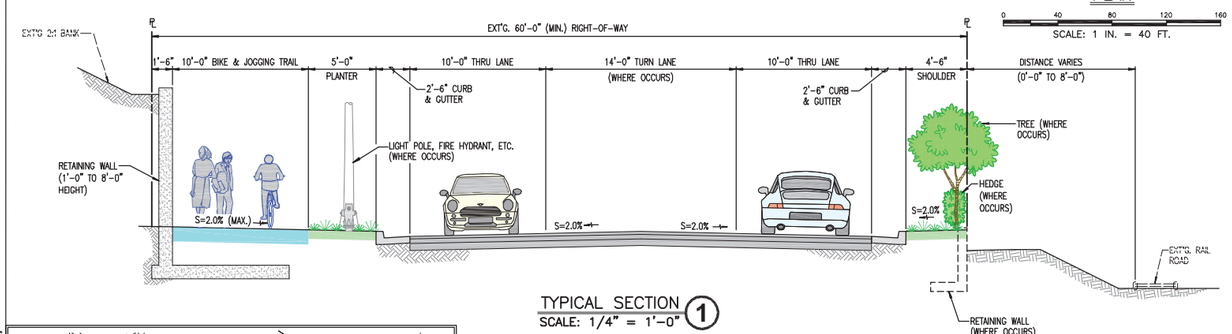
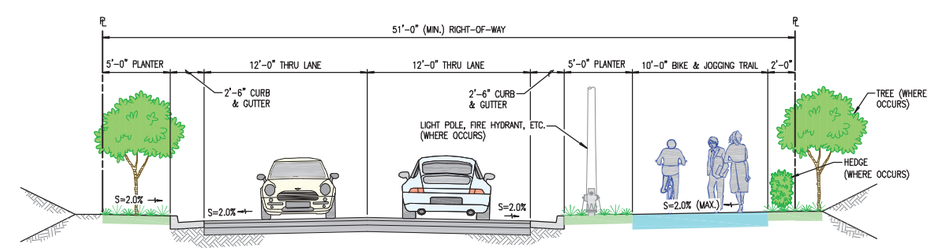


PLAN

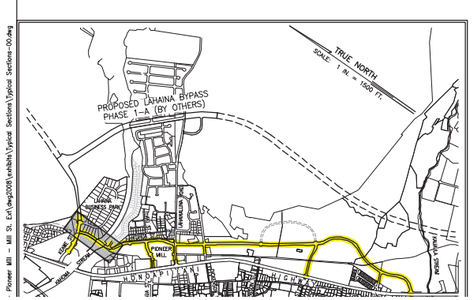
SCALE: 1 IN. = 40 FT.



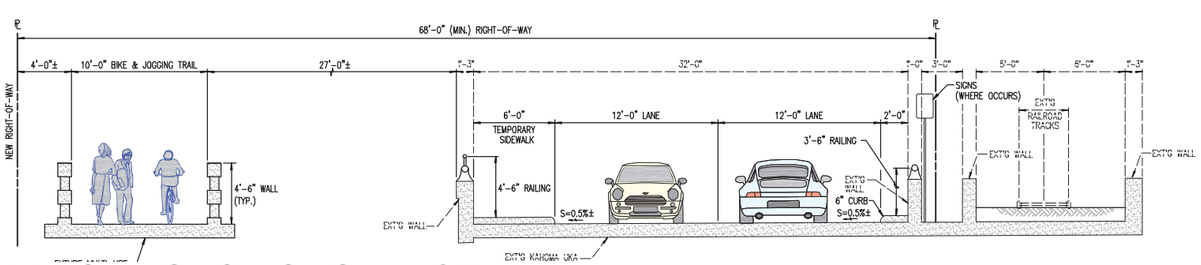
TYPICAL SECTION 1
SCALE: 1/4" = 1'-0"



TYPICAL SECTION 3
SCALE: 1/4" = 1'-0"



LOCATION MAP
SCALE: 1 IN. = 1500 FT.



SCALE: 1/4" = 1'-0"

MASTER-PLANNED PERMITTED FUTURE ACCESS LOCATIONS ARE CONCEPTUALLY SHOWN ALONG THESE ROADWAY CORRIDORS. ALL PERMITTED ACCESSES ARE SUBJECT TO APPROVAL BY DEPT. OF PUBLIC WORKS, COUNTY OF MAUI.

LEGEND:

- MULTI-USE TRAIL AND SIDEWALKS
- LANDSCAPED SHOULDER
- AC PAVEMENT
- TURNING MOVEMENTS

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EXHIBIT "D" - TYPICAL SECTIONS (1 of 9)

EXHIBIT "D" - TYPICAL SECTIONS (1 of 9)

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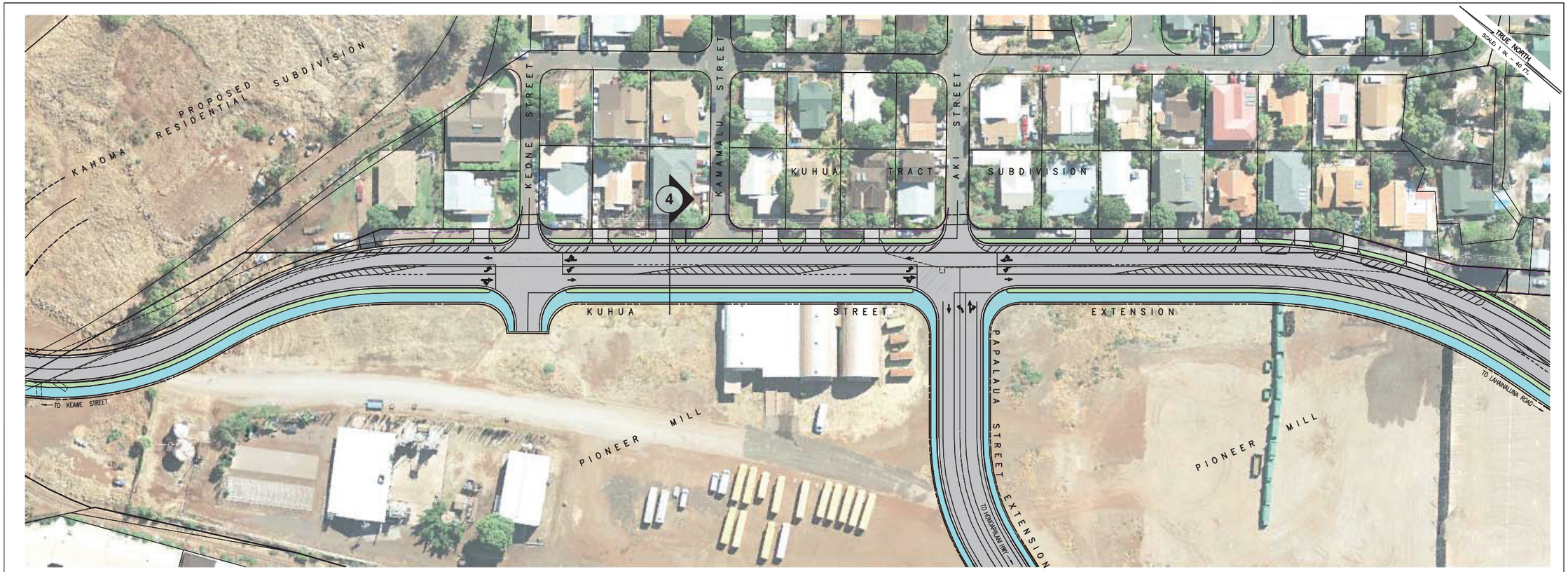
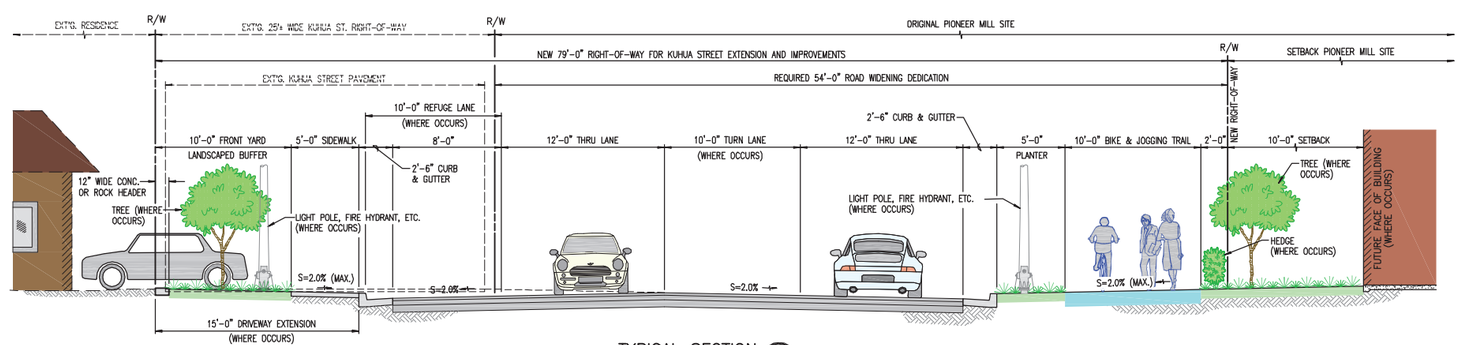
EXHIBIT "D" - TYPICAL SECTIONS (2 of 9)



PLAN

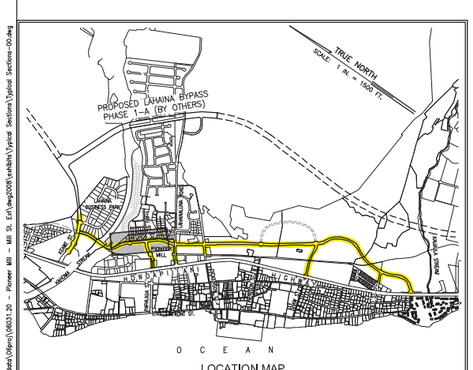
0 40 80 120 160

SCALE: 1 IN. = 40 FT.



TYPICAL SECTION 4

SCALE: 1/4" = 1'-0"



LOCATION MAP

SCALE: 1 IN. = 1500 FT.

MASTER-PLANNED PERMITTED FUTURE ACCESS LOCATIONS ARE CONCEPTUALLY SHOWN ALONG THESE ROADWAY CORRIDORS. ALL PERMITTED ACCESSES ARE SUBJECT TO APPROVAL BY DEPT. OF PUBLIC WORKS, COUNTY OF MAUI.

LEGEND:

- MULTI-USE TRAIL AND SIDEWALKS
- LANDSCAPED SHOULDER
- AC PAVEMENT
- TURNING MOVEMENTS

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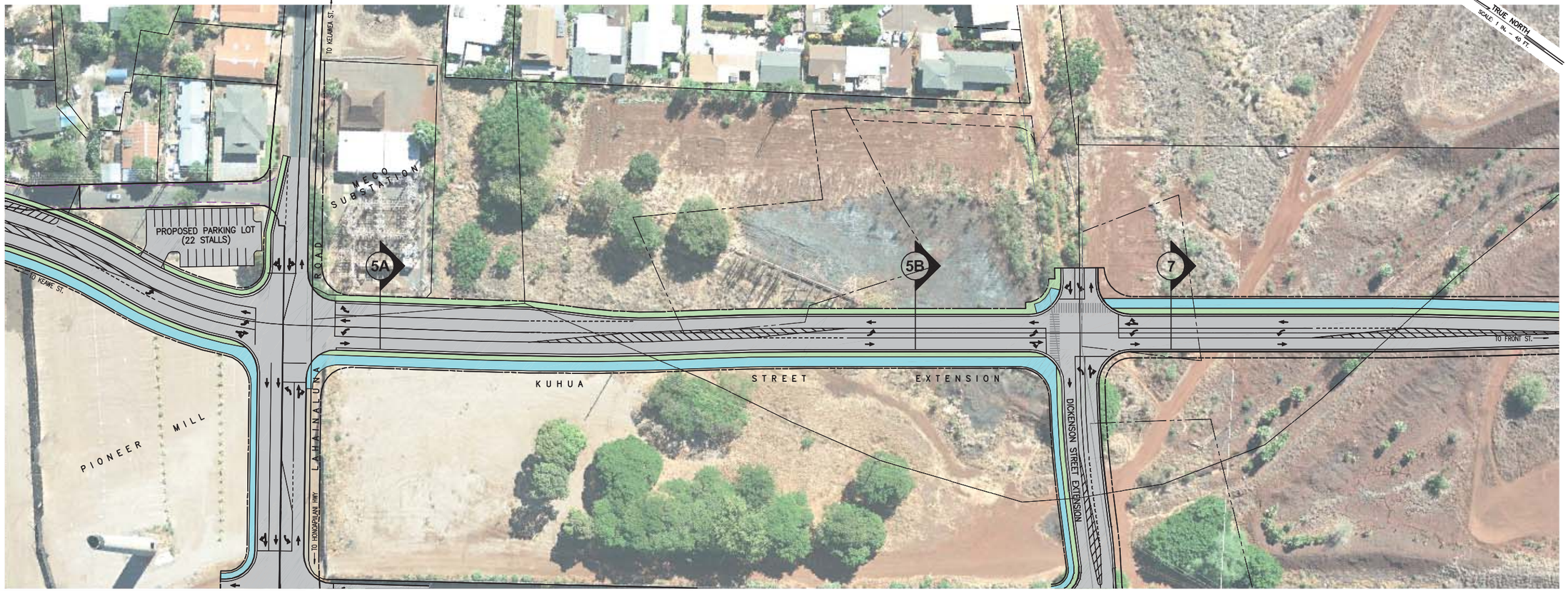
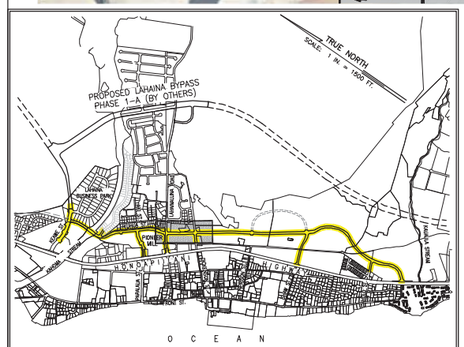
EXHIBIT D - TYPICAL SECTIONS (3 of 9)



PLAN

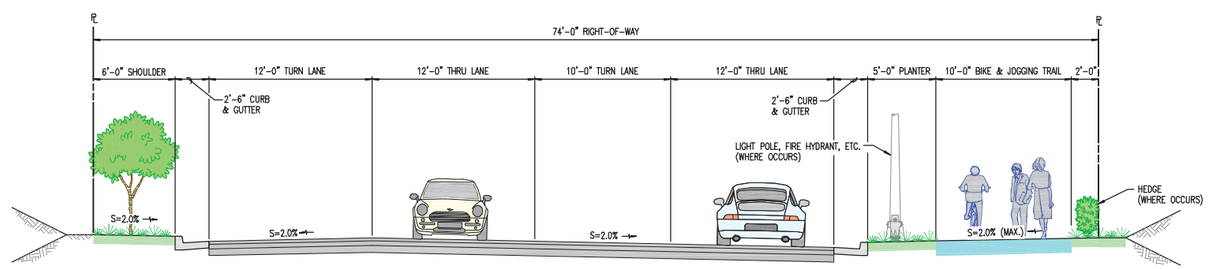
0 40 80 120 160

SCALE: 1 IN. = 40 FT.



LOCATION MAP

SCALE: 1 IN. = 1500 FT.

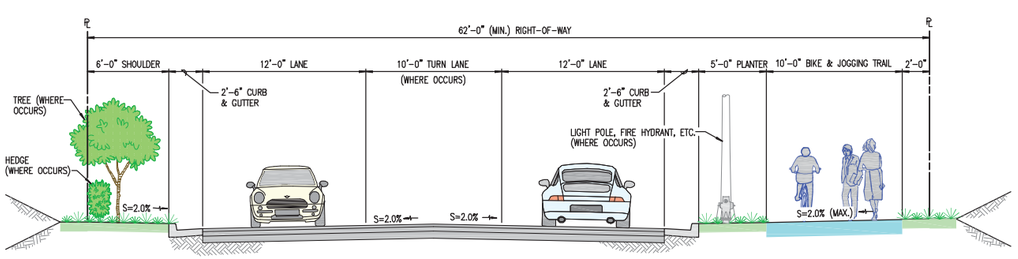


TYPICAL SECTION 5A

SCALE: 1/4" = 1'-0"

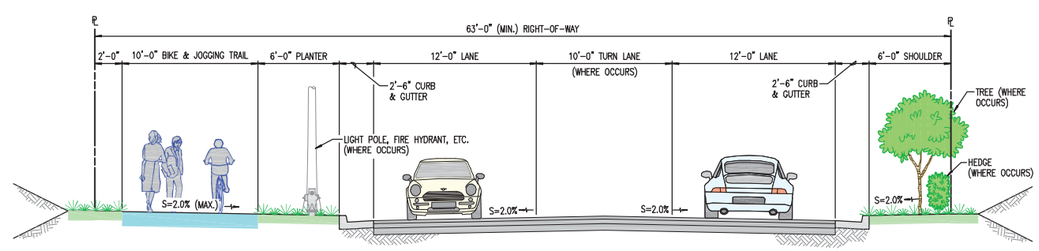
LEGEND:

- MULTI-USE TRAIL AND SIDEWALKS
- LANDSCAPED SHOULDER
- AC PAVEMENT
- TURNING MOVEMENTS



TYPICAL SECTION 5B

SCALE: 1/4" = 1'-0"



TYPICAL SECTION 7

SCALE: 1/4" = 1'-0"

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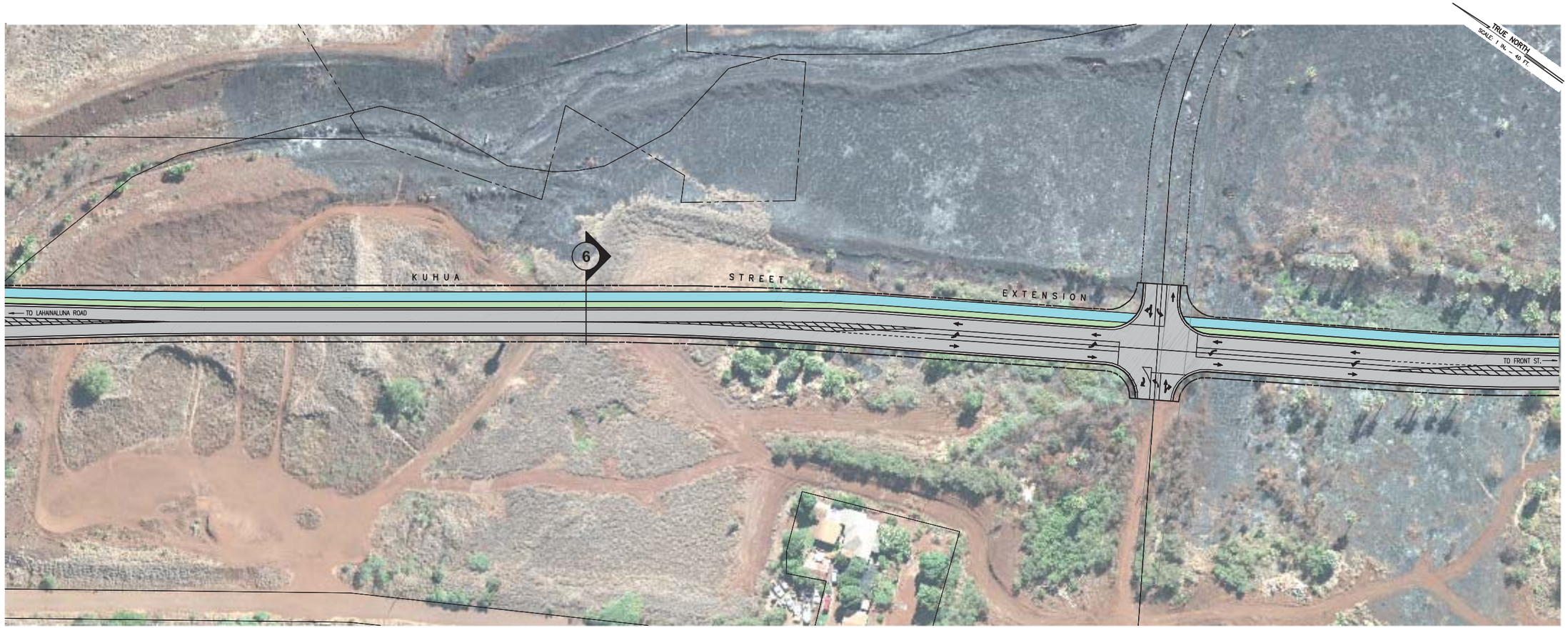
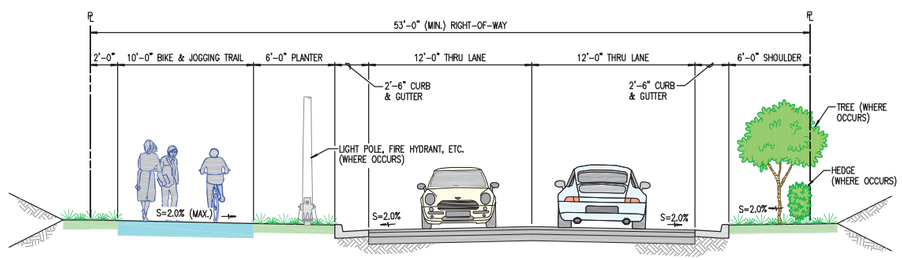
EXHIBIT "D" - TYPICAL SECTIONS (4 of 9)



PLAN

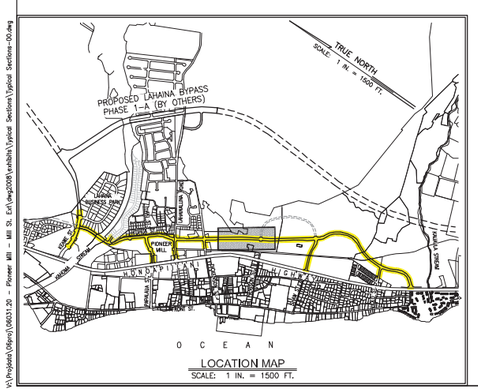
0 40 80 120 160

SCALE: 1 IN. = 40 FT.



TYPICAL SECTION 6

SCALE: 1/4" = 1'-0"



LOCATION MAP

SCALE: 1 IN. = 1500 FT.

LEGEND:

- MULTI-USE TRAIL AND SIDEWALKS
- LANDSCAPED SHOULDER
- AC PAVEMENT
- TURNING MOVEMENTS

WARREN S. UNEMORI ENGINEERING, INC.
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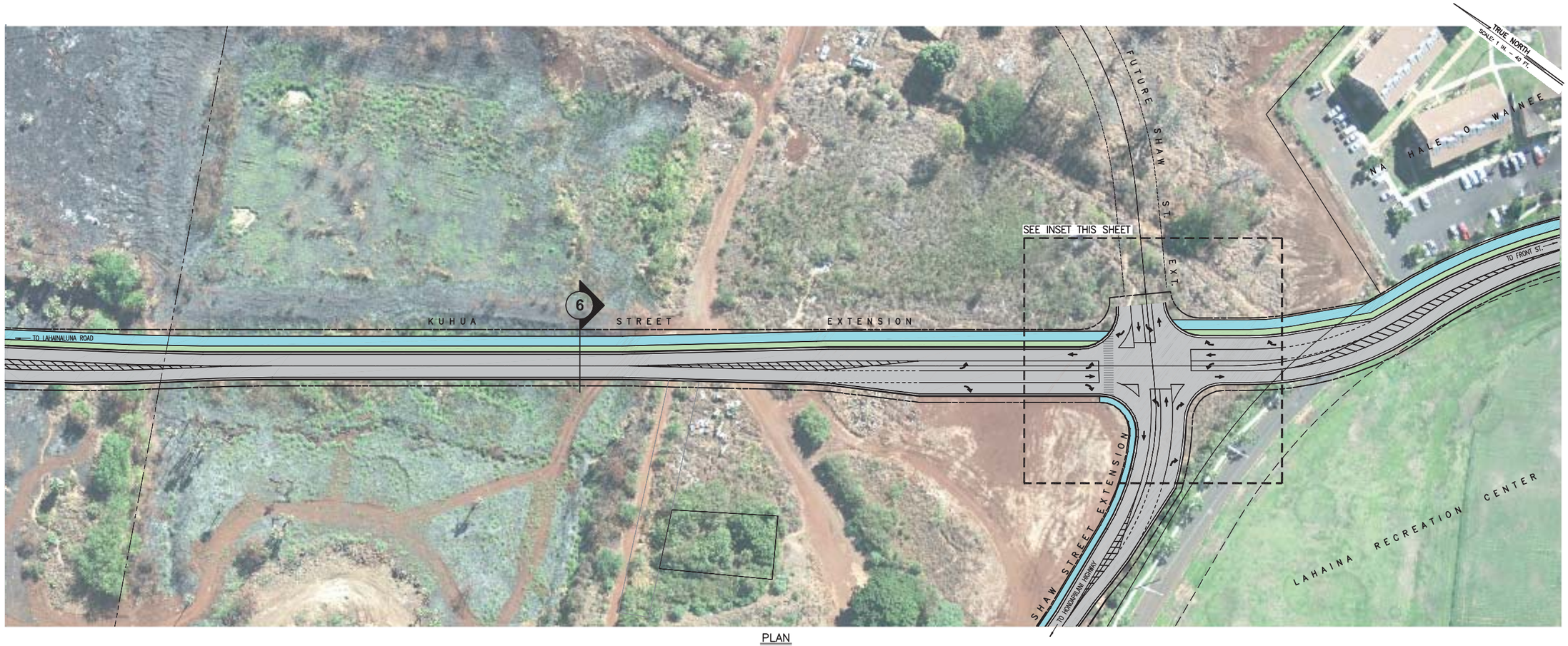
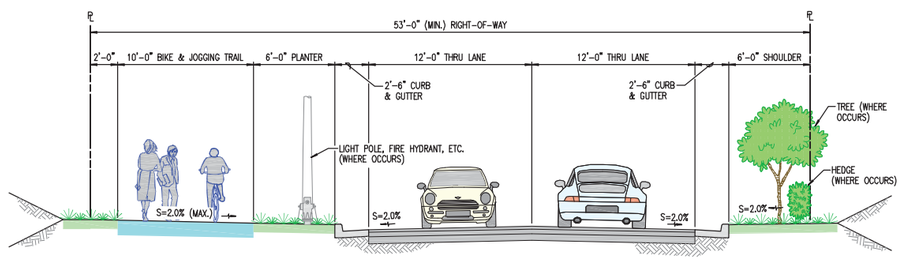
EXHIBIT "D" - TYPICAL SECTIONS (5 of 9)



PLAN

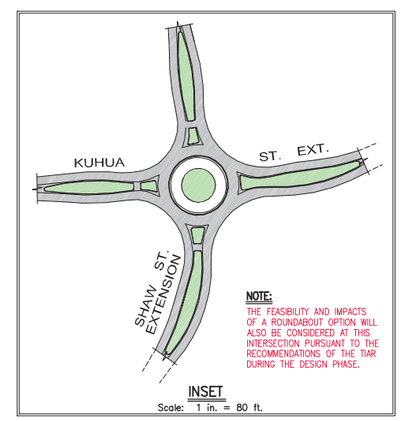
0 40 80 120 160

SCALE: 1 IN. = 40 FT.



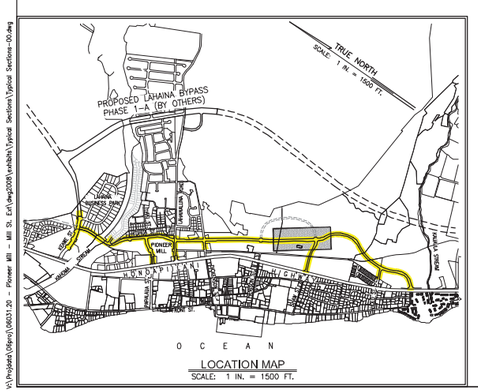
TYPICAL SECTION 6

SCALE: 1/4" = 1'-0"



INSET

Scale: 1 in. = 80 ft.



LOCATION MAP

SCALE: 1 IN. = 1500 FT.

LEGEND:

- MULTI-USE TRAIL AND SIDEWALKS
- LANDSCAPED SHOULDER
- AC PAVEMENT
- TURNING MOVEMENTS

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October 3, 2012

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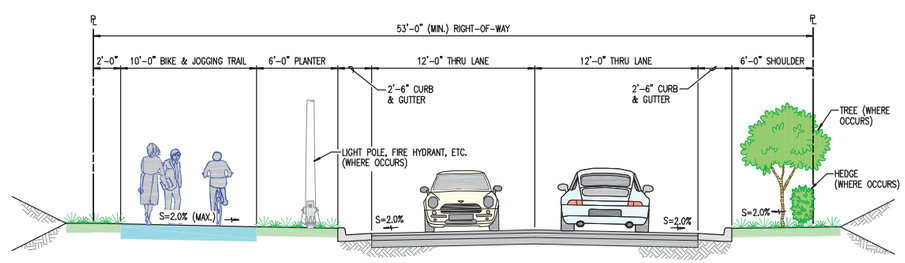
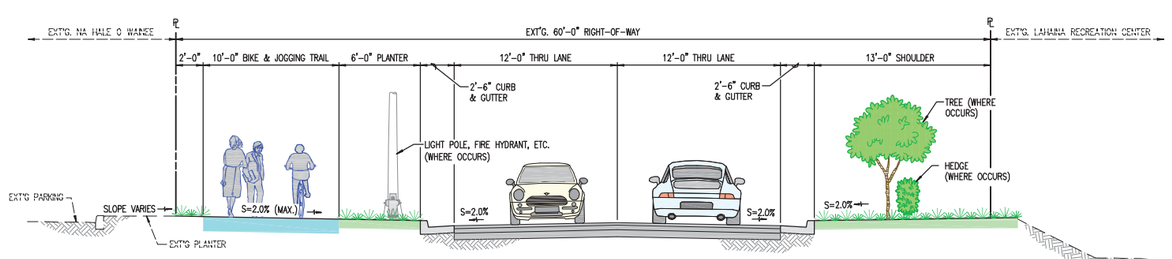
EXHIBIT "D" - TYPICAL SECTIONS (6 of 9)

TRUE NORTH
SCALE: 1 IN. = 40 FT.

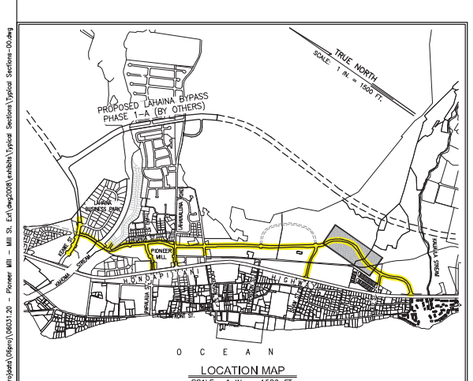
PLAN
0 40 80 120 160
SCALE: 1 IN. = 40 FT.



TYPICAL SECTION 6
SCALE: 1/4" = 1'-0"



TYPICAL SECTION 8
SCALE: 1/4" = 1'-0"



LOCATION MAP
SCALE: 1 IN. = 1500 FT.

LEGEND:
- MULTI-USE TRAIL AND SIDEWALKS
- LANDSCAPED SHOULDER
- AC PAVEMENT
- TURNING MOVEMENTS

WARREN S. UNEMORI ENGINEERING, INC.
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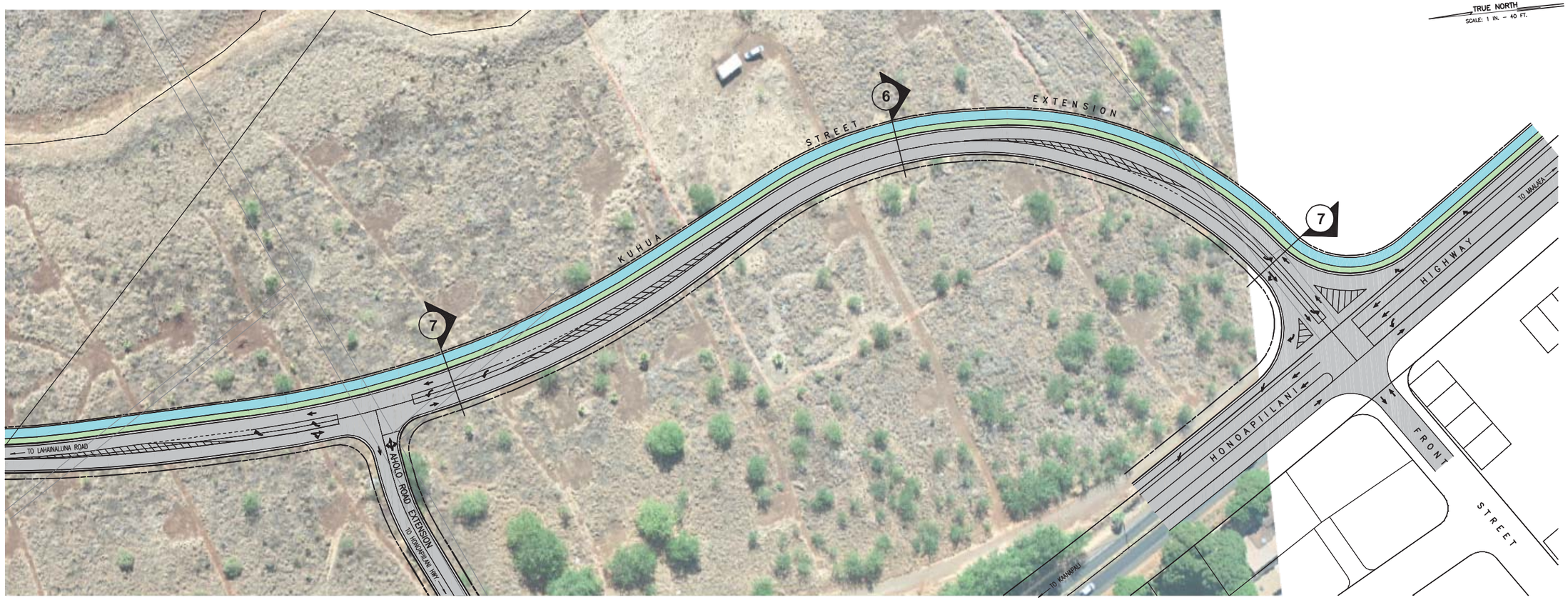
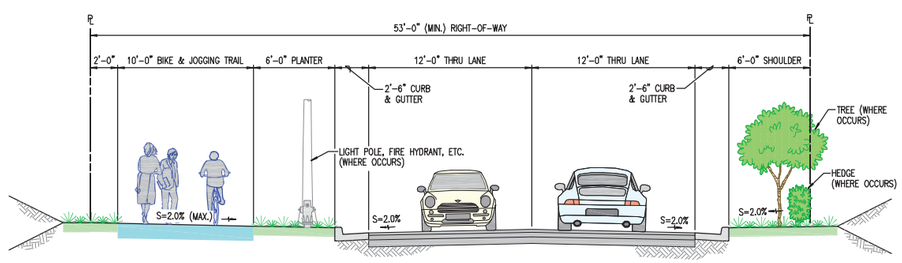
EXHIBIT "D" - TYPICAL SECTIONS (7 of 9)



PLAN

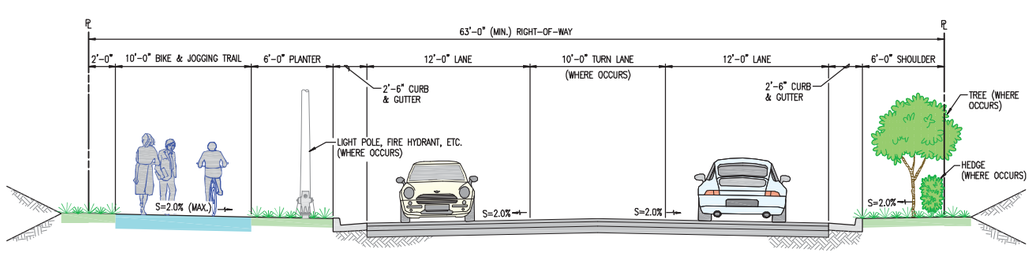
0 40 80 120 160

SCALE: 1 IN. = 40 FT.



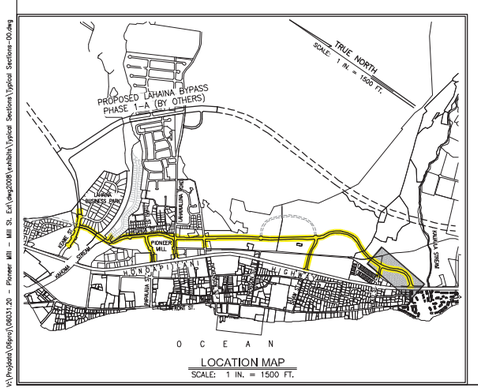
TYPICAL SECTION 6

SCALE: 1/4" = 1'-0"



TYPICAL SECTION 7

SCALE: 1/4" = 1'-0"



LOCATION MAP

SCALE: 1 IN. = 1500 FT.

LEGEND:

- MULTI-USE TRAIL AND SIDEWALKS
- LANDSCAPED SHOULDER
- AC PAVEMENT
- TURNING MOVEMENTS

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October 3, 2012

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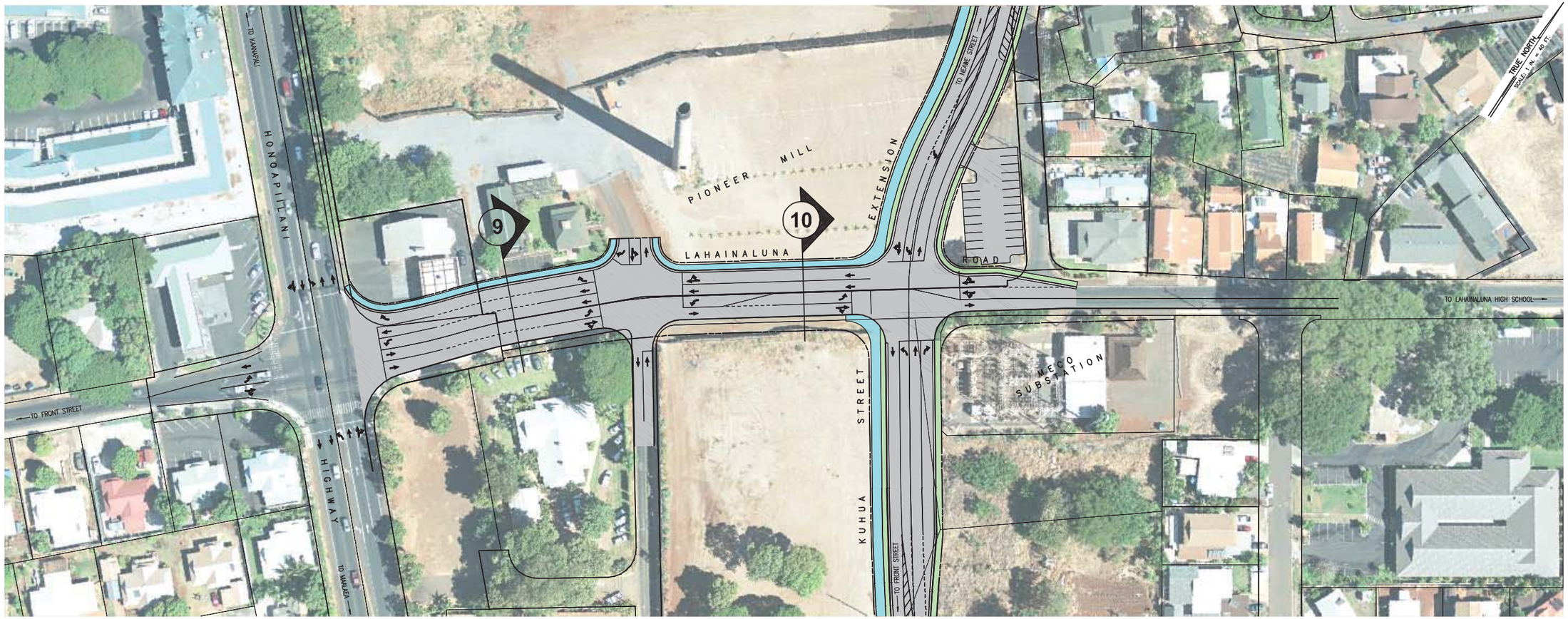
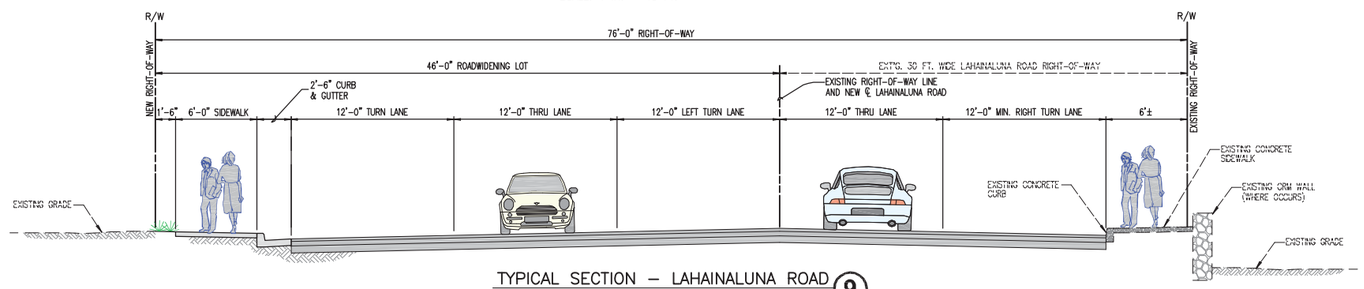
EXHIBIT "D" - TYPICAL SECTIONS (8 of 9)



PLAN

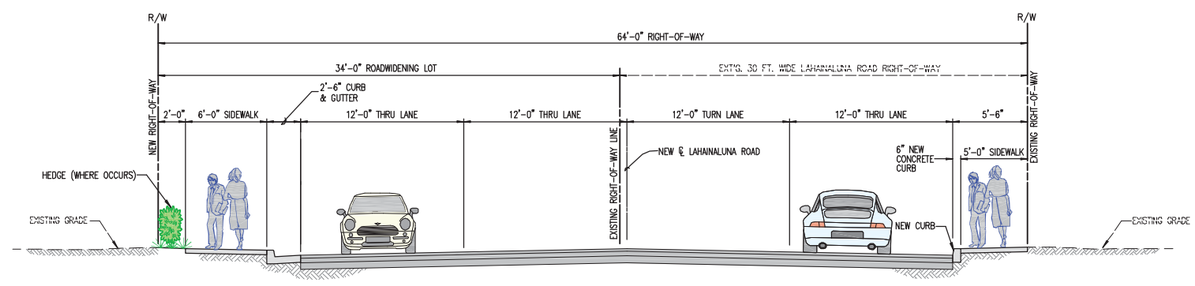
0 40 80 120 160

SCALE: 1 IN. = 40 FT.



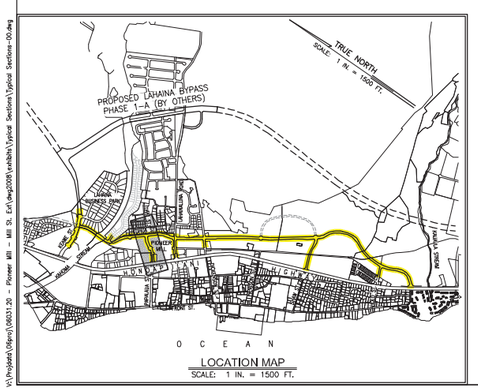
TYPICAL SECTION – LAHAINALUNA ROAD (9)

SCALE: 1/4" = 1'-0"



TYPICAL SECTION – LAHAINALUNA ROAD (10)

SCALE: 1/4" = 1'-0"



LOCATION MAP

SCALE: 1 IN. = 1500 FT.

MASTER-PLANNED PERMITTED FUTURE ACCESS LOCATIONS ARE CONCEPTUALLY SHOWN ALONG THESE ROADWAY CORRIDORS. ALL PERMITTED ACCESSES ARE SUBJECT TO APPROVAL BY DEPT. OF PUBLIC WORKS, COUNTY OF MAUI.

LEGEND:

- MULTI-USE TRAIL AND SIDEWALKS
- LANDSCAPED SHOULDER
- AC PAVEMENT
- TURNING MOVEMENTS

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October 3, 2012

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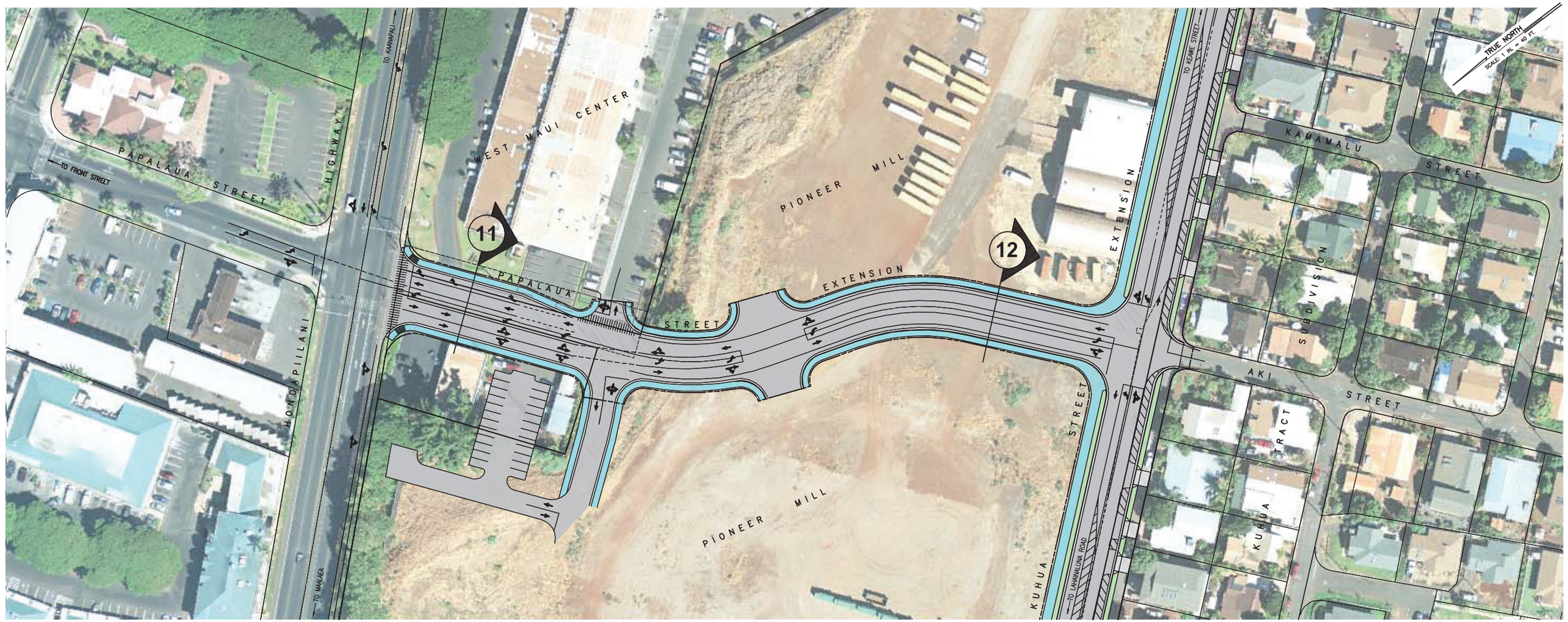
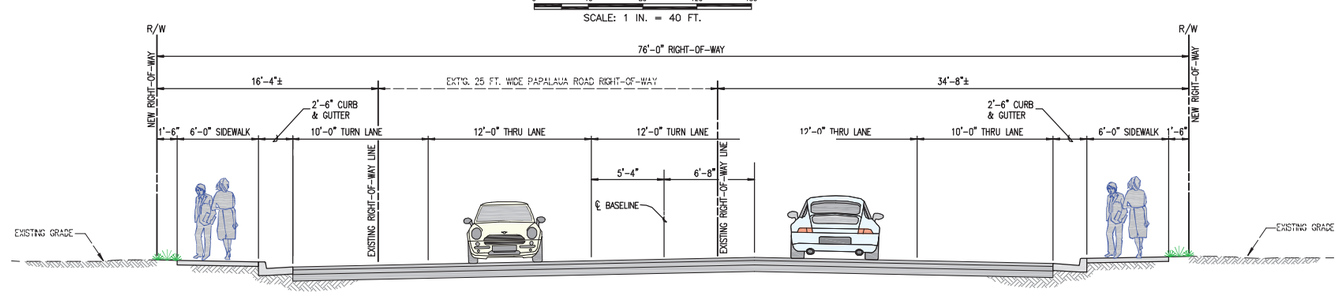
EXHIBIT "D" - TYPICAL SECTIONS (9 of 9)



PLAN

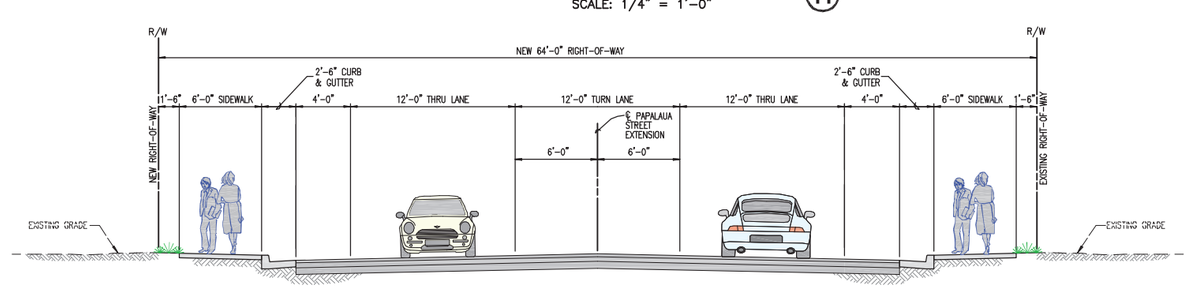
0 40 80 120 160

SCALE: 1 IN. = 40 FT.



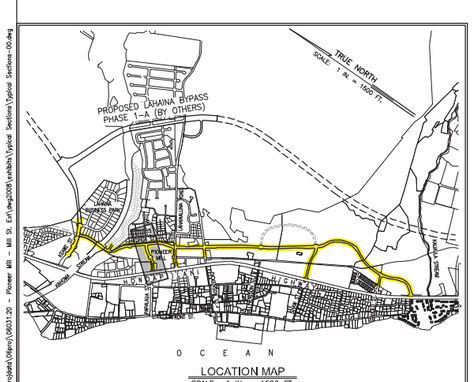
TYPICAL SECTION – PAPALAUA STREET (11)

SCALE: 1/4" = 1'-0"



TYPICAL SECTION – PAPALAUA STREET (12)

SCALE: 1/4" = 1'-0"



LOCATION MAP

SCALE: 1 IN. = 1500 FT.

MASTER-PLANNED PERMITTED FUTURE ACCESS LOCATIONS ARE CONCEPTUALLY SHOWN ALONG THESE ROADWAY CORRIDORS. ALL PERMITTED ACCESSES ARE SUBJECT TO APPROVAL BY DEPT. OF PUBLIC WORKS, COUNTY OF MAUI.

LEGEND:

- MULTI-USE TRAIL AND SIDEWALKS
- LANDSCAPED SHOULDER
- AC PAVEMENT
- TURNING MOVEMENTS

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October 3, 2012

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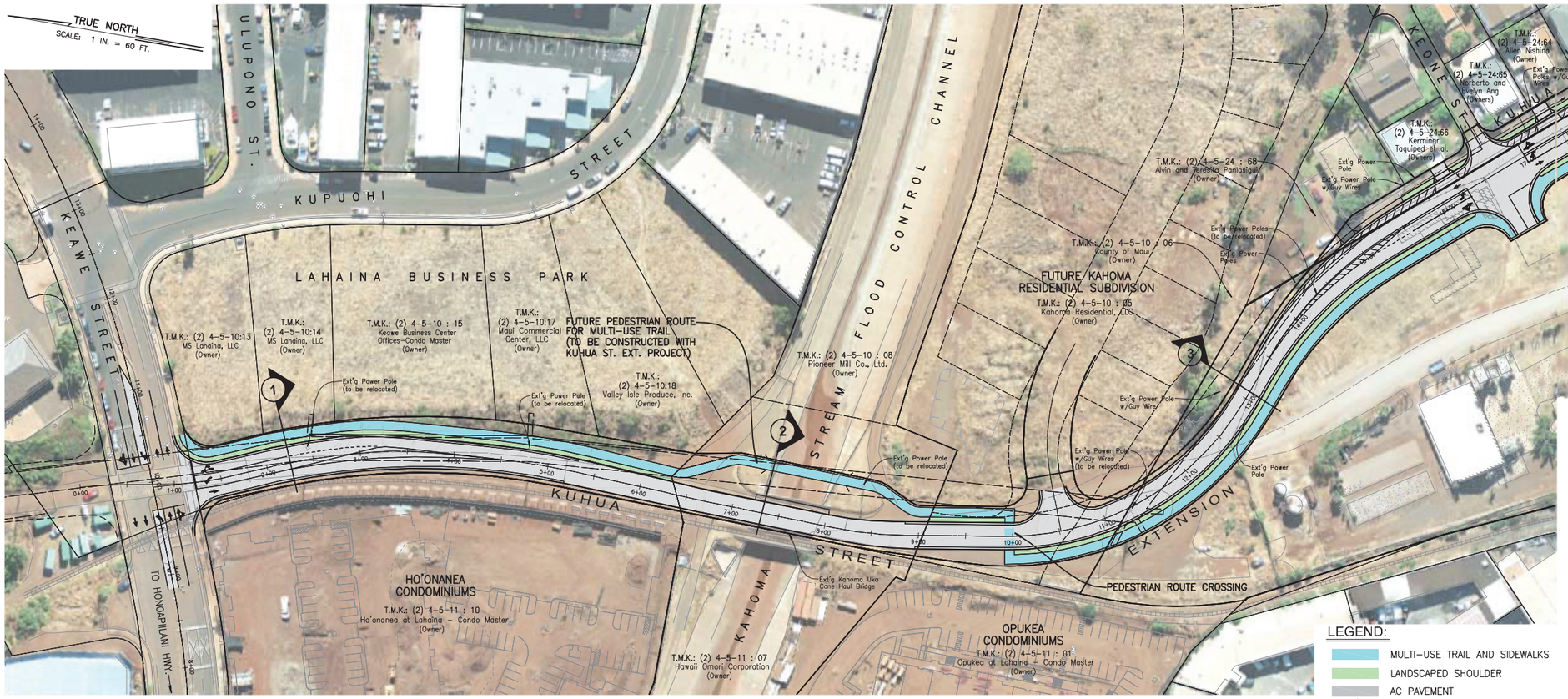
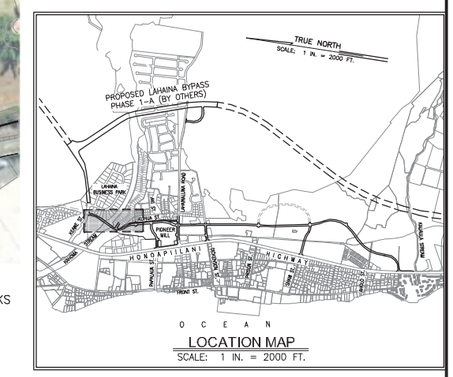
EXHIBIT "E" - CONCEPTUAL PLAN AND PROFILES (1 of 6)



PLAN
Scale: 1 in. = 60 ft.



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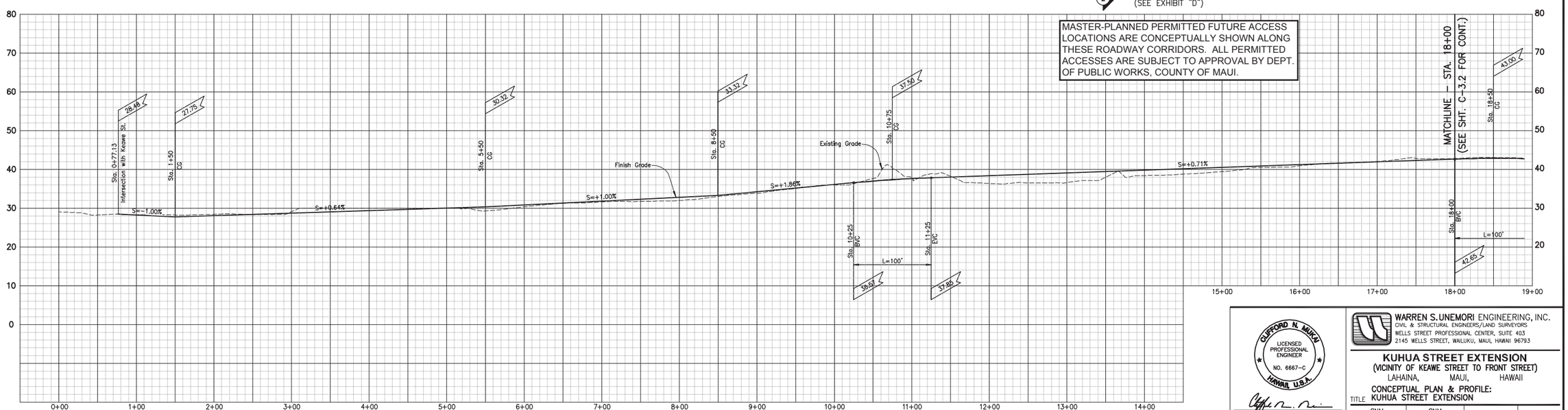

PROFILE – KUHUA STREET EXTENSION
Scale: Horiz. 1" = 60'
Vert. 1" = 12'

LETTER	DESCRIPTION	DATE

CLIFFORD N. MUKAI
LICENSED PROFESSIONAL ENGINEER
NO. 6667-C
HAWAII, U.S.A.

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CIVIL & STRUCTURAL ENGINEERS/LAND SURVEYORS
WELLS STREET PROFESSIONAL CENTER, SUITE 403
2145 WELLS STREET, WAILUKU, MAUI, HAWAII 96793

KUHUA STREET EXTENSION
(VICINITY OF KEAWE STREET TO FRONT STREET)
LAHAINA, MAUI, HAWAII

CONCEPTUAL PLAN & PROFILE:
TITLE KUHUA STREET EXTENSION

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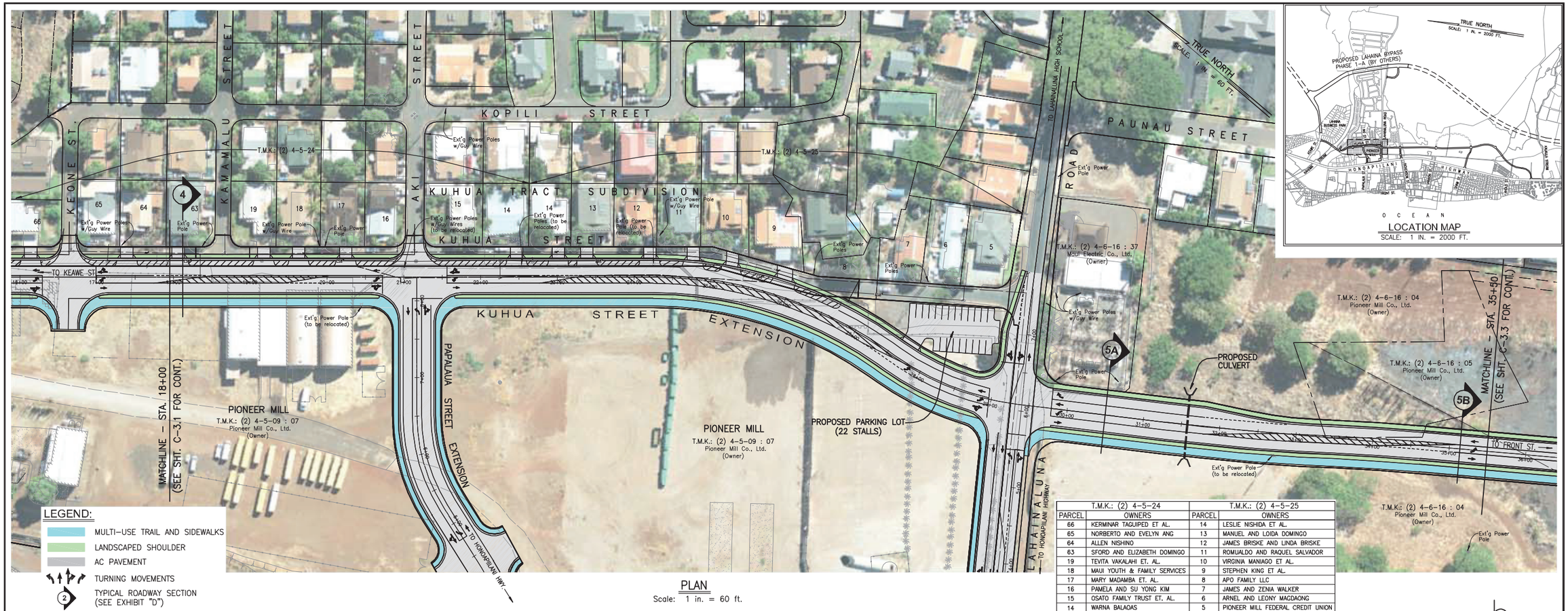

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65	NORBERTO AND EVELYN ANG	13	MANUEL AND LOIDA DOMINGO
64	ALLEN NISHINO	12	JAMES BRISKE AND LINDA BRISKE
63	SFORD AND ELIZABETH DOMINGO	11	ROMUALDO AND RAQUEL SALVADOR
19	TEVITA VAKALAHI ET. AL.	10	VIRGINIA MANIAGO ET AL.
18	MAUI YOUTH & FAMILY SERVICES	9	STEPHEN KING ET AL.
17	MARY MADAMBA ET. AL.	8	APO FAMILY LLC
16	PAMELA AND SU YONG KIM	7	JAMES AND ZENIA WALKER
15	OSATO FAMILY TRUST ET. AL.	6	ARNEL AND LEONY MAGDAONG
14	WARNA BALAOAS	5	PIONEER MILL FEDERAL CREDIT UNION

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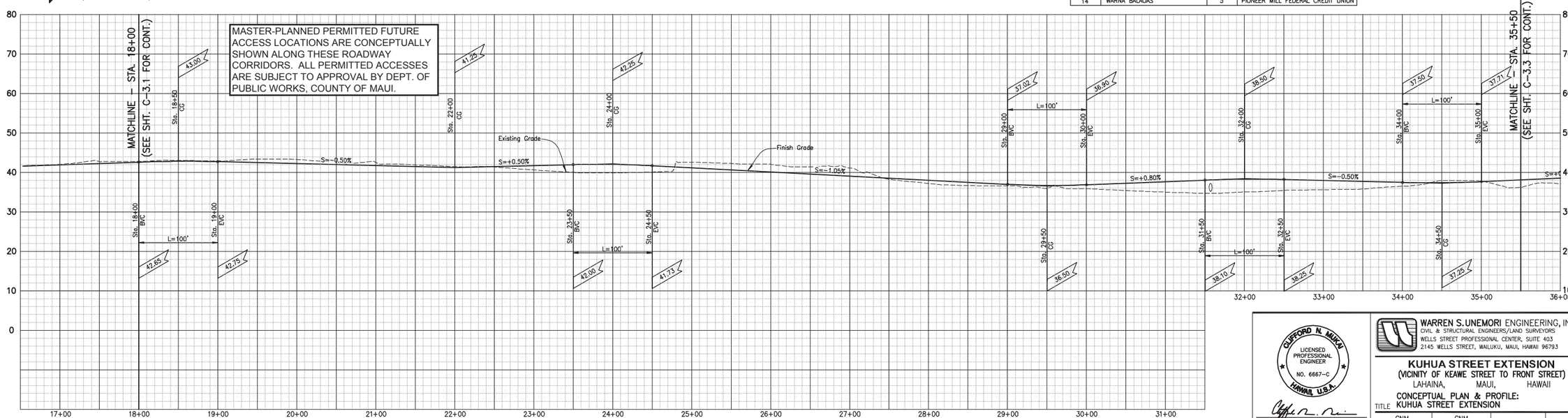

PROFILE – KUHUA STREET EXTENSION
Scale: Horiz. 1" = 60'
Vert. 1" = 12'

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KUHUA STREET EXTENSION
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LAHAINA, MAUI, HAWAII

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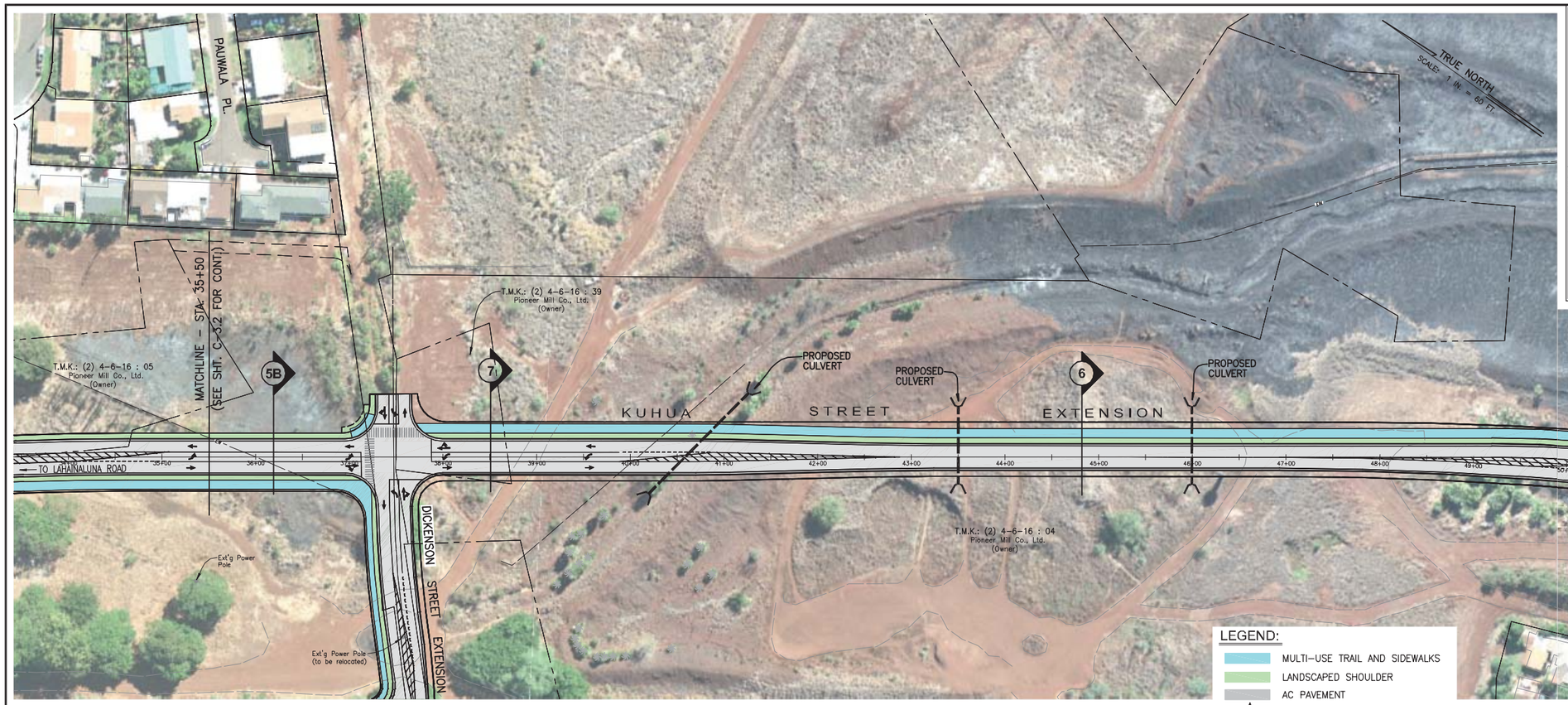

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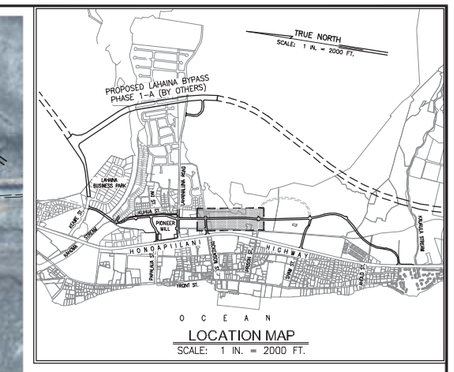

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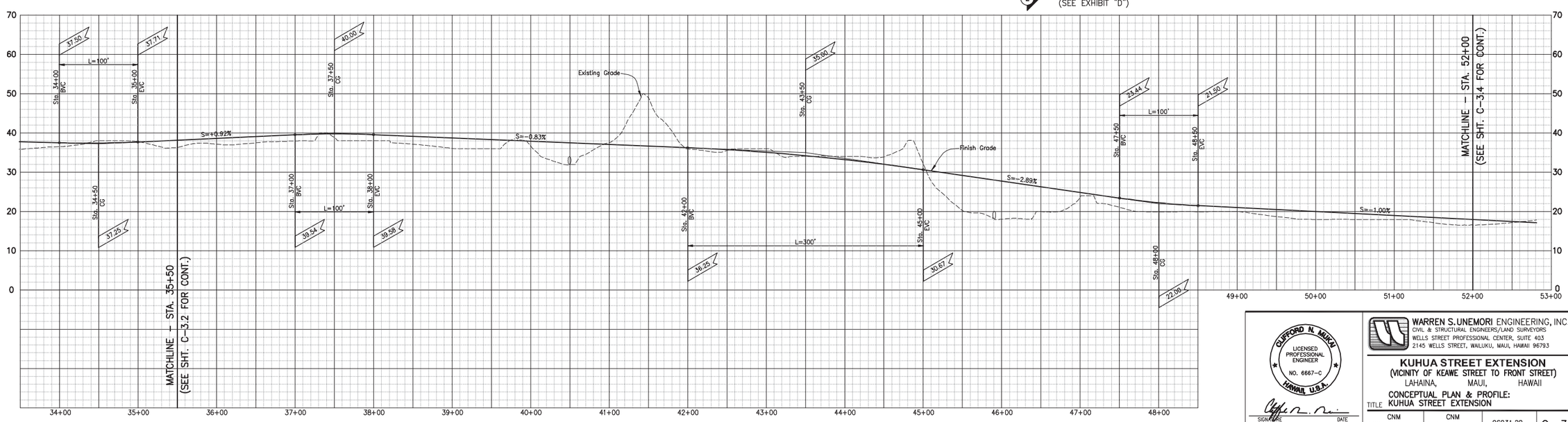

PROFILE – KUHUA STREET EXTENSION
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Vert. 1" = 12'

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KUHUA STREET EXTENSION
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LAHAINA, MAUI, HAWAII

TITLE CONCEPTUAL PLAN & PROFILE: KUHUA STREET EXTENSION

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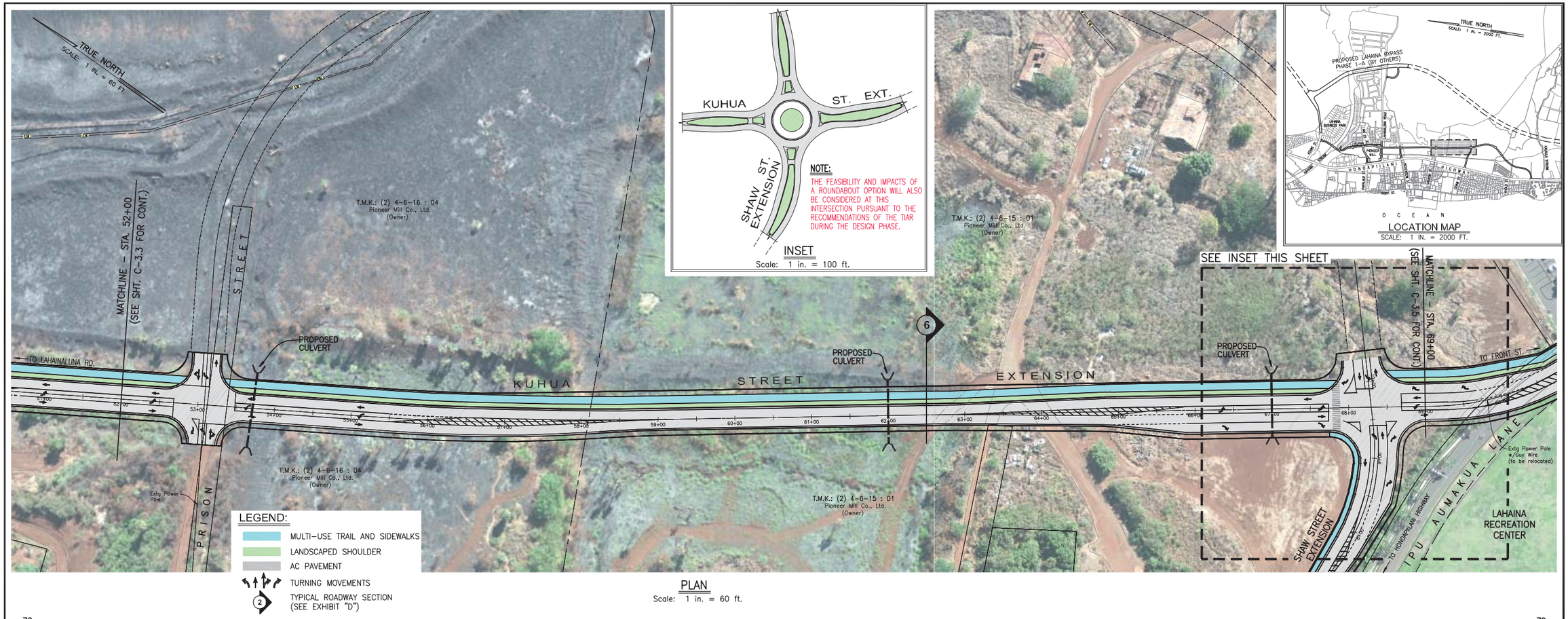

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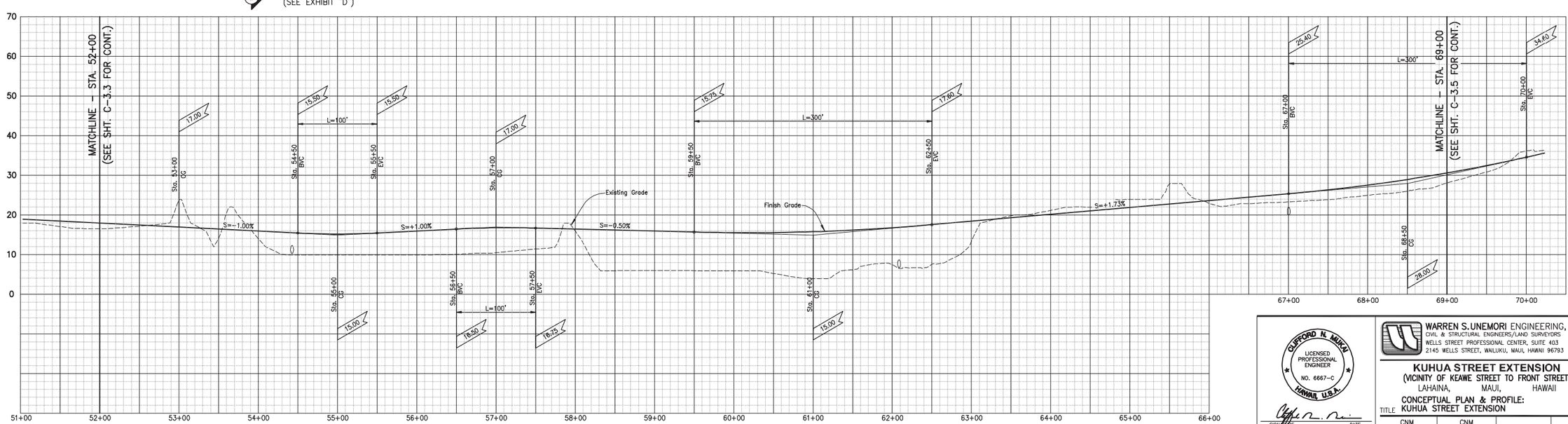

PROFILE – KUHUA STREET EXTENSION
Scale: Horiz. 1" = 60'
Vert. 1" = 12'

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KUHUA STREET EXTENSION
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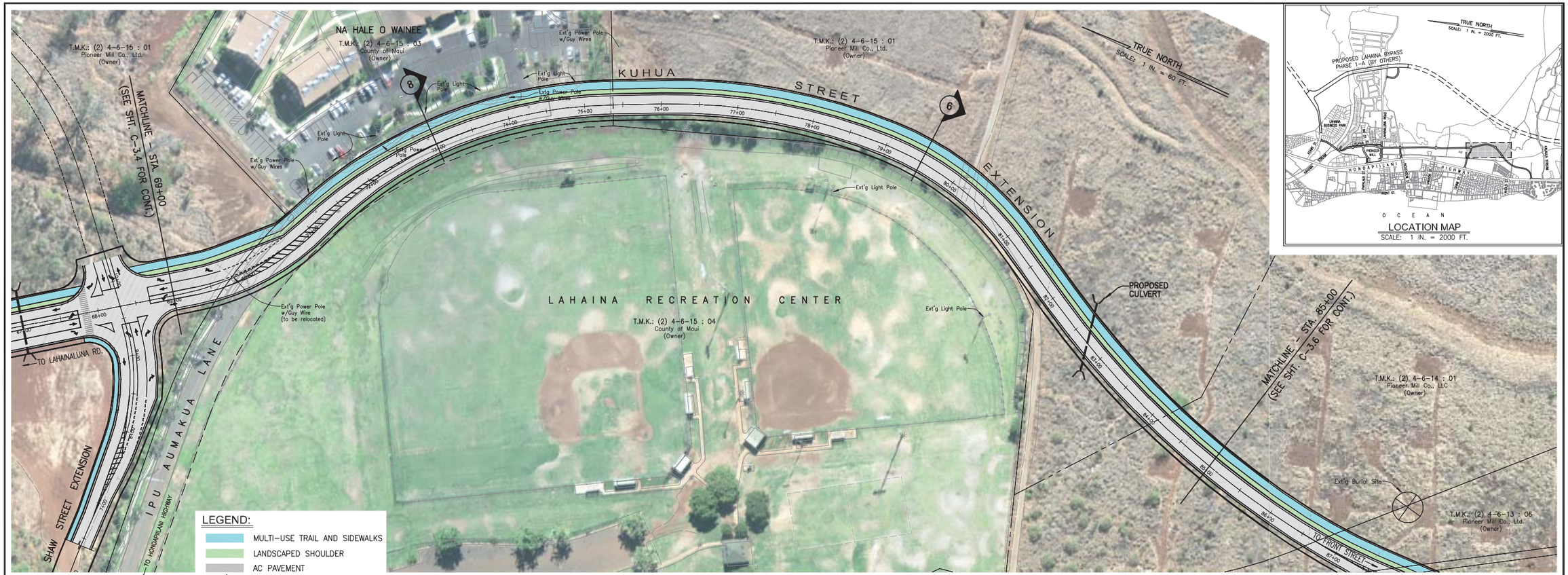

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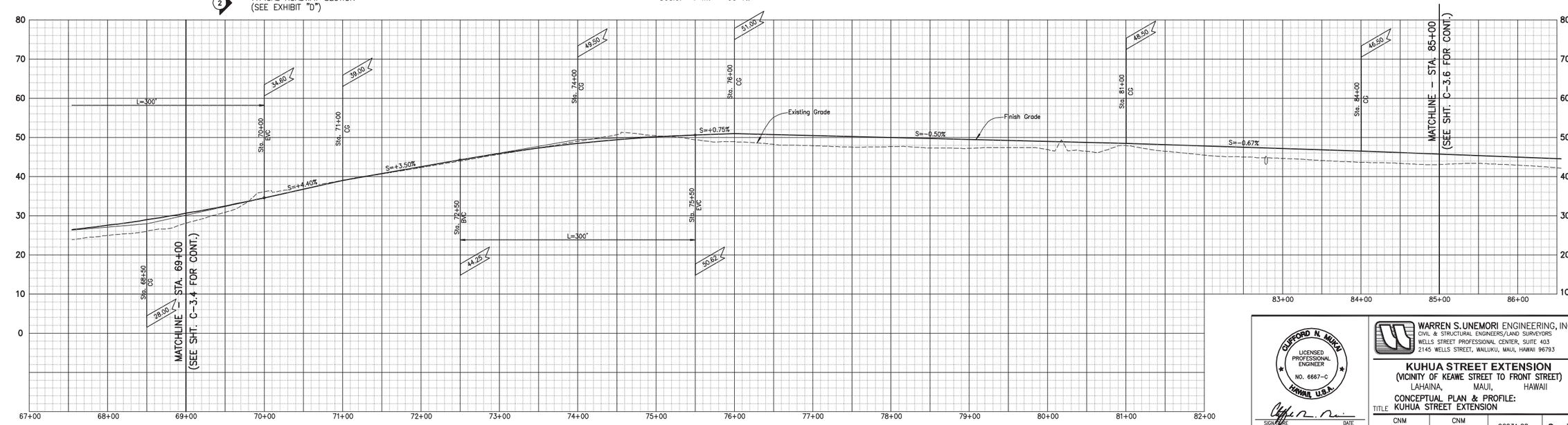

PROFILE – KUHUA STREET EXTENSION
Scale: Horiz. 1" = 60'
Vert. 1" = 12'

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NO. 6667-C
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KUHUA STREET EXTENSION
(VICINITY OF KEAWE STREET TO FRONT STREET)
LAHAINA, MAUI, HAWAII

TITLE CONCEPTUAL PLAN & PROFILE: KUHUA STREET EXTENSION

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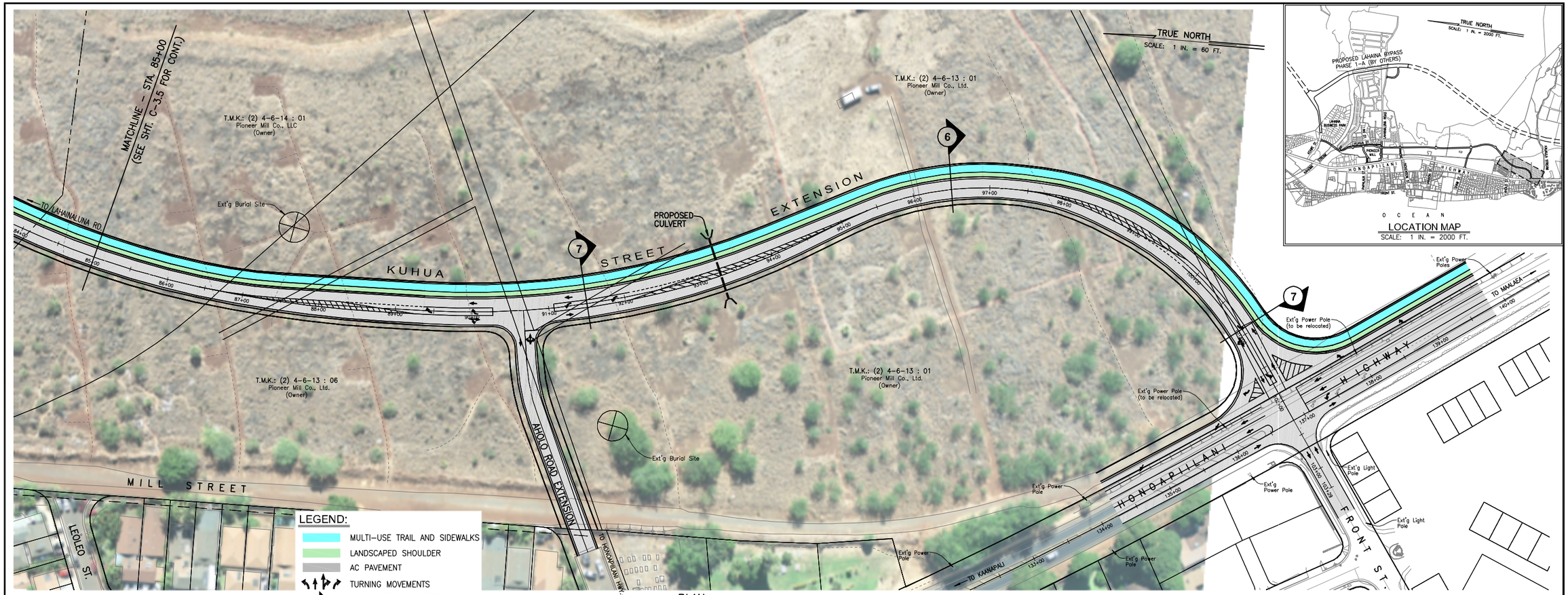

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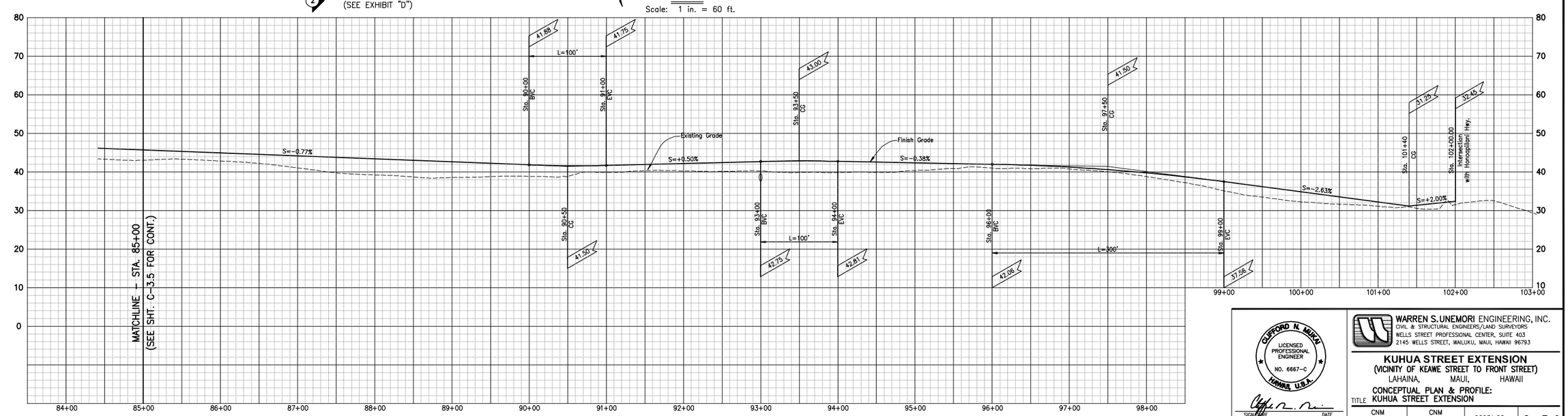

PROFILE – KUHUA STREET EXTENSION
Scale: Horiz. 1" = 60'
Vert. 1" = 12'

LETTER	DESCRIPTION	DATE

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NO. 6667-C
HAWAII, U.S.A.

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KUHUA STREET EXTENSION
(VICINITY OF KEAWE STREET TO FRONT STREET)
LAHAINA, MAUI, HAWAII

TITLE CONCEPTUAL PLAN & PROFILE: KUHUA STREET EXTENSION

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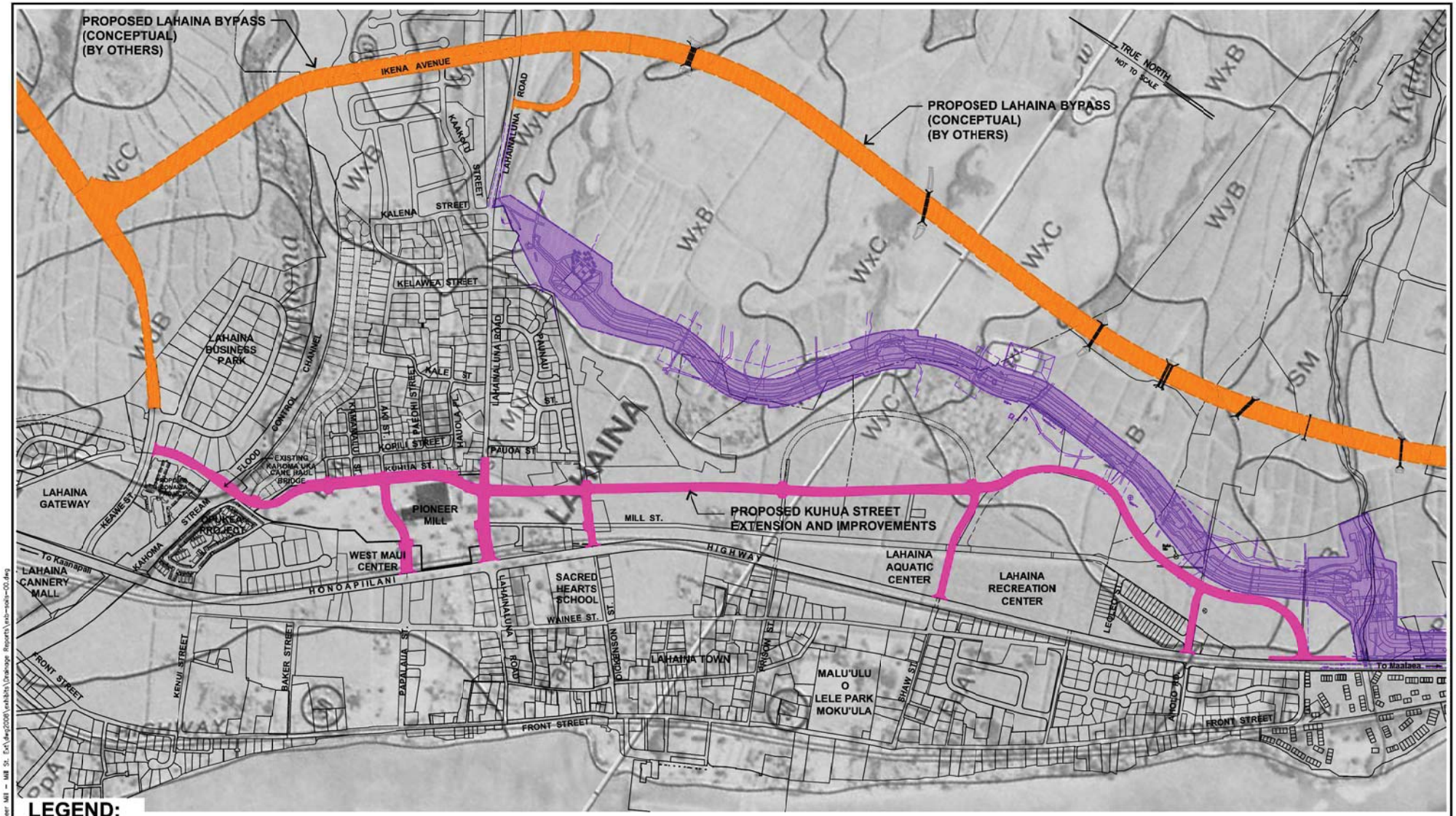

LEGEND:

- PROPOSED KUHUA STREET EXTENSION AND IMPROVEMENTS
- PROPOSED LAHAINA BYPASS (BY OTHERS)
- PROPOSED LAHAINA WATERSHED FLOOD CONTROL CHANNEL (BY OTHERS)

EXHIBIT F - SOIL SURVEY MAP

PROPOSED KUHUA STREET EXTENSION AND IMPROVEMENTS

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

October 3, 2012

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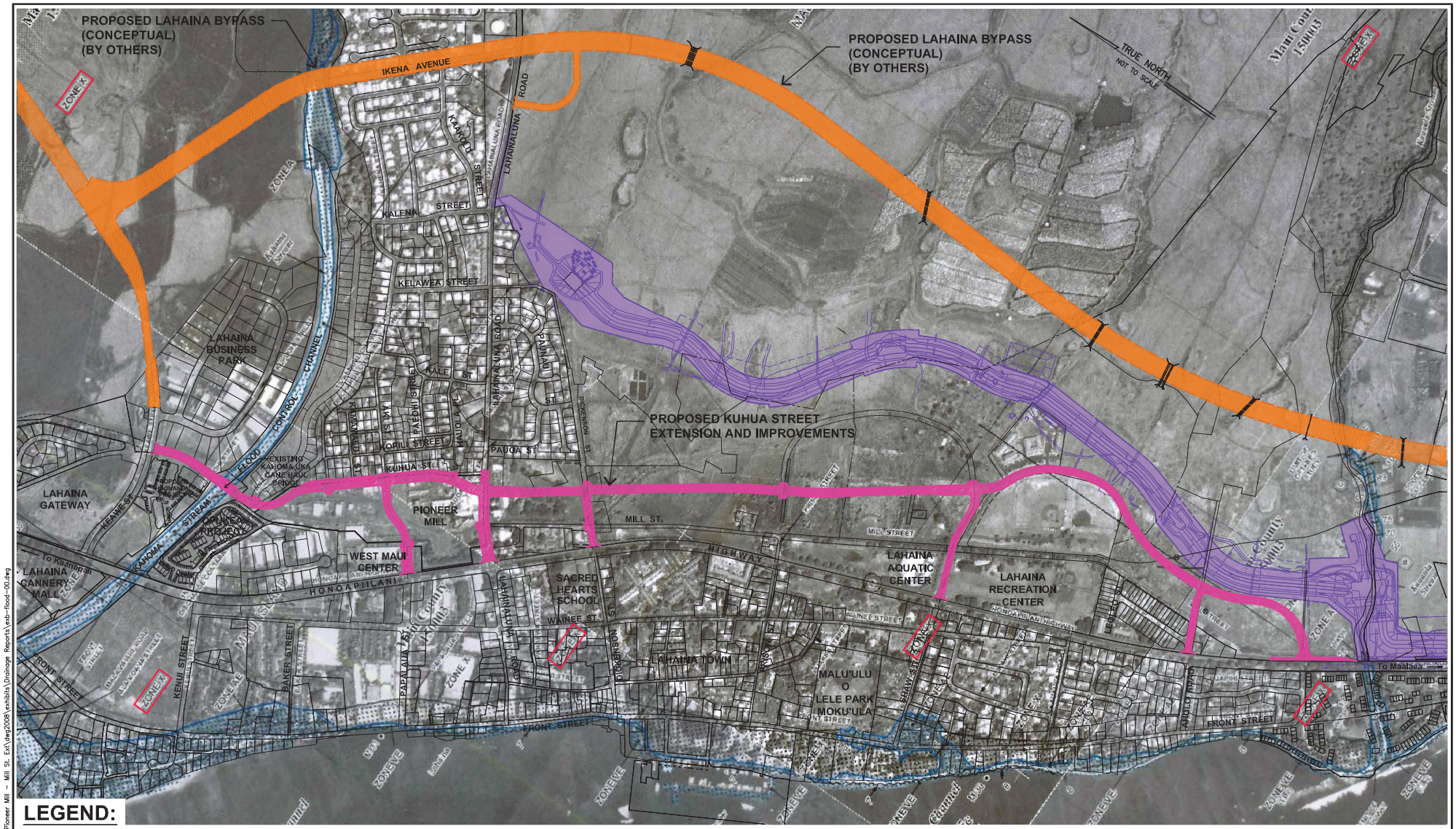

LEGEND:

- PROPOSED KUHUA STREET EXTENSION AND IMPROVEMENTS
- PROPOSED LAHAINA BYPASS (BY OTHERS)
- PROPOSED LAHAINA WATERSHED FLOOD CONTROL CHANNEL (BY OTHERS)

EXHIBIT G - FLOOD INSURANCE RATE MAP

PROPOSED KUHUA STREET EXTENSION AND IMPROVEMENTS

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

October 3, 2012

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APPENDICES:

A. Geotechnical Investigation Report
B. Preliminary Drainage Report
C. Traffic Impact Analysis Report

APPENDIX A: Geotechnical Investigation Report

GEOTECHNICAL INVESTIGATION REPORT
MILL STREET EXTENSION
LAHAINA, MAUI, HAWAII

A report by:
HAWAII GEOTECHNICAL CONSULTING, INC.

July 3, 2008

ROBERT M. GIBBENS
LICENSED PROFESSIONAL ENGINEER
No. 10094-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION

SIGNATURE

04/30/2010
EXPIRATION DATE
OF LICENSE

Hawaii Geotechnical Consulting

- I n c o r p o r a t e d -

P.O. Box 331223 • Kahului, Hawaii 96733 • Phone (808) 205-1727 • Fax (808) 573-5269

July 3, 2008
File No. 7012.01

Kaanapali Development Corp.
C/o Warren S. Unemori Engineering, Inc.
2145 Wells Street
Wailuku, Maui, Hawaii 96793

Subject: **GEOTECHNICAL INVESTIGATION REPORT FOR MILL STREET EXTENSION LAHAINA, MAUI, HAWAII**

Dear Mr. Mukai:

We are pleased to submit five copies of our Geotechnical Investigation Report for the proposed Mill Street Extension project in Lahaina, Maui, Hawaii. The enclosed report describes our subsurface investigation and presents our geotechnical recommendations for pavement design, mass grading, and utility backfill. In addition, design parameters for subsurface dry wells have been included.

We appreciate the opportunity to work with you on this project. If you should have any questions or require additional information, please contact us.

Sincerely,

HAWAII GEOTECHNICAL CONSULTING, INC.

Robert M. Gibbens, P.E.
Senior Geotechnical Engineer/President

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Figure 1 Boring Location Plan

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Appendix A Field Exploration
Appendix B Laboratory Testing

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1. INTRODUCTION

1.1 Authorization

Hawaii Geotechnical Consulting, Inc. (HGC) was retained by Kaanapali Development Corp. to conduct a geotechnical investigation for the proposed Mill Street Extension project in Lahaina, Maui, Hawaii. The scope of our services was outlined in our February 6, 2007 proposal No. P-074R.

Authorization to proceed was received via a signed proposal on March 21, 2007. An undated Pioneer Sugar Mill Topographic Survey map as well as the April 4, 2008 Proposed Mill Street Extension Option "A" plan by Warren S. Unemori Engineering, Inc. were used during this investigation.

1.2 Purpose and Scope

The purpose of this geotechnical investigation was to explore and evaluate the site's subsurface conditions in order to provide geotechnical recommendations for the project's pavement design and utility installation, including recommendations regarding the potential use of a storm water runoff disposal (dry well) system. In addition to evaluating the subsurface soil conditions, the site's groundwater conditions and construction considerations were addressed. A description of the scope of work is presented below:

Phase 1 – Field Investigation. A total of 5 auger borings were drilled with a Mobil B-57 truck mounted drill rig. Four-inch solid stem augers were used to penetrate the upper soils while a 2.5-inch diameter core barrel equipped with a diamond bit cutting head was used to penetrate the underlying basalt.

The borings were extended to depths ranging from 15 and 17 feet below the existing ground surface. A senior engineer with HGC observed and directed the boring investigation, maintained a log of the subsurface soils encountered, and

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collected disturbed grab and bulk samples as well as relatively undisturbed drive samples for laboratory testing. A more detailed description of the field exploration and the Logs of Test Borings are presented in Appendix A. The boring locations are presented on the Boring Location Plan, Figure 1.

A sixth boring was planned along the proposed alignment's south end. Due to circumstances beyond our control, attempts to drill the sixth boring were not successful. At the direction of Kaanapali Development Corp., the remaining boring was deleted from our scope.

Phase 2 – Laboratory Testing. Laboratory tests were performed on bulk, grab, and drive samples obtained during the field investigation. Laboratory tests were selected to verify field classifications and provide geotechnical parameters for use in design. Testing consisted of in-place moisture content and dry density, gradation, Atterberg limits, and California Bearing Ratio (CBR). The laboratory test methods are described in Appendix B while the laboratory test results are shown graphically in Appendix B and tabulated on the Logs of Borings, where appropriate.

Phase 3 – Geotechnical Analysis. Our field observations and laboratory test results were analyzed in combination with the preliminary construction plans. Our analysis focused on design of the extensions pavement structure. We evaluated an asphaltic concrete pavement (ACP) section for the roadway design. In addition to the pavement design, the subsurface soils were analyzed for their potential use in a storm runoff disposal system.

Phase 4 – Geotechnical Report. This report was prepared to present our findings, conclusions, and recommendations regarding the geotechnical feasibility for pavement design, dry well design, and utility backfills. Our report describes our field investigation and the site's general subsurface conditions.

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Discussions regarding critical geotechnical design issues and problem areas are presented. The report provides design level recommendations for the proposed roadway construction as well as construction considerations for roadway grading and utility backfill. Recommendations regarding the subsurface soils dry well capacity are also included.

1.3 Site Location

The proposed extension alignment is located on the lower western flank of the West Maui Mountains in Lahaina, Maui, Hawaii. The alignment's northern terminus is located at Keawe Street. From its northern terminus, the alignment runs south past the old Pioneer Mill site's eastern boundary. After crossing Lahainaluna Road, the alignment continues south through the cane fields, running north of the County pool and through the County of Maui Park facility. At its southern terminus, the alignment merges with the Honoapiilani Highway near the Honoapiilani Highway/Front Street intersection.

1.4 Site Description and Conditions

No alignment specific topographic maps were provided. Our visual observations indicate that the alignment generally slopes down gently from north to south. The alignment's existing surface varies from asphaltic concrete at its northern and southern ends, to heavily overgrown vacant cane fields through its central region.

The asphaltic pavements observed at the alignments northern and southern ends are both in poor condition, with considerable potholing and alligator and lateral cracking observed. The surface conditions within the Pioneer Mill site generally consist of gravel, placed after the recent demolition and grading work. Surface debris including metal and concrete were observed scattered across the Pioneer Mill extension alignment area.

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The alignment's central region, between Lahainaluna Road and the County pool, cuts across former agricultural land, most recently used for sugar cane cultivation. The surface conditions along this portion of the alignment consist of a combination of bare ground and densely populated brush, weeds, and small diameter Kiawe trees. A retention pond was observed just north of the County pool.

END OF INTRODUCTION

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2. PROJECT DESIGN CONSIDERATIONS

2.1 Proposed Project/Development Plans

We understand that the proposed development will include the construction of a new section of Mill Street between Keawe Street and the Honoapiilani Highway near its intersection with south Front Street. In addition to the main extension road, connecting roads between the main extension and Honapillani Highway at Papalaua Street, Lahainaluna Road, Dickenson Street, Prison, Street, Shaw Street, and Aholo Street are also planned. The new Mill Street alignment will not include the section of Mill Street currently in service between Dickenson Street and Lahainaluna Road.

We understand that all current project plans are still in the conceptual stage. According to the Civil Engineer, the main extension road will include at least 3 lanes of County Class "A" pavement with existing right-of-way sufficient to accommodate an additional 2 lanes. The connecting roads will also include at least 3 travel lanes, with more lanes required at larger intersections. In addition to the extension, we understand that a storm water runoff disposal system is being considered.

We understand that an alternative alignment which brings the roadway above the County of Maui Park facility is being considered. No subsurface explorations were performed along this alternative alignment route. Should this alignment be chosen, an additional field investigation should be performed.

2.2 Grading

No grading plans are available. Our visual observations indicate that much of the proposed alignment is relatively level. We anticipate average mass grading cuts and fills of less than 3 feet will be required over most of the alignment.

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It appears that thicker fills may be required to achieve finished grades over the alignment between the Prison Street and Shaw Street connecting roads. In this area, the alignment appears to cross an area previously excavated for a retention basin. Although the overall fill requirements will depend on the exact alignment location, we anticipate fills as thick as 10 to 15 feet may be required.

2.3 Pavements

We understand that the proposed extension will be paved with asphaltic concrete pavement (ACP). According to the project Civil Engineer, the main road extension and the connecting roads are classified as Class "A" in accordance with County of Maui specifications. No traffic information was made available at this time. We have assumed traffic along the proposed alignment will include passenger and light and heavy truck traffic.

2.4 Utilities

Buried utilities including water, drain, sewer, and electrical are planned. Excavations for installation of the buried utilities are expected as deep as 13 feet. We understand that if the extension's subsurface soils allow, dry wells will be used to handle storm runoff.

END OF PROJECT DESIGN CONSIDERATIONS

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3. SUBSURFACE INVESTIGATION

3.1 Auger Borings

A total of 5 auger borings were drilled with a Mobile B-57 truck mounted drill rig. The borings were drilled to depths ranging from 15 to 17 feet below the existing ground surface. The borings were spread throughout the proposed alignment at intervals convenient for drill rig access while still providing the overall boring spacing needed to evaluate the alignment. A sixth boring was planned for the alignments southern end. This boring was deleted due to access issues at the request of Kaanapali Development Corp.

Four-inch solid stem augers were used to penetrate the upper soils while a 2.5 inch diameter core barrel equipped with a diamond bit cutting head was used to penetrate the underlying basalt. A senior geotechnical engineer with HGC observed and directed the boring investigation, maintained a log of the subsurface soils encountered, and collected disturbed grab and bulk samples and relatively undisturbed drive samples for laboratory testing. The materials encountered are shown on the Logs of Test Borings in Appendix A. A Soil Classification Chart can also be found in Appendix A.

While penetrating the upper soils, disturbed drive samples were obtained with a Standard Penetration Test (SPT) sampler while relatively undisturbed drive samples were obtained with a California Sampler. The SPT sampler consisted of a 2-inch O.D. split barrel shaft while the California sampler consisted of a 3-inch O.D. split barrel shaft. At each test location, the appropriate split barrel shaft was driven a total of 18 inches, in three 6-inch increments, with a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler the last 12 of 18 inches is termed the blow count and is recorded on the boring logs.

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Samples of the underlying basalt were recovered with a 2.5-inch O.D. by 5-foot long core barrel. The core barrel was advanced and recovered using the wire line method. Both percent recovery and Rock Quality Designation (RQD) values were recorded for each rock core run and are presented on the boring logs.

3.2 Laboratory Testing

Laboratory tests were performed on drive, grab, and bulk samples obtained during the field investigation. Laboratory tests were selected to verify field classifications and provide geotechnical parameters for use in design. Testing consisted of in-place moisture content and dry density, gradation, Atterberg limits, and CBR. The laboratory test methods and results are described in Appendix B.

END OF SUBSURFACE INVESTIGATION

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4. SUBSURFACE CONDITIONS

4.1 General

The site, to the depths investigated during this study, is generally underlain by alluvial (water deposited) soils over weathered basalt. Several areas of fill were also encountered. A more detailed description of the various deposits is presented below.

4.2 Fill

A thin layer of fill was encountered in Boring No. 1, from the ground surface to a depth of 2 feet. The fill was encountered atop a 6-inch thick buried concrete slab. The fill consisted of medium dense sand and gravel with some silt. The fill was encountered in a dry to damp state, with a moisture content of 9 percent. It is likely that the sand and gravel was placed as a type of base course for the existing roadway the boring was drilled within.

A layer of sandy silt fill was encountered in Boring No. 4. The sandy silt, typically classified as ML under the Unified Soil Classification System (USCS), was encountered from the ground surface to a depth of 7 feet. The fill was generally stiff to very stiff and damp to moist. The fill possessed in-place dry densities ranging from 96 to 97 pcf and moisture contents ranging from 27 to 29 percent.

4.3 Alluvial Fill

A significant layer of low-density alluvial fill was encountered in Boring No. 4. The fill was likely deposited as settlement within a storm runoff retention basin. The fill consisted of olive brown silt, typically classified as ML in accordance with the USCS. The silt layer was encountered from a depth of 7 feet and extended to the bottom of the borehole at 16.5 feet. The silt possessed in-place dry densities ranging from 55 to 60 pcf and moisture contents ranging from 67 to 74 percent.

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A thin layer (less than 3 inches) of black organic peat was encountered in Boring No. 4 at a depth of about 15 feet.

4.4 Alluvium

Alluvial soils consisting of brown sandy silt were encountered from the ground surface in Boring Nos. 3, 4, and 5. The sandy silt, typically classified as ML under the USCS, was encountered to depths from 7 to 16.5 feet. Trace gravel was encountered within the sandy silts of Boring No. 3. The sandy silts were generally hard. In general, the sandy silts were dry to damp near the surface and transitioned to moist within the upper 3-foot depths. The sandy silts possessed in-place dry densities ranging from 83 to 97 pounds per cubic foot (pcf) and moisture contents ranging from 18 to 29 percent. Laboratory tests on the upper sandy silts indicated a measured CBR value of 49 at a free swell of 0.2 percent.

A single layer of brown and orange brown alluvial silty sand with gravel was encountered in Boring No. 2. The silty sand with gravel, typically classified as SM in accordance with the USCS, was encountered from the ground surface to a depth of 7 feet below the existing ground surface. The silty sand with gravel was generally dense and damp to moist, with an in-place moisture content of 11 percent. Laboratory tests on the upper silty sand with gravel indicated a measured CBR value of 94 at a free swell of 0.1 percent.

4.5 Basalt

Dark gray basalt was encountered below the concrete slab in Boring No. 1 and below the upper alluvium in Boring Nos. 2 and 5. No basalt was encountered in Boring Nos. 3 and 4. The basalt was vesicular, very hard, and broken to occasionally broken. The basalt ranged from fresh to moderately weathered. Some rounded basalt was encountered in Boring No. 2.

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4.6 Groundwater Conditions

Groundwater was encountered in Boring No. 5 at a depth of 14 feet below the existing ground surface. This measurement was taken just after completion of the boring. No other groundwater was encountered. Groundwater levels within the project areas may vary depending on seasonal rainfall and runoff conditions not apparent at the time of our field investigation. Therefore, groundwater levels may vary from those presented above at the time of construction.

END OF SUBSURFACE CONDITIONS

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5. DISCUSSION AND ANALYSIS

Based on the results of our field exploration, laboratory testing, and geotechnical analysis, we believe that it is geotechnically feasible to construct the proposed roadway, provided the recommendations of this report are incorporated into the project's design and construction. We believe that the major geotechnical issue affecting the project is the presence of undocumented fill and low-density alluvial fill in the area of Boring No. 4.

Laboratory test results on samples obtained from within Boring No. 4 indicate that the soils below 7 feet are low-density alluvial silts. Our past experience and visual observations indicate that the area around Boring No. 4 was formerly used as a retention basin. It is likely that all or a portion of the retention basin was filled in sometime in the past. Stand Penetration Test blow counts and penetration measurements indicate that the upper fill soils appear to be relatively well compacted, at least at the boring location. Similar tests on the lower alluvial fill indicate that it is likely uncompacted and compressible.

Predicting the alluvial fill's reaction to the extension roadway is difficult due to the variability inherent in this type of fill. In addition, we believe that there is potential for settlement within the upper fill soils if poorly compacted fill exist outside our boring location.

While its possible that the uncompacted compressible alluvial silt fill may remain stable in the long term while loaded with a relatively light pavement section, the possibility of damaging vertical and, more importantly, differential settlement still exists. Utilities buried within the lower alluvial fill will be most susceptible to the damaging effects of vertical settlement.

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We believe that the most positive method of minimizing potential vertical and differential settlements within the upper and lower fill soils is to completely remove them and replace them with engineered fill. Although the overall fill area was not defined, we believe it is limited to a relatively small area around the Boring No. 4 location.

END OF DISCUSSION AND ANALYSIS

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6. ENGINEERING RECOMMENDATIONS

6.1 General

Site grading design can be developed in accordance with the following recommendations. Unless stated otherwise, the maximum dry density (MDD) and optimum moisture content (OMC) of all engineered fill referenced within this report is based on Laboratory Test Method ASTM D1557.

6.2 Construction Considerations

The following recommendations are provided for geotechnical earthwork design as related to the construction of the proposed roadway and backfill of the roadways buried utilities. All site preparation and earthwork operations should be performed in accordance with the 2005 Hawaii Standard Specifications for Road, Bridge, and Public Works Construction (Standard Specifications).

6.2.1 Stripping and Grubbing

Prior to commencement of road grading, the site should be cleared and grubbed to remove all organics, vegetation, and other deleterious materials in accordance with the Standard Specifications. We anticipate stripping and grubbing will include surface vegetation and roots as well as asphalt and concrete. We believe that stripping and grubbing to depths of 12 inches will be required. Organic material should not be mixed with the underlying alluvial soils that may be later used as fill or backfill. Material with organic matter in excess of about 4 percent should not be used as fill or backfill.

The stripping and grubbing work should include the removal of topsoil and disturbed soil that, in the judgment of the geotechnical engineer, is uncertified, compressible, collapsible, or contains significant voids. The voids caused by the removal of subsurface features, if encountered, must also be processed and backfilled in accordance with the recommendations presented in this report.

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6.2.2 Site Preparation

Based on our interpretation of the geotechnical subsurface profile, we anticipate that the soils exposed during construction will consist primarily of fine-grained alluvial silt with some gravel as well as undocumented fill. We recommend that the upper fill and the concrete slab encountered in Boring No. 1 be removed down to competent soil or basalt. The overexcavated area should be filled with engineered fill in accordance with Section 6.2.4 of this report. We also recommend that the upper and lower fill in the area of Boring No. 4 be removed down to competent native alluvial soil. HGC personnel should be present onsite during the overexcavation operation to assist in the determination of the fills vertical and lateral extents. The overexcavated area should be filled with engineered fill in accordance with Section 6.2.4.

After the overexcavation and replacement operation is complete, all areas to receive fill should be stripped and grubbed to expose a firm, non-yielding subgrade, free of large voids, organics, and deleterious materials. The exposed subgrade soils should be compacted to at least 95 percent of their MDD at a moisture content between 0 and 3 percent above their OMC prior to the placement of fill.

6.2.3 Excavation Characteristics

The onsite soils generally consist of dense to hard alluvial sands and silts with limited amounts of gravel to depths varying from 2 to more than 16.5 feet. Hard rock was encountered in Boring Nos. 1, 2, and 5. We anticipate utility excavations in these areas will penetrate into the underlying basalt.

We believe that conventional earth moving construction equipment should be capable of performing onsite excavations within the upper soils. Although some of the subsurface rock is weathered and broken, we anticipate areas where hard

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rock removal techniques will be required where excavations penetrating into the underlying basalt.

6.2.4 Engineered Fill

The onsite soils are generally suitable for use as engineered fill provided all organics and rocks or clods larger than 3 inches in diameter are removed. If imported fill is required it should consist of fine- or coarse-grained material with a maximum particle size of 3 inches. Additionally, all imported fill should possess a minimum CBR value of 25, a plasticity index less than 20, and should qualify as SW, SP, GP, GM, SM, or ML in accordance with the USCS.

All fill should be placed in successive horizontal lifts of not more than 12 inches in loose thickness for the full width of the area being filled. The fill should be moisture conditioned to within 3 percent of its OMC prior to being compacted to at least 95 percent of its MDD.

Ground surfaces to receive fill with slopes in excess of 5H:1V should be benched with a series of horizontal terraces prior to fill placement. The benches should extend through any disturbed slope materials into the native residual soils.

6.3 Pavement Design

Detailed vehicular load and frequency information was not made available to us. We have assumed traffic along the proposed extension road will include passenger and light and heavy truck traffic. In order to determine the adequacy of a County of Maui Class "A" pavement section without a design Traffic Index (TI), we analyzed the proposed pavement section with several TI's and provided a range of TI's that the Class "A" pavement section could adequately handle.

CBR tests were performed on several of the site's predominant subsurface soils. The results of the tests indicated CBR values ranging from 49 to 94 within the

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upper gravelly silts and sands. We believe that both the CBR value of 49 for the upper sandy silt with trace gravel and the value of 94 for the upper silty sand with gravel, are not representative of the majority of the site's subsurface soils. We have therefore decided to use a subgrade CBR value of 25 for use in design. This value is consistent with readily available import fill, if required.

6.3.1 Flexible Pavement

Based on an assumed subgrade CBR value of 25, we believe that a County of Maui Class "A" pavement section consisting of:

Material	Thickness (inches)
Asphaltic Concrete Pavement (ACP)	2.5
Hot Mix Asphaltic Base Course (ATB)	5.0
Subbase	8.0

is sufficient for a TI as high as 9. Increasing the thickness of the ATB layer to 8 inches will allow for an increase in the design TI to 11.

Prior to the placement of Subbase, we recommend that the pavement subgrade be moisture conditioned to between 0 and 3 percent above the subgrade soils OMC prior to being compacted to at least 95 percent of the subgrade soils MDD. The moisture conditioning and compaction effort should extend to a depth of at least 12 inches.

The ATB should conform to Section 703.03 of the Standard Specifications. The Subbase should conform to Section 703.017 of the Standard Specifications and should be compacted to at least 95 percent of the materials MDD.

After completion of site grading, we recommend that the final subgrade soils be tested for their CBR values to confirm the values used in design. Modified

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pavement sections may be required if subgrade conditions vary from those assumed in design.

In the event unstable (pumping) subgrades are encountered within the planned pavement areas, we recommend that a heavy rubber tired vehicle (typically a loaded water truck) be used to test the load/deflection characteristics of the finished subgrade. If the tested surface shows a visible deflection, corrective measures should be implemented.

6.4 Storm Runoff Disposal System (Dry Wells)

We understand that dry wells are planned to handle the increase in storm water runoff along the new road extension. As the current project plans are only in the conceptual stage, no total number of planned wells or exact locations were available. A total of 3 percolation tests were performed along the proposed extension alignment. An additional percolation test was planned at the location of the deleted boring, but was not completed due to access problems.

Each percolation test was performed in accordance with the constant head method. Each test was performed by pumping water into a borehole to a predetermined height. Once the water surface stabilized, the rate of flow required to maintain the stabilized water surface was measured. From this flow rate, the borehole dimensions, and the water level, the calculation of permeability was derived. The permeability results are as follows:

Test Location	Total Depth of Borehole (ft.)	Diameter of Borehole (in.)	Depth to Water (ft.)	Flow Rate (gpm)	Percolation Rate (fpm)
Boring No. 1	16.0	3.5	0.5	45	4.6×10^{-1}
Boring No. 2	15.5	3.5	0.5	0.5	5.4×10^{-3}
Boring No. 5	17.0	3.5	0.5	4	3.9×10^{-2}

As anticipated, the percolation tests indicate that the alignment's subsurface soils have a relatively varying coefficient of permeability. These permeability

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rates generally correspond to disposal capacities of less than 0.1 to slightly more than 6 cubic feet per second (cfs). We understand that a majority of the dry wells are planned for the alignment's northern end, where both the maximum and minimum permeability rates were determined.

We believe that the upper alluvial silts possess the low end capacity of less than 0.1 cfs, while the fractured underlying basalt should possess capacities in excess of 6 cfs. Because of the observed variability, we recommend that field permeability tests be performed at each dry well location prior to construction.

6.5 Utilities

All utility installations should be performed in accordance with the Standard Specifications. The following recommendations are meant to supplement the Standard Specifications.

All utility backfills should be placed in horizontal lifts for the full width of the utility trench prior to compaction. In overwidened trenches, such as trenches excavated in hard rock, arching or shaping of the initial bedding lifts should not be allowed.

Shallow temporary utility trench excavations are anticipated for installation of the required utility lines. All vertical or steeply sided trench excavations deeper than 5 feet should be braced and shored in accordance with good construction practices and all applicable safety ordinances and codes.

6.5 Site Drainage

The ground surface should slope away from pavement areas, toward appropriate drop inlets or other surface drainage devices. Adjacent exterior grades should be sloped a minimum of two percent for a minimum distance of five feet away from structures. These grades should be maintained for the life of the project.

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Landscaping after construction should not promote ponding of water adjacent to structures.

END OF ENGINEERING RECOMMENDATIONS

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7. ADDITIONAL SERVICES

We recommend that a thorough review of the project plans and specifications be conducted before they are finalized to verify that our geotechnical recommendations have been properly interpreted and implemented during the design. If we are not accorded this review, we can assume no responsibility for misinterpretation of our recommendations. The review can be completed on a time-and-expense basis in accordance with our current Fee Schedule.

The construction process is an integral design component with respect to the geotechnical aspects of a project. Because geotechnical engineering is an inexact science due to the variability of natural processes and because we sample only a small portion of the soils affecting the performance of the proposed structures, unanticipated or changed conditions can be disclosed during grading. Proper geotechnical observation and testing during construction is imperative to allow the geotechnical engineer the opportunity to verify assumptions made during the design. Therefore, we recommend that Hawaii Geotechnical Consulting, Inc. be kept apprised of design modifications and construction schedules for the proposed development so that design changes can be made if subsurface field conditions warrant.

END OF ADDITIONAL SERVICES

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8. LIMITATIONS

This report has been prepared for the exclusive use of Kaanapali Development Corp. and their agents for specific application to the proposed Mill Street Extension project in Lahaina, Maui, Hawaii.

The findings, conclusions, and recommendations presented in this report were prepared in accordance with generally accepted geotechnical engineering practice as it exists in the site area at the time of our study. No warranty is expressed or implied. The recommendations provided in this report are based on the assumption that our firm will conduct an adequate program of tests and observations during the construction phase in order to evaluate compliance with our recommendations. If the scope of the proposed construction, including the proposed loads, grades, or structural locations change from that described in this report, our recommendations should also be reviewed. We have not reviewed a final grading or building plan for the project.

Hazardous materials may have been discovered during the course of Hawaii Geotechnical Consulting, Inc.'s services. Hawaii Geotechnical Consulting, Inc. will assume no responsibility or liability whatsoever for any claim, loss of property value, damage, or injury that results from pre-existing hazardous materials being encountered or present on the project site, or from the discovery of such hazardous materials.

Nothing contained in this scope of work should be construed or interpreted as requiring Hawaii Geotechnical Consulting, Inc. to assume the status of an owner, operator, generator, or person who arranges for disposal, transport, storage, or treatment of hazardous materials within the meaning of any governmental statute, regulation, or order.

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The client has the responsibility to see that all parties to the project, including the designer, contractor, subcontractor, etc., are made aware of this report in its entirety. This report contains information that may be useful in the preparation of contract specifications. However, the report is not designed as a specification document and may not contain sufficient information for this use without proper modification.

The recommendations contained in this report are based on our field observations and our present knowledge of the proposed construction. It is possible that soil conditions could vary between or beyond the areas observed. If soil conditions are encountered during construction which differ from those described herein, we should be notified immediately in order that a review may be made and any supplemental recommendations provided.

This report may be used only by the client and only for the purpose stated, within a reasonable time from its issuance. Land use, site conditions (both onsite and offsite) or other factors may change over time, and additional work may be required with the passage of time. Any party other than the client who wishes to use this report shall notify Hawaii Geotechnical Consulting, Inc. of such intended use. Based on the intended use of this report, Hawaii Geotechnical Consulting, Inc. may require that additional work be performed and that an updated report be issued. Non-compliance with any of these requirements by the client or anyone else will release Hawaii Geotechnical Consulting, Inc. from any liability resulting from the use of this report by any unauthorized party.

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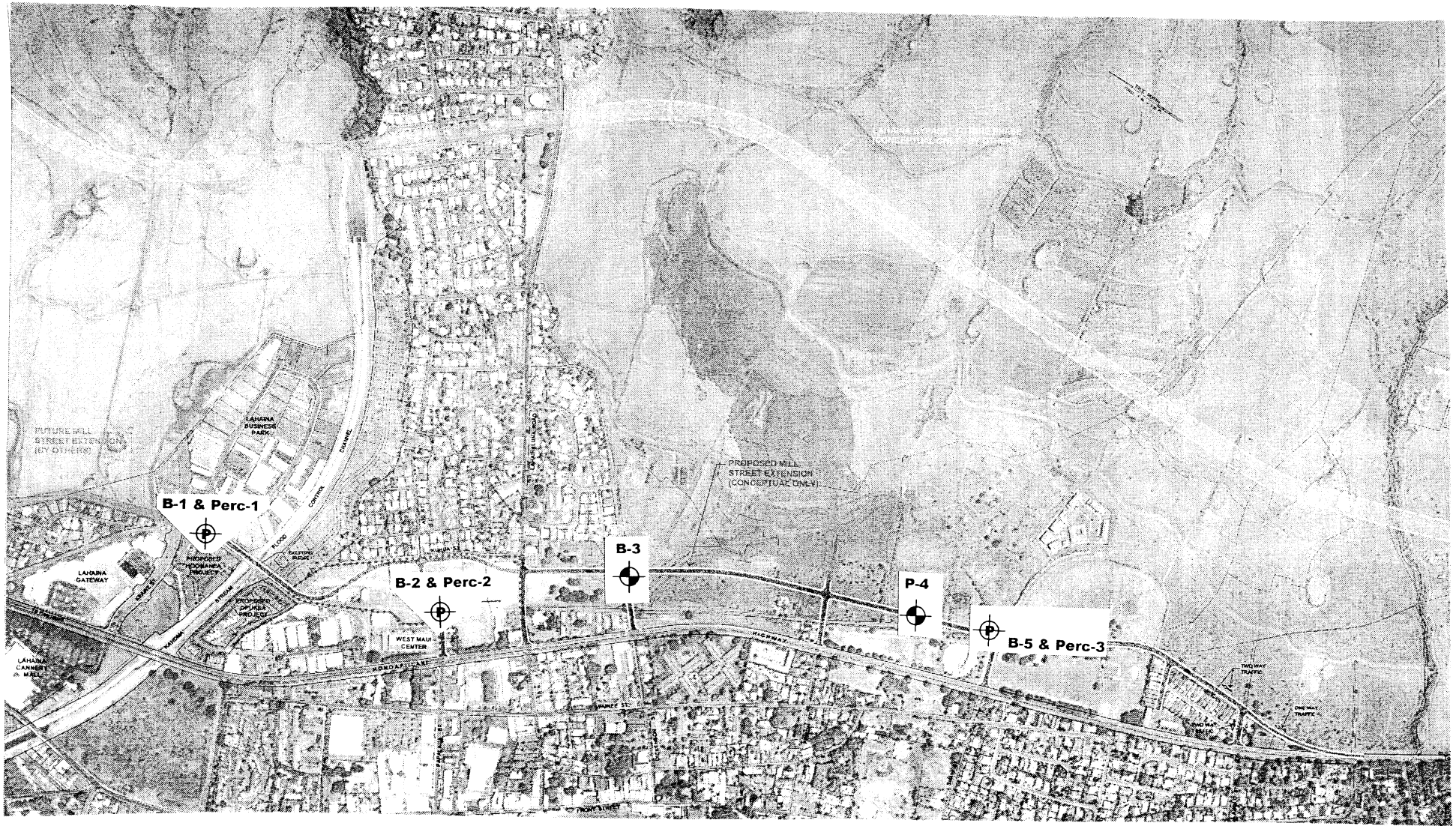
FIGURES



Legend

- Boring Location
- Boring & Percolation Test Location

HAWAII GEOTECHNICAL CONSULTING, INC.	
BORING LOCATION PLAN	
PROPOSED MILL STREET EXTENSION WAILUKU, MAUI, HAWAII	
File: 7012.01	JULY 2008
FIGURE 1	

APPENDIX A

Field Exploration

APPENDIX A
FIELD EXPLORATION

The subsurface exploration program for the proposed Mill Street Extension project included drilling and logging a total of 5 borings. The borings were advanced to maximum depths between 15.5 and 17 feet below the existing ground surface. Figure 1 presents the boring locations.

The Logs of Borings are presented as Figures A2 through A6. A soil classification chart is presented as Figure A1. The Logs of Borings describe the materials encountered, samples obtained, and show field and laboratory tests performed. The logs also show the boring number, drilling date, name of the logger and drilling subcontractor, and the groundwater level. A senior geotechnical engineer logged the materials encountered in accordance with the USCS. The boundaries between soil types shown on the logs are approximate because the transition between different soil layers may be gradual. Distinct material changes are represented with solid lines while more subtle changes within similar material types are represented with dashed lines. Bulk, grab, and drive samples of representative materials were obtained.

Four-inch solid stem augers were used to penetrate the upper soils while a 2.5 inch diameter core barrel equipped with a diamond bit cutting head was used to penetrate the underlying basalt. While penetrating the upper soils, disturbed drive samples were obtained with a Standard Penetration Test (SPT) sampler while relatively undisturbed drive samples were obtained with California Sampler. The SPT sampler consisted of a 2-inch O.D. split barrel shaft while the California sampler consisted of a 3-inch O.D. split barrel shaft. At each test location, the appropriate split barrel shaft was driven a total of 18 inches, in three 6-inch increments, with a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler the last 12 of 18 inches is termed the blow count and is recorded on the boring logs.

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Samples of the underlying basalt were recovered with a 2.5-inch O.D. by 5-foot long core barrel. The core barrel was advanced and recovered using the wire line method. Both percent recovery and Rock Quality Designation (RQD) values were recorded for each rock core run and are presented on the boring logs.

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COARSE GRAINED SOILS MORE THAN HALF OF THE MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVELS MORE THAN HALF OF COURSE FRACTION IS LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS (LITTLE OR NO FINES)	**GW**	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNTS OF FINES)	**GM**	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF OF COURSE FRACTION IS SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS (LITTLE OR NO FINES)	**SW**	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
			SP	POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNTS OF FINES)	**SM**	SILTY SANDS, SAND-SILT MIXTURES
			SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN HALF OF THE MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		**ML**	INORGANIC SILTSAND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		**MH**	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS

USCS SOIL CLASSIFICATION CHART

FIGURE **A1**

Date Completed:	04/30/2008	Water Depth:	--
Drilled By:	Valley Isle Well	Northing:	n/a
Drilling Method:	Solid Stem Auger/Rock Core	Easting:	n/a
Logged By:	R.M. Gibbens	Elevation:	--
		Description:	--
		Symbols:	California Sampler / SPT Sampler / Core Barrel

Depth (feet)	Sample Type	Sample No.	Blow Count	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Additional Tests
				1.0-in. Asphaltic Concrete				
		1	50/1"	SAND and GRAVEL (SM) with some Silt, brown, medium dense, dry to damp — FILL	4.0	--	9	Gravel = 40% Sand = 44% Silt/Clay = 16%
				6.0-in. Concrete Slab				
5		r1		BASALT (F), dark gray, vesicular, very hard, massive				20% Recovery 20% RQD
10		r2		broken to occasionally broken from 12 ft.				100% Recovery 76% RQD
15		r3		FORMATION				25% Recovery 23% RQD
				Bottom of Borehole at 16.0 feet Borehole backfilled with excavated soil				
20								
25								

Hawaii Geotechnical Consulting, Inc.

PROJECT NO. 7012.01
DATE 06/23/2008

MILL STREET EXTENSION
LAHAINA, MAUI, HAWAII

LOG OF TEST BORING 1

FIGURE **A2**

Date Completed:	04/30/2008	Water Depth:	--
Drilled By:	Valley Isle Well	Northing:	n/a
Drilling Method:	Solid Stem Auger/Rock Core	Easting:	n/a
Logged By:	R.M. Gibbens	Elevation:	--
		Description:	--
		Symbols:	California Sampler; SPT Sampler; Core Barrel

Depth (feet)	Sample Type	Sample No.	Blow Count	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Additional Tests
		1	90/10"	SILTY SAND (SM) with Gravel, brown and orange brown, dense, damp to moist	--	--	11	Gravel = 22% Sand = 55% Silt/Clay = 23% CBR = 94
5		2	50	ALLUVIUM	--	--	--	
10		r1		BASALT (WH), dark gray, vesicular, very hard, broken, with some rounded basalt				60% Recovery 23% RQD
				No rounded Basalt from 12.5 ft.				
15		r2		FORMATION/ALLUVIUM				30% Recovery 19% RQD
				Bottom of Borehole at 15.5 feet Borehole backfilled with excavated soil				
20								
25								

Hawaii Geotechnical Consulting, Inc.

PROJECT NO. 7012.01
DATE 06/23/2008

MILL STREET EXTENSION
LAHAINA, MAUI, HAWAII

LOG OF TEST BORING 2

FIGURE
A3

Date Completed:	05/01/2008	Water Depth:	Not Encountered
Drilled By:	Valley Isle Well	Northing:	n/a
Drilling Method:	Solid Stem Auger/Rock Core	Easting:	n/a
Logged By:	R.M. Gibbens	Elevation:	--
		Description:	--
		Symbols:	California Sampler, SPT Sampler, Core Barrel

Depth (feet)	Sample Type	Sample No.	Blow Count	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Additional Tests
		1	20	SANDY SILT (ML) with trace Gravel, brown, hard, dry to damp	>4.0	94	18	Gravel = 4% Sand = 37% Silt/Clay = 58% CBR = 49 LL = 47 PI = 15
				very stiff and moist from 3.0 ft.				
5		2	11		3.0	95	22	
				with no Gravel from 7.0 ft.				
		3	21		3.0	92	25	Gravel = 0% Sand = 12% Silt/Clay = 88%
10								
		4	19	ALLUVIUM	>4.0	83	29	Gravel = 0% Sand = 29% Silt/Clay = 71%
15				Bottom of Borehole at 15.0 feet No Groundwater Encountered Borehole backfilled with excavated soil				
20								
25								

Hawaii Geotechnical Consulting, Inc.

PROJECT NO. 7012.01
DATE 06/23/2008

MILL STREET EXTENSION
LAHAINA, MAUI, HAWAII

LOG OF TEST BORING 3

FIGURE
A4

Date Completed:	05/01/2008	Water Depth:	14.0' ATD
Drilled By:	Valley Isle Well	Northing:	n/a
Drilling Method:	Solid Stem Auger/Rock Core	Easting:	n/a
Logged By:	R.M. Gibbens	Elevation:	--
		Description:	--
		Symbols:	California Sampler, SPT Sampler, Core Barrel

Depth (feet)	Sample Type	Sample No.	Blow Count	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Additional Tests
		1	25	SANDY SILT (ML), brown, stiff to very stiff, damp	2.5	97	27	Gravel = 0% Sand = 14% Silt/Clay = 86%
5		2	8	some orange brown, medium stiff, moist to wet from 4.5 ft.	1.0	96	29	Gravel = 1% Sand = 15% Silt/Clay = 84%
				FILL				
		3	9		0.8	60	67	Gravel = 0% Sand = 4% Silt/Clay = 96%
10				SILT (ML) with trace Sand, olive brown, soft, damp to wet				
		4	6		0.5	55	74	Gravel = 2% Sand = 5% Silt/Clay = 93%
15				Peat (PT), black, organic				
		5	13	ORGANIC FILL	--	--	--	
				Bottom of Borehole at 16.5 feet Groundwater Encountered at 14.0 ft. Borehole backfilled with excavated soil				
20								
25								

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PROJECT NO. 7012.01
DATE 06/23/2008

MILL STREET EXTENSION
LAHAINA, MAUI, HAWAII

LOG OF TEST BORING 4

FIGURE **A5**

Date Completed:	05/01/2008	Water Depth:	--
Drilled By:	Valley Isle Well	Northing:	n/a
Drilling Method:	Solid Stem Auger/Rock Core	Easting:	n/a
Logged By:	R.M. Gibbens	Elevation:	--
		Description:	--
		Symbols:	California Sampler, SPT Sampler, Core Barrel

Depth (feet)	Sample Type	Sample No.	Blow Count	GEOTECHNICAL DESCRIPTION AND CLASSIFICATION	Penetrometer (tsf)	Dry Density (pcf)	Moisture Content (%)	Additional Tests
		1	40	SANDY SILT (ML), brown, hard, damp to moist	>4.0	97	23	Gravel = 0% Sand = 18% Silt/Clay = 82%
5		2	13	becomes grayish brown from 7 ft.	>4.0	94	28	Gravel = 0% Sand = 23% Silt/Clay = 77% LL = 44 PI = 13
10		3	18	ALLUVIUM	>4.0	94	28	Gravel = 2% Sand = 23% Silt/Clay = 75%
15		r1		BASALT (WM), dark gray, vesicular, very hard, broken to occasionally broken FORMATION				46% Recovery 27% RQD
				Bottom of Borehole at 17.0 feet Borehole backfilled with excavated soil				
20								
25								

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PROJECT NO. 7012.01
DATE 06/23/2008

MILL STREET EXTENSION
LAHAINA, MAUI, HAWAII

LOG OF TEST BORING 5

FIGURE
A6

APPENDIX B

Laboratory Testing

APPENDIX B
LABORATORY TESTING

Laboratory tests were performed on selected bulk, grab, and drive samples to estimate their pertinent engineering characteristics. Testing was performed in accordance with ASTM Standards for Soil Testing, latest revision.

MOISTURE CONTENT AND DRY DENSITY

Natural moisture content and dry density tests were performed on multiple samples in accordance with ASTM D2216 and D2937, respectively. The results of these tests are presented on the Logs of Borings in Appendix A.

PLASTICITY

Atterberg limit tests were performed in accordance with ASTM D4318. The results of the tests are presented on the Logs of Borings in Appendix A and graphically in Appendix B.

GRAIN SIZE

Grain size analyses were performed on select samples in accordance with ASTM D2487. The results are presented on the Logs of Borings in Appendix A.

CALIFORNIA BEARING RATIO (CBR)

CBR tests were performed on representative sample of the site's predominant near surface soils in accordance with ASTM D1883. The result is presented on the Logs of Borings in Appendix A and graphically in Appendix B.

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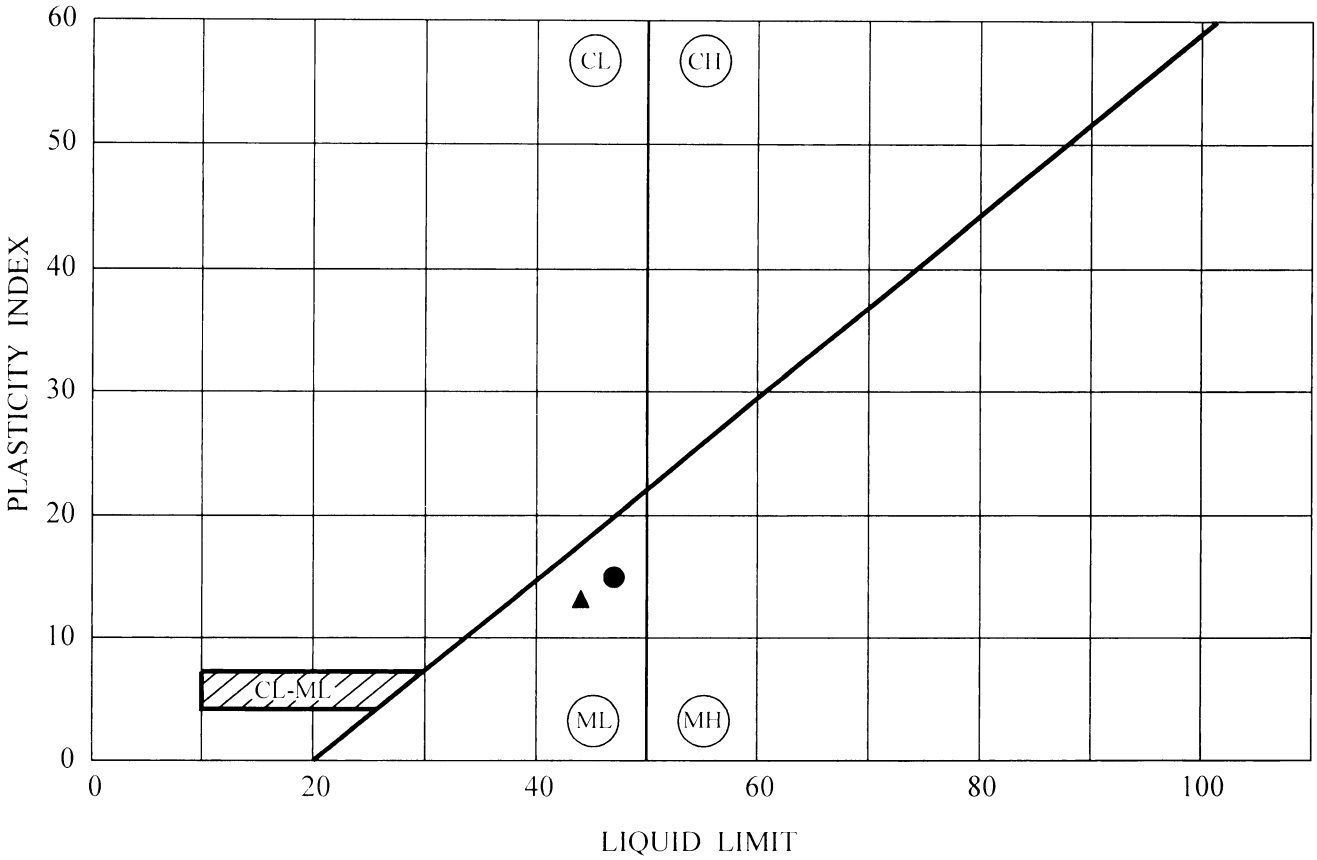

	Sample ID	Depth (ft)	LL	PL	PI	Classification
●	3-1	2-2.5	47	32	15	Brown sandy SILT (ML) w/trace gravel
▲	5-2	6-6.5	44	31	13	Brown sandy SILT (ML)

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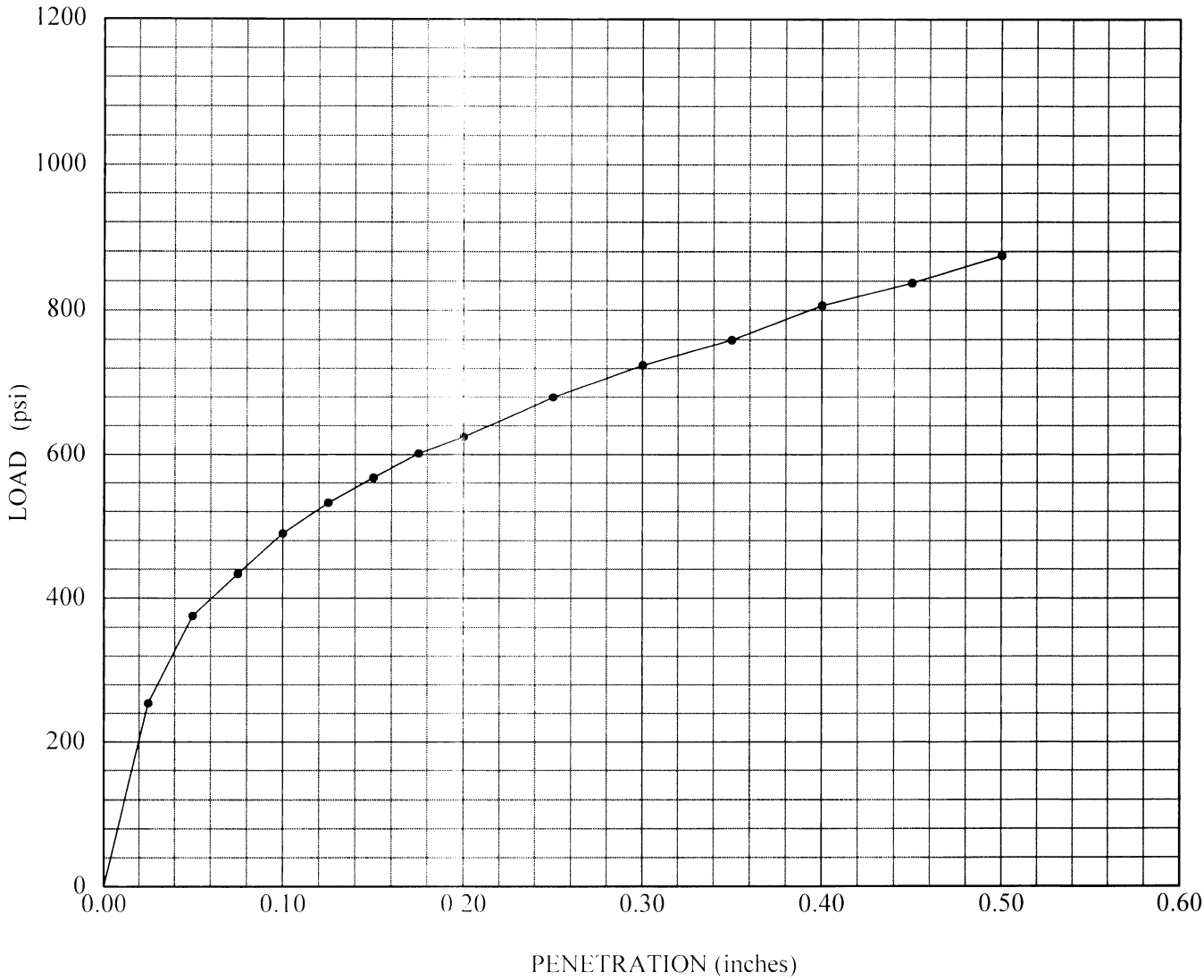
DATE 06/01/2008

PROPOSED MILL STREET EXTENSION
LAHAINA, MAUI, HAWAII

PLASTICITY INDEX

FIGURE
B1



	Sample Identification	Classification	CBR	% Comp.	Opt. Den.	Opt. % MC	% Swell	LL	PI
●	A	Brown Sandy SILT (ML) w/trace Gravel	49	100+	113	18	0.2	NP	NP

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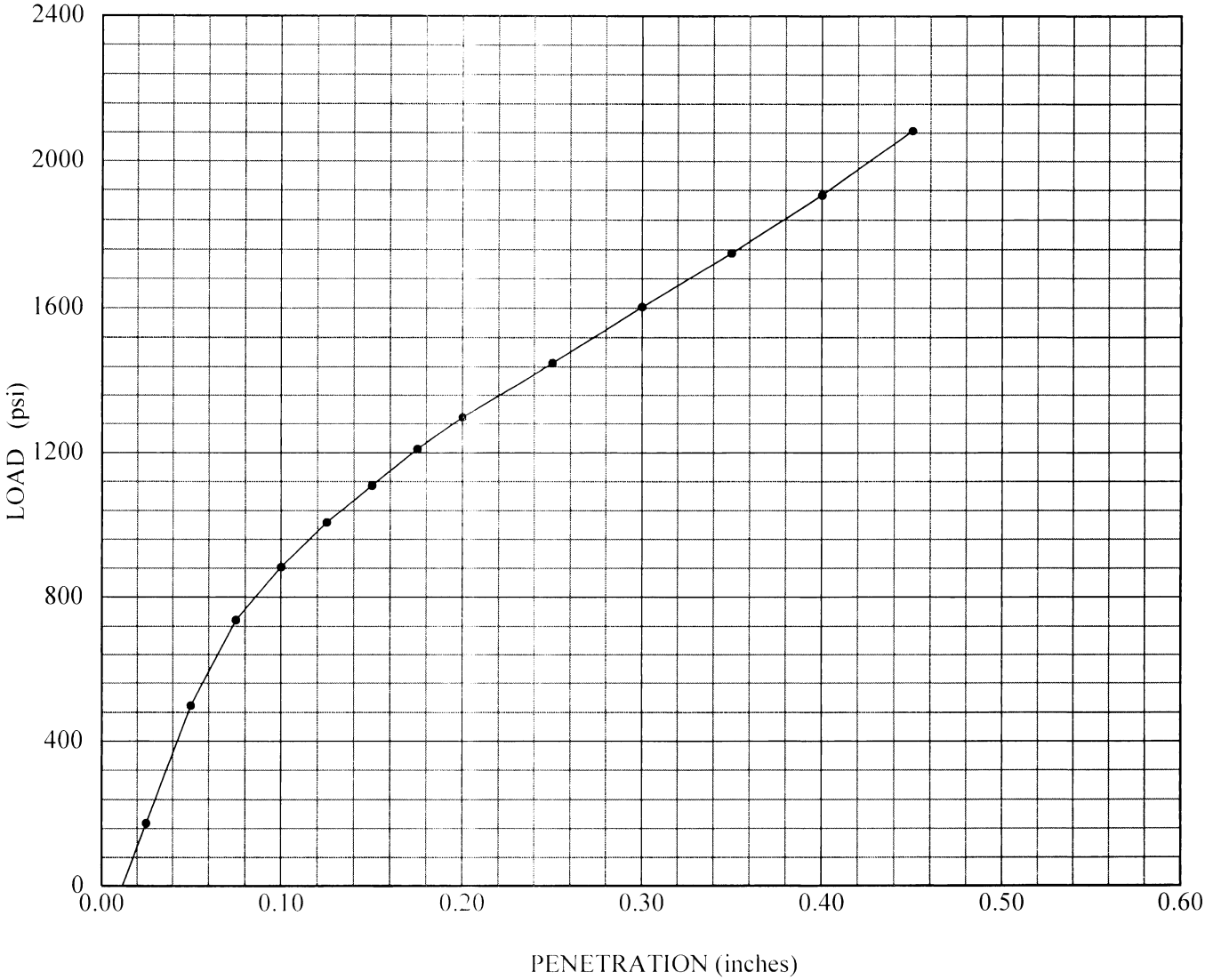
DATE 06/21/2008

MILL STREET EXTENSION
LAHAINA, MAUI, HAWAII

CALIFORNIA BEARING RATIO

FIGURE
B2



	Sample Identification	Classification	CBR	% Comp.	Opt Den.	Opt. % MC	% Swell	LL	PI
●	B	Brown Sandy SILT (ML) w/some Gravel	94	100+	117	15	0.1	NP	NP

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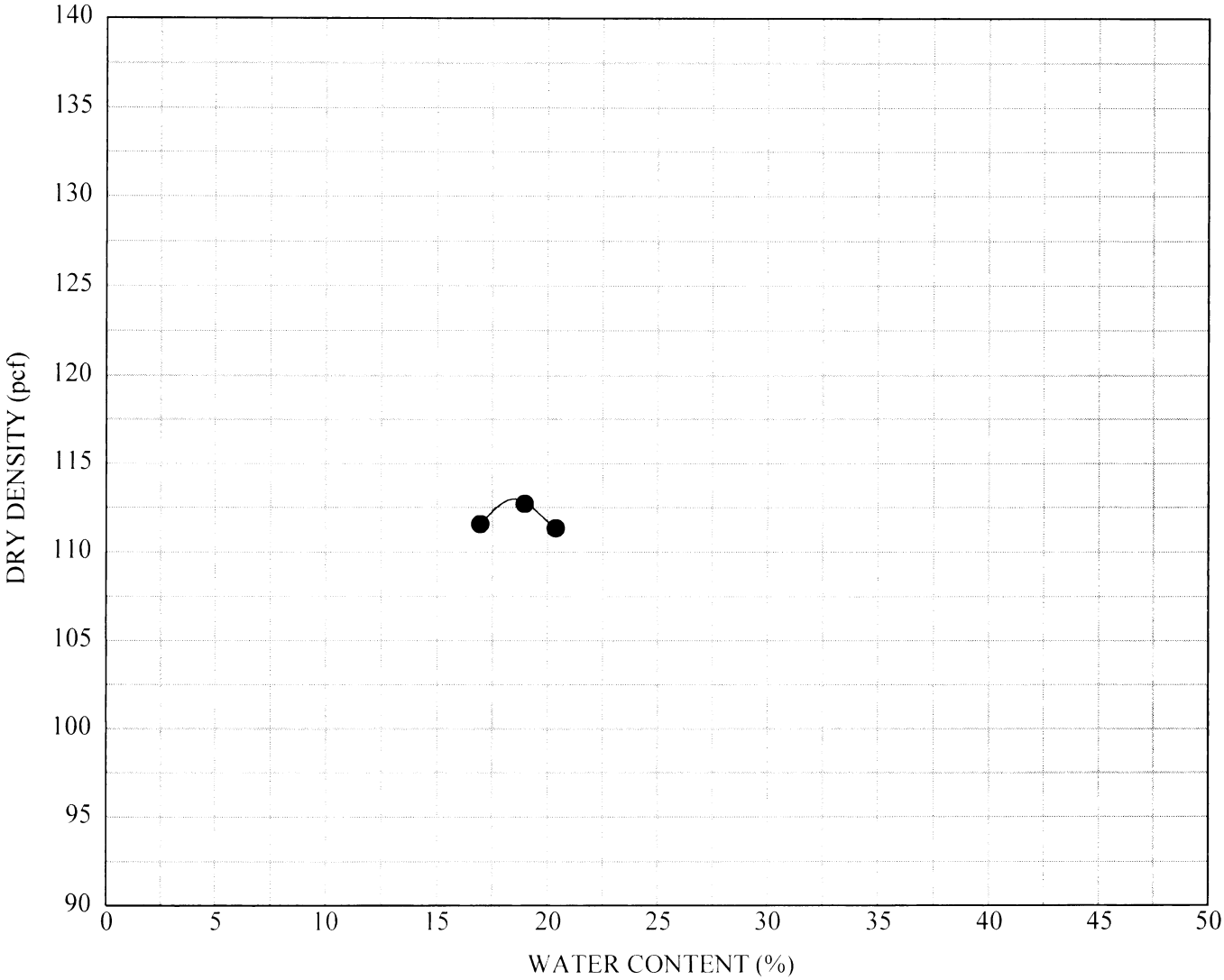
PROJECT NO. 7012.01
DATE 06/21/2008

MILL STREET EXTENSION
LAHAINA, MAUI, HAWAII

CALIFORNIA BEARING RATIO

FIGURE
B3



Sample Identification		Classification	Method	Maximum Dry Density	Optimum Moisture Content
●	A	Brown Sandy SILT (ML) w/trace Gravel B-3, 1 ft.	ASTM D1557 Method A	113 pcf	18 %

ID	Percent			Atterberg Limits			In-Situ Moisture Content (%)
	Gravel	Sand	Silt/Clay	LL	PL	PI	
A	4	37	58	47	32	15	18

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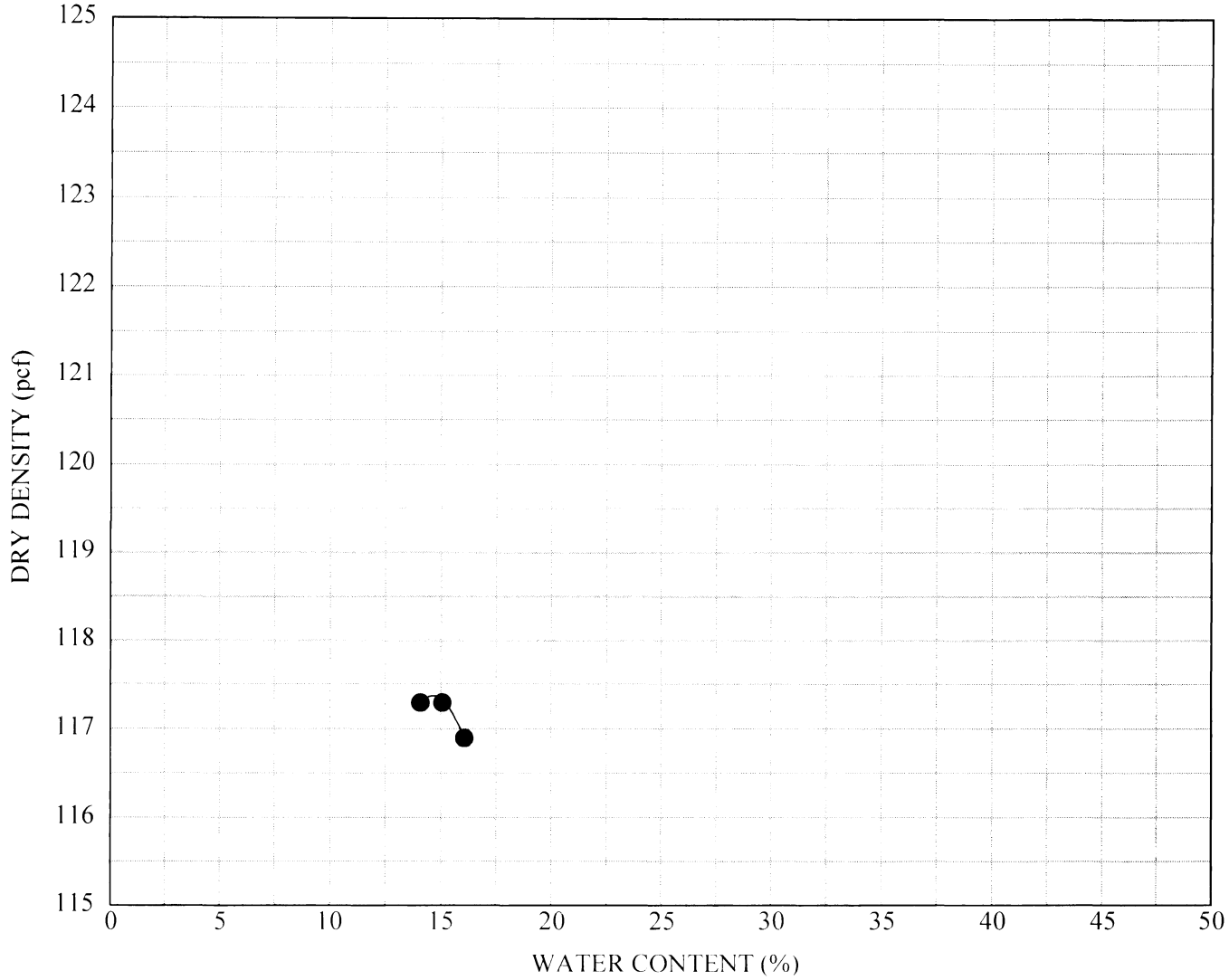
PROJECT NO. 7012.01
DATE 06-02-2008

MILL STREET EXTENSION
LAHAINA, MAUI, HAWAII

COMPACTION CURVE

FIGURE
B4



Sample Identification		Classification	Method	Maximum Dry Density	Optimum Moisture Content
●	B	Brown Silty SAND (SM) w/Gravel B-2, 1-5 ft.	ASTM D1557 Method A	117 pcf	15 %

ID	Percent			Atterberg Limits			In-Situ Moisture Content (%)
	Gravel	Sand	Silt/Clay	LL	PL	PI	
B	22	55	23	--	--	--	11

Hawaii Geotechnical Consulting, Inc.

PROJECT NO. 7012.01
DATE 06-02-2008

MILL STREET EXTENSION
LAHAINA, MAUI, HAWAII

COMPACTION CURVE

FIGURE
B5

APPENDIX B: Preliminary Drainage Report

Established 1969

Preliminary Drainage Report

KUHUA STREET EXTENSION (Vicinity of Keawe Street to Vicinity of Front Street)

Lahaina, Maui, Hawaii

TMK (2) 4-05-009, 4-05-010, 4-05-011, 4-06-012, 4-06-013 and 4-06-16

Prepared For:

Engineering Division
Department of Public Works
County of Maui
Wailuku, Maui, Hawaii

CLIFFORD N. MUKAI
LICENSED PROFESSIONAL ENGINEER
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License Expires April 30, 2014

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Wells Street Professional Center
2145 Wells Street, Suite 403
Wailuku, Maui, Hawaii

Date: December 19, 2012

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2 Soils Map
3 Flood Insurance Rate Map
4 Pre-Development Drainage Areas
5A-5B Conceptual Post-Development Drainage Plan

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B Individual Onsite & Offsite Drainage Area Calculations
C Preliminary Detention Basin and Subsurface Drainage Storage System Estimation Calculations

Preliminary Drainage Report
for
Kuhua Street Extension
Lahaina, Maui, Hawaii

I. PURPOSE

This report has been prepared to examine the existing drainage conditions and the proposed drainage plan for the proposed Kuhua Street Extension Project (KSE).

II. PROPOSED PROJECT

A. Site Location

The project site is located in Lahaina, on the island of Maui, and in the State of Hawaii. The KSE alignment is located approximately 400 to 1,200 feet east (mauka) of Honoapiilani Highway, and stretches approximately 1.9 miles long, beginning at the existing Keawe Street (mauka of the Lahaina Gateway) and ending at Honoapiilani Highway (across the southern terminus of Front Street). Also included in the KSE project, are the extensions of several existing roadways that will connect the KSE to the Honoapiilani Highway. Refer to EXHIBIT 1 for the project location.

B. Project Description

The proposed Kuhua Street Extension will improve traffic circulation and alleviate the existing traffic congestion with an additional route through Lahaina east (mauka) of, and roughly parallel to, the existing Honoapiilani Highway. The proposed KSE will also serve as an alternate route in the event of emergencies or during unexpected closures of Honopiilani Highway.

The approximately 1.9 mile long public roadway project generally consists of the following: widening and improvements to the existing Kuhua Street (from Keone Street to Lahainaluna Road), the extension of Kuhua Street to the north from Keone Street to Keawe Street (northern terminus), and the extension of Kuhua Street to the south from Lahainaluna Road to the Honoapiilani Highway/Front Street intersection (southern terminus). Additional connectivity and access to the new KSE from Honoapiilani Highway and downtown Lahaina Town will be provided by the proposed extensions of the existing Aholo Road and Shaw, Dickenson, and Papalaua Streets (see EXHIBIT 1). Also, the existing Lahainaluna Road (between Kuhua Street and Honoapiilani Highway) will be widened and improved with curb-and-gutters and sidewalks, to accommodate the vehicular and pedestrian traffic anticipated by the KSE.

In addition to enhancing local vehicular circulation throughout the Lahaina area, KSE will also incorporate a landscaped multi-use pedestrian and bicycle path, providing opportunities for a pedestrian-friendly linear path along KSE as well as an attractive pedestrian-friendly connectivity to downtown Lahaina and Front Street via the proposed extension of Papalaua Street. Drainage improvements will consist of catch basins, underground drainlines, drywells, detention basins, subsurface drainage (detention) systems, and roadway culverts.

III. EXISTING CONDITIONS

A. Topography and Soil Conditions

The KSE alignment starts at Keawe Street and proceeds south along an existing cane haul road where it crosses Kahoma Stream Flood Control Channel (i.e., Kahoma Channel), and generally follows the existing Kuhua Street until it connects with Lahainaluna Road. The majority of the KSE alignment to the south of Lahainaluna Road is currently undeveloped, and traverses through agricultural land that was previously cultivated by Pioneer Mill. The land surrounding the project site is characterized by a gently sloping topography with longitudinal slopes ranging from 0 to 5%, and cross slopes of approximately 1 to 4%.

According to the *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii,* underlying the proposed KSE project site are soils of the Pulehu-Ewa-Jaucas Wahikuli-Wainee association, and are characterized as having deep, nearly level to moderate sloping, well-drained and excessively drained soils that have a moderately fine textured to coarse-textured subsoils or underlying material.

The specific soils types are as follows: Ewa (EaA) silty clay loam with 0 to 3 percent slopes; Wahikuli (WdB) very stony silty clay with 3 to 7 percent slopes; Wainee (WxB) very stony silt clay with 3 to 7 percent slopes; Pulehu (PpA) silt loam with 0 to 3 percent slopes; and Pulehu (PtB) cobbly clay loam with 3 to 7 percent slopes (See EXHIBIT 2). Ewa soils are characterized as having a very slow runoff and a slight erosion hazard. Wahikuli soils are characterized as having a slow runoff and a light erosion hazard. Wainee soils are characterized as having a slow to medium runoff and a slight erosion hazard. Pulehu soils are characterized as having a slow runoff and a no more than a slight erosion hazard.

B. Existing Drainage Conditions

The existing runoff from the project site and in the adjacent areas generally flows in a westerly direction toward Honoapiilani Highway. Due to limitations in the existing drainage facilities and ditch structures in the area, runoff flows along roadways and through lots to the ocean or ponds in low-lying areas that dissipate over time through infiltration and evaporation.

The entire project site currently generates approximately 27.5 cfs of surface runoff based on a 50-year recurrence interval, 1-hour duration storm.

For the purposes of this drainage report, the Kuhua Street Extension Project will be evaluated in three (3) distinct drainage sections:

1) KSE from Keawe Street to Kahoma Channel (Sta 0+80± to 8+00±);

2) KSE from Kahoma Channel to Lahainaluna Road (Sta 8+00± to 29+50±), including the extension of Papalaua Street and roadway improvements to Lahainaluna Road; and

3) KSE from Lahainaluna Road to the Honoapiilani Highway/Front Street intersection (Sta 29+50± to 102+00±), including the extensions of Aholo Road and Shaw and Dickenson Streets.

See EXHIBIT 1 for a map showing the aforementioned sections of the project site ("Sections" referred to in this drainage report are solely to assist the reader in identifying and examining the drainage plan in various parts of the project site and shall not be construed as a phasing plan). The existing onsite and offsite surface runoff drainage conditions for each section are discussed below (see EXHIBIT 4).

Section 1 - Keawe Street to Kahoma Channel

According to the previously approved Lahaina Business Park - Phases I and II drainage report (dated August 2004 by Warren S. Unemori Engineering, Inc.), the onsite runoff from the lots and development's roadways along with the offsite mauka watershed were intercepted and conveyed to Kahoma Channel, and the individual lots will retain any additional runoff onsite through subsurface retention systems. Therefore, only approximately 3.7 cfs of offsite runoff from the mauka Lahaina Business Park currently sheet flows in a westerly direction through the project site. The onsite runoff currently being generated by the project site for this section of KSE is approximately 0.8 cfs and sheet flows in a westerly direction where it encounters an existing berm and is conveyed to Keawe Street.

Section 2 - Kahoma Channel to Lahainaluna Road

The existing Kuhua Tract Subdivision, immediately upstream of the proposed KSE, is an older subdivision with no drainage system and thus the entire area currently sheet flows downstream across Kuhua St. into the Pioneer Mill site where it encounters an existing berm, ponds in an existing sump, and potentially overflows onto the Honoapiilani Highway. Approximately 108.1 cfs of existing offsite runoff from the existing Kuhua Tract Subdivision is expected to sheet flow into the project site. The offsite runoff from the remainder of the Kelawea and Kelawea Mauka Subdivisions sheet flows onto Lahainaluna Road where it is conveyed across Honoapiilani Highway and continues on down Lahainaluna Road.

According to the "Lahaina Town Drainage Master Plan", prepared in March 2005 by Belt Collins Hawaii Ltd., the long term mitigation plan for this area envisioned Kuhua St. and the old Kuhua Subdivision to drain around the then existing Pioneer Mill, then down Lahainaluna Road through a proposed future 10'x6' box culvert to the ocean. Although this is classified as a high priority in the Drainage Master Plan due to existing flooding problems in the area, any future implementation of this conceptual solution is dependent on the availability of County funding. The onsite runoff currently being generated by the project site for this section of KSE is approximately 9.3 cfs.

Section 3 - Lahainaluna Road to Front Street

A new four-lane Lahaina Bypass corridor is currently being designed and constructed. The bypass alignment runs parallel to, and approximately 0.5 miles east (mauka) of, the proposed Kuhua Street Extension. According to the Drainage Report for the Honoapiilani Highway Realignment Phase 1B1 (referred to in this report as the Lahaina Bypass) dated January 2010 by Austin, Tsutsumi & Associates, Inc., the runoff discharging from culverts beneath the highway range from approximately 27 to 3,174 cfs based on a 50 year recurrence interval storm.

Also being constructed is the Lahaina Watershed Flood Control Channel (LWFCC), which is located approximately 700 feet east (mauka) of the Kuhua Street Extension (see EXHIBIT 4). Starting at an inlet basin immediately south of Lahainaluna Road at an elevation of 153.0 ft ± M.S.L., this approximately 2-mile long mainly grass-lined diversion channel runs roughly parallel to the KSE and intercepts stormwater runoff from the mauka watershed, conveys it southerly to Kauaula Stream and subsequently the Pacific Ocean. This Diversion Channel was designed to handle a 100-year storm event and thus any runoff mauka of it will be completely handled by the LWFCC. The completion of the LWFCC is expected to precede the construction of this section of the proposed KSE Project. Therefore, the

scope and area of the offsite mauka runoff covered in this report goes to the Lahaina Watershed Flood Control Channel which acts as the eastern (mauka) cutoff boundary.

Approximately 400 feet east (mauka) of the KSE, is an existing Interim NRCS Diversion Channel that was previously constructed by the West Maui Soil and Water Conservation District (see EXHIBIT 4). This temporary drainage facility consists of diversion berms approximately 1,800 feet in length, and two detention basins. The drainage and detention facilities have limited capacity and overflow from the berms and basins flows downstream to the existing Mill Street. The proposed KSE alignment runs through the western portion of the two detention basins, however it is expected that the interim basins will be removed (by others) once the aforementioned LWFCC is constructed.

The onsite and offsite surface runoff generated in the former agricultural fields mauka of this section of KSE generally sheet flows in a westerly direction through numerous small drainageways within fallow fields and cane haul roads, over Honoapiilani Highway, and into Lahaina Town where it is conveyed downstream through existing drainage culverts, or collected in existing low-lying areas. The onsite runoff currently being generated by this section of the project site is approximately18.7 cfs and the total offsite runoff is approximately 87.6 cfs based on a 50-year recurrence interval, 1-hour duration storm.

A portion of the KSE alignment and Shaw Street extension follows Ipu Amakua Lane, an existing roadway that was constructed as a part of the Na Hale O Wainee project. The increase in runoff generated from the Na Hale O Wainee project site and Ipu Amakua Lane is currently mitigated by two subsurface drainage systems installed with that project. Once a portion of Ipu Amakua Lane is integrated into the KSE and Shaw Street extension, any remaining capacity within the existing subsurface drainage systems could potentially be utilized by the KSE project. Runoff from the existing portion of Shaw Street mauka of Honoapiilani Highway is collected in existing curb-and-gutters, captured by an existing curb inlet catch basin, and conveyed within the existing Honoapiilani Highway drainage system.

C. Flood and Tsunami Zone

According to Panels 0361F, 0362F and 0364F, of the Flood Insurance Rate Map, dated September 19, 2012, the project site is situated within Zone “X”, which is designated as an area outside the 0.2% chance flood plain and of minimal flood hazard (see EXHIBIT 3).

The project site is not located within a tsunami zone.

IV. DRAINAGE PLAN

A. General

The general drainage plan that will be implemented for the proposed improvements shall generally include minimal alteration to the natural pre-development drainage patterns, and mitigating the increase in runoff generated by the proposed roadway improvements such that the runoff released downstream will be no greater than the pre-development conditions (see EXHIBITS 4 & 5). All drainage improvements are expected to be implemented pursuant to the current County of Maui's "Rules for the Design of Storm Drainage Facilities", and the recently adopted "Rules for the Design of Storm Water Treatment Best Management Practices" (adopted 11/09/2012). This preliminary drainage plan has been coordinated with the "Lahaina Town Drainage Master Plan" (dated March 2005 by Belt Collins Hawaii Ltd.).

In the absence of any onsite stormwater detention systems, the total onsite surface runoff that could potentially be generated by the construction of the Kuhua Street Extension, the extensions of Aholo Road and Shaw, Dickenson and Papalaua Streets, and the roadway improvements on Lahainaluna Road, is approximately 69.7 cfs, based on a 50-year frequency interval, 1-hour duration storm. However, a combination of dry wells (similar to what was recently implemented in the nearby State Department of Transportation's Honoapiilani Highway Widening project), offsite detention basins, and subsurface drainage systems will be implemented to mitigate the potential 42.2 cfs increase in surface runoff and limit the peak onsite runoff so there will be no net increase in onsite runoff leaving the project site. Preliminary soil studies conducted by Hawaii Geotechnical Consulting, Inc. in the vicinity of the project site indicate an approximate drywell capacity between 0.1 and 6 cfs per drywell depending on soil conditions and subject to field permeability tests. Preliminary subsurface drainage system calculations estimate an approximate reduction of 1.8 cfs of runoff per 100 l.f. of 72" subsurface drainage system (See Appendix C).

Section 1 - Keawe Street to Kahoma Channel

Approximately 3.7 cfs of offsite surface runoff currently sheet flows onto the project site from the existing Lahaina Business Park. This offsite runoff will be captured by new curb inlet catch basins located along the KSE, and will be allowed to discharge into the existing Keawe Street drainage system as it is presently doing via a new underground drainage system.

Based on a 50-year recurrent interval, 1-hr duration storm, approximately 3.9 cfs could potentially be generated by the KSE roadway improvements in this section. The potential 3.1 cfs increase in runoff will be mitigated by approximately three (3) new drywells located near the KSE terminus at

Keawe Street (see Exhibit 5A). According to preliminary soil studies, drywalls in this area are expected to perform well, with capacities up to 6 cfs. A portion of the runoff will be allowed to flow downstream into the Keawe Street drainage system as it is presently doing at a rate no greater than pre-development conditions.

Section 2 - Kahoma Channel to Lahainaluna Road

The onsite surface runoff generated within the new roadways and improvements for this section of the KSE will be collected in new curb-and-gutters, intercepted by curb-inlet type catch basins, and conveyed to new dry wells and subsurface drainage systems via underground pipes (see EXHIBIT 5A). The runoff that could potentially be generated by the roadway improvements in this section is approximately 24.0 cfs, which would result in a increase of approximately 14.7 cfs from pre-development conditions. However, as noted above, the potential additional runoff will be mitigated by a combination of dry wells and subsurface drainage systems such that the runoff discharging downstream is no greater than the pre-development conditions.

The potential increase in onsite runoff generated between Sta 27+00± and 29+50± is proposed to be collected and conveyed to a new approximately 200 ft long subsurface drainage system. This subsurface drainage system will then release runoff to a new drainage system beneath Lahainaluna Road at a rate no greater than pre-development conditions. The potential increase in onsite runoff generated by the improvements between Sta 8+00± and 27+00± is proposed to be mitigated by a total of approximately 450 ft of new subsurface drainage systems, and the existing runoff will be released toward Kahoma Channel. The increase in runoff generated by the improvements on Lahainaluna Road will be mitigated by approximately six (6) new drywells beneath Lahainaluna Road. The potential increase in runoff generated by the improvements along Papalaua Street will be mitigated by approximately two (2) new dry wells and an approximately 200 ft. long subsurface drainage system. See Exhibit 5A for the location of the proposed dry wells, subsurface drainage system, and existing drainline realignment.

Pursuant to the “Lahaina Town Drainage Master Plan”, the long term mitigation plan for this area was originally envisioned to install a 10'x6' box culvert down Lahainaluna Road to convey the mauka runoff to the ocean. However, Lahainaluna Road is a very narrow roadway within a 30 ft. wide right-of-way, and is typically encumbered by a congestion of existing underground utilities and numerous older commercial buildings that were built right up to the right-of-way. At the time the “Lahaina Town Drainage Master Plan” was originally developed, the Kuhua St. Extension project was not yet envisioned and potential drainage solutions were constrained by the then existing Pioneer Mill. Pioneer Mill has since then been demolished and, with the proposed construction of KSE and its proposed system of drain

inlets and underground drainage system, the preferred drainage plan will be to intercept the runoff from the old Kuhua Tract Subdivision currently sheet flowing onto the project site and convey it to Kahoma Channel.

The offsite surface runoff consists of approximately 108.1 cfs, primarily from the existing Kuhua Tract Subdivision, based on a 50-year recurrence interval, 1-hour duration storm. In an effort to alleviate the existing overburdened drainage systems makai of Kuhua Street (including but not limited to the existing drainage systems beneath Honoapiilani Highway, Papalaua Street, and Lahainaluna Road) and help mitigate some of the flooding issues in Lahaina Town, approximately 132 cfs is proposed to be conveyed to Kahoma Channel via a new underground drainline that will run through the Pioneer Mill site and discharge immediately downstream (makai) of the existing Kahoma Uka Cane Haul Bridge (see EXHIBIT 5A). Kuhua Street Extension, a portion of Papalaua Street Extension and their adjoining fringe areas will be handled by this drainage system and conveyed to Kahoma Channel. Given the relationship of the drainage characteristics of the relatively small tributary area for this conveyed runoff compared to the large watershed for the Kahoma Channel, the respective peak flows are not expected to coincide. Therefore, the proposed conveyance is not expected to adversely impact the hydrologic and hydraulic characteristics of Kahoma Channel. All Section 408 permits will be submitted in conjunction with any other required permits to the U.S. Army Corps of Engineers prior to the project's design phase.

A secondary, less desirable, alternate drainage plan is to convey the runoff in this area through a new drainage system down Papalaua Street (in lieu of Lahainaluna Road) and outlet to the ocean. This will consist of either replacing and upsizing the existing double pipe drainline with a new culvert or installing an additional box culvert adjacent to the existing double-pipe drainline generally consistent with the proposed long term mitigation plan noted in the "Lahaina Town Drainage Master Plan".

The existing offsite runoff from the remainder of the Kelawea and Kelawea Mauka Subdivisions will continue to be released downstream onto and down Lahainaluna Road where it crosses Honoapiilani Highway and continues on down Lahainaluna Road as it is presently doing. The increase in runoff generated by the Lahainaluna Road widening and improvements will be mitigated by drywells and subsurface drain. Additional dry wells may be installed based on the actual capacity determined from field permeability tests. A portion of the existing 30" drainline that cuts through the southeastern corner of Pioneer Mill site from the Paunau Subdivision will need to be relocated to run beneath Lahainaluna Road and Honoapiilani Highway, where it will reconnect to the existing drainline beneath the highway (see EXHIBIT 5A). Please note that no additional runoff is expected to be added to the relocated drainline.

It is our understanding that the future Kahoma Residential Subdivision, located mauka of the KSE and immediately north of the existing Kuhua Subdivision, will detain their additional runoff onsite through a detention basin that will have an emergency overflow into the Kahoma Channel upstream (mauka) of the existing Kahoma Uka Cane Haul Bridge. Therefore, inaccordance with the County drainage standards, this development should not adversely affect the KSE project.

Section 3 - Lahainaluna Road to Front Street

As previously mentioned, the Lahaina Bypass and the Lahaina Watershed Flood Control Channel are currently being designed and constructed. Due to the large watershed upstream of the project site, and the location and limited capacity of the existing downstream drainage facilities, this portion of the Kuhua Street Extension Project will not be constructed until the LWFCC is completed. With the LWFCC fully constructed, it is assumed that the existing Interim NRCS Diversion Channel will no longer be necessary and will be removed (by others). The LWFCC, which was designed to accommodate a 100 year storm event, intercepts the runoff from the mauka watershed, preventing it from flowing through the project site. Therefore, the project site's offsite surface runoff for this section is limited to the area between the KSE and the future LWFCC (see EXHIBIT 5B). The total offsite runoff expected in this section is approximately 87.6 cfs based on a 50-year recurrence interval, 1-hour duration storm, and will be allowed to pass through the Kuhua Street Extension, via multiple underground culverts strategically located beneath the roadway, and sheet flow downstream as it is presently doing.

The onsite surface runoff generated within the new roadways will be intercepted by new curb-and-gutters, captured by curb-inlet type catch basins, and conveyed to new dry wells and detention basins via the new underground drainage systems. Approximately 44.2 cfs of onsite surface runoff could potentially be generated by the roadway improvements in this section based on a 50-year recurrence interval, 1-hour duration storm, which would result in a 25.5 cfs increase. However, this potential increase in surface runoff is proposed to be mitigated by three (3) new detention basins, totaling approximately 2.75 acre-feet in storage volume and a new approximately 250 ft long subsurface drainage system (see APPENDIX C). To the extent feasible, the drainage basins will be located, sized, and optimized with the proposed adjacent Wainee Village project (accordingly basin locations are approximate and subject to change).

Furthermore, the potential increase in runoff generated by the improvements to Shaw Street will be mitigated by approximately four (4) new dry wells and any remaining capacity within the existing subsurface drainage system previously installed by the Na Hale O Wainee project. The potential increase

in runoff generated by the improvements to Dickenson Street will be mitigated by approximately four (4) new dry wells and the potential increase in runoff generated by the improvements to Aholo Road will be mitigated by approximately two (2) new dry wells (See Exhibit 5B).

Table 1 presents a summary of the relevant hydrologic analyses undertaken.

Section No.	Pre-Dev Onsite Runoff* (cfs)	Post-Dev Onsite Runoff* - Before Mitigation (cfs)	Mitigative Measure		
			No. of Drywells	No. of Subsurface Drainage Systems	No. of Det. Basins
1	0.8	3.9	3	0	0
2	9.3	24.0	8	3 (850 l.f.)	0
3	18.7	44.2	10	1 (250 l.f.)	3

*See Appendix A for total drainage area calculations (above component runoff values are conservative, not intended to be added, and is used solely for conservatively sizing the respective mitigative measures)

Table 1. Pre/Post Development Drainage Summary

B. Hydrologic Calculations

The hydrologic calculations are based on the “Rules for the Design of Storm Drainage Facilities in the County of Maui”, Title MC-15, Chapter 4 and the “Rainfall Frequency Atlas of the Hawaiian Islands”, Technical Paper No. 43, dated 1962. The rational method was used to estimate the runoff for this project.

Rational Formula used:

$$Q = CIA$$

Where:
- Q = Rate of Flow (cfs)
- C = Runoff Coefficient
- I = Rainfall Intensity (inch/hour)
- A = Area (Acre)

The design storm used in the calculations for this project is a 50-year recurrence interval, 1-hour duration storm with a precipitation of approximately 2.5 inches. A minimum time of concentration of 10 minutes was used, per the "Design Criteria for Highway Drainage," State of Hawaii Department of Transportation, 2010.

APPENDIX A contains the hydrologic calculations used to determine the impact of the proposed project in terms of drainage conditions by comparing the peak flows from before and after development.

C. Conclusion

This report evaluates both the existing drainage conditions and the proposed drainage improvements for the Kuhua Street Extension project, which also includes the extensions and improvements of the adjacent existing roadways. According to the analyses contained herein, the proposed Kuhua Street Extension project could potentially generate approximately 42.2 cfs of additional runoff. However, the construction of new dry wells, new subsurface drainage storage systems, and new detention basins, that are strategically located along the project alignment, will provide the necessary storage to accommodate any additional increase in post-development runoff, so that there will be no net increase in onsite runoff leaving the project site. In addition, a portion of the offsite surface runoff from the existing Kuhua and Kelawea Subdivisions is proposed to be intercepted and conveyed to Kahoma Channel, which will help to alleviate some of the existing drainage and flooding problems downstream of the project site in Lahaina Town.

Therefore, it is our professional opinion, that the proposed Kuhua Street Extension Project will not adversely affect the adjoining and downstream properties.

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V. REFERENCES

1. *Flood Insurance Rate Map, Maui County, Hawaii*, Revised September 25, 2009. Federal Emergency Management Agency.

2. *Rules for the Design of Storm Drainage Facilities in the County of Maui*, Chapter 4, Department of Public Works and Environmental Management - County of Maui, July 14, 1995.

3. *Honoapiilani Highway Realignment Phase 1B1, Lahainaluna Road to Hokiokio Place*, Austin Tsutsumi & Associates, January, 2010

4. *Lahaina Business Park - Phases I and II Drainage Report*, Warren S. Unemori Engineering, Inc., August 2004.

5. *Geotechnical Engineering Exploration - Honoapiilani Highway Widening - Lahainaluna Road to Aholo Road*, Geolabs, Inc., 2005.

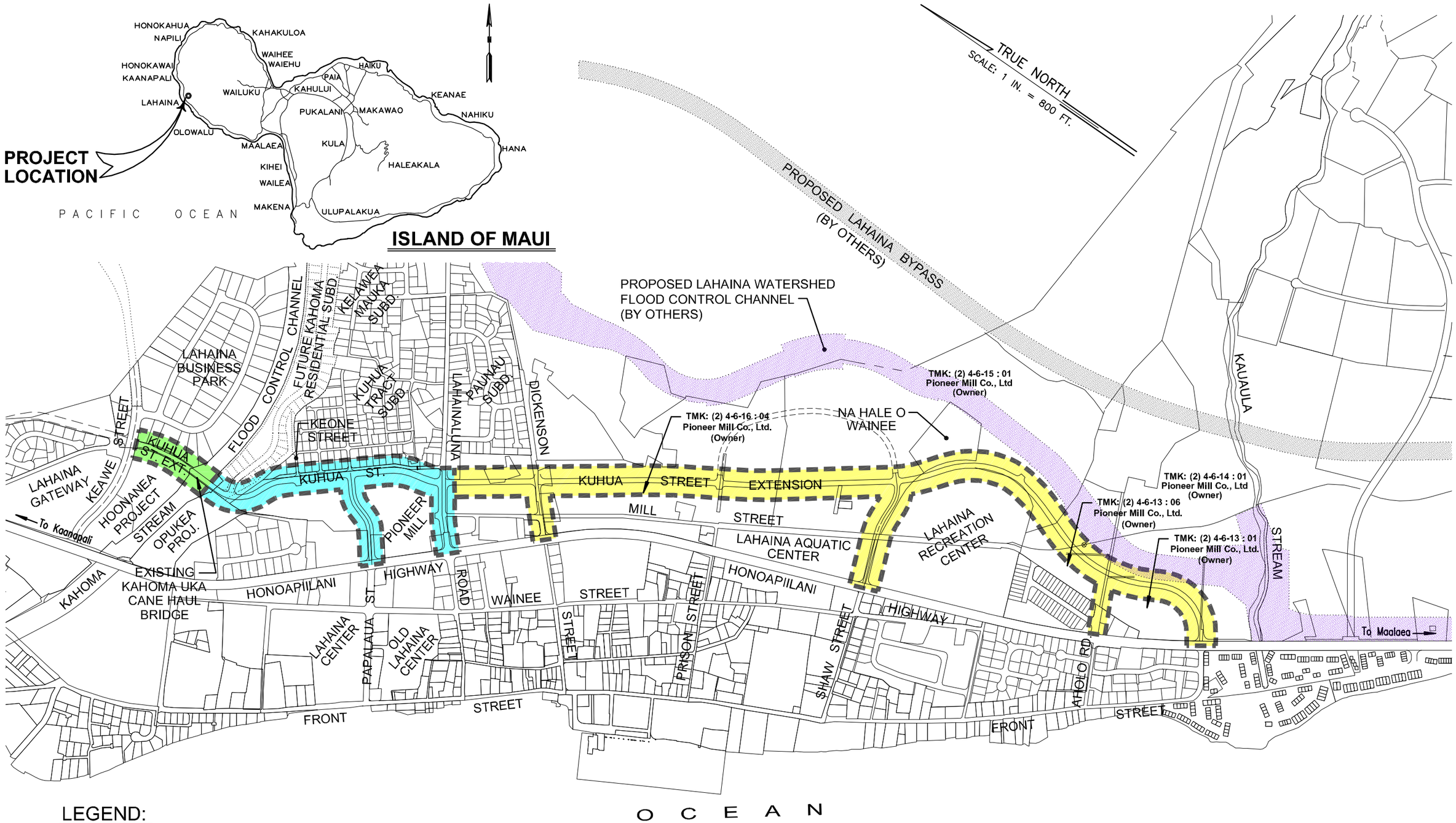
6. *Geotechnical Investigation Report - Mill Street Extension*, Hawaii Geotechnical Consulting, Inc., July 2008.

7. *Rainfall Frequency Atlas of the Hawaiian Islands, Technical Paper No. 43.* 1962. U.S. Department of Commerce, Weather Bureau.

8. *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii.* United States Department of Agriculture, Soil Conservation Service. August 1972.

9. *Design Criteria for Highway Drainage*, Highways Division, Department of Transportation, 2010.

10. *Lahaina Town Drainage Master Plan*, Belt Collins Hawaii Ltd., March 2005.



LEGEND:

- PROJECT LIMITS
- SECTION 1
- SECTION 2
- SECTION 3

EXHIBIT 1 - PROJECT LOCATION MAP

0 800 1600 2400 3200

SCALE: 1 IN. = 800 FT.

NOTE:

"SECTIONS" SHOWN IN THIS EXHIBIT ARE SOLELY TO ASSIST THE READER IN IDENTIFYING THE DRAINAGE PLAN IN VARIOUS PARTS OF THE PROJECT SITE. THIS EXHIBIT SHALL NOT BE CONSTRUED AS A PHASING PLAN.

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

October 3, 2012

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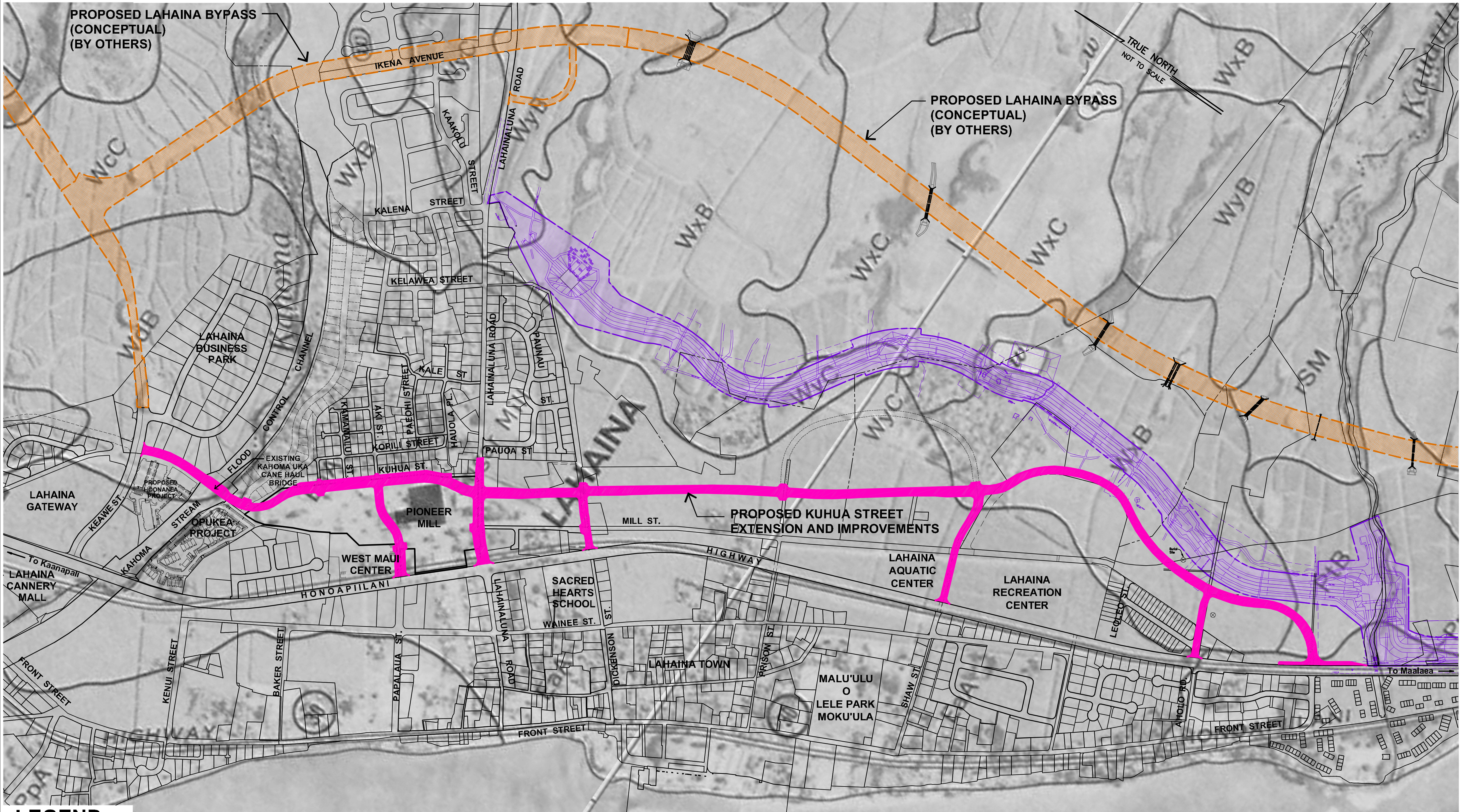

LEGEND:

PROPOSED KUHUA STREET EXTENSION AND IMPROVEMENTS

PROPOSED LAHAINA BYPASS (BY OTHERS)

PROPOSED LAHAINA WATERSHED FLOOD CONTROL CHANNEL (BY OTHERS)

EXHIBIT 2 - SOILS MAP

PROPOSED KUHUA STREET EXTENSION AND IMPROVEMENTS

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October 3, 2012

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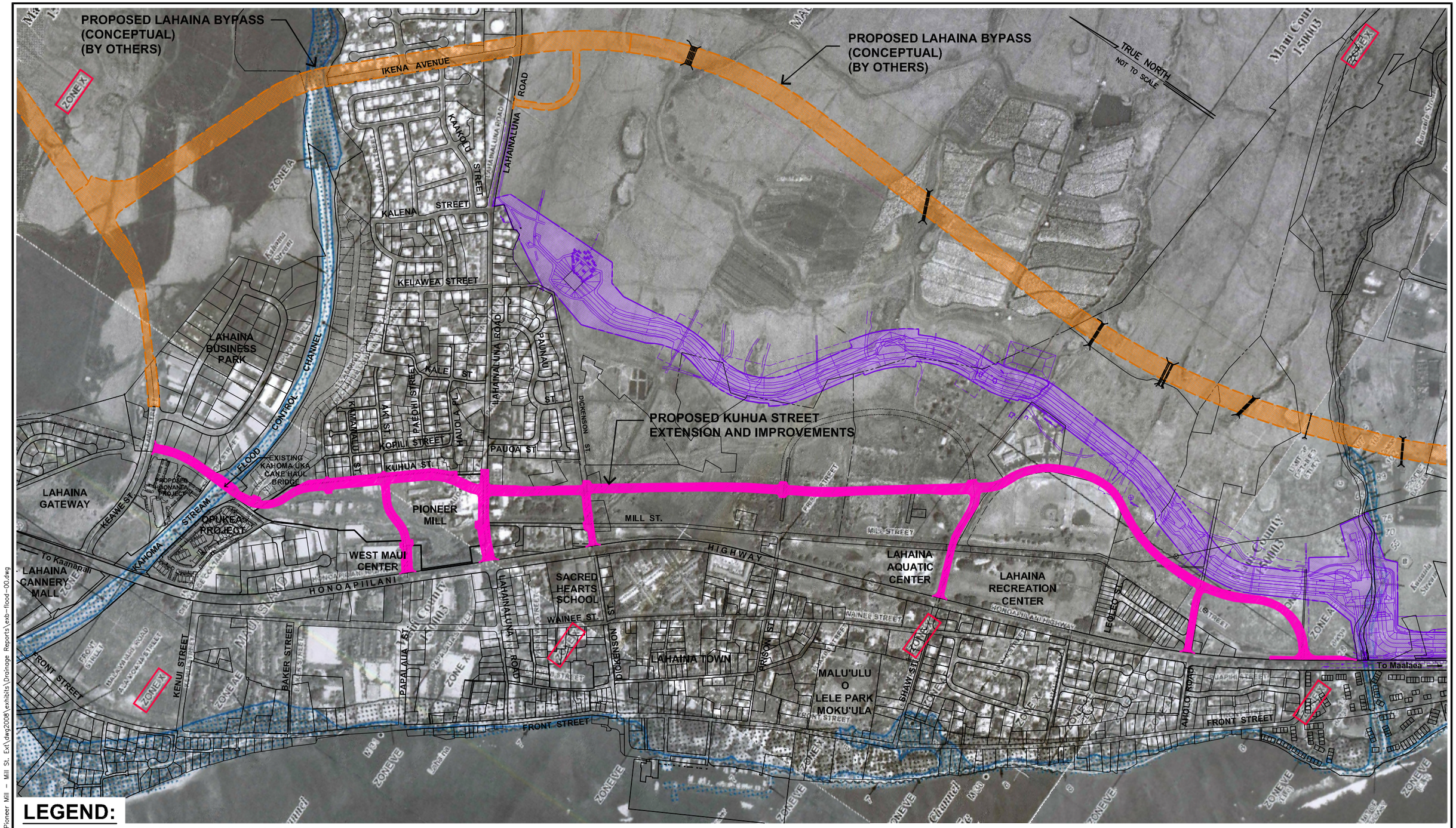

LEGEND:

- PROPOSED KUHUA STREET EXTENSION AND IMPROVEMENTS
- PROPOSED LAHAINA BYPASS (BY OTHERS)
- PROPOSED LAHAINA WATERSHED FLOOD CONTROL CHANNEL (BY OTHERS)

EXHIBIT 3 - FLOOD INSURANCE RATE MAP

PROPOSED KUHUA STREET EXTENSION AND IMPROVEMENTS

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CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

October 3, 2012

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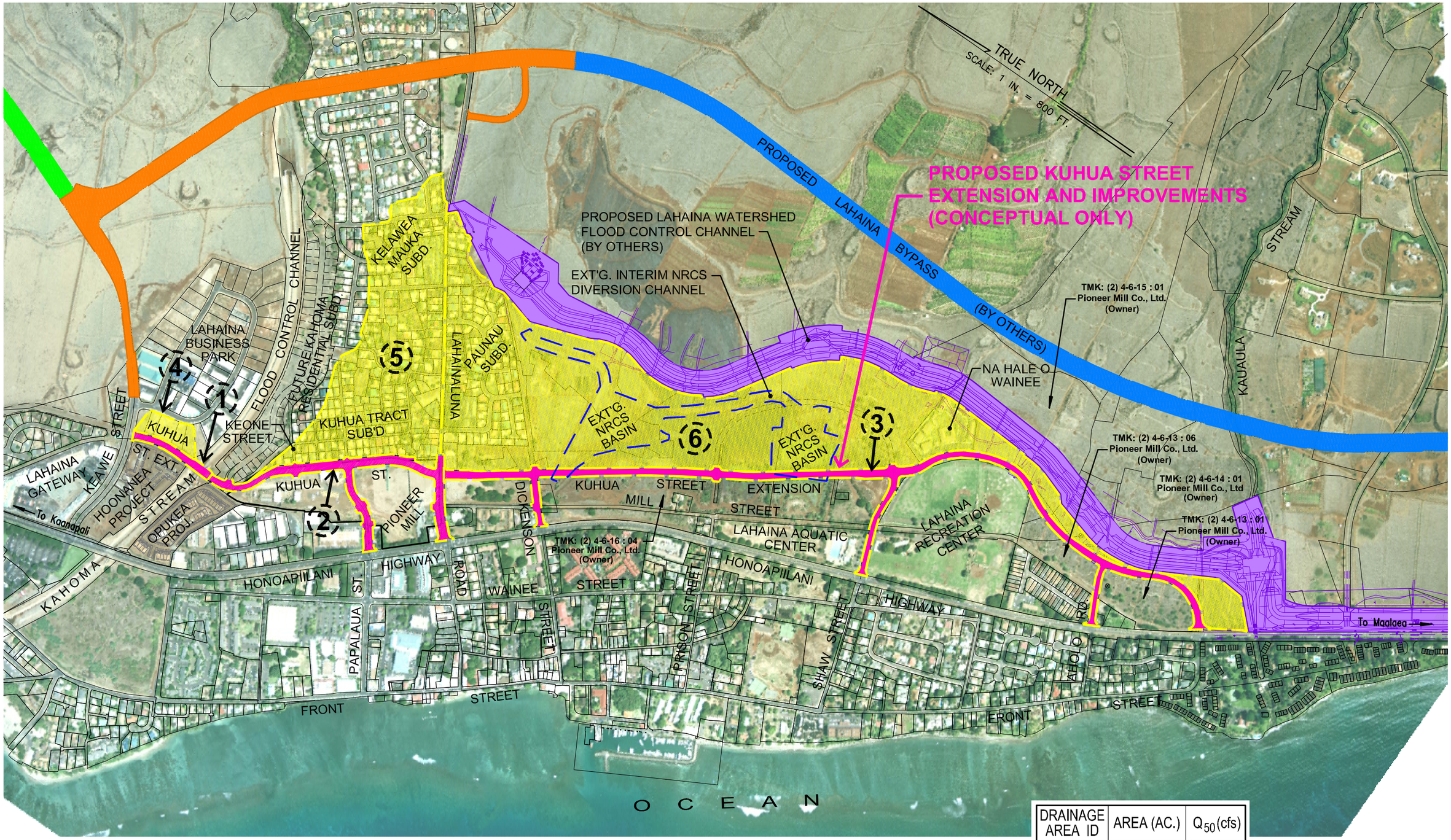

EXHIBIT 4 - PRE-DEVELOPMENT DRAINAGE AREAS

DRAINAGE AREA ID	AREA (AC.)	Q_{50} (cfs)
1	0.9	0.8
2	5.8	9.3
3	12.0	18.7
*4	3.7	3.7
5	48.9	108.1
6	104.6	87.6

* OFFSITE RUNOFF FROM THE PREVIOUSLY APPROVED LAHAINA BUSINESS PARK - PHASES I AND II DRAINAGE REPORT, DATED AUGUST 2004.

0 800 1600 2400 3200

SCALE: 1 IN. = 800 FT.

WARREN S. UNEMORI ENGINEERING, INC.
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October 3, 2012

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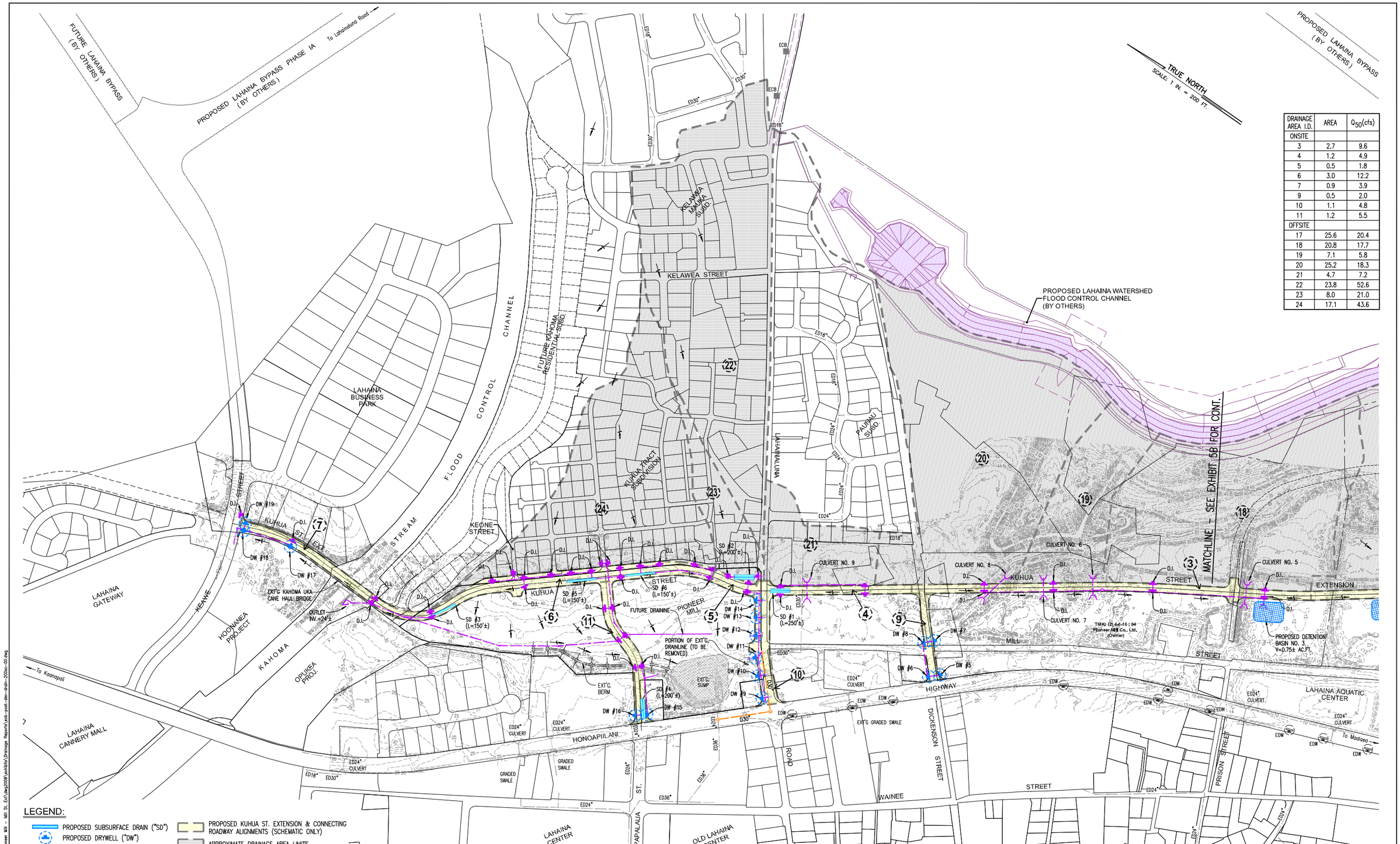

DRAINAGE AREA I.D.	AREA	Q_{50}(cfs)
ONSITE		
3	2.7	9.6
4	1.2	4.9
5	0.5	1.8
6	3.0	12.2
7	0.9	3.9
9	0.5	2.0
10	1.1	4.8
11	1.2	5.5
OFFSITE		
17	25.6	20.4
18	20.8	17.7
19	7.1	5.8
20	25.2	18.3
21	4.7	7.2
22	23.8	52.6
23	8.0	21.0
24	17.1	43.6

EXHIBIT 5A - CONCEPTUAL POST-DEVELOPMENT DRAINAGE PLAN

0 200 400 600 800

SCALE: 1 IN. = 200 FT.

NOTE:
PROPOSED DRAINAGE IMPROVEMENTS ARE CONCEPTUAL AND SUBJECT TO CHANGE (INCLUDING BUT NOT LIMITED TO SUBSURFACE DRAINS, DRYWELLS, DRAINLINES, DRAIN INLETS, ROADWAY CULVERTS, DETENTION BASINS, ETC.)

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October 3, 2012

24"x36"

WSUE #06031.20

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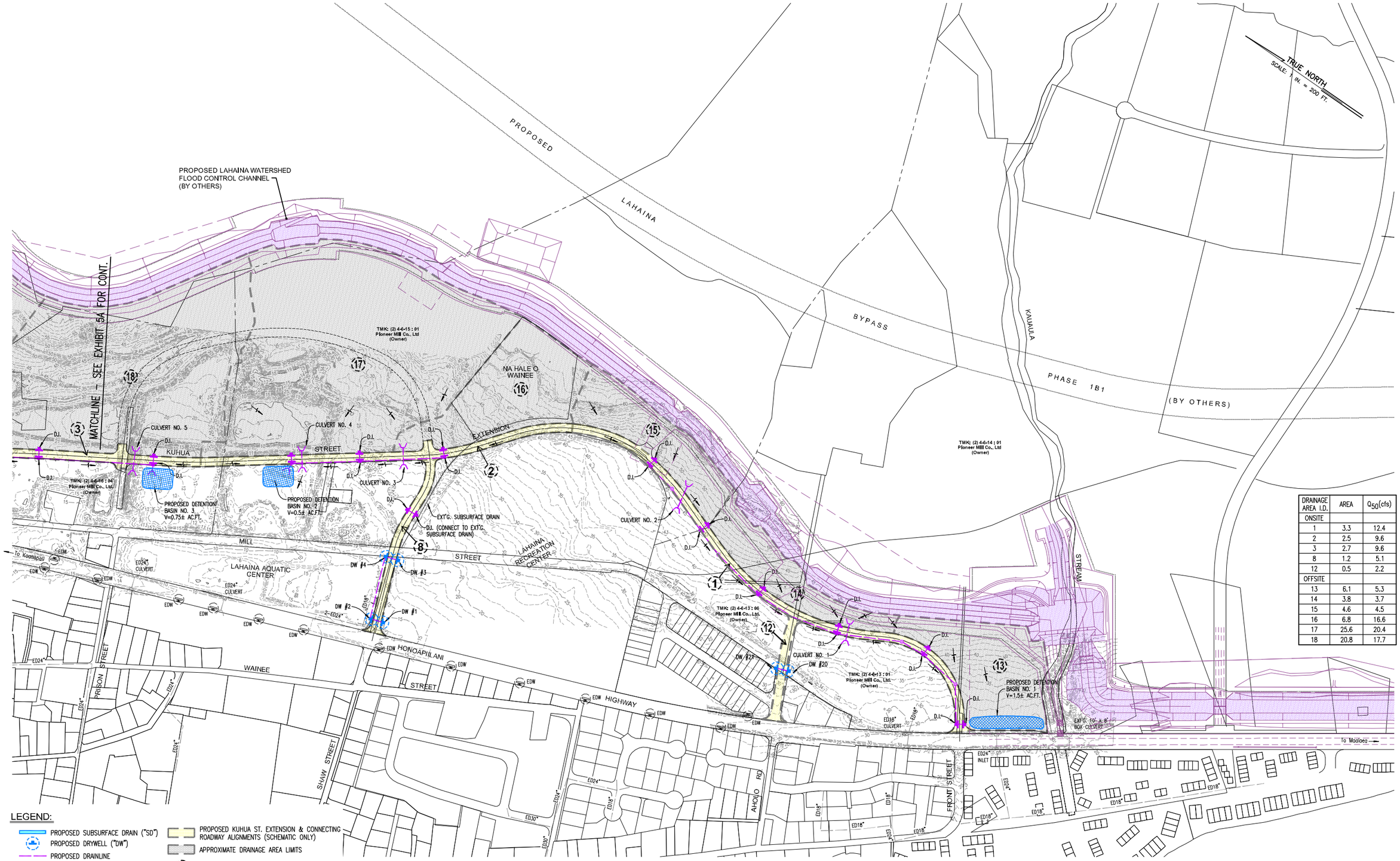

DRAINAGE AREA I.D.	AREA	Q_{50}(cfs)
ONSITE		
1	3.3	12.4
2	2.5	9.6
3	2.7	9.6
8	1.2	5.1
12	0.5	2.2
OFFSITE		
13	6.1	5.3
14	3.8	3.7
15	4.6	4.5
16	6.8	16.6
17	25.6	20.4
18	20.8	17.7

EXHIBIT 5B - CONCEPTUAL POST-DEVELOPMENT DRAINAGE PLAN

NOTE:
PROPOSED DRAINAGE IMPROVEMENTS ARE CONCEPTUAL AND SUBJECT TO CHANGE (INCLUDING BUT NOT LIMITED TO SUBSURFACE DRAINS, DRYWELLS, DRAINLINES, DRAIN INLETS, ROADWAY CULVERTS, DETENTION BASINS, ETC.)

WARREN S. UNEMORI ENGINEERING, INC.
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October 3, 2012

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24"x36"

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APPENDIX A

HYDROLOGIC CALCULATIONS

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui , Hawai'i 96793
Date: May, 2012

HYDROLOGIC CALCULATIONS: PRE-DEVELOPMENT - KUHUA ST. EXTENSION PROJECT (TOTAL)

Objective: To Determine the Pre-Development Runoff from the entire Kuhua Street Extension Project, including the extensions of Aholo Rd., Shaw St., Dickenson St, and Papalaua St., and improvements along Lahainaluna Road.

I. 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Lahaina, Maui.
R(50 Yr.-1Hr.) = 2.5 inches

2. Total Area:

Area (Ac.):		18.7

3. Runoff Coefficents:

Infiltration:	High	0.00
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	Poor (<10%)	0.05
Development Type:	Agricultural	0.15
Runoff Coeff't., C:		0.20
Grassed Area (Ac.):		14.7
Runoff Coeff't for Grassed Areas:		0.20
Paved Area (Ac.):		4.0
Runoff Coeff't for Paved Areas:		0.95
Weighted Runoff Coeff't:		0.36

4. Time of Concentration:

Approx. Longest Run (ft.):		700
Approx. Elev. Diff'l. (ft.):		4
Higher Elev. (ft.):	33	
Lower Elev. (ft.):	29	
Average Slope:		0.6%
Time of Concentration (min.): (Plate 1)		21.0

5. Intensity:

Intensity (in./hr.):		4.1

6. Total Runoff:

Q = C x I x A (cfs):		**27.5**

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui , Hawai'i 96793
Date: May, 2012

HYDROLOGIC CALCULATIONS: POST-DEVELOPMENT - KUHUA ST. EXTENSION PROJECT (TOTAL)

Objective: To Determine the Post-Development Runoff from the entire Kuhua Street Extension Project, including the extensions of Aholo Rd., Shaw St., Dickenson St, and Papalaua St., and improvements along Lahainaluna Road.

I. 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Lahaina, Maui.
R(50 Yr.-1Hr.) = 2.5 inches

2. Total Area:

Area (Ac.):		18.70

3. Runoff Coefficents:

Grassed Area (Ac.):		3.70
Runoff Coeff't for Grassed Areas:		0.20
Paved Area (Ac.):		15.00
Runoff Coeff't for Paved Areas:		0.95
Weighted Runoff Coeff't:		0.80

4. Time of Concentration:

Longest Run (ft.):		1725
Approx. Elev. Diff'l. (ft.):		26
Higher Elev. (ft.):	43	
Lower Elev. (ft.):	17	
Average Slope:		1.51%
Time of Concentration (min.): (Plate 1)		15.0

5. Intensity:

Intensity (in./hr.):		4.7

6. Total Runoff:

Q = C x I x A (cfs):		**69.70**

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui , Hawai'i 96793
Date: May, 2012

HYDROLOGIC CALCULATIONS: SECTION 1 - PRE-DEVELOPMENT ONSITE RUNOFF

Objective: To Determine the Pre-Development Onsite Surface Runoff from Section 1, Kuhua St. Extension from Sta 0+80± to 8+00±.

I. 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Lahaina, Maui.
R(50 Yr.-1Hr.) = 2.5 inches

2. Total Area:

Area (Ac.):		0.9

3. Runoff Coefficents:

Infiltration:	High	0.00
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	Poor (<10%)	0.05
Development Type:	Agricultural	0.15
Runoff Coeff't., C:		0.20
Grassed Area (Ac.):		0.9
Runoff Coeff't for Grassed Areas:		0.20
Paved Area (Ac.):		0.00
Runoff Coeff't for Paved Areas:		0.95
Weighted Runoff Coeff't:		0.20

4. Time of Concentration:

Approx. Longest Run (ft.):		700
Approx. Elev. Diff'l. (ft.):		4
Higher Elev. (ft.):	33	
Lower Elev. (ft.):	29	
Average Slope:		0.57%
Time of Concentration (min.):		21.0
(Plate 1)		

5. Intensity:

Intensity (in./hr.):		4.1

6. Total Runoff:

Q = C x I x A (cfs):		**0.8**

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui , Hawai'i 96793
Date: May, 2012

HYDROLOGIC CALCULATIONS: SECTION 1 - POST-DEVELOPMENT ONSITE RUNOFF

Objective: To Determine the Post-Development Onsite Surface Runoff from Section 1, Kuhua Street Extension from Sta 0+80± to 8+00±.

I. 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Lahaina, Maui.
R(50 Yr.-1Hr.) = 2.5 inches

2. Total Area:

Area (Ac.):		0.92

3. Runoff Coefficents:

Grassed Area (Ac.):		0.14
Runoff Coeff't for Grassed Areas:		0.20
Paved Area (Ac.):		0.78
Runoff Coeff't for Paved Areas:		0.95
Weighted Runoff Coeff't:		0.84

4. Time of Concentration:

Approx. Longest Run (ft.):		800
Approx. Elev. Diff'l. (ft.):		5
Higher Elev. (ft.):	33	
Lower Elev. (ft.):	28	
Average Slope:		0.63%
Time of Concentration (min.): (Plate 1)		11.0

5. Intensity:

Intensity (in./hr.):		5.1

6. Total Runoff:

Q = C x I x A (cfs):		**3.9**

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui , Hawai'i 96793
Date: May, 2012

HYDROLOGIC CALCULATIONS: SECTION 2 - PRE-DEVELOPMENT ONSITE RUNOFF

Objective: To Determine the Pre-Development Onsite Surface Runoff from Section 2, which includes the Kuhua St. Extension from Sta 8+00± to 29+50±, Lahainaluna Road Improvements, and Papalaua Street Extension.

I. 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Lahaina, Maui.
R(50 Yr.-1Hr.) = 2.5 inches

2. Total Area:

Area (Ac.):		5.8

3. Runoff Coefficents:

Infiltration:	High	0.00
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	Poor (<10%)	0.05
Development Type:	Agricultural	0.15
Runoff Coeff't., C:		0.20
Grassed Area (Ac.):		4.3
Runoff Coeff't for Grassed Areas:		0.20
Paved Area (Ac.):		1.49
Runoff Coeff't for Paved Areas:		0.95
Weighted Runoff Coeff't:		0.39

4. Time of Concentration:

Approx. Longest Run (ft.):		780
Approx. Elev. Diff'l. (ft.):		18
Higher Elev. (ft.):	42	
Lower Elev. (ft.):	24	
Average Slope:		2.31%
Time of Concentration (min.):		21.5
(Plate 1)		

5. Intensity:

Intensity (in./hr.):		4.1

6. Total Runoff:

Q = C x I x A (cfs):		**9.3**

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui , Hawai'i 96793
Date: May, 2012

HYDROLOGIC CALCULATIONS: SECTION 2 - POST-DEVELOPMENT ONSITE RUNOFF

Objective: To Determine the Pre-Development Onsite Surface Runoff from Section 2, which includes the Kuhua St. Extension from Sta 8+00± to 29+50±, Lahainaluna Road Improvements, and Papalaua Street Extension.

I. 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Lahaina, Maui.
R(50 Yr.-1Hr.) = 2.5 inches

2. Total Area:

Area (Ac.):		5.8

3. Runoff Coefficents:

Grassed Area (Ac.):		1.0
Runoff Coeff't for Grassed Areas:		0.20
Paved Area (Ac.):		4.9
Runoff Coeff't for Paved Areas:		0.95
Weighted Runoff Coeff't:		0.84

4. Time of Concentration:

Approx. Longest Run (ft.):		1600
Approx. Elev. Diff'l. (ft.):		11
Higher Elev. (ft.):	44	
Lower Elev. (ft.):	33	
Average Slope:		0.69%
Time of Concentration (min.): (Plate 1)		12.0

5. Intensity:

Intensity (in./hr.):		4.95

6. Total Runoff:

Q = C x I x A (cfs):		**24.0**

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui , Hawai'i 96793
Date: May, 2012

HYDROLOGIC CALCULATIONS: SECTION 2 - OFFSITE RUNOFF

Objective: To Determine the Offsite Surface Runoff from the Section 2, of the KSE Project.

I. 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Lahaina, Maui.
R(50 Yr.-1Hr.) = 2.5 inches

2. Total Area:

Area (Ac.):	48.9

3. Runoff Coefficents:

Minimum Runoff Coeff't for Residential Areas (Table 3*):	0.55

4. Time of Concentration:

Approx. Longest Run (Grass):	100
Slope (%):	4.8%
Grass Travel Time (min):	11.0
Approx. Longest Run (Paved):	2100
Slope (%):	4.8%
Grass Travel Time (min):	11.0
Time of Concentration (min.): (Plate 1)	22.0

5. Intensity:

Intensity (in./hr.):	4.02

6. Total Runoff:

Q = C x I x A (cfs):	**108.1**

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui , Hawai'i 96793
Date: May, 2012

HYDROLOGIC CALCULATIONS: SECTION 3 - PRE-DEVELOPMENT ONSITE RUNOFF

Objective: To Determine the Pre-Development Onsite Surface Runoff from Section 3, which includes the Kuhua St. Extension from Sta 29+50± to 101+50±, the extension of Shaw Street, Dickenson Street and Aholo Road.

I. 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Lahaina, Maui.
R(50 Yr.-1Hr.) = 2.5 inches

2. Total Area:

Area (Ac.):		12.0

3. Runoff Coefficents:

Infiltration:	High	0.00
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	Poor (<10%)	0.05
Development Type:	Agricultural	0.15
Runoff Coeff't., C:		0.20
Grassed Area (Ac.):		9.6
Runoff Coeff't for Grassed Areas:		0.20
Paved Area (Ac.):		2.4
Runoff Coeff't for Paved Areas:		0.95
Weighted Runoff Coeff't:		0.35

4. Time of Concentration:

Approx. Longest Run (ft.):		200
Approx. Elev. Diff'l. (ft.):		1
Higher Elev. (ft.):	16	
Lower Elev. (ft.):	15	
Average Slope:		0.50%
Time of Concentration (min.): (Plate 1)		17.0

5. Intensity:

Intensity (in./hr.):		4.5

6. Total Runoff:

Q = C x I x A (cfs):		**18.7**

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui , Hawai'i 96793
Date: May, 2012

HYDROLOGIC CALCULATIONS: SECTION 3 - POST-DEVELOPMENT ONSITE RUNOFF

Objective: To Determine the Post-Development Onsite Surface Runoff from Section 3, which includes the Kuhua St. Extension from Sta 29+50± to 101+50±, the extension of Shaw Street, Dickenson Street and Aholo Road.

I. 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Lahaina, Maui.
R(50 Yr.-1Hr.) = 2.5 inches

2. Total Area:

Area (Ac.):		12.0

3. Runoff Coefficents:

Infiltration:	High	0.00
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	Poor (<10%)	0.05
Development Type:	Agricultural	0.15
Runoff Coeff't., C:		0.20
Grassed Area (Ac.):		2.8
Runoff Coeff't for Grassed Areas:		0.20
Paved Area (Ac.):		9.2
Runoff Coeff't for Paved Areas:		0.95
Weighted Runoff Coeff't:		0.78

4. Time of Concentration:

Approx. Longest Run (ft.):		1725
Approx. Elev. Diff'l. (ft.):		25
Higher Elev. (ft.):	40	
Lower Elev. (ft.):	15	
Average Slope:		1.5%
Time of Concentration (min.):		15.0
(Plate 1)		

5. Intensity:

Intensity (in./hr.):		4.8

6. Total Runoff:

Q = C x I x A (cfs):		**44.2**

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui , Hawai'i 96793
Date: May, 2012

HYDROLOGIC CALCULATIONS: SECTION 3 - OFFSITE RUNOFF

Objective: To Determine the Offsite Surface Runoff from Section 3 of the Kuhua Street Extension Project. (Mauka area between KSE and Limits of furture LWFCC)

I. 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Lahaina, Maui.
R(50 Yr.-1Hr.) = 2.5 inches

2. Total Area:

Area (Ac.):		104.6

3. Runoff Coefficents:

Infiltration:	High	0.00
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	Poor (<10%)	0.05
Development Type:	Agricultural	0.15
Runoff Coeff't., C:		0.20
Grassed Area (Ac.):		100.3
Runoff Coeff't for Grassed Areas:		0.20
Paved Area (Ac.):		4.3
Runoff Coeff't for Paved Areas:		0.95
Weighted Runoff Coeff't:		0.23

4. Time of Concentration:

Approx. Longest Run (ft.):		1600
Approx. Elev. Diff'l. (ft.):		32
Higher Elev. (ft.):	68	
Lower Elev. (ft.):	36	
Average Slope:		2.00%
Time of Concentration (min.):		28.0
(Plate 1)		

5. Intensity:

Intensity (in./hr.):		3.6

6. Total Runoff:

Q = C x I x A (cfs):		**87.6**

APPENDIX B

INDIVIDUAL ONSITE & OFFSITE DRAINAGE AREA CALCULATIONS

ONSITE AND OFFSITE INDIVIDUAL DRAINAGE AREA CALCULATIONS

(Based on a 50-year 1-hour storm = 2.5 inches)

ONSITE

			Runoff Coeff't		Pre-Development				Post-Development							Mitigative Measure			
Drainage Area No.	Station Range	Area	Pre	Post	Longest Run	Slope	Tc	Intensity	Longest Run	Slope	Tc	Intensity	**Q(pre)***	**Q(post)***	**Q(post)-Q(pre)**	Type	Q(in) (cfs)	Capacity (cfs)	**Q(out)**
1	76+01 to 101+50	3.3	0.20	0.76	170	3.50%	14	4.75	2600	2.04%	12.5	4.9	**3.2**	**12.4**	**9.3**	Detention Basin (1.5 ac-ft)	12.4	12.4	**0.0**
2	57+01 to 76+00	2.5	0.20	0.77	300	2.00%	15	4.65	1450	2.48%	11.5	5	**2.3**	**9.6**	**7.2**	Detention Basin (0.5 ac-ft)	9.6	7.5	**2.1**
3	37+51 to 57+00	2.7	0.20	0.77	200	0.50%	17	4.45	1725	1.51%	15	4.65	**2.4**	**9.6**	**7.2**	Detention Basin (0.75 ac-ft)	9.6	9.6	**0.0**
4	29+51 to 37+50	1.2	0.20	0.80	200	0.50%	16	4.55	800	0.60%	12	4.95	**1.1**	**4.8**	**3.7**	Subsurface Drain (L=250 l.f.)	4.8	4.5	**0.3**
5	27+01 to 29+50	0.5	0.28	0.79	200	2.00%	10	5.15	400	1.20%	10	5.15	**0.7**	**1.8**	**1.2**	Subsurface Drain (L=200 l.f.)	1.8	3.6	**0.0**
6	8+01 to 27+00	3.0	0.36	0.82	315	1.90%	12	4.95	1600	0.69%	12	4.95	**5.4**	**12.2**	**6.8**	Subsurface Drain (L=450 l.f.)	12.2	8.1	**4.1**
7	0+77 to 8+00	0.9	0.20	0.84	700	0.57%	21	4.09	800	0.63%	11	5.05	**0.8**	**3.9**	**3.1**	(3) Dry Wells	3.9	12.0	**0.0**
8	Shaw St. Ext.	1.2	0.46	0.81	660	0.90%	22	4.02	920	0.90%	11	5.05	**2.3**	**5.1**	**2.8**	(4) Dry Wells	5.1	4.0	**1.1**
9	Dickenson St. Ext.	0.5	0.39	0.76	440	2.40%	15	4.65	440	2.40%	10	5.15	**0.9**	**2.0**	**1.1**	(4) Dry Wells	2.0	2.0	**0.0**
10	Lahainaluna Rd. Imp.	1.1	0.44	0.83	600	1.80%	12	4.95	650	1.80%	10	5.15	**2.5**	**4.8**	**2.4**	(6) Dry Wells	4.8	4.5	**0.3**
11	Papalaua St. Ext.	1.2	0.46	0.92	780	2.35%	21.5	4.05	780	2.31%	10	5.15	**2.2**	**5.5**	**3.3**	(2) Dry Wells, Subsurface Drain (L=200 l.f.)	5.5	4.6	**0.9**
12	Aholo St. Ext.	0.5	0.48	0.81	100	3.33%	11.5	5	500	2.60%	10	5.15	**1.3**	**2.2**	**0.9**	(2) Dry Wells	2.2	1.0	**1.2**

OFFSITE

Drainage Area No.	Area	Runoff Coeff't	Longest Run	Elevation Difference	Slope	Tc	Intensity	**Q(peak)**	Discharge Point
13	6.1	0.20	500	14	2.80%	17.5	4.4	**5.3**	Detention Basin No. 1
14	3.8	0.20	285	12	4.21%	12.5	4.9	**3.7**	Culvert No. 1
15	4.6	0.20	234	9	3.85%	12	4.95	**4.5**	Culvert No. 2
16	6.8	0.56	350	15	4.29%	18	4.35	**16.6**	Culvert No. 3
17	25.6	0.20	1150	46	4.00%	22.5	3.99	**20.4**	Culvert No. 4
18	20.8	0.20	831	43	5.17%	19	4.25	**17.7**	Culvert No. 5
19	7.1	0.20	902	28	3.10%	21	4.09	**5.8**	Culvert No. 6 & 7
20	25.1	0.20	1600	32	2.00%	28	3.63	**18.3**	Culvert No. 8
21	4.7	0.38	550	12	2.18%	20	4.15	**7.2**	Culvert No. 9
22	23.8	0.55	2200	106	4.82%	22	4.02	**52.6**	Lahainaluna Road
23	8.0	0.55	1700	67	3.94%	14	4.75	**21.0**	Lahainaluna Road
24	17.1	0.55	1400	60	4.29%	15	4.65	**43.6**	Kahoma Stream

* Above component runoff values are conservative, not intended to be added, and is used solely for conservatively sizing the respective mitigative measures.

APPENDIX C

PRELIMINARY DETENTION BASIN AND SUBSURFACE DRAINAGE STORAGE SYSTEM ESTIMATION CALCULATIONS

MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID IDF Storms

Return Event	Rainfall Type	IDF ID
10	I-D-F Curve	Lahaina 50yr-1hr

MASTER NETWORK SUMMARY
Rational Method -- q/Qp

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID		Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*OUT 10		JCT	50	.000		.0500	.00		
POND 10	IN	POND	50	1.404		.9000	17.21		
POND 10	OUT	POND	50	.000		.0500	.00	4.67	1.404
SUBAREA 10		AREA	50	1.404		.9000	17.21		

BASIN NO. 1
V = 1.5 ac.-ft. Basin retains 100% of runoff

Q(out) = 0 cfs Riser outlet = 5.0 ft.
Q(pre) = 3.15 cfs

RATIONAL METHOD HYDROGRAPH USING Q/Qp TEMPLATE
Q/Qp Template File/ID: Q/Qp1

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

Tag	Freq	File	IDF Curve
10	50		Lahaina 50yr-1hr

Tc = .3000 hrs

Tag	Freq (years)	C	C adj factor	C final	I in/hr	Area acres	Peak Q cfs
10	50	.420	1.000	.420	4.3289	9.390	17.21

HYG file =
HYG ID = SUBAREA 10
HYG Tag = 10

Peak Discharge = 17.21 cfs
Time to Peak = .9000 hrs
HYG Volume = 1.404 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
.0000	.00	.60	1.21	1.81	2.41
.2500	3.01	3.62	3.87	4.13	4.39
.5000	4.65	4.91	5.16	7.17	9.18
.7500	11.19	13.20	15.21	17.21	15.89
1.0000	14.58	13.26	11.94	10.62	9.30
1.2500	8.87	8.44	8.00	7.57	7.14
1.5000	6.71	6.31	5.91	5.51	5.11
1.7500	4.71	4.30	4.10	3.90	3.70
2.0000	3.50	3.30	3.10	3.01	2.93
2.2500	2.84	2.75	2.67	2.58	2.55
2.5000	2.52	2.50	2.47	2.44	2.41
2.7500	2.38	2.35	2.32	2.30	2.27
3.0000	2.24	1.86	1.49	1.12	.75

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs			
3.2500	.37	.00	.00

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
.00	-----	.2500	.0000	.000	.000
2.00	-----	.3000	.8239	.549	.549
4.00	-----	.3300	.9446	.630	1.179
5.00	-----	.3500	1.0199	.340	1.519

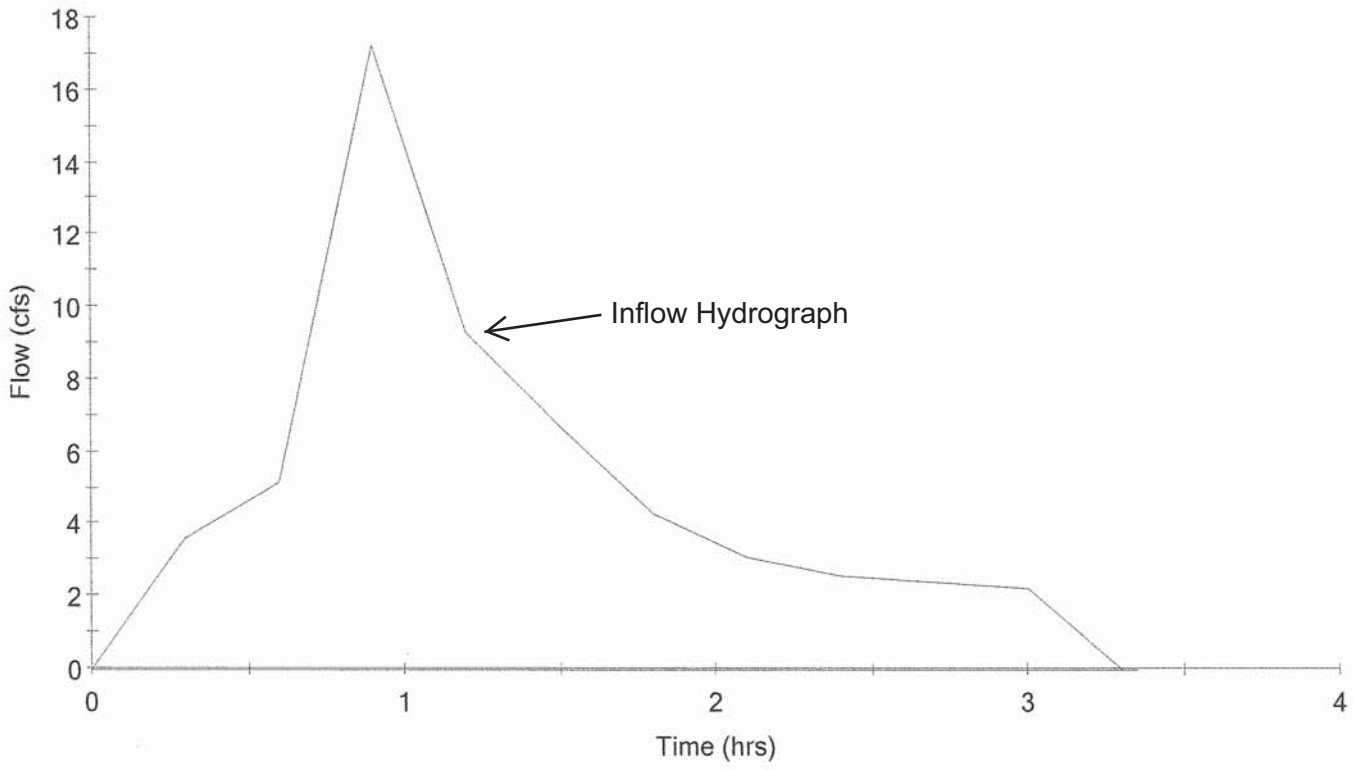
POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Hydrograph
SUBAREA 10 10



MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID IDF Storms

Return Event	Rainfall Type	IDF ID
10	I-D-F Curve	Lahaina 50yr-1hr

MASTER NETWORK SUMMARY
Rational Method -- q/Qp

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID		Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*OUT 10		JCT	50	.131		1.3000	2.03		
POND 10	IN	POND	50	.521		.6000	9.57		
POND 10	OUT	POND	50	.131		1.3000	2.03	4.12	.403
SUBAREA 10		AREA	50	.521		.6000	9.57		

<u>BASIN NO. 2</u>
V = 0.5 ac.-ft. Riser outlet el. = 4.0 ft.

Q(out) = 2.0 cfs
Q(pre) = 2.7 cfs

RATIONAL METHOD HYDROGRAPH USING Q/Qp TEMPLATE
Q/Qp Template File/ID: Q/Qp1

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

Tag	Freq	File	IDF Curve
10	50		Lahaina 50yr-1hr

Tc = .2000 hrs

Tag	Freq (years)	C	C adj factor	C final	I in/hr	Area acres	Peak Q cfs
10	50	.770	1.000	.770	4.9313	2.500	9.57

HYG file =
HYG ID = SUBAREA 10
HYG Tag = 10

Peak Discharge = 9.57 cfs
Time to Peak = .6000 hrs
HYG Volume = .521 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
.0000	.00	.50	1.01	1.51	2.01
.2500	2.23	2.44	2.66	2.87	4.55
.5000	6.22	7.90	9.57	8.47	7.37
.7500	6.27	5.17	4.81	4.45	4.09
1.0000	3.73	3.40	3.06	2.73	2.39
1.2500	2.23	2.06	1.89	1.72	1.65
1.5000	1.58	1.51	1.44	1.41	1.39
1.7500	1.36	1.34	1.32	1.29	1.27
2.0000	1.24	.93	.62	.31	.00
2.2500	.00				

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
.00	-----	.0800	.0000	.000	.000
2.00	-----	.1000	.2694	.180	.180
4.00	-----	.1100	.3149	.210	.390
5.00	-----	.1200	.3449	.115	.505

POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

LEVEL POOL ROUTING SUMMARY

```
HYG Dir          = V:\Projdata\06proj\06031.20 - Pioneer Mill - Mill St. Ext\Calcs\draina
Inflow  HYG file = NONE STORED - POND 10      IN  10
Outflow HYG file = NONE STORED - POND 10      OUT 10

Pond Node   Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS
----------------------------------
Starting WS Elev   =      .00 ft
Starting Volume    =     .000 ac-ft
Starting Outflow   =      .00 cfs
Starting Infiltr.  =      .00 cfs
Starting Total Qout=      .00 cfs
Time Increment     =    .0500 hrs


INFLOW/OUTFLOW HYDROGRAPH SUMMARY
=====================================================
Peak Inflow       =      9.57 cfs    at     .6000 hrs
Peak Outflow      =      2.03 cfs    at    1.3000 hrs
-----------------------------------------------------
Peak Elevation    =      4.12 ft
Peak Storage =           .403 ac-ft
=====================================================


MASS BALANCE (ac-ft)
--------------------------
+ Initial Vol  =        .000
+ HYG Vol IN   =        .521
- Infiltration =        .000
- HYG Vol OUT  =        .131
- Retained Vol =        .390
                   ----------
Unrouted Vol =       -.000 ac-ft  (.000% of Inflow Volume)
```

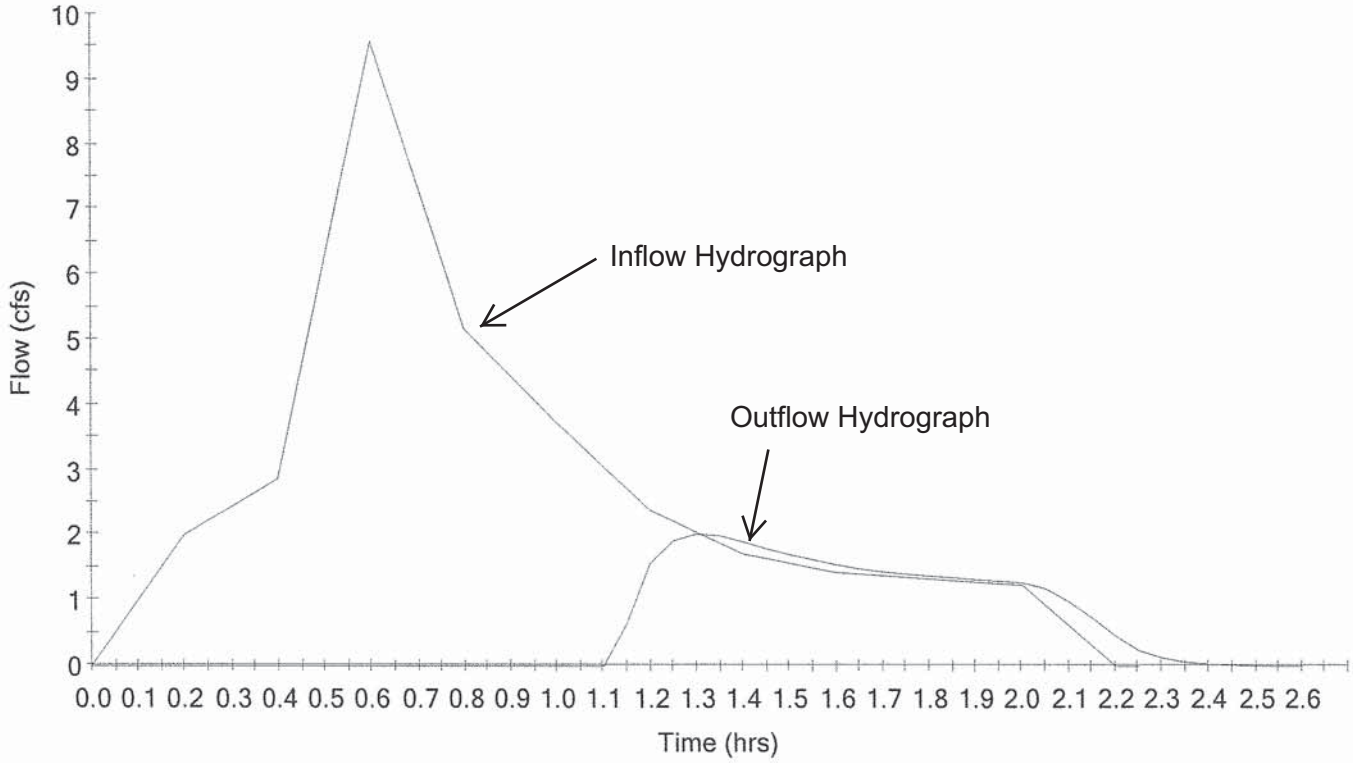
POND ROUTED TOTAL OUTFLOW HYG...
HYG file =
HYG ID = POND 10 OUT
HYG Tag = 10

Peak Discharge = 2.03 cfs
Time to Peak = 1.3000 hrs
HYG Volume = .131 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
.0000	.00	.00	.00	.00	.00
.2500	.00	.00	.00	.00	.00
.5000	.00	.00	.00	.00	.00
.7500	.00	.00	.00	.00	.00
1.0000	.00	.00	.00	.66	1.57
1.2500	1.92	2.03	2.00	1.91	1.80
1.5000	1.71	1.63	1.56	1.49	1.45
1.7500	1.41	1.38	1.36	1.33	1.31
2.0000	1.28	1.19	.99	.74	.46
2.2500	.24	.13	.07	.03	.02
2.5000	.01	.00	.00		

Hydrograph
SUBAREA 10 10



MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID IDF Storms

Return Event	Rainfall Type	IDF ID
10	I-D-F Curve	Lahaina 50yr-1hr

MASTER NETWORK SUMMARY
Rational Method -- q/Qp

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID		Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*OUT 10		JCT	50	.000		.0500	.00		
POND 10	IN	POND	50	.648		.7500	9.54		
POND 10	OUT	POND	50	.000		.0500	.00	4.38	.648
SUBAREA 10		AREA	50	.648		.7500	9.54		

<u>BASIN NO. 3</u>
V = 0.75 ac.-ft. Basin retains 100% of runoff

Q(out) = 0 cfs Riser outlet el. = 4.5 ft.
Q(pre) = 1.1 cfs

RATIONAL METHOD HYDROGRAPH USING Q/Qp TEMPLATE
Q/Qp Template File/ID: Q/Qp1

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

Tag	Freq	File	IDF Curve
10	50		Lahaina 50yr-1hr

Tc = .2500 hrs

Tag	Freq (years)	C	C adj factor	C final	I in/hr	Area acres	Peak Q cfs
10	50	.770	1.000	.770	4.6000	2.670	9.54

HYG file =
HYG ID = SUBAREA 10
HYG Tag = 10

Peak Discharge = 9.54 cfs
Time to Peak = .7500 hrs
HYG Volume = .648 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
.0000	.00	.40	.80	1.20	1.60
.2500	2.00	2.17	2.35	2.52	2.69
.5000	2.86	4.20	5.53	6.87	8.20
.7500	9.54	8.66	7.78	6.90	6.03
1.0000	5.15	4.86	4.58	4.29	4.01
1.2500	3.72	3.45	3.19	2.92	2.65
1.5000	2.38	2.25	2.12	1.98	1.85
1.7500	1.72	1.66	1.60	1.54	1.49
2.0000	1.43	1.41	1.39	1.37	1.35
2.2500	1.34	1.32	1.30	1.28	1.26
2.5000	1.24	.99	.74	.50	.25
2.7500	.00				

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
.00	-----	.1300	.0000	.000	.000
2.00	-----	.1450	.4123	.275	.275
4.00	-----	.1650	.4647	.310	.585
5.00	-----	.1700	.5025	.167	.752

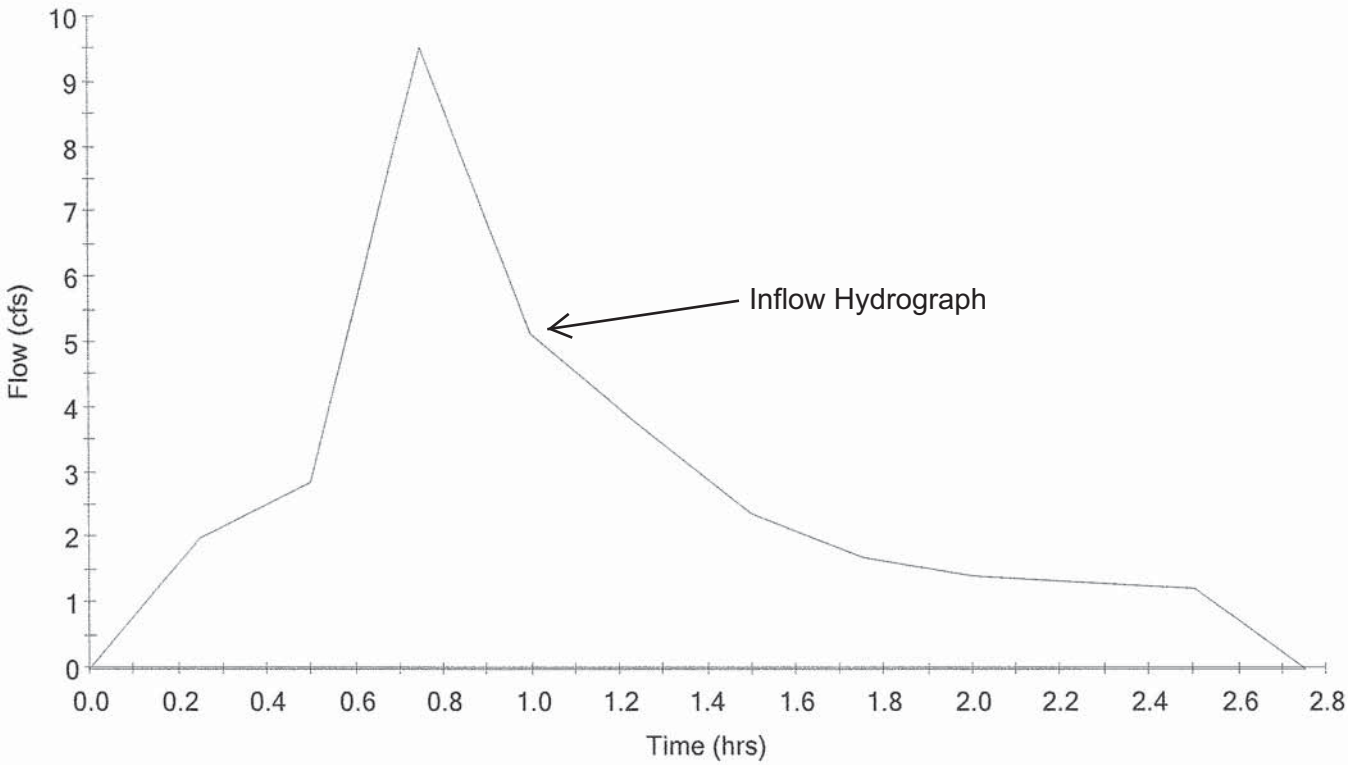
POND VOLUME EQUATIONS

* Incremental volume computed by the Conic Method for Reservoir Volumes.

Volume = (1/3) * (EL2-EL1) * (Area1 + Area2 + sq.rt.(Area1*Area2))

where: EL1, EL2 = Lower and upper elevations of the increment
Area1,Area2 = Areas computed for EL1, EL2, respectively
Volume = Incremental volume between EL1 and EL2

Hydrograph
SUBAREA 10 10



MASTER DESIGN STORM SUMMARY

Default Network Design Storm File, ID IDF Storms

Return Event	Rainfall Type	IDF ID
50	I-D-F Curve	Lahaina 50yr-1hr

MASTER NETWORK SUMMARY
Rational Method -- q/Qp

(*Node=Outfall; +Node=Diversion;)
(Trun= HYG Truncation: Blank=None; L=Left; R=Rt; LR=Left&Rt)

Node ID		Type	Return Event	HYG Vol ac-ft	Trun	Qpeak hrs	Qpeak cfs	Max WSEL ft	Max Pond Storage ac-ft
*OUT 10		JCT	50	.037		1.4500	.59		
POND 10	IN	POND	50	.194		.5000	4.24		
POND 10	OUT	POND	50	.037		1.4500	.59	7.50	.167
SUBAREA 10		AREA	50	.194		.5010	4.26		

<u>200 L.F. SUBSURFACE DRAIN (72" PIPE)</u>
Crushed Rock Inv.= 0 ft.
Pipe Inv. = 2.0 ft.
12" Outlet Pipe Inv. = 7.0 ft.

Inflow Hydrograph Based On:
Area = 1.0 ac.
Tc = 10 min.
C = 0.82

Q(in) - Q(out) = 4.2 cfs - 0.6 cfs = 3.6 cfs

APPROX. 3.6 cfs REDUCTION IN PEAK RUNOFF PER 200 l.f. OF SUBSURFACE DRAIN

RATIONAL METHOD HYDROGRAPH USING Q/Qp TEMPLATE
Q/Qp Template File/ID: Q/Qp1

Q = CiA * Units Conversion; Where Conversion = 43560 / (12 * 3600)

Tag	Freq	File	IDF Curve
50	50		Lahaina 50yr-1hr

Tc = .1670 hrs

Tag	Freq (years)	C	C adj factor	C final	I in/hr	Area acres	Peak Q cfs
50	50	.820	1.000	.820	5.1500	1.000	4.26

HYG file =
HYG ID = SUBAREA 10
HYG Tag = 50

Peak Discharge = 4.26 cfs
Time to Peak = .5010 hrs
HYG Volume = .194 ac-ft

HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
.0010	.01	.27	.54	.81	.97
.2510	1.09	1.20	1.58	2.47	3.37
.5010	4.26	3.67	3.09	2.50	2.17
.7510	1.98	1.79	1.60	1.43	1.25
1.0010	1.07	.98	.89	.80	.74
1.2510	.70	.67	.63	.62	.61
1.5010	.60	.58	.57	.56	.45
1.7510	.29	.12	.00		

LEVEL POOL ROUTING SUMMARY

```
HYG Dir          = C:\Documents and Settings\dtakahashi\My Documents\pondpack data\
Inflow  HYG file = NONE STORED - POND 10      IN  50
Outflow HYG file = NONE STORED - POND 10      OUT 50

Pond Node   Data = POND 10
Pond Volume Data = POND 10
Pond Outlet Data = Outlet 1

No Infiltration

INITIAL CONDITIONS
----------------------------------
Starting WS Elev   =      .00 ft
Starting Volume    =     .000 ac-ft
Starting Outflow   =      .00 cfs
Starting Infiltr.  =      .00 cfs
Starting Total Qout=      .00 cfs
Time Increment     =    .0500 hrs


INFLOW/OUTFLOW HYDROGRAPH SUMMARY
=====================================================
Peak Inflow       =      4.24 cfs    at     .5000 hrs
Peak Outflow      =       .60 cfs    at    1.4500 hrs
-----------------------------------------------------
Peak Elevation    =      7.50 ft
Peak Storage =           .167 ac-ft
=====================================================


MASS BALANCE (ac-ft)
--------------------------
+ Initial Vol  =        .000
+ HYG Vol IN   =        .194
- Infiltration =        .000
- HYG Vol OUT  =        .037
- Retained Vol =        .157
                 ----------
Unrouted Vol =        .000 ac-ft  (.000% of Inflow Volume)
```

```
DIVERTED HYDROGRAPH...
HYG file =
HYG ID   = ROUTE 10
HYG Tag  = 50
-----------------------------------
Peak Discharge =          .59 cfs
Time to Peak   =       1.4500 hrs
HYG Volume     =         .037 ac-ft
-----------------------------------
```

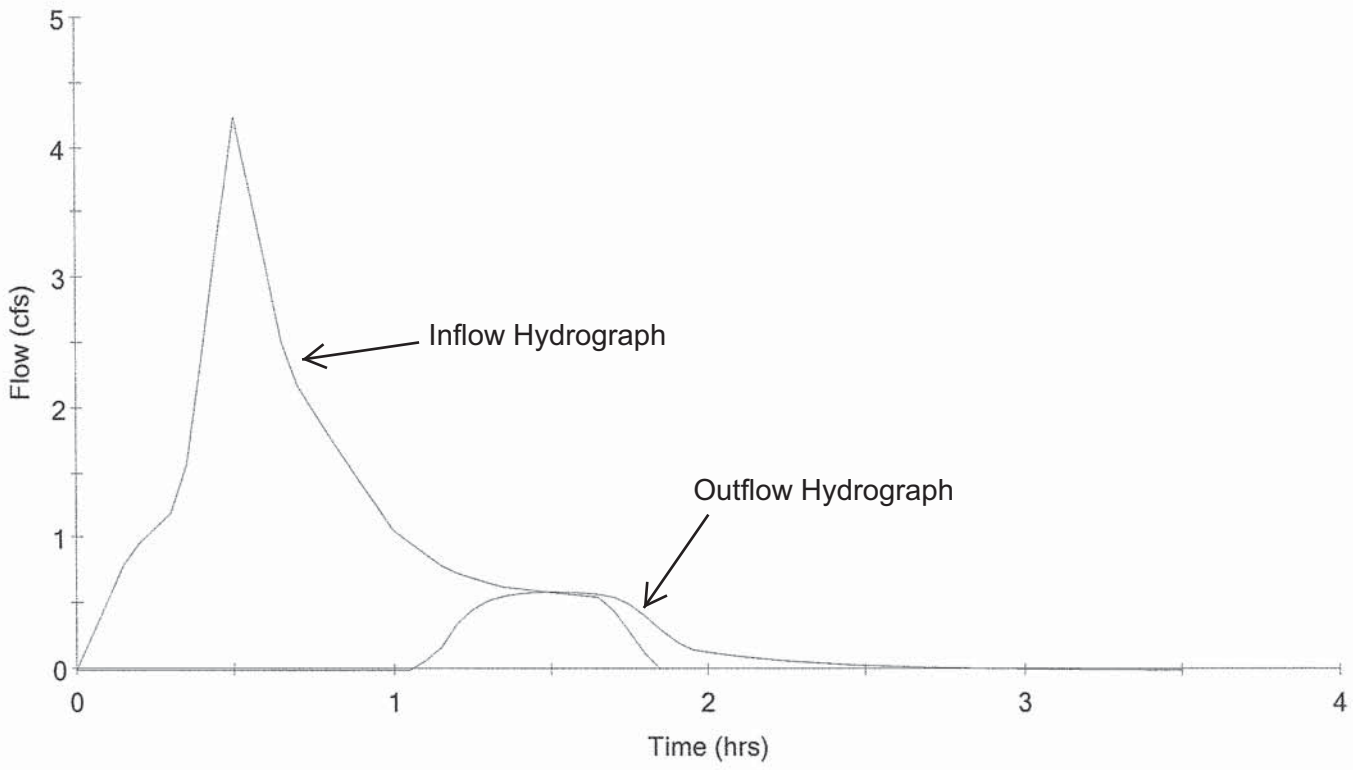
HYDROGRAPH ORDINATES (cfs)
Output Time increment = .0500 hrs
Time on left represents time for first value in each row.

Time hrs					
1.0500	.00	.07	.17	.35	.46
1.3000	.53	.57	.59	.59	.60
1.5500	.60	.59	.58	.56	.50
1.8000	.41	.31	.21	.16	.14
2.0500	.12	.11	.09	.08	.07
2.3000	.06	.06	.05	.04	.04
2.5500	.03	.03	.03	.02	.02
2.8000	.02	.02	.01	.01	.01
3.0500	.01	.01	.01	.01	.01
3.3000	.00	.00	.00	.00	.00

USER DEFINED VOLUME RATING TABLE

Elevation (ft)	Volume (ac-ft)
.00	.000
2.00	.018
3.00	.039
4.00	.067
5.00	.098
6.00	.129
7.00	.157
8.00	.177
9.00	.187

Hydrograph
POND 10 OUT 50



APPENDIX C: Traffic Impact Analysis Report

TRAFFIC IMPACT ANALYSIS REPORT
KUHUA STREET EXTENSION
LAHAINA, MAUI, HAWAII

October 5, 2012

Prepared for:

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TRAFFIC IMPACT ANALYSIS REPORT
KUHUA STREET EXTENSION

Lahaina, Maui, Hawaii

Prepared for

Warren S. Unemori Engineering, Inc.

Prepared by
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October 5, 2012

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TRAFFIC IMPACT ANALYSIS REPORT

KUHUA STREET EXTENSION

Lahaina, Maui, Hawaii

I. INTRODUCTION

This report documents the findings of a traffic study conducted by Austin, Tsutsumi, and Associates, Inc. (ATA) to evaluate the potential traffic impacts resulting from the Kuhua Street Extension (KSE).

The KSE will provide a new two-lane north-south road, parallel and to the east of Honoapiilani Highway that will begin in the vicinity of Front Street (southern terminus) and continue to its northern terminus at Keawe Street.

It is also proposed that Papalaua Street be extended from its existing eastern terminus at Honoapiilani Highway to connect with the KSE across of Aki Street. This extension will provide additional connectivity between Honoapiilani Highway and the KSE, while relieving congestion at the intersection of Honoapiilani Highway and Lahainaluna Road. See Figure 1 for the proposed KSE and Papalaua Street Extension alignments.

In addition to significantly improving vehicular circulation and corridor capacity, the KSE will also incorporate a landscaped multi-use pedestrian and bicycle path, which will also provide opportunities for a pedestrian-friendly linear path as well as an attractive pedestrian- and bicycle-friendly connection to downtown Lahaina and Front Street via the extension of Papalaua Street.

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Herein, four (4) alternative alignments will be studied (see Figure 1):

Alternative 1 – Front Street Terminus (KSE-A1):

The KSE begins at the Honoapiilani Highway/Front Street (southern) intersection, and continues northward around the Lahaina Recreation Center; it intersects with Lahainaluna Road west of the Existing MECO power substation, deflects eastward and continues along the existing Kuhua Street, and finally terminates at its intersection with Keawe Street across of the future access to the proposed Hawaii Housing Finance and Development Corporation (HHFDC) Villages of Leialii.

Alternative 2 – Aholo Road Terminus (KSE-A2):

Alternative 2 would be identical to Alternative 1, but with the southernmost terminus at Aholo Road instead of Front Street. A connection to Honoapiilani Highway in the vicinity of Front Street will still be available for northbound traffic only.

Alternative 3 – Mill Street Alignment (KSE-A3):

The alignment would be identical to that of Alternatives 1 and 2, but with the KSE shifted westward to follow the existing cane haul alignment of Mill Street. This alignment would bifurcate the existing Lahaina Recreation Center, crossing between the two (2) parking areas for the east and west baseball fields and recreation areas.

Alternative 4 – Frontage Road Alignment (KSE-A4):

This alignment would be identical to Alternative 1, but with the KSE shifted slightly westward in the vicinity of the Pioneer Mill site to maintain the existing Kuhua Street as a parallel frontage road (hereinafter referred to as “Old Kuhua Street”). Old Kuhua Street is assumed to retain its existing physical characteristics, while receiving access to the KSE via an extension of Aki Street; it will become a dead end at Lahainaluna Road.

In all the aforementioned alternatives, KSE is planned as a two-lane roadway with median left-turn lanes at its intersections and will have seven (7) connections to Honoapiilani Highway via its intersections with:

- Front Street
- Aholo Road
- Shaw Street
- Dickenson Street
- Lahainaluna Road
- Papalaua Street/Aki Street
- Keawe Street

In addition to enhancing local circulation throughout the Lahaina area, the KSE will also provide access to future developments and serve as an alternate route to Honoapiilani Highway. Throughout this report, the KSE shall also interchangeably be referred to as the "Project."

A. Background and Location

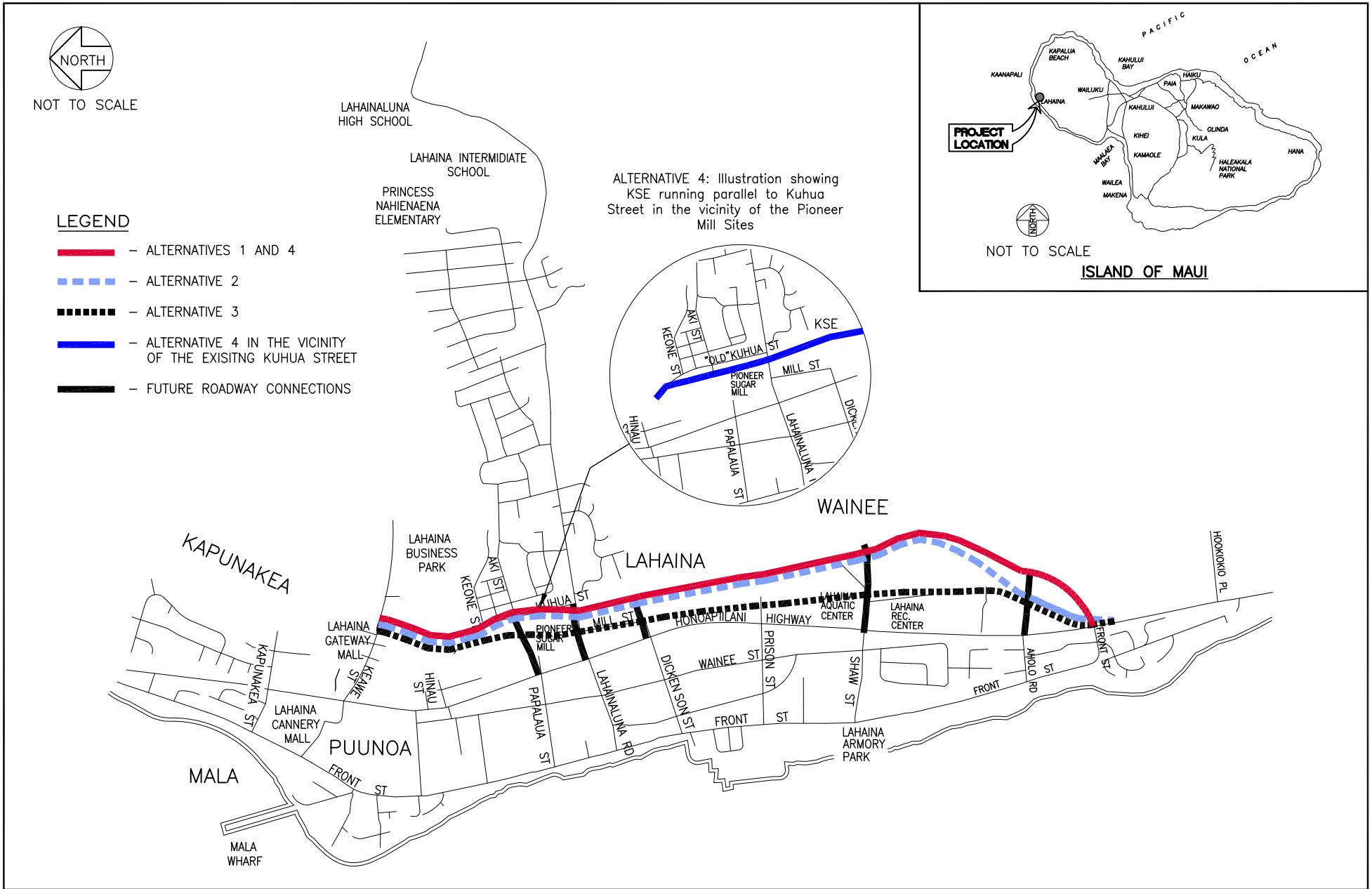
This Project is located in Lahaina, Maui, Hawaii, to the east of Honoapiilani Highway and between Front Street's southern terminus and Keawe Street.

See Figure 1 for Project Location and plan.

B. Study Methodology

This study will address the following:

1. Assess existing traffic operating conditions at key locations within the study area.
2. Project Base Year 2020 traffic (without improvements) including traffic generated by the Maui Travel Demand Forecasting Model (MTDFM)
3. Identify planned improvements and potential traffic mitigative measures for the Base Year 2020 Traffic.
4. Reassign traffic with the new and improved roadways proposed in the Project.
5. Recommend roadway improvements or other mitigative measures, as appropriate when the KSE, Alternatives 1 and 2 are considered.



KUHUA STREET EXTENSION

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

FIGURE 1

PROJECT LOCATION AND LAYOUT

C. Definitions

- **Base Year 2020** – describes the scenario where vehicular traffic volumes for the year 2020 are projected without the improvements proposed by the Project.
- **High, or Heavy Turning Movement Volume –** a subjective term that for this report, shall be used to describe conditions where the turning movement volume forms a significant component of the traffic processed through the intersection, and noticeably reduces capacity along the main arterial. This term can apply to a single heavy turning movement, or the collective effect of all turning movements.
- **Level-of-Service (LOS)** – as based on The Highway Capacity Manual – Special Report 209 (HCM), dated 2000, LOS is a qualitative measure used to describe the conditions of traffic flow at intersections. Values range from LOS A (minimal delay) to LOS F (congested).
- **Trips** – for the purposes of this report, vehicular trips traversing the roadway network. Note that this term can also signify other modes of transportation, however vehicular trips will be the only trips considered in this report.

II. EXISTING CONDITIONS

A. Roadway System

Honoapiilani Highway

Honoapiilani Highway is a north-south, two-way, two-lane, undivided roadway between Aholo Road[1] and the Project limit to the south. North of Aholo Road, Honoapiilani Highway widens to become a two-way, four-lane, divided roadway. North of Dickenson Street, Honoapiilani highway becomes undivided. Regionally, Honoapiilani Highway begins in Central Maui and runs southward

[1] Note: At the time of field observations and data collection, the recent widening of Honoapiilani Highway had not been completed; therefore, existing conditions are described as they were in 2008.

wrapping around the Lahaina "Pali" and through West Maui before terminating at its junction with Kahekili Highway to the north-west side of the island.

Keawe Street

Keawe Street is an east-west, two-way, four-lane, roadway. To the east of Honoapiilani Highway, Keawe Street provides access to the Lahaina Gateway Mall via two (2) driveways and the Lahaina Business Park where it terminates. Ultimately, Keawe Street will also provide access to the HHFDC Villages of Leialii and will be extended eastward to provide access to the Lahaina Bypass Road. To the west of Honoapiilani Highway, it is a driveway into the Lahaina Cannery Mall.

Hinau Street

Hinau Street is an east-west, two-way, two-lane, undivided roadway providing access to the Wiliko Light Industrial Subdivision, residences, the Opukea multi-family residential development (condo), and the Lahaina Sugar Train's southern terminus.

Papalaua Street

Papalaua Street is an east-west, two-way, two-lane, undivided roadway. To the east of Honoapiilani Highway, Papalaua Street provides access to the Prudential Site and the West Maui Center. To the west of Honoapiilani Highway, the roadway extends to an oceanfront section of Front Street and provides access to various businesses with wide landscaped shoulders and sidewalks on the north side of the street.

Lahainaluna Road

Lahainaluna Road is an east-west, two-way, two-lane, undivided roadway. To the east of Honoapiilani Highway, Lahainaluna Road runs approximately 7,300 feet providing access to a large residential area and the three main schools of West Maui: Princess Nahienaena Elementary, Lahaina Intermediate School and Lahainaluna High School. To the west, Lahainaluna Road is relatively narrow with vehicles parked along both sides of it and provides access to businesses before terminating at its intersection with Front Street.

Dickenson Street

Dickenson Street is a narrow east-west, two-way, two-lane roadway. To the east, Dickenson Street is a short roadway providing access to a gas station before connecting with Mill Street approximately 150 feet from Honoapiilani Highway. To the west, Dickenson Street provides access to the Hawaii Catholic School and various businesses before terminating at its intersection with Front Street.

Shaw Street

Shaw Street is a narrow east-west, two-way, two-lane, undivided roadway. To the east of Honoapiilani Highway, Shaw Street provides access to the Lahaina Aquatic Center, the Lahaina Youth Center and Ball Field, Lahaina Resource Center and the Lahaina Recreation Center Park. To the west, it provides access to the Hawaii Baptist Church, the Malu Ulu O Lele Park and some businesses and residences before terminating at its intersection with Front Street.

Aholo Road

Aholo Road is an east-west, two-way, two-lane roadway. To the east and west, Aholo Road provides access to residences and terminates at its intersection with Front Street to the west.

Front Street

Front Street is a north-south, two-way, two-lane roadway. It starts to the south at its intersection with Honoapiilani Highway and terminates approximately 2.5 miles north at its intersection with Honoapiilani Highway.

Mill Street

Mill Street is a north-south, two-way, two-lane, undivided roadway that provides access to residents and also serves as a defacto bypass of the Honoapiilani Highway/Lahainaluna Road intersection.

Kuhua Street

Kuhua Street is a north-south, two-way, two-lane, undivided roadway. This roadway begins at its intersection with Lahainaluna Road, runs northward and terminates in the vicinity of Keone Street. This roadway provides access to a couple of auto shops and to residences via Aki Street, Kamamalu Street and the various driveways connected to it. In addition to the various driveways, the roadway is narrowed due to cars parked on either side of the roadway.

Aki Street

Aki Street is an east-west, two-way, two-lane roadway providing access to residences. Similar to other roadways servicing the area, the road is narrow with vehicles parked on the side of the road.

B. Existing Traffic Volumes

Manual turning movement traffic counts and field observations were conducted at the following study intersections on February 5th, 6th, and 7th, 2008. These counts were deemed conservative since they were taken prior to the 2008 economic decline. A comparative count taken on October 21, 2009 at the intersection of Keawe Street/Honoapiilani Highway showed an overall decrease of 30 percent on the through movement along the highway. Another count conducted at the intersection of Front Street/Honoapiilani Highway (south of Aholo Road) on January 27th, 2010, showed that the traffic volume along Honoapiilani Highway was similar or slightly lower than the 2008 counts. Therefore, it was considered more conservative to use the 2008 counts rather than the depressed counts which would have been obtained in 2009. See below for study intersections:

- Front Street/Honoapiilani Highway (Unsignalized)
- Aholo Road/Honoapiilani Highway (Unsignalized)
- Shaw Street/Honoapiilani Highway (Signalized)
- Dickenson Street/Honoapiilani Highway (Signalized)
- Lahainaluna Road/Honoapiilani Highway (Signalized)
- Papalaua Street/Honoapiilani Highway (Signalized)

- Hinau Street/Honoapiilani Highway (Signalized)
- Keawe Street/Honoapiilani Highway (Signalized)
- Kuhua Street/Lahainaluna Road (Unsignalized)
- Aki Street/Kuhua Street (Unsignalized)
- Lahaina Gateway Mall driveways

Based on the count data, it was determined that the weekday AM peak hour of traffic occurs between 7:00 AM and 8:00 AM and the weekday PM peak hour of traffic occurs between 3:30 PM and 4:30 PM. The turning movement count data is included in Appendix A.

C. Existing Traffic Conditions

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 – Special Report 209 (HCM), dated 2000, methods for calculating volume to capacity ratios, delays and corresponding Levels of Service were utilized in this study. LOS definitions for signalized and unsignalized intersections are provided in Appendix B.

Methodology

Analysis for the study intersections was performed using Synchro and RODEL. Synchro is an analysis program that is capable of preparing reports consistent with the methodologies prescribed by the HCM. These reports contain control delay results, based on intersection lane geometry, signal timing inputs, and hourly traffic volume.

RODEL is a British program designed for estimating operating conditions at roundabouts. This program estimates delay based upon empirical correlations with geometric factors.

Both programs assign a LOS based on delay (see Appendix B) as a qualitative measure of performance. These results, as confirmed or refined by field observations, constitute the technical analysis that will form the basis for the recommendations outlined in this report.

Regional Analysis

The analysis and observations described below are based on prevailing conditions during the time at which the data was collected. Hereinafter, observations that are expressed as ongoing and current shall represent the conditions that prevailed at the time at which the data was collected.

West Maui is a “mixed bag” of various land uses, ranging from the long-established residential and commercial areas of Historic Lahaina, to the hotel, timeshare, and upscale residential land uses seen in Kaanapali and Kapalua.

Regional traffic throughout West Maui is primarily served by Honoapiilani Highway, and to a lesser extent Front Street and Lower Honoapiilani Road. While traffic was generally observed to be light north of Kaanapali Parkway, the Wahikuli and Lahaina Areas experienced congestion.

Lahainaluna Road

On a more local level, Lahainaluna Road experiences heavy congestion due to its narrow roadway widths and sole provision of access to Lahaina residents and:

- Lahainaluna High School
- Lahaina Intermediate School
- Princess Nahienaena Elementary School.

These are three (3) of the four (4) existing public schools within West Maui.

In this area, congestion is heaviest during the AM peak hour when schools are in-session. During this period, the southbound left-turn from and westbound approach onto Honoapiilani Highway in general experiences severe overcapacity conditions; during the busiest 30 minutes, the queue from the westbound approach was observed to extend to near Hookuhua Street, approximately 1.1 miles.

Front Street

Front Street primarily serves the tourist population and Wainee residents, as hotels, stores, and restaurants front the historic street. Its traffic is generally slow-moving throughout the day as a result of:

- Heavy pedestrian traffic,
- Numerous parking maneuvers, and
- Narrow pavement widths

Therefore, it is not likely used as a bypass of Honoapiilani Highway; this is evidenced by the relatively low turning movement volume at the southern Honoapiilani Highway/Front Street intersection.

Keawe Street

Subsequent to the development of the Lahaina Gateway Mall and Walgreens, traffic has increased significantly along this road, causing difficulty in making the westbound left-turn onto Honoapiilani Highway[2].

Observations and Intersection Analysis

Front Street/Honoapiilani Highway

This unsignalized "tee" intersection was analyzed to operate at LOS C(C) or better on all its movements during the AM(PM) peak hours of traffic except on its eastbound approach during the (PM) peak hour of traffic, which operated at LOS (E). The eastbound approach was observed to service 37(74) vehicles during the AM(PM) peak hours of traffic of which 5(3) were left-turn movements. See Figure 2 for the intersection lane configuration.

[2] Recent improvements made after the data collection has likely improved the westbound left-turn delay.

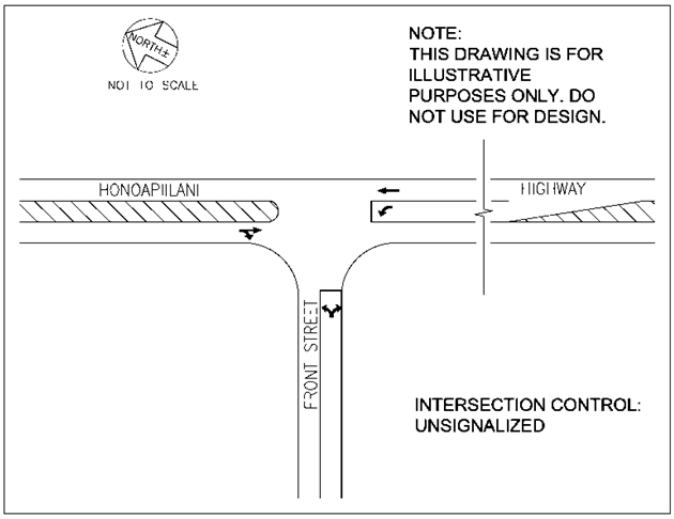


Figure 2: Existing Lane Configuration at Front Street/Honoapiilani

Aholo Road/Honoapiilani Highway

This unsignalized intersection was analyzed to operate at LOS D or better on all of its movements except the eastbound approach which was analyzed to operate at LOS F(E) during the AM(PM) peak hours of traffic. However, when the counts were taken, queuing was observed to occur in the northbound and southbound direction during the AM(PM) peak hours of traffic. The back of queue was observed to extend beyond Aholo Road in the northbound direction and in the southbound direction as far as Lahainaluna Road.

An existing driveway road provides sole access to some residences situated along it. Residents have complained that at times, it is difficult to gain access to Aholo Road. See Figure 3 for the intersection layout.

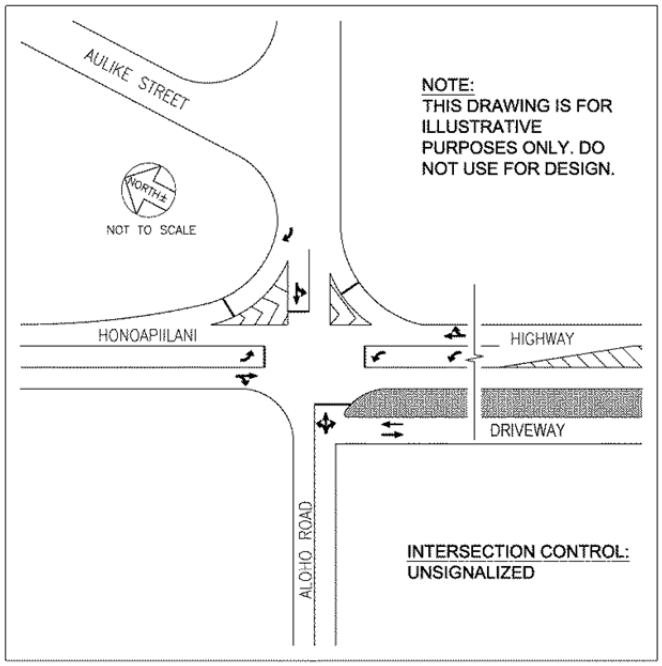


Figure 3: Existing Lane Configuration at Aholo Road/Honoapiilani Highway

Shaw Street/Honoapiilani Highway

This intersection provides access to The Lahaina Recreation Center to the east and Front Street to the west. Although the analysis shows the intersection operating at LOS B during the AM and (PM) peak hours of traffic, it was observed that the through movement along Honoapiilani Highway in the northbound and southbound directions had queues extending beyond Front Street in the northbound direction and beyond Lahainaluna Road in the southbound direction. The side street operated at LOS E or better during both peak hours of traffic. See Figure 4 for the intersection lane configuration.

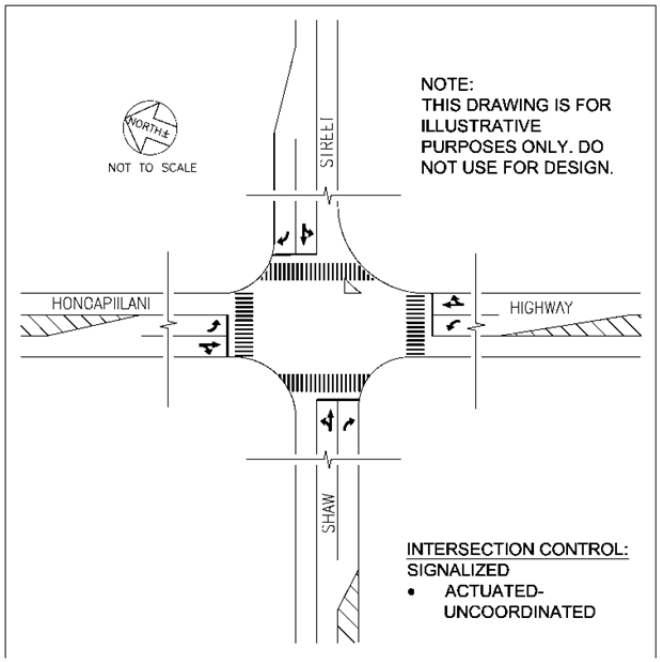


Figure 4: Existing Lane Configuration at Shaw Street/Honoapiilani Highway

Dickenson Street/Honoapiilani Highway

Similar to the intersection of Shaw Street/Honoapiilani Highway the northbound through movements along Honoapiilani Highway queue to beyond Aholo Road and to near Lahainaluna Road in the southbound direction. The side street and left-turn movements on the major approaches experience delay of LOS E during both peak hours of traffic. See Figure 5 for the intersection lane configuration.

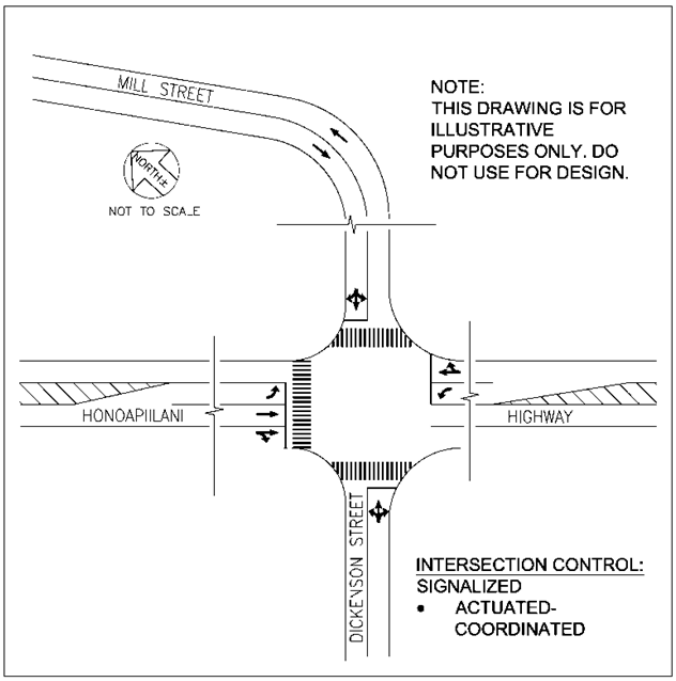


Figure 5: Existing Lane Configuration at Dickenson Street/Honoapiilani Highway

Lahainaluna Road/Honoapiilani Highway

During the AM peak hour of traffic, some of the intersection movements operate at LOS F[3] and overcapacity conditions. Although the analysis shows the northbound shared through/right-turn movements operating at LOS C or better, queues were observed to extend beyond Aholo Road during the AM peak hour of traffic. The long delays experienced at this intersection are due to the fact that

[3] The analysis was modified for the westbound approach to represent conditions observed during the AM peak hour of traffic.

Lahainaluna Road provides sole access to three (3) major schools and the residences in that area. As a result, the Lahainaluna Road/Honoapiilani Highway intersection and Lahainaluna Road in general, experiences significant congestion during the AM peak hour of traffic. The congestion was observed to occur within a 20 to 30-minute period during the AM peak hour of traffic which corresponds with parents dropping off children, causing the majority of the peak hour volume along Lahainaluna Road to be concentrated within that time period. During this congested period, the southbound left-turn traffic was observed to queue as far back as Papalaua Street; the westbound approach along Lahainaluna Road was observed to queue back to Ikena Street, roughly 3,700 feet east of the intersection.

During the (PM) peak hour of traffic, the southbound left-turn operates at LOS (F) and overcapacity conditions, the northbound left-turn at LOS (F) and the minor movement's eastbound shared through/right-turn and westbound left-turn at LOS (F) and (E) respectively. See Figure 6 for the intersection lane configuration.

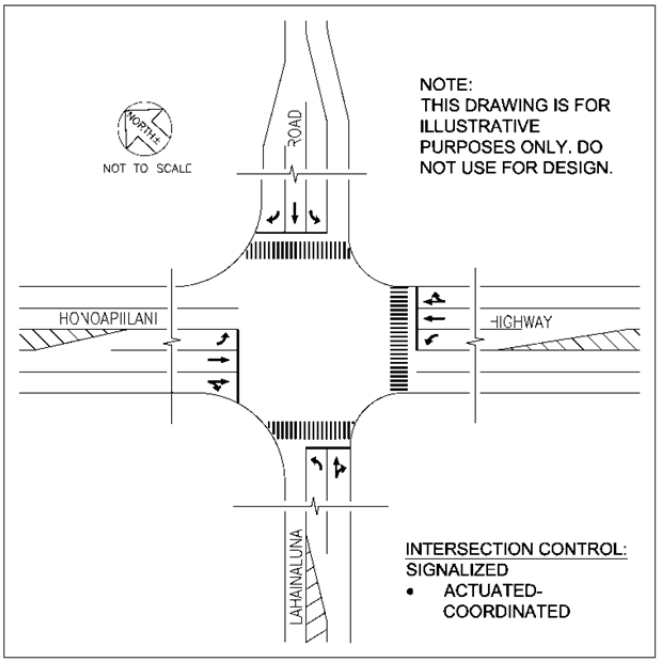


Figure 6: Existing Lane Configuration at Lahainaluna Road/Honoapiilani Highway

Papalaua Street/Honoapiilani Highway

Overall, this intersection operates at LOS C(C) during both AM(PM) peak hours of traffic. However, as mentioned previously, the southbound left-turn at Lahainaluna Road/Honoapiilani Highway queues back through Papalaua Street. The eastbound approach shared through and left-turn lane operates at LOS F(F) and overcapacity conditions during both peak hours of traffic. The northbound AM(PM) left-turn and southbound (PM) left-turn operate at LOS E. See Figure 7 for the intersection lane configuration.

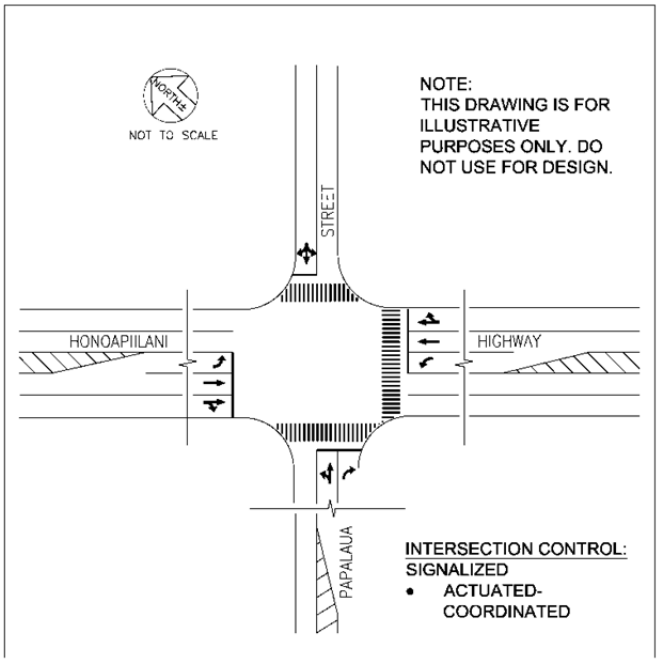


Figure 7: Existing Lane Configuration at Papalaua Street/Honoapiilani Highway

Hinau Street/Honoapiilani Highway

This signalized "tee" intersection provides access to a residential/commercial area as well as the Lahaina Sugar Train's southern terminus. This intersection was observed to operate relatively smoothly during the AM(PM) peak hours of traffic. The westbound minor approach operates at LOS E or better during both peak hours of traffic. See Figure 8 for the intersection lane configuration.

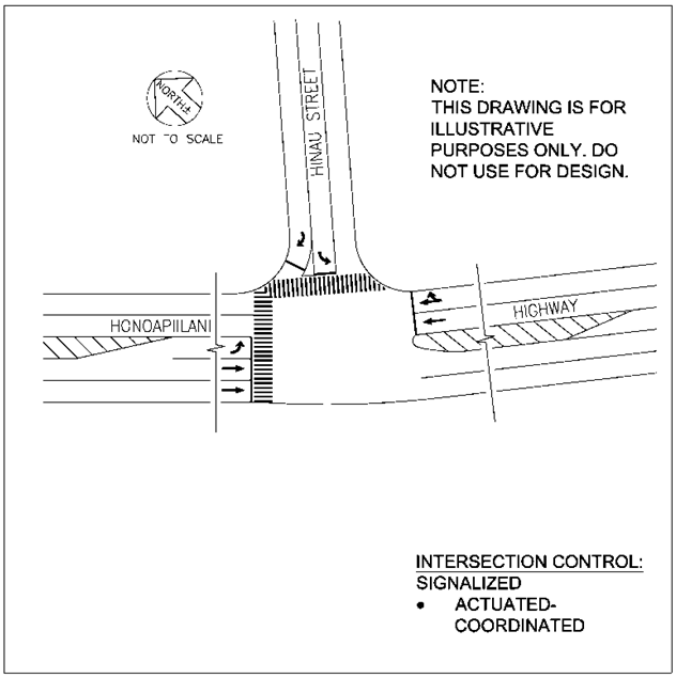


Figure 8: Existing Lane Configuration at Hinau Street/Honoapiilani Highway

Keawe Street/Honoapiilani Highway

Volumes at this intersection were adjusted to reflect the increase in traffic, based upon the October 21, 2009 recount, associated with the continuing development of the Lahaina Gateway Mall (LGM).

The major through movements along Honoapiilani Highway operate at LOS B or better during both peak hours of traffic while the left-turn movements operate at LOS E and F and overcapacity during the AM(PM) peak hours of traffic. The minor street movements operate at LOS E or better during both peak hours of traffic. See Figure 9 for the intersection lane configuration.

Note: subsequent to field observations and data collection, a westbound left-turn lane was installed; this has been observed to improve operations for the westbound left-turn.

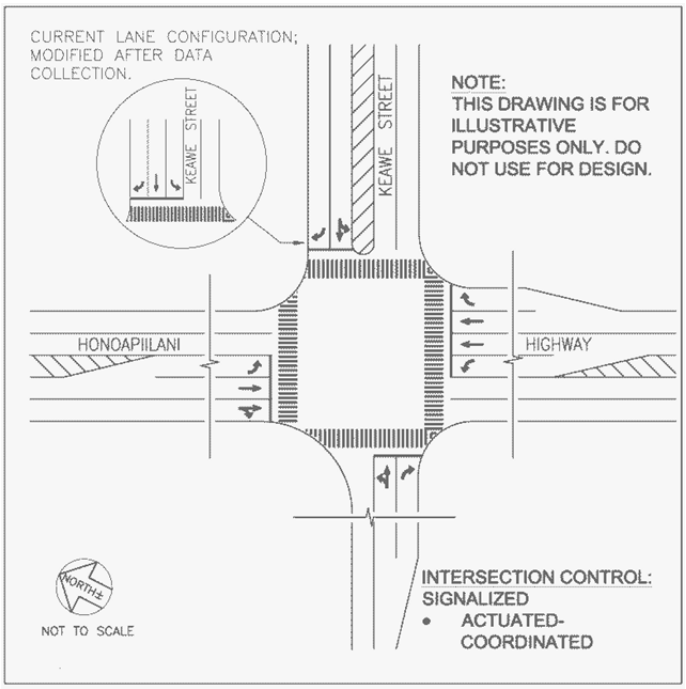


Figure 9: Existing Lane Configuration at Keawe Street/Honoapiilani Highway

Mill Street/Lahainaluna Road

The northbound approach to this unsignalized two-way stop-controlled "tee" intersection provides access to residences, Dickenson Street, and Lahainaluna Road. Similar to the Kuhua Street/Lahainaluna Road intersection, the eastbound and westbound approaches were observed to be congested during the busiest 20 minutes of the AM peak. The northbound approach operates at LOS F during the AM peak hour of traffic. The heavy northbound right-turn movement during the AM peak hour of traffic (106 vehicles) is most likely comprised of vehicles avoiding making a northbound right-turn at the Lahainaluna Road/Honoapiilani Highway intersection to bypass some of the congestion along Lahainaluna Road or vehicles coming from the gas station located on the northeast corner of the intersection. See Figure 10 for the intersection lane configuration.

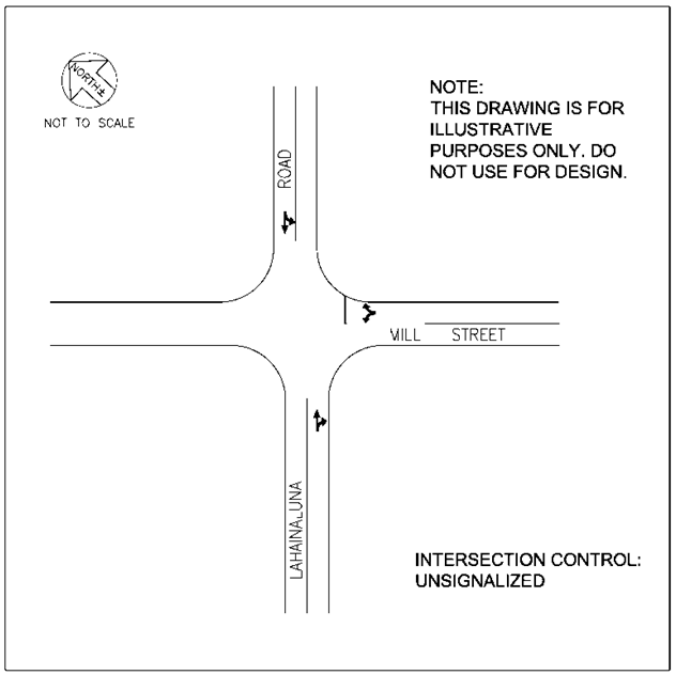


Figure 10: Existing Lane Configuration at Mill Street/ Lahainaluna Road

Kuhua Street/Lahainaluna Road

This intersection was observed to have congestion in the eastbound and westbound directions during the AM peak hour of traffic due to residents headed for work and parents dropping off their children at one of the three schools located towards the end of Lahainaluna Road. During the busiest 20 minutes, it was observed that vehicles exiting Kuhua Street were able to execute the turn onto Lahainaluna Road; however once congestion began to dissipate, it became more difficult for vehicles to exit the side street as gaps in traffic were not long enough for vehicles to maneuver out. Therefore, the southbound left-turn movement operates at LOS F and the southbound right-turn movement at LOS F and overcapacity conditions during the AM peak hour of traffic. See Figure 11 for the intersection lane configuration.

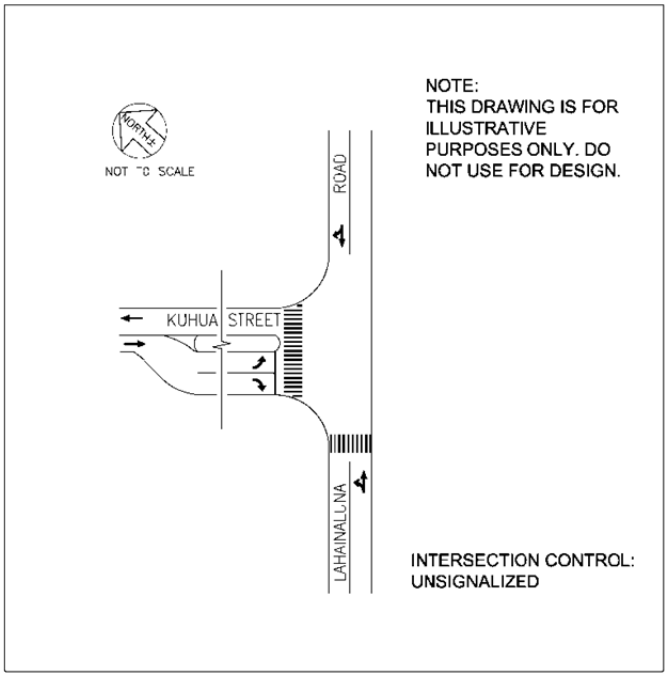


Figure 11: Existing Lane Configuration at Kuhua Street/Lahainaluna Road

Aki Street/Kuhua Street

This intersection was observed to operate with minimal delay during the AM (PM) peak hours of traffic as a result of it's the low volume. See Figure 12 for the intersection lane configuration.

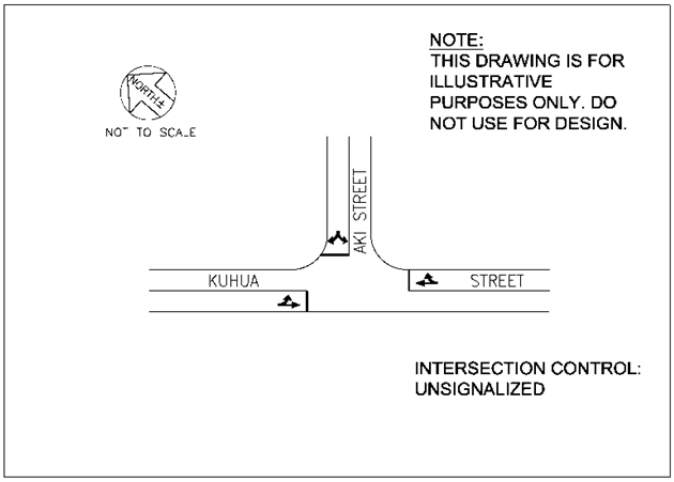


Figure 12: Existing Lane Configuration at Aki Street/Kuhua Street

Keawe Street/LGM West Driveway/Walgreens Driveway

The striping for the southbound approach is atypical in that a double right-turn movement is allowed, despite the absence of a traffic signal, channelized lane markings, and a right-turn signal. In addition, the left-turn movement is not provided. Similarly for the northbound approach no through lane is provided. Vehicles expectedly disobeyed these stripings, and treated the approaches as through/left-turn and right-turn lanes. Therefore, modified striping will be recommended as base year improvements for all future-year discussions of this intersection.

This intersection was observed to operate relatively smoothly during the AM(PM) peak hours of traffic. Queuing on the westbound shared left-turn/through movement at the intersection of Keawe Street/Honoapiilani Highway caused some delay on the northbound left-turn and southbound right-turn movements during the (PM) peak hour of traffic. See Figure 13 for the intersection lane configuration.

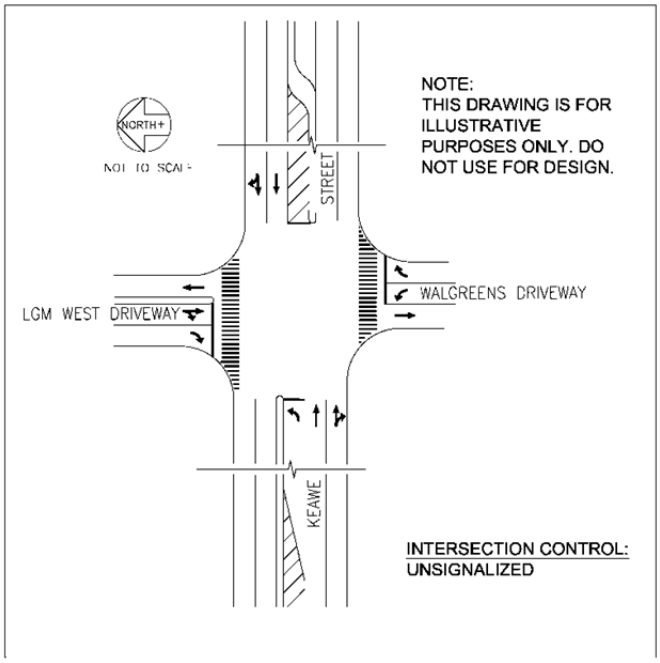


Figure 13: Existing Lane Configuration at Keawe Street/LGM West Driveway/Walgreens Driveway

Keawe Street/LGM East Driveway/Hoonanea Access

Similar to the previous intersection, the southbound and northbound approaches do not provide left-turn movements. However, vehicles were observed disregarding the lack of striping for these movements. Modified striping will be recommended as base year improvements for all future-year discussions of this intersection.

This intersection was observed to operate relatively smoothly during the AM(PM) peak hours of traffic. The majority of the trips entering the Lahaina Gateway Mall were observed to utilize the West Driveway since it is the closest access to Honoapiilani Highway. See Figure 14 for the intersection lane configuration.

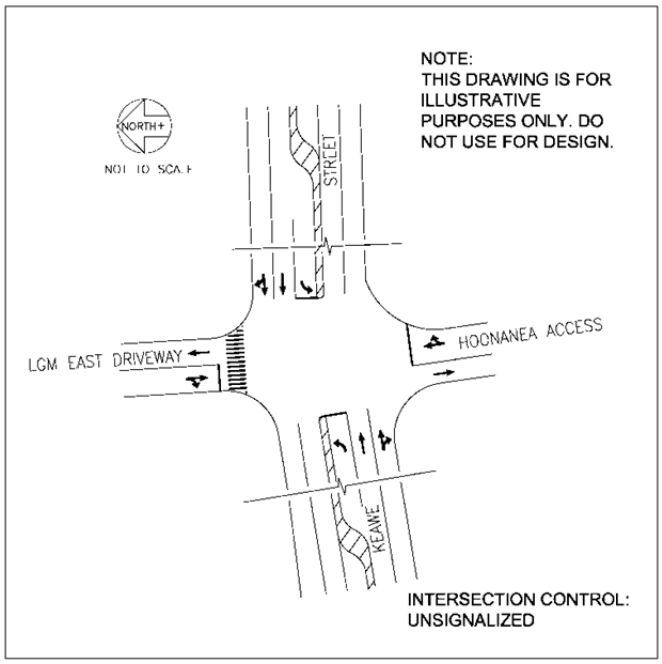


Figure 14: Existing Lane Configuration at Keawe Street/LGM East Driveway/Hoonanea Access

Table 1: Level of Service Summary, Existing Conditions

	Existing 2008					
	AM			PM		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
Front Street & Honoapiilani Highway						
EB LT/RT	18	0.13	C	40	0.45	E
NB LT	9	0.06	A	12	0.13	B
Aholo Street & Honoapiilani Highway						
EB LT/TH/RT	76	0.02	F	37	0.15	E
WB LT/TH	27	0.21	D	33	0.12	D
WB RT	27	0.21	D	33	0.12	D
NB LT	9	0.01	A	12	0.04	B
SB LT	11	0.05	B	11	0.05	B
Shaw Street & Honoapiilani Highway						
EB LT/TH	72	0.60	E	70	0.67	E
EB RT	61	0.02	E	55	0.10	E
WB LT/TH	62	0.18	E	57	0.31	E
WB RT	61	0.02	E	47	0.04	D
NB LT	3	0.13	A	23	0.54	C
NB TH/RT	7	0.64	A	10	0.66	B
SB LT	2	0.05	A	3	0.10	A
SB TH/RT	5	0.46	A	14	0.85	B
Overall or Max v/c	11	0.62	B	19	0.84	B
Dickenson Street & Honoapiilani Highway						
EB LT/TH/RT	80	0.78	E	80	0.78	E
WB LT/TH/RT	64	0.61	E	64	0.61	E
NB LT	69	0.41	E	69	0.41	E
NB TH/RT	10	0.76	A	10	0.76	A
SB LT	68	0.47	E	68	0.47	E
SB TH/RT	3	0.30	A	3	0.30	A
Overall or Max v/c	15	0.75	B	15	0.75	B
Lahainaluna Road & Honoapiilani Highway						
EB LT	47	0.41	D	44.3	0.43	D
EB TH/RT	84	0.89	F	84	0.91	F
WB LT	143	1.11	F*	59	0.73	E
WB TH	81	0.89	F	52	0.47	D
WB RT	398	1.73	F*	30	0.34	C
NB LT	80	0.39	E	85	0.59	F
NB TH/RT	31	0.77	C	20	0.60	C
SB LT	91	0.92	F	146	1.11	F*
SB TH/RT	7	0.34	A	5	0.63	A
Overall or Max v/c	123	1.04	F*	37	0.77	D

Note: * = Over-capcity Conditions

Table 1: Level of Service Summary, Existing Conditions Continued

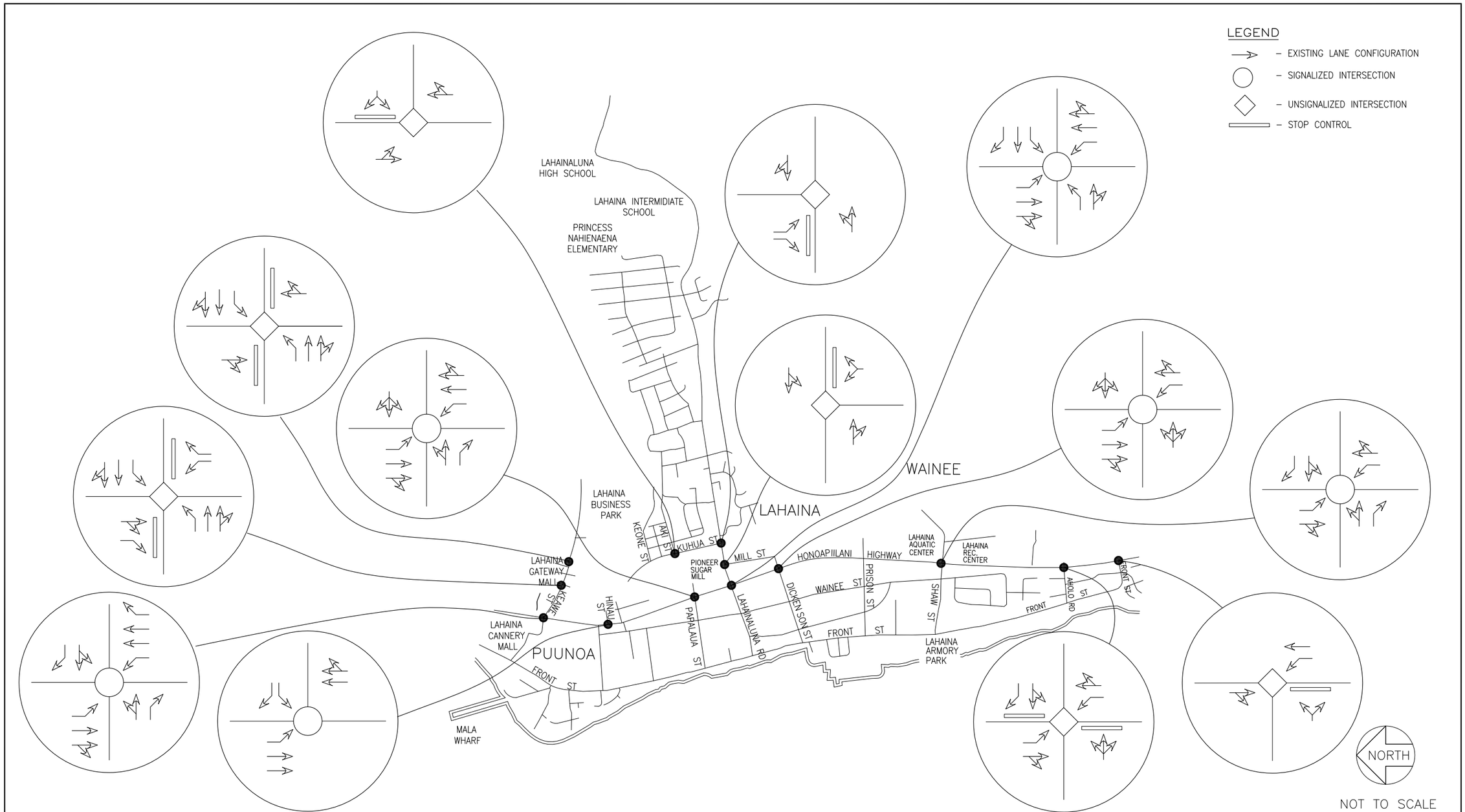
	Existing 2008					
	AM			PM		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
Papalaua Street & Honoapiilani Highway						
EB LT/TH	221	1.30	F*	141	1.12	F*
EB RT	50	0.06	D	41	0.06	D
WB LT/TH/RT	51	0.12	D	44	0.35	D
NB LT	57	0.60	E	63	0.64	E
NB TH/RT	11	0.70	B	15	0.62	B
SB LT	51	0.12	D	62	0.13	E
SB TH/RT	15	0.46	B	10	0.76	B
Overall or Max v/c	35	0.81	C	28	0.85	C
Hinau Street & Honoapiilani Highway						
WB LT	67	0.37	E	65	0.65	E
WB RT	63	0.02	E	54	0.08	D
NB TH/RT	3	0.61	A	8	0.67	A
SB LT	63	0.47	E	51	0.65	D
SB TH	2	0.36	A	12	0.55	B
Overall or Max v/c	5	0.59	A	15	0.67	B
Keawe Street & Honoapiilani Highway						
EB LT/TH	61	0.32	E	52	0.50	D
EB RT	58	0.03	E	34	0.15	C
WB LT/TH	68	0.60	E	75	0.83	E
WB RT	58	0.04	E	40	0.43	D
NB LT	163	0.92	F	73	0.62	E
NB TH	3	0.51	A	6	0.59	A
NB RT	2	0.07	A	3	0.14	A
SB LT	116	0.81	F	162	1.08	F*
SB TH/RT	6	0.43	A	6	0.73	A
Overall or Max v/c	13	0.53	B	20	0.76	B
Mill Street & Lahainaluna Road						
WB LT/TH	0	0.07	A	1	0.04	A
NB LT/RT	104	0.86	F	18	0.26	C
Kuhua Street & Lahainaluna Road						
EB LT/TH	4	0.10	A	2	0.06	A
SB LT	503	0.92	F	27	0.08	D
SB RT	396	1.55	F*	12	0.06	B
Aki Street & Kuhua Street						
WB LT/RT	9	0.09	A	9	0.03	A

Notes: 1) * = Over-capcity Conditions 2) NC = Intersection not counted.

Table 1: Level of Service Summary, Existing Conditions Continued

	Existing 2008					
	AM			PM		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
Lahaina Gateway Mall West Driveway & Keawe Street						
EB LT	NC	NC	NC	7.9	0.11	A
WB LT	NC	NC	NC	8	0.01	A
NB LT	NC	NC	NC	30	0.40	D
NB TH/RT	NC	NC	NC	12	0.05	B
SB LT/TH	NC	NC	NC	17	0.06	C
SB RT	NC	NC	NC	9	0.15	A
Lahaina Gateway Mall East Driveway & Keawe Street						
NB LT/TH	NC	NC	NC	11	0.01	B
NB RT	NC	NC	NC	11	0.01	B
SB LT/TH	NC	NC	NC	11	0.01	B
SB RT	NC	NC	NC	9	0.05	A

Notes: 1) * = Over-capcity Conditions 2) NC = Intersection not counted.



KUHUA STREET EXTENSION

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FIGURE 15

EXISTING LANE CONFIGURATION

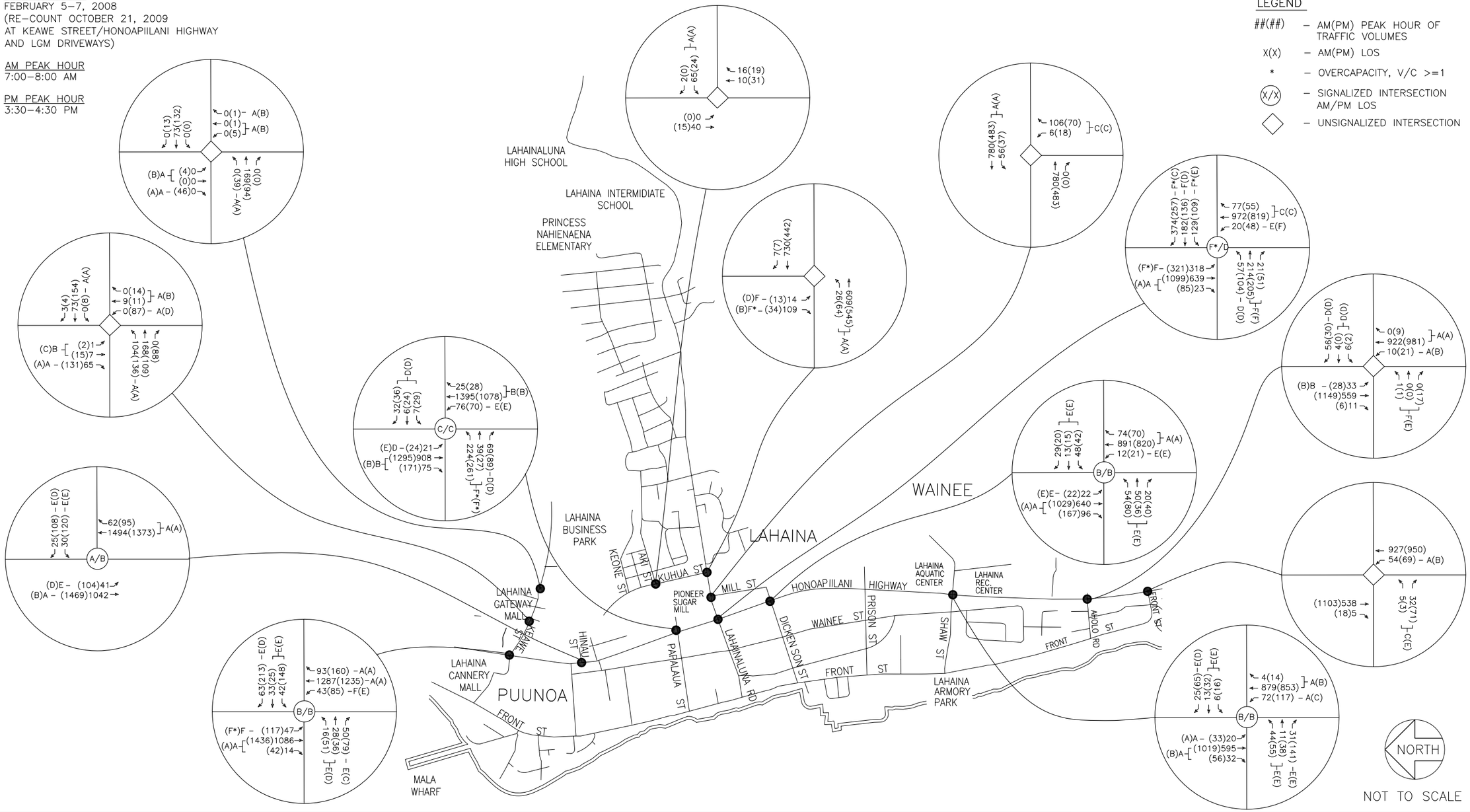
DATE OF COUNT
FEBRUARY 5–7, 2008
(RE–COUNT OCTOBER 21, 2009
AT KEAWE STREET/HONOAPIILANI HIGHWAY
AND LGM DRIVEWAYS)

AM PEAK HOUR
7:00–8:00 AM

PM PEAK HOUR
3:30–4:30 PM

LEGEND

##(##)	–	AM(PM) PEAK HOUR OF TRAFFIC VOLUMES
X(X)	–	AM(PM) LOS
*	–	OVERCAPACITY, V/C >=1
(X/X)	–	SIGNALIZED INTERSECTION AM/PM LOS
◇	–	UNSIGNALIZED INTERSECTION



KUHUA STREET EXTENSION

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FIGURE 16

EXISTING VOLUME AND LEVEL OF SERVICE

III. BASE YEAR 2020 PROJECTIONS AND ASSUMPTIONS

An 80 percent increase in corridor traffic is projected to occur by the Year 2020; this was based upon projections from the Maui Travel Demand Forecasting Model (MTDFM), and supplemented by Trip Generation methodology when necessary. Refer to Appendix C for further detail.

A. Core Assumptions for Wainee Residential Community, Pioneer Mill Sites, and HHFDC Villages of Leialii

It is likely that Wainee Residential Community and the HHFDC Villages of Leialii developments will require new collector roads with connectivity to Honoapiilani Highway to accommodate their respective traffic demands. However, these projects are at various stages of entitlement and therefore the exact number and locations of these connections are not as of yet known. The following assumptions were made:

<u>Wainee Residential Community</u>

- Connections to Honoapiilani Highway via the extension of Dickenson Street, Shaw Street and Aholo Road
- Connectivity within the development is also assumed

<u>Pioneer Mill Sites 1 and 2</u>

- Access provided via Papalaua Street (continued use as driveway), Lahainaluna Road (widened) across of Mill Street, and Kuhua Street.

<u>HHFDC Villages of Leialii</u>

- Accesses are provided via connection to Honoapiilani Highway at Leialii Parkway, Fleming Road, Kapunakea Street and Keawe Street between the LGM West Driveway and the LBP Driveway.
- The Keawe Street access was assumed to be situated directly north of the northern terminus of the KSE.

B. Planned Roadway Improvements

It was assumed that the roadway improvements described below will be completed by Base Year 2020.

Lahaina Bypass Road

According to the Final Supplemental Environmental Impact Statement (FEIS) for Honoapiilani Highway, Launiupoko to Honokowai, the Lahaina Bypass Road (LBR) is planned as a limited access highway between Launiupoko and Honokowai, generally parallel and to the east of Honoapiilani Highway on the slopes of the West Maui Mountains. It is proposed to be built in phases, initially as a two-lane highway and will ultimately be widened to have four (4) lanes. Proposed connector roadways in Puukolii, Kaanapali, Wahikuli, Kapunakea, Lahaina, and Puamana will provide vehicular circulation between Honoapiilani Highway and the LBR. As of this writing, Phases 1A and 1B1 were under construction. Phase 1A is the segment of the LBR between Keawe Street and Lahainaluna Road began construction in April 2009. Phase 1B1 will run between Hokiokio Place to the south and connect with Phase 1A at Lahainaluna Road.

According to current plans, only Phase 1A and 1B1 are planned to be constructed and completed before year 2020.

Impacts:

The LBR will allow school traffic currently accessing the Princess Nahienaena Elementary, Lahaina Intermediate School and Lahainaluna High School via the southbound left-turn at the intersection of Lahainaluna Road/Honoapiilani Highway to instead access the LBR by making a southbound left-turn at the Keawe Street/Honoapiilani Highway intersection. Other potential users of the LBR would be:

- Trips traveling through Lahaina to areas beyond the access of the LBR
- Lahaina Business Park workers and customers
- Lahaina Gateway Mall workers and customers
- Residents of the Hoonanea Development
- Residents along Lahainaluna Road east of Honoapiilani Highway

- Parents dropping off students and headed south towards areas beyond the access of the LBR

The LBR impact will result in a reduction of trips along Honoapiilani Highway and increase in trips on the southbound left-turn, westbound right-turn movements at the Keawe Street/Honoapiilani Highway intersection.

Keawe Street Extension

Keawe Street is planned to be extended eastward to intercept the planned LBR by the time Phase 1A is completed.

Phase 1A, in concert with the Keawe Street Extension, will relieve congestion at the intersection of Lahainaluna Road and Honoapiilani Highway by allowing southbound vehicles along Honoapiilani Highway to turn left onto Keawe Street to eventually access the residential areas and schools along Lahainaluna Road. Conversely, vehicles that normally make a westbound right-turn from Lahainaluna Road onto Honoapiilani Highway would have the option of accessing Honoapiilani Highway via Phase 1A and Keawe Street.

With Phase 1B1, vehicles traveling northbound along Honoapiilani Highway will be able to access the LBR at its south connection with Honoapiilani Highway at the Hokiokio Place connection. This would relieve some of the traffic along Honoapiilani Highway. This will be beneficial to residents who need to access their homes via Lahainaluna Road and those going towards the business park.

Impacts:

Keawe Street will become the interim terminal connection to the LBR; as such, traffic will increase along it.

Honoapiilani Highway Widening

The HDOT recently widened Honoapiilani Highway from two lanes to four lanes between Lahainaluna Road and Aholo Road. This widening project improved capacity in the northbound and southbound through direction within Lahaina. Construction of the widening started in October 2009; the widening completed in January, 2011. Note: the widening occurred after traffic counts

were taken for this Traffic Impact Analysis Report (TIAR), and is therefore not reflected in its existing conditions; therefore, the analysis at the intersections between Aholo Road and Lahainaluna Road is considered conservative.

Impacts:

The additional capacity provided along Honoapiilani Highway has improved through movement operation.

C. Consideration of Roundabouts

Along Honoapiilani Highway

HDOT's December, 2008 "Modern Roundabouts Policy Guideline" requires that the feasibility of roundabouts be studied at all proposed intersections. However, it appears that the construction of roundabouts along Honoapiilani Highway would be infeasible because:

- The traffic volumes are much heavier along Honoapiilani Highway than on intersecting side streets; therefore, the flow will not be balanced.
- The ROW is limited.
- At this time, the roundabout policy only allows the consideration of modern single-lane roundabouts. RODEL analysis indicates that double-lane roundabouts would be required at the major intersections along Honoapiilani Highway due to heavy traffic volumes.
- "Roundabouts: an Informational Guide" (2000) states that where major arterials intersect minor arterials or local roads, "roundabouts delay and deflect all traffic entering the intersection and could introduce excessive delay or speed inconsistencies to flow on the major arterial."
- If a roundabout were to be installed at one intersection along Honoapiilani Highway, roundabouts would have to replace traffic

signals at all other nearby intersections along Honoapiilani Highway due to queuing issues[4].

At Other Intersections

A roundabout should be considered at the future Shaw Street Extension/KSE intersection as a means of calming traffic near the Lahaina Recreation Center and Lahaina Aquatic Center. Refer to Section IV. Roundabouts were not analyzed at the other intersections due to:

- Relatively light minor movement volume
- Potential for queue spillback from neighboring intersections or parking lot operations, which could cause the entire roundabout to experience gridlock[5.]
- Limited ROW.

[4] If a queue from a neighboring intersection extends downstream into a roundabout, all movements within the roundabout will experience gridlock. In contrast, a traffic signal or stop control will continue to allow unaffected movements to flow.

[5] Refer to footnote 4.

IV. BASE YEAR 2020 ANALYSIS

The following scenarios will be discussed in this section:

1. Base Year 2020 ("Do-Nothing") – improvements that are likely to occur are incorporated into the roadway network, though in general, no new recommendations are introduced.
2. Base Year 2020 with Mitigative Measures – includes the maximum extent of feasible new improvements in lieu of the KSE.
3. "Deferred Action" Alternative – considers the idea of constructing the Project at a later date when the demand is necessary.

A summary of the findings of each of these scenarios is provided below.

A. Summary of Findings for Base Year 2020

Base Year 2020

By year 2020, the network will continue to operate with long delays along Honoapiilani Highway. The LBR is projected to reduce the through traffic volume along Honoapiilani Highway by approximately 20 percent. The extent of this diversion, particularly in the southbound direction, will be limited by operations at the Keawe Street/Honoapiilani Highway intersection.

Despite all of the roadway improvements assumed for Base Year 2020, many movements at intersections along Honoapiilani Highway will continue to experience LOS F and overcapacity conditions as a result of the projected increase in demand throughout the corridor.

Base Year 2020 with Mitigative Measures

Much of the congestion projected throughout the study area is a result of a lack of regional capacity, that which is currently served primarily by Honoapiilani Highway, and will ultimately be only somewhat relieved by Phases 1A and 1B1 of the LBR.

The continuing construction of the LBR further northward towards Kaanapali or Honokowai would allow for additional LBR connections, and therefore increase its accessibility; this would, in turn, further relieve congestion along Honoapiilani Highway. However, due to the uncertainty of the timing for

requisite funding for these future phases, they were not included as possible mitigations for Base Year 2020.

At the time of this writing, an Environmental Impact Statement (EIS) was underway for the widening of Honoapiilani Highway between Maalaea and Lahaina to four lanes. As with the LBR's future phases, the timing of the implementation of this improvement will depend on the availability of federal funding.

On a more local level, mitigative measures are proposed at various locations, primarily to accommodate specific demands of future developments. The one exception would be along Keawe Street, which will serve as the de facto northern access to the LBR until it is extended further northward. The result will be increased turning movement traffic demand to and from Honoapiilani Highway; this will require a southbound double left-turn, eastbound left-turn, eastbound through, westbound double right-turn, and westbound double left-turn at the Honoapiilani Highway/Keawe Street intersection.

For the sake of continuity, all detailed discussions of the Mitigative Measures have been combined with those of Base Year 2020.

Deferred Action

As described above, the operating conditions will dictate that improvements will be sought as a means of alleviating congestion; therefore, deferred action is not considered a viable alternative. No further discussion will for this scenario.

B. Detailed Analysis for Base Year 2020

Keawe Street Area (See Figures 17a and 18a)

An approximate 187-percent increase in traffic is projected along Keawe Street as a result of:

1. Its functioning as the terminal connection between the LBR and Honoapiilani Highway.
2. Increased occupancy of LGM
3. The continuing construction of Hoonanea

4. The construction of HHFDC Villages of Leialii

This will strain operations at the Honoapiilani Highway/Keawe Street intersection, and necessitate as a minimum:

- Southbound: double left-turn lanes
- Westbound: dedicated left-turn lane, shared left-turn/through/right-turn lane, and dedicated right-turn lane
- Eastbound: dedicated left-turn lane and dedicated through lane

This is the lane configuration that is shown in Figure 18a. These improvements would likely require ROW acquisition along Honoapiilani Highway. While some ROW would be required as a result of the proposed westbound double right-turn, the physical impact to Keawe Street in general would be minimal. In tandem with these improvements, split-phase traffic signal phasing and the removal of the southern east-west crosswalk is recommended.

It is likely that during the PM peak hour of traffic, westbound queues could extend from Honoapiilani Highway to beyond the westernmost LGM driveway. In general, traffic entering and exiting the LGM will experience difficulty due to the heavier traffic along Keawe Street.

However, a traffic signal will not likely be warranted at the accesses[6]. It is recommended that these intersections be reassessed subsequent to the construction of the LBR, Phases 1A and 1B1.

Lahainaluna Road and Papalaua Street Area (See Figures 17b and 18b)

Minor improvements were assumed at the intersection of Papalaua Street and Honoapiilani Highway due to existing ROW constraints and alignment issues. The result was that both Honoapiilani Highway's intersections with Lahainaluna Road and Papalaua Street would operate at overcapacity conditions overall. Due to the increased traffic along Papalaua Street, accessibility to the existing driveways along the West Maui Center/Prudential/Pioneer Mill Site Driveway across of Papalaua Street will become difficult. Queuing along

[6] Weekend count data was not taken as part of this study, and therefore, a full warrant analysis could not be performed.

Papalaua Street in the westbound direction headed towards Honoapiilani Highway will significantly increase.

It is assumed that in conjunction with future development in this area, it would be possible for Lahainaluna Road to be widened and improved to accommodate existing as well as future demand. This could require modifying the shape, location, and accesses to the gas station on the northeast corner of the Honoapiilani Highway/Lahainaluna Road intersection. It is recommended that the road be widened to five (5) lanes between Mill Street and Honoapiilani Highway and four (4) lanes between Mill Street and Kuhua Street as shown in Figure 18b.

South of Dickenson Street (See Figures 17c and 18c)

Despite the widening of Honoapiilani Highway between Aholo Road and Shaw Street, a bottleneck will still occur at the Honoapiilani Highway's intersections with Lahainaluna Road and Papalaua Street. Therefore, northbound traffic along Honoapiilani Highway will likely experience long queues that could affect operations at Dickenson Street, Shaw Street, Aholo Road, and Front Street during the AM(PM) peak hours of traffic.

An approximate 50 percent increase in traffic is projected for the southbound traffic along Honoapiilani Highway[7]. As a result, it is likely that bottlenecks will begin to occur south of Aholo Road, where the highway narrows to two (2) lanes, and where it intersects Hokiokio Place, which will serve as the southern terminus of the LBR. Mitigation would involve widening Honoapiilani Highway to four (4) lanes between Maalaea and Aholo Road. However, the timing of this improvement would depend upon the availability of federal funding.

See below for a discussion of Base Year 2020 conditions at the individual intersections. See Figures 17a, 17b and 17c for Base Year 2020 intersection lane configuration, volumes and level of service. See Figures 18a, 18b and 18c for Base Year with mitigative measures lane configuration, volumes and level of

[7] As mentioned earlier, the disproportionally high growth in the southbound direction is due to the difficulty in making the left-turn onto Keawe Street to access the LBR.

service. See Table 2 for the existing, Base Year 2020 and Base Year 2020 with mitigation LOS summary.

C. Summary of Mitigative Measures for Base Year 2020

Note: Mitgative measures are intended to address baseline future conditions without the Project, and are therefore not associated with the Project.

Honoapiilani Highway/Keawe Street

Southbound Approach: widen to provide two (2) left-turn lanes; this will likely require ROW acquisition.

Eastbound Approach: widen to provide dedicated left-turn and through lane. This will require ROW acquisition.

Westbound Approach: re-stripe to provide a dedicated left-turn lane, a shared left-turn/through/right-turn lane, and dedicated right-turn lane.

- *This will require the construction of a larger-radius channelized island at the northeast corner, which will require ROW Acquisition.*
- *Because of the shared-use lanes, split-phase traffic signal phasing is recommended.*

Crosswalk: remove eastbound crosswalk (south side) to improve the operational efficiency of the traffic signal.

Keawe Street/LGM West Driveway/Walgreens Driveway

Southbound Approach: Restripe the shared through/right-turn lane to become a shared left-turn/through lane.

Northbound Approach: Restripe the shared through/right-turn lane to become a shared left-turn/through lane.

Traffic Signal Warrant: Not met based upon AM and PM count data. It is recommended that this intersection be reassessed subsequent to the completion of the LBR, Phases 1A and 1B1.

Keawe Street/LGM East Driveway/Hoonanea Driveway

Southbound Approach: Restripe the shared through/right-turn lane to become a shared left-turn/through lane.

Traffic Signal Warrant: Not met based upon AM and PM count data. It is recommended that this intersection be reassessed subsequent to the completion of the LBR, Phases 1A and 1B1.

Lahainaluna Road/Mill Street

Eastbound Approach: Widen to provide a left-turn lane and a shared through/right-turn lane. This will require ROW acquisition.

Westbound Approach: Widen to provide a dedicated left-turn lane, a through lane, and a shared through/right-turn lane. This will require ROW acquisition.

Northbound Approach: Stripe the approach with a shared left-turn/through/right-turn lane.

Southbound Approach: Provide a shared through/left-turn and a right-turn lane.

Traffic Signal Warrant: Not likely met.

Lahainaluna Road/Kuhua Street

Eastbound Approach: Widen to provide a dedicated left-turn lane. This will require ROW acquisition.

Traffic Signal Warrant: Not met.

Honoapiilani Highway/Lahainaluna Road

Westbound Approach: Lengthen left-turn and right-turn lane storage length; provide two receiving lanes in the eastbound direction. This will require ROW acquisition.

Honoapiilani Highway/Papalaua Street

Southbound Approach: Lengthen the left-turn lane.

Eastbound Approach: Restripe to provide dedicated left-turn lane and shared through/right-turn lane.

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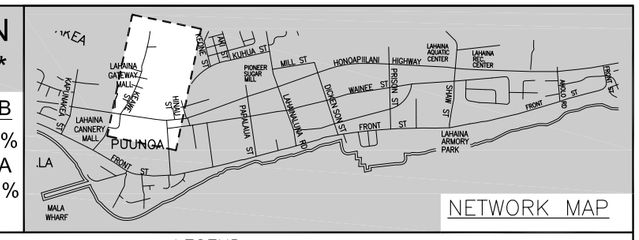
DISTRIBUTION BREAKDOWN*	NB	SB
LBR, PH 1A & 1B	21%	19%
KSE	N/A	N/A
Honoapiilani	79%	81%
(Average Values)		

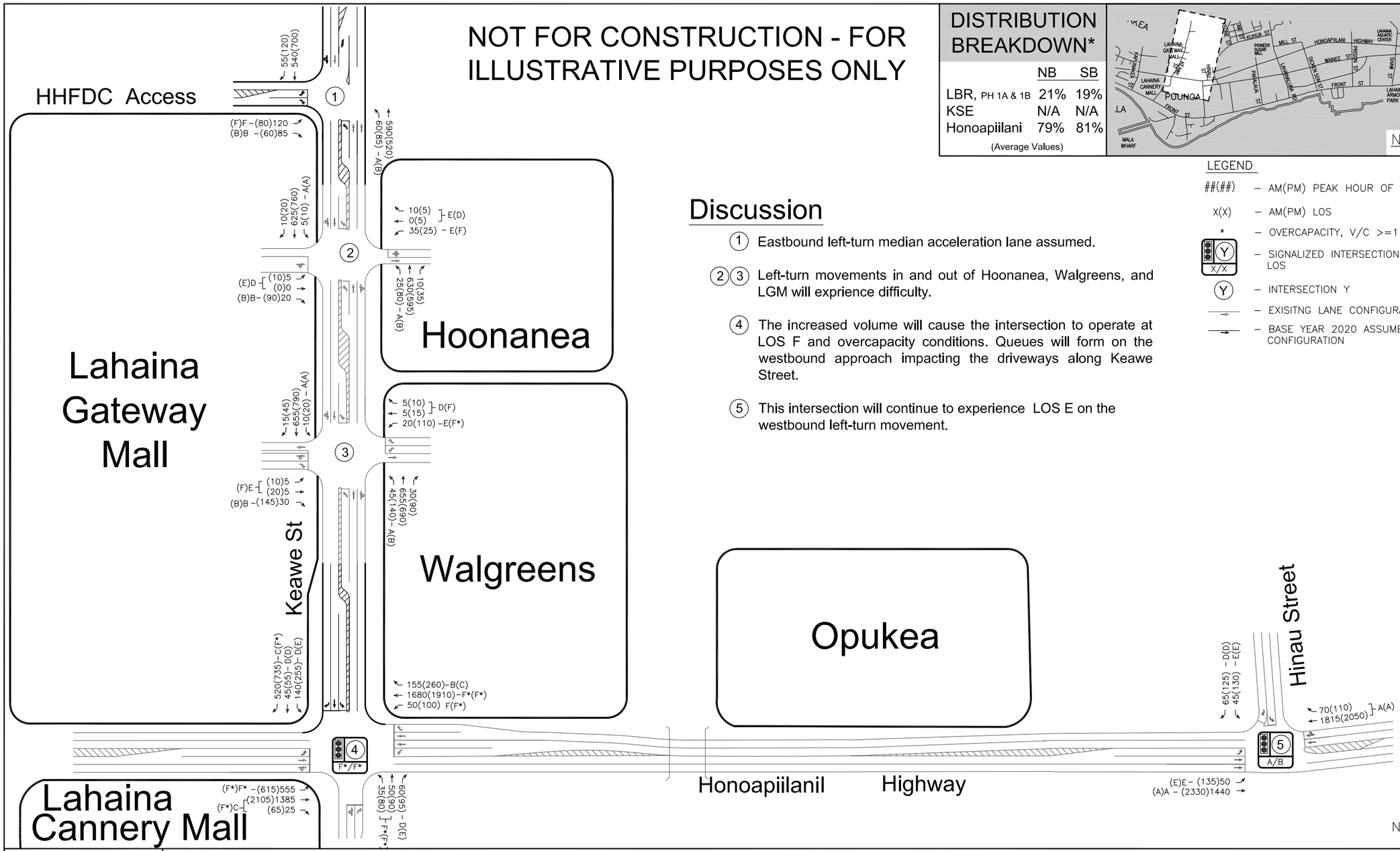


Discussion

1. Eastbound left-turn median acceleration lane assumed.
2. 3 Left-turn movements in and out of Hoonanea, Walgreens, and LGM will exprience difficulty.
4. The increased volume will cause the intersection to operate at LOS F and overcapacity conditions. Queues will form on the westbound approach impacting the driveways along Keawe Street.
5. This intersection will continue to experience LOS E on the westbound left-turn movement.

LEGEND

##(##)	– AM(PM) PEAK HOUR OF TRAFFIC VOLUMES
X(X)	– AM(PM) LOS
*	– OVERCAPACITY, V/C >=1
Y X/X	– SIGNALIZED INTERSECTION Y, AM/PM LOS
Y	– INTERSECTION Y
	– EXISITNG LANE CONFIGURATION
	– BASE YEAR 2020 ASSUMED LANE CONFIGURATION



KUHUA STREET EXTENSION

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BASE YEAR 2020 VOLUME, LEVEL OF SERVICE AND LANE CONFIGURATION

FIGURE 17a

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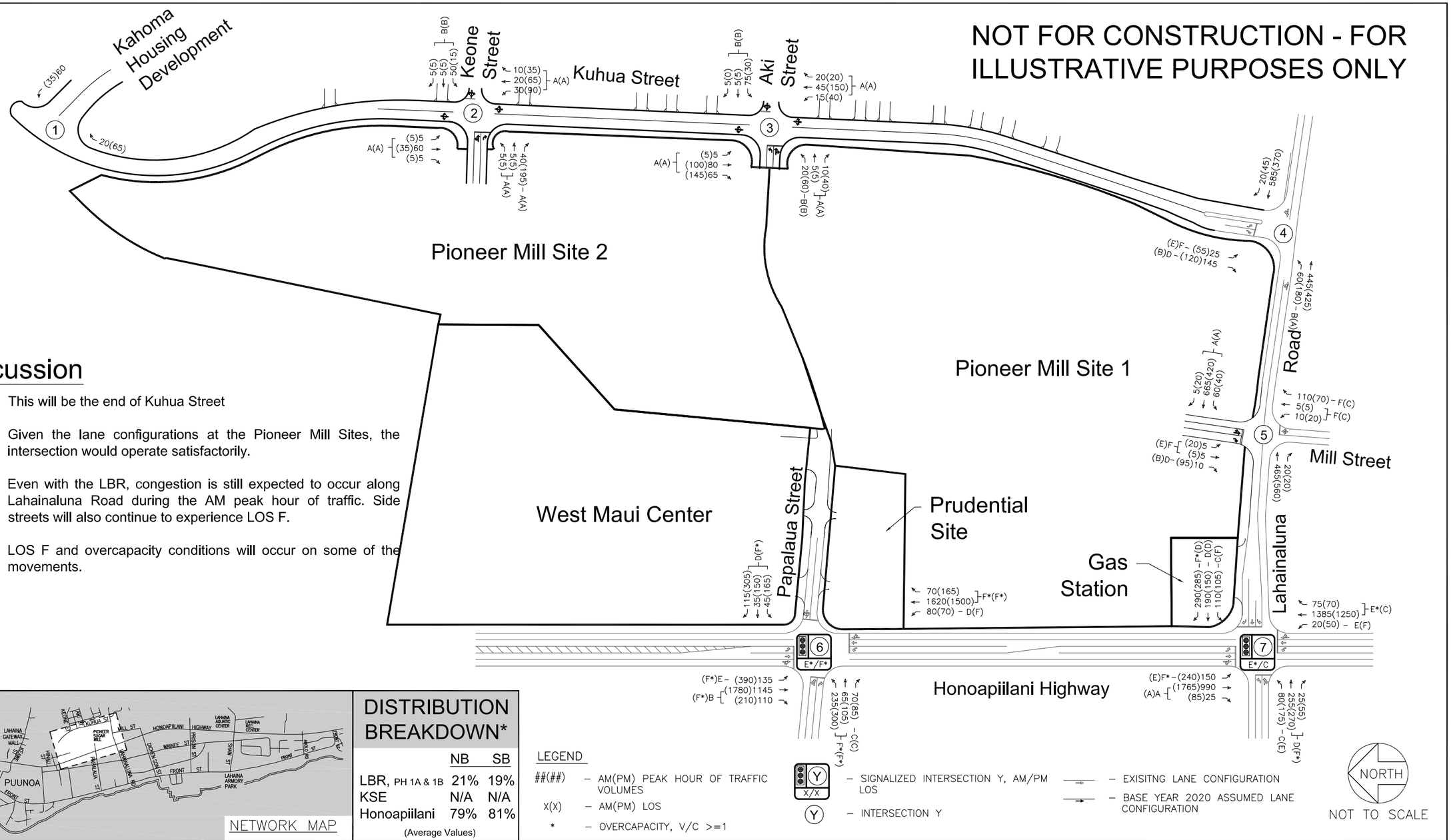
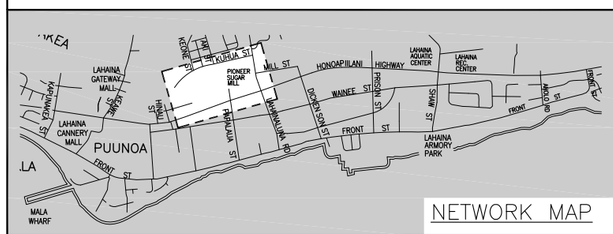


Discussion

1. This will be the end of Kuhua Street
2. 3. Given the lane configurations at the Pioneer Mill Sites, the intersection would operate satisfactorily.
4. 5. Even with the LBR, congestion is still expected to occur along Lahainaluna Road during the AM peak hour of traffic. Side streets will also continue to experience LOS F.
6. 7. LOS F and overcapacity conditions will occur on some of the movements.



DISTRIBUTION BREAKDOWN*

	NB	SB
LBR, PH 1A & 1B	21%	19%
KSE	N/A	N/A
Honoapiilani	79%	81%

(Average Values)

LEGEND

- ##(##) – AM(PM) PEAK HOUR OF TRAFFIC VOLUMES
- X(X) – AM(PM) LOS
- * – OVERCAPACITY, V/C >=1
- Y, X/X – SIGNALIZED INTERSECTION Y, AM/PM LOS
- Y – INTERSECTION Y
- EXISITNG LANE CONFIGURATION
- BASE YEAR 2020 ASSUMED LANE CONFIGURATION

KUHUA STREET EXTENSION

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
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FIGURE 17b

BASE YEAR 2020 VOLUME, LEVEL OF SERVICE AND LANE CONFIGURATION

Discussion

(1)(2)(3)(4) The widening of Honoapiilani Highway between Dickenson Street and Aholo Road, in conjunction with Phases 1A and 1B of the LBR, will improve traffic operations along the highway. However, bottlenecks will still occur at the merge points, leading to continued congestion throughout the area.

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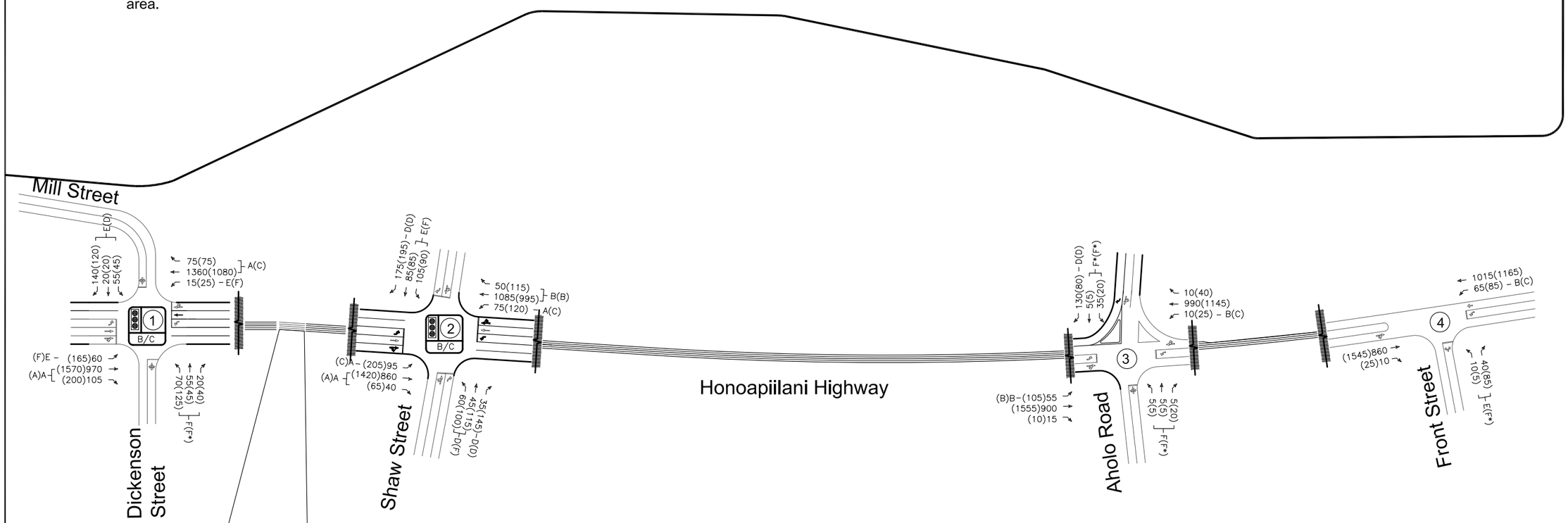

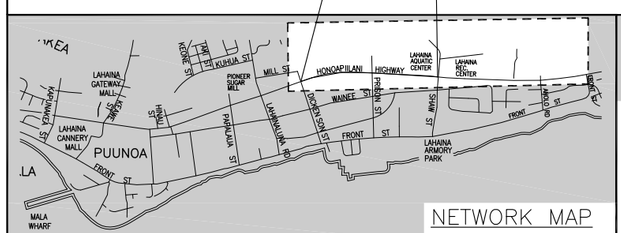

NETWORK MAP

DISTRIBUTION BREAKDOWN*

	NB	SB
LBR, PH 1A & 1B	21%	19%
KSE	N/A	N/A
Honoapiilani	79%	81%

(Average Values)

LEGEND

- ##(##) – AM(PM) PEAK HOUR OF TRAFFIC VOLUMES
- X(X) – AM(PM) LOS
- * – OVERCAPACITY, V/C >=1
- (Y) X/X – SIGNALIZED INTERSECTION Y, AM/PM LOS
- (Y) – INTERSECTION Y
- – EXISITNG LANE CONFIGURATION
- – BASE YEAR 2020 ASSUMED LANE CONFIGURATION

NORTH

NOT TO SCALE

KUHUA STREET EXTENSION

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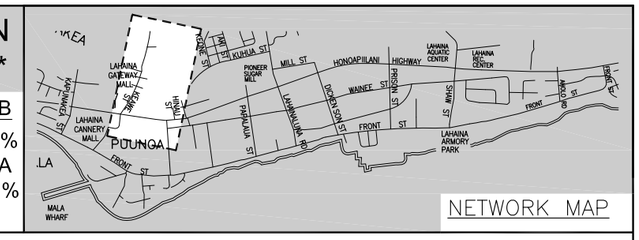
FIGURE 17c

BASE YEAR 2020 VOLUME, LEVEL OF SERVICE AND LANE CONFIGURATION

NOT FOR CONSTRUCTION - FOR ILLUSTRATIVE PURPOSES ONLY

DISTRIBUTION BREAKDOWN*	NB	SB
LBR, PH 1A & 1B	21%	19%
KSE	N/A	N/A
Honoapiilani	79%	81%

(Average Values)



Discussion

1. The intersection will likely not warrant a traffic signal. However, it should be re-evaluated for a traffic signal once the project access is in place. An acceleration lane should be provided for the southbound left-turn movement.

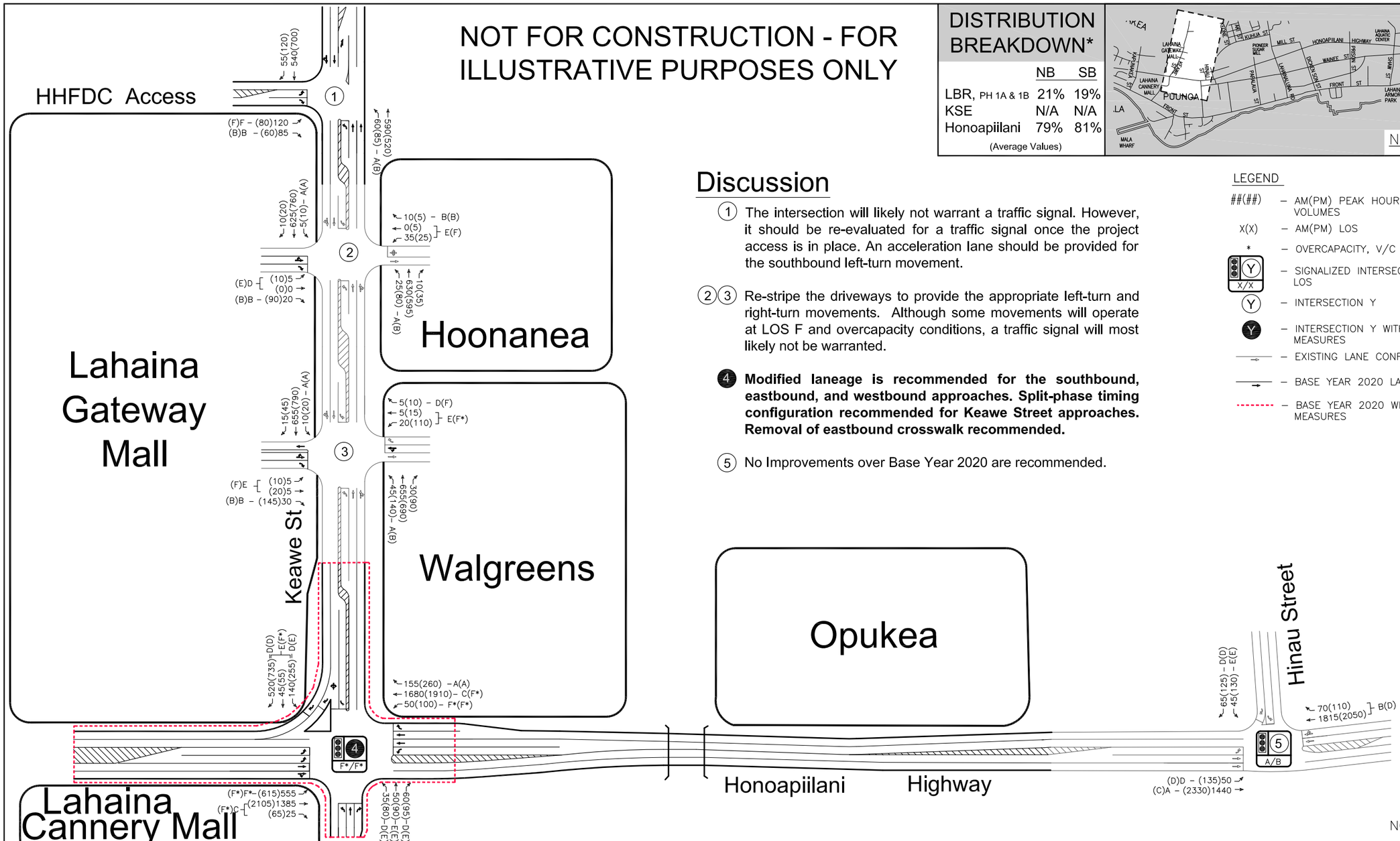
2 3. Re-stripe the driveways to provide the appropriate left-turn and right-turn movements. Although some movements will operate at LOS F and overcapacity conditions, a traffic signal will most likely not be warranted.

4. **Modified laneage is recommended for the southbound, eastbound, and westbound approaches. Split-phase timing configuration recommended for Keawe Street approaches. Removal of eastbound crosswalk recommended.**

5. No Improvements over Base Year 2020 are recommended.

LEGEND

- ##(##) – AM(PM) PEAK HOUR OF TRAFFIC VOLUMES
- X(X) – AM(PM) LOS
- * – OVERCAPACITY, V/C >=1
- Y X/X – SIGNALIZED INTERSECTION Y, AM/PM LOS
- Y – INTERSECTION Y
- Y – INTERSECTION Y WITH MITIGATIVE MEASURES
- EXISTING LANE CONFIGURATION
- BASE YEAR 2020 LANE CONFIGURATION
- BASE YEAR 2020 WITH MITIGATIVE MEASURES



KUHUA STREET EXTENSION

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BASE YEAR 2020 WITH MITIGATION VOLUME, LEVEL OF SERVICE AND LANE CONFIGURATION

FIGURE 18a

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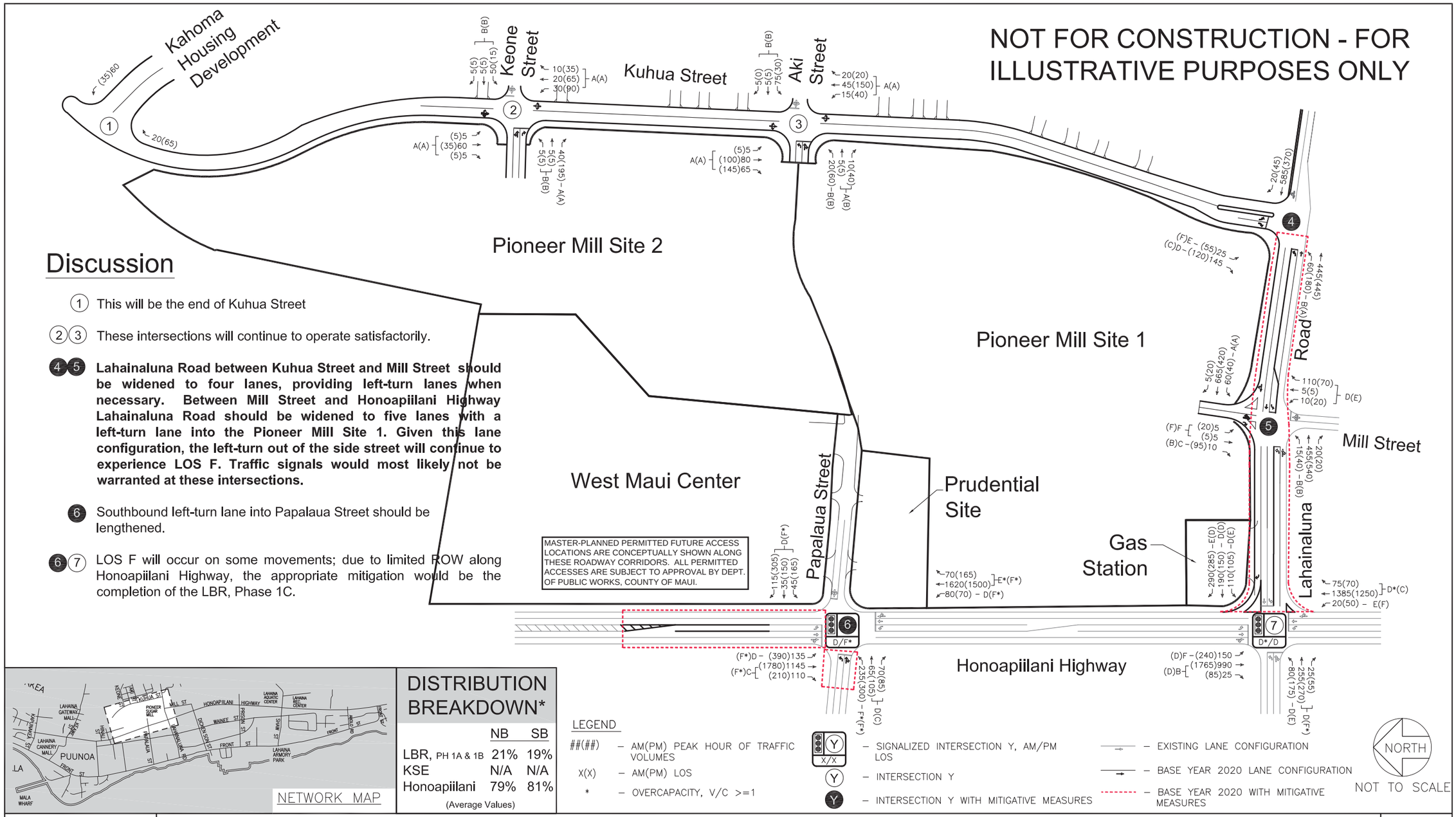

Discussion

(1) This will be the end of Kuhua Street

(2)(3) These intersections will continue to operate satisfactorily.

(4)(5) **Lahainaluna Road between Kuhua Street and Mill Street should be widened to four lanes, providing left-turn lanes when necessary. Between Mill Street and Honoapiilani Highway Lahainaluna Road should be widened to five lanes with a left-turn lane into the Pioneer Mill Site 1. Given this lane configuration, the left-turn out of the side street will continue to experience LOS F. Traffic signals would most likely not be warranted at these intersections.**

(6) Southbound left-turn lane into Papalaua Street should be lengthened.

(6)(7) LOS F will occur on some movements; due to limited ROW along Honoapiilani Highway, the appropriate mitigation would be the completion of the LBR, Phase 1C.

DISTRIBUTION BREAKDOWN*

	NB	SB
LBR, PH 1A & 1B	21%	19%
KSE	N/A	N/A
Honoapiilani	79%	81%

(Average Values)

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KUHUA STREET EXTENSION

FIGURE 18b

BASE YEAR 2020 WITH MITIGATION VOLUME, LEVEL OF SERVICE AND LANE CONFIGURATION

Discussion

(1)(2)(3)(4) These intersections will continue to operate at conditions similar to Base Year 2020. Due to ROW constraints, roadway improvements on the minor streets would be difficult.
Widening of Honoapiilani Highway to four lanes beyond Aholo Road along with extending the LBR would help alleviate some of the congestion anticipated.

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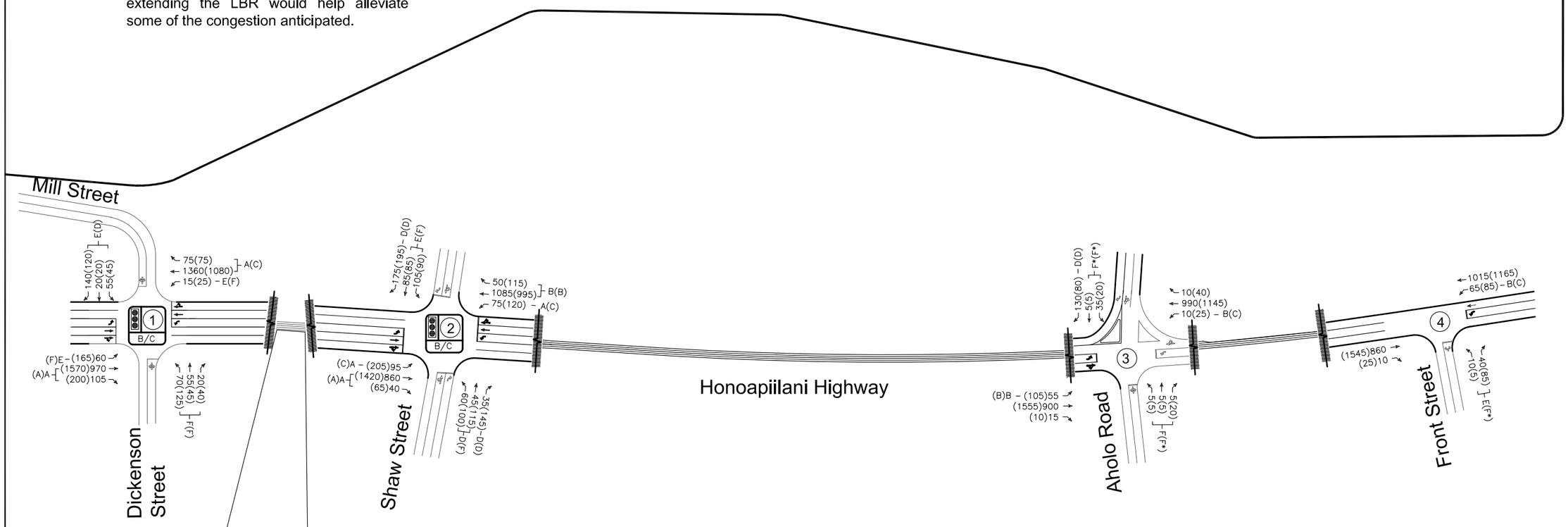

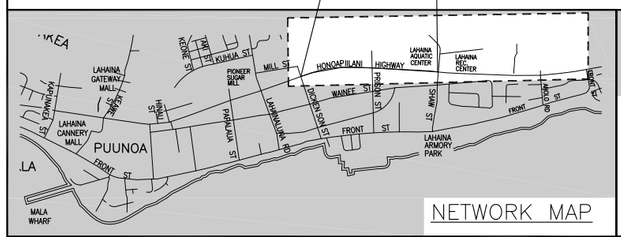

NETWORK MAP

DISTRIBUTION BREAKDOWN*

	NB	SB
LBR, PH 1A & 1B	21%	19%
KSE	N/A	N/A
Honoapiilani	79%	81%

(Average Values)

LEGEND

- ##(##) – AM(PM) PEAK HOUR OF TRAFFIC VOLUMES
- X(X) – AM(PM) LOS
- * – OVERCAPACITY, V/C >=1
- (Y) X/X – SIGNALIZED INTERSECTION Y, AM/PM LOS
- (Y) – INTERSECTION Y
- – EXISTING LANE CONFIGURATION
- – BASE YEAR 2020 LANE CONFIGURATION

NORTH

NOT TO SCALE

KUHUA STREET EXTENSION

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FIGURE 18c

BASE YEAR 2020 WITH MITIGATION VOLUME, LEVEL OF SERVICE AND LANE CONFIGURATION

Table 2: Level of Service Summary, Exisitng, Base Year 2020 and Base year 2020 with Mitigations

	Existing 2008						Base Year 2020						Base Year 2020 with Mitigations					
	AM			PM			AM			PM			AM			PM		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
Front Street & Honoapiilani Highway																		
EB LT/RT	18	0.13	C	40	0.45	E	44	0.38	E	348	1.40	F*	44	0.38	E	348	1.40	F*
NB LT	9	0.06	A	12	0.13	B	11	0.10	B	18	0.25	C	11	0.10	B	18	0.25	C
Aholo Street & Honoapiilani Highway																		
EB LT/TH/RT	76	0.02	F	37	0.15	E	258	0.60	F	Err	6.73	F*	258	0.60	F	Err	6.73	F*
WB LT/TH	27	0.21	D	33	0.12	D	625	1.63	F*	Err	16.92	F*	625	1.63	F*	Err	16.92	F*
WB RT	27	0.21	D	33	0.12	D	33	0.53	D	35	0.42	D	33	0.53	D	35	0.42	D
NB LT	9	0.01	A	12	0.04	B	10	0.02	B	15	0.07	C	10	0.02	B	15	0.07	C
SB LT	11	0.05	B	11	0.05	B	11	0.09	B	13	0.20	B	11	0.09	B	13	0.20	B
Shaw Street & Honoapiilani Highway																		
EB LT/TH	72	0.60	E	70	0.67	E	50	0.62	D	98	0.96	F	50	0.62	D	99	0.96	F
EB RT	61	0.02	E	55	0.10	E	39	0.02	D	44	0.19	D	39	0.02	D	44	0.19	D
WB LT/TH	62	0.18	E	57	0.31	E	62	0.80	E	102	0.95	F	62	0.80	E	105	0.96	F
WB RT	61	0.02	E	47	0.04	D	42	0.32	D	46	0.34	D	42	0.31	D	46	0.35	D
NB LT	3	0.13	A	23	0.54	C	7	0.22	A	27	0.65	C	7	0.22	A	28	0.65	C
NB TH/RT	7	0.64	A	10	0.66	B	13	0.55	B	14	0.53	B	13	0.55	B	14	0.53	B
SB LT	2	0.05	A	3	0.10	A	5	0.35	A	32	0.88	C	5	0.35	A	28	0.88	C
SB TH/RT	5	0.46	A	14	0.85	B	7	0.43	A	6	0.76	A	6	0.43	A	5	0.76	A
Overall or Max v/c	11	0.62	B	19	0.84	B	18	0.62	B	24	0.88	C	17	0.62	B	24	0.88	C
Dickenson Street & Honoapiilani Highway																		
EB LT/TH/RT	80	0.78	E	80	0.78	E	105	0.95	F	116	1.00	F*	105	0.95	F	97	0.95	F
WB LT/TH/RT	64	0.61	E	64	0.61	E	57	0.75	E	53	0.49	D	60	0.75	E	51	0.46	D
NB LT	69	0.41	E	69	0.41	E	78	0.53	E	173	0.90	F	80	0.53	E	166	0.90	F
NB TH/RT	10	0.76	A	10	0.76	A	8	0.67	A	27	0.64	C	9	0.68	A	29	0.65	C
SB LT	68	0.47	E	68	0.47	E	60	0.67	E	91	0.83	F	77	0.63	E	85	0.80	F
SB TH/RT	3	0.30	A	3	0.30	A	6	0.48	A	4	0.82	A	4	0.48	A	4	0.84	A
Overall or Max v/c	15	0.75	B	15	0.75	B	17	0.72	B	26	0.85	C	17	0.72	B	25	0.84	C
Lahainaluna Road & Honoapiilani Highway																		
													Modified From Exisitng: WB RT channelized Two receiving lanes on the westbound approach					
EB LT	47	0.41	D	44.3	0.43	D	35	0.34	C	63	0.75	E	36	0.39	D	56	0.71	E
EB TH/RT	84	0.89	F	84	0.91	F	44	0.68	D	106	1.00	F*	47	0.70	D	106	1.00	F*
WB LT	143	1.11	F*	59	0.73	E	33	0.63	C	94	0.88	F	44	0.73	D	73	0.81	E
WB TH	81	0.89	F	52	0.47	D	38	0.57	D	50	0.44	D	42	0.62	D	51	0.45	D
WB RT	398	1.73	F*	30	0.34	C	120	1.12	F*	47	0.21	D	56	0.94	E	49	0.27	D
NB LT	80	0.39	E	85	0.59	F	78	0.50	E	118	0.86	F	62	0.50	E	89	0.76	F
NB TH/RT	31	0.77	C	20	0.60	C	65	1.06	E*	25	0.90	C	51	1.02	D*	30	0.89	C
SB LT	91	0.92	F	146	1.11	F*	133	1.01	F*	75	0.86	E	87	0.92	F	48	0.90	D
SB TH/RT	7	0.34	A	5	0.63	A	6	0.64	A	9	0.96	A	16	0.60	B	44	0.98	D
Overall or Max v/c	123	1.04	F*	37	0.77	D	56	1.07	E*	33	0.98	C	43	1.00	D*	47	0.98	D

Note: * = Over-capacity Conditions

Table 2: Level of Service Summary, Exisitng, Base Year 2020 and Base year 2020 with Mitigations Continued

	Existing 2008						Base Year 2020						Base Year 2020 with Mitigations					
	AM			PM			AM			PM			AM			PM		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
Papalaua Street & Honoapiilani Highway																		
													Modified From Exisitng: EB: LT and TH/RT					
EB LT													114.4	1.05	F*	381.9	1.70	F*
EB LT/TH	221	1.30	F*	141	1.12	F*	115	1.07	F*	641	2.28	F*						
EB TH/RT													37	0.27	D	35	0.32	C
EB RT	50	0.06	D	41	0.06	D	21	0.09	C	28	0.15	C						
WB LT/TH/RT	51	0.12	D	44	0.35	D	36	0.51	D	1642	4.51	F*	39	0.45	D	313	1.57	F*
NB LT	57	0.60	E	63	0.64	E	49	0.59	D	90	0.85	F	44	0.61	D	204	1.21	F*
NB TH/RT	11	0.70	B	15	0.62	B	100	1.14	F*	163	1.28	F*	67	1.05	E*	219	1.35	F*
SB LT	51	0.12	D	62	0.13	E	57	0.62	E	172	1.24	F*	55	0.62	D	216	1.34	F*
SB TH/RT	15	0.46	B	10	0.76	B	18	0.77	B	94	1.13	F*	22	0.71	C	110	1.18	F*
Overall or Max v/c	35	0.81	C	28	0.85	C	66	1.04	E*	347	2.35	F*	51	0.98	D	191	1.48	F*
Hinau Street & Honoapiilani Highway																		
WB LT	67	0.37	E	65	0.65	E	56	0.40	E	68	0.68	E	56	0.40	E	68	0.68	E
WB RT	63	0.02	E	54	0.08	D	46	0.26	D	46	0.36	D	46	0.25	D	44	0.34	D
NB TH/RT	3	0.61	A	8	0.67	A	3	0.74	A	11	0.95	B	20	0.75	B	46	0.96	D
SB LT	63	0.47	E	51	0.65	D	58	0.73	E	78	0.97	E	52	0.65	D	47	0.85	D
SB TH	2	0.36	A	12	0.55	B	5	0.52	A	8	0.87	A	6	0.52	A	21	0.87	C
Overall or Max v/c	5	0.59	A	15	0.67	B	6	0.72	A	14	0.92	B	15	0.72	B	35	0.94	C
Keawe Street & Honoapiilani Highway																		
							Modified From Exisitng: WB: LT, TH and RT						*Modified From Exisitng:* SB: Double LT, TH and TH/RT EB: LT, TH and RT WB: LT, LT/TH/RT and RT					
EB LT													54	0.29	D	62	0.50	E
EB TH													57	0.45	E	66	0.58	E
EB LT/TH	61	0.32	E	52	0.50	D	228	1.21	F*	452	1.78	F*						
EB RT	58	0.03	E	34	0.15	C	51	0.08	D	62	0.45	E	53	0.04	D	59	0.16	E
WB LT							39	0.36	D	61	0.75	E	45	0.46	D	59	0.72	E
WB TH							37	0.11	D	47	0.16	D						
WB LT/TH	68	0.60	E	75	0.83	E												
WB LT/TH/RT													61	0.76	E	162	1.17	F*
WB RT	58	0.04	E	40	0.43	D	31	0.75	C	119	1.14	F*	43	0.21	D	55	0.61	D
NB LT	163	0.92	F	73	0.62	E	93	0.76	F	419	1.73	F*	263	1.23	F*	437	1.73	F*
NB TH	3	0.51	A	6	0.59	A	192	1.37	F*	248	1.47	F*	25	0.97	C	135	1.24	F*
NB RT	2	0.07	A	3	0.14	A	15	0.23	B	28	0.39	C	4	0.18	A	9	0.34	A
SB LT	116	0.81	F	162	1.08	F*	411	1.78	F*	435	1.82	F*	673	2.35	F*	500	1.95	F*
SB TH/RT	6	0.43	A	6	0.73	A	28	0.82	C	113	1.17	F*	21	0.74	C	147	1.25	F*
Overall or Max v/c	13	0.53	B	20	0.76	B	137	1.30	F*	192	1.52	F*	107	1.01	F*	165	1.21	F*

Note: * = Over-capacity Conditions

Table 2: Level of Service Summary, Exisitng, Base Year 2020 and Base year 2020 with Mitigations Continued

	Existing 2008						Base Year 2020						Base Year 2020 with Mitigations					
	AM			PM			AM			PM			AM			PM		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
Mill Street & Lahainaluna Road & Pioneer Mill site 1 Access																		
													Modified From Exisitng: NB: shared LT/TH/RT SB: LT/TH and RT WB: LT and TH/RT					
EB LT													13	0.04	B	10	0.06	B
WB LT													9	0.06	A	9	0.05	A
WB LT/TH	0	0.07	A	1	0.04	A												
WB LT/TH/RT							4	0.06	A	1	0.05	A						
NB LT/RT	104	0.86	F	18	0.26	C												
NB LT/TH/RT							95	0.86	F	28	0.40	D	34	0.53	D	46	0.56	E
SB LT/TH							295	0.52	F	46	0.24	E	430	0.68	F	277	0.82	F
SB RT							29	0.07	D	12	0.17	B	15	0.03	C	13	0.19	B
Kuhua Street & Lahainaluna Road																		
													Modified From Exisitng: EB: LT and TH					
EB LT													11	0.09	B	10	0.21	A
EB LT/TH	4	0.10	A	2	0.06	A	3	0.09	A	4	0.18	A						
SB LT	503	0.92	F	27	0.08	D	53	0.27	F	53	0.45	F	50	0.25	E	76	0.56	F
SB RT	396	1.55	F*	12	0.06	B	28	0.51	D	12	0.21	B	28	0.51	D	15	0.27	C
Aki Street & Kuhua Street																		
							Modified From Exisitng: NB, SB & WB: LT/TH/RT EB: LT and TH/RT						*Modified From Exisitng:* NB, SB & WB: LT/TH/RT EB: LT and TH/RT					
EB LT							9	0.03	B	14	0.13	B	10	0.03	B	13	0.13	B
EB TH/RT							10	0.02	A	10	0.06	A	10	0.02	A	13	0.13	B
WB LT/RT	9	0.09	A	9	0.03	A												
WB LT/TH/RT							11	0.13	B	14	0.09	B	11	0.13	B	14	0.07	B
NB LT/TH/RT							2	0.01	A	2	0.03	A	2	0.01	A	2	0.03	A
SB LT/TH/RT							0	0.00	A	0	0.00	A	0	0.00	A	0	0.00	A
Lahaina Gateway Mall West Driveway & Keawe Street																		
													Modified From Exisitng: NB & SB: LT/TH and RT					
EB LT	8	0.07	A	7.9	0.11	A	9	0.06	A	11	0.20	B	9	0.06	A	11	0.20	B
WB LT	0	0.00	0	8	0.01	A	9	0.01	A	10	0.03	A	9	0.01	A	10	0.03	A
NB LT	0	0.00	A	30	0.40	D	44	0.19	E	Err	6.20	F*	44	0.19	E	Err	6.20	F*
NB TH/RT	0	0.00	A	12	0.05	B	27	0.06	D	91	0.40	F	27	0.06	D	91	0.40	F
SB LT/TH	13	0.02	B	17	0.06	C	41	0.10	E	237	0.81	F	41	0.10	E	237	0.81	F
SB RT	9	0.07	A	9	0.15	A	11	0.05	B	14	0.28	B	11	0.05	B	14	0.28	B
Lahaina Gateway Mall East Driveway & Keawe Street																		
													Modified From Exisitng: SB: LT/TH and RT					
EB LT	0	0.00	0	7.6	0.03	A	9	0.03	A	10	0.11	B	9	0.03	A	10	0.11	B
WB LT	0	0.00	0	0	0.00	0	9	0.01	A	9	0.01	A	9	0.01	A	9	0.01	A
NB LT/TH	0	0.00	A	11	0.01	B	36	0.25	E	79	0.41	F	36	0.25	E	79	0.41	F
NB RT	0	0.00	A	11	0.01	B	11	0.02	B	11	0.01	B	11	0.02	B	11	0.01	B
SB LT/TH	0	0.00	A	11	0.01	B	29	0.03	D	50	0.12	E	29	0.03	D	50	0.12	E
SB RT	0	0.00	A	9	0.05	A	11	0.03	B	13	0.17	B	11	0.03	B	13	0.17	B

Note: * = Over-capacity Conditions

Table 2: Level of Service Summary, Exisitng, Base Year 2020 and Base year 2020 with Mitigations Continued

	Existing 2008						Base Year 2020						Base Year 2020 with Mitigations					
	AM			PM			AM			PM			AM			PM		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
HHFDC Access & Keawe Street																		
							New Intersection:: SB: LT and RT with SB LT acceleration lane EB: LT and TH WB: TH and TH/RT						*New Intersection::* SB: LT and RT with SB LT acceleration lane EB: LT and TH WB: TH and TH/RT					
EB LT							9	0.07	A	10	0.12	B	9	0.07	A	10	0.12	B
EB TH							0	0.19	0	0	0.17	0	0	0.19	0	0	0.17	0
WB TH/RT							0	0.15	0	0	0.23	0	0	0.15	0	0	0.23	0
SB LT							51	0.65	F	70	0.64	F	51	0.65	F	70	0.64	F
SB RT							11	0.14	B	12	0.12	B	11	0.14	B	12	0.12	B
Pioneer Mill site 2 Access & Keone Street & Kuhua Street																		
							Modified From Exisitng: NB, SB & WB: LT/TH/RT EB: LT and TH/RT						*Modified From Exisitng:* NB, SB & WB: LT/TH/RT EB: LT and TH/RT					
EB LT/TH							9	0.04	A	10	0.21	A	10	0.01	B	11	0.01	B
EB RT							9	0.04	A	10	0.21	A	9	0.04	A	9	0.21	A
WB LT/TH/RT							10	0.09	B	13	0.06	B	11	0.09	B	14	0.06	B
NB LT/TH/RT							4	0.02	A	4	0.06	A	4	0.02	A	4	0.06	A
SB LT/TH/RT							1	0.00	A	1	0.00	A	1	0.00	A	1	0.00	A

Note: * = Over-capacity Conditions

V. YEAR 2020 WITH PROJECT

As mentioned in the introduction, the KSE will provide a new north-south two-lane roadway with median turning lanes at its intersections. Whereas the LBR will improve regional mobility, the KSE will provide more localized access for circulation within the Lahaina community, while also improving accessibility for pedestrians and bicyclists.

Direct pedestrian and vehicular connections between the KSE and Lahaina Town will occur via the Papalaua Street Extension – an easterly extension of Papalaua Street from its existing terminus at Honoapiilani Highway, between Pioneer Mill Sites 1 and 2, and ultimately connecting to the KSE across of Aki Street. Papalaua Street was identified based upon early community meetings as the ideal connection point due to its existing provision of wide sidewalks on the makai side of Honoapiilani Highway headed towards Lahaina Town.

The primary effects of the KSE will be:

1. Improvement in north-south corridor capacity between Keawe Street and Front Street.
2. Provision of local access for Lahaina residents, employees, and patrons originating from/destined for Lahaina areas mauka of Honoapiilani Highway.
3. Improvement of pedestrian and bicycle accessibility, connectivity, and safety through the provision of a walking path between residences and the commercial and the park areas.
4. Provision of a new mauka-makai pedestrian connection via the Papalaua Street Extension
5. Reduction in the number of turning movements onto and off of Honoapiilani Highway.

In each of the four alternative routes that will be discussed, the KSE will generally run north-south, east of and parallel to Honoapiilani Highway between Keawe Street and Front Street. While its northern terminus will be at Keawe Street across the assumed

HHFDC access, its southern terminus will be either Aholo Road or Front Street. See below for descriptions of the alternatives:

Alternative 1 – Front Street Terminus

The KSE begins as a new eastern approach to the Honoapiilani Highway/Front Street (southern) intersection, and continues northward around the Lahaina Recreation Center; it intersects with Lahainaluna Road west of the Existing MECO power substation, deflects eastward, and continues along the existing Kuhua Street, and finally terminates at its intersection with Keawe Street across of the future access to the proposed HHFDC Villages of Leialii.

Alternative 2 – Aholo Road Terminus

Alternative 2 is identical to Alternative 1, but with the southernmost terminus at Aholo Road instead of Front Street.

Alternative 3 – Mill Street Alignment

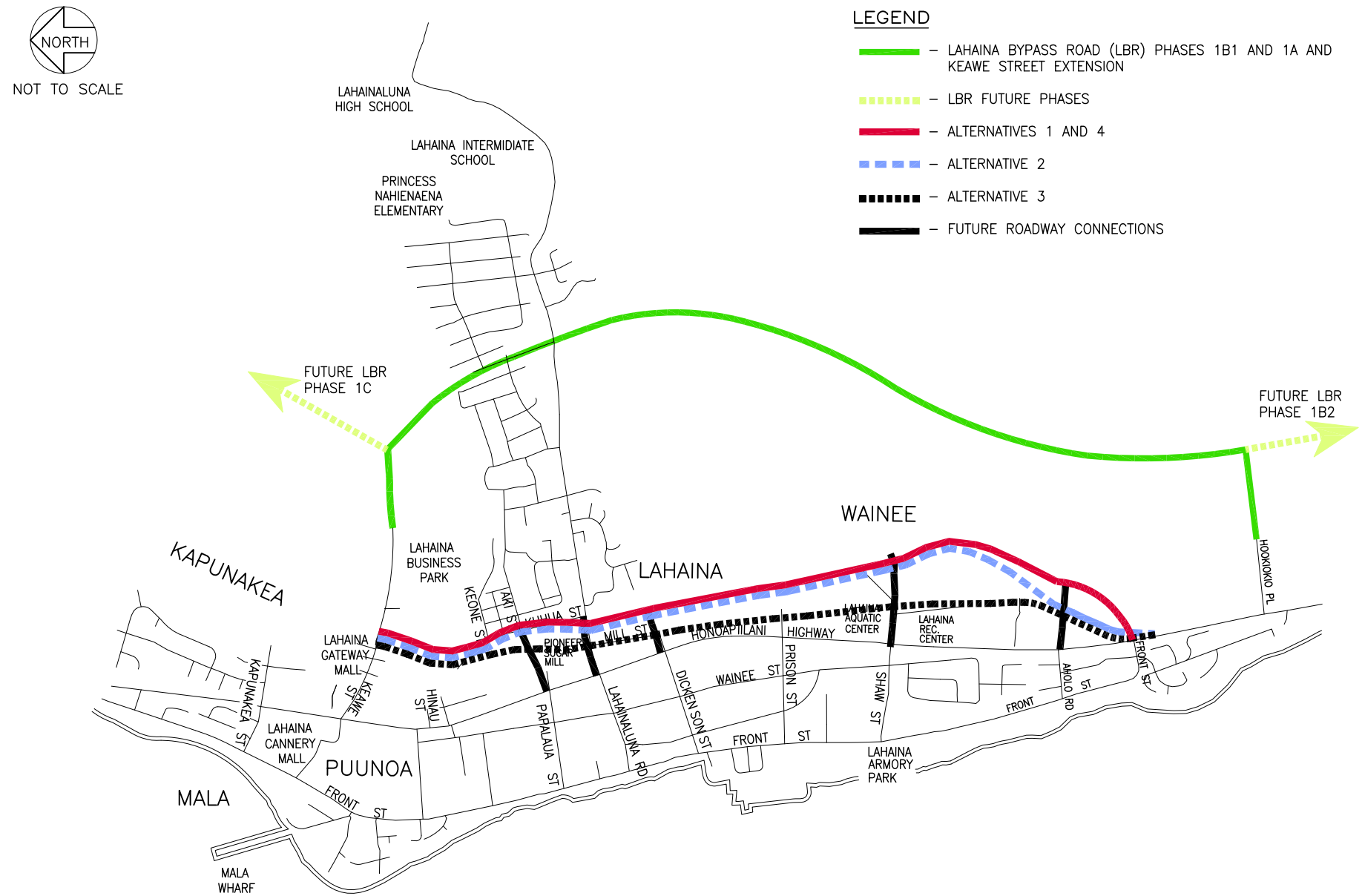
This alignment would be identical to that of Alternatives 1 and 2, but with the KSE shifted westward to follow the existing cane haul alignment of Mill Street. This alignment would bifurcate the existing Lahaina Recreation Center, crossing between the two (2) parking areas for the east and west baseball fields and recreation areas.

Alternative 4 – Frontage Road Alignment

This alignment would be identical to Alternative 1 or 2, but with the KSE shifted slightly westward in the vicinity of the Pioneer Mill site to maintain the existing Kuhua Street as a parallel frontage road (hereinafter referred to as “Old Kuhua Street”). Old Kuhua Street is assumed to retain its existing physical characteristics, while receiving access to the KSE via an extension of Aki Street; it will become a dead end at Lahainaluna Road.

The following discussions will concentrate on overall operations and differences between the alternatives and Base Year 2020 with mitigation scenario. Refer to Figure 19 for a depiction of the four (4) alignments.

Note that all the alternatives studied require ROW acquisition to construct the KSE.



KUHUA STREET EXTENSION

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

ALIGNMENTS 1 THROUGH 4

FIGURE 19

A. Year 2020 with Alternative 1 Analysis

1. Assignment of Traffic

Equilibrium[8] would dictate that approximately 22 percent of vehicles would use the KSE. As can be seen in Figure 20 below, the combination of the LBR and the KSE would reduce the burden of Honoapiilani Highway to 62 percent of corridor traffic – a marked decrease over Base Year 2020.

However, ultimately the traffic would recombine onto Honoapiilani Highway at Keawe Street to the north, and Front Street and Hokiokio Street to the south. See Figures 21 and 22 for spatial distributions of corridor traffic.

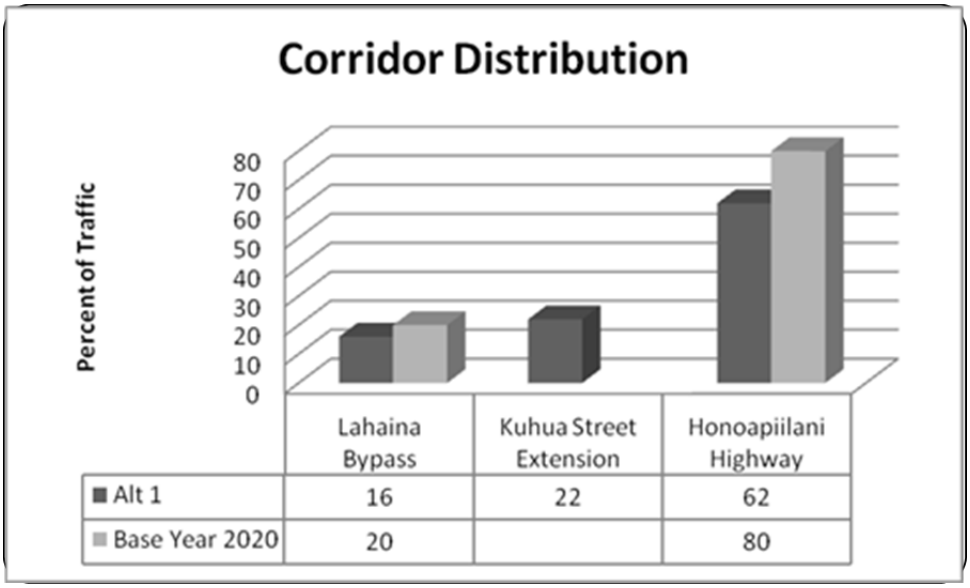


Figure 20: Distribution of Corridor Traffic

[8] Concept that drivers will "even out" congestion among competing routes.

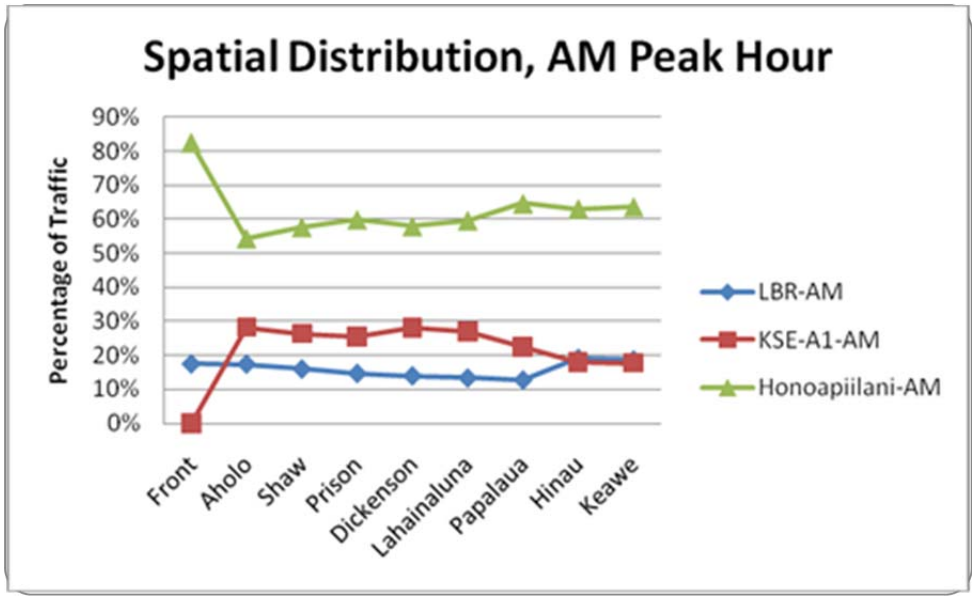


Figure 21: AM Spatial Distribution of Traffic

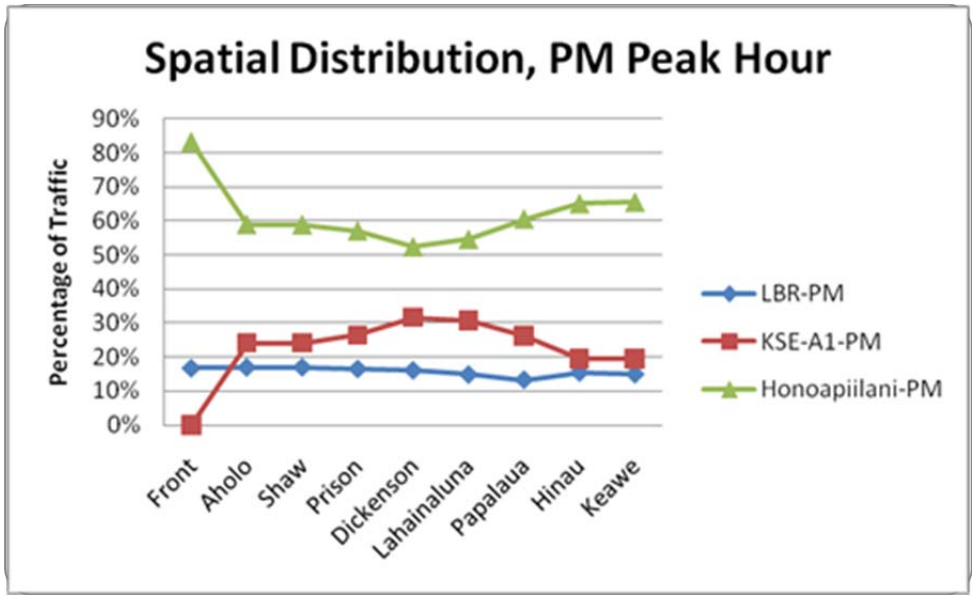


Figure 22: PM Spatial Distribution of Traffic

2. Summary of Findings

The regional capacity issues described in Section IV will continue, and ultimately have the same solutions:

a. Widen Honoapiilani Highway to four (4) lanes between Maalaea and Aholo Road

b. Extend the Lahaina Bypass Road further north to at least the proposed Kaanapali Connector Road.

In lieu of these two (2) improvements, traffic will continue to be constrained by bottlenecks in the northbound and southbound direction, assuming that all of the developments in our projections are built as assumed in this report.

Regional issues notwithstanding[9], the KSE will significantly improve the volume-to-capacity (v/c) ratios and delay along Honoapiilani Highway through the Lahaina Area. See Figures 23 through 26 below.

[9] It is likely that the queues emanating from the anticipated bottlenecks will restrict the flow of traffic at most of the intersections along Honoapiilani Highway to a greater extent than shown in the analysis, with the exception of the Honoapiilani Highway/Keawe Street intersection.

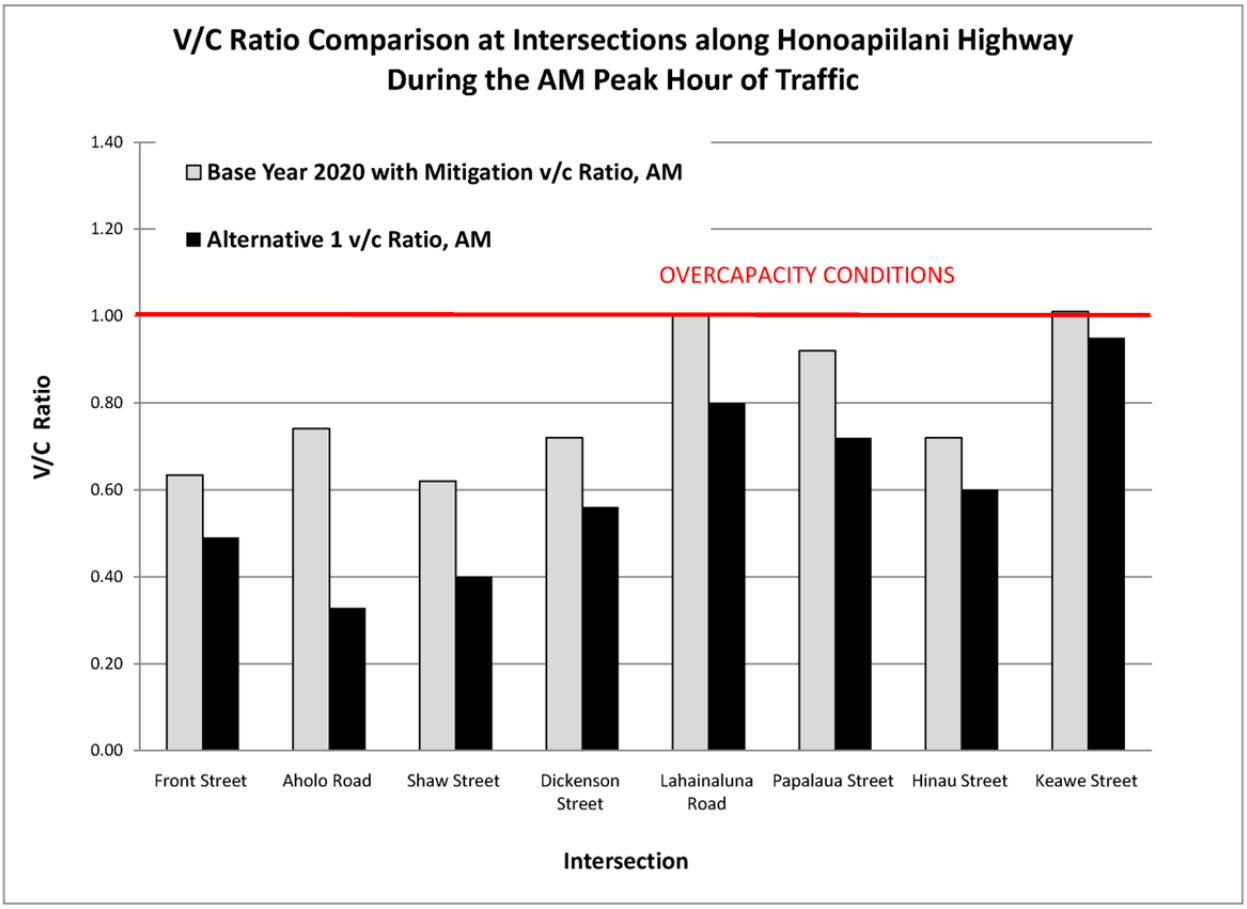


Figure 23: V/C Ratio Comparison at Intersections Along Honoapiilani Highway During the AM Peak Hour of Traffic.

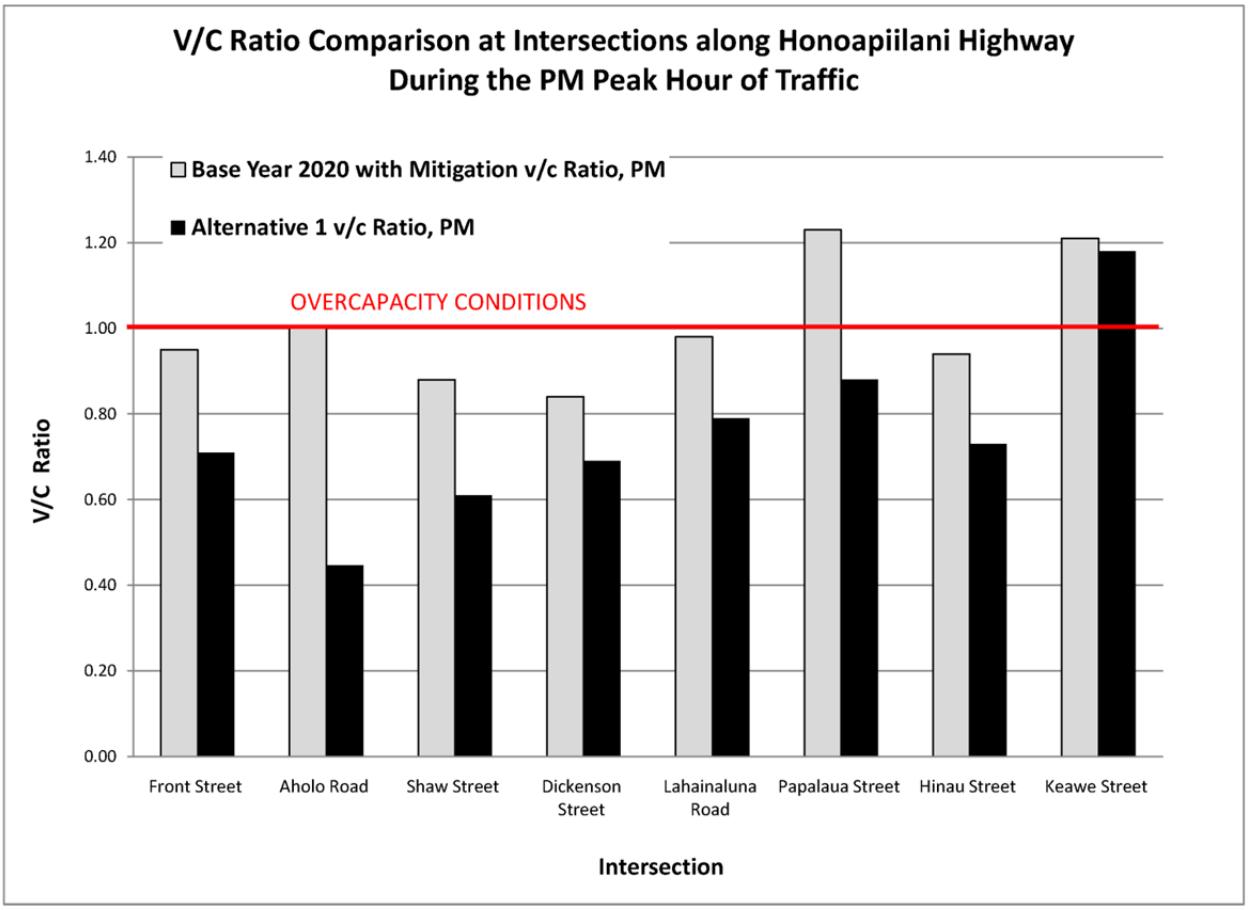


Figure 24: V/C Ratio Comparison at Intersections Along Honoapiilani Highway During the PM Peak Hour of Traffic.

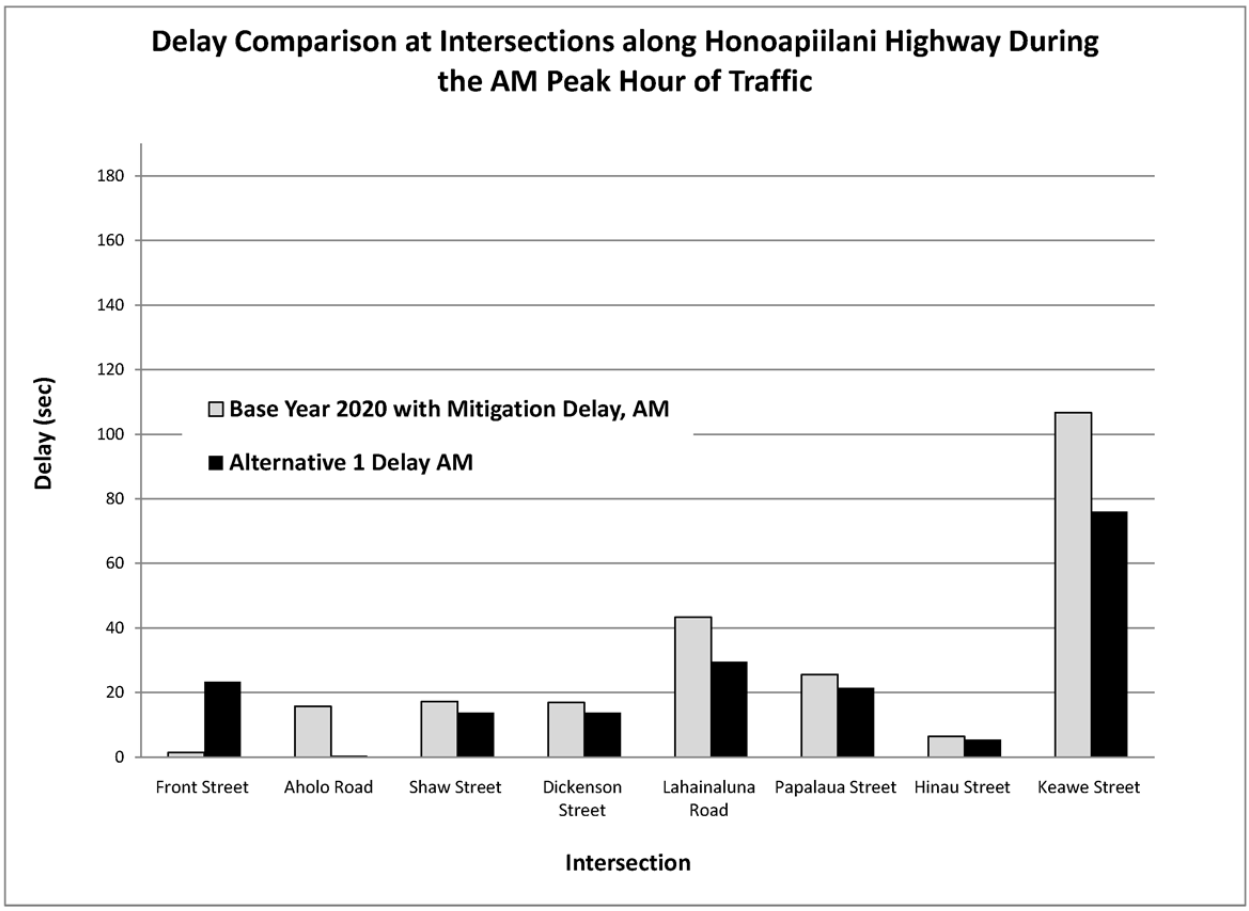


Figure 25: Delay Comparison at Intersections Along Honoapiilani Highway During the AM Peak Hour of Traffic.

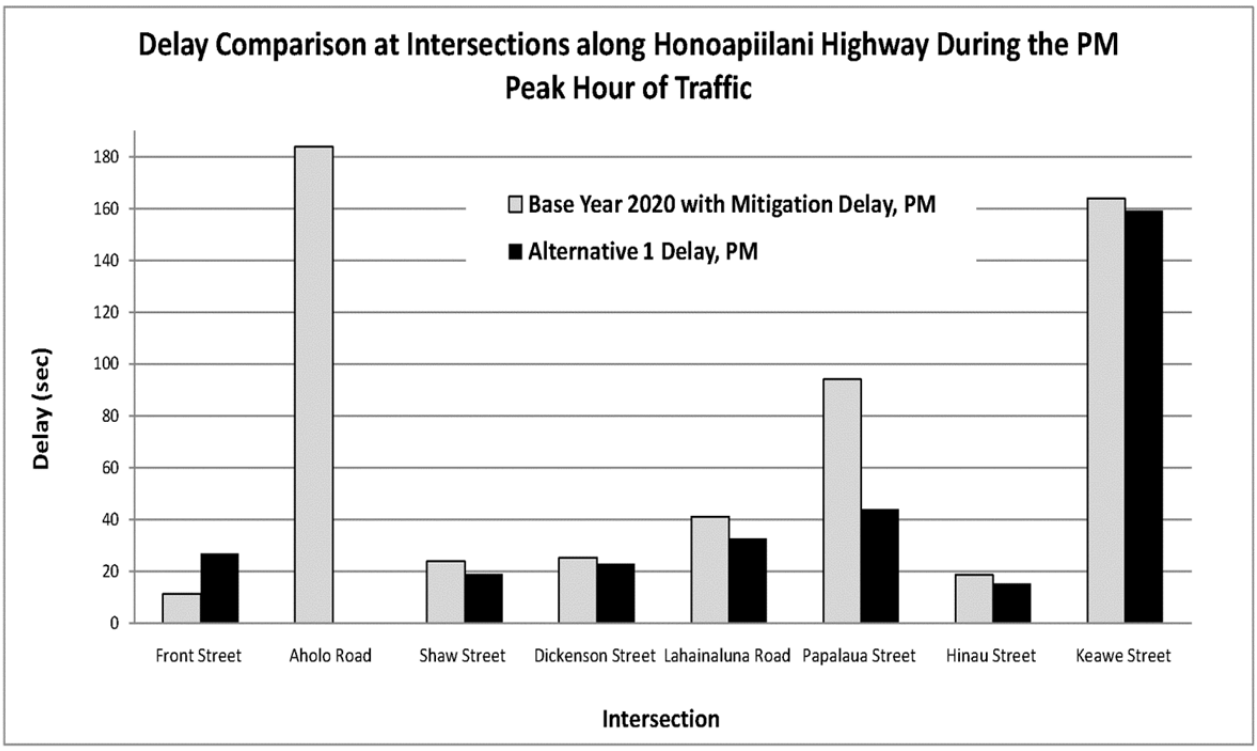


Figure 26: Delay Comparison at Intersections along Honoapiilani Highway During the PM Peak Hour of Traffic.

3. Detailed Intersection Analysis

Keawe Street Area (See Figure 28a)

Traffic along Keawe Street is anticipated to increase by 3.7 percent; this can be attributed to the fact that at the Keawe Street/Honoapiilani Highway intersection:

- Westbound approach: while left-turn traffic decreases, right-turn traffic increases, and conversely
- While the southbound left-turn traffic increases, the northbound right-turn traffic decreases.

In essence, local traffic will be able to directly access the KSE instead of using Honoapiilani Highway when traveling- to and from the south.

Ultimately, conditions along Keawe Street will resemble those of Base Year 2020, with the exception that the Keawe Street/KSE intersection will likely warrant a signal; the resulting signalized intersection would operate at LOS B(B) during the AM(PM) peak hours of traffic. The traffic signal should be designed to ensure that its queues do not obstruct the path of the Lahaina Sugar Train.

Lahainaluna Road and Papalaua Street Area (See Figure 28b)

The construction of the KSE will significantly alter the flow of traffic through and accessibility to this area. The KSE must be aligned and deflected to avoid the existing MECO Power Substation along Lahainaluna Road, while maintaining the maximum feasible distance from Honoapiilani Highway to maintain queue stacking distance; it is therefore recommended that the KSE-A1 intersect Lahainaluna Road immediately west of the MECO Power Substation.

As a result, the existing Kuhua Street/Lahainaluna Road intersection would have to be relocated approximately 120 feet makai of its current location and then be transitioned back to its existing alignment (ROW will need to be acquired from the Pioneer Mill Site 1) joining Kuhua Street and KSE into a single intersection; the projected volume at this intersection would most likely warrant a traffic signal. A roundabout is not feasible here due to its proximity to the signalized Honoapiilani Highway/Lahainaluna Road intersection.

The Papalaua Street Extension will serve the following purposes:

1. Relieve congestion at the Lahainaluna Road/Honoapiilani Highway intersection
2. Provide vehicular, bicycle, and pedestrian connectivity between the KSE, Honoapiilani Highway, and Lahaina Town.

At the intersection of Papalaua Street and Honoapiilani Highway, it is recommended that the Papalaua Street provide dedicated left-turn,

through, and right-turn lanes in the westbound direction, while providing two eastbound receiving lanes. Accomplishing this will require:

1. Reconfiguration of the Prudential site ROW,
2. Utilizing the existing access easement along the West Maui Center's property, and
3. Reconfiguration and consolidation of the driveways for the West Maui Center and the Prudential site; this is recommended due to the increased volume, proximity to Honoapiilani Highway, and potential for queue spillback onto Honoapiilani Highway.

Without these improvements, the congestion that currently exists in this area will be exacerbated, and Honoapiilani Highway's intersections with Lahainaluna Road and Papalaua Street will operate at overcapacity conditions. Refer to Table 3 for a comparison of operations with and without the proposed improvements.

Kamamalu Street's existing access to Kuhua Street should be restricted to emergency vehicles only to maintain the flow of traffic along the KSE. At the KSE's intersections with Papalaua Street/Aki Street and Keone Street, a signal will likely not be warranted. However, the traffic should be restudied after the Pioneer Mill Sites 1 and 2 are developed to reassess whether or not a signal is warranted.

Table 3: Level of Service Summary Year 2020 with KSE at the intersection of Honoapiilani Highway with Lahainaluna Road and Papalaua Street with and without the Papalaua Street Extension

	Year 2020 with Kuhua Street Extension and without Papalaua Extension						Year 2020 with Kuhua Street Extension and Papalaua Street Extension					
	AM			PM			AM			PM		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
Lahainaluna Road/Honoapiilani Highway												
EB LT	58	0.52	E	73	0.69	E	39	0.30	D	46	0.43	D
EB TH/RT	69	0.89	E	161	1.17	F*	63	0.85	E	87	0.92	F
WB LT	171	1.12	F*	157	1.09	F*	74	0.85	E	69	0.70	E
WB TH	62	0.91	E	99	0.95	F	57	0.77	E	66	0.59	E
WB RT	12	0.46	B	26	0.59	C	23	0.39	C	36	0.37	D
NB LT	59	0.50	E	80	0.63	E	68	0.50	E	79	0.63	E
NB TH	37	0.92	D	48	0.95	D	24	0.80	C	21	0.66	C
SB LT	195	1.20	F*	248	1.47	F*	86	0.79	F	79	0.88	E
SB TH/RT	13	0.53	B	39	0.83	D	12	0.50	B	9	0.74	A
Overall	53	0.96	D	91	1.23	F*	33	0.80	C	32	0.79	C
Papalaua Street/Honoapiilani Highway												
							Modified From Existing: EB: LT and TH/RT WB: LT, TH and RT					
EB LT							60	0.82	E	61	0.85	E
EB LT/TH	75	0.91	E	104	1.00	F	48	0.52	D	65	0.79	E
EB TH/RT												
EB RT	35	0.23	D	44	0.37	D						
WB LT							46	0.18	D	51	0.55	D
WB TH							50	0.20	D	68	0.69	E
WB LT/TH/RT	28	0.19	C	43	0.34	D						
WB RT							52	0.11	D	59	0.18	E
NB LT	64	0.61	E	91	0.85	F	66	0.61	E	86	0.78	F
NB TH/RT	13	0.80	B	34	0.71	C	8	0.72	A	37	0.93	D
SB LT	66	0.14	E	54	0.23	D	63	0.58	E	75	0.97	E
SB TH/RT	18	0.67	B	43	1.02	D*	10	0.57	A	27	0.91	C
Overall	23	0.83	C	45	1.01	D*	21	0.72	C	43	0.88	D

Note: * = Over-capacity Conditions

Parking Along the KSE

Currently, vehicles park on both sides of the 20-foot wide Kuhua Street, which fails to provide sidewalks or landscape buffers between its houses and the road. The KSE, Alternative 1 (KSE-A1) would:

- Widen the existing Kuhua Street to 34 feet – two (2) lanes with a median left-turn lane,
- Provide a landscape-buffered (from the roadway) 10-foot shared bicycle and pedestrian pathway,
- While disallowing or significantly reducing parallel roadside parking, the KSE would also:
    - Provide a community parking area near Lahainaluna Road (see "New Parking Lot" on Figure 28b). It is recommended that the parking lot be one-way with its entrance along Kuhua Street and its exit as a right-turn only onto Lahainaluna Road.
    - Provide a buffer between the KSE and existing properties that front it,
    - Increase the houses' effective driveway lengths by 15 feet, thereby allowing for two (2) additional cars (side-by-side) to be parked within them, and
    - Provide a refuge lane along the east side of the roadway as shown in Figure 27.

See Figure 27 below for a conceptual depiction of the proposed section along the existing Kuhua Street, which was developed with and approved by the Maui County Department of Public Works and Engineering Division in 2009.

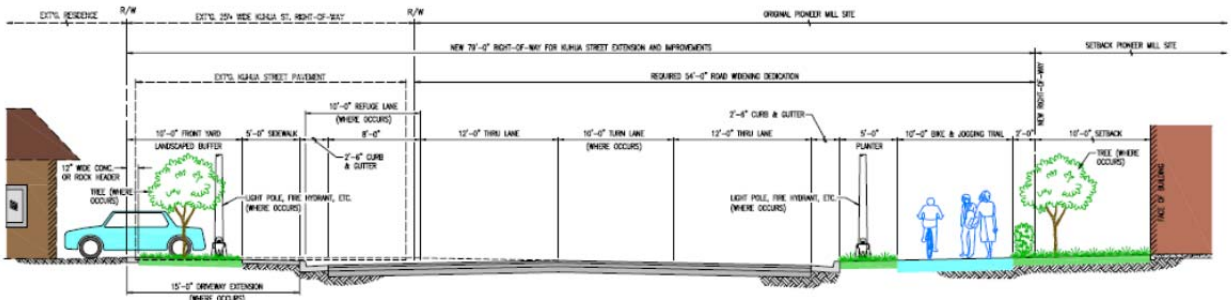


Figure 27: Kuhua Street Extension Section

<u>Dickenson Street and Further South (See Figures 28c and 28d)</u>

The KSE-A1 was conceived developed in response to community concerns regarding increased traffic that would be routed through the Honoapiilani Highway/Aholo Road intersection if it were signalized.

Therefore, in KSE-A1, the Honoapiilani Highway/Aholo Road intersection would remain unsignalized, and would also be restricted to right-turn in/out at its Aholo Road approaches; the terminal KSE access to Honoapiilani Highway would be provided at a new approach to the intersection of Honoapiilani Highway and Front Street (further south). Consequently, the Front Street intersection would most likely warrant a traffic signal.

Due to the heavy demand at the KSE's southern terminus, it is recommended that westbound double left-turn lanes be provided at the Honoapiilani Highway/Front Street intersection. This would require Honoapiilani Highway to be widened to four (4) lanes further south of the Honoapiilani Highway/Front Street intersection.

A roundabout could be recommended[10] at the Shaw Street Extension/KSE intersection for both operational and traffic calming purposes, as the intersection resides near the border of the Lahaina Aquatic Center and the Lahaina Recreation Park.

[10] Recommendation of a roundabout at this location hinges on the assumptions made in this report relative to the Wainee Development and location of the intersection. .

4. Summary of Recommended Improvements for Alternative 1

KSE

Construct the KSE as a two-lane roadway with medians for left-turn lanes using the "Alternative 1" alignment shown in Figure 19. Note that for the construction of the KSE, ROW will need to be acquired.

Papalaua Street Extension

Extend Papalaua Street eastward to connect with the KSE.

Honoapiilani Highway/Keawe Street

Westbound Approach: re-stripe to provide a dedicated left-turn lane, a shared through/right-turn lane, and dedicated right-turn lane. This will require the construction of a larger-radius channelized island at the northeast corner, which will require ROW Acquisition.

Honoapiilani Highway/Papalaua Street

Westbound Approach: widen to provide a dedicated left-turn lane, a dedicated through lane, and a dedicated right-turn lane; provide two receiving lanes in the eastbound direction. This will require ROW acquisition.

Honoapiilani Highway/Aholo Road

Honoapiilani Highway: Widen to four (4) lanes southward beyond Aholo Road.

Eastbound Approach: Restrict to right-in/right-out due to provision of signalized access via Front Street and heavier conflicting volume along Honoapiilani Highway.

Westbound Approach: Restrict to right-in/right-out due to provision of signalized access via Front Street and heavier conflicting volume along Honoapiilani Highway.

Honoapiilani Highway/Front Street

Honoapiilani Highway: *Widen to four (4) lanes between Aholo Road and beyond Front Street.*

Northbound Approach: *Construct a dedicated right-turn deceleration lane. This will require ROW acquisition.*

Westbound Approach: *Construct a dedicated westbound left-turn lane and a shared left-turn/through/right-turn lane. This will require ROW acquisition.*

Traffic Signal Warrant: *Would likely be met; therefore, a traffic signal is recommended at this intersection.*

KSE Intersections

As stated earlier, the KSE will generally provide two (2) lanes with median left-turns at its intersections. It is recommended that all intersections along the KSE be two-way stop controlled (TWSC), with the following exceptions:

- *Keawe Street/HHFDC Access/KSE – Signalized; the traffic signal should be designed to ensure that its queues do not obstruct the path of the Lahaina Sugar Train.*
- *Lahainaluna Road/KSE – Signalized*
- *Shaw Street Extension/KSE – Roundabout*[11]
- *Honoapiilani Highway/KSE – Signalized*

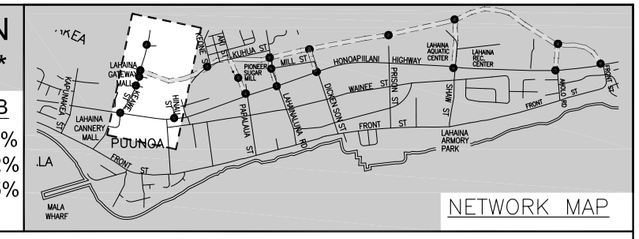
A new parking lot will be provided at the corner of Lahainaluna Road and Kuhua Street; it is recommended that the lot be designated as one-way, with the entrance along Kuhua Street and the exit as a right-out only onto Lahainaluna Road.

Refer to Figures 28a through 28d for recommended lane configurations, as most of the alignment will be new.

[11] Recommendation of a roundabout at this location hinges on the assumptions made in this report relative to the Wainee Development and location of the intersection. .

DISTRIBUTION BREAKDOWN*	NB	SB
LBR, PH 1A & 1B	18%	13%
KSE	22%	22%
Honoapiilani	60%	65%

(Average Values)



Discussion

1. Volumes will most likely warrant a traffic signal. Northbound leg added; new turning lanes recommended to allow for optimal operating efficiency and to reduce flow obstructions. The intersection will operate satisfactorily.

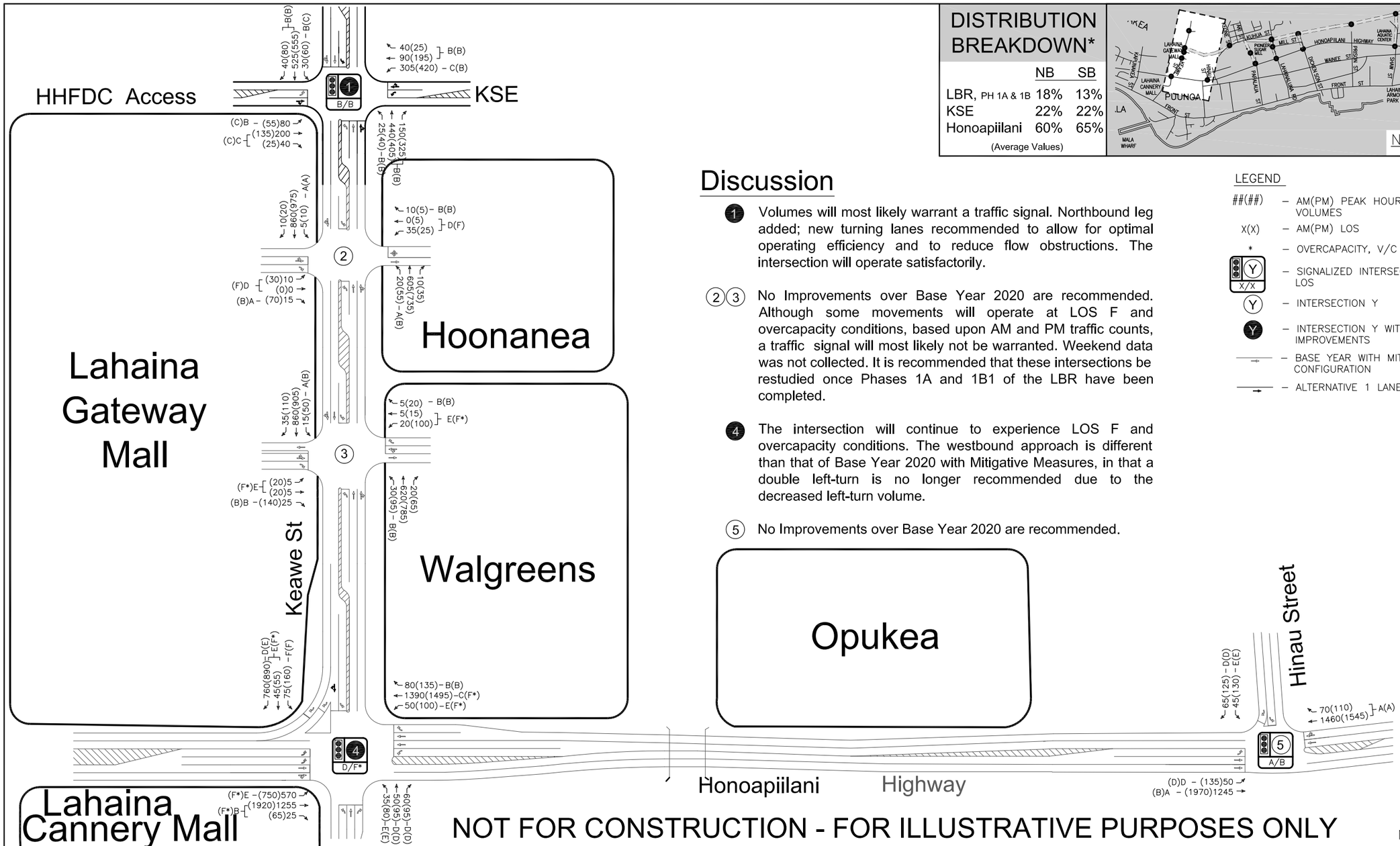
2 3 No Improvements over Base Year 2020 are recommended. Although some movements will operate at LOS F and overcapacity conditions, based upon AM and PM traffic counts, a traffic signal will most likely not be warranted. Weekend data was not collected. It is recommended that these intersections be restudied once Phases 1A and 1B1 of the LBR have been completed.

4. The intersection will continue to experience LOS F and overcapacity conditions. The westbound approach is different than that of Base Year 2020 with Mitigative Measures, in that a double left-turn is no longer recommended due to the decreased left-turn volume.

5 No Improvements over Base Year 2020 are recommended.

LEGEND

- ##(##) – AM(PM) PEAK HOUR OF TRAFFIC VOLUMES
- X(X) – AM(PM) LOS
- * – OVERCAPACITY, V/C >=1
- Y X/X – SIGNALIZED INTERSECTION Y, AM/PM LOS
- Y – INTERSECTION Y
- Y – INTERSECTION Y WITH RECOMMENDED IMPROVEMENTS
- – BASE YEAR WITH MITIGATION LANE CONFIGURATION
- – ALTERNATIVE 1 LANE CONFIGURATION



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KUHUA STREET EXTENSION

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ALTERNATIVE 1 FRONT STREET TERMINUS YEAR 2020 VOLUME, LEVEL OF SERVICE AND LANE CONFIGURATION

FIGURE 28a

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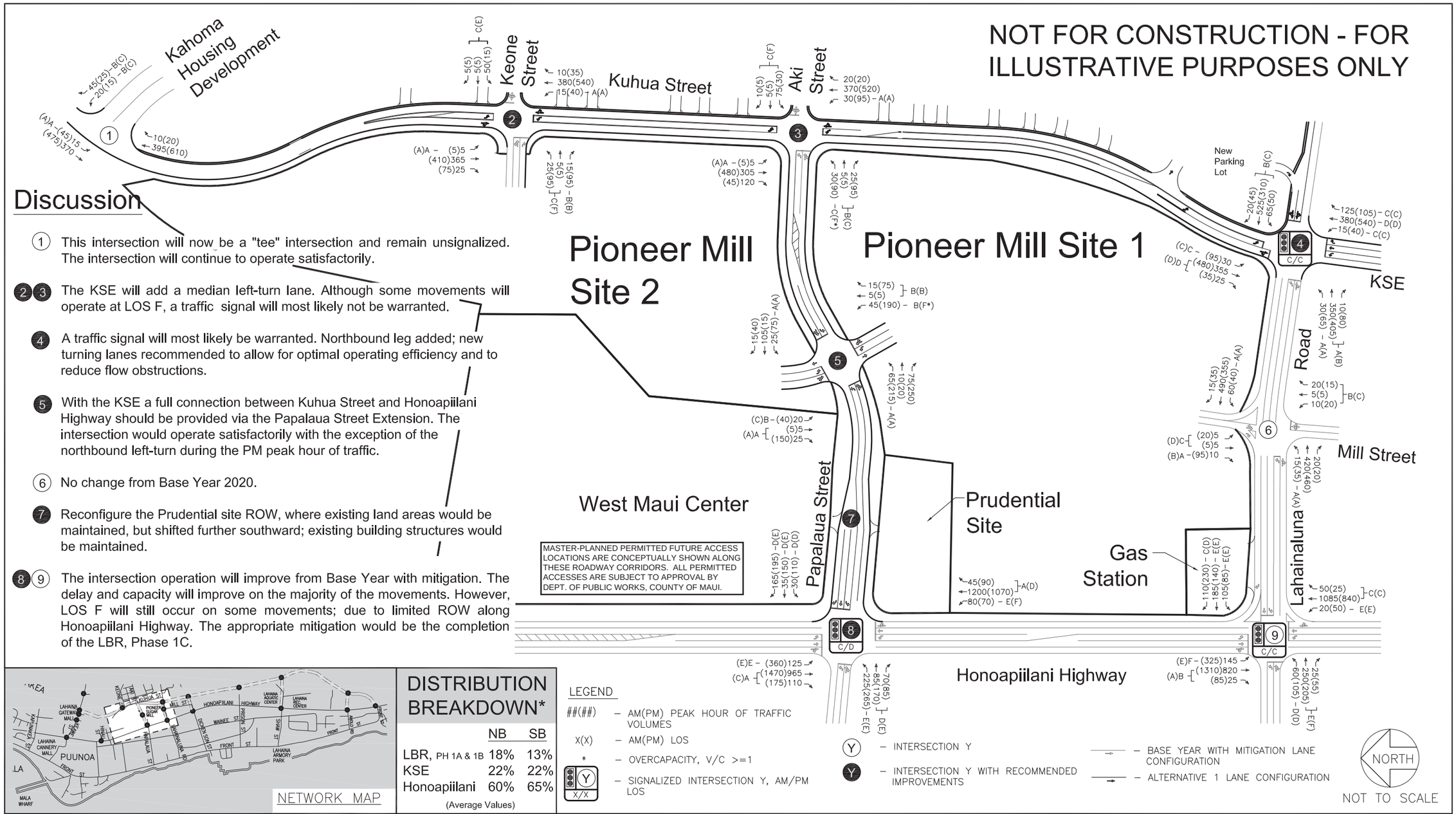

Discussion

1. This intersection will now be a "tee" intersection and remain unsignalized. The intersection will continue to operate satisfactorily.

2 3. The KSE will add a median left-turn lane. Although some movements will operate at LOS F, a traffic signal will most likely not be warranted.

4. A traffic signal will most likely be warranted. Northbound leg added; new turning lanes recommended to allow for optimal operating efficiency and to reduce flow obstructions.

5. With the KSE a full connection between Kuhua Street and Honoapiilani Highway should be provided via the Papalaua Street Extension. The intersection would operate satisfactorily with the exception of the northbound left-turn during the PM peak hour of traffic.

6. No change from Base Year 2020.

7. Reconfigure the Prudential site ROW, where existing land areas would be maintained, but shifted further southward; existing building structures would be maintained.

8 9. The intersection operation will improve from Base Year with mitigation. The delay and capacity will improve on the majority of the movements. However, LOS F will still occur on some movements; due to limited ROW along Honoapiilani Highway. The appropriate mitigation would be the completion of the LBR, Phase 1C.

NETWORK MAP

DISTRIBUTION BREAKDOWN*

	NB	SB
LBR, PH 1A & 1B	18%	13%
KSE	22%	22%
Honoapiilani	60%	65%

(Average Values)

LEGEND

- ##(##) – AM(PM) PEAK HOUR OF TRAFFIC VOLUMES
- X(X) – AM(PM) LOS
- * – OVERCAPACITY, V/C >=1
- Y X/X – SIGNALIZED INTERSECTION Y, AM/PM LOS
- Y – INTERSECTION Y
- Y – INTERSECTION Y WITH RECOMMENDED IMPROVEMENTS
- BASE YEAR WITH MITIGATION LANE CONFIGURATION
- ALTERNATIVE 1 LANE CONFIGURATION

KUHUA STREET EXTENSION

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FIGURE 28b

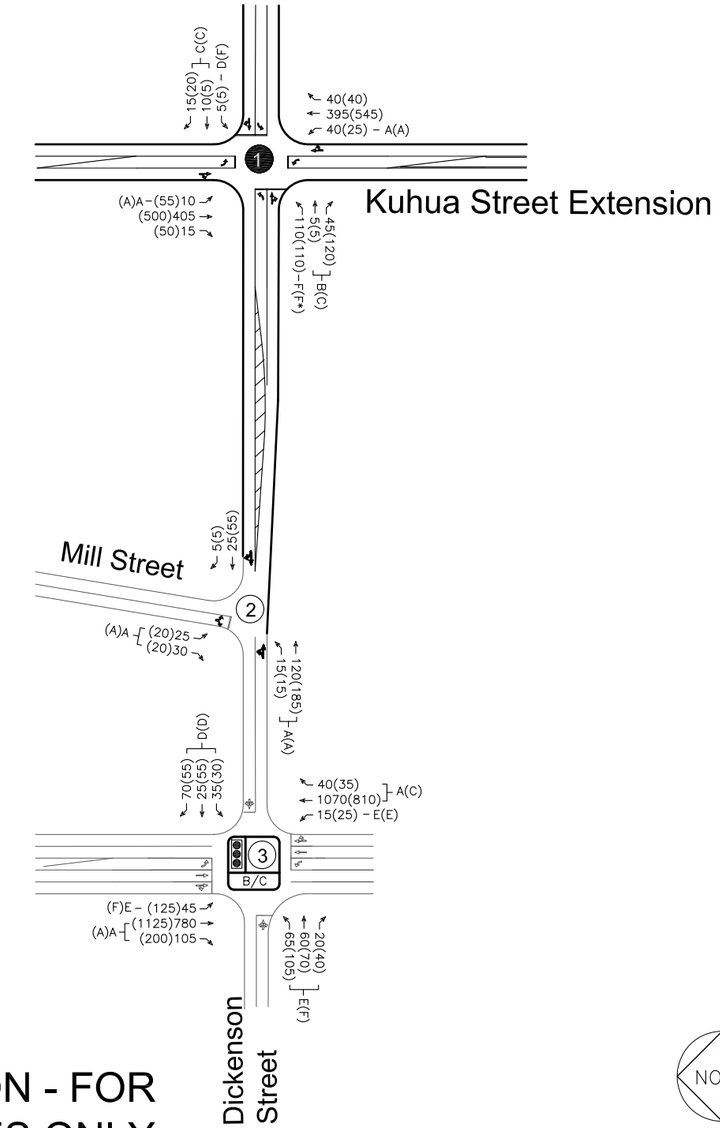
ALTERNATIVE 1 FRONT STREET TERMINUS YEAR 2020 VOLUME, LEVEL OF SERVICE AND LANE CONFIGURATION

Discussion

1. This intersection will operate as a TWSC with left-turn lanes on all of its approaches. Although some movements will operate at LOS F, a traffic signal will most likely not be warranted.

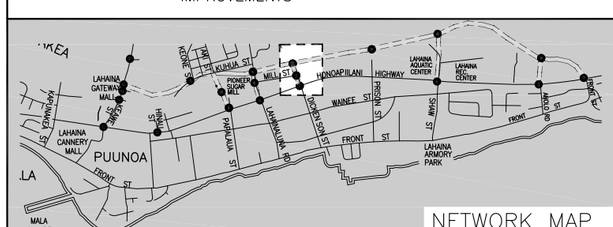
2. Additional approaches and turning movements have been added; however, it is recommended that all approaches remain single-lane.

3. The intersection operation will improve from Base Year 2020 with mitigation. The delay and capacity will improve on the majority of the movements. However, some movements will continue to operate at LOS F. No improvements recommended beyond Base Year 2020.



LEGEND

##(##)	– AM(PM) PEAK HOUR OF TRAFFIC VOLUMES
X(X)	– AM(PM) LOS
*	– OVERCAPACITY, V/C >=1
Y X/X	– SIGNALIZED INTERSECTION Y, AM/PM LOS
Y	– INTERSECTION Y
Y	– INTERSECTION Y WITH RECOMMENDED IMPROVEMENTS
	– BASE YEAR WITH MITIGATION LANE CONFIGURATION
	– ALTERNATIVE 1 LANE CONFIGURATION



NETWORK MAP

DISTRIBUTION BREAKDOWN*	NB	SB
LBR, PH 1A & 1B	18%	13%
KSE	22%	22%
Honoapiilani	60%	65%

(Average Values)

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KUHUA STREET EXTENSION

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ALTERNATIVE 1 FRONT STREET TERMINUS YEAR 2020 VOLUME, LEVEL OF SERVICE AND LANE CONFIGURATION

FIGURE 28C

NOT FOR CONSTRUCTION - FOR ILLUSTRATIVE PURPOSES ONLY

Wainee

Discussion

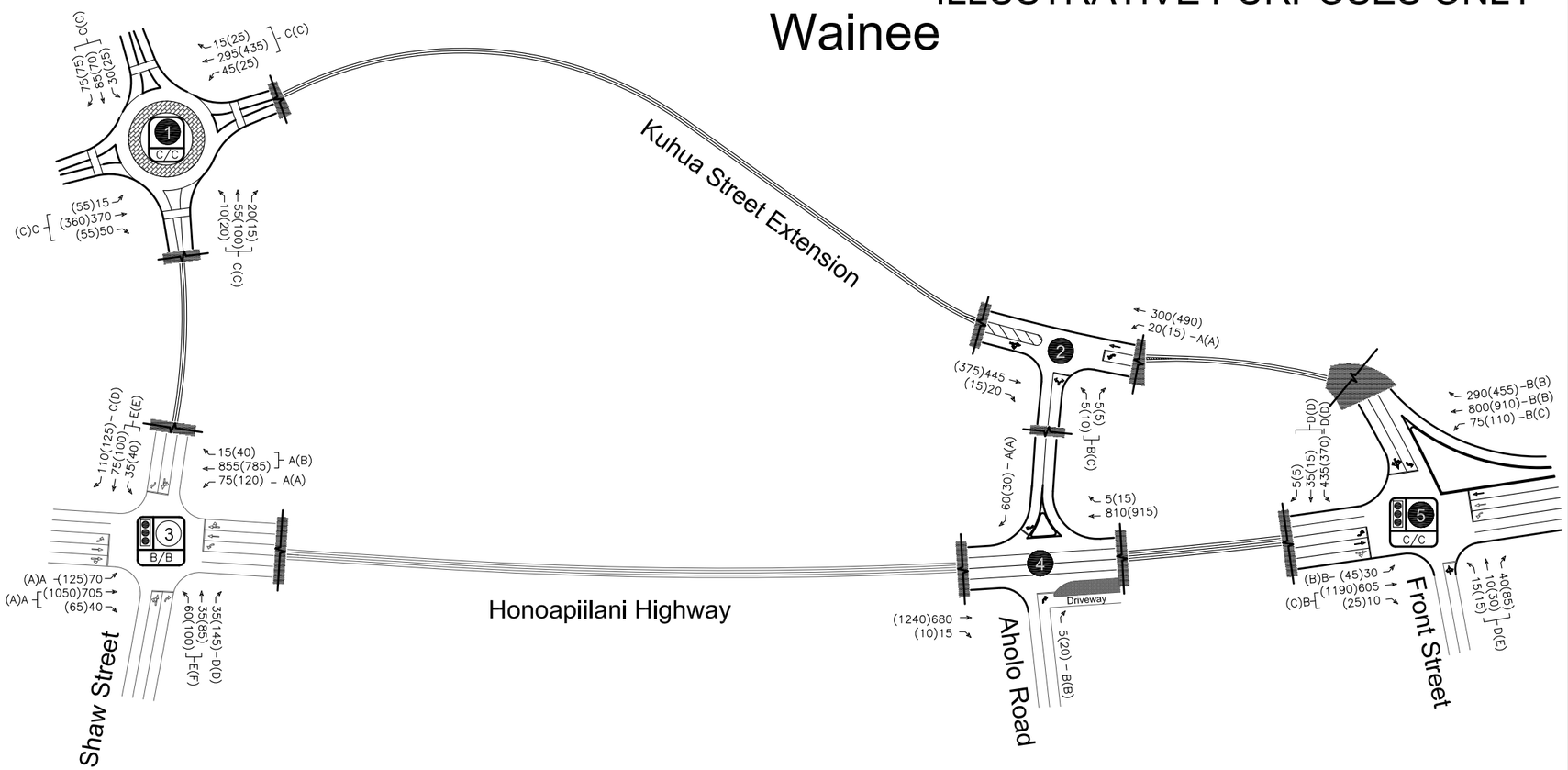
1. As a TWSC, this intersection would experience LOS F on the minor movements. Since adequate distance is provided between intersections and speed is a concern, a roundabout is recommended. However, this is recommendation is contingent on assumptions made in this report relative to the Wainee Development and location of the intersection.

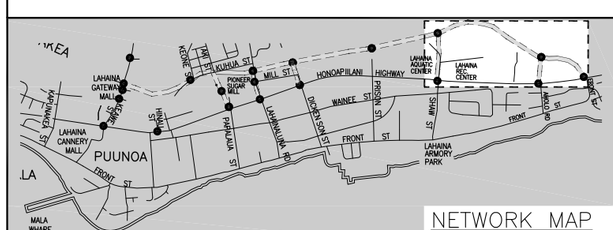
2. This intersection will be a "tee" intersection.

3. No Improvements over Base Year 2020 are recommended. However, the delay and v/c ratio improve from Base Year with mitigation.

4. This intersection will be modified to allow only right-turns in and out since Front Street would be signalized and would be able to accommodate the left-turns.

5. A traffic signal will most likely be warranted. A westbound approach will be added and require two left-turn lanes. Honoapiilani Highway would need to be widened to four lanes beyond Front Street.





NETWORK MAP

DISTRIBUTION BREAKDOWN*

	NB	SB
LBR, PH 1A & 1B	18%	13%
KSE	22%	22%
Honoapiilani	60%	65%

(Average Values)

LEGEND

- ##(##) – AM(PM) PEAK HOUR OF TRAFFIC VOLUMES
- X(X) – AM(PM) LOS
- * – OVERCAPACITY, V/C >=1
- (Y) X/X – SIGNALIZED INTERSECTION Y, AM/PM LOS
- (Y) C/C – ROUNDABOUT INTERSECTION Y, AM/PM LOS
- (Y) – INTERSECTION Y
- (Y) – INTERSECTION Y WITH RECOMMENDED IMPROVEMENTS
- – BASE YEAR WITH MITIGATION LANE CONFIGURATION
- – ALTERNATIVE 1 LANE CONFIGURATION

NORTH

NOT TO SCALE

KUHUA STREET EXTENSION

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FIGURE 28d

ALTERNATIVE 1 FRONT STREET TERMINUS YEAR 2020 VOLUME, LEVEL OF SERVICE AND LANE CONFIGURATION

B. Year 2020 with Alternative 2 Analysis

As discussed earlier, the KSE Alternative 2 (KSE-A2) would be identical to KSE-A1, but with its southern terminus located at Aholo Road instead of Front Street. This scenario would likely warrant a signal at this relocated southern KSE terminus, and trigger the following community-raised impacts:

a. Heavier traffic along Aholo Road. Aholo Road currently operates as a minor collector road on both sides of Honoapiilani Highway. It is possible that the KSE-A2 could increase the flow of traffic through Aholo Road; this potential has been identified as a negative impact by neighboring residents.

b. Traffic Signal at the Honoapiilani Highway/Aholo Road Intersection. The increase in traffic at this intersection would likely warrant and necessitate the construction of a traffic signal. This would increase the use of the eastbound approach to become a primary route for some drivers – and consequently increase queuing along the approach. This queuing and increased traffic would likely negatively impact the accessibility of residents that use the driveway approximately 24 feet west of Honoapiilani Highway.

Nevertheless, the KSE-A2 would impose a smaller financial impact – in ROW acquisition and design/construction – than the KSE-A1.

It is projected that the operational and distributional differences between the KSE-A1 and KSE-A2 would be negligible beyond the triangle created by the following three (3) intersections:

- Honoapiilani Highway/Aholo Road
- Honoapiilani Highway/Front Street/KSE
- KSE/Aholo Road.

These three intersections shall be collectively referred to as the “Aholo Road Area”, to which the ensuing discussion of operations will be limited to.

1. Detailed Intersection Analysis

Aholo Road Area

Operationally, the KSE-A1 and KSE-A2 would be similar. This is evidenced by the similar delays and v/c ratios that can be observed between the KSE-A1 Honoapiilani Highway/Front Street and KSE-A2 Honoapiilani Highway/Aholo Road intersection analyses.

See Figures 29 and 30 for the v/c ratio comparison and Figures 31 and 32 for delay comparison between Base Year with mitigation, Alternative 1 and Alternative 2 at the impacted intersections. See Figure 33 for the intersection impacted from the alignment change volumes, level of service and lane configurations. See Table 3 for Base Year 2020 with mitigation, Alternative 1 and Alternative 2 LOS summary.

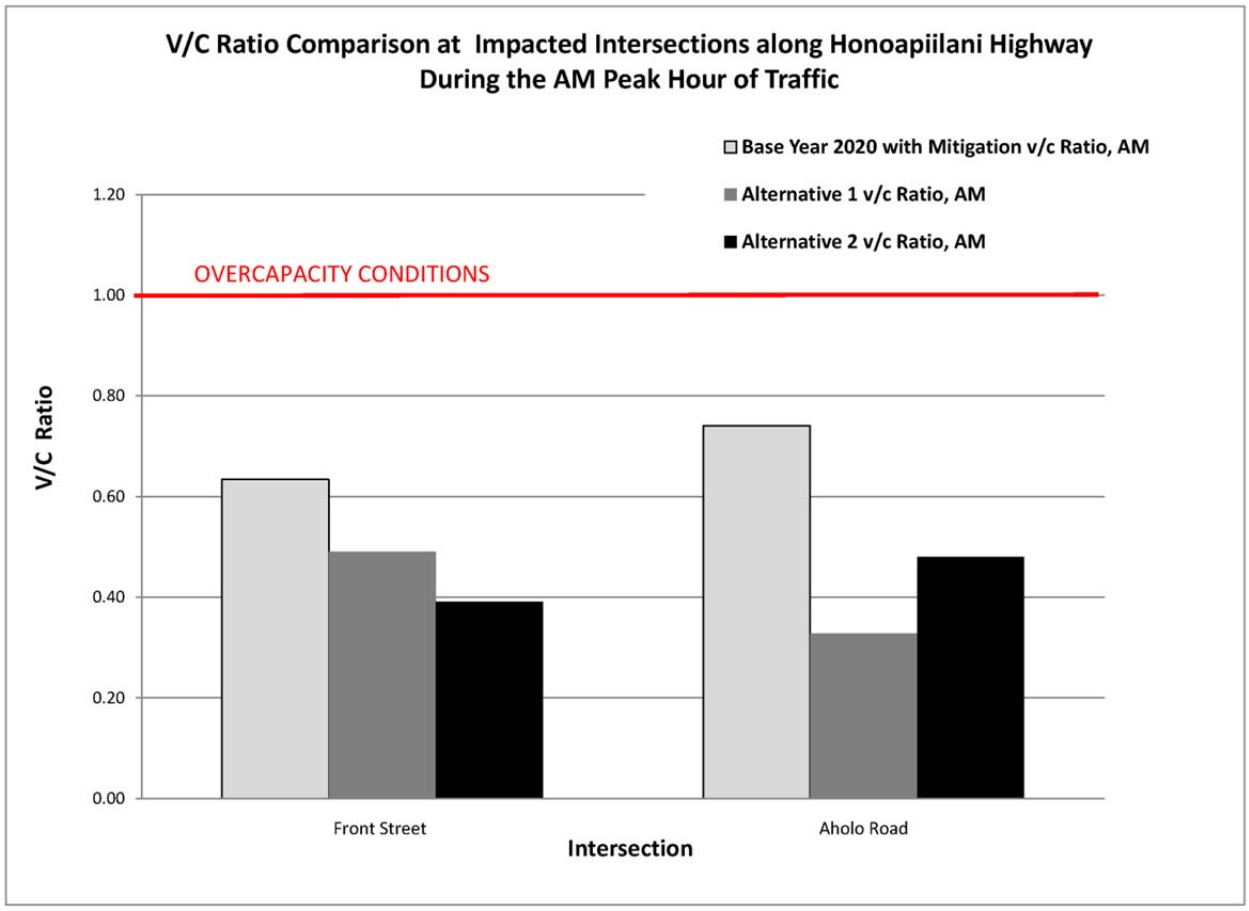

Figure 29: V/C Ratio Comparison at Impacted Intersections along Honoapiilani Highway During the AM Peak Hour of Traffic.

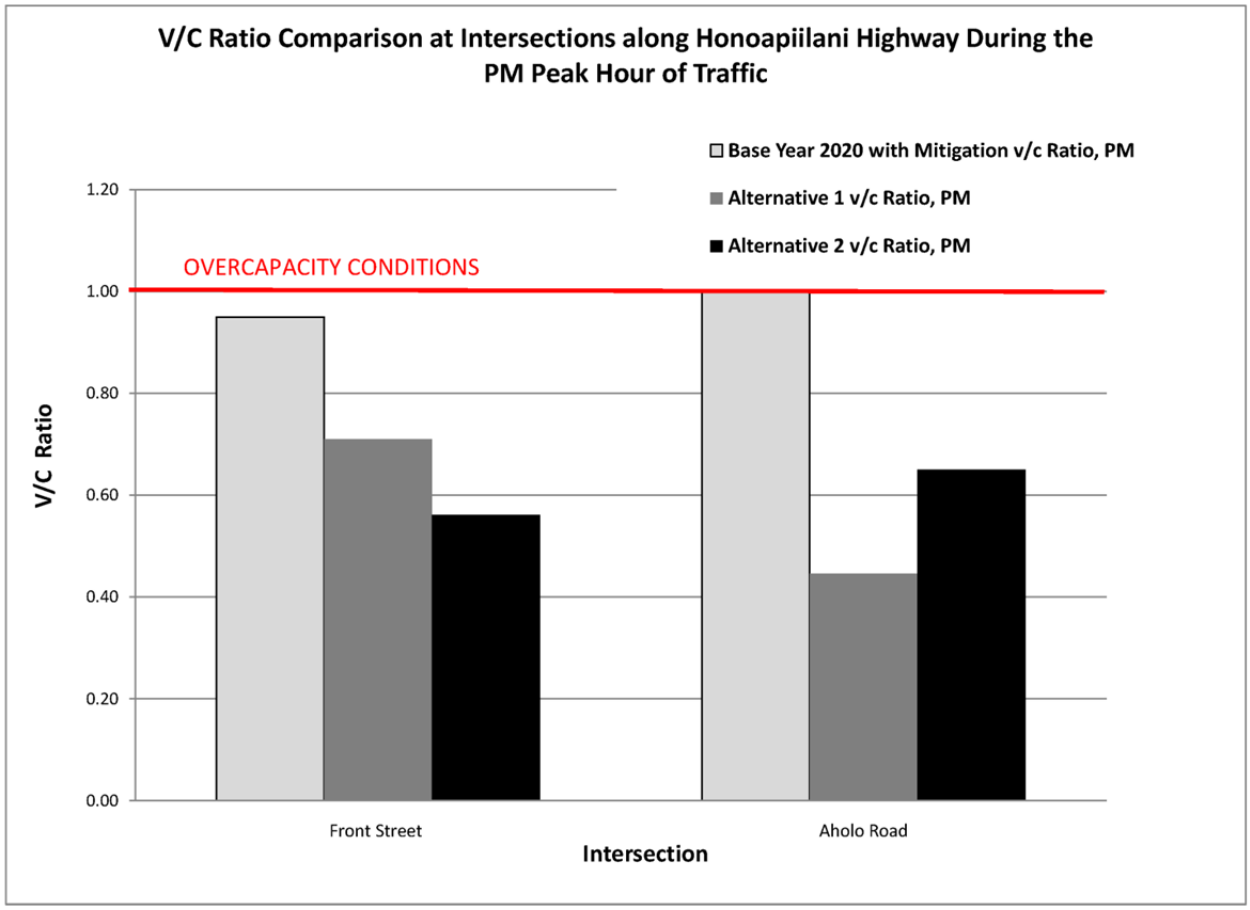

Figure 30: V/C Ratio Comparison at Impacted Intersections along Honoapiilani Highway During the PM Peak Hour of Traffic.

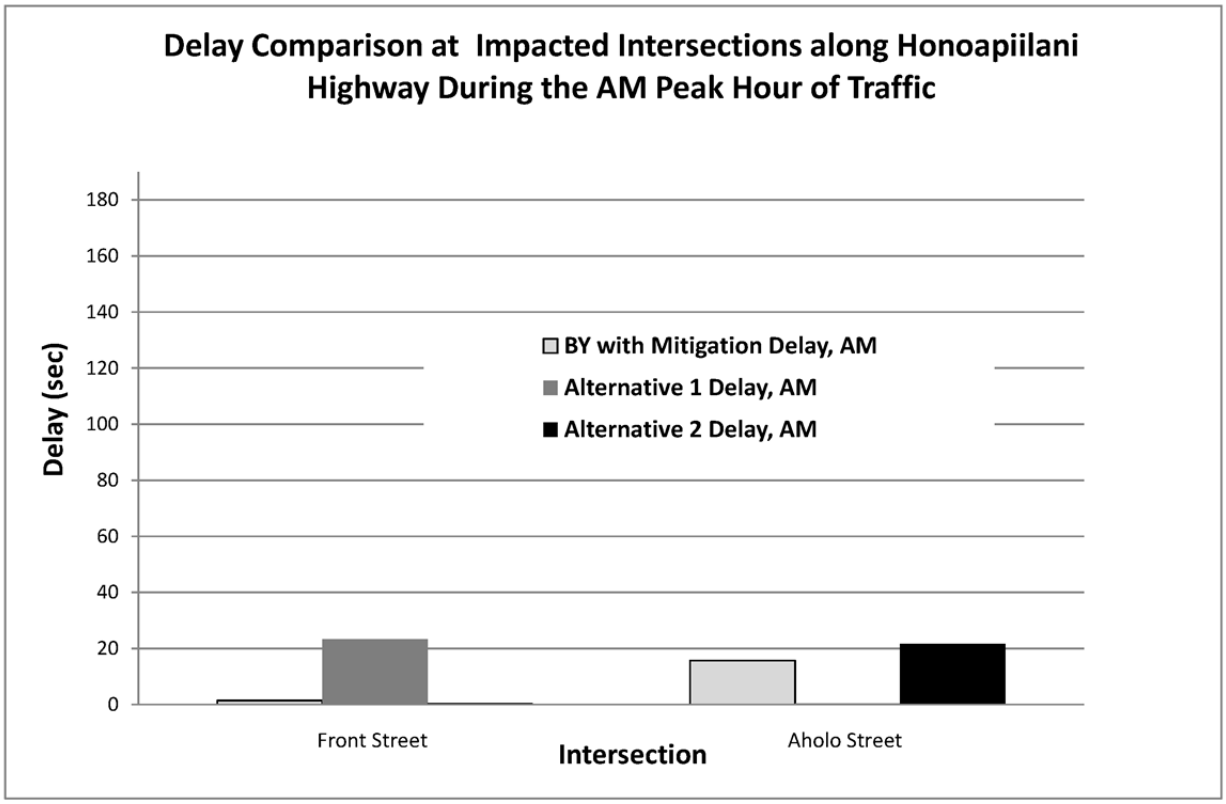

Figure 31: Delay Comparison at Impacted Intersections along Honoapiilani Highway During the AM Peak Hour of Traffic.

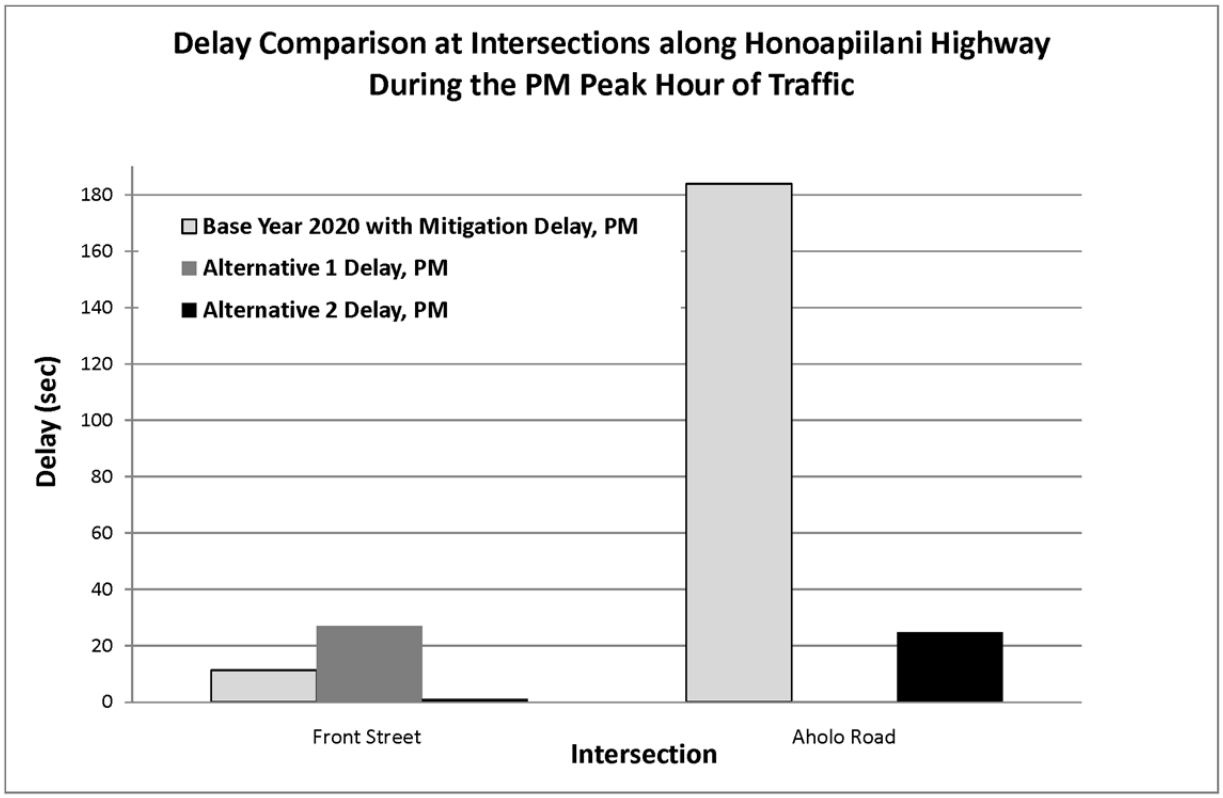

Figure 32: Delay Comparison at Impacted Intersections along Honoapiilani Highway During the PM Peak Hour of Traffic.[12]

[12] Note: The high delay associated with the Base Year 2020 delay for Aholo Road can be attributed to it being unsignalized, while allowing through movements and left-turns. While overall delay is not generally provided for TWSC intersections, it was used in this case as a common means of comparison.

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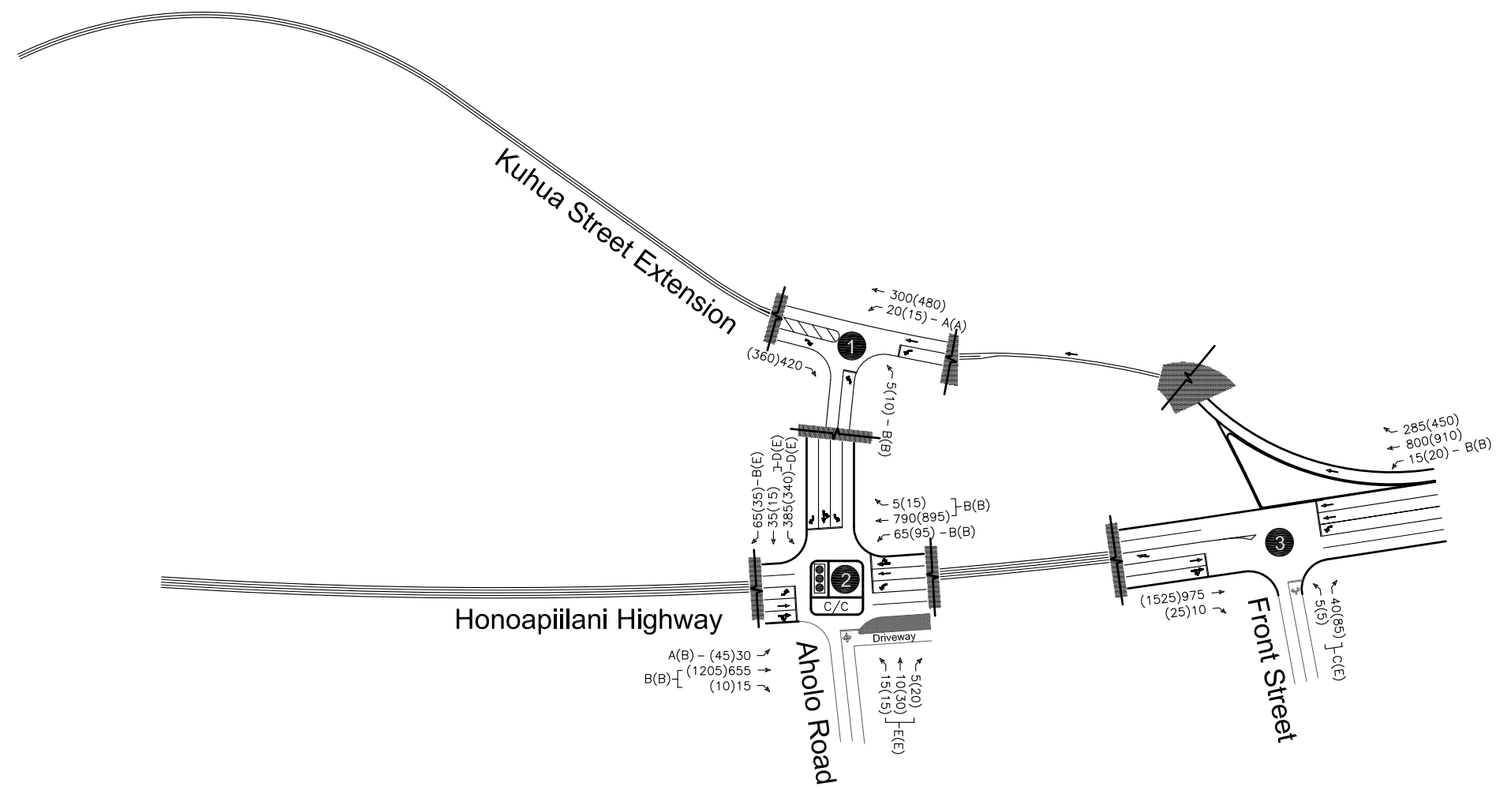
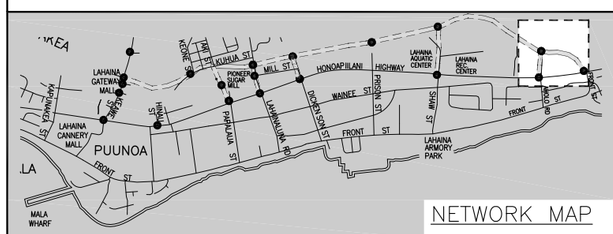
Wainee

Discussion

1. All southbound traffic must turn right.
2. This intersection will be the KSE southern terminus. Projected volume would most likely warrant a traffic signal. The westbound approach would be modified to provide two left-turn lanes; Honoapiilani Highway would also need to be widened to four lanes beyond Front Street for optimal efficiency.
3. It is recommended that Honoapiilani Highway be widened to four lanes to south of Front Street.





NETWORK MAP

DISTRIBUTION BREAKDOWN*

	NB	SB
LBR, PH 1A & 1B	18%	13%
KSE	22%	22%
Honoapiilani	60%	65%

(Average Values)

LEGEND

- ##(##) – AM(PM) PEAK HOUR OF TRAFFIC VOLUMES
- X(X) – AM(PM) LOS
- * – OVERCAPACITY, V/C >=1
- Y X/X – SIGNALIZED INTERSECTION Y, AM/PM LOS
- Y – INTERSECTION Y
- Y – INTERSECTION Y WITH RECOMMENDED IMPROVEMENTS
- EXISTING LANE CONFIGURATION
- ALTERNATIVE 2 LANE CONFIGURATION

NORTH

NOT TO SCALE

KUHUA STREET EXTENSION

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FIGURE 33

ALTERNATIVE 2 AHOLO ROAD TERMINUS YEAR 2020 VOLUME, LEVEL OF SERVICE AND LANE CONFIGURATION

Table 4: Level of Service Summary, Base Year with Mitigation, Alternative 1 and Alternative 2 Conditions

	Base Year 2020 with Mitigations						Year 2020 Alternative 1						Year 2020 Alternative 2					
	AM			PM			AM			PM			AM			PM		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
Front Street & Honoapiilani Highway																		
							Modified From Exisitng: Signalized NB: LT, TH and RT SB: LT, TH and TH/RT WB: LT and LT/TH/RT						*Modified From Exisitng:* NB: LT, TH and RT SB: TH and TH/RT EB: LT/RT with EB LT Acceleration Lane					
EB LT/RT	44	0.38	E	348	1.40	F*							20	0.17	C	37	0.47	E
EB LT/TH/RT							52	0.33	D	58	0.58	E						
WB LT							50	0.75	D	55	0.72	D						
WB LT/TH/RT							50	0.75	D	54	0.71	D						
NB LT	11	0.10	B	18	0.25	C	11	0.20	B	22	0.57	C	11	0.02	B	14	0.05	B
NB TH	0	0.65	0	0	0.74	0	16	0.46	B	18	0.51	B	0	0.26	0	0	0.29	0
NB RT							14	0.20	B	16	0.34	B	0	0.19	0	0	0.29	0
SB LT							12	0.11	B	15	0.19	B						
SB TH/RT	0	0.56	0	0	1.00	*	16	0.36	B	26	0.74	C	0	0.23	0	0	0.35	0
Overall or Max v/c	1	0.63	B	11	0.95	F	23	0.49	C	27	0.71	C						
Aholo Street & Honoapiilani Highway																		
							Modified From Exisitng: Right-in/Right-out only						*Modified From Exisitng:* Signalized NB & SB: LT, TH and TH/RT EB: LT/TH/RT WB: LT, LT/TH and RT					
EB LT/TH/RT	258	0.60	F	Err	6.73	F*							59	0.36	E	72	0.58	E
EB RT							11	0.01	B	15	0.06	B						
WB LT													44	0.75	D	68	0.73	E
WB LT/TH	625	1.63	F*	Err	16.92	F*							44	0.75	D	67	0.73	E
WB RT	33	0.53	D	35	0.42	D	9	0.07	A	9	0.04	A	19	0.09	B	64	0.04	E
NB LT	10	0.02	B	15	0.07	C							10	0.17	B	16	0.43	B
NB TH							0	0.26	0	0	0.29	0						
NB TH/RT	0	0.64	0	0	0.76	0							16	0.44	B	16	0.46	B
NB RT							0	0.00	0	0	0.01	0						
SB LT	11	0.09	B	13	0.20	B							6	0.10	A	13	0.16	B
SB TH/RT	0	0.59	0	0	1.00	*	0	0.15	0	0	0.27	0	14	0.38	B	16	0.65	B
Overall or Max v/c	16	0.74	D	184	1.00	G	0	0.33	A	0	0.45	A	22	0.48	C	25	0.65	C
Shaw Street & Honoapiilani Highway																		
EB LT/TH	50	0.62	D	99	0.96	F	75	0.77	E	90	0.90	F	75	0.77	E	90	0.90	F
EB RT	39	0.02	D	44	0.19	D	47	0.02	D	47	0.16	D	47	0.02	D	47	0.16	D
WB LT/TH	62	0.80	E	105	0.96	F	67	0.69	E	56	0.60	E	59	0.69	E	57	0.60	E
WB RT	42	0.31	D	46	0.35	D	69	0.08	E	48	0.20	D	44	0.08	D	57	0.09	E
NB LT	7	0.22	A	28	0.65	C	4	0.16	A	9	0.42	A	2	0.16	A	24	0.42	C
NB TH/RT	13	0.55	B	14	0.53	B	7	0.37	A	12	0.39	B	8	0.37	A	10	0.39	B
SB LT	5	0.35	A	28	0.88	C	4	0.17	A	2	0.32	A	3	0.17	A	3	0.32	A
SB TH/RT	6	0.43	A	5	0.76	A	7	0.32	A	4	0.53	A	5	0.32	A	5	0.53	A
Overall or Max v/c	17	0.62	B	24	0.88	C	17	0.40	B	19	0.61	B	15	0.40	B	20	0.61	B

Note: * = Over-capacity Conditions

Table 4: Level of Service Summary, Base Year with Mitigation, Alternative 1 and Alternative 2 Conditions Continued

	Base Year 2020 with Mitigations						Year 2020 Alternative 1						Year 2020 Alternative 2					
	AM			PM			AM			PM			AM			PM		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
Dickenson Street & Honoapiilani Highway																		
EB LT/TH/RT	105	0.95	F	97	0.95	F	77	0.84	E	88	0.91	F	77	0.84	E	88	0.91	F
WB LT/TH/RT	60	0.75	E	51	0.46	D	44	0.49	D	42	0.42	D	43	0.49	D	39	0.42	D
NB LT	80	0.53	E	166	0.90	F	70	0.53	E	67	0.59	E	73	0.43	E	69	0.48	E
NB TH/RT	9	0.68	A	29	0.65	C	7	0.50	A	20	0.44	C	5	0.50	A	11	0.44	B
SB LT	77	0.63	E	85	0.80	F	64	0.52	E	100	0.81	F	57	0.52	E	100	0.81	F
SB TH/RT	4	0.48	A	4	0.84	A	3	0.38	A	4	0.62	A	5	0.38	A	4	0.63	A
Overall or Max v/c	17	0.72	B	25	0.84	C	14	0.56	B	23	0.69	C	13	0.58	B	20	0.70	B
Lahainaluna Road & Honoapiilani Highway																		
	Modified From Exisitng: WB RT channelized						*Modified From Exisitng:* WB RT channelized						*Modified From Exisitng:* WB RT channelized					
EB LT	36	0.39	D	56	0.71	E	39	0.30	D	46	0.43	D	39	0.30	D	47	0.43	D
EB TH/RT	47	0.70	D	106	1.00	F*	63	0.85	E	87	0.92	F	63	0.85	E	87	0.92	F
WB LT	44	0.73	D	73	0.81	E	74	0.85	E	69	0.70	E	75	0.85	E	73	0.70	E
WB TH	42	0.62	D	51	0.45	D	57	0.77	E	66	0.59	E	59	0.77	E	69	0.57	E
WB RT	56	0.94	E	49	0.27	D	23	0.39	C	36	0.37	D	24	0.39	C	23	0.37	C
NB LT	62	0.50	E	89	0.76	F	68	0.50	E	79	0.63	E	75	0.50	E	74	0.59	E
NB TH/RT	51	1.02	D*	30	0.89	C	24	0.80	C	21	0.66	C	17	0.80	B	21	0.66	C
SB LT	87	0.92	F	48	0.90	D	86	0.79	F	79	0.88	E	79	0.79	E	79	0.88	E
SB TH/RT	16	0.60	B	44	0.98	D	12	0.50	B	9	0.74	A	14	0.50	B	8	0.74	A
Overall or Max v/c	43	1.00	D*	47	0.98	D	33	0.80	C	32	0.79	C	31	0.80	C	31	0.79	C
Papalaua Street & Honoapiilani Highway																		
	Modified From Exisitng: EB: LT and TH/RT WB: LT, TH and RT						*Modified From Exisitng:* EB: LT and TH/RT WB: LT, TH and RT						*Modified From Exisitng:* EB: LT and TH/RT WB: LT, TH and RT					
EB LT	114	1.05	F*	381.9	1.70	F*	60	0.82	E	61	0.85	E	44	0.69	D	75	0.91	E
EB TH/RT	37	0.27	D	35	0.32	C	48	0.52	D	65	0.79	E	43	0.43	D	68	0.81	E
WB LT							46	0.18	D	51	0.55	D	41	0.20	D	53	0.59	D
WB TH							50	0.20	D	68	0.69	E	45	0.21	D	64	0.64	E
WB LT/TH/RT	39	0.45	D	313	1.57	F*												
WB RT							52	0.11	D	59	0.18	E	60	0.75	E	58	0.16	E
NB LT	44	0.61	D	204	1.21	F*	66	0.61	E	86	0.78	F	71	0.61	E	87	0.78	F
NB TH/RT	67	1.05	E*	219	1.35	F*	8	0.72	A	37	0.93	D	11	0.79	B	37	0.92	D
SB LT	55	0.62	D	216	1.34	F*	63	0.58	E	75	0.97	E	56	0.58	E	73	0.97	E
SB TH/RT	22	0.71	C	110	1.18	F*	10	0.57	A	27	0.91	C	14	0.62	B	29	0.91	C
Overall or Max v/c	51	0.98	D	191	1.48	F*	21	0.72	C	43	0.88	D	25	0.72	C	44	0.90	D
Hinau Street & Honoapiilani Highway																		
WB LT	56	0.40	E	68	0.68	E	57	0.44	E	68	0.68	E	57	0.44	E	68	0.68	E
WB RT	46	0.25	D	44	0.34	D	45	0.18	D	42	0.30	D	45	0.18	D	42	0.30	D
NB TH/RT	20	0.75	B	46	0.96	D	3	0.61	A	6	0.76	A	2	0.61	A	6	0.76	A
SB LT	52	0.65	D	47	0.85	D	46	0.53	D	46	0.75	D	44	0.53	D	51	0.75	D
SB TH	6	0.52	A	21	0.87	C	3	0.44	A	12	0.74	B	3	0.44	A	10	0.74	A
Overall or Max v/c	15	0.72	B	35	0.94	C	6	0.60	A	13	0.73	B	5	0.60	A	12	0.73	B

Note: * = Over-capacity Conditions

Table 4: Level of Service Summary, Base Year with Mitigation, Alternative 1 and Alternative 2 Conditions Continued

	Base Year 2020 with Mitigations						Year 2020 Alternative 1						Year 2020 Alternative 2					
	AM			PM			AM			PM			AM			PM		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
Keawe Street & Honoapiilani Highway																		
	Modified From Exisitng: SB: Double LT, TH and TH/RT EB: LT, TH and RT WB: LT, LT/TH/RT and RT						*Modified From Exisitng:* SB: Double LT, TH and TH/RT EB: LT, TH and RT WB: LT, TH/RT and RT						*Modified From Exisitng:* SB: Double LT, TH and TH/RT EB: LT, TH and RT WB: LT, TH/RT and RT					
EB LT	54	0.29	D	62	0.50	E	59	0.44	E	64	0.53	E	59	0.44	E	64	0.53	E
EB TH	57	0.45	E	66	0.58	E	45	0.19	D	51	0.31	D	45	0.19	D	51	0.31	D
EB RT	53	0.04	D	59	0.16	E	44	0.04	D	49	0.12	D	44	0.04	D	49	0.12	D
WB LT	45	0.46	D	59	0.72	E	80	0.75	F	84	0.83	F	80	0.75	F	84	0.83	F
WB TH/RT							57	0.71	E	118	1.04	F*	57	0.71	E	116	1.05	F*
WB LT/TH/RT	61	0.76	E	162	1.17	F*												
WB RT	43	0.21	D	55	0.61	D	46	0.43	D	78	0.88	E	46	0.43	D	76	0.88	E
NB LT	263	1.23	F*	437	1.73	F*	69	0.60	E	454	1.73	F*	71	0.60	E	446	1.73	F*
NB TH	25	0.97	C	135	1.24	F*	35	0.98	C	88	1.12	F*	37	0.98	D	86	1.11	F*
NB RT	4	0.18	A	9	0.34	A	10	0.10	A	14	0.19	B	10	0.10	A	18	0.19	B
SB LT	673	2.35	F*	500	1.95	F*	63	0.91	E	269	1.45	F*	62	0.91	E	269	1.45	F*
SB TH/RT	21	0.74	C	147	1.25	F*	20	0.67	B	100	1.14	F*	19	0.67	B	98	1.13	F*
Overall or Max v/c	107	1.01	F*	165	1.21	F*	38	0.86	D	120	1.13	F*	39	0.86	D	118	1.13	F*
Aholo Road & KSE																		
							New Intersection: NB: LT and TH SB: TH/RT EB: LT/RT						*New Intersection:* NB: LT and TH SB: TH/RT EB: LT/RT					
EB LT													11	0.01	B	13	0.02	B
EB LT/RT							14	0.03	B	16	0.05	C						
NB LT							9	0.02	A	8	0.01	A	9	0.02	A	8	0.01	A
SB TH/RT							0	0.30	0	0	0.25	0						
Shaw Street & KSE																		
							New Intersection: NB & SB: LT and TH/RT EB & WB: LT/TH/RT						*New Intersection:* NB & SB: LT and TH/RT EB & WB: LT/TH/RT					
EB LT/TH/RT							25	0.34	D	78	0.81	F	25	0.34	D	78	0.81	F
WB LT/TH/RT							34	0.64	D	68	0.82	F	34	0.64	D	68	0.82	F
NB LT							8	0.04	A	8	0.02	A	8	0.04	A	8	0.02	A
SB LT							8	0.01	A	9	0.06	A	8	0.01	A	9	0.06	A
Shaw Street & KSE - Roundabout Alternative, RODEL analysis																		
							New Intersection: Roundabout						*New Intersection:* Roundabout					
EB LT/TH/RT							21	0.51	C	21	0.52	C	21	0.51	C	21	0.52	C
WB LT/TH/RT							18	0.40	C	23	0.57	C	18	0.40	C	23	0.57	C
NB LT/TH/RT							16	0.12	C	17	0.19	C	16	0.12	C	17	0.19	C
SB LT/TH/RT							17	0.25	C	18	0.25	C	17	0.25	C	18	0.25	C
Overall or Max v/c							16		C	18		C	16		C	18		C

Note: * = Over-capacity Conditions

Table 4: Level of Service Summary, Base Year with Mitigation, Alternative 1 and Alternative 2 Conditions Continued

	Base Year 2020 with Mitigations						Year 2020 Alternative 1						Year 2020 Alternative 2					
	AM			PM			AM			PM			AM			PM		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
Dickenson Street & KSE																		
							New Intersection: NB, SB, EB & WB: LT and TH/RT						*New Intersection:* NB, SB, EB & WB: LT and TH/RT					
EB LT							51	0.63	F	314	1.38	F*	51	0.63	F	314	1.38	F*
EB TH/RT							12	0.10	B	15	0.28	C	12	0.10	B	15	0.28	C
WB LT							27	0.03	D	75	0.10	F	27	0.03	D	75	0.10	F
WB TH/RT							16	0.08	C	19	0.10	C	16	0.08	C	19	0.10	C
NB LT							8	0.04	A	9	0.03	A	8	0.04	A	9	0.03	A
SB LT							8	0.01	A	9	0.06	A	8	0.01	A	9	0.06	A
Kuhua Street-KSE & Lahainaluna Road																		
	Modified From Exisitng: EB: LT and TH WB: TH and TH/RT						*Modified From Exisitng:* Signalized NB: LT, TH and RT SB: LT and TH/RT WB: LT/TH and TH/RT EB: LT and TH/RT						*Modified From Exisitng:* Signalized NB: LT, TH and RT SB: LT and TH/RT WB: LT/TH and TH/RT EB: LT and TH/RT					
EB LT	11	0.09	B	10	0.21	A	6	0.12	A	8	0.18	A	5	0.12	A	7	0.18	A
EB TH/RT							6	0.35	A	11	0.60	B	5	0.35	A	9	0.60	A
WB LT/TH/RT							19	0.65	B	26	0.45	C	19	0.65	B	26	0.45	C
NB LT							33	0.13	C	30	0.24	C	33	0.13	C	30	0.24	C
NB TH							48	0.80	D	48	0.83	D	48	0.80	D	48	0.83	D
NB RT							33	0.19	C	29	0.14	C	33	0.19	C	29	0.14	C
SB LT	50	0.25	E	76	0.56	F	33	0.26	C	34	0.58	C	33	0.26	C	33	0.58	C
SB TH/RT							47	0.78	D	39	0.75	D	47	0.78	D	41	0.75	D
SB RT	28	0.51	D	15	0.27	C												
Overall or Max v/c	4	0.63	B	6	0.55	B	27	0.66	C	31	0.72	C	27	0.66	C	31	0.72	C
Aki Street & Kuhua Street & Papalaua Street extension																		
	Modified From Exisitng: NB, SB & WB: LT/TH/RT EB: LT and TH/RT						*Modified From Exisitng:* NB, SB & WB: LT/TH/RT						*Modified From Exisitng:* NB, SB & WB: LT/TH/RT					
EB LT	10	0.03	B	13	0.13	B	21	0.13	C	195	1.06	F*	21	0.13	C	195	1.06	F*
EB TH/RT	10	0.02	A	13	0.13	B	12	0.06	B	16	0.24	C	12	0.06	B	16	0.24	C
WB LT/TH/RT	11	0.13	B	14	0.07	B	24	0.35	C	105	0.58	F	24	0.34	C	105	0.58	F
NB LT							8	0.03	A	9	0.10	A	8	0.03	A	9	0.10	A
NB LT/TH/RT	2	0.01	A	2	0.03	A												
SB LT							8	0.00	A	9	0.01	A	8	0.00	A	9	0.01	A
SB LT/TH/RT	0	0.00	A	0	0.00	A												
Pioneer Mill site 2 Access & Keone Street & Kuhua Street																		
EB LT/TH	10	0.01	B	11	0.01	B	21	0.12	C	85	0.76	F	21	0.12	C	84	0.76	F
EB RT	9	0.04	A	9	0.21	A	11	0.03	B	13	0.18	B	11	0.03	B	13	0.18	B
WB LT/TH/RT	11	0.09	B	14	0.06	B	23	0.24	C	40	0.21	E	23	0.24	C	39	0.21	E
NB LT							8	0.01	A	9	0.04	A	8	0.01	A	9	0.04	A
NB LT/TH/RT	4	0.02	A	4	0.06	A												
SB LT							8	0.00	A	9	0.01	A	8	0.00	A	9	0.01	A
SB LT/TH/RT	1	0.00	A	1	0.00	A												

Note: * = Over-capacity Conditions

Table 4: Level of Service Summary, Base Year with Mitigation, Alternative 1 and Alternative 2 Conditions Continued

	Base Year 2020 with Mitigations						Year 2020 Alternative 1						Year 2020 Alternative 2					
	AM			PM			AM			PM			AM			PM		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
Kahoma Housing Access & KSE																		
							New Intersection: NB & SB: LT and TH/RT WB: LT and RT						*New Intersection:* NB & SB: LT and TH/RT WB: LT and RT					
WB LT							13	0.08	B	19	0.10	C	13	0.08	B	19	0.10	C
WB RT							13	0.08	B	19	0.10	C	13	0.08	B	19	0.10	C
SB LT							8	0.01	A	9	0.05	A	8	0.01	A	9	0.05	A
SB TH							0	0.24	0	0	0.30	0	0	0.24	0	0	0.30	0
HHFDC Access & Keawe Street & KSE																		
	New Intersection: SB: LT and RT with SB LT acceleration lane EB: LT and TH WB: TH and TH/RT						*New Intersection:* NB & SB: LT and TH/RT EB & WB: LT, TH and TH/RT						*New Intersection:* NB & SB: LT and TH/RT EB & WB: LT, TH and TH/RT					
EB LT	9	0.07	A	10	0.12	B	12	0.10	B	17	0.20	B	12	0.10	B	6	0.17	A
EB TH/RT							15	0.42	B	19	0.50	B	15	0.42	B	10	0.45	A
WB LT							13	0.12	B	22	0.37	C	12	0.12	B	17	0.31	B
WB TH/RT	0	0.15	0	0	0.23	0	14	0.42	B	19	0.50	B	14	0.42	B	16	0.46	B
NB LT							24	0.79	C	20	0.76	B	24	0.79	C	34	0.88	C
NB TH/RT							17	0.20	B	18	0.36	B	17	0.20	B	16	0.42	B
SB LT	51	0.65	F	70	0.64	F	18	0.23	B	23	0.19	C	18	0.23	B	20	0.18	C
SB TH/RT							24	0.59	C	29	0.48	C	24	0.59	C	26	0.46	C
SB RT	11	0.14	B	12	0.12	B												
Mill Street & Lahainaluna Road & Pioneer Mill site 1 Access																		
	Modified From Exisitng: NB: LT and RT SB: LT/TH and RT WB: LT/TH and TH/RT						*Modified From Exisitng:* NB: LT and RT SB: LT/TH and RT WB: LT/TH and TH/RT						*Modified From Exisitng:* NB: LT and RT SB: LT/TH and RT WB: LT/TH and TH/RT					
EB LT	13	0.04	B	10	0.06	B	9	0.02	A	8	0.03	A	9	0.01	A	8	0.03	A
WB LT	9	0.06	A	9	0.05	A	9	0.06	A	9	0.04	A	9	0.06	A	9	0.04	A
NB LT/TH/RT	34	0.53	D	46	0.56	E	13	0.08	B	25	0.19	C	13	0.08	B	25	0.19	C
SB LT/TH	430	0.68	F	277	0.82	F	21	0.05	C	33	0.18	D	21	0.05	C	33	0.18	D
SB RT	15	0.03	C	13	0.19	B	9	0.01	A	10	0.13	B	9	0.01	A	10	0.13	B
Pioneer Mill site 1 and 2 Access & Papalaua Street extension																		
	New Intersection: NB, SB, EB & WB: LT and TH/RT						*New Intersection:* NB, SB, EB & WB: LT and TH/RT						*New Intersection:* NB, SB, EB & WB: LT and TH/RT					
EB LT	8	0.06	A	8	0.21	A	8	0.05	A	8	0.15	A	8	0.05	A	8	0.15	A
WB LT	8	0.01	A	8	0.04	A	8	0.02	A	8	0.07	A	8	0.02	A	8	0.07	A
NB LT	13	0.11	B	679	2.28	F*	14	0.11	B	317	1.50	F*	14	0.11	B	317	1.50	F*
NB TH/RT	10	0.03	A	11	0.11	B	10	0.03	B	11	0.13	B	10	0.03	B	11	0.13	B
SB LT	11	0.01	B	29	0.03	D	12	0.04	B	25	0.19	C	12	0.04	B	25	0.19	C
SB TH/RT	9	0.05	A	11	0.24	B	10	0.04	A	10	0.19	A	10	0.04	A	10	0.19	A

Note: * = Over-capacity Conditions

Table 4: Level of Service Summary, Base Year with Mitigation, Alternative 1 and Alternative 2 Conditions Continued

	Base Year 2020 with Mitigations						Year 2020 Alternative 1						Year 2020 Alternative 2					
	AM			PM			AM			PM			AM			PM		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
Lahaina Gateway Mall West Driveway & Keawe Street																		
	Modified From Exisitng: NB & SB: LT/TH and RT						*Modified From Exisitng:* NB & SB: LT/TH and RT						*Modified From Exisitng:* NB & SB: LT/TH and RT					
EB LT	9	0.06	A	11	0.20	B	10	0.04	B	11	0.15	B	10	0.04	B	12	0.16	B
WB LT	9	0.01	A	10	0.03	A	9	0.02	A	10	0.07	B	9	0.02	A	10	0.07	B
NB LT	44	0.19	E	Err	6.20	F*												
NB LT/TH							47	0.24	E	Err	8.38	F*	47	0.24	E	Err	8.80	F*
NB TH/RT	27	0.06	D	91	0.40	F												
NB RT							11	0.01	B	12	0.04	B	11	0.01	B	12	0.04	B
SB LT/TH	41	0.10	E	237	0.81	F	49	0.12	E	592	1.57	F*	49	0.12	E	609	1.60	F*
SB RT	11	0.05	B	14	0.28	B	11	0.04	B	13	0.25	B	11	0.04	B	13	0.26	B
Lahaina Gateway Mall East Driveway & Keawe Street																		
EB LT	9	0.03	A	10	0.11	B	10	0.03	A	11	0.08	B	10	0.03	A	11	0.08	B
WB LT	9	0.01	A	9	0.01	A	9	0.01	A	10	0.01	A	9	0.01	A	10	0.01	A
NB LT/TH	36	0.25	E	79	0.41	F	32	0.22	D	90	0.45	F	32	0.22	D	93	0.46	F
NB RT	11	0.02	B	11	0.01	B	11	0.02	B	11	0.01	B	11	0.02	B	11	0.01	B
SB LT/TH	29	0.03	D	50	0.12	E	34	0.08	D	92	0.45	F	34	0.08	D	95	0.47	F
SB RT	11	0.03	B	13	0.17	B	10	0.02	A	11	0.11	B	10	0.02	A	11	0.11	B
Lahaina Business Park & Keawe Street																		
WB LT	10	0.04	A	9	0.02	A	8	0.03	A	9	0.02	A	8	0.03	A	9	0.02	A
NB LT	33	0.47	D	73	0.88	F	18	0.29	C	33	0.64	D	18	0.29	C	33	0.64	D
NB RT	11	0.03	B	11	0.04	B	9	0.02	A	10	0.04	B	9	0.02	A	10	0.04	B
Overall or Max v/c	3	0.37	A	10	0.36	A	2	0.35	A	6	0.32	A	2	0.35	A	6	0.32	A

Note: * = Over-capacity Conditions

C. Year 2020 with Alternative 3 Discussion

This alternative would follow Mill Street's existing Cane Haul Road alignment between Aholo Road and Keawe Street. While it would ostensibly be easier to follow this existing alignment, the following issues would exist:

1. Proximity to Honoapiilani Highway – The existing cane haul road comes close – within 150 feet (six (6) car lengths) at times, of Honoapiilani Highway. When the intersections of regional facilities with moderate to heavy cross-traffic are closely spaced, the queues at their respective intersections have the potential to spill back between the two (2) intersections. Because the KSE-A3 would likely experience this problem, it is recommended that the greatest feasible separation be afforded between the KSE and Honoapiilani Highway; this was the intent in laying out the KSE-A1 and KSE-A2.

2. Bifurcation of Lahaina Recreation Park – The KSE, Alignment 3 (KSE-A3) would cut through the Lahaina Recreation Park between the current parking lots on its east and west sides. This would lead to increased potential for conflicts between pedestrians and children crossing the street and KSE traffic. This issue was raised during preliminary community meetings; therein, bifurcation of the park was adamantly and unanimously opposed by the community members that were present.

For the reasons stated above, the KSE-A3 was neither fully analyzed nor conceptualized. However, it is likely that the layout for the roadway and individual intersections of the KSE-A3 would be similar to that of the KSE-A1 or KSE-A2.

D. Year 2020 with Alternative 4 Discussion

This alternative would maintain the existing Kuhua Street as a frontage road[13], median-separated from the KSE Alternative 4 (KSE-A4) by an absolute minimum of 32 feet[14].

For operational reasons, nearby residents that currently access Lahainaluna Road through Kuhua Street and its cross streets would instead be funneled onto Old Kuhua Street, and subsequently the KSE-A4 via an intersection with Aki Street across of Papalaua Street. The current Kuhua Street/Lahainaluna Road intersection would become a dead end. The alignment will otherwise resemble the KSE-A1 or KSE-A2.

The primary benefit of this alignment would be the shielding of driveways and local traffic from the heavier traffic imposed by the KSE. This benefit, however, could be overshadowed by design and safety issues.

According to the AASHTO Green Book[15],

> *"Not only is there an increase in the number of conflicting movements [associated with frontage roads], but the confusing pattern of roadways and separations can lead to wrong-way entry. Inevitably, where an arterial is flanked by frontage roads, the problems of design and traffic control are far more complex than where the arterial consists of a single roadway. [Two intersections] actually exist at each cross street."*

In light of this, the following issues should be noted:

a. <u>Wider Pavement</u> – While the KSE-A1 and KSE-A2 would create a dual-purpose 34-foot pavement width through the Pioneer Mill Area, the KSE-A4 would require a minimum of 86 feet of

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[13] Local road near and parallel to a higher-capacity road.

[14] The AASHTO Green Book states a preference for a minimum of 150 feet of separation, but allows for narrower separation "where frontage-road traffic is very light…"

[15] AASHTO, <u>A Policy on Geometric Design of Highways and Streets</u> (Washington, D.C.: AASHTO, 20114), p.9-176 – 9-177.

combined pavement and separating median width, excluding sidewalk, curb, gutter, and buffer.

b. Awkward Turning Movements – Combinations of turning movements would be combined into single movements, leading to driver confusion and accident potential.

c. Turning Restrictions – Depending on the final design, turning movements might have to be restricted.

d. Limited Sight Distance and Associated Conflicts – The AASHTO Green Book generally recommends that frontage roads be separated from arterials by a minimum of 150 feet; this is done to satisfy sight distance requirements. In the absence of this sight distance, drivers could sometimes be required to make split-second decisions without being aware of downstream pedestrian or vehicles.

e. Queue Interactions – In the event that traffic along the frontage road were to become obstructed near its intersection with Aki Street, the resulting queue could extend into the KSE-A4 intersection, and impact operations along the KSE-A4.

f. Greater ROW Acquisition Costs – The KSE-A4 would require considerably more ROW acquisition than the KSE-A1 and KSE-A2, and would therefore be more expensive.

For the reasons stated above, the KSE-A4 was neither fully analyzed nor conceptualized. However, it is likely that the layout for the roadway (beyond Old Kuhua Street) and individual intersections of the KSE-A4 would be similar to that of the KSE-A1 or KSE-A2.

E. Traffic Calming Devices

In order to address residents' concerns regarding the potential for speeding along Kuhua Street, traffic calming devices should be considered near the residences that front the existing Kuhua Street, which may include the following:

a. Narrower Lanes – While maintaining the existing 34-foot pavement width, stripe the travel lanes to be 10 feet wide in either direction, with a 14-foot left-turn/median lane.

b. Bulbouts – Raised curbs to physically narrow the travel widths at key locations. See Figure 34 below for a general depiction (not intended to be used for design).

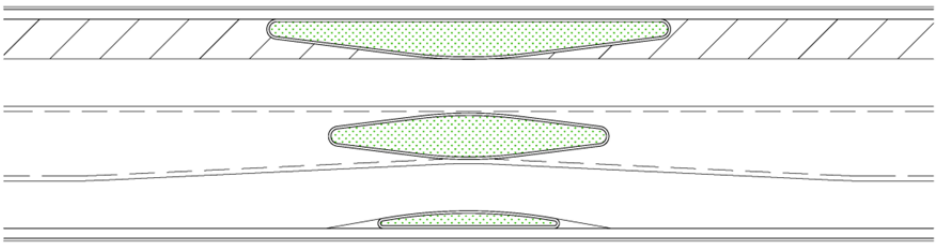


Figure 34: Bulbout Example

c. Passive Speed Control Monitoring Devices – Devices installed to monitor speed; police would be notified when speeding occurs.

These traffic calming measures could be constructed individually or in combination.

F. Discussion and Findings

Based on the preceding discussions of the four (4) alternatives, **Alternative 1 is recommended as the preferred alternative**. While providing equitable or better traffic operations than the other alternatives, it would also address community concerns regarding operations near the Honoapiilani Highway/Aholo Road intersection, and near the Lahaina Community Park.

Despite the anticipated continuance of regional congestion along Honoapiilani Highway, the KSE-A1 would enhance vehicular, pedestrian, and bicycle circulation for local traffic throughout the Lahaina Area, and in the process reduce traffic along Honoapiilani Highway by approximately 18 percent over Base Year 2020 conditions throughout the study area.

VI. CONCLUSIONS

Existing Conditions

Regional north-south traffic in West Maui is primarily served by Honoapiilani Highway, which experiences congestion within the Lahaina Area and further south. Its most obvious bottlenecks include the Honoapiilani Highway/Lahainaluna Road intersection, and the narrowing of Honoapiilani Highway from four to two lanes near Aholo Road.

Currently, some movements within the study area along Honoapiilani Highway operate over-capacity and LOS F.

The traffic counts that form the basis for this traffic study were taken on February 5th, 6th, and 7th, 2008 – before the precipitous economic downturn that resulted in reduced tourism occupancy and arrivals; the result of the downturn was a measured 30 percent reduction in traffic volume along Honoapiilani Highway during October 21, 2009. A subsequent count taken on January 27th, 2010 would indicate that traffic has since rebounded to relative parity with the February 2008 counts.

Base Year 2020

An approximate 80 percent increase in corridor traffic is projected by Year 2020, assuming that all of the projects considered in this TIAR are constructed. While approximately 20 percent of this traffic would likely divert to the planned Lahaina Bypass Road, Phases 1A and 1B1, it is likely that congestion would continue to worsen along Honoapiilani Highway. Despite recommended mitigative measures, LOS F and overcapacity conditions will continue along Honoapiilani Highway.

The most effective mitigation of the projected regional traffic ("regional improvements") would be:

1. Extension of the LBR further northward – effectively, this would increase access and diversion to the LBR; the result would be improved operations along Honoapiilani Highway.

2. Widening of Honoapiilani Highway to four (4) lanes between Maalaea and Aholo Road; this would reduce the bottlenecks and long queues that would be caused by merging down to two (2) lanes.

However, the timing of these improvements will depend on the availability of funding; throughout this report, these improvements were considered unlikely to occur before Year 2020.

The Lahainaluna Road/Papalaua Street and Keawe Street areas will experience added traffic as a result of new development and diverted traffic:

Lahainaluna Road and Papalaua Street Area

It is assumed that in conjunction with future development in this area, it would be possible for Lahainaluna Road to be widened and improved to accommodate existing as well as future demand. This could require modifying the shape, location, and accesses to the gas station on the northeast corner of the Honoapiilani Highway/Lahainaluna Road intersection.

Keawe Street Area

Given that the Keawe Street Extension will serve as the terminal connection to the LBR, Phase 1A, all of the traffic that will be diverted onto it will create congestion at the Honoapiilani Highway/Keawe Street intersection; the intersection will therefore require modifications to its phasing and laneage. The driveways to the commercial and residential areas that front Keawe Street will experience increased congestion; however, traffic signals will most likely not be warranted at the intersections.

Year 2020 with Project

The KSE, alternatives 1 through 4 would all serve their intended purpose of reducing congestion and providing an alternate circulatory route that could also be used by pedestrians and bicyclists; and improvement over Base Year 2020 is evident.

The Papalaua Street Extension would provide a new pedestrian and vehicular connection between the KSE and Honoapiilani Highway. In addition, the Papalaua Street Extension would also provide access to the existing pedestrian-friendly segment of Papalua Street that extends westward to Front Street. Due to anticipated future demand, widening the westbound approach is recommended to accommodate future demand and to improve operations at the Honoapiilani Highway/Papalaua Street and Honoapiilani Highway/Lahainaluna Road intersections to within capacity overall. Accomplishing this will require:

1. Reconfiguration of the Prudential site ROW,
2. Utilizing the existing access easement along the West Maui Center's property, and
3. Reconfiguration and consolidation of the driveways for the West Maui Center and the Prudential site; this is recommended due to the increased volume, proximity to Honoapiilani Highway, and potential for queue spillback onto Honoapiilani Highway.

Alternative 1 is considered the "preferred alternative" due to its:

1. Maximized distance from the Highway – reduces potential for queue spillback between Honoapiilani Highway and the KSE
2. Circumventing of the Lahaina Recreation Park
3. Sensitivity to Aholo Street and neighboring residents' concerns about increased traffic

Alternative 1 will enhance local traffic circulation – and in the process, reduce traffic along Honoapiilani Highway by approximately 18 percent. However, in lieu of the aforementioned "regional improvements," the following bottlenecks would still result in congestion along Honoapiilani Highway:

1. <u>Honoapiilani Highway merge to two (2) lanes</u> – based on the recommendation for Alternative 1, this would occur south of Front Street or Hokiokio Road.

2. Honoapiilani Highway/Keawe Street Intersection – being the terminal connection to the LBR and KSE, heavy southbound left-turns and westbound right-turns will occur at this intersection; to its north, the entire corridor traffic will be funneled back onto the four-lane Honoapiilani Highway until the LBR, Phase 1C is built.

These projections, however, should be considered with the understanding that they are based on a conservative approximation of the combined effect of numerous projects which are at various stages of entitlement; their schedules, composition, and potentially viability could change between now and 2020.

VII. RECOMMENDATIONS

Mitigative Measures for Base Year 2020

Note: Mitgative measures are intended to address baseline future conditions without the Project, and are therefore not associated with the Project.

Honoapiilani Highway/Keawe Street

Southbound Approach: widen to provide two (2) left-turn lanes; this will likely require ROW acquisition.

Eastbound Approach: widen to provide dedicated left-turn and through lane. This will require ROW acquisition.

Westbound Approach: re-stripe to provide a dedicated left-turn lane, a shared left-turn/through/right-turn lane, and dedicated right-turn lane.

- *This will require the construction of a larger-radius channelized island at the northeast corner, which will require ROW Acquisition.*
- *Because of the shared-use lanes, split-phase traffic signal phasing is recommended.*

Crosswalk: remove eastbound crosswalk (south side) to improve the operational efficiency of the traffic signal.

Keawe Street/LGM West Driveway/Walgreens Driveway

Southbound Approach: Restripe the shared through/right-turn lane to become a shared left-turn/through lane.

Northbound Approach: Restripe the shared through/right-turn lane to become a shared left-turn/through lane.

Traffic Signal Warrant: Not met based upon AM and PM count data. It is recommended that this intersection be reassessed subsequent to the completion of the LBR, phases 1A and 1B1.

Keawe Street/LGM East Driveway/Hoonanea Driveway

Southbound Approach: Restripe the shared through/right-turn lane to become a shared left-turn/through lane.

Traffic Signal Warrant: Not met based upon AM and PM count data. It is recommended that this intersection be reassessed subsequent to the completion of the LBR, phases 1A and 1B1.

Lahainaluna Road/Mill Street

Eastbound Approach: Widen to provide a left-turn lane and a shared through/right-turn lane. This will require ROW acquisition.

Westbound Approach: Widen to provide a dedicated left-turn lane, a through lane, and a shared through/right-turn lane. This will require ROW acquisition.

Northbound Approach: Stripe the approach with a shared left-turn/through/right-turn lane.

Southbound Approach: Provide a shared through/left-turn and a right-turn lane.

Traffic Signal Warrant: Not likely met.

Lahainaluna Road/Kuhua Street

Eastbound Approach: Widen to provide a dedicated left-turn lane. This will require ROW acquisition.

Traffic Signal Warrant: Not met.

Honoapiilani Highway/Lahainaluna Road

Westbound Approach: Lengthen left-turn and right-turn lane storage length; provide two receiving lanes in the eastbound direction. This will require ROW acquisition.

Honoapiilani Highway/Papalaua Street

Southbound Approach: Lengthen the left-turn lane.

Eastbound Approach: Restripe to provide dedicated left-turn lane and shared through/right-turn lane.

Recommended Improvements for the KSE, Alternative 1 ("Preferred Alternative")

KSE

Construct the KSE as a two-lane roadway with medians for left-turn lanes using the "Alternative 1" alignment shown in Figure 19. *Note that for the construction of the KSE, ROW will need to be acquired.*

Papalaua Street Extension

Extend Papalaua Street eastward to connect with the KSE.

Honoapiilani Highway/Keawe Street

Westbound Approach: re-stripe to provide a dedicated left-turn lane, a shared through/right-turn lane, and dedicated right-turn lane. This will require the construction of a larger-radius channelized island at the northeast corner, which will require ROW Acquisition.

Honoapiilani Highway/Papalaua Street

Westbound Approach: widen to provide a dedicated left-turn lane, a dedicated through lane, and a dedicated right-turn lane; provide two receiving lanes in the eastbound direction. This will require ROW acquisition.

Honoapiilani Highway/Aholo Road

Honoapiilani Highway: Widen to four (4) lanes southward beyond Aholo Road.

Eastbound Approach: *Restrict to right-in/right-out due to provision of signalized access via Front Street and heavier conflicting volume along Honoapiilani Highway.*

Westbound Approach: *Restrict to right-in/right-out due to provision of signalized access via Front Street and heavier conflicting volume along Honoapiilani Highway.*

Honoapiilani Highway/Front Street

Honoapiilani Highway: *Widen to four (4) lanes between Aholo Road and beyond Front Street.*

Northbound Approach: *Construct a dedicated right-turn deceleration lane. This will require ROW acquisition.*

Westbound Approach: *Construct a dedicated westbound left-turn lane and a shared left-turn/through/right-turn lane. This will require ROW acquisition.*

Traffic Signal Warrant: *Would likely be met; therefore, a traffic signal is recommended at this intersection.*

KSE Interesctions

Provide two (2) lanes with median left-turn lanes at its intersections. It is recommended that all intersections along the KSE be two-way stop controlled (TWSC), with the following exceptions:

- *Keawe Street/HHFDC Access/KSE – Signalized; the traffic signal should be designed to ensure that its queues do not obstruct the path of the Lahaina Sugar Train.*
- *Lahainaluna Road/KSE – Signalized*
- *Shaw Street Extension/KSE – Roundabout*[16]
- *Honoapiilani Highway/KSE – Signalized*

[16] Recommendation of a roundabout at this location hinges on the assumptions made in this report relative to the Wainee Development and location of the intersection. .

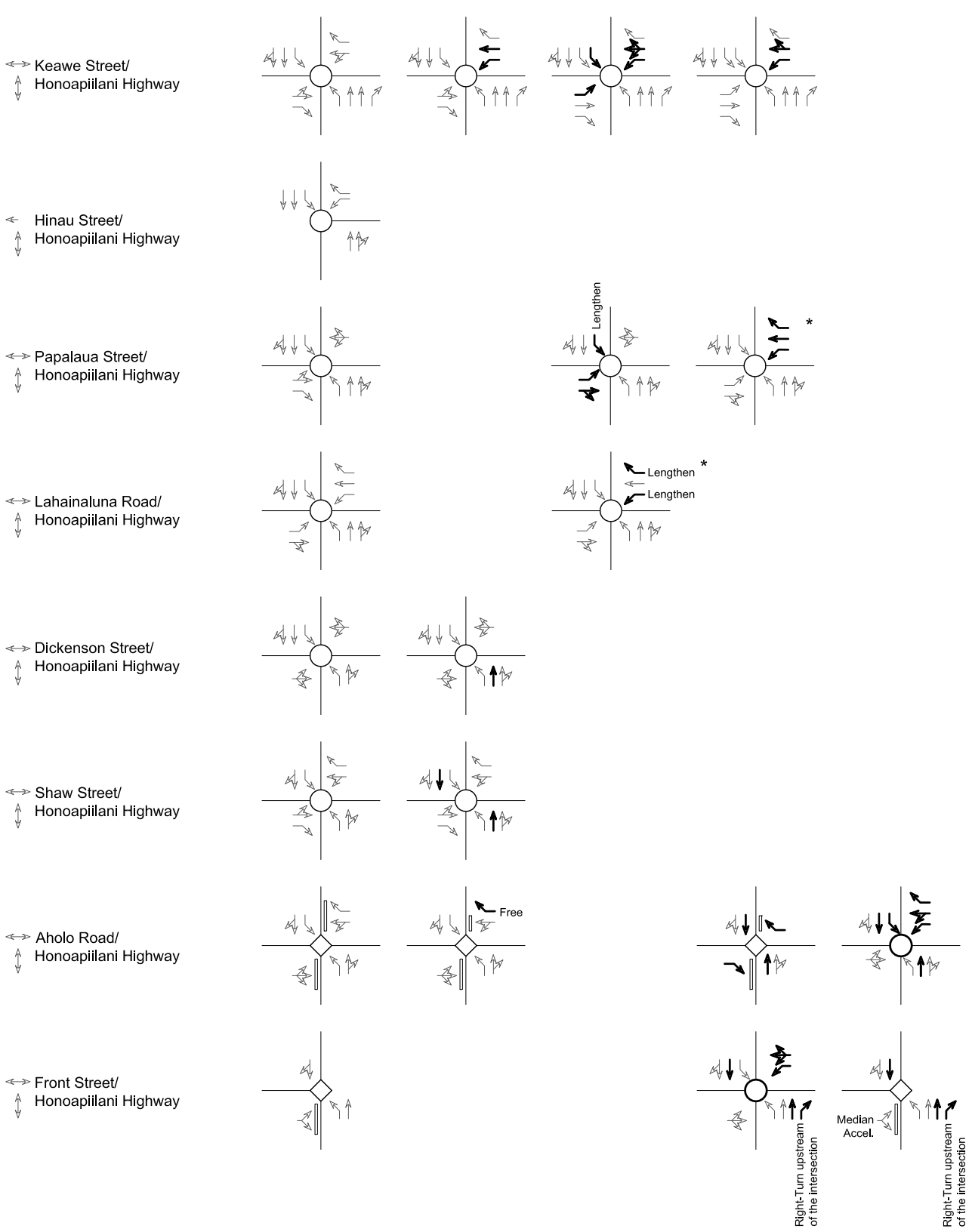
A new parking lot will be provided at the corner of Lahainaluna Road and Kuhua Street; it is recommended that the lot be designated as one-way, with the entrance along Kuhua Street and the exit as a right-out only onto Lahainaluna Road.

Refer to Figures 28a through 28d for recommended lane configurations, as most of the alignment will be new. See Figures 36a and 36b for a complete graphical matrix of recommended mitigations and improvements.

Traffic Calming Measures

In order to address residents' concerns regarding the potential for speeding along the KSE – particularly along the existing Kuhua Street Alignment – it is recommended that one or more of the following traffic calming measures be considered to be implemented along the KSE:

- *Narrower Lanes – While maintaining the existing 34-foot pavement width, stripe the travel lanes to be 10 feet wide in either direction, with a 14-foot left-turn/median lane.*
- *Bulbouts – Raised curbs to physically narrow the travel widths at key locations. Refer to Figure 34 for a general depiction.*
- *Passive Speed Control Monitoring Devices – Devices installed to monitor speed; police would be notified when speeding occurs.*



* Note: Recommended improvement would require access modification for nearby driveways.

LEGEND

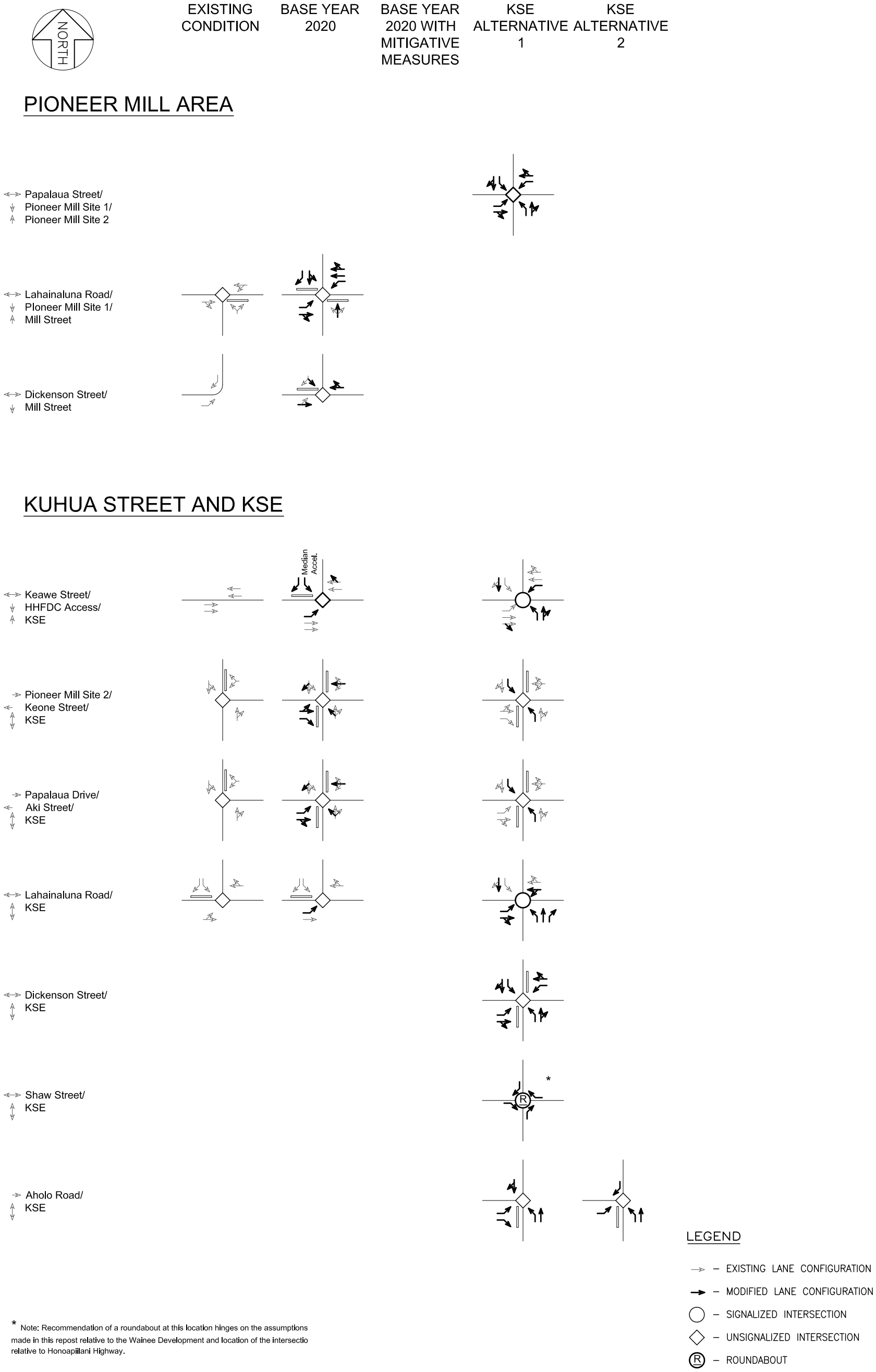
- EXISTING LANE CONFIGURATION
- MODIFIED LANE CONFIGURATION
- SIGNALIZED INTERSECTION
- UNSIGNALIZED INTERSECTION
- ROUNDABOUT

KUHUA STREET EXTENSION

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

LANEAGE RECOMMENDATION SUMMARY

FIGURE 35a



* Note: Recommendation of a roundabout at this location hinges on the assumptions made in this repost relative to the Wainee Development and location of the intersectio relative to Honoapiilani Highway.

KUHUA STREET EXTENSION

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

FIGURE 35b

LANEAGE RECOMMENDATION SUMMARY

VIII. REFERENCES

1. American Association of State Highways and Transportation Officials, A Policy on Geometric Design of Highways and Street, 2004.

2. Federal Highway Administration, Manual on Uniform Traffic Control Devices for Streets and Highways, Including Revision 1, 2009.

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4. Transportation Research Board, Highway Capacity Manual, 2000.

5. Wilson Okamoto Corp., Lahaina Bypass Modified Alignment, 2009.

6. Wilson Okamoto Corp., Kahoma Residential Development, 2007

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A P P E N D I C E S

APPENDIX A

TRAFFIC COUNT DATA

Austin, Tsutsumi, and Associates
501 Sumner Street, Suite 521
Honolulu, HI 96817-5031

Hono & Keawe
AM Peak
weather: overcast

File Name : Keawe AM
Site Code : 00000000
Start Date : 2/6/2008
Page No : 1

Groups Printed- Unshifted - Bank 1

	Honoapiilani Southbound				Keawe Westbound				Honoapiilani Northbound				Keawe Eastbound				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
06:30 AM	1	145	9	0	0	1	0	0	27	323	14	0	9	0	1	0	530
06:45 AM	1	181	15	3	0	0	0	0	32	252	11	0	11	3	2	5	516
Total	2	326	24	3	0	1	0	0	59	575	25	0	20	3	3	5	1046
07:00 AM	2	216	14	1	14	6	9	0	24	294	12	0	15	5	1	0	613
07:15 AM	5	293	6	3	15	18	9	0	12	268	8	0	12	2	4	1	656
07:30 AM	4	318	18	0	19	5	11	0	33	351	12	0	10	15	5	0	801
07:45 AM	3	259	9	1	15	4	13	0	24	374	11	0	13	6	6	1	739
Total	14	1086	47	5	63	33	42	0	93	1287	43	0	50	28	16	2	2809
08:00 AM	4	204	11	3	15	2	8	0	23	237	13	0	18	12	4	0	554
08:15 AM	6	272	8	2	16	0	18	2	16	201	14	0	14	3	3	1	576
Grand Total	26	1888	90	13	94	36	68	2	191	2300	95	0	102	46	26	8	4985
Apprch %	1.3	93.6	4.5	0.6	47	18	34	1	7.4	88.9	3.7	0	56	25.3	14.3	4.4	
Total %	0.5	37.9	1.8	0.3	1.9	0.7	1.4	0	3.8	46.1	1.9	0	2	0.9	0.5	0.2	
Unshifted	26	1888	90	13	94	36	68	2	191	2300	95	0	102	46	26	8	4985
% Unshifted	100	100	100	100	100	100	100	100	100	100	100	0	100	100	100	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

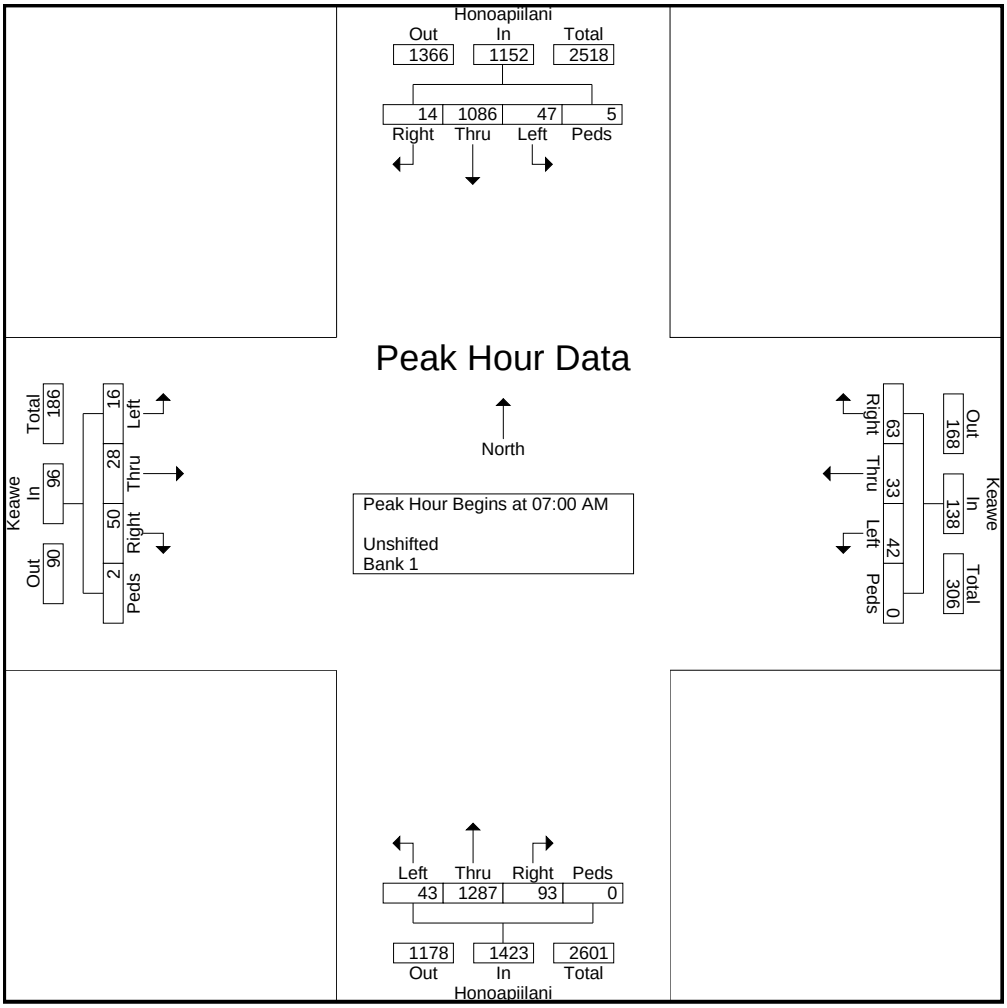
Austin, Tsutsumi, and Associates

501 Sumner Street, Suite 521
Honolulu, HI 96817-5031

Hono & Keawe
AM Peak
weather: overcast

File Name : Keawe AM
Site Code : 00000000
Start Date : 2/6/2008
Page No : 2

	Honoapiilani Southbound					Keawe Westbound					Honoapiilani Northbound					Keawe Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	2	216	14	1	233	14	6	9	0	29	24	294	**12**	0	330	**15**					
07:15 AM	**5**	**293**	**6**	**3**	**307**	**15**	**18**	**9**	**0**	**42**	12	268	8	0	288	12	2	4	**1**	**19**	**656**
07:30 AM	**4**	**318**	**18**	**0**	**340**	**19**	5	11	0	35	**33**	**351**	**12**	**0**	**396**	**10**	**15**	5	0	**30**	**801**
07:45 AM	3	259	9	1	272	15	4	**13**				**374**			**409**	13	6	**6**			
Total Volume	14	1086	47	5	1152	63	33	42	0	138	93	1287	43	0	1423	50	28	16	2	96	2809
% App. Total																					
PHF	.700	.854	.653	.417	.847	.829	.458	.808	.000	.821	.705	.860	.896	.000	.870	.833	.467	.667	.500	.800	.877



Peak Hour Data

North

Peak Hour Begins at 07:00 AM

Unshifted
Bank 1

Austin, Tsutsumi, and Associates

501Sumner Street, Suite 521
Honolulu, HI 96817-5031

Hono & Hinau
AM Peak

File Name : Hinau AM
Site Code : 00000000
Start Date : 2/5/2008
Page No : 1

Groups Printed- Unshifted - Bank 1

	HONO HWY From North				HINAU ST From East				HONO HWY From South				HINAU ST From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
06:30 AM	0	148	5	0	6	0	1	1	12	338	0	0	0	0	0	0	511
06:45 AM	0	184	9	0	8	0	5	0	22	308	0	0	0	0	0	1	537
Total	0	332	14	0	14	0	6	1	34	646	0	0	0	0	0	1	1048
07:00 AM	0	221	7	0	3	0	4	0	11	321	0	0	0	0	0	0	567
07:15 AM	0	283	10	0	5	0	11	0	11	304	0	0	0	0	0	0	624
07:30 AM	0	320	10	0	10	0	5	0	17	419	0	2	0	0	0	0	783
07:45 AM	0	218	14	0	7	0	10	0	23	380	0	0	0	0	0	0	652
Total	0	1042	41	0	25	0	30	0	62	1424	0	2	0	0	0	0	2626
08:00 AM	0	195	13	0	8	0	7	0	21	273	0	0	0	0	0	0	517
08:15 AM	0	260	11	0	11	0	8	0	19	206	0	0	0	0	0	0	515
*** BREAK ***																	
Grand Total	0	1829	79	0	58	0	51	1	136	2549	0	2	0	0	0	1	4706
Apprch %	0	95.9	4.1	0	52.7	0	46.4	0.9	5.1	94.9	0	0.1	0	0	0	100	
Total %	0	38.9	1.7	0	1.2	0	1.1	0	2.9	54.2	0	0	0	0	0	0	
Unshifted	0	1829	79	0	58	0	51	1	136	2549	0	2	0	0	0	1	4706
% Unshifted	0	100	100	0	100	0	100	100	100	100	0	100	0	0	0	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

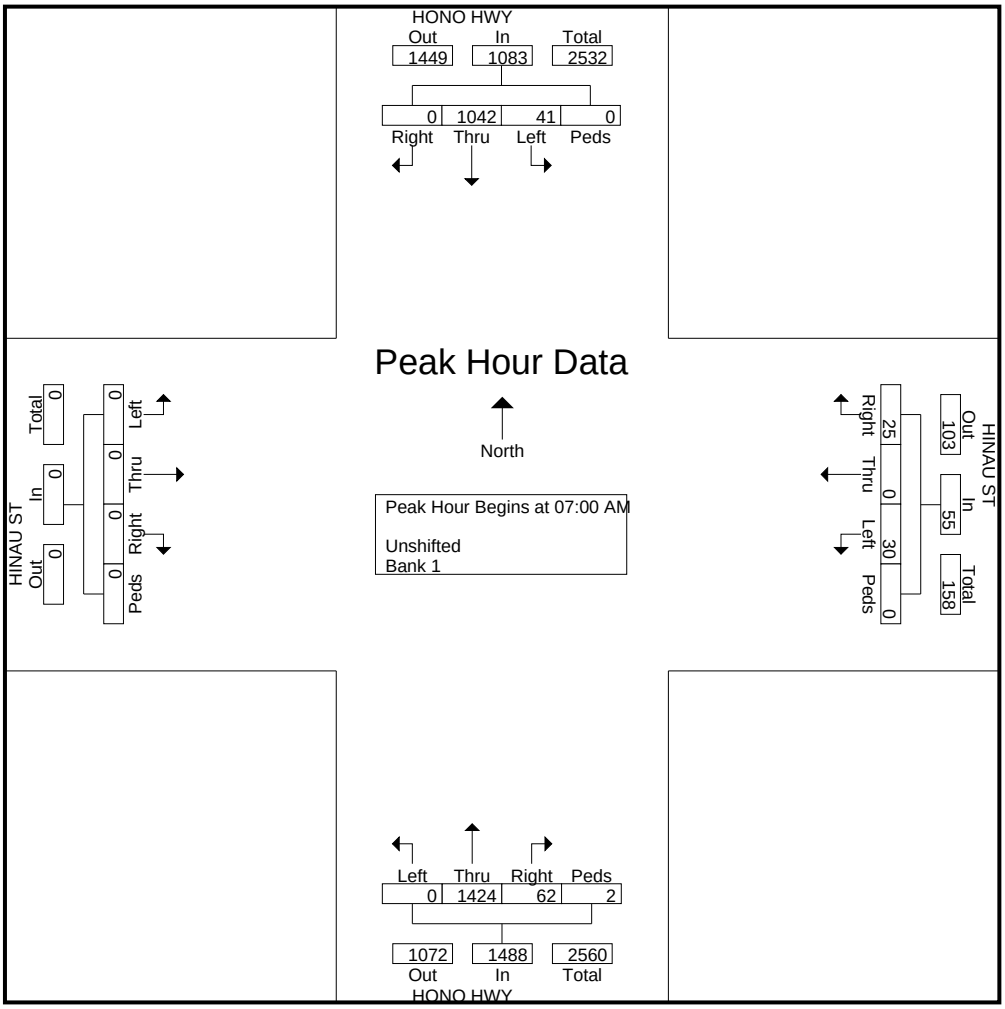
Austin, Tsutsumi, and Associates

501Sumner Street, Suite 521
Honolulu, HI 96817-5031

Hono & Hinau
AM Peak

File Name : Hinau AM
Site Code : 00000000
Start Date : 2/5/2008
Page No : 2

	HONO HWY From North					HINAU ST From East					HONO HWY From South					HINAU ST From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	221	7	0	228	3	0	4	0	7	11	321	0	0	332	0	0	0	0	0	567
07:15 AM	0	283	10	0	293	5	0	11	0	16	11	304	0	0	315	0	0	0	0	0	624
07:30 AM	0	320	10	0	330	10	0	5	0	15	17	419	0	2	438	0	0	0	0	0	783
07:45 AM	0	218	14	0	232	7	0	10	0	17	23	380	0	0	403	0	0	0	0	0	652
Total Volume	0	1042	41	0	1083	25	0	30	0	55	62	1424	0	2	1488	0	0	0	0	0	2626
% App. Total																					
PHF	.000	.814	.732	.000	.820	.625	.000	.682	.000	.809	.674	.850	.000	.250	.849	.000	.000	.000	.000	.000	.838



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File Name : Papalaua AM
Site Code : 00000000
Start Date : 2/6/2008
Page No : 1

Groups Printed- Unshifted

	Honoapiilani From North					Papalaua From East					Honoapiilani From South					Papalaua From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:30 AM	12	124	1	0	137	0	5	0	0	5	3	317	13	0	333	5	4	38	0	47	522
06:45 AM	13	159	1	0	173	4	1	0	0	5	6	299	17	0	322	7	2	43	0	52	552
Total	25	283	2	0	310	4	6	0	0	10	9	616	30	0	655	12	6	81	0	99	1074
07:00 AM	19	183	5	0	207	5	3	3	0	11	5	296	18	1	320	19	9	38	0	66	604
07:15 AM	19	244	0	0	263	3	0	2	0	5	5	324	20	0	349	13	14	43	0	70	687
07:30 AM	25	313	10	0	348	15	0	1	0	16	8	415	14	0	437	13	3	62	1	79	880
07:45 AM	12	168	16	0	196	9	3	1	0	13	7	360	24	0	391	24	13	81	0	118	718
Total	75	908	31	0	1014	32	6	7	0	45	25	1395	76	1	1497	69	39	224	1	333	2889
08:00 AM	28	216	8	0	252	15	3	2	0	20	32	279	26	2	339	17	6	58	0	81	692
08:15 AM	15	227	12	0	254	2	3	1	0	6	8	252	17	0	277	6	29	57	0	92	629
Grand Total	143	1634	53	0	1830	53	18	10	0	81	74	2542	149	3	2768	104	80	420	1	605	5284
Apprch %	7.8	89.3	2.9	0		65.4	22.2	12.3	0		2.7	91.8	5.4	0.1		17.2	13.2	69.4	0.2		
Total %	2.7	30.9	1	0	34.6	1	0.3	0.2	0	1.5	1.4	48.1	2.8	0.1	52.4	2	1.5	7.9	0	11.4	

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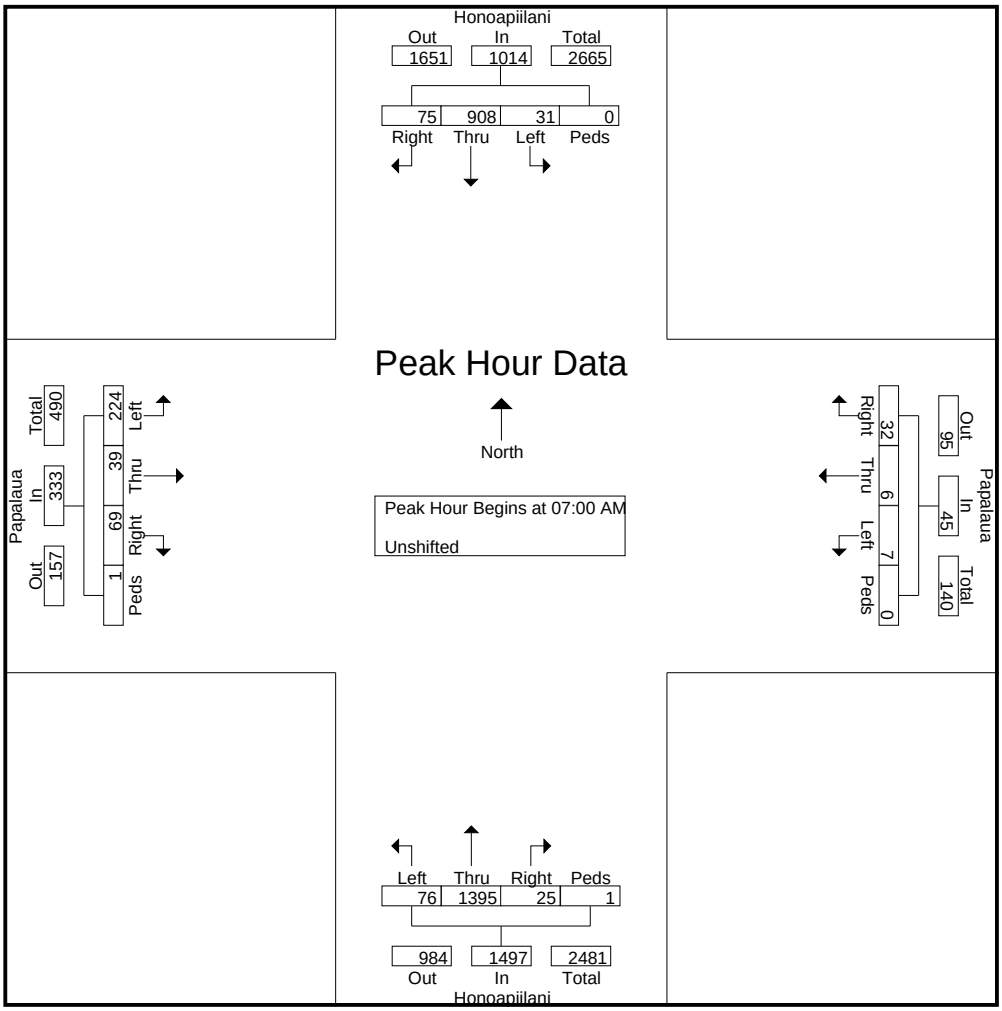
File Name : Papalaua AM
Site Code : 00000000
Start Date : 2/6/2008
Page No : 2

	Honoapiilani From North					Papalaua From East					Honoapiilani From South					Papalaua From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	19	183	5	0	207	5	**3**	**3**	0	11	5	296	18	**1**	320	19	9	38	0	66	604
07:15 AM	19	244	0	0	263	3	0	2	0	5	5	324	20	0	349	13	**14**	43	0	70	687
07:30 AM	**25**	**313**	10	0	**348**	**15**	0	1	0	**16**	**8**	**415**	14	0	**437**	13	3	62	**1**	79	**880**
07:45 AM	12	168	**16**	0	196	9	3	1	0	13	7	360	**24**	0	391	**24**	13	**81**	0	**118**	718
Total Volume	75	908	31	0	1014	32	6	7	0	45	25	1395	76	1	1497	69	39	224	1	333	2889
% App. Total	7.4	89.5	3.1	0		71.1	13.3	15.6	0		1.7	93.2	5.1	0.1		20.7	11.7	67.3	0.3		
PHF	.750	.725	.484	.000	.728	.533	.500	.583	.000	.703	.781	.840	.792	.250	.856	.719	.696	.691	.250	.706	.821



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501Sumner Street, Suite 521
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Hono & Lahainaluna
AM Peak

File Name : Lahaina AM (new)
Site Code : 00000000
Start Date : 2/7/2008
Page No : 1

Groups Printed- Unshifted - Bank 1

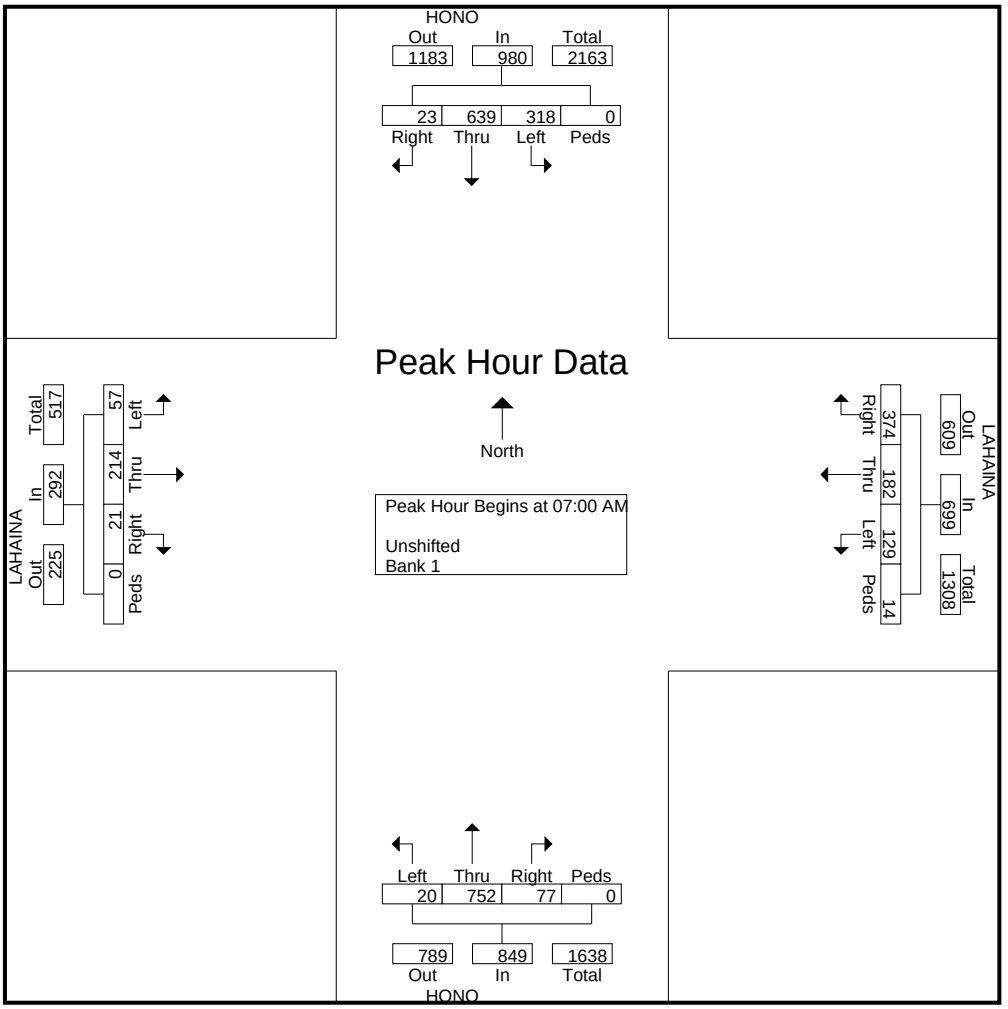
	HONO From North				LAHAINA From East				HONO From South				LAHAINA From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	3	100	68	0	94	47	28	0	21	187	10	0	6	48	8	0	620
07:15 AM	2	169	109	0	84	34	31	4	20	189	3	0	5	58	12	0	720
07:30 AM	10	227	81	0	102	51	41	10	22	182	4	0	3	68	16	0	817
07:45 AM	8	143	60	0	94	50	29	0	14	194	3	0	7	40	21	0	663
Total	23	639	318	0	374	182	129	14	77	752	20	0	21	214	57	0	2820
08:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	23	639	318	0	374	182	129	14	77	752	20	0	21	214	57	0	2820
Apprch %	2.3	65.2	32.4	0	53.5	26	18.5	2	9.1	88.6	2.4	0	7.2	73.3	19.5	0	
Total %	0.8	22.7	11.3	0	13.3	6.5	4.6	0.5	2.7	26.7	0.7	0	0.7	7.6	2	0	
Unshifted	23	639	318	0	374	182	129	14	77	752	20	0	21	214	57	0	2820
% Unshifted	100	100	100	0	100	100	100	100	100	100	100	0	100	100	100	0	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Austin, Tsutsumi, and Associates

501Sumner Street, Suite 521
Honolulu, HI 96817-5031

File Name : Lahaina AM (new)
Site Code : 00000000
Start Date : 2/7/2008
Page No : 2

	HONO From North					LAHAINA From East					HONO From South					LAHAINA From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	3	100	68	0	171	94	47	28	0	169	21	187	10	0	218	6	48	8	0	62	620
07:15 AM	2	169	109	0	280	84	34	31	4	153	20	189	3	0	212	5	58	12	0	75	720
07:30 AM	10	227	81	0	318	102	51	41	10	204	22	182	4	0	208	3	68	16	0	87	817
07:45 AM	8	143	60	0	211	94	50	29	0	173	14	194	3	0	211	7	40	21	0	68	663
Total Volume	23	639	318	0	980	374	182	129	14	699	77	752	20	0	849	21	214	57	0	292	2820
% App. Total	2.3	65.2	32.4	0		53.5	26	18.5	2		9.1	88.6	2.4	0		7.2	73.3	19.5	0		
PHF	.575	.704	.729	.000	.770	.917	.892	.787	.350	.857	.875	.969	.500	.000	.974	.750	.787	.679	.000	.839	.863



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501Sumner Street, Suite 521
Honolulu, HI 96817-5031

Honoapiilani & Kaanapali
AM peak
weather: overcast

File Name : Not Named 4
Site Code : 00000000
Start Date : 10/22/2009
Page No : 1

Groups Printed- Unshifted - Bank 1

	KUHUA From North				AKI From East				KUHUA From South				AKI From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	0	8	0	0	1	0	7	1	4	1	0	0	0	0	0	0	22
07:15 AM	0	5	0	0	0	0	9	0	4	1	0	0	0	0	0	0	19
07:30 AM	0	6	0	0	0	0	14	0	4	3	0	0	0	0	0	0	27
07:45 AM	0	4	0	0	1	0	7	0	4	5	0	0	0	0	0	0	21
Total	0	23	0	0	2	0	37	1	16	10	0	0	0	0	0	0	89
Grand Total	0	23	0	0	2	0	37	1	16	10	0	0	0	0	0	0	89
Apprch %	0	100	0	0	5	0	92.5	2.5	61.5	38.5	0	0	0	0	0	0	
Total %	0	25.8	0	0	2.2	0	41.6	1.1	18	11.2	0	0	0	0	0	0	
Unshifted	0	23	0	0	2	0	37	1	16	10	0	0	0	0	0	0	89
% Unshifted	0	100	0	0	100	0	100	100	100	100	0	0	0	0	0	0	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

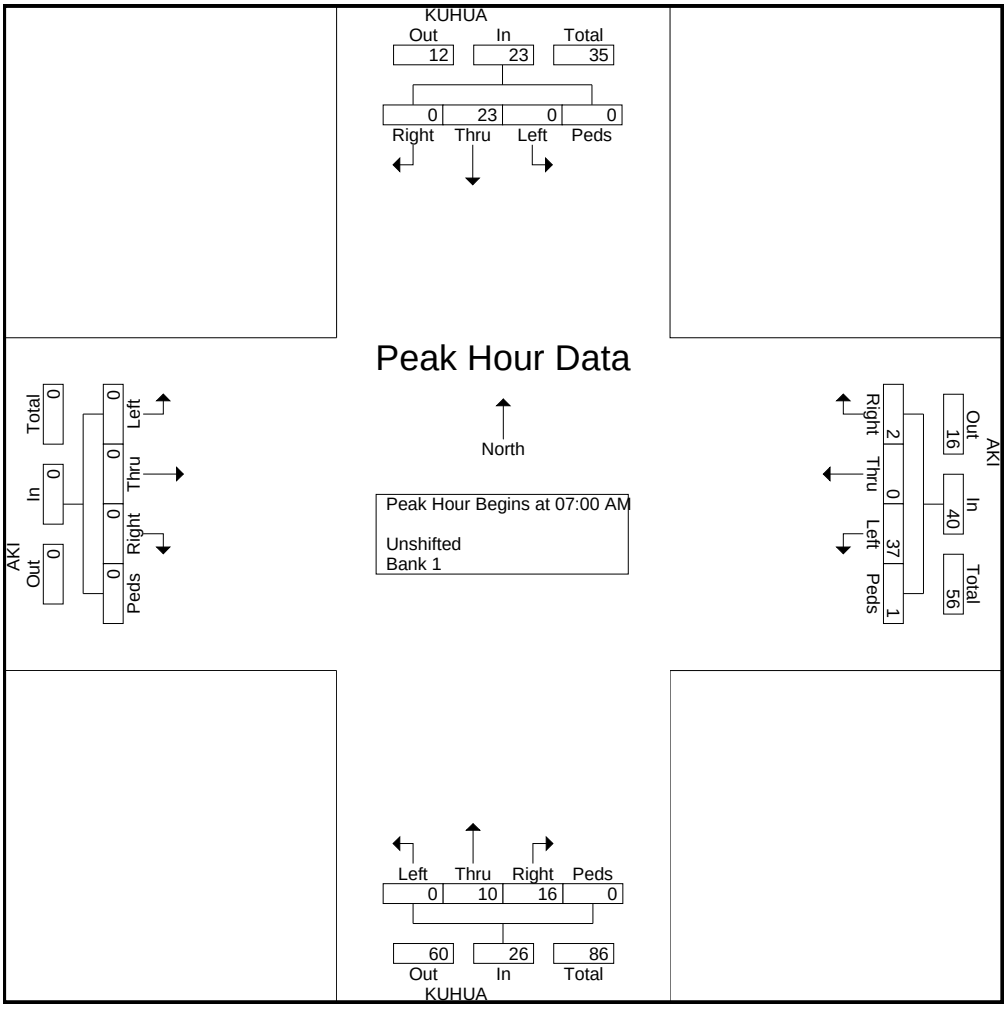
Austin, Tsutsumi, and Associates

501Sumner Street, Suite 521
Honolulu, HI 96817-5031

Honoapiilani & Kaanapali
AM peak
weather: overcast

File Name : Not Named 4
Site Code : 00000000
Start Date : 10/22/2009
Page No : 2

	KUHUA From North					AKI From East					KUHUA From South					AKI From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	**8**	0	0	**8**	**1**			**1**		**4**										
07:15 AM	**0**	**5**	**0**	**0**	**5**	**0**	**0**	**9**	**0**	**9**	**4**	**1**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**19**
07:30 AM	**0**	**6**	**0**	**0**	**6**	**0**	**0**	**14**	**0**	**14**	4	3	0	0	7	0	0	0	0	0	**27**
07:45 AM	0	4	0	0	4	1	0	7	0	8	4	**5**	0	0	**9**	0	0	0	0	0	21
Total Volume	0	23	0	0	23	2	0	37	1	40	16	10	0	0	26	0	0	0	0	0	89
% App. Total	0	100	0	0		5	0	92.5	2.5		61.5	38.5	0	0		0	0	0	0		
PHF	.000	.719	.000	.000	.719	.500	.000	.661	.250	.714	1.000	.500	.000	.000	.722	.000	.000	.000	.000	.000	.824



Austin, Tsutsumi, and Associates

501Sumner Street, Suite 521
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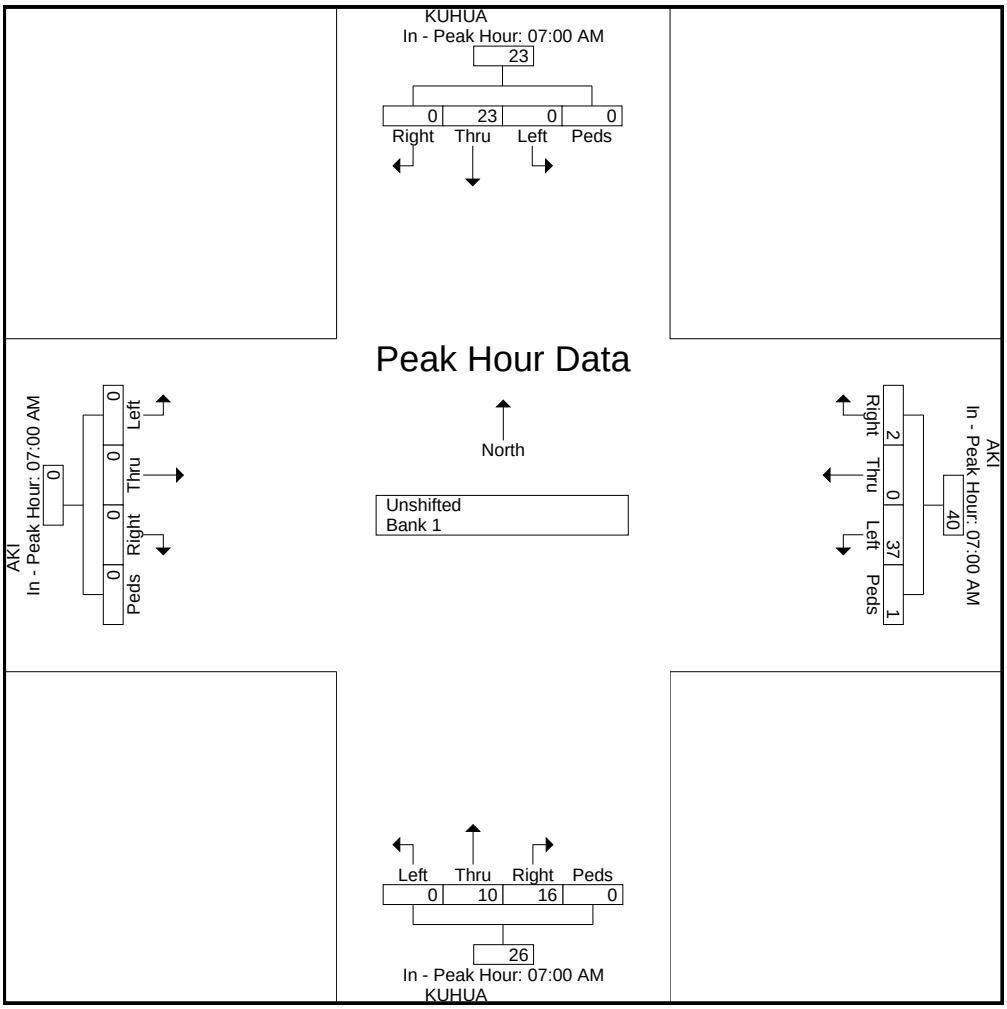
Honoapiilani & Kaanapali
AM peak
weather: overcast

File Name : Not Named 4
Site Code : 00000000
Start Date : 10/22/2009
Page No : 3

	KUHUA From North					AKI From East					KUHUA From South					AKI From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	07:00 AM					07:00 AM					07:00 AM					07:00 AM					
+0 mins.	0	**8**	0	0	**8**	**1**			**1**		**4**										
+15 mins.	**0**	**5**	**0**	**0**	**5**	**0**	**0**	**9**	**0**	**9**	**4**	**1**	**0**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	
+30 mins.	**0**	**6**	**0**	**0**	**6**	**0**	**0**	**14**	**0**	**14**	4	3	0	0	7	0	0	0	0	0	
+45 mins.	0	4	0	0	4	1	0	7	0	8	4	**5**	0	0	**9**	0	0	0	0	0	
Total Volume	0	23	0	0	23	2	0	37	1	40	16	10	0	0	26	0	0	0	0	0	
% App. Total	0	100	0	0		5	0	92.5	2.5		61.5	38.5	0	0		0	0	0	0		
PHF	.000	.719	.000	.000	.719	.500	.000	.661	.250	.714	1.000	.500	.000	.000	.722	.000	.000	.000	.000	.000	



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File Name : Mill-Lahainaluna AM
Site Code : 00000000
Start Date : 2/7/2008
Page No : 1

Groups Printed- Unshifted

	MILL ST From North					LAHAINALUNA From East					MILL ST From South					LAHAINALUNA From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:30 AM	0	0	0	0	0	1	117	3	1	122	7	0	1	0	8	1	49	1	4	55	185
06:45 AM	1	0	0	1	2	0	129	4	0	133	11	0	2	0	13	1	81	0	1	83	231
Total	1	0	0	1	2	1	246	7	1	255	18	0	3	0	21	2	130	1	5	138	416
07:00 AM	0	0	0	1	1	1	175	12	0	188	17	0	2	0	19	1	144	0	3	148	356
07:15 AM	0	0	0	1	1	1	197	12	0	210	27	0	0	0	27	0	184	2	4	190	428
07:30 AM	0	0	0	0	0	1	202	23	1	227	40	0	2	0	42	13	165	0	1	179	448
07:45 AM	2	0	0	0	2	1	206	9	0	216	22	1	2	0	25	2	104	1	2	109	352
Total	2	0	0	2	4	4	780	56	1	841	106	1	6	0	113	16	597	3	10	626	1584
08:00 AM	0	0	0	0	0	0	175	14	0	189	12	0	1	0	13	1	62	1	5	69	271
08:15 AM	0	0	0	0	0	1	123	5	0	129	9	0	2	0	11	0	67	2	8	77	217
Grand Total	3	0	0	3	6	6	1324	82	2	1414	145	1	12	0	158	19	856	7	28	910	2488
Apprch %	50	0	0	50		0.4	93.6	5.8	0.1		91.8	0.6	7.6	0		2.1	94.1	0.8	3.1		
Total %	0.1	0	0	0.1	0.2	0.2	53.2	3.3	0.1	56.8	5.8	0	0.5	0	6.4	0.8	34.4	0.3	1.1	36.6	

Austin Tsutsumi & Asscociates

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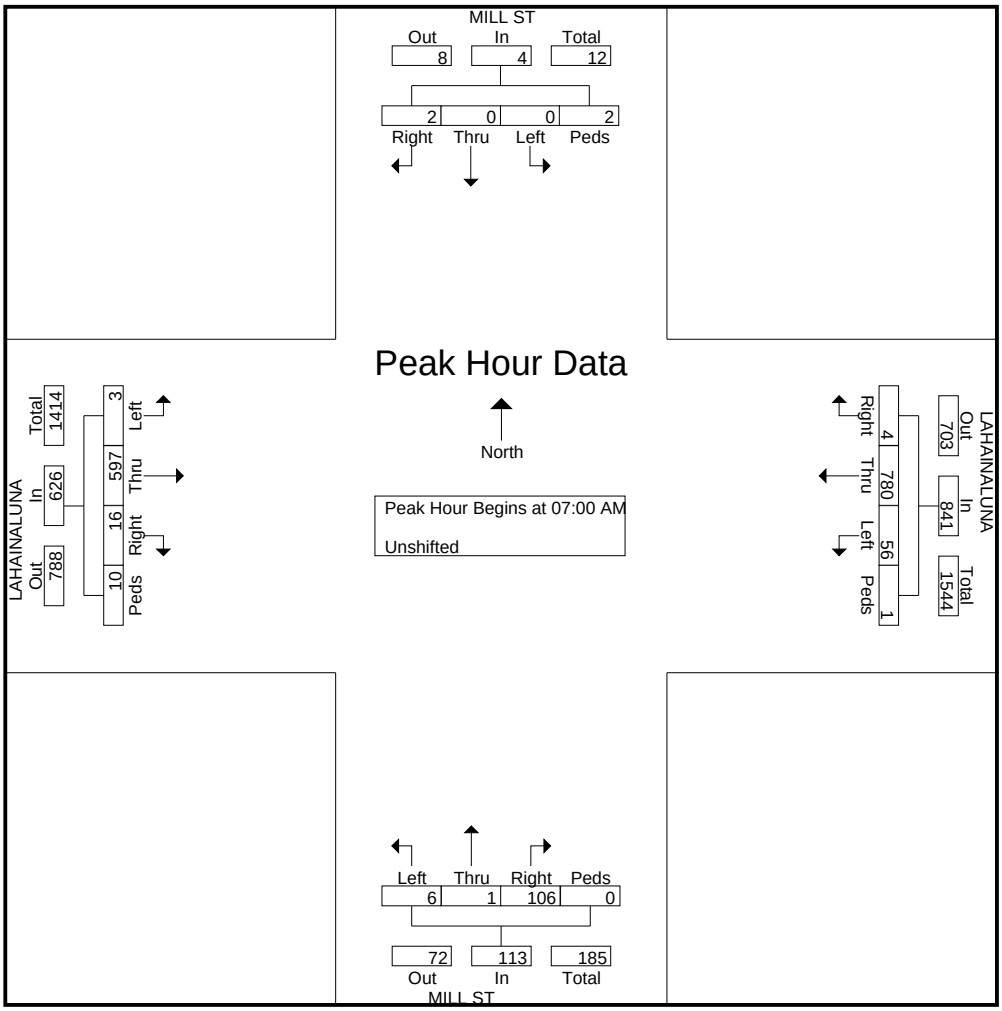
File Name : Mill-Lahainaluna AM
Site Code : 00000000
Start Date : 2/7/2008
Page No : 2

	MILL ST From North					LAHAINALUNA From East					MILL ST From South					LAHAINALUNA From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 AM to 08:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	0	0	0	**1**	1	**1**	175	12	0	188	17	0	**2**	0	19	1	144	0	3	148	356
07:15 AM	0	0	0	1	1	1	197	12	0	210	27	0	0	0	27	0	**184**	**2**	**4**	**190**	428
07:30 AM	0	0	0	0	0	1	202	**23**	**1**	**227**	**40**	0	2	0	**42**	**13**	165	0	1	179	**448**
07:45 AM	**2**	0	0	0	**2**	1	**206**	9	0	216	22	**1**	2	0	25	2	104	1	2	109	352
Total Volume	2	0	0	2	4	4	780	56	1	841	106	1	6	0	113	16	597	3	10	626	1584
% App. Total	50	0	0	50		0.5	92.7	6.7	0.1		93.8	0.9	5.3	0		2.6	95.4	0.5	1.6		
PHF	.250	.000	.000	.500	.500	1.000	.947	.609	.250	.926	.663	.250	.750	.000	.673	.308	.811	.375	.625	.824	.884



Austin Tsutsumi & Asscociates

501 Sumner St. Ste. 521
Honolulu, HI 96817
(808) 533-3646

File Name : Dickenson AM
Site Code : 00000000
Start Date : 2/7/2008
Page No : 1

Groups Printed- Unshifted - Bank 1

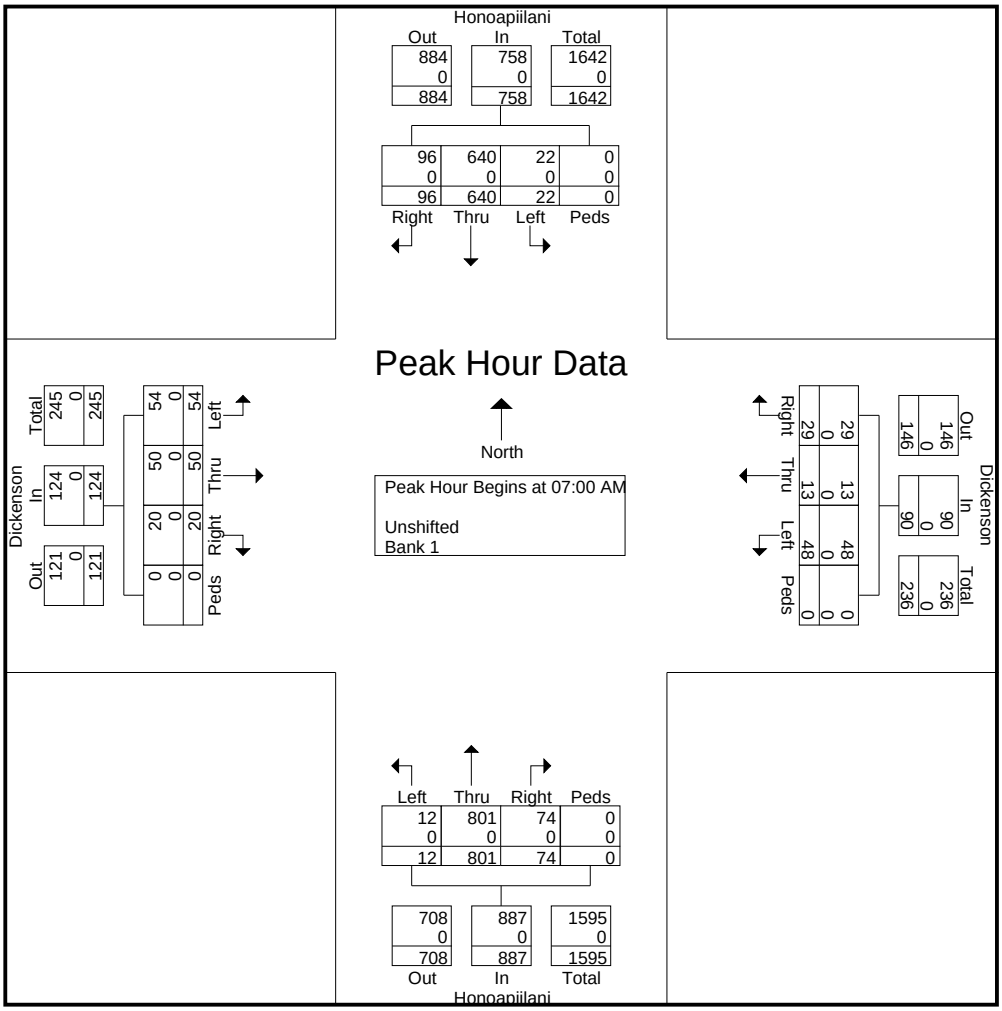
	Honoapiilani From North					Dickenson From East					Honoapiilani From South					Dickenson From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:00 AM	11	77	1	0	89	8	1	6	0	15	15	161	3	0	179	2	4	2	0	8	291
06:15 AM	11	117	3	0	131	15	2	6	0	23	12	151	3	0	166	1	1	2	0	4	324
06:30 AM	12	97	0	0	109	9	1	2	0	12	16	256	1	0	273	2	4	2	0	8	402
06:45 AM	16	125	1	0	142	13	1	3	0	17	18	225	3	0	246	4	6	1	0	11	416
Total	50	416	5	0	471	45	5	17	0	67	61	793	10	0	864	9	15	7	0	31	1433
07:00 AM	18	125	1	0	144	12	5	9	0	26	19	228	6	0	253	0	7	6	0	13	436
07:15 AM	28	166	4	0	198	5	3	10	0	18	15	189	2	0	206	6	16	10	0	32	454
07:30 AM	30	187	11	0	228	10	4	11	0	25	22	181	2	0	205	5	21	19	0	45	503
07:45 AM	20	162	6	0	188	2	1	18	0	21	18	203	2	0	223	9	6	19	0	34	466
Total	96	640	22	0	758	29	13	48	0	90	74	801	12	0	887	20	50	54	0	124	1859
08:00 AM	22	177	2	0	201	5	5	10	0	20	17	213	6	0	236	2	3	11	0	16	473
08:15 AM	25	190	4	0	219	5	4	8	0	17	11	229	8	0	248	7	4	9	0	20	504
Grand Total	193	1423	33	0	1649	84	27	83	0	194	163	2036	36	0	2235	38	72	81	0	191	4269
Apprch %	11.7	86.3	2	0		43.3	13.9	42.8	0		7.3	91.1	1.6	0		19.9	37.7	42.4	0		
Total %	4.5	33.3	0.8	0	38.6	2	0.6	1.9	0	4.5	3.8	47.7	0.8	0	52.4	0.9	1.7	1.9	0	4.5	
Unshifted	193	1423	33	0	1649	84	27	83	0	194	163	2036	36	0	2235	38	72	81	0	191	4269
% Unshifted	100	100	100	0	100	100	100	100	0	100	100	100	100	0	100	100	100	100	0	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Austin Tsutsumi & Asscociates

501 Sumner St. Ste. 521
Honolulu, HI 96817
(808) 533-3646

File Name : Dickenson AM
Site Code : 00000000
Start Date : 2/7/2008
Page No : 2

	Honoapiilani From North					Dickenson From East					Honoapiilani From South					Dickenson From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	18	125	1	0	144	**12**	**5**	9	0	**26**	19	**228**	**6**	0	**253**	0	7	6	0	13	436
07:15 AM	28	166	4	0	198	5	3	10	0	18	15	189	2	0	206	6	16	10	0	32	454
07:30 AM	**30**	**187**	**11**	0	**228**	10	4	11	0	25	**22**	181	2	0	205	5	**21**	**19**	0	**45**	**503**
07:45 AM	20	162	6	0	188	2	1	**18**	0	21	18	203	2	0	223	**9**	6	19	0	34	466
Total Volume	96	640	22	0	758	29	13	48	0	90	74	801	12	0	887	20	50	54	0	124	1859
% App. Total	12.7	84.4	2.9	0		32.2	14.4	53.3	0		8.3	90.3	1.4	0		16.1	40.3	43.5	0		
PHF	.800	.856	.500	.000	.831	.604	.650	.667	.000	.865	.841	.878	.500	.000	.876	.556	.595	.711	.000	.689	.924
Unshifted	96	640	22	0	758	29	13	48	0	90	74	801	12	0	887	20	50	54	0	124	1859
% Unshifted																					
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



Austin, Tsutsumi, and Associates

501Sumner Street, Suite 521
Honolulu, HI 96817-5031

Hono & Shaw
AM Peak

File Name : shaw am (new)
Site Code : 00000000
Start Date : 2/7/2008
Page No : 1

Groups Printed- Unshifted

	AHONO From North				SHAW From East				AHONO From South				SHAW From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
07:00 AM	2	125	4	0	9	2	2	1	0	248	14	0	5	1	10	0	423
07:15 AM	10	138	2	0	9	6	1	1	3	211	22	0	6	2	3	0	414
07:30 AM	7	151	5	0	3	0	3	0	0	219	17	0	12	1	18	0	436
07:45 AM	13	141	9	0	4	5	0	0	1	201	19	0	8	7	13	0	421
Total	32	555	20	0	25	13	6	2	4	879	72	0	31	11	44	0	1694
Grand Total	32	555	20	0	25	13	6	2	4	879	72	0	31	11	44	0	1694
Apprch %	5.3	91.4	3.3	0	54.3	28.3	13	4.3	0.4	92	7.5	0	36	12.8	51.2	0	
Total %	1.9	32.8	1.2	0	1.5	0.8	0.4	0.1	0.2	51.9	4.3	0	1.8	0.6	2.6	0	

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501Sumner Street, Suite 521
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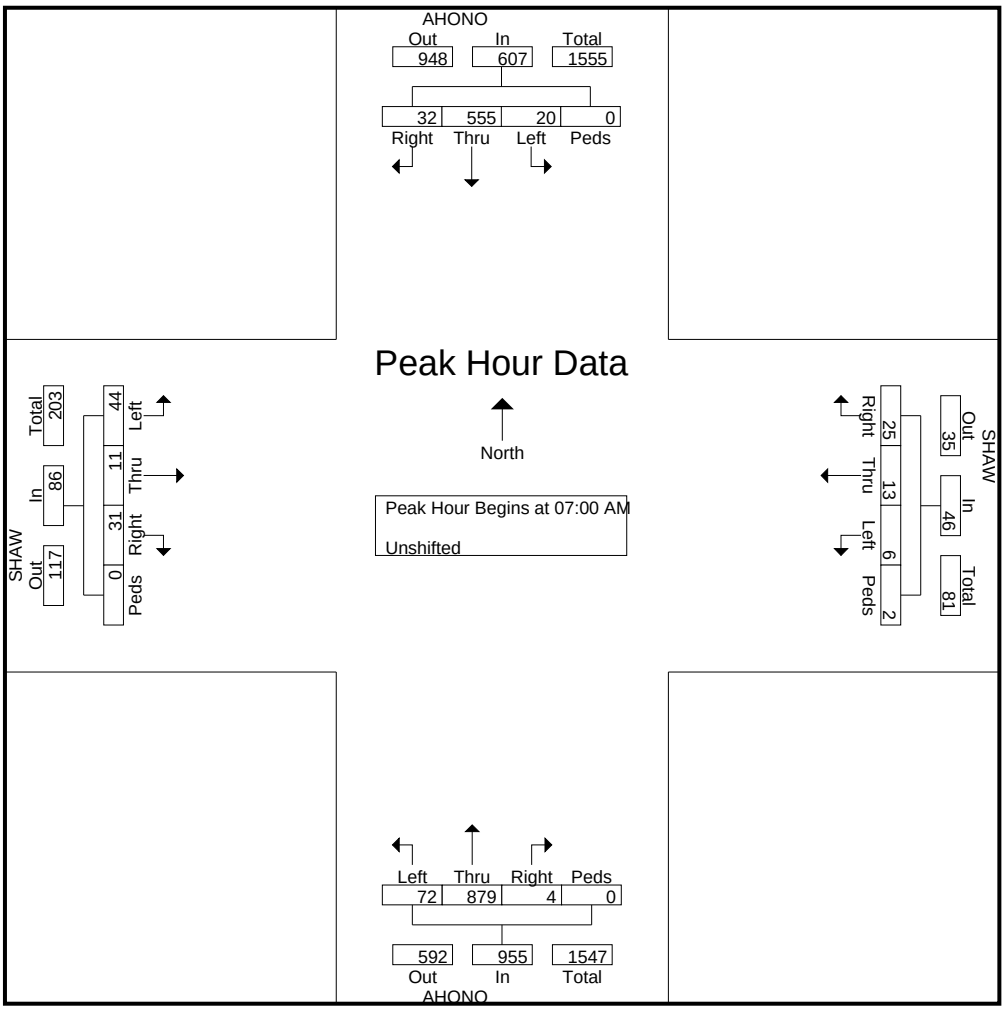
Hono & Shaw
AM Peak

File Name : shaw am (new)
Site Code : 00000000
Start Date : 2/7/2008
Page No : 2

	AHONO From North					SHAW From East					AHONO From South					SHAW From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	2	125	4	0	131	9	2	2	1	14	0	248	14	0	262	5	1	10	0	16	423
07:15 AM	10	138	2	0	150	9	6	1	1	17	3	211	22	0	236	6	2	3	0	11	414
07:30 AM	7	151	5	0	163	3	0	3	0	6	0	219	17	0	236	12	1	18	0	31	436
07:45 AM	13	141	9	0	163	4	5	0	0	9	1	201	19	0	221	8	7	13	0	28	421
Total Volume	32	555	20	0	607	25	13	6	2	46	4	879	72	0	955	31	11	44	0	86	1694
% App. Total	5.3	91.4	3.3	0		54.3	28.3	13	4.3		0.4	92	7.5	0		36	12.8	51.2	0		
PHF	.615	.919	.556	.000	.931	.694	.542	.500	.500	.676	.333	.886	.818	.000	.911	.646	.393	.611	.000	.694	.971



Austin Tsutsumi & Asscociates

501 Sumner St. Ste. 521
Honolulu, HI 96817
(808) 533-3646

File Name : aholo am (new)
Site Code : 00000000
Start Date : 2/7/2008
Page No : 1

Groups Printed- Unshifted

	HONO From North					AHOLO From East					HONO From South					AHOLO From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
07:00 AM	6	116	5	0	127	15	1	1	0	17	0	269	4	0	273	0	0	0	0	0	417
07:15 AM	2	142	7	0	151	24	1	3	1	29	0	212	3	0	215	0	0	0	0	0	395
07:30 AM	2	149	11	0	162	12	2	1	1	16	0	218	2	0	220	0	0	0	0	0	398
07:45 AM	1	152	10	0	163	5	0	1	0	6	0	223	1	0	224	0	0	1	0	1	394
Total	11	559	33	0	603	56	4	6	2	68	0	922	10	0	932	0	0	1	0	1	1604
Grand Total	11	559	33	0	603	56	4	6	2	68	0	922	10	0	932	0	0	1	0	1	1604
Apprch %	1.8	92.7	5.5	0		82.4	5.9	8.8	2.9		0	98.9	1.1	0		0	0	100	0		
Total %	0.7	34.9	2.1	0	37.6	3.5	0.2	0.4	0.1	4.2	0	57.5	0.6	0	58.1	0	0	0.1	0	0.1	

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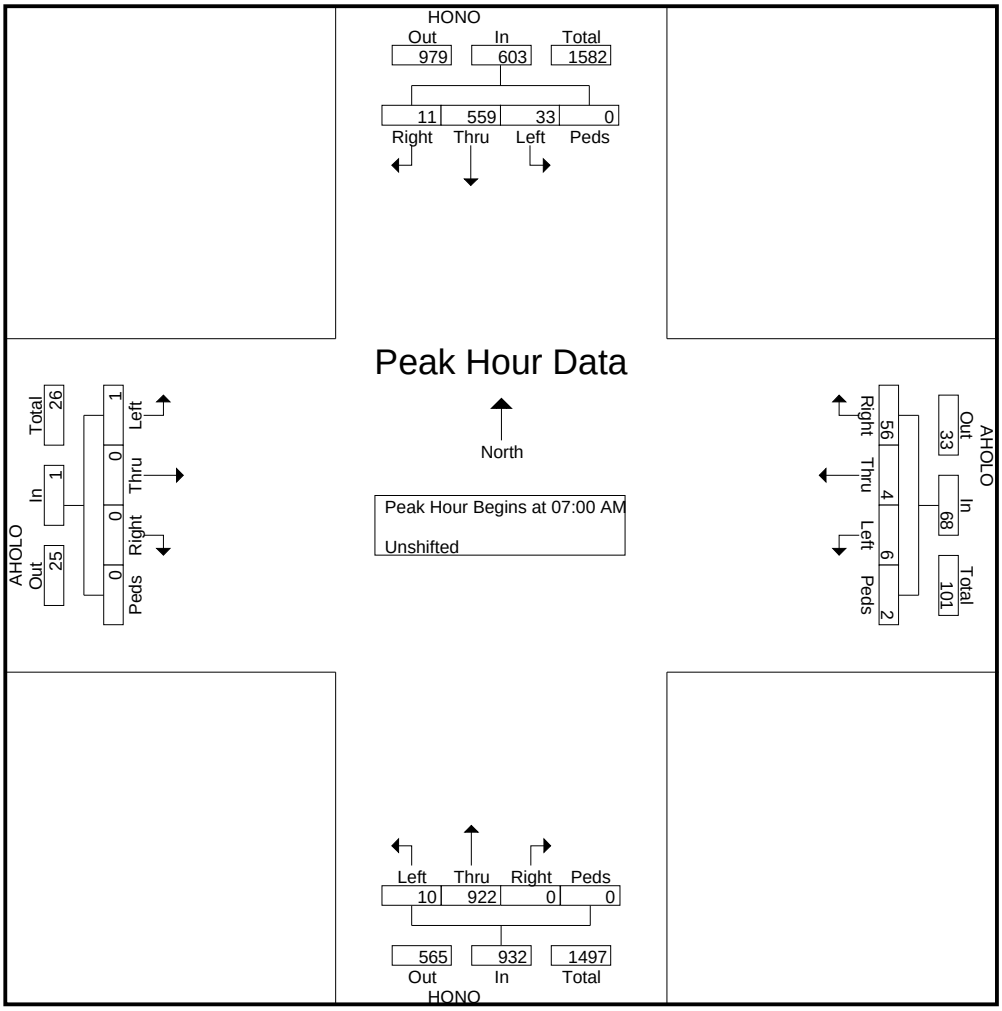
File Name : aholo am (new)
Site Code : 00000000
Start Date : 2/7/2008
Page No : 2

	HONO From North					AHOLO From East					HONO From South					AHOLO From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:00 AM to 07:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:00 AM																					
07:00 AM	**6**	116	5	0	127	15	1	1	0	17	0	**269**	**4**	0	**273**	0	0	0	0	0	**417**
07:15 AM	2	142	7	0	151	**24**	1	**3**	**1**	**29**	0	212	3	0	215	0	0	0	0	0	395
07:30 AM	2	149	**11**	0	162	12	**2**	1	1	16	0	218	2	0	220	0	0	0	0	0	398
07:45 AM	1	**152**	10	0	**163**	5	0	1	0	6	0	223	1	0	224	0	0	**1**	0	**1**	394
Total Volume	11	559	33	0	603	56	4	6	2	68	0	922	10	0	932	0	0	1	0	1	1604
% App. Total	1.8	92.7	5.5	0		82.4	5.9	8.8	2.9		0	98.9	1.1	0		0	0	100	0		
PHF	.458	.919	.750	.000	.925	.583	.500	.500	.500	.586	.000	.857	.625	.000	.853	.000	.000	.250	.000	.250	.962



Austin, Tsutsumi and Associates

501 Sumner Street, Suite 521
Honolulu, Hawaii 96817
ph: 533-3646 Fax: 526-1267

File Name : Honoapiilani - Front AM
Site Code : 00000000
Start Date : 1/27/2010
Page No : 1

Groups Printed- Unshifted

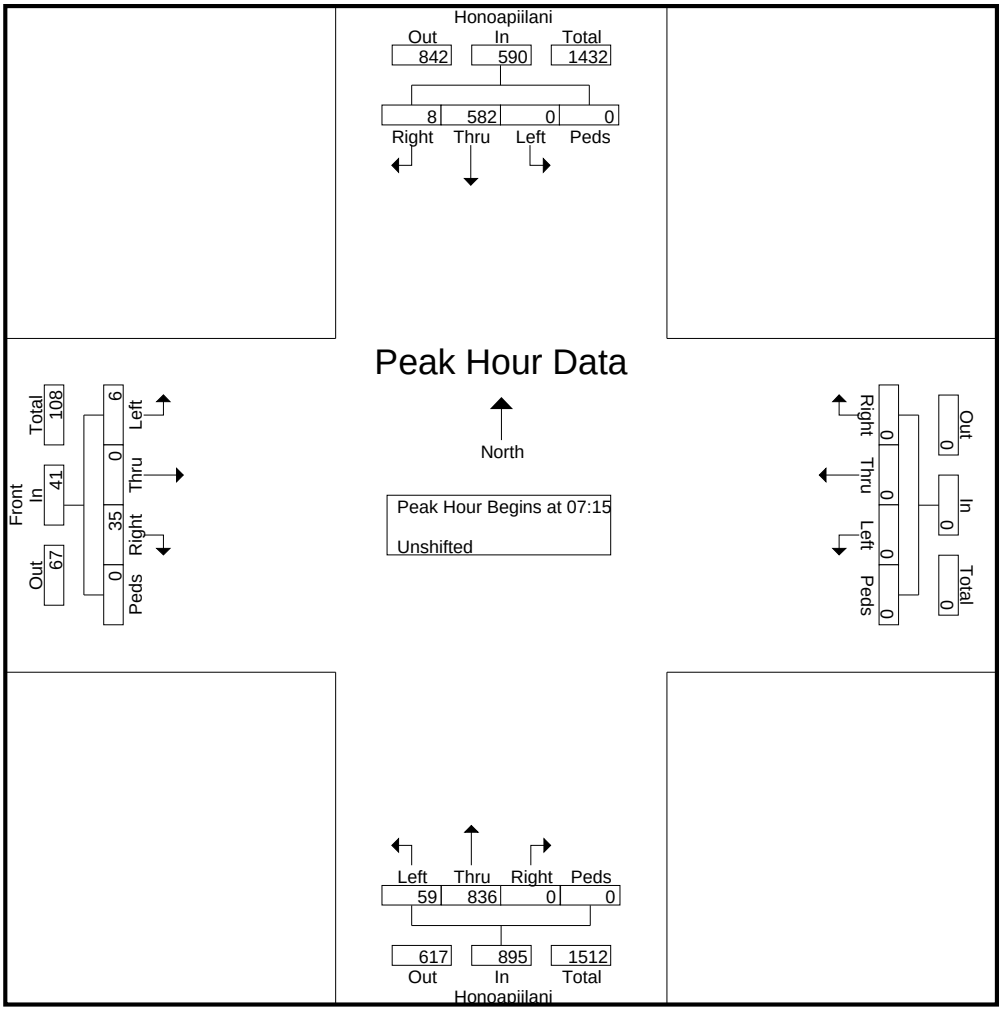
	Honoapiilani From North				From East				Honoapiilani From South				Front From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
06:30	3	78	0	0	0	0	0	0	0	167	11	0	5	0	0	0	264
06:45	1	120	0	0	0	0	0	0	0	178	13	0	6	0	0	0	318
Total	4	198	0	0	0	0	0	0	0	345	24	0	11	0	0	0	582
07:00	0	116	0	0	0	0	0	0	0	169	8	0	7	0	0	0	300
07:15	0	128	0	0	0	0	0	0	0	232	7	0	11	0	1	0	379
07:30	1	138	0	0	0	0	0	0	0	227	22	0	7	0	1	0	396
07:45	4	156	0	0	0	0	0	0	0	199	17	0	7	0	3	0	386
Total	5	538	0	0	0	0	0	0	0	827	54	0	32	0	5	0	1461
08:00	3	160	0	0	0	0	0	0	0	178	13	0	10	0	1	0	365
08:15	2	139	0	0	0	0	0	0	0	193	9	0	8	0	0	0	351
Grand Total	14	1035	0	0	0	0	0	0	0	1543	100	0	61	0	6	0	2759
Apprch %	1.3	98.7	0	0	0	0	0	0	0	93.9	6.1	0	91	0	9	0	
Total %	0.5	37.5	0	0	0	0	0	0	0	55.9	3.6	0	2.2	0	0.2	0	

Austin, Tsutsumi and Associates

501 Sumner Street, Suite 521
Honolulu, Hawaii 96817
ph: 533-3646 Fax: 526-1267

File Name : Honoapiilani - Front AM
Site Code : 00000000
Start Date : 1/27/2010
Page No : 2

	Honoapiilani From North					From East					Honoapiilani From South					Front From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:30 to 08:15 - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15																					
07:15	0	128	0	0	128	0	0	0	0	0	0	**232**	7	0	239	**11**	0	1	0	**12**	379
07:30	1	138	0	0	139	0	0	0	0	0	0	227	**22**	0	**249**	7	0	1	0	8	**396**
07:45	**4**	156	0	0	160	0	0	0	0	0	0	199	17	0	216	7	0	**3**	0	10	386
08:00	3	**160**	0	0	**163**	0	0	0	0	0	0	178	13	0	191	10	0	1	0	11	365
Total Volume	8	582	0	0	590	0	0	0	0	0	0	836	59	0	895	35	0	6	0	41	1526
% App. Total	1.4	98.6	0	0		0	0	0	0		0	93.4	6.6	0		85.4	0	14.6	0		
PHF	.500	.909	.000	.000	.905	.000	.000	.000	.000	.000	.000	.901	.670	.000	.899	.795	.000	.500	.000	.854	.963



Austin Tsutsumi & Asscociates

501 Sumner St. Ste. 521
Honolulu, HI 96817
(808) 533-3646

File Name : Keawe PM
Site Code : 00000000
Start Date : 2/6/2008
Page No : 1

Groups Printed- Unshifted

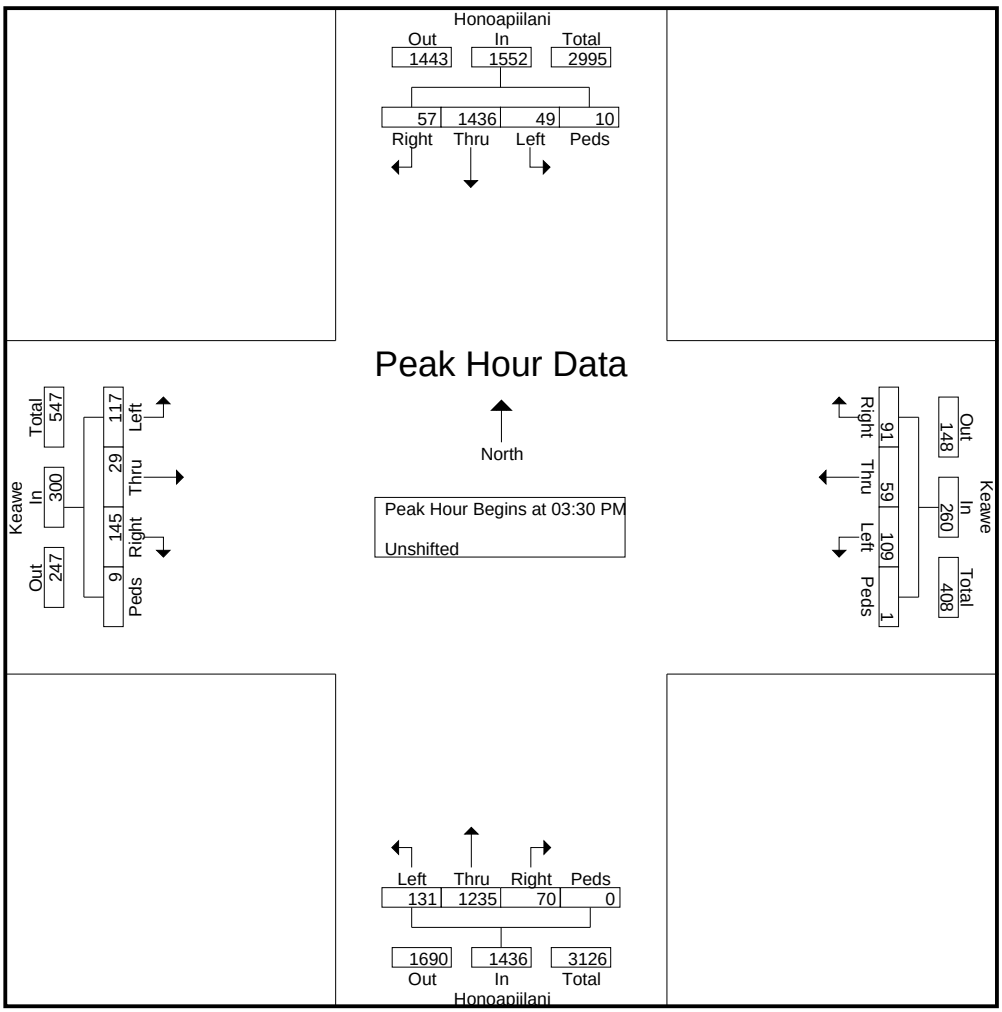
	Honoapiilani From North					Keawe From East					Honoapiilani From South					Keawe From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
03:00 PM	16	295	13	2	326	24	4	24	0	52	18	328	36	0	382	45	7	22	1	75	835
03:15 PM	5	346	24	0	375	22	16	32	3	73	21	288	36	0	345	30	8	31	0	69	862
03:30 PM	14	357	10	3	384	17	8	31	1	57	16	305	23	0	344	39	9	29	4	81	866
03:45 PM	15	382	17	3	417	25	5	25	0	55	21	345	42	0	408	29	10	23	1	63	943
Total	50	1380	64	8	1502	88	33	112	4	237	76	1266	137	0	1479	143	34	105	6	288	3506
04:00 PM	11	335	8	4	358	22	7	24	0	53	17	305	35	0	357	40	7	34	1	82	850
04:15 PM	17	362	14	0	393	27	39	29	0	95	16	280	31	0	327	37	3	31	3	74	889
04:30 PM	13	391	7	3	414	22	5	22	0	49	10	316	34	0	360	38	8	29	0	75	898
04:45 PM	12	312	9	0	333	16	3	13	0	32	12	279	34	0	325	50	4	29	1	84	774
Total	53	1400	38	7	1498	87	54	88	0	229	55	1180	134	0	1369	165	22	123	5	315	3411
05:00 PM	13	316	1	0	330	20	7	20	1	48	8	281	38	0	327	37	5	37	2	81	786
05:15 PM	20	387	9	0	416	12	8	17	0	37	12	302	30	0	344	39	1	27	1	68	865
Grand Total	136	3483	112	15	3746	207	102	237	5	551	151	3029	339	0	3519	384	62	292	14	752	8568
Apprch %	3.6	93	3	0.4		37.6	18.5	43	0.9		4.3	86.1	9.6	0		51.1	8.2	38.8	1.9		
Total %	1.6	40.7	1.3	0.2	43.7	2.4	1.2	2.8	0.1	6.4	1.8	35.4	4	0	41.1	4.5	0.7	3.4	0.2	8.8	

Austin Tsutsumi & Asscociates

501 Sumner St. Ste. 521
Honolulu, HI 96817
(808) 533-3646

File Name : Keawe PM
Site Code : 00000000
Start Date : 2/6/2008
Page No : 2

	Honoapiilani From North					Keawe From East					Honoapiilani From South					Keawe From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	14	357	10	3	384	17	8	**31**	**1**	57	16	305	23	0	344	39	9	29	**4**	81	866
03:45 PM	15	**382**	**17**	3	**417**	25	5	25	0	55	**21**	**345**	**42**	0	**408**	29	**10**	23	1	63	**943**
04:00 PM	11	335	8	**4**	358	22	7	24	0	53	17	305	35	0	357	**40**	7	**34**	1	**82**	850
04:15 PM	**17**	362	14	0	393	**27**	**39**	29	0	**95**	16	280	31	0	327	37	3	31	3	74	889
Total Volume	57	1436	49	10	1552	91	59	109	1	260	70	1235	131	0	1436	145	29	117	9	300	3548
% App. Total	3.7	92.5	3.2	0.6		35	22.7	41.9	0.4		4.9	86	9.1	0		48.3	9.7	39	3		
PHF	.838	.940	.721	.625	.930	.843	.378	.879	.250	.684	.833	.895	.780	.000	.880	.906	.725	.860	.563	.915	.941



Austin, Tsutsumi, and Associates

501 Summer Street, Suite 521
Honolulu, HI 96817-5031

Honoapiilani & Kaanapali
AM peak
weather: overcast

File Name : Not Named 3
Site Code : 00000000
Start Date : 10/21/2009
Page No : 1

Groups Printed- Unshifted - Bank 1

	LGATE From North				KEAWE From East				LGATE From South				KEAWE From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
03:30 PM	30	1	1	0	1	50	3	0	3	5	18	0	18	44	32	0	206
03:45 PM	40	3	0	0	0	52	1	0	5	2	26	0	30	23	34	0	216
Total	70	4	1	0	1	102	4	0	8	7	44	0	48	67	66	0	422
04:00 PM	32	7	0	0	2	34	1	0	5	3	18	0	19	22	33	0	176
04:15 PM	29	4	1	0	1	18	3	0	1	1	25	0	21	20	37	0	161
Grand Total	131	15	2	0	4	154	8	0	14	11	87	0	88	109	136	0	759
Apprch %	88.5	10.1	1.4	0	2.4	92.8	4.8	0	12.5	9.8	77.7	0	26.4	32.7	40.8	0	
Total %	17.3	2	0.3	0	0.5	20.3	1.1	0	1.8	1.4	11.5	0	11.6	14.4	17.9	0	
Unshifted	131	15	2	0	4	154	8	0	14	11	87	0	88	109	136	0	759
% Unshifted	100	100	100	0	100	100	100	0	100	100	100	0	100	100	100	0	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Austin, Tsutsumi, and Associates

501Sumner Street, Suite 521
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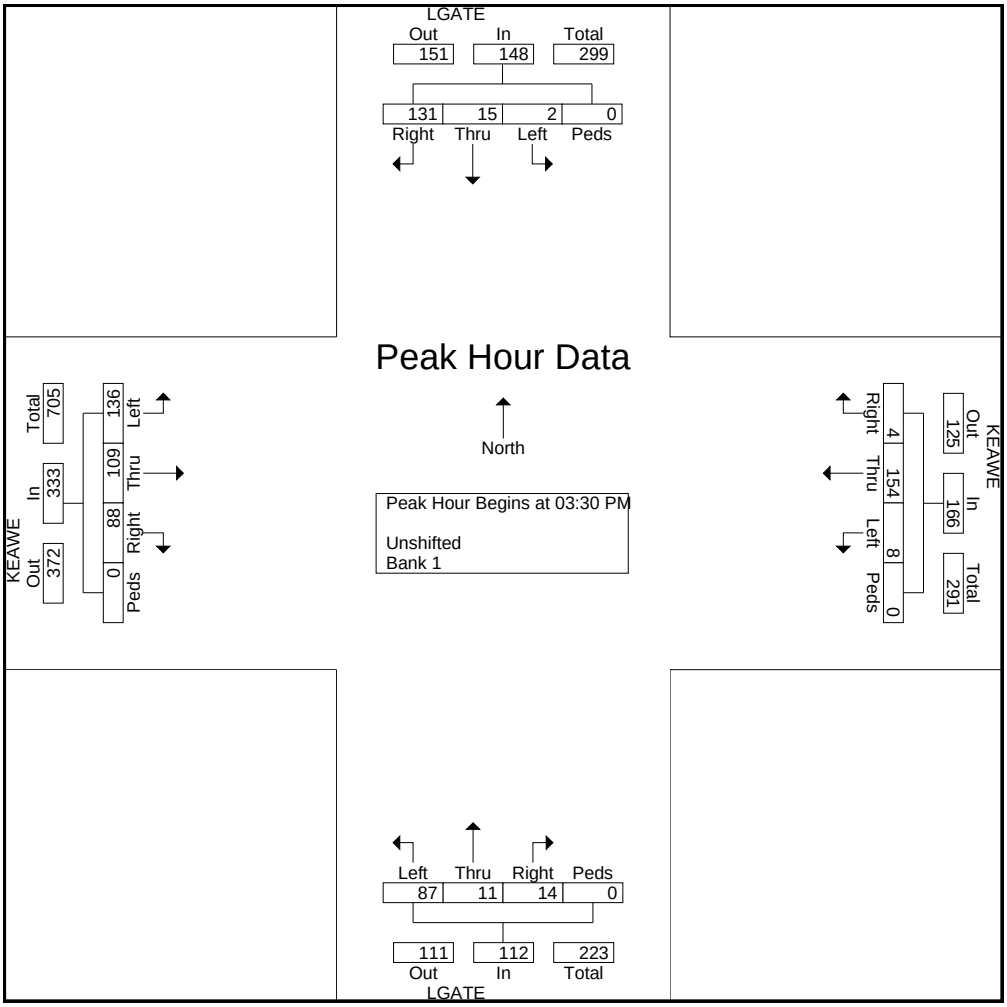
Honoapiilani & Kaanapali
AM peak
weather: overcast

File Name : Not Named 3
Site Code : 00000000
Start Date : 10/21/2009
Page No : 2

	LGATE From North					KEAWE From East					LGATE From South					KEAWE From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	30	1	1	0	32	1	50	3	0	54	3	5	18	0	26	18	44	32	0	94	206
03:45 PM	40	3	0	0	43	0	52	1	0	53	5	2	26	0	33	30	23	34	0	87	216
04:00 PM	32	7	0	0	39	2	34	1	0	37	5	3	18	0	26	19	22	33	0	74	176
04:15 PM	29	4	1	0	34	1	18	3	0	22	1	1	25	0	27	21	20	37	0	78	161
Total Volume	131	15	2	0	148	4	154	8	0	166	14	11	87	0	112	88	109	136	0	333	759
% App. Total	88.5	10.1	1.4	0		2.4	92.8	4.8	0		12.5	9.8	77.7	0		26.4	32.7	40.8	0		
PHF	.819	.536	.500	.000	.860	.500	.740	.667	.000	.769	.700	.550	.837	.000	.848	.733	.619	.919	.000	.886	.878



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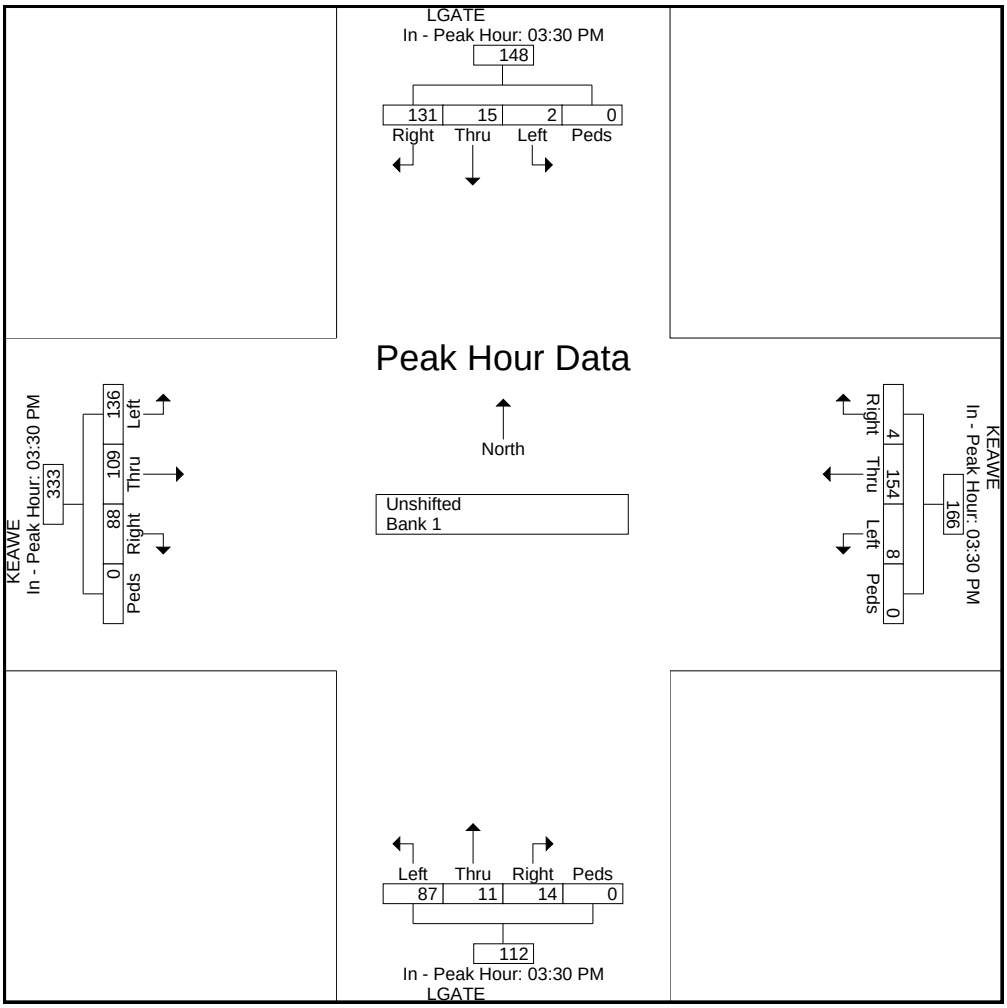
Honoapiilani & Kaanapali
AM peak
weather: overcast

File Name : Not Named 3
Site Code : 00000000
Start Date : 10/21/2009
Page No : 3

	LGATE From North					KEAWE From East					LGATE From South					KEAWE From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	03:30 PM					03:30 PM					03:30 PM					03:30 PM					
+0 mins.	30	1	1	0	32	1	50	3	0	54	3	5	18	0	26	18	44	32	0	94	
+15 mins.	40	3	0	0	43	0	52	1	0	53	5	2	26	0	33	30	23	34	0	87	
+30 mins.	32	7	0	0	39	2	34	1	0	37	5	3	18	0	26	19	22	33	0	74	
+45 mins.	29	4	1	0	34	1	18	3	0	22	1	1	25	0	27	21	20	37	0	78	
Total Volume	131	15	2	0	148	4	154	8	0	166	14	11	87	0	112	88	109	136	0	333	
% App. Total	88.5	10.1	1.4	0		2.4	92.8	4.8	0		12.5	9.8	77.7	0		26.4	32.7	40.8	0		
PHF	.819	.536	.500	.000	.860	.500	.740	.667	.000	.769	.700	.550	.837	.000	.848	.733	.619	.919	.000	.886	



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Honoapiilani & Kaanapali
AM peak
weather: overcast

File Name : Not Named 6
Site Code : 00000000
Start Date : 10/29/2009
Page No : 1

Groups Printed- Unshifted - Bank 1

	From North				From East				From South				From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
03:30 PM	16	0	2	0	2	44	0	0	0	1	3	0	0	39	11	0	118
03:45 PM	5	0	2	0	4	39	0	0	0	0	1	0	1	29	11	0	92
Total	21	0	4	0	6	83	0	0	0	1	4	0	1	68	22	0	210
04:00 PM	15	0	0	0	6	30	0	0	1	0	0	0	2	13	10	1	78
04:15 PM	10	0	0	0	1	19	0	0	0	0	1	0	1	13	7	0	52
Grand Total	46	0	4	0	13	132	0	0	1	1	5	0	4	94	39	1	340
Apprch %	92	0	8	0	9	91	0	0	14.3	14.3	71.4	0	2.9	68.1	28.3	0.7	
Total %	13.5	0	1.2	0	3.8	38.8	0	0	0.3	0.3	1.5	0	1.2	27.6	11.5	0.3	
Unshifted	46	0	4	0	13	132	0	0	1	1	5	0	4	94	39	1	340
% Unshifted	100	0	100	0	100	100	0	0	100	100	100	0	100	100	100	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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501Sumner Street, Suite 521
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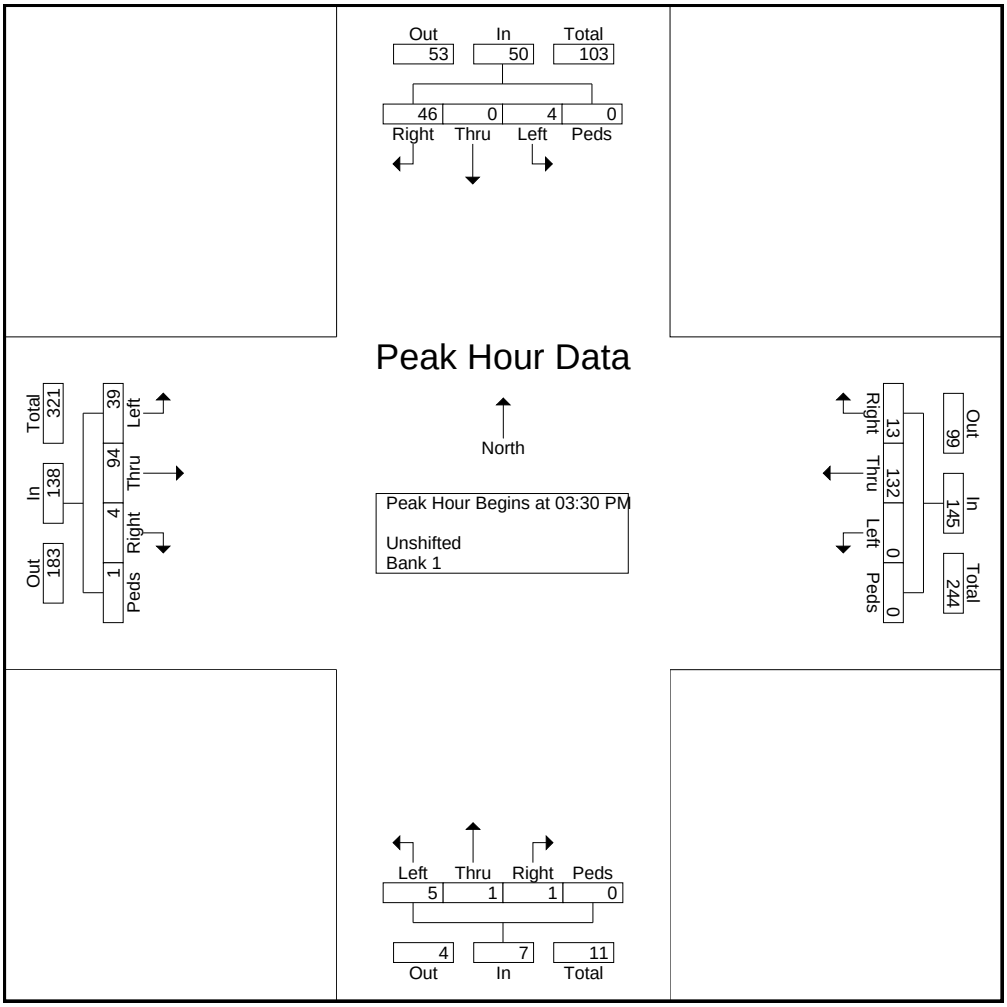
Honoapiilani & Kaanapali
AM peak
weather: overcast

File Name : Not Named 6
Site Code : 00000000
Start Date : 10/29/2009
Page No : 2

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	16	0	2	0	18	2	44	0	0	46	0	1	3	0	4	0	39	11	0	50	118
03:45 PM	5	0	2	0	7	4	39	0	0	43	0	0	1	0	1	1	29	11	0	41	92
04:00 PM	15	0	0	0	15	6	30	0	0	36	1	0	0	0	1	2	13	10	1	26	78
04:15 PM	10	0	0	0	10	1	19	0	0	20	0	0	1	0	1	1	13	7	0	21	52
Total Volume	46	0	4	0	50	13	132	0	0	145	1	1	5	0	7	4	94	39	1	138	340
% App. Total	92	0	8	0		9	91	0	0		14.3	14.3	71.4	0		2.9	68.1	28.3	0.7		
PHF	.719	.000	.500	.000	.694	.542	.750	.000	.000	.788	.250	.250	.417	.000	.438	.500	.603	.886	.250	.690	.720



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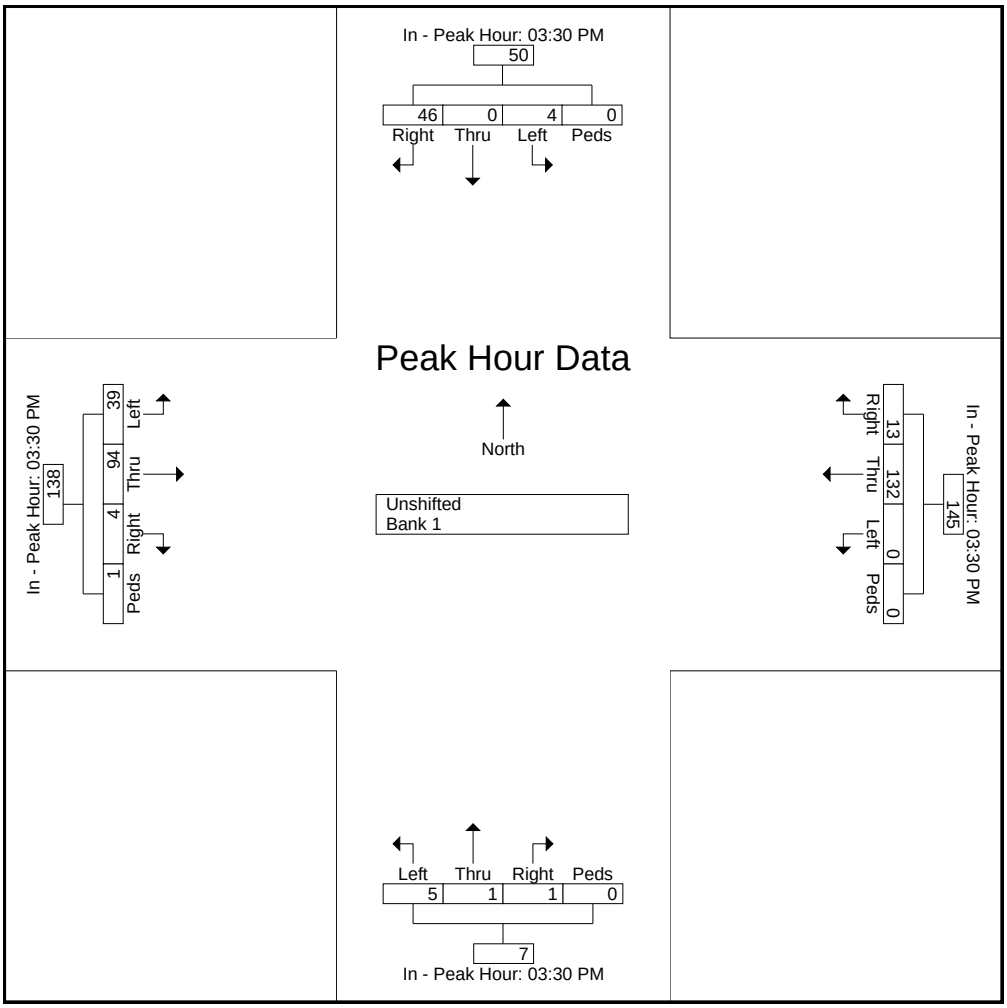
Honoapiilani & Kaanapali
AM peak
weather: overcast

File Name : Not Named 6
Site Code : 00000000
Start Date : 10/29/2009
Page No : 3

	From North					From East					From South					From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Each Approach Begins at:																					
	03:30 PM					03:30 PM					03:30 PM					03:30 PM					
+0 mins.	16	0	2	0	18	2	44	0	0	46	0	1	3	0	4	0	39	11	0	50	
+15 mins.	5	0	2	0	7	4	39	0	0	43	0	0	1	0	1	1	29	11	0	41	
+30 mins.	15	0	0	0	15	6	30	0	0	36	1	0	0	0	1	2	13	10	1	26	
+45 mins.	10	0	0	0	10	1	19	0	0	20	0	0	1	0	1	1	13	7	0	21	
Total Volume	46	0	4	0	50	13	132	0	0	145	1	1	5	0	7	4	94	39	1	138	
% App. Total	92	0	8	0		9	91	0	0		14.3	14.3	71.4	0		2.9	68.1	28.3	0.7		
PHF	.719	.000	.500	.000	.694	.542	.750	.000	.000	.788	.250	.250	.417	.000	.438	.500	.603	.886	.250	.690	



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Honoapiilani & Hinau
PM Peak Hour

File Name : Hinau PM
Site Code : 00000000
Start Date : 2/6/2008
Page No : 1

Groups Printed- Unshifted

	Honoapiilani From North					Hinau From East					Honoapiilani From South					Hinau From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
03:00 PM	0	315	23	0	338	23	0	32	0	55	21	321	0	0	342	0	0	0	0	0	735
03:15 PM	0	343	25	2	370	18	1	32	0	51	18	324	0	0	342	0	0	0	0	0	763
03:30 PM	0	331	29	0	360	25	0	37	2	64	31	352	0	0	383	0	0	0	0	0	807
03:45 PM	0	354	30	0	384	34	0	39	0	73	30	334	0	0	364	0	0	0	0	0	821
Total	0	1343	107	2	1452	100	1	140	2	243	100	1331	0	0	1431	0	0	0	0	0	3126
04:00 PM	0	300	17	1	318	27	0	21	1	49	18	323	0	0	341	0	0	0	0	0	708
04:15 PM	0	394	28	1	423	22	0	23	0	45	16	364	0	0	380	0	0	0	0	0	848
04:30 PM	0	340	22	1	363	23	0	37	1	61	16	331	0	0	347	0	0	0	0	0	771
04:45 PM	0	319	17	0	336	18	0	32	1	51	21	308	0	0	329	0	0	0	0	0	716
Total	0	1353	84	3	1440	90	0	113	3	206	71	1326	0	0	1397	0	0	0	0	0	3043
05:00 PM	0	297	14	0	311	28	0	33	0	61	18	330	0	0	348	0	0	0	0	0	720
05:15 PM	0	361	18	0	379	19	0	23	2	44	20	303	0	0	323	0	0	0	0	0	746
Grand Total	0	3354	223	5	3582	237	1	309	7	554	209	3290	0	0	3499	0	0	0	0	0	7635
Apprch %	0	93.6	6.2	0.1		42.8	0.2	55.8	1.3		6	94	0	0		0	0	0	0		
Total %	0	43.9	2.9	0.1	46.9	3.1	0	4	0.1	7.3	2.7	43.1	0	0	45.8	0	0	0	0	0	

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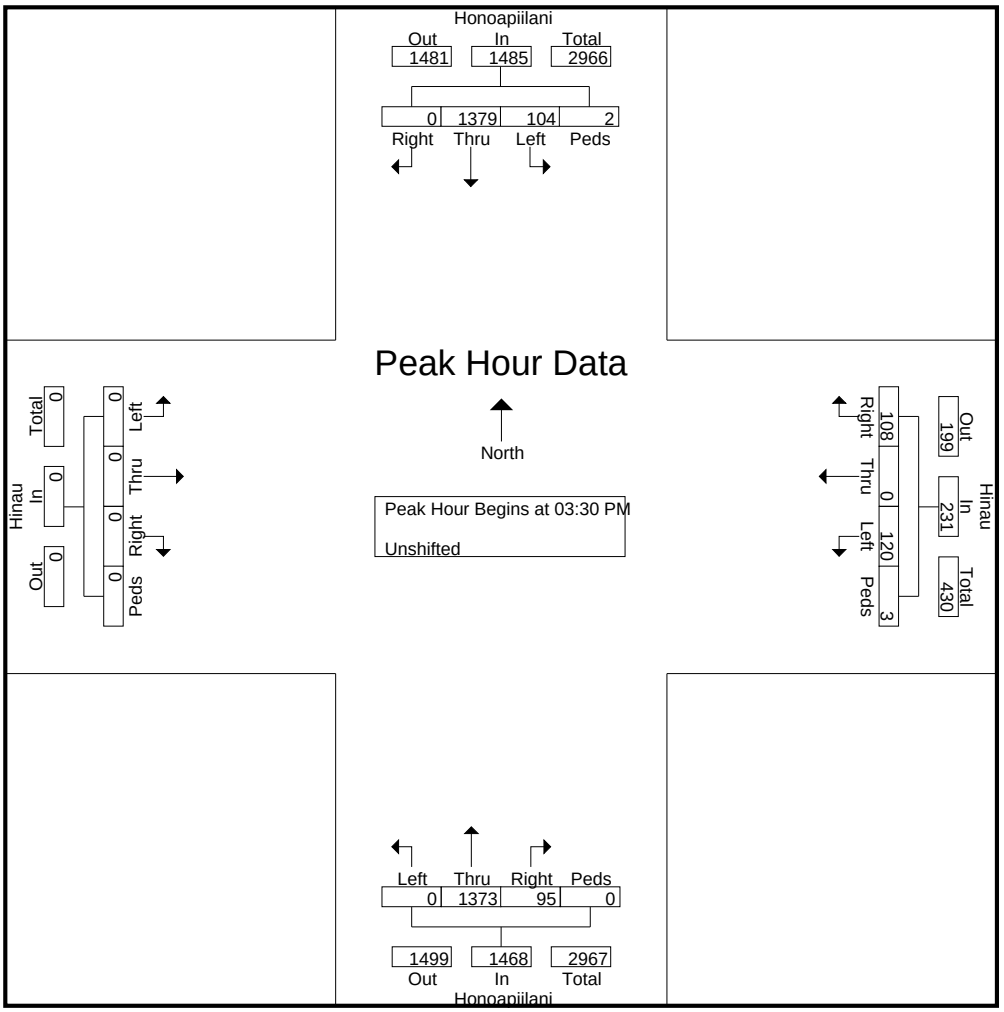
Honoapiilani & Hinau
PM Peak Hour

File Name : Hinau PM
Site Code : 00000000
Start Date : 2/6/2008
Page No : 2

	Honoapiilani From North					Hinau From East					Honoapiilani From South					Hinau From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	0	331	29	0	360	25	0	37	**2**	64	**31**	352	0	0	**383**	0	0	0	0	0	807
03:45 PM	0	354	**30**	0	384	**34**	0	**39**	0	**73**	30	334	0	0	364	0	0	0	0	0	821
04:00 PM	0	300	17	**1**	318	27	0	21	1	49	18	323	0	0	341	0	0	0	0	0	708
04:15 PM	0	**394**	28	1	**423**	22	0	23	0	45	16	**364**	0	0	380	0	0	0	0	0	**848**
Total Volume	0	1379	104	2	1485	108	0	120	3	231	95	1373	0	0	1468	0	0	0	0	0	3184
% App. Total	0	92.9	7	0.1		46.8	0	51.9	1.3		6.5	93.5	0	0		0	0	0	0		
PHF	.000	.875	.867	.500	.878	.794	.000	.769	.375	.791	.766	.943	.000	.000	.958	.000	.000	.000	.000	.000	.939



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Honopiilani & Papalaua
PM Peak

File Name : Papalaua pm (new)
Site Code : 00000000
Start Date : 2/6/2008
Page No : 1

Groups Printed- Unshifted

	HONO From North					PAQPALAUA From East					HONO From South					PAQPALAUA From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
03:30 PM	42	323	7	0	372	9	7	7	0	23	3	276	19	0	298	17	7	53	0	77	770
03:45 PM	49	311	5	0	365	11	4	8	0	23	7	263	18	0	288	22	9	75	0	106	782
Total	91	634	12	0	737	20	11	15	0	46	10	539	37	0	586	39	16	128	0	183	1552
04:00 PM	39	278	4	0	321	9	6	7	0	22	10	266	12	0	288	25	8	56	0	89	720
04:15 PM	41	323	8	0	372	7	7	7	0	21	8	273	21	0	302	25	3	77	0	105	800
Grand Total	171	1235	24	0	1430	36	24	29	0	89	28	1078	70	0	1176	89	27	261	0	377	3072
Apprch %	12	86.4	1.7	0		40.4	27	32.6	0		2.4	91.7	6	0		23.6	7.2	69.2	0		
Total %	5.6	40.2	0.8	0	46.5	1.2	0.8	0.9	0	2.9	0.9	35.1	2.3	0	38.3	2.9	0.9	8.5	0	12.3	

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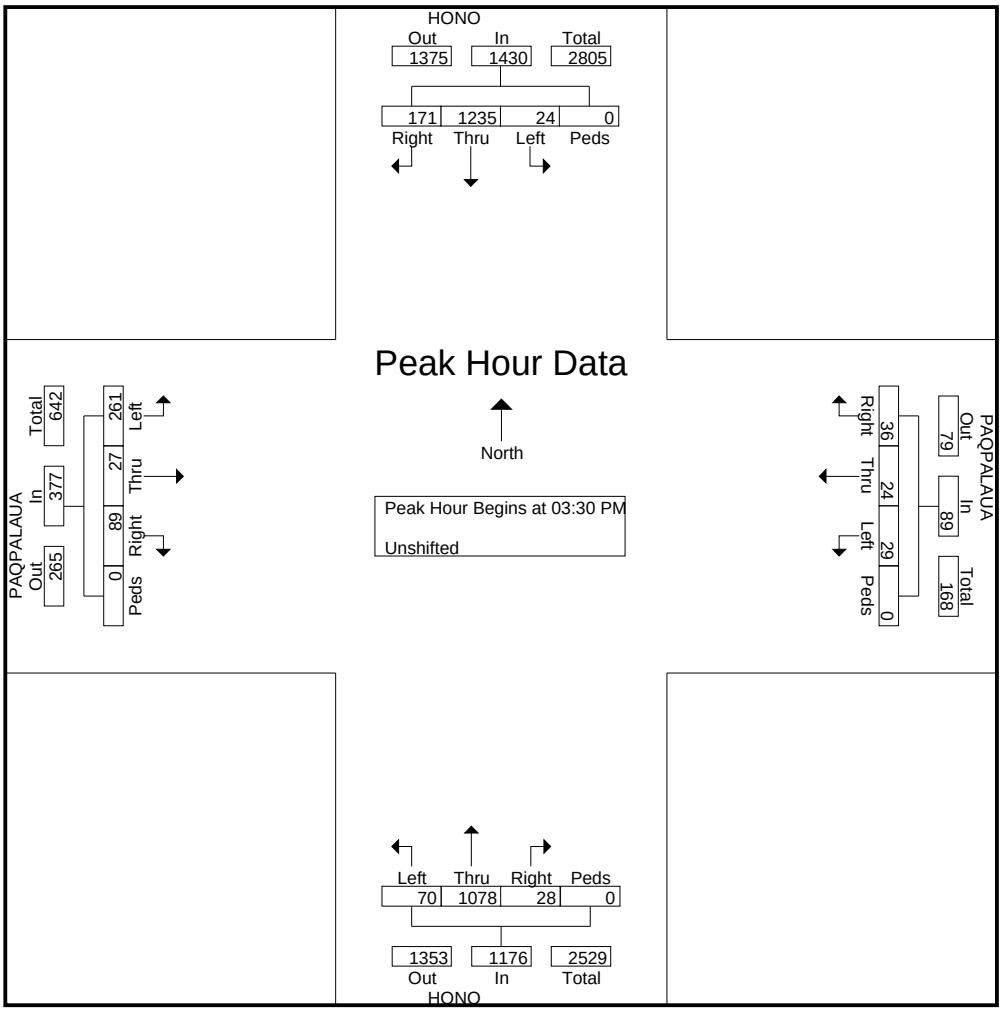
Honopiilani & Papalaua
PM Peak

File Name : Papalaua pm (new)
Site Code : 00000000
Start Date : 2/6/2008
Page No : 2

	HONO From North					PAQPALAUA From East					HONO From South					PAQPALAUA From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	42	**323**	7	0	**372**	9	**7**	7	0	**23**	3	**276**	19	0	298	17	7	53	0	77	770
03:45 PM	**49**	311	5	0	365	**11**	4	**8**	0	23	7	263	18	0	288	22	**9**	75	0	**106**	782
04:00 PM	39	278	4	0	321	9	6	7	0	22	**10**	266	12	0	288	**25**	8	56	0	89	720
04:15 PM	41	323	**8**	0	372	7	7	7	0	21	8	273	**21**	0	**302**	25	3	**77**	0	105	**800**
Total Volume	171	1235	24	0	1430	36	24	29	0	89	28	1078	70	0	1176	89	27	261	0	377	3072
% App. Total	12	86.4	1.7	0		40.4	27	32.6	0		2.4	91.7	6	0		23.6	7.2	69.2	0		
PHF	.872	.956	.750	.000	.961	.818	.857	.906	.000	.967	.700	.976	.833	.000	.974	.890	.750	.847	.000	.889	.960



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Lahainaluna & Kahua
PM Peak

File Name : Kahua - Lahainaluna PM
Site Code : 00000000
Start Date : 2/7/2008
Page No : 1

Groups Printed- Unshifted

	KAHUA From North					LAHAINALUNA From East					KAHUA From South					LAHAINALUNA From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
03:00 PM	10	0	3	0	13	1	132	0	0	133	0	0	0	0	0	0	90	8	0	98	244
03:15 PM	7	0	3	0	10	2	100	0	0	102	0	0	0	0	0	0	115	9	0	124	236
03:30 PM	9	0	1	1	11	3	107	0	0	110	0	0	0	0	0	0	137	13	0	150	271
03:45 PM	7	0	5	0	12	1	117	0	0	118	0	0	0	0	0	0	132	10	0	142	272
Total	33	0	12	1	46	7	456	0	0	463	0	0	0	0	0	0	474	40	0	514	1023
04:00 PM	9	0	3	5	17	0	115	0	0	115	0	0	0	0	0	0	125	17	1	143	275
04:15 PM	9	0	4	0	13	3	103	0	0	106	0	0	0	1	1	0	151	24	0	175	295
04:30 PM	6	1	2	1	10	2	105	0	0	107	0	0	0	0	0	0	144	26	0	170	287
04:45 PM	10	0	4	1	15	2	110	0	0	112	0	0	0	0	0	0	129	22	0	151	278
Total	34	1	13	7	55	7	433	0	0	440	0	0	0	1	1	0	549	89	1	639	1135
05:00 PM	7	0	2	0	9	6	91	0	0	97	0	0	0	0	0	0	118	18	0	136	242
05:15 PM	11	0	2	2	15	1	93	0	0	94	0	0	0	0	0	0	114	11	1	126	235
Grand Total	85	1	29	10	125	21	1073	0	0	1094	0	0	0	1	1	0	1255	158	2	1415	2635
Apprch %	68	0.8	23.2	8		1.9	98.1	0	0		0	0	0	100		0	88.7	11.2	0.1		
Total %	3.2	0	1.1	0.4	4.7	0.8	40.7	0	0	41.5	0	0	0	0	0	0	47.6	6	0.1	53.7	

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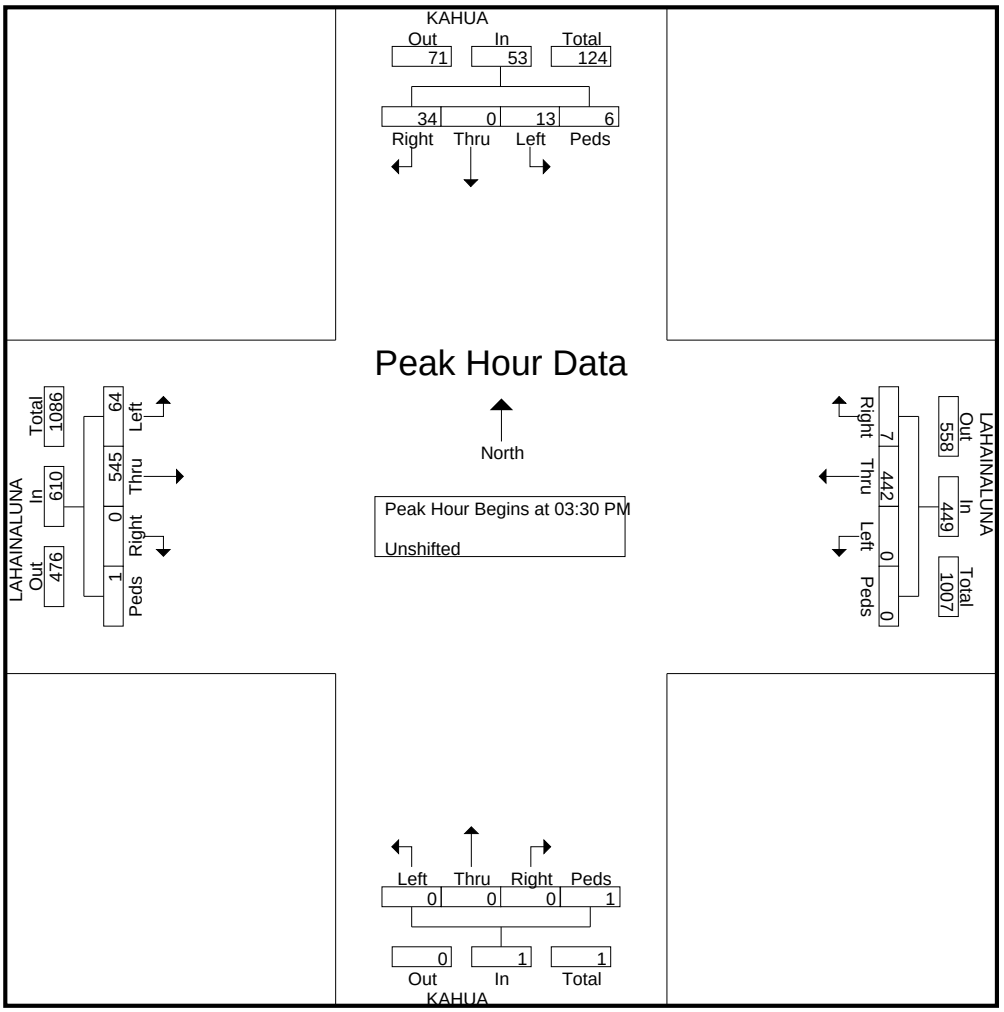
Lahainaluna & Kahua
PM Peak

File Name : Kahua - Lahainaluna PM
Site Code : 00000000
Start Date : 2/7/2008
Page No : 2

	KAHUA From North					LAHAINALUNA From East					KAHUA From South					LAHAINALUNA From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	**9**	0	1	1	11	**3**	107	0	0	110	0	0	0	0	0	0	137	13	0	150	271
03:45 PM	7	0	**5**	0	12	1	**117**	0	0	**118**	0	0	0	0	0	0	132	10	0	142	272
04:00 PM	9	0	3	**5**	**17**	0	115	0	0	115	0	0	0	0	0	0	125	17	**1**	143	275
04:15 PM	9	0	4	0	13	3	103	0	0	106	0	0	0	**1**	**1**	0	**151**	**24**	0	**175**	**295**
Total Volume	34	0	13	6	53	7	442	0	0	449	0	0	0	1	1	0	545	64	1	610	1113
% App. Total	64.2	0	24.5	11.3		1.6	98.4	0	0		0	0	0	100		0	89.3	10.5	0.2		
PHF	.944	.000	.650	.300	.779	.583	.944	.000	.000	.951	.000	.000	.000	.250	.250	.000	.902	.667	.250	.871	.943



Austin, Tsutsumi & Associates

501 Sumner Street Suite 521
Honolulu, HI, Zip 96817
(808) 533-3646

File Name : Lahainaluna - Mill
Site Code : 00000000
Start Date : 2/7/2008
Page No : 1

Groups Printed- Class 1

	Mill From North					Lahaina From East					Mill From South					Lahaina From West					
Start Time	Rght	Thru	Left	Other	App. Total	Rght	Thru	Left	Other	App. Total	Rght	Thru	Left	Other	App. Total	Rght	Thru	Left	Other	App. Total	Int. Total
03:00 PM	3	1	0	0	4	1	130	10	0	141	8	0	3	1	12	9	84	3	1	97	254
03:15 PM	2	1	0	0	3	0	104	4	0	108	14	0	2	0	16	4	106	3	3	116	243
03:30 PM	2	0	1	0	3	0	119	12	0	131	19	0	2	0	21	1	146	0	3	150	305
03:45 PM	2	0	1	0	3	0	134	8	2	144	16	0	6	0	22	5	134	2	7	148	317
Total	9	2	2	0	13	1	487	34	2	524	57	0	13	1	71	19	470	8	14	511	1119
04:00 PM	1	0	0	0	1	0	116	8	0	124	17	0	4	0	21	3	119	5	9	136	282
04:15 PM	1	1	0	0	2	0	114	9	0	123	18	0	6	0	24	7	164	1	10	182	331
04:30 PM	4	0	0	0	4	0	101	8	0	109	27	0	0	0	27	4	145	0	4	153	293
04:45 PM	4	1	1	0	6	1	121	9	0	131	22	1	4	0	27	3	129	1	9	142	306
Total	10	2	1	0	13	1	452	34	0	487	84	1	14	0	99	17	557	7	32	613	1212
05:00 PM	2	2	0	0	4	0	86	8	0	94	21	0	8	0	29	6	115	0	4	125	252
05:15 PM	1	0	0	0	1	0	41	1	0	42	7	0	2	0	9	3	54	0	1	58	110
Grand Total	22	6	3	0	31	2	1066	77	2	1147	169	1	37	1	208	45	1196	15	51	1307	2693
Apprch %	71	19.4	9.7	0		0.2	92.9	6.7	0.2		81.2	0.5	17.8	0.5		3.4	91.5	1.1	3.9		
Total %	0.8	0.2	0.1	0	1.2	0.1	39.6	2.9	0.1	42.6	6.3	0	1.4	0	7.7	1.7	44.4	0.6	1.9	48.5	

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501 Sumner Street Suite 521
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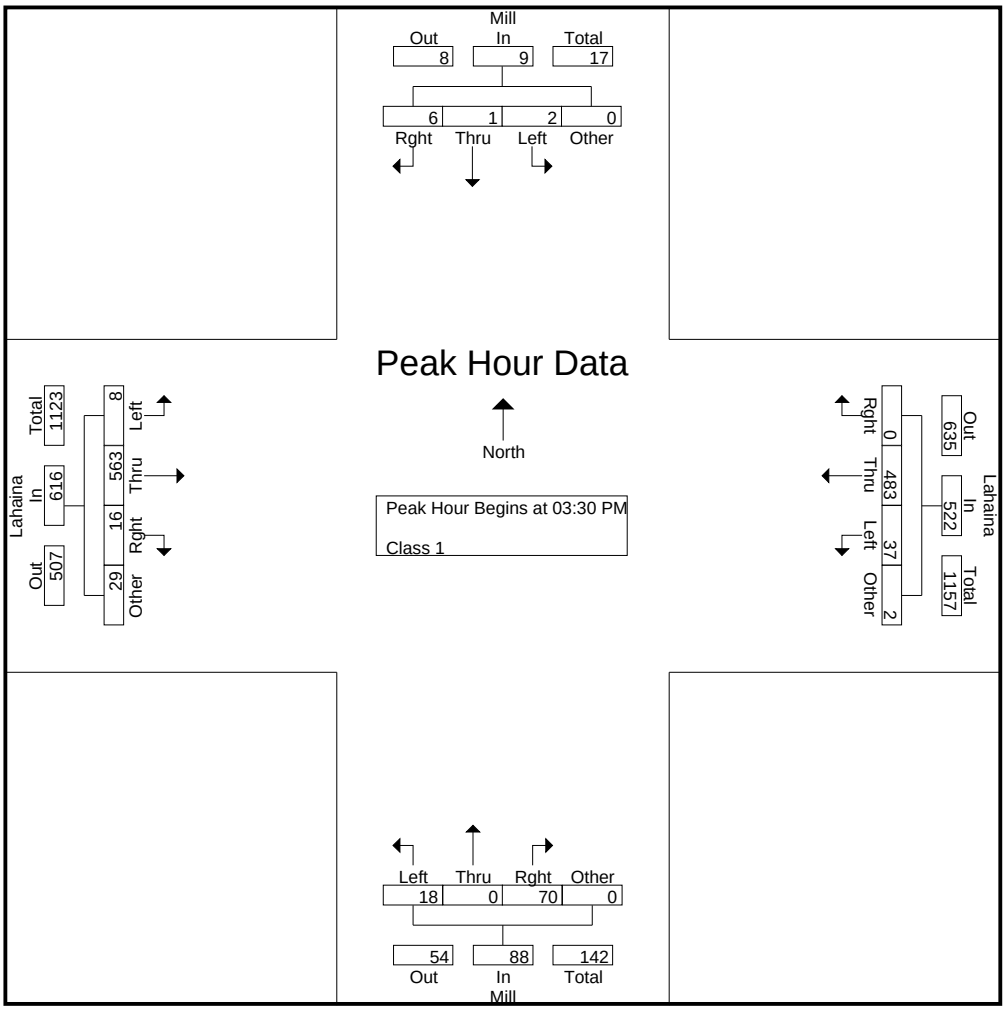
File Name : Lahainaluna - Mill
Site Code : 00000000
Start Date : 2/7/2008
Page No : 2

	Mill From North					Lahaina From East					Mill From South					Lahaina From West					
Start Time	Rght	Thru	Left	Other	App. Total	Rght	Thru	Left	Other	App. Total	Rght	Thru	Left	Other	App. Total	Rght	Thru	Left	Other	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	**2**	0	**1**	0	**3**	0	119	**12**	0	131	**19**	0	2	0	21	1	146	0	3	150	305
03:45 PM	2	0	1	0	3	0	**134**	8	**2**	**144**	16	0	**6**	0	22	5	134	2	7	148	317
04:00 PM	1	0	0	0	1	0	116	8	0	124	17	0	4	0	21	3	119	**5**	9	136	282
04:15 PM	1	**1**	0	0	2	0	114	9	0	123	18	0	6	0	**24**	**7**	**164**	1	**10**	**182**	**331**
Total Volume	6	1	2	0	9	0	483	37	2	522	70	0	18	0	88	16	563	8	29	616	1235
% App. Total	66.7	11.1	22.2	0		0	92.5	7.1	0.4		79.5	0	20.5	0		2.6	91.4	1.3	4.7		
PHF	.750	.250	.500	.000	.750	.000	.901	.771	.250	.906	.921	.000	.750	.000	.917	.571	.858	.400	.725	.846	.933



Austin Tsutsumi & Asscociates

501 Sumner St. Ste. 521
Honolulu, HI 96817
(808) 533-3646

File Name : Lahainaluna (forced peak)
Site Code : 00000000
Start Date : 2/7/2008
Page No : 1

Groups Printed- Unshifted

	Honoapiilani From North					Lahainaluna From East					Honoapiilani From South					Lahainaluna From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
03:30 PM	13	266	81	0	360	62	41	27	2	132	19	198	9	5	231	16	47	23	0	86	809
03:45 PM	29	271	71	0	371	74	41	35	0	150	15	207	10	8	240	11	51	25	0	87	848
Total	42	537	152	0	731	136	82	62	2	282	34	405	19	13	471	27	98	48	0	173	1657
04:00 PM	23	266	77	0	366	61	26	28	0	115	12	219	14	12	257	15	45	36	0	96	834
04:15 PM	20	246	92	1	359	60	28	19	0	107	9	195	15	13	232	9	62	20	0	91	789
Grand Total	85	1049	321	1	1456	257	136	109	2	504	55	819	48	38	960	51	205	104	0	360	3280
Apprch %	5.8	72	22	0.1		51	27	21.6	0.4		5.7	85.3	5	4		14.2	56.9	28.9	0		
Total %	2.6	32	9.8	0	44.4	7.8	4.1	3.3	0.1	15.4	1.7	25	1.5	1.2	29.3	1.6	6.2	3.2	0	11	

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501 Sumner St. Ste. 521
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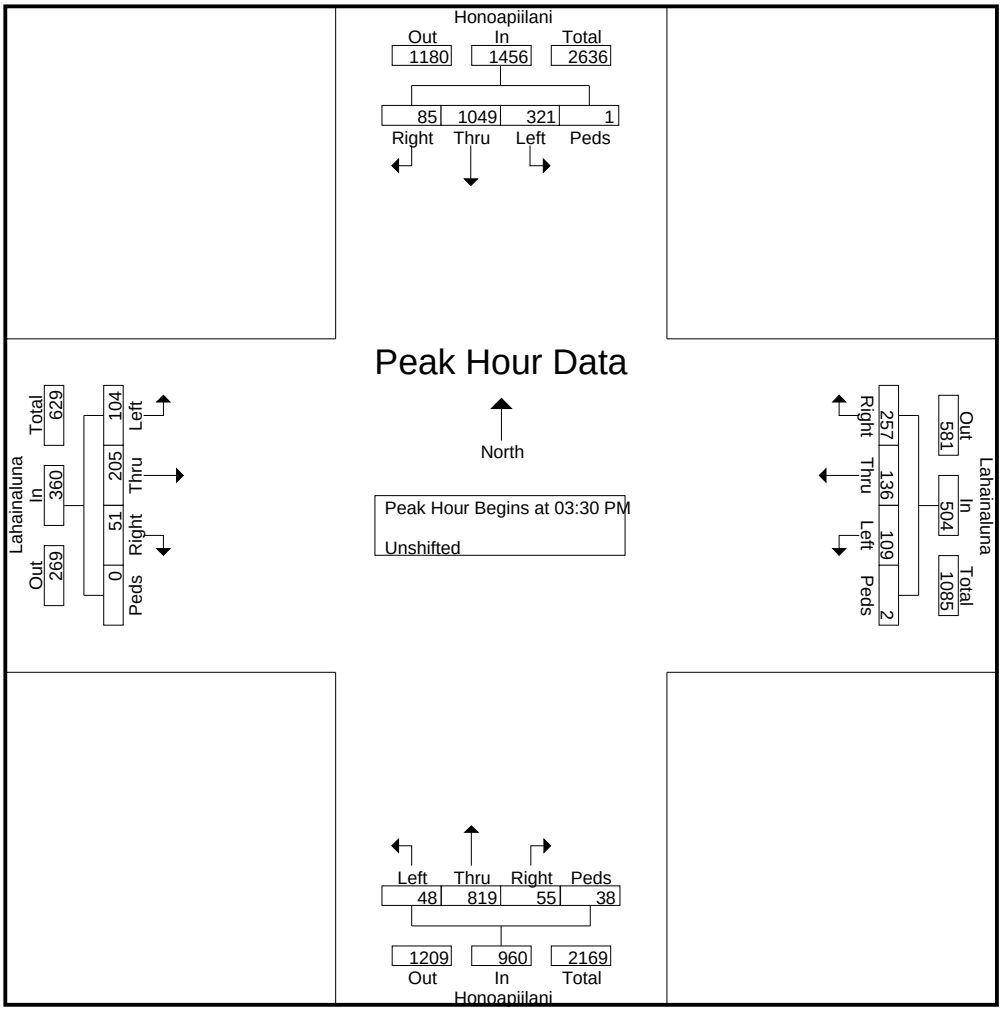
File Name : Lahainaluna (forced peak)
Site Code : 00000000
Start Date : 2/7/2008
Page No : 2

	Honoapiilani From North					Lahainaluna From East					Honoapiilani From South					Lahainaluna From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	13	266	81	0	360	62	**41**	27	**2**	132	**19**	198	9	5	231	**16**	47	23	0	86	809
03:45 PM	**29**	**271**	71	0	**371**	**74**	41	**35**	0	**150**	15	207	10	8	240	11	51	25	0	87	**848**
04:00 PM	23	266	77	0	366	61	26	28	0	115	12	**219**	14	12	**257**	15	45	**36**	0	**96**	834
04:15 PM	20	246	**92**	**1**	359	60	28	19	0	107	9	195	**15**	**13**	232	9	**62**	20	0	91	789
Total Volume	85	1049	321	1	1456	257	136	109	2	504	55	819	48	38	960	51	205	104	0	360	3280
% App. Total	5.8	72	22	0.1		51	27	21.6	0.4		5.7	85.3	5	4		14.2	56.9	28.9	0		
PHF	.733	.968	.872	.250	.981	.868	.829	.779	.250	.840	.724	.935	.800	.731	.934	.797	.827	.722	.000	.938	.967



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501 Sumner St. Ste. 521
Honolulu, HI 96817
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File Name : 245 - 445 (4 april)
Site Code : 00000000
Start Date : 2/7/2008
Page No : 1

Groups Printed- Unshifted - Bank 1

	Honoapiilani From North					Dickenson From East					Honoapiilani From South					Dickenson From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
02:45 PM	35	249	2	3	289	2	2	23	0	27	5	210	8	0	223	4	12	19	0	35	574
Total	35	249	2	3	289	2	2	23	0	27	5	210	8	0	223	4	12	19	0	35	574
03:00 PM	24	250	3	4	281	8	5	7	0	20	18	179	12	0	209	10	6	18	4	38	548
03:15 PM	31	294	8	1	334	5	1	12	0	18	9	215	6	0	230	7	6	16	0	29	611
03:30 PM	37	262	8	0	307	4	3	12	0	19	19	201	10	0	230	13	6	20	0	39	595
03:45 PM	63	261	5	0	329	5	7	11	0	23	21	211	5	0	237	6	7	19	1	33	622
Total	155	1067	24	5	1251	22	16	42	0	80	67	806	33	0	906	36	25	73	5	139	2376
04:00 PM	32	279	2	2	315	3	3	9	0	15	14	215	4	0	233	9	8	19	0	36	599
04:15 PM	35	227	7	0	269	8	2	10	0	20	16	193	2	0	211	12	15	22	0	49	549
04:30 PM	44	245	6	1	296	5	2	15	0	22	10	199	6	2	217	6	18	22	0	46	581
Grand Total	301	2067	41	11	2420	40	25	99	0	164	112	1623	53	2	1790	67	78	155	5	305	4679
Apprch %	12.4	85.4	1.7	0.5		24.4	15.2	60.4	0		6.3	90.7	3	0.1		22	25.6	50.8	1.6		
Total %	6.4	44.2	0.9	0.2	51.7	0.9	0.5	2.1	0	3.5	2.4	34.7	1.1	0	38.3	1.4	1.7	3.3	0.1	6.5	
Unshifted	301	2067	41	11	2420	40	25	99	0	164	112	1623	53	2	1790	67	78	155	5	305	4679
% Unshifted	100	100	100	100	100	100	100	100	0	100	100	100	100	100	100	100	100	100	100	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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501 Sumner St. Ste. 521
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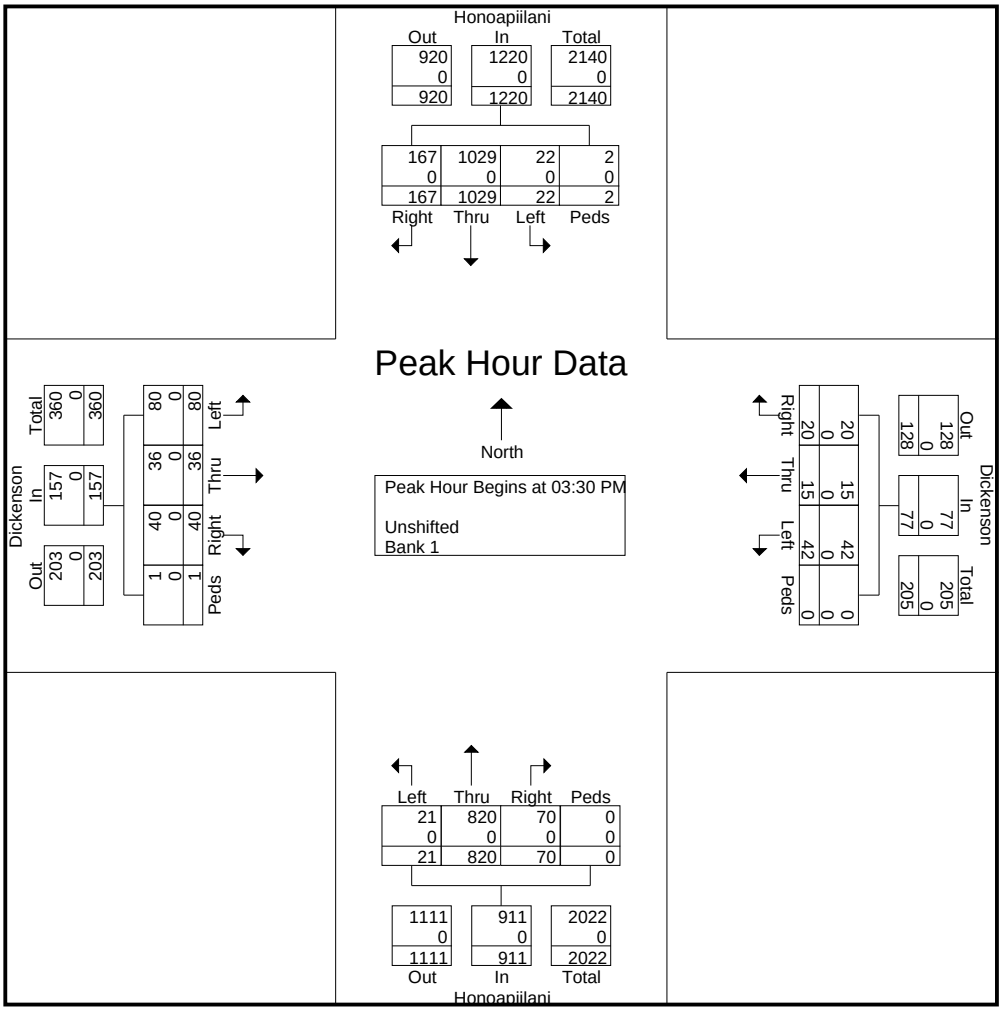
File Name : 245 - 445 (4 april)
Site Code : 00000000
Start Date : 2/7/2008
Page No : 2

	Honoapiilani From North					Dickenson From East					Honoapiilani From South					Dickenson From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	37	262	**8**	0	307	4	3	**12**	0	19	19	201	**10**	0	230	**13**	6	20	0	39	595
03:45 PM	**63**	261	5	0	**329**	5	**7**	11	0	**23**	**21**	211	5	0	**237**	6	7	19	**1**	33	**622**
04:00 PM	32	**279**	2	**2**	315	3	3	9	0	15	14	**215**	4	0	233	9	8	19	0	36	599
04:15 PM	35	227	7	0	269	**8**	2	10	0	20	16	193	2	0	211	12	**15**	**22**	0	**49**	549
Total Volume	167	1029	22	2	1220	20	15	42	0	77	70	820	21	0	911	40	36	80	1	157	2365
% App. Total	13.7	84.3	1.8	0.2		26	19.5	54.5	0		7.7	90	2.3	0		25.5	22.9	51	0.6		
PHF	.663	.922	.688	.250	.927	.625	.536	.875	.000	.837	.833	.953	.525	.000	.961	.769	.600	.909	.250	.801	.951
Unshifted	167	1029																			
% Unshifted	100	100	100	100	100	100	100	100	0	100	100	100	100	0	100	100	100	100	100	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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501 Sumner St. Ste. 521
Honolulu, HI 96817
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File Name : Shaw PM (2)
Site Code : 00000000
Start Date : 2/7/2008
Page No : 1

Groups Printed- Unshifted - Bank 1

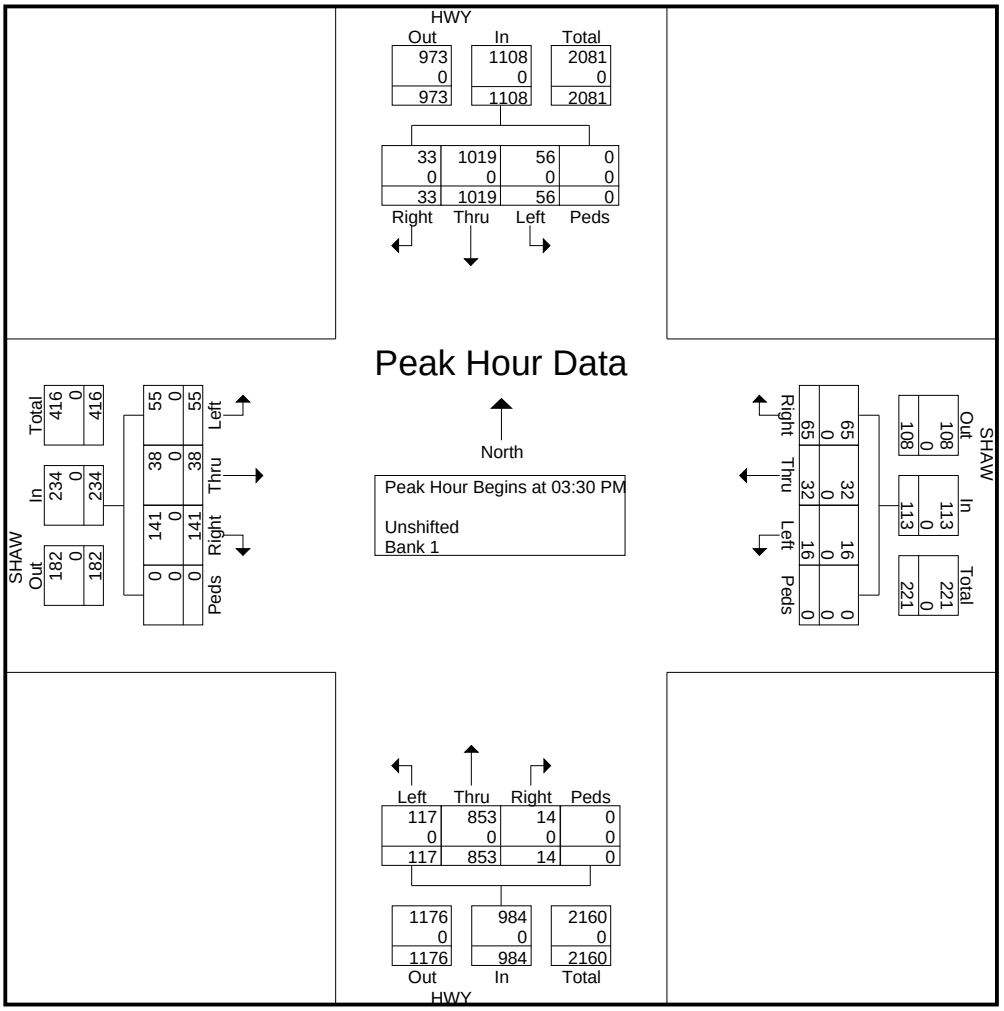
	HWY From North					SHAW From East					HWY From South					SHAW From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
03:00 PM	17	231	11	0	259	12	2	3	0	17	2	213	24	0	239	28	4	12	0	44	559
03:15 PM	8	262	17	0	287	9	2	1	0	12	3	227	26	0	256	29	2	5	0	36	591
03:30 PM	5	256	17	0	278	22	7	1	0	30	4	209	36	0	249	31	5	11	0	47	604
03:45 PM	7	252	14	0	273	16	12	4	0	32	3	228	30	0	261	36	16	15	0	67	633
Total	37	1001	59	0	1097	59	23	9	0	91	12	877	116	0	1005	124	27	43	0	194	2387
04:00 PM	8	258	14	0	280	17	8	7	0	32	4	214	25	0	243	36	10	18	0	64	619
04:15 PM	13	253	11	0	277	10	5	4	0	19	3	202	26	0	231	38	7	11	0	56	583
04:30 PM	9	211	14	0	234	9	5	2	0	16	5	208	31	0	244	36	9	12	0	57	551
04:45 PM	16	242	14	0	272	13	3	4	0	20	3	226	20	0	249	32	8	8	0	48	589
Total	46	964	53	0	1063	49	21	17	0	87	15	850	102	0	967	142	34	49	0	225	2342
Grand Total	83	1965	112	0	2160	108	44	26	0	178	27	1727	218	0	1972	266	61	92	0	419	4729
Apprch %	3.8	91	5.2	0		60.7	24.7	14.6	0		1.4	87.6	11.1	0		63.5	14.6	22	0		
Total %	1.8	41.6	2.4	0	45.7	2.3	0.9	0.5	0	3.8	0.6	36.5	4.6	0	41.7	5.6	1.3	1.9	0	8.9	
Unshifted	83	1965	112	0	2160	108	44	26	0	178	27	1727	218	0	1972	266	61	92	0	419	4729
% Unshifted	100	100	100	0	100	100	100	100	0	100	100	100	100	0	100	100	100	100	0	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Austin Tsutsumi & Asscociates

501 Sumner St. Ste. 521
Honolulu, HI 96817
(808) 533-3646

File Name : Shaw PM (2)
Site Code : 00000000
Start Date : 2/7/2008
Page No : 2

	HWY From North					SHAW From East					HWY From South					SHAW From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	5	256	**17**	0	278	**22**	7	1	0	30	**4**	209	**36**	0	249	31	5	11	0	47	604
03:45 PM	7	252	14	0	273	16	**12**	4	0	**32**	3	**228**	30	0	**261**	36	**16**	15	0	**67**	**633**
04:00 PM	8	**258**	14	0	**280**	17	8	**7**	0	32	4	214	25	0	243	36	10	**18**	0	64	619
04:15 PM	**13**	253	11	0	277	10	5	4	0	19	3	202	26	0	231	**38**	7	11	0	56	583
Total Volume	33	1019	56	0	1108	65	32	16	0	113	14	853	117	0	984	141	38	55	0	234	2439
% App. Total	3	92	5.1	0		57.5	28.3	14.2	0		1.4	86.7	11.9	0		60.3	16.2	23.5	0		
PHF	.635	.987	.824	.000	.989	.739	.667	.571	.000	.883	.875	.935	.813	.000	.943	.928	.594	.764	.000	.873	.963
Unshifted	33	1019																			
% Unshifted	100	100	100	0	100	100	100	100	0	100	100	100	100	0	100	100	100	100	0	100	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0



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501 Sumner St. Ste. 521
Honolulu, HI 96817
(808) 555-5646

Default Comments
Change These in The Preferences Window
Select File/Preference in the Main Scree
Then Click the Comments Tab

File Name : aholo pm (new, missing some movements)
Site Code : 00000000
Start Date : 4/7/2008
Page No : 1

Groups Printed- Class 1

	Hono From North				Aholo From East				Hono From South				Aholo From West				
Start Time	Rght	Thru	Left	Other	Rght	Thru	Left	Other	Rght	Thru	Left	Other	Rght	Thru	Left	Other	Int. Total
*** BREAK ***																	
03:30 PM	2	293	7	0	6	0	0	0	0	248	2	0	1	0	1	0	560
03:45 PM	0	287	10	0	10	0	0	0	0	246	4	0	6	0	0	0	563
Total	2	580	17	0	16	0	0	0	0	494	6	0	7	0	1	0	1123
04:00 PM	1	289	8	0	10	0	0	0	0	250	2	0	7	0	0	0	567
04:15 PM	3	280	3	0	4	0	2	0	0	237	13	0	3	0	0	0	545
*** BREAK ***																	
Total	4	569	11	0	14	0	2	0	0	487	15	0	10	0	0	0	1112
*** BREAK ***																	
Grand Total	6	1149	28	0	30	0	2	0	0	981	21	0	17	0	1	0	2235
Apprch %	0.5	97.1	2.4	0	93.8	0	6.2	0	0	97.9	2.1	0	94.4	0	5.6	0	
Total %	0.3	51.4	1.3	0	1.3	0	0.1	0	0	43.9	0.9	0	0.8	0	0	0	

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501 Sumner St. Ste. 521
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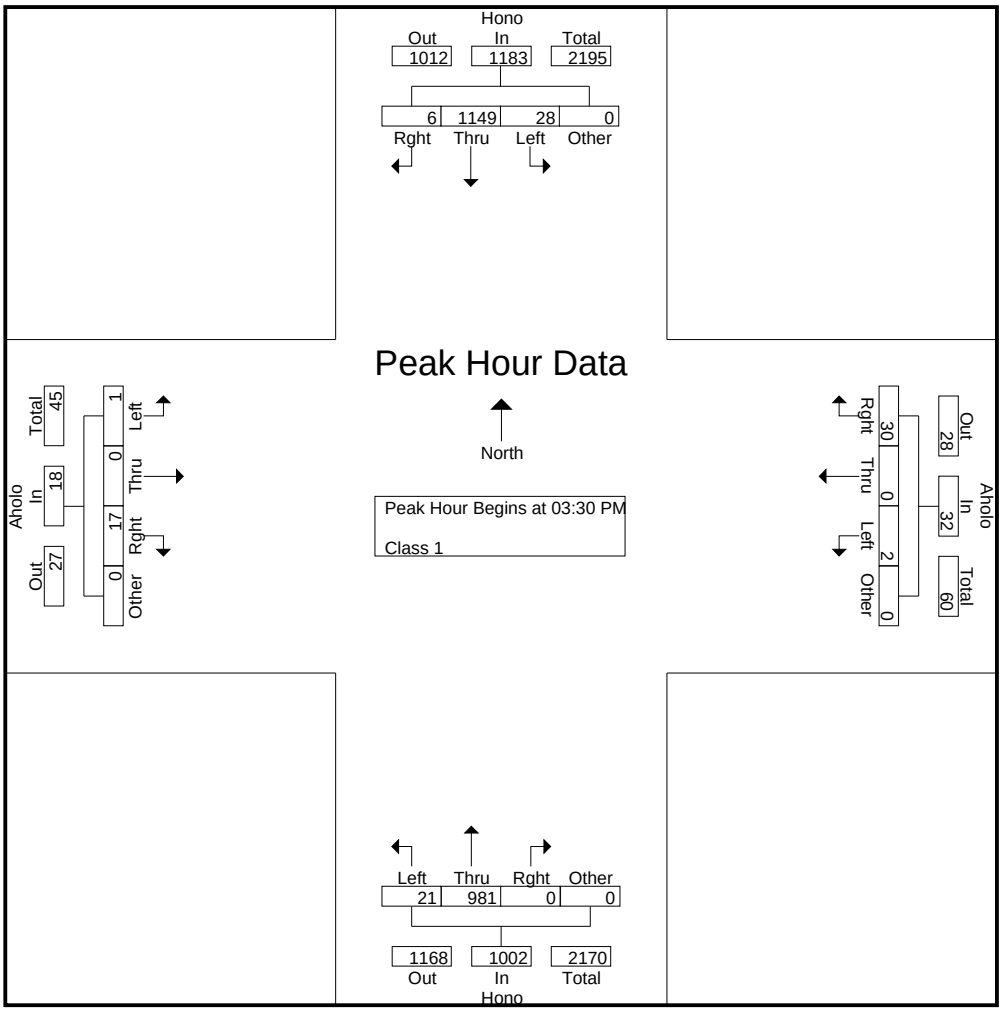
(808) 555-5646

Default Comments
Change These in The Preferences Window
Select File/Preference in the Main Scree
Then Click the Comments Tab

File Name : aholo pm (new, missing some movements)
Site Code : 00000000
Start Date : 4/7/2008
Page No : 2

	Hono From North					Aholo From East					Hono From South					Aholo From West					
Start Time	Rght	Thru	Left	Other	App. Total	Rght	Thru	Left	Other	App. Total	Rght	Thru	Left	Other	App. Total	Rght	Thru	Left	Other	App. Total	Int. Total
Peak Hour Analysis From 03:30 PM to 04:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	2	**293**	7	0	**302**	6	0	0	0	6	0	248	2	0	250	1	0	**1**	0	2	560
03:45 PM	0	287	**10**	0	297	**10**	0	0	0	**10**	0	246	4	0	250	6	0	0	0	6	563
04:00 PM	1	289	8	0	298	10	0	0	0	10	0	**250**	2	0	**252**	**7**	0	0	0	**7**	**567**
04:15 PM	**3**	280	3	0	286	4	0	**2**	0	6	0	237	**13**	0	250	3	0	0	0	3	545
Total Volume	6	1149	28	0	1183	30	0	2	0	32	0	981	21	0	1002	17	0	1	0	18	2235
% App. Total	0.5	97.1	2.4	0		93.8	0	6.2	0		0	97.9	2.1	0		94.4	0	5.6	0		
PHF	.500	.980	.700	.000	.979	.750	.000	.250	.000	.800	.000	.981	.404	.000	.994	.607	.000	.250	.000	.643	.985



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File Name : Honoapiilani - Front PM
Site Code : 00000000
Start Date : 1/26/2010
Page No : 1

Groups Printed- Unshifted

	Honoapiilani From North				From East				Honoapiilani From South				Front From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
15:00	6	237	0	0	0	0	0	0	0	242	9	0	11	0	3	0	508
15:15	7	230	0	0	0	0	0	0	0	220	16	0	20	0	2	1	496
15:30	5	271	0	0	0	0	0	0	0	218	18	0	14	0	0	0	526
15:45	7	220	0	0	0	0	0	0	0	237	12	0	9	0	1	0	486
Total	25	958	0	0	0	0	0	0	0	917	55	0	54	0	6	1	2016
16:00	2	228	0	0	0	0	0	0	0	261	16	0	27	0	1	0	535
16:15	4	234	0	0	0	0	0	0	0	234	23	0	21	0	1	0	517
16:30	2	261	0	0	0	0	0	0	0	238	18	0	17	0	3	0	539
16:45	5	218	0	0	0	0	0	0	0	223	27	0	12	0	2	0	487
Total	13	941	0	0	0	0	0	0	0	956	84	0	77	0	7	0	2078
Grand Total	38	1899	0	0	0	0	0	0	0	1873	139	0	131	0	13	1	4094
Apprch %	2	98	0	0	0	0	0	0	0	93.1	6.9	0	90.3	0	9	0.7	
Total %	0.9	46.4	0	0	0	0	0	0	0	45.7	3.4	0	3.2	0	0.3	0	

Austin, Tsutsumi and Associates

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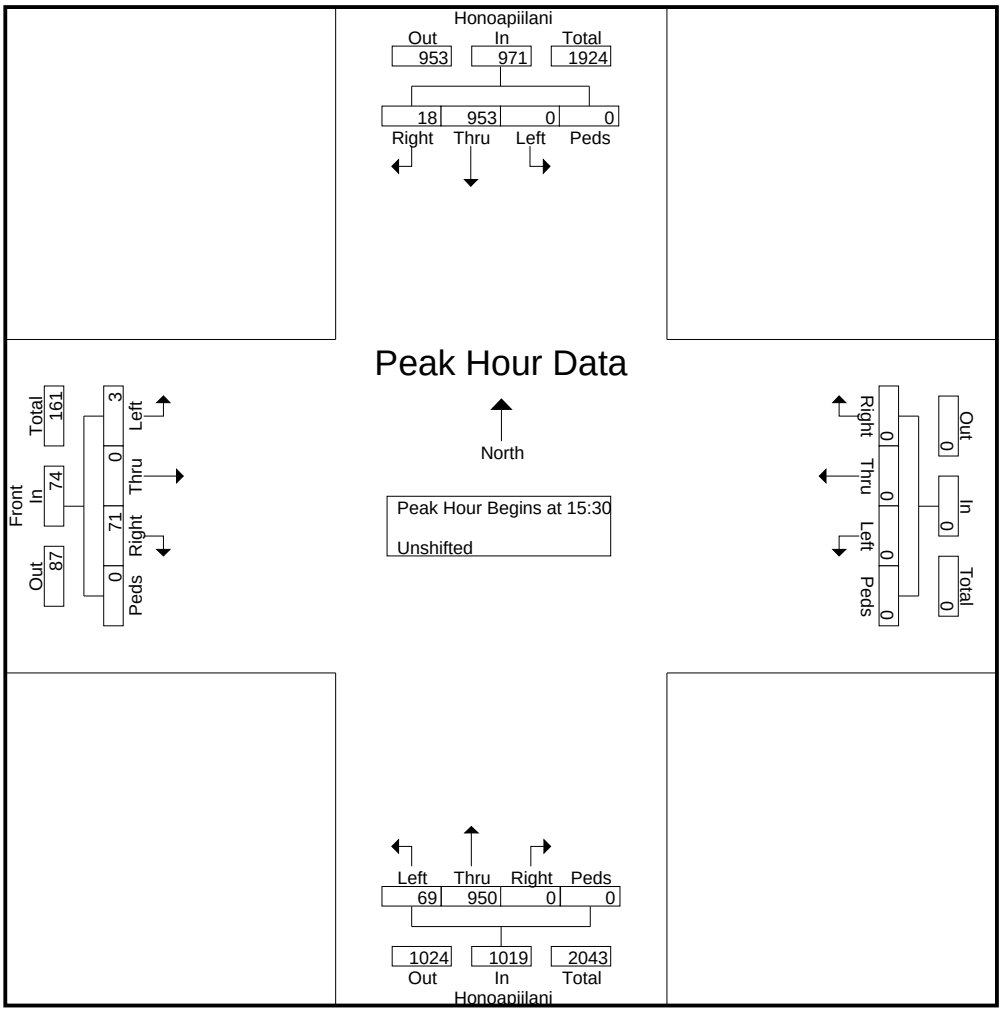
File Name : Honoapiilani - Front PM
Site Code : 00000000
Start Date : 1/26/2010
Page No : 2

	Honoapiilani From North					From East					Honoapiilani From South					Front From West					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. 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	**271**	0	0	**276**	0	0	0	0	0	0	218	18	0	236	14	0	0	0	14	526
15:45	**7**	220	0	0	227	0	0	0	0	0	0	237	12	0	249	9	0	**1**	0	10	486
16:00	2	228	0	0	230	0	0	0	0	0	0	**261**	16	0	**277**	**27**	0	1	0	**28**	**535**
16:15	4	234	0	0	238	0	0	0	0	0	0	234	**23**	0	257	21	0	1	0	22	517
Total Volume	18	953	0	0	971	0	0	0	0	0	0	950	69	0	1019	71	0	3	0	74	2064
% App. Total	1.9	98.1	0	0		0	0	0	0		0	93.2	6.8	0		95.9	0	4.1	0		
PHF	.643	.879	.000	.000	.880	.000	.000	.000	.000	.000	.000	.910	.750	.000	.920	.657	.000	.750	.000	.661	.964



APPENDIX B

LEVEL OF SERVICE CRITERIA

APPENDIX B – LEVEL OF SERVICE (LOS) CRITERIA

LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS (HCM 2000)

Level of service for 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 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.

LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS (HCM 2000)

The level of service criteria for 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

APPENDIX C

MODEL TRANSCODING METHODOLOGY

Appendix C: Model Transcoding Methodology

The Maui travel Demand Forecasting Model (MTDFM) and Trip Generation Methodology[1] were used to project and assign the traffic onto the roadway network. The result was an 80-percent increase in corridor demand[2] over existing conditions, which would cause congestion and require additional corridor capacity. However, some of this traffic will be alleviated by the planned construction of Phase 1A and 1B1 of the Lahaina Bypass Road in conjunction with the Keawe Street Extension.

Projection Methodology

The MTDFM projects over a 30-year span and assigns land use and socioeconomic data to Traffic Analysis Zones (TAZ's). The attributes were obtained from Maui County in 2007 and used to generate and assign traffic across the roadway network.

Between 2001 and 2030, the MTDFM assumed an aggregate growth of 4,499 residential units and 8,589 employees for the West Maui region; approximately 80% of the increase in West Maui employment would occur north of Keawe Street.

The following projects were noticeably absent or partly absent from the MTDFM: the Wainee development, the Lahaina Business Park, the Pioneer Mill site commercial areas and HHFDC Villages of Leialii development. Therefore, the impacts of these projects were estimated using Trip Generation methodology. See Table C2 below for the results of the ITE Trip Generation. See Figures C1, C2, and C3 for an overlay of MTDFM TAZ increases between 2001 and 2030 and known projects as reported by the County of Maui Long Range Planning Department.

In general, new trips were assigned based upon knowledge of future developments and existing travel patterns.

---

[1] Trip Generation Methodology used for projects that were not part of the 2007 MTDFM data set.

[2] Based on through movement volume (without the LBR) for the PM peak hour of traffic at the Keawe Street/Honoapiilani Highway intersection.

Table C1: Trip Generation Rates

Land Use (ITE Code)	Independent Variable	AM Peak Hour of Traffic		PM Peak Hour of Traffic	
		Trip Rate	% Entering	Trip Rate	% Entering
Single-Family Residential (210)	Dwelling Units (DU)	[a]	25%	[b]	63%
Multi-Family Residential (230)	Dwelling Units (DU)	[c]	17%	[d]	67%
General Light Industrial (110)	Acres	7.51	83%	7.76	22%
Shopping Center (820)	Gross Leasable Area (GLA)	[e]	61%	[f]	49%

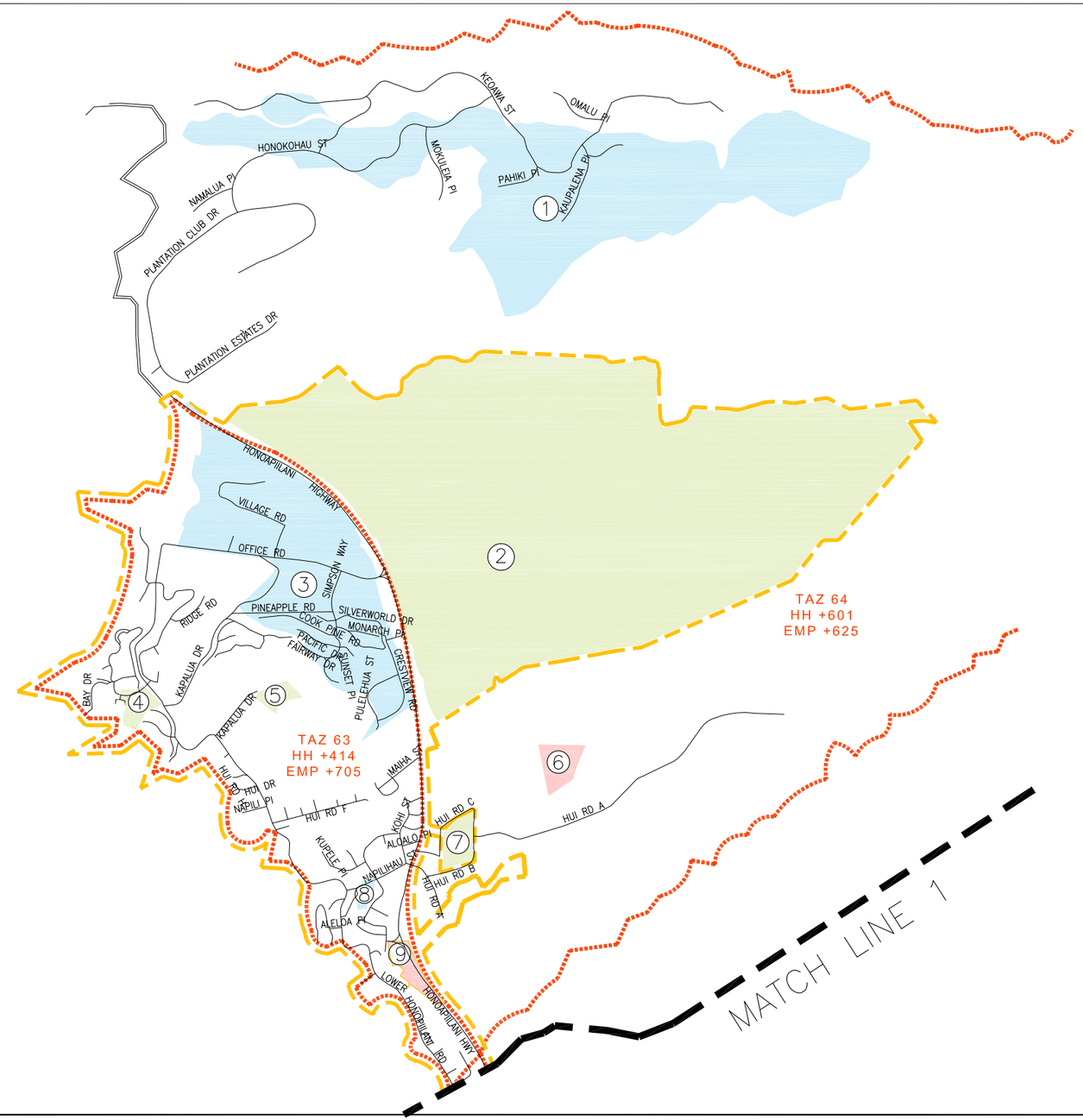
Source: Trip Generation, 8th Edition, Institute of Transportation Engineers.

[a] 0.7 * x + 9.74
[b] EXP (0.9 * LN(x) + 0.51)
[c] EXP (0.8*LN(x) + 0.26)
[d] EXP (0.82 * LN(x) + 0.32)
[e] EXP (0.59 * LN(x) + 2.32)
[f] EXP (0.67 * LN(x) + 3.37)
where "x" is the independent variable

Table C2: Project Trip Generation

Land Use Designation	Independent Variable	AADT	AM Peak Hour of Traffic		PM Peak Hour of Traffic	
			Enter (vph)	Exit (vph)	Enter (vph)	Exit (vph)
Wainee						
Single-Family Residential (210)	118[3] DU	1,211	24	70	77	46
Multi-Family Residential (230)	563 DU	2,893	35	171	167	82
HHFDC Villages of Leialii						
Single-Family Residential (210)	1,200 DU	10,228	213	638	620	364
Light Industrial (110)	8 Acres	414	50	11	14	49
Pioneer Mill site 1						
Shopping Center (820)	122,000 Sq. Ft. GLA	7,728	106	68	357	371
Pioneer Mill site 2						
Shopping Center (820)	122,000 Sq. Ft. GLA	7,728	106	68	357	371
	Total	**30,202**	**534**	**1,026**	**1,592**	**1,283**

[3] Approximately 462 Single-Family units are accounted for by the MTDFM



NOTES:

1. THE PROJECTS DEPICTED IN THIS FIGURE WERE OBTAINED FROM THE LONG RANGE PLANNING DIVISION WEBSITE, AND WAS CURRENT AS OF JUNE 15, 2010.
2. THE URBAN GROWTH BOUNDARY WAS BASED UPON THE MAUI COUNTY PLANNING DIRECTOR'S RECOMMENDED DIRECTED GROWTH MAP (OCTOBER, 2009) -- WHICH AS OF THIS WRITING HAS NOT BEEN APPROVED BY THE COUNTY COUNCIL.
3. THE TAZ GROWTH (2001-2030) AND BOUNDARIES WERE BASED UPON THE MTDFM, USING 2030 LAND USE FORECASTS PROVIDED BY MAUI COUNTY IN 2007. IN SOME CASES, STANDARD TRIP GENERATION METHODOLOGY WAS EMPLOYED TO ACCOUNT FOR PROJECTS CLEARLY NOT INCLUDED IN THE MTDFM.

1. HONOLUA
2. KAPALUA MAUKA
3. KAPALUA
4. RESIDENCES AT KAPALUA BA
5. PALOLO PLACE
6. NAPILIHAU MAUKA RESIDENCES
7. WEST MAUI VILLAGE
8. KILI NAHE HOMES
9. PINEAPPLE RIDGE

LEGEND

- URBAN GROWTH BOUNDARY (UGB)
- HH – HOUSEHOLDS (GROWTH, 2001-2030)
- EMP – EMPLOYMENT (GROWTH, 2001-2030)
- TAZ – MTDFM TRAFFIC ANALYSIS ZONE
- TAZ BORDER
- RECENTLY COMPLETED
- PLANNED/COMMITTED
- PLANNED/DESIGNATED
- PROPOSED

KUHUA STREET EXTENSION

AUSTIN, TSUTSUMI & ASSOCIATES, INC.
ENGINEERS, SURVEYORS • HONOLULU, HAWAII

MAJOR PROJECTS IN PROJECT VICINITY

FIGURE C1

NOTES:

1. THE PROJECTS DEPICTED IN THIS FIGURE WERE OBTAINED FROM THE LONG RANGE PLANNING DIVISION WEBSITE, AND WAS CURRENT AS OF JUNE 15, 2010.
2. THE URBAN GROWTH BOUNDARY WAS BASED UPON THE MAUI COUNTY PLANNING DIRECTOR'S RECOMMENDED DIRECTED GROWTH MAP (OCTOBER, 2009) -- WHICH AS OF THIS WRITING HAS NOT BEEN APPROVED BY THE COUNTY COUNCIL.
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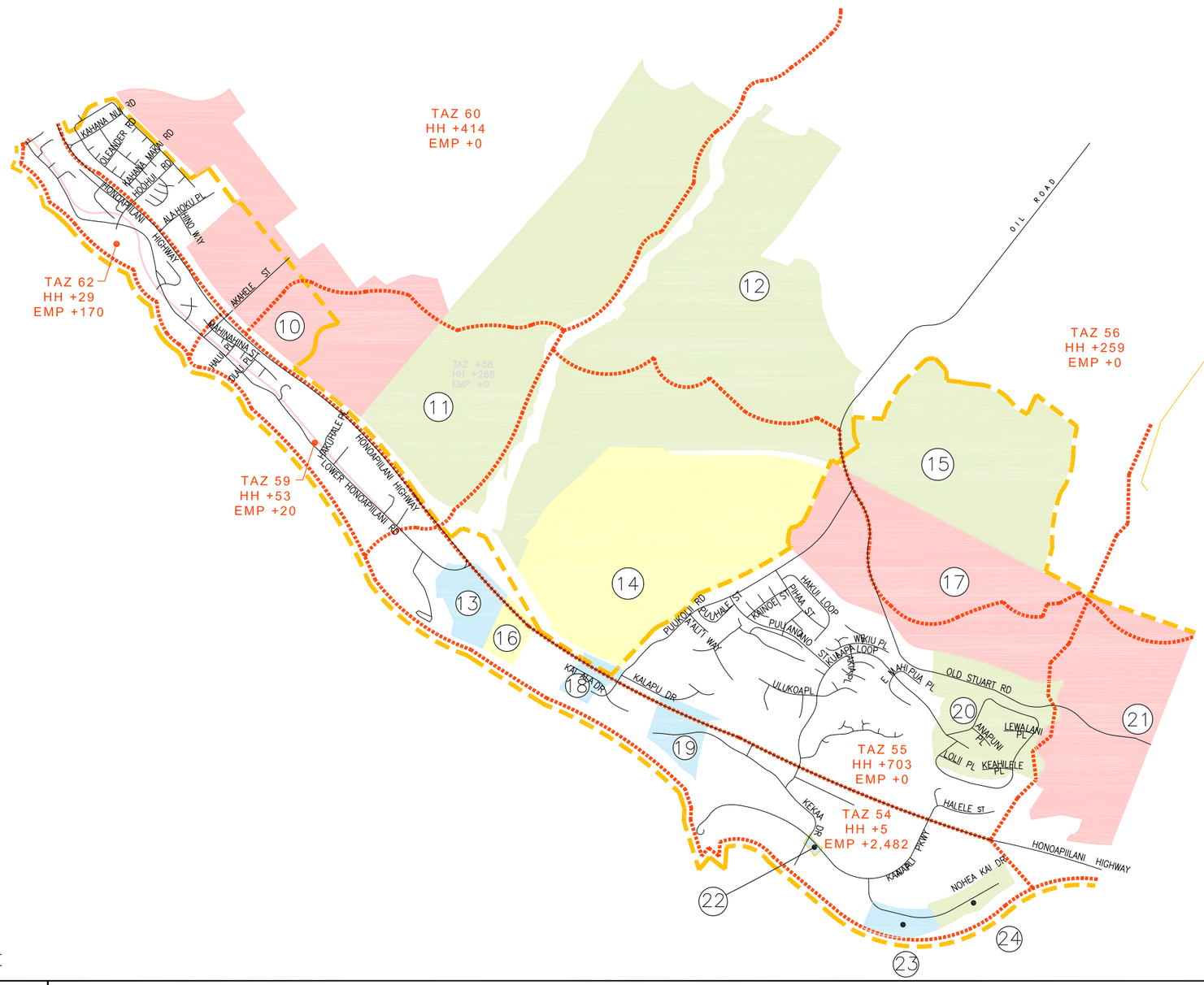

10. PULELEHUA
11. DHHL HONOKOWAI
12. KAANAPALI COFFEE FARMS
13. HONUA KAI (INTRAWEST NORTH BEACH LOT 4)
14. KAANAPALI LOWER NORTH HONOKOWAI
15. PUUKOLII VILLAGES MAUKA
16. KAANAPALI OCEAN RESORT VILLAS (NORTH BEACH LOT 3)
17. KAANAPALI LOWER EAST HONOKOWAI
18. KAANAPALI OCEAN RESORT VILLAS (NORTH BEACH LOT 2)
19. WESTIN (NORTH BEACH LOT 1)
20. LANIKEHA
21. KAANAPALI LOWER SOUTH HONOKOWAI
22. SUNSTONE
23. MARRIOTT MAUI OCEAN CLUB SEQUEL TOWERS
24. HYATT REGENCY MAUI TIMESHARES

LEGEND

- URBAN GROWTH BOUNDARY (UGB)
- HH – HOUSEHOLDS (GROWTH, 2001-2030)
- EMP – EMPLOYMENT (GROWTH, 2001-2030)
- TAZ – MTDFM TRAFFIC ANALYSIS ZONE
- TAZ BORDER
- RECENTLY COMPLETED
- PLANNED/COMMITTED
- PLANNED/DESIGNATED
- PROPOSED

NORTH

NOT TO SCALE

KUHUA STREET EXTENSION

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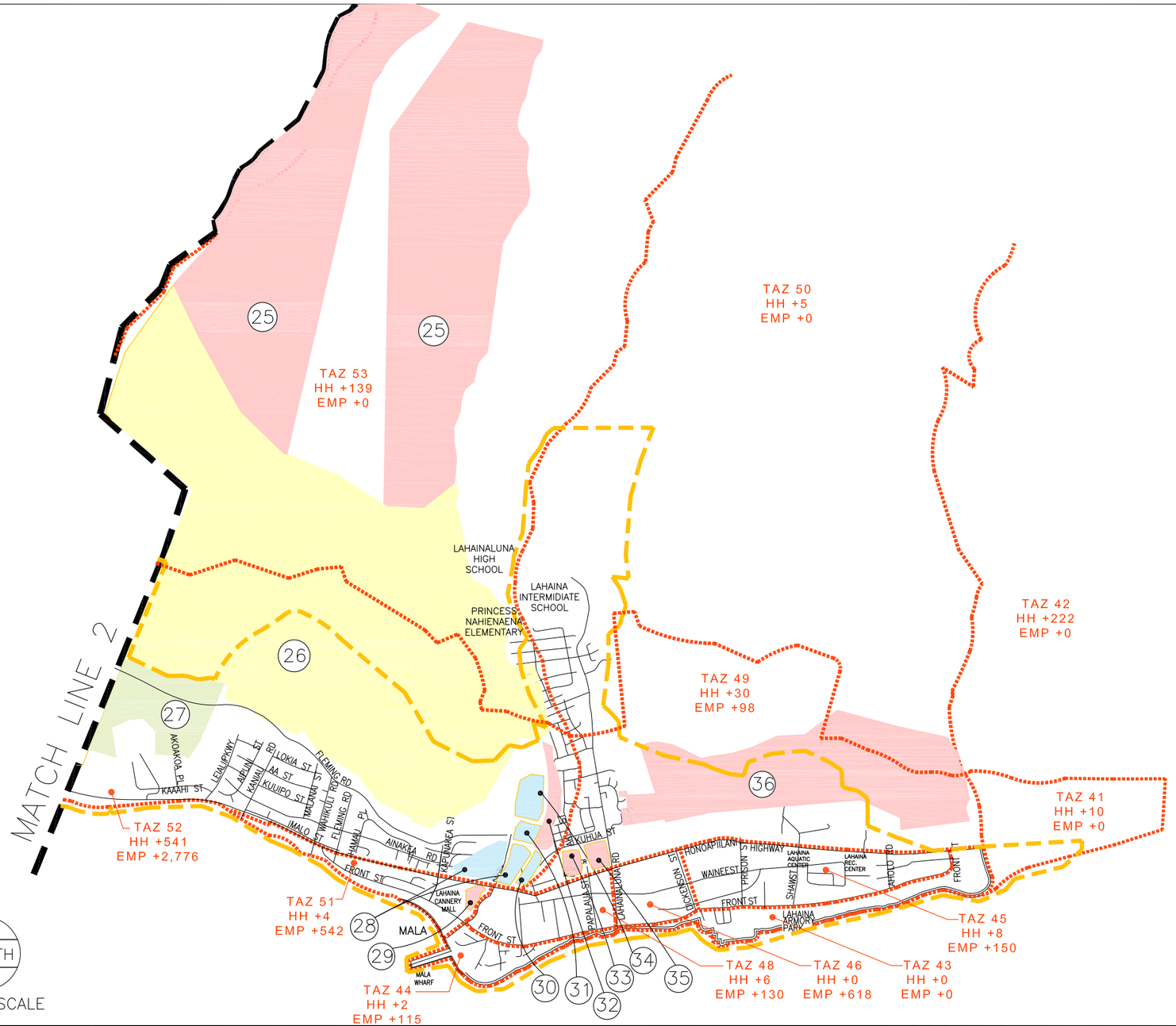
MAJOR PROJECTS IN PROJECT VICINITY

FIGURE C2

NOTES:

1. THE PROJECTS DEPICTED IN THIS FIGURE WERE OBTAINED FROM THE LONG RANGE PLANNING DIVISION WEBSITE, AND WAS CURRENT AS OF JUNE 15, 2010.
2. THE URBAN GROWTH BOUNDARY WAS BASED UPON THE MAUI COUNTY PLANNING DIRECTOR'S RECOMMENDED DIRECTED GROWTH MAP (OCTOBER, 2009) -- WHICH AS OF THIS WRITING HAS NOT BEEN APPROVED BY THE COUNTY COUNCIL.
3. THE TAZ GROWTH (2001-2030) AND BOUNDARIES WERE BASED UPON THE MTDFM, USING 2030 LAND USE FORECASTS PROVIDED BY MAUI COUNTY IN 2007. IN SOME CASES, STANDARD TRIP GENERATION METHODOLOGY WAS EMPLOYED TO ACCOUNT FOR PROJECTS CLEARLY NOT INCLUDED IN THE MTDFM.



25. KAHOMA LOTS
26. LEIALII HHFDC COMMUNITY
27. VILLAGES OF LEAIALII, PHASE 1B
28. LAHAINA GATEWAY COMMERCIAL CENTER/WALGREENS
29. LAHAINA CANNERY MALL EXPANSION
30. OPUKEA
31. HOONANEA
32. KAHOMA RESIDENT HOUSING
33. PIONEER MILL SITE 1
34. LAHAINA BUSINESS PARK
35. PIONEER MILL SITE 2
36. WAINEE RESIDENTIAL COMMUNITY

LEGEND

- URBAN GROWTH BOUNDARY (UGB)
- HH – HOUSEHOLDS (GROWTH, 2001-2030)
- EMP – EMPLOYMENT (GROWTH, 2001-2030)
- TAZ – MTDFM TRAFFIC ANALYSIS ZONE
- TAZ BORDER
- RECENTLY COMPLETED
- PLANNED/COMMITTED
- PLANNED/DESIGNATED
- PROPOSED

KUHUA STREET EXTENSION

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MAJOR PROJECTS IN PROJECT VICINITY

FIGURE C3

APPENDIX D

LEVEL OF SERVICE CALCULATIONS

APPENDIX D

LEVEL OF SERVICE CALCULATIONS

- Existing Conditions AM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	0	0	6	4	56	10	922	0	33	559	11
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	0	0	7	4	61	11	1002	0	36	608	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)						2						
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1711	1709	614	1703	1715	1002	620			1002		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1711	1709	614	1703	1715	1002	620			1002		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	100	91	95	79	99			95		
cM capacity (veh/h)	52	85	492	69	84	294	961			691		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	1	72	11	1002	36	620
Volume Left	1	7	11	0	36	0
Volume Right	0	61	0	0	0	12
cSH	52	347	961	1700	691	1700
Volume to Capacity	0.02	0.21	0.01	0.59	0.05	0.36
Queue Length 95th (ft)	2	19	1	0	4	0
Control Delay (s)	76.0	26.5	8.8	0.0	10.5	0.0
Lane LOS	F	D	A		B	
Approach Delay (s)	76.0	26.5	0.1		0.6	
Approach LOS	F	D				

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	65.3%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Volume (vph)	44	11	31	6	13	25	72	879	20	595
Turn Type	Perm		Perm	Perm		Perm	pm+pt		pm+pt	
Protected Phases		4			8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	4	4	4	8	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	20.0	1.0	20.0
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	7.0	33.0	5.0	29.0
Total Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	9.0	107.0	9.0	107.0
Total Split (%)	17.1%	17.1%	17.1%	17.1%	17.1%	17.1%	6.4%	76.4%	6.4%	76.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 74 (53%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Splits and Phases: 2: Shaw Street & Honoapiilani Highway

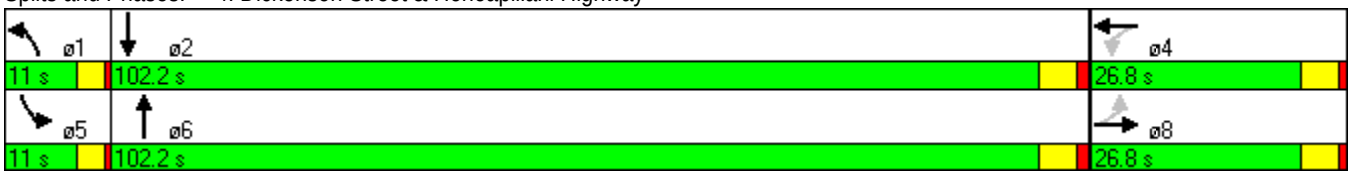
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	44	11	31	6	13	25	72	879	4	20	595	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1791	1583		1832	1583	1770	1862		1770	1848	
Flt Permitted		0.75	1.00		0.89	1.00	0.35	1.00		0.25	1.00	
Satd. Flow (perm)		1406	1583		1658	1583	658	1862		459	1848	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	48	12	34	7	14	27	78	955	4	22	647	35
RTOR Reduction (vph)	0	0	32	0	0	25	0	0	0	0	1	0
Lane Group Flow (vph)	0	60	2	0	21	2	78	959	0	22	681	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		10.0	10.0		10.0	10.0	118.0	113.1		114.0	111.1	
Effective Green, g (s)		10.0	10.0		10.0	10.0	118.0	113.1		114.0	111.1	
Actuated g/C Ratio		0.07	0.07		0.07	0.07	0.84	0.81		0.81	0.79	
Clearance Time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	2.0	5.0		2.0	5.0	
Lane Grp Cap (vph)		100	113		118	113	594	1504		401	1467	
v/s Ratio Prot							c0.00	c0.52		0.00	0.37	
v/s Ratio Perm		c0.04	0.00		0.01	0.00	0.11			0.04		
v/c Ratio		0.60	0.02		0.18	0.02	0.13	0.64		0.05	0.46	
Uniform Delay, d1		63.1	60.4		61.1	60.4	2.7	5.3		4.5	4.7	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.53	1.61	
Incremental Delay, d2		9.3	0.1		0.7	0.1	0.0	2.1		0.0	1.0	
Delay (s)		72.4	60.5		61.9	60.5	2.7	7.4		2.4	8.6	
Level of Service		E	E		E	E	A	A		A	A	
Approach Delay (s)		68.1			61.1			7.1			8.4	
Approach LOS		E			E			A			A	

Intersection Summary			
HCM Average Control Delay	12.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	71.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	54	50	48	13	12	891	22	640
Turn Type	Perm		Perm		Prot		Prot	
Protected Phases		8		4	1	6	5	2
Permitted Phases	8		4					
Detector Phase	8	8	4	4	1	6	5	2
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	3.0	15.0	3.0	15.0
Minimum Split (s)	10.0	10.0	26.0	26.0	6.5	26.5	6.5	24.5
Total Split (s)	26.8	26.8	26.8	26.8	11.0	102.2	11.0	102.2
Total Split (%)	19.1%	19.1%	19.1%	19.1%	7.9%	73.0%	7.9%	73.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	0.5	1.5	0.5	1.5
Lost Time Adjust (s)	-1.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	4.0	5.0	3.5	5.5	3.5	5.5
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 104 (74%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 4: Dickenson Street & Honoapiilani Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	54	50	20	48	13	29	12	891	74	22	640	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		3.5	5.5		3.5	5.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.96		1.00	0.99		1.00	0.98	
Flt Protected		0.98			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1764			1707		1770	1834		1770	3470	
Flt Permitted		0.79			0.67		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1419			1176		1770	1834		1770	3470	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	59	54	22	52	14	32	13	968	80	24	696	104
RTOR Reduction (vph)	0	5	0	0	13	0	0	2	0	0	6	0
Lane Group Flow (vph)	0	130	0	0	85	0	13	1046	0	24	794	0
Confl. Peds. (#/hr)	8		1	1		8			10			
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		16.4			16.4		2.5	105.6		4.0	107.1	
Effective Green, g (s)		16.4			16.4		2.5	105.6		4.0	107.1	
Actuated g/C Ratio		0.12			0.12		0.02	0.75		0.03	0.76	
Clearance Time (s)		5.0			5.0		3.5	5.5		3.5	5.5	
Vehicle Extension (s)		2.0			2.0		1.5	5.0		1.5	5.0	
Lane Grp Cap (vph)		166			138		32	1383		51	2655	
v/s Ratio Prot							0.01	c0.57		c0.01	0.23	
v/s Ratio Perm		c0.09			0.07							
v/c Ratio		0.78			0.61		0.41	0.76		0.47	0.30	
Uniform Delay, d1		60.1			58.8		68.0	9.8		67.0	5.0	
Progression Factor		1.00			1.00		0.98	0.63		0.92	0.87	
Incremental Delay, d2		19.4			5.6		2.5	3.2		2.1	0.2	
Delay (s)		79.5			64.1		69.5	9.5		63.8	4.6	
Level of Service		E			E		E	A		E	A	
Approach Delay (s)		79.5			64.1			10.2			6.3	
Approach LOS		E			E			B			A	

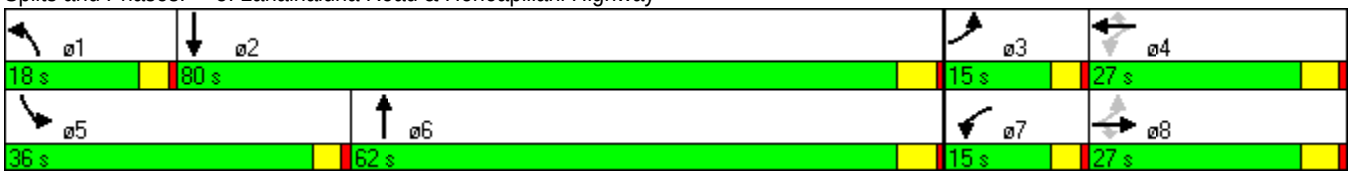
Intersection Summary			
HCM Average Control Delay	15.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	70.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Volume (vph)	57	214	21	129	182	374	20	972	318	639
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot		Prot	
Protected Phases	3	8		7	4		1	6	5	2
Permitted Phases	8		8	4		4				
Detector Phase	3	8	8	7	4	4	1	6	5	2
Switch Phase										
Minimum Initial (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	15.0	3.0	15.0
Minimum Split (s)	7.0	27.0	27.0	7.0	27.0	27.0	7.0	24.0	7.0	24.0
Total Split (s)	15.0	27.0	27.0	15.0	27.0	27.0	18.0	62.0	36.0	80.0
Total Split (%)	10.7%	19.3%	19.3%	10.7%	19.3%	19.3%	12.9%	44.3%	25.7%	57.1%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 13 (9%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated

Splits and Phases: 5: Lahainaluna Road & Honoapiilani Highway



HCM Signalized Intersection Capacity Analysis
5: Lahainaluna Road & Honoapiilani Highway

2/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	214	21	129	182	374	20	972	77	318	639	23
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	12	12	11	11	11	12	12	12	12	12	12
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.93	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1475	1705	1801	1531	1770	3490		1770	3517	
Flt Permitted	0.18	1.00	1.00	0.17	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	340	1863	1475	312	1801	1531	1770	3490		1770	3517	
Peak-hour factor, PHF	0.84	0.84	0.84	0.86	0.86	0.86	0.92	0.92	0.92	0.77	0.77	0.77
Growth Factor (vph)	100%	100%	100%	150%	150%	200%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	68	255	25	225	317	870	22	1057	84	413	830	30
RTOR Reduction (vph)	0	0	5	0	0	322	0	4	0	0	2	0
Lane Group Flow (vph)	68	255	20	225	317	548	22	1137	0	413	858	0
Confl. Peds. (#/hr)			30	30					5			3
Turn Type	pm+pt		Perm	pm+pt		Perm	Prot			Prot		
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4						
Actuated Green, G (s)	29.2	21.9	21.9	36.6	25.6	25.6	4.4	57.1		32.0	84.7	
Effective Green, g (s)	29.2	21.9	21.9	36.6	25.6	25.6	4.4	57.1		32.0	84.7	
Actuated g/C Ratio	0.21	0.16	0.16	0.26	0.18	0.18	0.03	0.41		0.23	0.61	
Clearance Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	2.0	2.0	2.0	2.0	4.0	4.0	2.0	4.5		2.0	4.5	
Lane Grp Cap (vph)	145	291	231	191	329	280	56	1423		405	2128	
v/s Ratio Prot	0.02	0.14		c0.09	0.18		0.01	c0.33		c0.23	0.24	
v/s Ratio Perm	0.07		0.01	0.22		c0.36						
v/c Ratio	0.47	0.88	0.09	1.18	0.96	1.96	0.39	0.80		1.02	0.40	
Uniform Delay, d1	46.5	57.7	50.5	47.1	56.7	57.2	66.5	36.4		54.0	14.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.20	0.83		0.92	0.38	
Incremental Delay, d2	0.9	23.6	0.1	121.3	39.8	443.6	1.2	3.6		48.6	0.5	
Delay (s)	47.4	81.3	50.6	168.4	96.6	500.8	81.0	33.9		98.4	6.0	
Level of Service	D	F	D	F	F	F	F	C		F	A	
Approach Delay (s)		72.5			357.0			34.8			36.0	
Approach LOS		E			F			C			D	

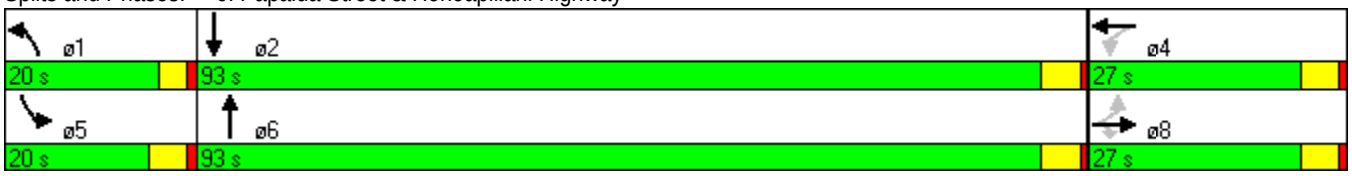
Intersection Summary			
HCM Average Control Delay	146.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	90.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	224	39	69	7	6	76	1395	21	908
Turn Type	Perm		Perm	Perm		Prot		Prot	
Protected Phases		8			4	1	6	5	2
Permitted Phases	8		8	4					
Detector Phase	8	8	8	4	4	1	6	5	2
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	15.0	15.0	5.0
Minimum Split (s)	27.0	27.0	27.0	27.0	27.0	9.0	22.0	20.0	22.0
Total Split (s)	27.0	27.0	27.0	27.0	27.0	20.0	93.0	20.0	93.0
Total Split (%)	19.3%	19.3%	19.3%	19.3%	19.3%	14.3%	66.4%	14.3%	66.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	4.0	5.0	5.0	5.0
Lead/Lag						Lead	Lag	Lead	Lag
Lead-Lag Optimize?									Yes
Recall Mode	None	None	None	None	None	None	C-Max	Max	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 112 (80%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 6: Papalua Street & Honoapiilani Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	224	39	69	7	6	32	76	1395	25	21	908	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		4.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.97		0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.91		1.00	1.00		1.00	0.99	
Flt Protected		0.96	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1784	1541		1655		1770	3526		1770	3490	
Flt Permitted		0.75	1.00		0.63		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1397	1541		1046		1770	3526		1770	3490	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	243	42	75	8	7	35	83	1516	27	23	987	82
RTOR Reduction (vph)	0	0	61	0	30	0	0	1	0	0	4	0
Lane Group Flow (vph)	0	285	14	0	21	0	83	1542	0	23	1065	0
Confl. Peds. (#/hr)	1		8	8		1			10			3
Turn Type	Perm		Perm	Perm			Prot			Prot		
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4								
Actuated Green, G (s)		22.0	22.0		22.0		10.9	88.0		15.0	93.1	
Effective Green, g (s)		22.0	22.0		22.0		10.9	88.0		15.0	93.1	
Actuated g/C Ratio		0.16	0.16		0.16		0.08	0.63		0.11	0.66	
Clearance Time (s)		5.0	5.0		5.0		4.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	6.0		6.0	3.0	
Lane Grp Cap (vph)		220	242		164		138	2216		190	2321	
v/s Ratio Prot							c0.05	c0.44		0.01	c0.31	
v/s Ratio Perm		c0.20	0.01		0.02							
v/c Ratio		1.30	0.06		0.12		0.60	0.70		0.12	0.46	
Uniform Delay, d1		59.0	50.2		50.7		62.4	17.2		56.5	11.3	
Progression Factor		1.00	1.00		1.00		0.94	0.92		0.99	0.80	
Incremental Delay, d2		162.3	0.1		0.3		0.5	0.2		1.2	0.6	
Delay (s)		221.3	50.3		51.1		58.9	16.0		57.2	9.6	
Level of Service		F	D		D		E	B		E	A	
Approach Delay (s)		185.7			51.1			18.2			10.6	
Approach LOS		F			D			B			B	

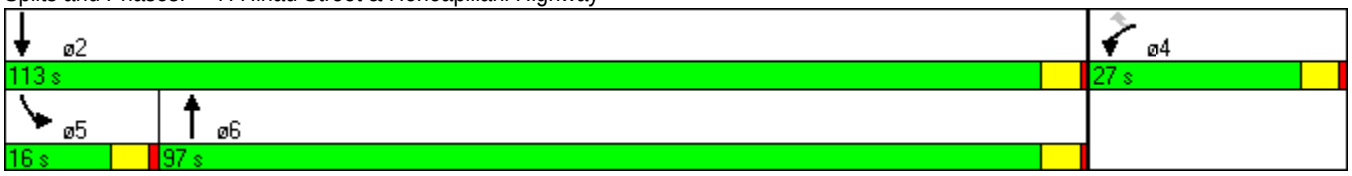
Intersection Summary			
HCM Average Control Delay	35.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	85.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations					
Volume (vph)	30	25	1494	41	1042
Turn Type		Perm		Prot	
Protected Phases	4		6	5	2
Permitted Phases		4			
Detector Phase	4	4	6	5	2
Switch Phase					
Minimum Initial (s)	7.0	7.0	15.0	4.0	15.0
Minimum Split (s)	27.0	27.0	22.0	9.0	20.0
Total Split (s)	27.0	27.0	97.0	16.0	113.0
Total Split (%)	19.3%	19.3%	69.3%	11.4%	80.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?				Yes	
Recall Mode	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 129 (92%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 7: Hinau Street & Honoapiilani Highway



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	30	25	1494	62	41	1042
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.98	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1550	3518		1770	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1550	3518		1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	27	1624	67	45	1133
RTOR Reduction (vph)	0	26	1	0	0	0
Lane Group Flow (vph)	33	1	1690	0	45	1133
Confl. Peds. (#/hr)		5				
Turn Type		Perm			Prot	
Protected Phases	4		6		5	2
Permitted Phases		4				
Actuated Green, G (s)	7.0	7.0	110.5		7.5	123.0
Effective Green, g (s)	7.0	7.0	110.5		7.5	123.0
Actuated g/C Ratio	0.05	0.05	0.79		0.05	0.88
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	5.0		3.0	5.0
Lane Grp Cap (vph)	89	78	2777		95	3109
v/s Ratio Prot	c0.02		c0.48		0.03	c0.32
v/s Ratio Perm		0.00				
v/c Ratio	0.37	0.02	0.61		0.47	0.36
Uniform Delay, d1	64.4	63.2	6.0		64.3	1.5
Progression Factor	1.00	1.00	0.57		1.16	0.47
Incremental Delay, d2	2.6	0.1	0.6		3.4	0.3
Delay (s)	67.0	63.3	4.0		78.3	1.0
Level of Service	E	E	A		E	A
Approach Delay (s)	65.3		4.0			4.0
Approach LOS	E		A			A

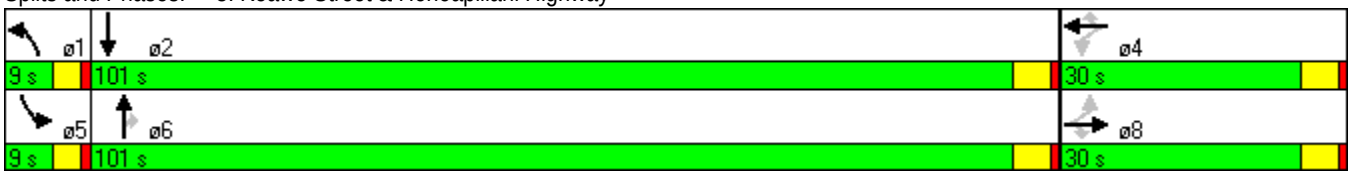
Intersection Summary			
HCM Average Control Delay	5.3	HCM Level of Service	A
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	59.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Volume (vph)	16	28	50	42	33	63	43	1287	93	47	1086
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot	
Protected Phases		8			4		1	6		5	2
Permitted Phases	8		8	4		4			6		
Detector Phase	8	8	8	4	4	4	1	6	6	5	2
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	15.0	15.0	3.0	15.0
Minimum Split (s)	30.0	30.0	30.0	30.0	30.0	30.0	7.0	20.0	20.0	7.0	24.0
Total Split (s)	30.0	30.0	30.0	30.0	30.0	30.0	9.0	101.0	101.0	9.0	101.0
Total Split (%)	21.4%	21.4%	21.4%	21.4%	21.4%	21.4%	6.4%	72.1%	72.1%	6.4%	72.1%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	None	C-Min	C-Min	None	C-Min

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 70
Control Type: Actuated-Coordinated

Splits and Phases: 8: Keawe Street & Honoapiilani Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	28	50	42	33	63	43	1287	93	47	1086	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	0.99		1.00	0.99	1.00	1.00	0.98	1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1829	1562		1810	1562	1770	3539	1557	1770	3531	
Flt Permitted		0.87	1.00		0.80	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1613	1562		1489	1562	1770	3539	1557	1770	3531	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	17	30	54	46	36	68	47	1399	101	51	1180	15
RTOR Reduction (vph)	0	0	49	0	0	62	0	0	15	0	0	0
Lane Group Flow (vph)	0	47	5	0	82	6	47	1399	86	51	1195	0
Confl. Peds. (#/hr)	1		1	1		1			1			7
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4		4			6			
Actuated Green, G (s)		12.9	12.9		12.9	12.9	4.0	108.1	108.1	5.0	109.1	
Effective Green, g (s)		12.9	12.9		12.9	12.9	4.0	108.1	108.1	5.0	109.1	
Actuated g/C Ratio		0.09	0.09		0.09	0.09	0.03	0.77	0.77	0.04	0.78	
Clearance Time (s)		5.0	5.0		5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	2.0	5.0	5.0	2.0	5.0	
Lane Grp Cap (vph)		149	144		137	144	51	2733	1202	63	2752	
v/s Ratio Prot							0.03	c0.40		c0.03	0.34	
v/s Ratio Perm		0.03	0.00		c0.06	0.00			0.06			
v/c Ratio		0.32	0.03		0.60	0.04	0.92	0.51	0.07	0.81	0.43	
Uniform Delay, d1		59.4	57.9		61.1	57.9	67.8	6.0	3.8	67.0	5.2	
Progression Factor		1.00	1.00		1.00	1.00	0.93	0.92	0.92	1.00	1.00	
Incremental Delay, d2		1.2	0.1		6.9	0.1	85.0	0.6	0.1	49.3	0.5	
Delay (s)		60.6	58.0		67.9	58.1	147.8	6.1	3.6	116.4	5.7	
Level of Service		E	E		E	E	F	A	A	F	A	
Approach Delay (s)		59.2			63.5			10.2			10.2	
Approach LOS		E			E			B			B	

Intersection Summary			
HCM Average Control Delay	14.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	58.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	597	16	56	780	6	106
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	649	17	61	2120	7	115
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	351					
pX, platoon unblocked			0.88		0.88	0.88
vC, conflicting volume			666		2899	658
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			550		3093	540
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		39	76
cM capacity (veh/h)			895		11	475

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	666	2180	122
Volume Left	0	61	7
Volume Right	17	0	115
cSH	1700	895	143
Volume to Capacity	0.39	0.07	0.85
Queue Length 95th (ft)	0	5	139
Control Delay (s)	0.0	0.3	100.8
Lane LOS		A	F
Approach Delay (s)	0.0	0.3	100.8
Approach LOS			F

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	235.6%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	26	609	730	7	14	109
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	28	662	1984	8	15	118
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		737				
pX, platoon unblocked					0.93	
vC, conflicting volume	1991				2706	1988
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1991				2802	1988
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	90				10	0
cM capacity (veh/h)	288				17	76

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	690	1991	15	118
Volume Left	28	0	15	0
Volume Right	0	8	0	118
cSH	288	1700	17	76
Volume to Capacity	0.10	1.17	0.90	1.55
Queue Length 95th (ft)	8	0	57	245
Control Delay (s)	3.7	0.0	489.3	396.3
Lane LOS	A		F	F
Approach Delay (s)	3.7	0.0	406.9	
Approach LOS			F	

Intersection Summary			
Average Delay	20.2		
Intersection Capacity Utilization	166.2%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	74	2	10	16	0	46
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	80	2	11	17	0	50
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	70	20			28	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	70	20			28	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	100			100	
cM capacity (veh/h)	935	1058			1585	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	83	28	50
Volume Left	80	0	0
Volume Right	2	17	0
cSH	938	1700	1585
Volume to Capacity	0.09	0.02	0.00
Queue Length 95th (ft)	7	0	0
Control Delay (s)	9.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	9.2	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	14.2%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
88: Keawe Street & Lgate Dw 1

2/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	104	168	0	0	73	3	0	9	0	1	7	65
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	113	183	0	0	79	3	0	10	0	1	8	71
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		320										
pX, platoon unblocked												
vC, conflicting volume	83			183			523	491	91	403	490	41
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	83			183			523	491	91	403	490	41
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			100			100	98	100	100	98	93
cM capacity (veh/h)	1513			1390			379	441	948	493	442	1021

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	113	122	61	0	53	30	0	10	9	71
Volume Left	113	0	0	0	0	0	0	0	1	0
Volume Right	0	0	0	0	0	3	0	0	0	71
cSH	1513	1700	1700	1700	1700	1700	1700	441	448	1021
Volume to Capacity	0.07	0.07	0.04	0.00	0.03	0.02	0.00	0.02	0.02	0.07
Queue Length 95th (ft)	6	0	0	0	0	0	0	2	1	6
Control Delay (s)	7.6	0.0	0.0	0.0	0.0	0.0	0.0	13.3	13.2	8.8
Lane LOS	A						A	B	B	A
Approach Delay (s)	2.9			0.0			13.3		9.3	
Approach LOS							B		A	

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	22.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
89: Keawe Street & LGate DW 2

2/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	169	0	0	73	0	0	0	0	0	0	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	184	0	0	79	0	0	0	0	0	0	0
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									2			
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		606										
pX, platoon unblocked												
vC, conflicting volume	79			184			223	263	92	171	263	40
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	79			184			223	263	92	171	263	40
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	100	100	100	100
cM capacity (veh/h)	1517			1389			713	641	947	776	641	1023

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	0	122	61	0	53	26	0	0	0
Volume Left	0	0	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.00	0.07	0.04	0.00	0.03	0.02	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0	0	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS							A	A	A
Approach Delay (s)	0.0			0.0			0.0	0.0	
Approach LOS							A	A	

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	8.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	0	169	0	0	73	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	184	0	0	79	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1294					
pX, platoon unblocked						
vC, conflicting volume			184		92	92
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			184		92	92
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		91	100
cM capacity (veh/h)			1389		898	947

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	0	184	0	0	0	79	0
Volume Left	0	0	0	0	0	79	0
Volume Right	0	184	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	898	1700
Volume to Capacity	0.00	0.11	0.00	0.00	0.00	0.09	0.00
Queue Length 95th (ft)	0	0	0	0	0	7	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	9.4	0.0
Lane LOS						A	A
Approach Delay (s)	0.0		0.0			9.4	
Approach LOS						A	

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	16.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	32	54	927	538	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	35	59	1008	585	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1712	588	590			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1712	588	590			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	93	94			
cM capacity (veh/h)	94	509	985			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	40	59	1008	590
Volume Left	5	59	0	0
Volume Right	35	0	0	5
cSH	318	985	1700	1700
Volume to Capacity	0.13	0.06	0.59	0.35
Queue Length 95th (ft)	11	5	0	0
Control Delay (s)	17.9	8.9	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	17.9	0.5		0.0
Approach LOS	C			

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

APPENDIX D

LEVEL OF SERVICE CALCULATIONS

- Existing Conditions PM

HCM Unsignalized Intersection Capacity Analysis
1: Aholo Street & HOnoapiilani Highway

2/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	1	0	17	2	0	30	21	981	9	28	1149	6
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	1	0	18	2	0	33	23	1066	10	30	1249	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)						2						
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2425	2425	1252	2445	2433	1071	1255			1066		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2425	2425	1252	2445	2433	1071	1255			1066		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	100	91	88	100	88	96			95		
cM capacity (veh/h)	18	29	210	18	29	268	554			653		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	20	35	23	1076	30	1255
Volume Left	1	2	23	0	30	0
Volume Right	18	33	0	10	0	7
cSH	132	286	554	1700	653	1700
Volume to Capacity	0.15	0.12	0.04	0.63	0.05	0.74
Queue Length 95th (ft)	13	10	3	0	4	0
Control Delay (s)	36.9	33.2	11.8	0.0	10.8	0.0
Lane LOS	E	D	B		B	
Approach Delay (s)	36.9	33.2	0.2		0.3	
Approach LOS	E	D				

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Volume (vph)	55	38	141	16	32	65	117	853	33	1019
Turn Type	Perm		Perm	Perm		custom	pm+pt		pm+pt	
Protected Phases		8			4		1	6	5	2
Permitted Phases	8		8	4		4 5	6		2	
Detector Phase	8	8	8	4	4	4 5	1	6	5	2
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		3.0	20.0	3.0	20.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0		7.0	25.0	7.0	25.0
Total Split (s)	22.0	22.0	22.0	22.0	22.0	34.0	12.0	101.0	12.0	101.0
Total Split (%)	16.3%	16.3%	16.3%	16.3%	16.3%	25.2%	8.9%	74.8%	8.9%	74.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag							Lead	Lead	Lag	Lag
Lead-Lag Optimize?								Yes	Yes	
Recall Mode	None	None	None	None	None		None	C-Max	None	Max

Intersection Summary
Cycle Length: 135
Actuated Cycle Length: 135
Offset: 122 (90%), Referenced to phase 6:NBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 2: Shaw Street & Honoapiilani Highway

HCM Signalized Intersection Capacity Analysis
2: Shaw Street & Honoapiilani Highway

2/3/2010

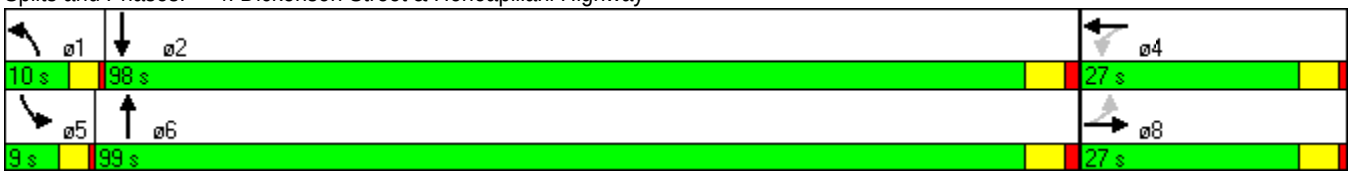
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	55	38	141	16	32	65	117	853	14	33	1019	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected		0.97	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1809	1583		1833	1583	1770	1858		1770	1848	
Flt Permitted		0.79	1.00		0.88	1.00	0.08	1.00		0.25	1.00	
Satd. Flow (perm)		1467	1583		1631	1583	149	1858		460	1848	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	60	41	153	17	35	71	127	927	15	36	1108	61
RTOR Reduction (vph)	0	0	137	0	0	60	0	0	0	0	1	0
Lane Group Flow (vph)	0	101	16	0	52	11	127	942	0	36	1168	0
Turn Type	Perm		Perm	Perm		custom	pm+pt			pm+pt		
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4		4 5	6			2		
Actuated Green, G (s)		13.8	13.8		13.8	24.2	100.8	100.8		100.8	99.8	
Effective Green, g (s)		13.8	13.8		13.8	20.2	100.8	100.8		100.8	99.8	
Actuated g/C Ratio		0.10	0.10		0.10	0.15	0.75	0.75		0.75	0.74	
Clearance Time (s)		5.0	5.0		5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	5.0		2.0	5.0	
Lane Grp Cap (vph)		150	162		167	237	200	1387		406	1366	
v/s Ratio Prot							0.03	c0.51		0.00	c0.63	
v/s Ratio Perm		c0.07	0.01		0.03	0.01	0.44			0.06		
v/c Ratio		0.67	0.10		0.31	0.04	0.64	0.68		0.09	0.85	
Uniform Delay, d1		58.4	54.9		56.2	49.1	25.5	8.8		12.1	12.5	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.65	0.90	
Incremental Delay, d2		11.3	0.3		1.1	0.1	4.8	2.7		0.0	6.2	
Delay (s)		69.7	55.2		57.3	49.2	30.2	11.5		7.9	17.4	
Level of Service		E	E		E	D	C	B		A	B	
Approach Delay (s)		61.0			52.6			13.7			17.1	
Approach LOS		E			D			B			B	

Intersection Summary			
HCM Average Control Delay	21.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	86.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	80	36	42	15	21	820	22	1029
Turn Type	Perm		Perm		Prot		Prot	
Protected Phases		8		4	1	6	5	2
Permitted Phases	8		4					
Detector Phase	8	8	4	4	1	6	5	2
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	3.0	15.0	3.0	15.0
Minimum Split (s)	10.0	10.0	26.0	26.0	6.5	26.5	6.5	24.5
Total Split (s)	27.0	27.0	27.0	27.0	10.0	99.0	9.0	98.0
Total Split (%)	20.0%	20.0%	20.0%	20.0%	7.4%	73.3%	6.7%	72.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	0.5	1.5	0.5	1.5
Lost Time Adjust (s)	-1.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	4.0	5.0	3.5	5.5	3.5	5.5
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 135
Actuated Cycle Length: 135
Offset: 60 (44%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 4: Dickenson Street & Honoapiilani Highway



HCM Signalized Intersection Capacity Analysis
4: Dickenson Street & Honoapiilani Highway

2/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	36	40	42	15	20	21	820	70	22	1029	167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		3.5	5.5		3.5	5.5	
Lane Util. Factor		1.00			1.00		1.00	1.00		1.00	0.95	
Frpb, ped/bikes		1.00			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		0.99			1.00		1.00	1.00		1.00	1.00	
Frt		0.97			0.96		1.00	0.99		1.00	0.98	
Flt Protected		0.97			0.97		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1729			1727		1770	1833		1770	3465	
Flt Permitted		0.79			0.70		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1395			1242		1770	1833		1770	3465	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	39	43	46	16	22	23	891	76	24	1118	182
RTOR Reduction (vph)	0	9	0	0	9	0	0	2	0	0	8	0
Lane Group Flow (vph)	0	160	0	0	75	0	23	965	0	24	1292	0
Confl. Peds. (#/hr)	8		1	1		8			10			
Turn Type	Perm			Perm			Prot			Prot		
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		18.5			18.5		3.7	99.2		3.3	98.8	
Effective Green, g (s)		18.5			18.5		3.7	99.2		3.3	98.8	
Actuated g/C Ratio		0.14			0.14		0.03	0.73		0.02	0.73	
Clearance Time (s)		5.0			5.0		3.5	5.5		3.5	5.5	
Vehicle Extension (s)		2.0			2.0		1.5	5.0		1.5	5.0	
Lane Grp Cap (vph)		191			170		49	1347		43	2536	
v/s Ratio Prot							0.01	c0.53		c0.01	0.37	
v/s Ratio Perm		c0.11			0.06							
v/c Ratio		0.84			0.44		0.47	0.72		0.56	0.51	
Uniform Delay, d1		56.8			53.5		64.7	10.0		65.1	7.7	
Progression Factor		1.00			0.99		1.16	1.20		0.93	0.66	
Incremental Delay, d2		24.8			0.7		2.0	2.6		7.0	0.6	
Delay (s)		81.6			53.7		77.0	14.6		67.4	5.7	
Level of Service		F			D		E	B		E	A	
Approach Delay (s)		81.6			53.7			16.1			6.9	
Approach LOS		F			D			B			A	

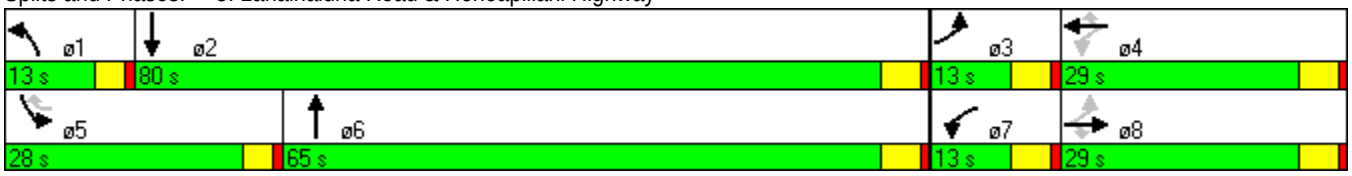
Intersection Summary			
HCM Average Control Delay	16.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	8.5
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Volume (vph)	104	205	51	109	136	257	48	819	321	1099
Turn Type	pm+pt		Perm	pm+pt		custom	Prot		Prot	
Protected Phases	3	8		7	4		1	6	5	2
Permitted Phases	8		8	4		4 5				
Detector Phase	3	8	8	7	4	4 5	1	6	5	2
Switch Phase										
Minimum Initial (s)	4.0	5.0	5.0	4.0	5.0		3.0	15.0	3.0	15.0
Minimum Split (s)	9.0	29.0	29.0	9.0	29.0		7.0	24.0	7.0	24.0
Total Split (s)	13.0	29.0	29.0	13.0	29.0	57.0	13.0	65.0	28.0	80.0
Total Split (%)	9.6%	21.5%	21.5%	9.6%	21.5%	42.2%	9.6%	48.1%	20.7%	59.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0		3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None		None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 135
Actuated Cycle Length: 135
Offset: 97 (72%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 5: Lahainaluna Road & Honoapiilani Highway



HCM Signalized Intersection Capacity Analysis
5: Lahainaluna Road & Honoapiilani Highway

2/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	104	205	51	109	136	257	48	819	55	321	1099	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	0.94	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1863	1486	1758	1863	1583	1770	3497		1770	3494	
Flt Permitted	0.48	1.00	1.00	0.26	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	901	1863	1486	488	1863	1583	1770	3497		1770	3494	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	113	223	55	118	148	279	52	890	60	349	1195	92
RTOR Reduction (vph)	0	0	14	0	0	72	0	4	0	0	4	0
Lane Group Flow (vph)	113	223	41	118	148	207	52	946	0	349	1283	0
Confl. Peds. (#/hr)			30	30					5			3
Turn Type	pm+pt		Perm	pm+pt		custom	Prot			Prot		
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8		8	4		4 5						
Actuated Green, G (s)	27.7	19.7	19.7	27.7	19.7	48.7	6.7	64.3		24.0	81.6	
Effective Green, g (s)	27.7	19.7	19.7	27.7	19.7	48.7	6.7	64.3		24.0	81.6	
Actuated g/C Ratio	0.21	0.15	0.15	0.21	0.15	0.36	0.05	0.48		0.18	0.60	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	2.0	2.0	3.0	4.0		2.0	4.5		2.0	4.5	
Lane Grp Cap (vph)	236	272	217	175	272	571	88	1666		315	2112	
v/s Ratio Prot	0.03	c0.12		c0.04	0.08		0.03	0.27		c0.20	c0.37	
v/s Ratio Perm	0.07		0.03	0.10		0.13						
v/c Ratio	0.48	0.82	0.19	0.67	0.54	0.36	0.59	0.57		1.11	0.61	
Uniform Delay, d1	45.7	55.9	50.6	46.2	53.5	31.7	62.8	25.4		55.5	16.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.30	0.60		1.20	0.19	
Incremental Delay, d2	1.5	16.5	0.2	9.8	2.8	0.5	4.9	1.0		76.0	1.0	
Delay (s)	47.2	72.4	50.8	56.1	56.3	32.3	86.3	16.3		142.8	4.2	
Level of Service	D	E	D	E	E	C	F	B		F	A	
Approach Delay (s)		62.1			43.9			20.0			33.8	
Approach LOS		E			D			B			C	

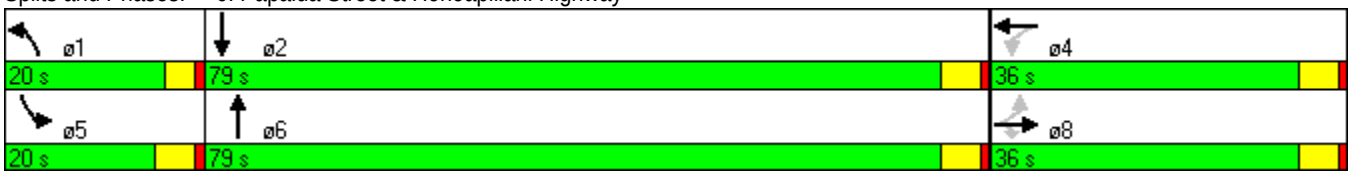
Intersection Summary			
HCM Average Control Delay	34.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	261	27	89	29	24	70	1078	24	1295
Turn Type	Perm		Perm	Perm		Prot		Prot	
Protected Phases		8			4	1	6	5	2
Permitted Phases	8		8	4					
Detector Phase	8	8	8	4	4	1	6	5	2
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	15.0	15.0	5.0
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	9.0	23.0	20.0	23.0
Total Split (s)	36.0	36.0	36.0	36.0	36.0	20.0	79.0	20.0	79.0
Total Split (%)	26.7%	26.7%	26.7%	26.7%	26.7%	14.8%	58.5%	14.8%	58.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	4.0	5.0	5.0	5.0
Lead/Lag						Lead	Lag	Lead	Lag
Lead-Lag Optimize?									Yes
Recall Mode	None	None	None	None	None	None	C-Max	Max	C-Max

Intersection Summary
Cycle Length: 135
Actuated Cycle Length: 135
Offset: 68 (50%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 6: Papalua Street & Honoapiilani Highway



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	261	27	89	29	24	36	70	1078	28	24	1295	171
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		4.0	5.0		5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.97		0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.95		1.00	1.00		1.00	0.98	
Flt Protected		0.96	1.00		0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1780	1543		1720		1770	3521		1770	3465	
Flt Permitted		0.66	1.00		0.57		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1220	1543		997		1770	3521		1770	3465	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	284	29	97	32	26	39	76	1172	30	26	1408	186
RTOR Reduction (vph)	0	0	75	0	18	0	0	1	0	0	7	0
Lane Group Flow (vph)	0	313	22	0	79	0	76	1201	0	26	1587	0
Confl. Peds. (#/hr)	1		8	8		1			10			3
Turn Type	Perm		Perm	Perm			Prot			Prot		
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8	4								
Actuated Green, G (s)		31.0	31.0		31.0		9.0	74.0		15.0	81.0	
Effective Green, g (s)		31.0	31.0		31.0		9.0	74.0		15.0	81.0	
Actuated g/C Ratio		0.23	0.23		0.23		0.07	0.55		0.11	0.60	
Clearance Time (s)		5.0	5.0		5.0		4.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0		2.0	6.0		6.0	3.0	
Lane Grp Cap (vph)		280	354		229		118	1930		197	2079	
v/s Ratio Prot							c0.04	0.34		0.01	c0.46	
v/s Ratio Perm		c0.26	0.01		0.08							
v/c Ratio		1.12	0.06		0.35		0.64	0.62		0.13	0.76	
Uniform Delay, d1		52.0	40.6		43.5		61.4	20.9		54.1	19.9	
Progression Factor		1.00	1.00		1.00		0.94	0.71		1.08	0.55	
Incremental Delay, d2		89.3	0.1		0.9		7.5	1.3		1.2	2.3	
Delay (s)		141.3	40.7		44.4		64.9	16.1		59.6	13.4	
Level of Service		F	D		D		E	B		E	B	
Approach Delay (s)		117.5			44.4			19.0			14.1	
Approach LOS		F			D			B			B	

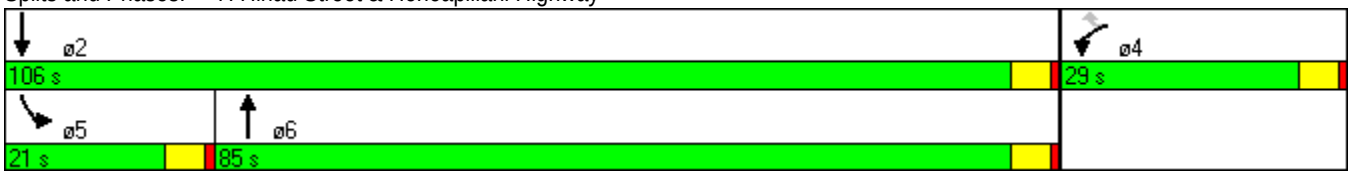
Intersection Summary			
HCM Average Control Delay	29.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	79.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations					
Volume (vph)	120	108	1373	104	1469
Turn Type		Perm		Prot	
Protected Phases	4		6	5	2
Permitted Phases		4			
Detector Phase	4	4	6	5	2
Switch Phase					
Minimum Initial (s)	7.0	7.0	15.0	4.0	15.0
Minimum Split (s)	29.0	29.0	23.0	9.0	20.0
Total Split (s)	29.0	29.0	85.0	21.0	106.0
Total Split (%)	21.5%	21.5%	63.0%	15.6%	78.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?					
Recall Mode	None	None	Max	None	C-Max

Intersection Summary
Cycle Length: 135
Actuated Cycle Length: 135
Offset: 87 (64%), Referenced to phase 2:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 7: Hinau Street & Honoapiilani Highway



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	120	108	1373	95	104	1469
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.98	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1551	3505		1770	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1551	3505		1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	130	117	1492	103	113	1597
RTOR Reduction (vph)	0	104	3	0	0	0
Lane Group Flow (vph)	130	13	1592	0	113	1597
Confl. Peds. (#/hr)		5				
Turn Type		Perm			Prot	
Protected Phases	4		6		5	2
Permitted Phases		4				
Actuated Green, G (s)	15.2	15.2	91.5		13.3	109.8
Effective Green, g (s)	15.2	15.2	91.5		13.3	109.8
Actuated g/C Ratio	0.11	0.11	0.68		0.10	0.81
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	5.0		3.0	5.0
Lane Grp Cap (vph)	199	175	2376		174	2878
v/s Ratio Prot	c0.07		c0.45		0.06	c0.45
v/s Ratio Perm		0.01				
v/c Ratio	0.65	0.08	0.67		0.65	0.55
Uniform Delay, d1	57.4	53.6	12.8		58.6	4.3
Progression Factor	1.00	1.00	0.57		0.71	2.00
Incremental Delay, d2	7.5	0.2	1.1		5.8	0.6
Delay (s)	64.9	53.8	8.4		47.7	9.1
Level of Service	E	D	A		D	A
Approach Delay (s)	59.6		8.4			11.7
Approach LOS	E		A			B

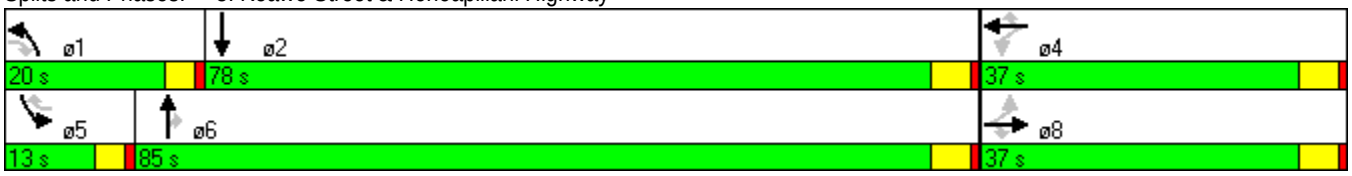
Intersection Summary			
HCM Average Control Delay	13.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Volume (vph)	51	36	79	148	25	213	85	1235	160	117	1436
Turn Type	Perm		custom	Perm		custom	Prot		Perm	Prot	
Protected Phases		8			4		1	6		5	2
Permitted Phases	8		8 1	4		4 5			6		
Detector Phase	8	8	8 1	4	4	4 5	1	6	6	5	2
Switch Phase											
Minimum Initial (s)	5.0	5.0		5.0	5.0		3.0	15.0	15.0	3.0	15.0
Minimum Split (s)	30.0	30.0		30.0	30.0		7.0	33.0	33.0	7.0	33.0
Total Split (s)	37.0	37.0	57.0	37.0	37.0	50.0	20.0	85.0	85.0	13.0	78.0
Total Split (%)	27.4%	27.4%	42.2%	27.4%	27.4%	37.0%	14.8%	63.0%	63.0%	9.6%	57.8%
Yellow Time (s)	4.0	4.0		4.0	4.0		3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	None		None	None		None	C-Max	C-Max	None	C-Max

Intersection Summary
Cycle Length: 135
Actuated Cycle Length: 135
Offset: 0 (0%), Referenced to phase 2:SBT and 6:NBT, Start of Green, Master Intersection
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 8: Keawe Street & Honoapiilani Highway



HCM Signalized Intersection Capacity Analysis
8: Keawe Street & Honoapiilani Highway

2/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	51	36	79	148	25	213	85	1235	160	117	1436	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	0.99		1.00	0.99	1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1809	1562		1784	1562	1770	3539	1562	1770	3520	
Flt Permitted		0.55	1.00		0.66	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1016	1562		1232	1562	1770	3539	1562	1770	3520	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	55	39	86	161	27	232	92	1342	174	127	1561	46
RTOR Reduction (vph)	0	0	15	0	0	37	0	0	33	0	1	0
Lane Group Flow (vph)	0	94	71	0	188	195	92	1342	141	127	1606	0
Confl. Peds. (#/hr)	1		1	1		1			1			7
Turn Type	Perm		custom	Perm		custom	Prot		Perm	Prot		
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8		8 1	4		4 5			6			
Actuated Green, G (s)		24.8	41.1		24.8	38.8	11.3	87.2	87.2	9.0	84.9	
Effective Green, g (s)		24.8	41.1		24.8	38.8	11.3	87.2	87.2	9.0	84.9	
Actuated g/C Ratio		0.18	0.30		0.18	0.29	0.08	0.65	0.65	0.07	0.63	
Clearance Time (s)		5.0			5.0		4.0	5.0	5.0	4.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	5.0	5.0	2.0	5.0	
Lane Grp Cap (vph)		187	476		226	449	148	2286	1009	118	2214	
v/s Ratio Prot							0.05	0.38		c0.07	c0.46	
v/s Ratio Perm		0.09	0.05		c0.15	0.12			0.09			
v/c Ratio		0.50	0.15		0.83	0.43	0.62	0.59	0.14	1.08	0.73	
Uniform Delay, d1		49.6	34.2		53.1	39.2	59.8	13.6	9.3	63.0	17.1	
Progression Factor		1.00	1.00		1.00	1.00	1.42	0.21	0.04	1.15	0.28	
Incremental Delay, d2		2.1	0.1		22.2	0.7	4.4	0.8	0.2	87.4	1.3	
Delay (s)		51.7	34.4		75.3	39.8	89.5	3.7	0.6	159.7	6.1	
Level of Service		D	C		E	D	F	A	A	F	A	
Approach Delay (s)		43.4			55.7			8.2			17.3	
Approach LOS		D			E			A			B	

Intersection Summary			
HCM Average Control Delay	18.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	135.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	563	16	37	483	18	70
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	612	17	40	525	20	76
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	351					
pX, platoon unblocked			0.88		0.88	0.88
vC, conflicting volume			629		1226	621
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			516		1190	506
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		89	85
cM capacity (veh/h)			929		175	501

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	629	565	96
Volume Left	0	40	20
Volume Right	17	0	76
cSH	1700	929	363
Volume to Capacity	0.37	0.04	0.26
Queue Length 95th (ft)	0	3	26
Control Delay (s)	0.0	1.2	18.4
Lane LOS		A	C
Approach Delay (s)	0.0	1.2	18.4
Approach LOS			C

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	64	545	442	7	13	34
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	70	592	480	8	14	37
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		737				
pX, platoon unblocked					0.91	
vC, conflicting volume	488				1216	484
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	488				1186	484
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				92	94
cM capacity (veh/h)	1075				177	583

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	662	488	14	37
Volume Left	70	0	14	0
Volume Right	0	8	0	37
cSH	1075	1700	177	583
Volume to Capacity	0.06	0.29	0.08	0.06
Queue Length 95th (ft)	5	0	6	5
Control Delay (s)	1.7	0.0	27.1	11.6
Lane LOS	A		D	B
Approach Delay (s)	1.7	0.0	15.9	
Approach LOS			C	

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	29	0	31	19	0	15
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	32	0	34	21	0	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						200
pX, platoon unblocked						
vC, conflicting volume	60	44			54	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	60	44			54	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	97	100			100	
cM capacity (veh/h)	946	1026			1551	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	32	54	16
Volume Left	32	0	0
Volume Right	0	21	0
cSH	946	1700	1551
Volume to Capacity	0.03	0.03	0.00
Queue Length 95th (ft)	3	0	0
Control Delay (s)	8.9	0.0	0.0
Lane LOS	A		
Approach Delay (s)	8.9	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
88: Keawe Street & LGate DW 1

2/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	136	109	88	8	154	4	87	11	14	2	15	131
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	148	118	96	9	167	4	95	12	15	2	16	142
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		359										
pX, platoon unblocked												
vC, conflicting volume	172			214			714	651	107	563	697	86
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	172			214			714	651	107	563	697	86
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	89			99			60	97	98	99	95	85
cM capacity (veh/h)	1403			1353			239	343	926	358	323	956

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	148	79	135	9	112	60	95	27	18	142
Volume Left	148	0	0	9	0	0	95	0	2	0
Volume Right	0	0	96	0	0	4	0	15	0	142
cSH	1403	1700	1700	1353	1700	1700	239	530	327	956
Volume to Capacity	0.11	0.05	0.08	0.01	0.07	0.04	0.40	0.05	0.06	0.15
Queue Length 95th (ft)	9	0	0	0	0	0	45	4	4	13
Control Delay (s)	7.9	0.0	0.0	7.7	0.0	0.0	29.6	12.2	16.7	9.4
Lane LOS	A			A			D	B	C	A
Approach Delay (s)	3.2			0.4			25.7		10.3	
Approach LOS							D		B	

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	33.4%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
89: Keawe Street & LGate DW 2

2/3/2010

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	39	94	0	0	132	13	5	1	1	4	0	46
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	42	102	0	0	143	14	5	1	1	4	0	50
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)									2			
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		608										
pX, platoon unblocked												
vC, conflicting volume	158			102			309	345	51	288	338	79
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	158			102			309	345	51	288	338	79
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			100			99	100	100	99	100	95
cM capacity (veh/h)	1420			1488			575	560	1006	626	565	966

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	42	68	34	0	96	62	8	4	50
Volume Left	42	0	0	0	0	0	5	4	0
Volume Right	0	0	0	0	0	14	1	0	50
cSH	1420	1700	1700	1700	1700	1700	668	626	966
Volume to Capacity	0.03	0.04	0.02	0.00	0.06	0.04	0.01	0.01	0.05
Queue Length 95th (ft)	2	0	0	0	0	0	1	1	4
Control Delay (s)	7.6	0.0	0.0	0.0	0.0	0.0	11.0	10.8	8.9
Lane LOS	A						B	B	A
Approach Delay (s)	2.2			0.0			11.0	9.1	
Approach LOS							B	A	

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	21.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	0	99	0	0	145	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	108	0	0	158	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1290					
pX, platoon unblocked						
vC, conflicting volume			108		54	54
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			108		54	54
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		83	100
cM capacity (veh/h)			1481		948	1002

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	0	108	0	0	0	158	0
Volume Left	0	0	0	0	0	158	0
Volume Right	0	108	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	948	1700
Volume to Capacity	0.00	0.06	0.00	0.00	0.00	0.17	0.00
Queue Length 95th (ft)	0	0	0	0	0	15	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	9.6	0.0
Lane LOS						A	A
Approach Delay (s)	0.0		0.0			9.6	
Approach LOS						A	

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	18.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	3	71	69	950	1103	18
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	77	75	1033	1199	20
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2391	1209	1218			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2391	1209	1218			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	65	87			
cM capacity (veh/h)	32	223	572			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	80	75	1033	1218
Volume Left	3	75	0	0
Volume Right	77	0	0	20
cSH	180	572	1700	1700
Volume to Capacity	0.45	0.13	0.61	0.72
Queue Length 95th (ft)	52	11	0	0
Control Delay (s)	40.2	12.2	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	40.2	0.8		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	70.4%	ICU Level of Service	C
Analysis Period (min)	15		

APPENDIX D

LEVEL OF SERVICE CALCULATIONS

- Base Year 2020 AM

HCM Unsignalized Intersection Capacity Analysis
1: Honoapiilani Hwy/Honoapiilani Highway & Aholo Street

12/28/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	5	35	5	130	10	990	10	55	900	15
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	5	5	5	38	5	141	11	1076	11	60	978	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2207	2204	986	2209	2217	1082	995			1076		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2207	2204	986	2209	2217	1082	995			1076		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	55	86	98	0	86	47	98			91		
cM capacity (veh/h)	12	40	300	26	39	265	696			648		

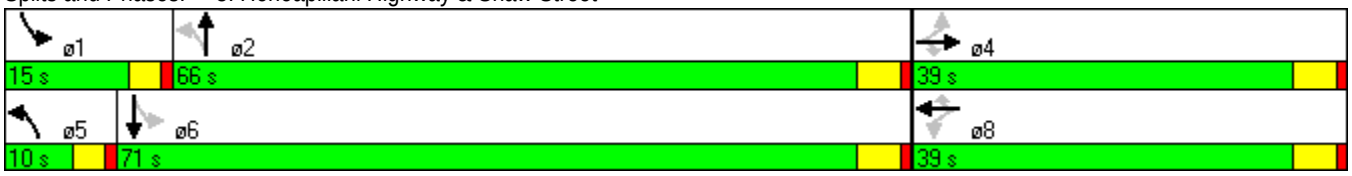
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	16	43	141	11	1087	60	995
Volume Left	5	38	0	11	0	60	0
Volume Right	5	0	141	0	11	0	16
cSH	27	27	265	696	1700	648	1700
Volume to Capacity	0.60	1.63	0.53	0.02	0.64	0.09	0.59
Queue Length 95th (ft)	47	130	72	1	0	8	0
Control Delay (s)	257.9	624.9	33.2	10.3	0.0	11.1	0.0
Lane LOS	F	F	D	B		B	
Approach Delay (s)	257.9	172.4		0.1		0.6	
Approach LOS	F	F					

Intersection Summary			
Average Delay	15.7		
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Volume (vph)	60	45	35	105	85	175	75	1085	95	860
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases		4			8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	4	4	4	8	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	20.0	3.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	7.0	25.0	7.0	25.0
Total Split (s)	39.0	39.0	39.0	39.0	39.0	39.0	10.0	66.0	15.0	71.0
Total Split (%)	32.5%	32.5%	32.5%	32.5%	32.5%	32.5%	8.3%	55.0%	12.5%	59.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0	5.0		5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 7 (6%), Referenced to phase 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 3: Honoapiilani Highway & Shaw Street



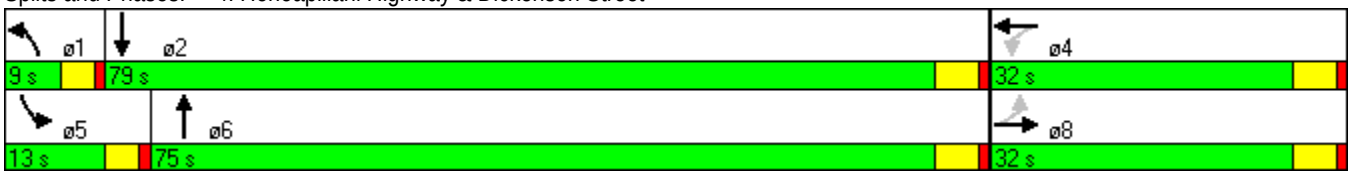
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	45	35	105	85	175	75	1085	50	95	860	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.97	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1811	1583		1813	1583	1770	3516		1770	3516	
Flt Permitted		0.51	1.00		0.71	1.00	0.25	1.00		0.16	1.00	
Satd. Flow (perm)		956	1583		1332	1583	475	3516		306	3516	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	49	38	114	92	190	82	1179	54	103	935	43
RTOR Reduction (vph)	0	0	31	0	0	94	0	2	0	0	2	0
Lane Group Flow (vph)	0	114	7	0	206	96	82	1231	0	103	976	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		23.2	23.2		23.2	23.2	80.9	76.2		84.7	78.1	
Effective Green, g (s)		23.2	23.2		23.2	23.2	80.9	76.2		84.7	78.1	
Actuated g/C Ratio		0.19	0.19		0.19	0.19	0.67	0.64		0.71	0.65	
Clearance Time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	2.0	5.0		2.0	5.0	
Lane Grp Cap (vph)		185	306		258	306	371	2233		297	2288	
v/s Ratio Prot							0.01	c0.35		c0.02	0.28	
v/s Ratio Perm		0.12	0.00		c0.15	0.06	0.14			0.23		
v/c Ratio		0.62	0.02		0.80	0.32	0.22	0.55		0.35	0.43	
Uniform Delay, d1		44.3	39.2		46.2	41.6	7.2	12.3		8.1	10.1	
Progression Factor		1.00	1.00		0.99	0.98	1.00	1.00		0.56	0.63	
Incremental Delay, d2		6.0	0.0		15.7	0.6	0.1	1.0		0.2	0.5	
Delay (s)		50.3	39.3		61.6	41.5	7.3	13.3		4.8	6.9	
Level of Service		D	D		E	D	A	B		A	A	
Approach Delay (s)		47.5			52.0			12.9			6.7	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM Average Control Delay	17.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	65.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	70	55	55	20	15	1360	60	970
Turn Type	Perm	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases		8		4	1	6	5	2
Permitted Phases	8		4					
Detector Phase	8	8	4	4	1	6	5	2
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	3.0	15.0	3.0	15.0
Minimum Split (s)	10.0	10.0	29.0	29.0	7.0	20.0	7.0	20.0
Total Split (s)	32.0	32.0	32.0	32.0	9.0	75.0	13.0	79.0
Total Split (%)	26.7%	26.7%	26.7%	26.7%	7.5%	62.5%	10.8%	65.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0		5.0	4.0	5.0	4.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 55 (46%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 4: Honoapiilani Highway & Dickenson Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	55	20	55	20	140	15	1360	75	60	970	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.91		1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1776			1652		1770	3500		1770	3487	
Flt Permitted		0.53			0.83		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		970			1397		1770	3500		1770	3487	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	60	22	60	22	152	16	1478	82	65	1054	114
RTOR Reduction (vph)	0	5	0	0	60	0	0	3	0	0	5	0
Lane Group Flow (vph)	0	153	0	0	174	0	16	1557	0	65	1163	0
Confl. Peds. (#/hr)	8		1	1		8			10			
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		19.9			19.9		2.0	79.5		6.6	84.1	
Effective Green, g (s)		19.9			19.9		2.0	79.5		6.6	84.1	
Actuated g/C Ratio		0.17			0.17		0.02	0.66		0.05	0.70	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		2.0			2.0		1.5	5.0		1.5	5.0	
Lane Grp Cap (vph)		161			232		30	2319		97	2444	
v/s Ratio Prot							0.01	c0.44		c0.04	0.33	
v/s Ratio Perm		c0.16			0.12							
v/c Ratio		0.95			0.75		0.53	0.67		0.67	0.48	
Uniform Delay, d1		49.6			47.7		58.5	12.3		55.6	8.1	
Progression Factor		1.00			0.97		1.19	0.54		0.88	0.73	
Incremental Delay, d2		55.7			11.0		7.9	1.4		10.6	0.5	
Delay (s)		105.3			57.4		77.5	8.1		59.7	6.4	
Level of Service		F			E		E	A		E	A	
Approach Delay (s)		105.3			57.4			8.8			9.2	
Approach LOS		F			E			A			A	

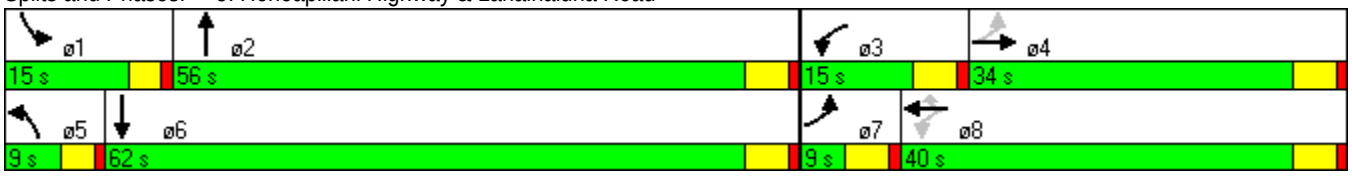
Intersection Summary			
HCM Average Control Delay	17.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	80	255	110	190	290	20	1385	150	990
Turn Type	pm+pt	NA	pm+pt	NA	Perm	Prot	NA	Prot	NA
Protected Phases	7	4	3	8		5	2	1	6
Permitted Phases	4		8		8				
Detector Phase	7	4	3	8	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	4.0	5.0	4.0	5.0	5.0	3.0	15.0	3.0	15.0
Minimum Split (s)	9.0	32.0	9.0	29.0	29.0	7.0	30.0	7.0	30.0
Total Split (s)	9.0	34.0	15.0	40.0	40.0	9.0	56.0	15.0	62.0
Total Split (%)	7.5%	28.3%	12.5%	33.3%	33.3%	7.5%	46.7%	12.5%	51.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 83 (69%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 140
Control Type: Actuated-Coordinated

Splits and Phases: 5: Honoapiilani Highway & Lahainaluna Road



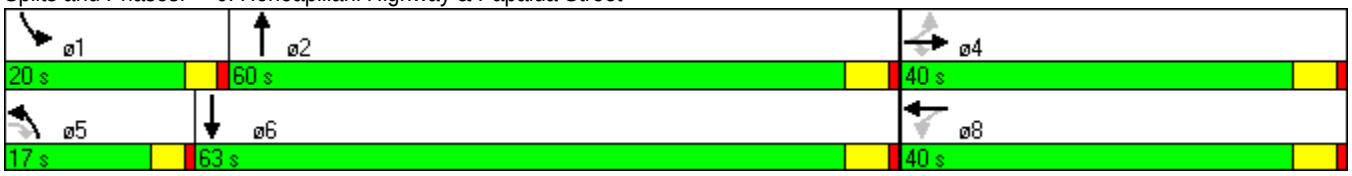
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	255	25	110	190	290	20	1385	75	150	990	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1829		1762	1863	1583	1770	3506		1770	3524	
Flt Permitted	0.44	1.00		0.26	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	817	1829		489	1863	1583	1770	3506		1770	3524	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	100%	100%	100%	150%	150%	200%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	87	277	27	179	310	630	22	1505	82	163	1076	27
RTOR Reduction (vph)	0	3	0	0	0	115	0	3	0	0	2	0
Lane Group Flow (vph)	87	301	0	179	310	515	22	1584	0	163	1101	0
Confl. Peds. (#/hr)			30	30					5			3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	33.1	29.1		44.0	35.0	35.0	3.0	51.0		11.0	59.0	
Effective Green, g (s)	33.1	29.1		44.0	35.0	35.0	3.0	51.0		11.0	59.0	
Actuated g/C Ratio	0.28	0.24		0.37	0.29	0.29	0.02	0.42		0.09	0.49	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	2.0		3.0	4.0	4.0	2.0	4.5		2.0	4.5	
Lane Grp Cap (vph)	257	444		284	543	462	44	1490		162	1733	
v/s Ratio Prot	0.01	0.16		c0.05	0.17		0.01	c0.45		c0.09	0.31	
v/s Ratio Perm	0.08			0.18		c0.33						
v/c Ratio	0.34	0.68		0.63	0.57	1.12	0.50	1.06		1.01	0.64	
Uniform Delay, d1	33.9	41.2		28.5	36.1	42.5	57.8	34.5		54.5	22.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.31	0.76		1.35	0.23	
Incremental Delay, d2	0.8	3.2		4.5	1.7	77.2	2.4	39.2		59.6	1.2	
Delay (s)	34.7	44.4		33.0	37.9	119.7	77.8	65.4		133.0	6.3	
Level of Service	C	D		C	D	F	E	E		F	A	
Approach Delay (s)		42.3			83.2			65.6			22.6	
Approach LOS		D			F			E			C	

Intersection Summary			
HCM Average Control Delay	55.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	93.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	235	65	70	45	35	80	1620	135	1145
Turn Type	Perm	NA	custom	Perm	NA	Prot	NA	Prot	NA
Protected Phases		4			8	5	2	1	6
Permitted Phases	4		4 5	8					
Detector Phase	4	4	4 5	8	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	15.0	15.0	5.0
Minimum Split (s)	29.0	29.0		29.0	29.0	9.0	23.0	20.0	23.0
Total Split (s)	40.0	40.0		40.0	40.0	17.0	60.0	20.0	63.0
Total Split (%)	33.3%	33.3%		33.3%	33.3%	14.2%	50.0%	16.7%	52.5%
Yellow Time (s)	4.0	4.0		4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0			5.0	4.0	5.0	4.0	5.0
Lead/Lag						Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None		None	None	None	C-Max	Max	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 63 (53%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated

Splits and Phases: 6: Honoapiilani Highway & Papalua Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	235	65	70	45	35	115	80	1620	70	135	1145	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.98		0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.92		1.00	0.99		1.00	0.99	
Flt Protected		0.96	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1791	1546		1679		1770	3510		1770	3483	
Flt Permitted		0.56	1.00		0.67		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1043	1546		1131		1770	3510		1770	3483	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	255	71	76	49	38	125	87	1761	76	147	1245	120
RTOR Reduction (vph)	0	0	19	0	43	0	0	3	0	0	6	0
Lane Group Flow (vph)	0	326	57	0	169	0	87	1834	0	147	1359	0
Confl. Peds. (#/hr)	1		8	8		1			10			3
Turn Type	Perm	NA	custom	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4 5	8								
Actuated Green, G (s)		35.0	50.0		35.0		10.0	55.0		16.0	61.0	
Effective Green, g (s)		35.0	50.0		35.0		10.0	55.0		16.0	61.0	
Actuated g/C Ratio		0.29	0.42		0.29		0.08	0.46		0.13	0.51	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	6.0		6.0	3.0	
Lane Grp Cap (vph)		304	644		330		148	1609		236	1771	
v/s Ratio Prot							0.05	c0.52		c0.08	0.39	
v/s Ratio Perm		c0.31	0.04		0.15							
v/c Ratio		1.07	0.09		0.51		0.59	1.14		0.62	0.77	
Uniform Delay, d1		42.5	21.2		35.4		53.0	32.5		49.1	23.8	
Progression Factor		1.00	1.00		0.96		0.92	1.10		0.95	0.64	
Incremental Delay, d2		72.2	0.1		1.3		0.3	63.8		10.5	2.9	
Delay (s)		114.7	21.3		35.5		49.4	99.6		57.2	18.1	
Level of Service		F	C		D		D	F		E	B	
Approach Delay (s)		97.0			35.5			97.3			21.9	
Approach LOS		F			D			F			C	

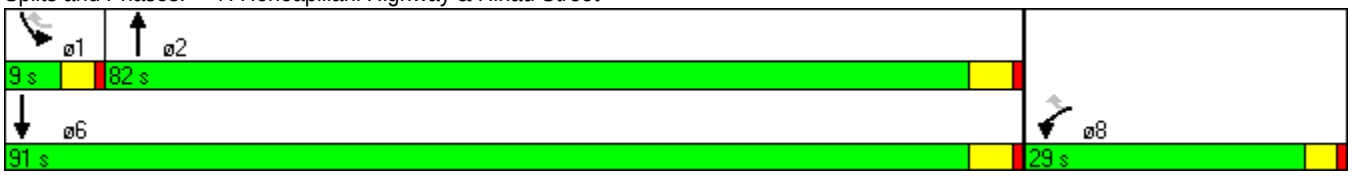
Intersection Summary			
HCM Average Control Delay	65.9	HCM Level of Service	E
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	104.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations					
Volume (vph)	45	65	1815	50	1440
Turn Type	NA	custom	NA	Prot	NA
Protected Phases	8		2	1	6
Permitted Phases		8 1			
Detector Phase	8	8 1	2	1	6
Switch Phase					
Minimum Initial (s)	7.0		15.0	4.0	15.0
Minimum Split (s)	29.0		23.0	9.0	20.0
Total Split (s)	29.0		82.0	9.0	91.0
Total Split (%)	24.2%		68.3%	7.5%	75.8%
Yellow Time (s)	3.0		4.0	3.0	4.0
All-Red Time (s)	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0		5.0	4.0	5.0
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?					
Recall Mode	None		C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 87 (73%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

Splits and Phases: 7: Honoapiilani Highway & Hinau Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	45	65	1815	70	50	1440
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0		4.0	5.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.98	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1553	3520		1770	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1553	3520		1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	71	1973	76	54	1565
RTOR Reduction (vph)	0	14	1	0	0	0
Lane Group Flow (vph)	49	57	2048	0	54	1565
Confl. Peds. (#/hr)		5				
Turn Type	NA	custom	NA		Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8 1				
Actuated Green, G (s)	8.2	17.2	93.8		5.0	102.8
Effective Green, g (s)	8.2	17.2	93.8		5.0	102.8
Actuated g/C Ratio	0.07	0.14	0.78		0.04	0.86
Clearance Time (s)	4.0		5.0		4.0	5.0
Vehicle Extension (s)	3.0		5.0		3.0	5.0
Lane Grp Cap (vph)	121	223	2751		74	3032
v/s Ratio Prot	c0.03		c0.58		c0.03	0.44
v/s Ratio Perm		0.04				
v/c Ratio	0.40	0.26	0.74		0.73	0.52
Uniform Delay, d1	53.6	45.7	6.8		56.8	2.2
Progression Factor	1.00	1.00	0.46		0.66	1.90
Incremental Delay, d2	2.2	0.6	0.2		20.4	0.4
Delay (s)	55.8	46.3	3.3		57.9	4.6
Level of Service	E	D	A		E	A
Approach Delay (s)	50.2		3.3			6.4
Approach LOS	D		A			A

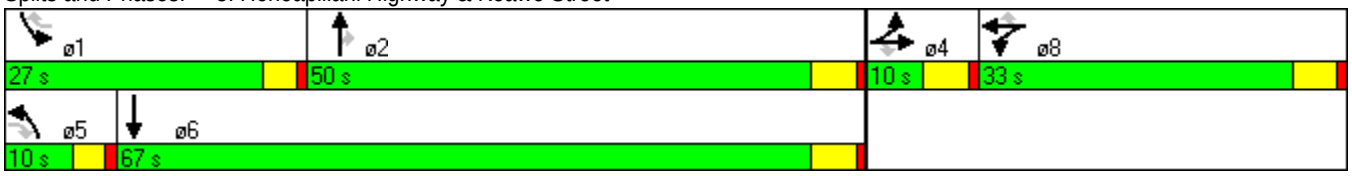
Intersection Summary			
HCM Average Control Delay	6.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Volume (vph)	50	60	140	45	520	50	1680	155	555	1385
Turn Type	NA	custom	Split	NA	custom	Prot	NA	Perm	Prot	NA
Protected Phases	4		8	8		5	2		1	6
Permitted Phases		4 5			8 1			2		
Detector Phase	4	4 5	8	8	8 1	5	2	2	1	6
Switch Phase										
Minimum Initial (s)	5.0		5.0	5.0		3.0	15.0	15.0	3.0	15.0
Minimum Split (s)	10.0		33.0	33.0		7.0	26.0	26.0	7.0	26.0
Total Split (s)	10.0		33.0	33.0		10.0	50.0	50.0	27.0	67.0
Total Split (%)	8.3%		27.5%	27.5%		8.3%	41.7%	41.7%	22.5%	55.8%
Yellow Time (s)	4.0		4.0	4.0		3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		-1.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		4.0	5.0		4.0	5.0	5.0	4.0	5.0
Lead/Lag						Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None		None	None		None	C-Max	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 1 (1%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated

Splits and Phases: 8: Honoapiilani Highway & Keawe Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	50	60	140	45	520	50	1680	155	555	1385	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1825	1559	1770	1863	1562	1770	3539	1562	1770	3527	
Flt Permitted		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1825	1559	1770	1863	1562	1770	3539	1562	1770	3527	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	54	65	152	49	565	54	1826	168	603	1505	27
RTOR Reduction (vph)	0	0	55	0	0	18	0	0	31	0	1	0
Lane Group Flow (vph)	0	92	10	152	49	547	54	1826	137	603	1531	0
Confl. Peds. (#/hr)	1		1	1		1			1			7
Turn Type	Split	NA	custom	Split	NA	custom	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4 5			8 1			2			
Actuated Green, G (s)		5.0	9.8	27.7	27.7	55.7	4.8	45.3	45.3	23.0	63.5	
Effective Green, g (s)		5.0	9.8	28.7	27.7	55.7	4.8	45.3	45.3	23.0	63.5	
Actuated g/C Ratio		0.04	0.08	0.24	0.23	0.46	0.04	0.38	0.38	0.19	0.53	
Clearance Time (s)		5.0		5.0	5.0		4.0	5.0	5.0	4.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		2.0	5.0	5.0	2.0	5.0	
Lane Grp Cap (vph)		76	127	423	430	725	71	1336	590	339	1866	
v/s Ratio Prot		c0.05		0.09	0.03		0.03	c0.52		c0.34	0.43	
v/s Ratio Perm			0.01			c0.35			0.09			
v/c Ratio		1.21	0.08	0.36	0.11	0.75	0.76	1.37	0.23	1.78	0.82	
Uniform Delay, d1		57.5	50.9	38.0	36.5	26.5	57.0	37.4	25.5	48.5	23.5	
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.20	0.63	0.55	1.00	1.00	
Incremental Delay, d2		170.4	0.3	0.5	0.1	4.5	24.9	168.4	0.6	362.2	4.2	
Delay (s)		227.9	51.2	38.5	36.6	31.0	93.2	191.9	14.7	410.7	27.7	
Level of Service		F	D	D	D	C	F	F	B	F	C	
Approach Delay (s)		154.8			32.8			174.8			135.9	
Approach LOS		F			C			F			F	

Intersection Summary			
HCM Average Control Delay	136.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.30		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	103.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	465	20	60	665	5	10	5	110	5	5	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	505	22	65	1446	5	11	5	120	5	5	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		351										
pX, platoon unblocked				0.86			0.86	0.86	0.86	0.86	0.86	
vC, conflicting volume	1451			527			2109	2098	516	2217	2106	1448
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1451			369			2207	2195	357	2334	2204	1448
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			94			49	85	80	64	85	93
cM capacity (veh/h)	467			1023			21	36	591	15	36	161

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	527	1516	136	11	11
Volume Left	0	65	11	5	0
Volume Right	22	5	120	0	11
cSH	1700	1023	158	21	161
Volume to Capacity	0.31	0.06	0.86	0.52	0.07
Queue Length 95th (ft)	0	5	147	37	5
Control Delay (s)	0.0	4.0	95.1	294.5	29.0
Lane LOS		A	F	F	D
Approach Delay (s)	0.0	4.0	95.1	161.7	
Approach LOS			F	F	

Intersection Summary			
Average Delay	10.2		
Intersection Capacity Utilization	123.6%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	60	445	585	20	25	145
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	65	484	954	22	27	158
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		737				
pX, platoon unblocked					0.93	
vC, conflicting volume	976				1579	965
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	976				1585	965
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				73	49
cM capacity (veh/h)	707				101	309

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	549	976	27	158
Volume Left	65	0	27	0
Volume Right	0	22	0	158
cSH	707	1700	101	309
Volume to Capacity	0.09	0.57	0.27	0.51
Queue Length 95th (ft)	8	0	25	68
Control Delay (s)	2.5	0.0	53.4	28.1
Lane LOS	A		F	D
Approach Delay (s)	2.5	0.0	31.8	
Approach LOS			D	

Intersection Summary			
Average Delay	4.2		
Intersection Capacity Utilization	83.9%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	60	590	540	55	120	85
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	65	641	587	60	130	92
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		1002				
pX, platoon unblocked						
vC, conflicting volume	647				1068	323
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	647				1068	323
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				35	86
cM capacity (veh/h)	935				202	672

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	65	321	321	391	255	130	92
Volume Left	65	0	0	0	0	130	0
Volume Right	0	0	0	0	60	0	92
cSH	935	1700	1700	1700	1700	202	672
Volume to Capacity	0.07	0.19	0.19	0.23	0.15	0.65	0.14
Queue Length 95th (ft)	6	0	0	0	0	96	12
Control Delay (s)	9.1	0.0	0.0	0.0	0.0	50.7	11.2
Lane LOS	A					F	B
Approach Delay (s)	0.8			0.0		34.4	
Approach LOS						D	

Intersection Summary			
Average Delay	5.2		
Intersection Capacity Utilization	36.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	5	10	75	5	5	15	45	20	5	80	65
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	22	5	11	82	5	5	16	49	22	5	87	71
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	234	236	122	239	261	60	158			71		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	234	236	122	239	261	60	158			71		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	99	99	88	99	99	99			100		
cM capacity (veh/h)	704	654	929	694	634	1006	1422			1530		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	22	16	92	87	163
Volume Left	22	0	82	16	5
Volume Right	0	11	5	22	71
cSH	704	815	703	1422	1530
Volume to Capacity	0.03	0.02	0.13	0.01	0.00
Queue Length 95th (ft)	2	2	11	1	0
Control Delay (s)	10.3	9.5	10.9	1.5	0.3
Lane LOS	B	A	B	A	A
Approach Delay (s)	9.9		10.9	1.5	0.3
Approach LOS	A		B		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	28.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	70	10	0	175	0	20	0	0	0	0	60
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	22	76	11	0	190	0	22	0	0	0	0	65
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	171	76	33	92	109	0	65			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	171	76	33	92	109	0	65			0		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	91	99	100	75	100	99			100		
cM capacity (veh/h)	635	803	1041	809	770	1085	1537			1623		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	22	87	190	22	0	0	65
Volume Left	22	0	0	22	0	0	0
Volume Right	0	11	0	0	0	0	65
cSH	635	826	770	1537	1700	1700	1700
Volume to Capacity	0.03	0.11	0.25	0.01	0.00	0.00	0.04
Queue Length 95th (ft)	3	9	24	1	0	0	0
Control Delay (s)	10.9	9.9	11.2	7.4	0.0	0.0	0.0
Lane LOS	B	A	B	A			
Approach Delay (s)	10.1		11.2	7.4		0.0	
Approach LOS	B		B				

Intersection Summary			
Average Delay	8.8		
Intersection Capacity Utilization	31.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	40	65	1015	860	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	43	71	1103	935	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2185	940	946			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2185	940	946			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	76	86	90			
cM capacity (veh/h)	45	320	726			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	54	71	1103	946
Volume Left	11	71	0	0
Volume Right	43	0	0	11
cSH	145	726	1700	1700
Volume to Capacity	0.38	0.10	0.65	0.56
Queue Length 95th (ft)	40	8	0	0
Control Delay (s)	44.1	10.5	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	44.1	0.6		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	45	655	30	10	655	15	20	5	5	5	5	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	49	712	33	11	712	16	22	5	5	5	5	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		419										
pX, platoon unblocked												
vC, conflicting volume	728			745			1239	1576	372	1204	1584	364
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	728			745			1239	1576	372	1204	1584	364
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			99			81	95	99	96	95	95
cM capacity (veh/h)	871			859			114	101	625	126	100	633

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	49	475	270	11	475	254	22	11	11	33
Volume Left	49	0	0	11	0	0	22	0	5	0
Volume Right	0	0	33	0	0	16	0	5	0	33
cSH	871	1700	1700	859	1700	1700	114	174	112	633
Volume to Capacity	0.06	0.28	0.16	0.01	0.28	0.15	0.19	0.06	0.10	0.05
Queue Length 95th (ft)	4	0	0	1	0	0	17	5	8	4
Control Delay (s)	9.4	0.0	0.0	9.2	0.0	0.0	44.1	27.0	40.7	11.0
Lane LOS	A			A			E	D	E	B
Approach Delay (s)	0.6			0.1			38.4		18.4	
Approach LOS							E		C	

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	630	10	5	625	10	35	0	10	5	0	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	27	685	11	5	679	11	38	0	11	5	0	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		665										
pX, platoon unblocked												
vC, conflicting volume	690			696			1117	1446	348	1103	1446	345
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	690			696			1117	1446	348	1103	1446	345
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			99			75	100	98	97	100	97
cM capacity (veh/h)	900			896			152	126	648	159	126	651

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	27	457	239	5	453	237	38	11	5	22
Volume Left	27	0	0	5	0	0	38	0	5	0
Volume Right	0	0	11	0	0	11	0	11	0	22
cSH	900	1700	1700	896	1700	1700	152	648	159	651
Volume to Capacity	0.03	0.27	0.14	0.01	0.27	0.14	0.25	0.02	0.03	0.03
Queue Length 95th (ft)	2	0	0	0	0	0	23	1	3	3
Control Delay (s)	9.1	0.0	0.0	9.0	0.0	0.0	36.3	10.6	28.5	10.7
Lane LOS	A			A			E	B	D	B
Approach Delay (s)	0.3			0.1			30.6		14.3	
Approach LOS							D		B	

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	36.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	485	230	30	510	100	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	527	250	33	554	109	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1264					
pX, platoon unblocked						
vC, conflicting volume			777		995	389
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			777		995	389
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		53	97
cM capacity (veh/h)			835		232	610

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	351	426	33	277	277	109	16
Volume Left	0	0	33	0	0	109	0
Volume Right	0	250	0	0	0	0	16
cSH	1700	1700	835	1700	1700	232	610
Volume to Capacity	0.21	0.25	0.04	0.16	0.16	0.47	0.03
Queue Length 95th (ft)	0	0	3	0	0	57	2
Control Delay (s)	0.0	0.0	9.5	0.0	0.0	33.4	11.1
Lane LOS			A			D	B
Approach Delay (s)	0.0		0.5			30.5	
Approach LOS						D	

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	37.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	40	50	5	5	30	20	10	5	60	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	5	5	43	54	5	5	33	22	11	5	65	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			4									
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	179	177	68	196	174	27	71			33		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	179	177	68	196	174	27	71			33		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	99	96	92	99	99	98			100		
cM capacity (veh/h)	759	699	995	712	702	1048	1530			1579		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	54	65	65	76
Volume Left	5	54	33	5
Volume Right	43	5	11	5
cSH	1244	731	1530	1579
Volume to Capacity	0.04	0.09	0.02	0.00
Queue Length 95th (ft)	3	7	2	0
Control Delay (s)	9.0	10.4	3.8	0.5
Lane LOS	A	B	A	A
Approach Delay (s)	9.0	10.4	3.8	0.5
Approach LOS	A	B		

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	26.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	5	5	5	5	5	5	1345	5	0	1045	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	5	5	5	5	5	5	1462	5	0	1136	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1283				
pX, platoon unblocked	0.81	0.81		0.81	0.81	0.81				0.81		
vC, conflicting volume	1889	2617	571	2052	2617	734	1141			1467		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1622	2525	571	1824	2525	190	1141			1100		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	75	99	82	75	99	99			100		
cM capacity (veh/h)	44	22	464	31	22	661	608			509		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	11	16	5	975	493	757	384
Volume Left	0	5	5	0	0	0	0
Volume Right	5	5	0	0	5	0	5
cSH	42	38	608	1700	1700	1700	1700
Volume to Capacity	0.26	0.43	0.01	0.57	0.29	0.45	0.23
Queue Length 95th (ft)	22	37	1	0	0	0	0
Control Delay (s)	119.2	160.2	11.0	0.0	0.0	0.0	0.0
Lane LOS	F	F	B				
Approach Delay (s)	119.2	160.2	0.0			0.0	
Approach LOS	F	F					

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX D

LEVEL OF SERVICE CALCULATIONS

- Base Year 2020 PM

HCM Unsignalized Intersection Capacity Analysis
1: Honoapiilani Hwy/Honoapiilani Highway & Aholo Street

12/29/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	20	20	5	80	25	1145	40	105	1555	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	5	5	22	22	5	87	27	1245	43	114	1690	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3226	3223	1696	3264	3250	1266	1701			1245		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3226	3223	1696	3264	3250	1266	1701			1245		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	24	81	0	21	58	93			80		
cM capacity (veh/h)	1	7	115	1	7	206	374			559		

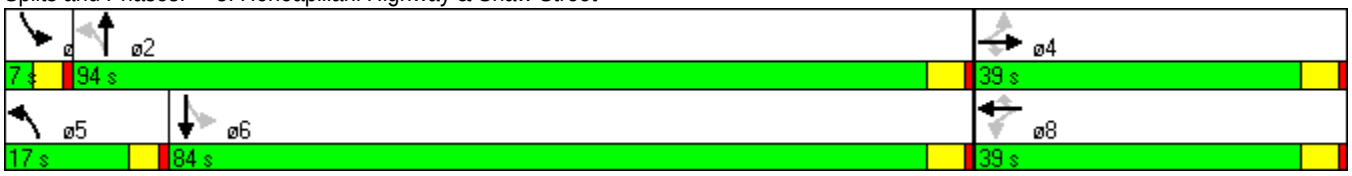
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	33	27	87	27	1288	114	1701
Volume Left	5	22	0	27	0	114	0
Volume Right	22	0	87	0	43	0	11
cSH	5	2	206	374	1700	559	1700
Volume to Capacity	6.73	16.92	0.42	0.07	0.76	0.20	1.00
Queue Length 95th (ft)	Err	Err	48	6	0	19	0
Control Delay (s)	Err	Err	34.6	15.4	0.0	13.1	0.0
Lane LOS	F	F	D	C		B	
Approach Delay (s)	Err	2407.1		0.3		0.8	
Approach LOS	F	F					

Intersection Summary			
Average Delay	183.9		
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Volume (vph)	100	115	145	90	85	195	120	995	205	1420
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases		4			8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	4	4	4	8	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	20.0	3.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	7.0	25.0	7.0	25.0
Total Split (s)	39.0	39.0	39.0	39.0	39.0	39.0	17.0	94.0	7.0	84.0
Total Split (%)	27.9%	27.9%	27.9%	27.9%	27.9%	27.9%	12.1%	67.1%	5.0%	60.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0	5.0		5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 48 (34%), Referenced to phase 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 3: Honoapiilani Highway & Shaw Street



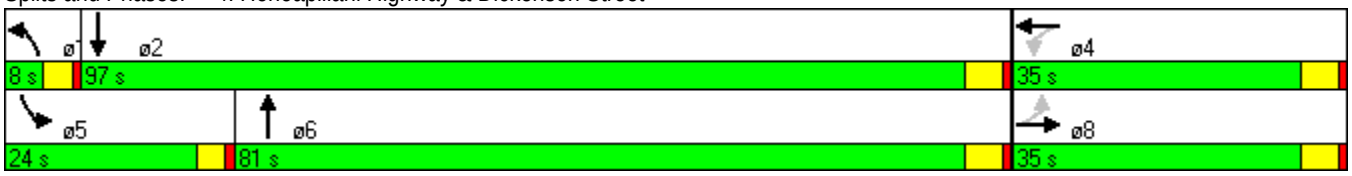
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	115	145	90	85	195	120	995	115	205	1420	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.98		1.00	0.99	
Flt Protected		0.98	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1820	1583		1816	1583	1770	3484		1770	3516	
Flt Permitted		0.58	1.00		0.47	1.00	0.07	1.00		0.19	1.00	
Satd. Flow (perm)		1072	1583		873	1583	130	3484		355	3516	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	125	158	98	92	212	130	1082	125	223	1543	71
RTOR Reduction (vph)	0	0	89	0	0	88	0	6	0	0	2	0
Lane Group Flow (vph)	0	234	69	0	190	124	130	1201	0	223	1612	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		32.0	32.0		32.0	32.0	98.0	91.0		87.6	84.6	
Effective Green, g (s)		32.0	32.0		32.0	32.0	98.0	91.0		87.6	84.6	
Actuated g/C Ratio		0.23	0.23		0.23	0.23	0.70	0.65		0.63	0.60	
Clearance Time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	2.0	5.0		2.0	5.0	
Lane Grp Cap (vph)		245	362		200	362	201	2265		252	2125	
v/s Ratio Prot							c0.04	0.34		0.02	0.46	
v/s Ratio Perm		c0.22	0.04		0.22	0.08	0.41			c0.53		
v/c Ratio		0.96	0.19		0.95	0.34	0.65	0.53		0.88	0.76	
Uniform Delay, d1		53.3	43.6		53.2	45.2	22.1	13.1		23.3	20.2	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.56	0.24	
Incremental Delay, d2		44.7	0.3		48.8	0.6	5.3	0.9		18.6	1.5	
Delay (s)		98.0	43.8		102.0	45.8	27.4	14.0		31.7	6.4	
Level of Service		F	D		F	D	C	B		C	A	
Approach Delay (s)		76.2			72.3			15.3			9.5	
Approach LOS		E			E			B			A	

Intersection Summary			
HCM Average Control Delay	24.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	125	45	45	20	25	1080	165	1570
Turn Type	Perm	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases		8		4	1	6	5	2
Permitted Phases	8		4					
Detector Phase	8	8	4	4	1	6	5	2
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	3.0	15.0	3.0	15.0
Minimum Split (s)	10.0	10.0	29.0	29.0	7.0	20.0	7.0	20.0
Total Split (s)	35.0	35.0	35.0	35.0	8.0	81.0	24.0	97.0
Total Split (%)	25.0%	25.0%	25.0%	25.0%	5.7%	57.9%	17.1%	69.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0		5.0	4.0	5.0	4.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 137 (98%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 4: Honoapiilani Highway & Dickenson Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	125	45	40	45	20	120	25	1080	75	165	1570	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.97			0.91		1.00	0.99		1.00	0.98	
Flt Protected		0.97			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1750			1651		1770	3489		1770	3479	
Flt Permitted		0.57			0.87		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1031			1451		1770	3489		1770	3479	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	136	49	43	49	22	130	27	1174	82	179	1707	217
RTOR Reduction (vph)	0	6	0	0	47	0	0	3	0	0	7	0
Lane Group Flow (vph)	0	222	0	0	154	0	27	1253	0	179	1917	0
Confl. Peds. (#/hr)	8		1	1		8			10			
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		30.0			30.0		2.4	79.0		17.0	93.6	
Effective Green, g (s)		30.0			30.0		2.4	79.0		17.0	93.6	
Actuated g/C Ratio		0.21			0.21		0.02	0.56		0.12	0.67	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		2.0			2.0		1.5	5.0		1.5	5.0	
Lane Grp Cap (vph)		221			311		30	1969		215	2326	
v/s Ratio Prot							0.02	0.36		c0.10	c0.55	
v/s Ratio Perm		c0.22			0.11							
v/c Ratio		1.00			0.49		0.90	0.64		0.83	0.82	
Uniform Delay, d1		55.0			48.3		68.7	20.7		60.1	17.1	
Progression Factor		1.00			1.09		0.92	1.26		1.37	0.14	
Incremental Delay, d2		61.4			0.5		109.3	1.3		8.1	1.1	
Delay (s)		116.4			53.0		172.5	27.4		90.7	3.5	
Level of Service		F			D		F	C		F	A	
Approach Delay (s)		116.4			53.0			30.5			11.0	
Approach LOS		F			D			C			B	

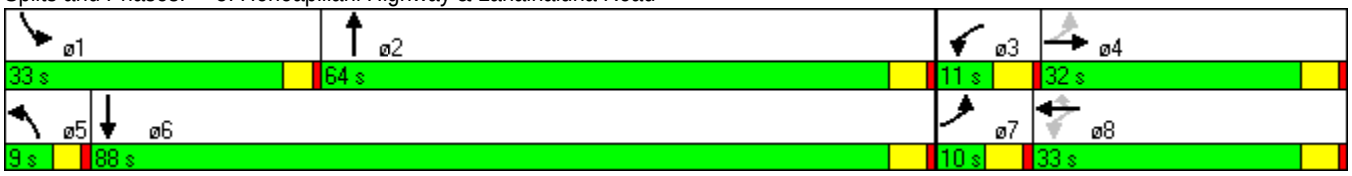
Intersection Summary			
HCM Average Control Delay	26.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	90.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	175	270	105	150	285	50	1250	240	1765
Turn Type	pm+pt	NA	pm+pt	NA	Perm	Prot	NA	Prot	NA
Protected Phases	7	4	3	8		5	2	1	6
Permitted Phases	4		8		8				
Detector Phase	7	4	3	8	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	4.0	5.0	4.0	5.0	5.0	3.0	15.0	3.0	15.0
Minimum Split (s)	9.0	32.0	9.0	29.0	29.0	7.0	30.0	7.0	30.0
Total Split (s)	10.0	32.0	11.0	33.0	33.0	9.0	64.0	33.0	88.0
Total Split (%)	7.1%	22.9%	7.9%	23.6%	23.6%	6.4%	45.7%	23.6%	62.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated

Splits and Phases: 5: Honoapiilani Highway & Lahainaluna Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	175	270	55	105	150	285	50	1250	70	240	1765	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1796		1767	1863	1583	1770	3504		1770	3510	
Flt Permitted	0.53	1.00		0.14	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	986	1796		266	1863	1583	1770	3504		1770	3510	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	190	293	60	114	163	310	54	1359	76	261	1918	92
RTOR Reduction (vph)	0	6	0	0	0	245	0	3	0	0	2	0
Lane Group Flow (vph)	190	347	0	114	163	65	54	1432	0	261	2008	0
Confl. Peds. (#/hr)			30	30					5			3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	32.0	27.0		34.0	28.0	28.0	5.0	63.9		24.1	83.0	
Effective Green, g (s)	32.0	27.0		34.0	28.0	28.0	5.0	63.9		24.1	83.0	
Actuated g/C Ratio	0.23	0.19		0.24	0.20	0.20	0.04	0.46		0.17	0.59	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	2.0		3.0	4.0	4.0	2.0	4.5		2.0	4.5	
Lane Grp Cap (vph)	253	346		129	373	317	63	1599		305	2081	
v/s Ratio Prot	0.03	c0.19		c0.04	0.09		0.03	0.41		c0.15	c0.57	
v/s Ratio Perm	0.14			0.18		0.04						
v/c Ratio	0.75	1.00		0.88	0.44	0.21	0.86	0.90		0.86	0.96	
Uniform Delay, d1	50.7	56.5		48.5	49.1	46.7	67.1	35.0		56.3	27.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.97	0.52		1.30	0.27	
Incremental Delay, d2	11.8	49.4		45.7	1.1	0.4	52.5	6.5		2.2	1.9	
Delay (s)	62.5	105.9		94.2	50.2	47.2	117.6	24.7		75.2	9.1	
Level of Service	E	F		F	D	D	F	C		E	A	
Approach Delay (s)		90.7			57.1			28.1			16.7	
Approach LOS		F			E			C			B	

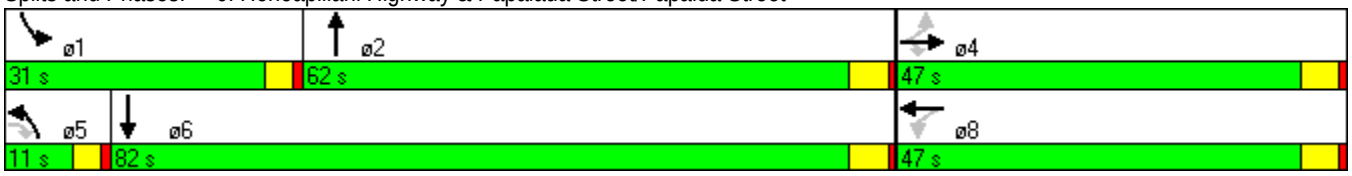
Intersection Summary			
HCM Average Control Delay	33.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	95.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	300	105	85	165	150	70	1500	390	1780
Turn Type	Perm	NA	custom	Perm	NA	Prot	NA	Prot	NA
Protected Phases		4			8	5	2	1	6
Permitted Phases	4		4 5	8					
Detector Phase	4	4	4 5	8	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	15.0	15.0	5.0
Minimum Split (s)	29.0	29.0		29.0	29.0	9.0	23.0	20.0	23.0
Total Split (s)	47.0	47.0		47.0	47.0	11.0	62.0	31.0	82.0
Total Split (%)	33.6%	33.6%		33.6%	33.6%	7.9%	44.3%	22.1%	58.6%
Yellow Time (s)	4.0	4.0		4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0			0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0			5.0	4.0	5.0	4.0	5.0
Lead/Lag						Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None		None	None	None	C-Max	Max	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 127 (91%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated

Splits and Phases: 6: Honoapiilani Highway & Papalaua Street/Papalua Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	300	105	85	165	150	305	70	1500	165	390	1780	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00	0.97		0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes		1.00	1.00		1.00		1.00	1.00		1.00	1.00	
Frt		1.00	0.85		0.93		1.00	0.99		1.00	0.98	
Flt Protected		0.96	1.00		0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1796	1543		1704		1770	3467		1770	3472	
Flt Permitted		0.35	1.00		0.28		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		643	1543		480		1770	3467		1770	3472	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	326	114	92	179	163	332	76	1630	179	424	1935	228
RTOR Reduction (vph)	0	0	5	0	25	0	0	6	0	0	6	0
Lane Group Flow (vph)	0	440	87	0	649	0	76	1803	0	424	2157	0
Confl. Peds. (#/hr)	1		8	8		1			10			3
Turn Type	Perm	NA	custom	Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4 5	8								
Actuated Green, G (s)		42.0	54.0		42.0		7.0	57.0		27.0	77.0	
Effective Green, g (s)		42.0	54.0		42.0		7.0	57.0		27.0	77.0	
Actuated g/C Ratio		0.30	0.39		0.30		0.05	0.41		0.19	0.55	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0			3.0		2.0	6.0		6.0	3.0	
Lane Grp Cap (vph)		193	595		144		89	1412		341	1910	
v/s Ratio Prot							0.04	c0.52		c0.24	0.62	
v/s Ratio Perm		0.68	0.06		c1.35							
v/c Ratio		2.28	0.15		4.51		0.85	1.28		1.24	1.13	
Uniform Delay, d1		49.0	28.0		49.0		66.0	41.5		56.5	31.5	
Progression Factor		1.00	1.00		0.99		0.88	0.84		0.89	1.03	
Incremental Delay, d2		592.1	0.1		1593.4		32.2	127.8		121.6	61.9	
Delay (s)		641.1	28.1		1641.7		90.0	162.7		171.7	94.4	
Level of Service		F	C		F		F	F		F	F	
Approach Delay (s)		535.1			1641.7			159.8			107.1	
Approach LOS		F			F			F			F	

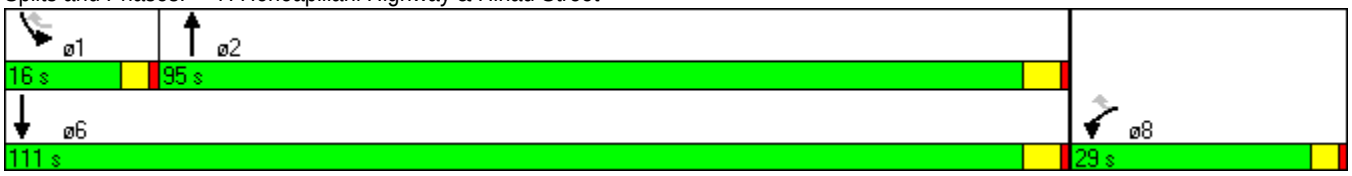
Intersection Summary			
HCM Average Control Delay	346.8	HCM Level of Service	F
HCM Volume to Capacity ratio	2.35		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	132.8%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations					
Volume (vph)	130	125	2050	135	2330
Turn Type	NA	custom	NA	Prot	NA
Protected Phases	8		2	1	6
Permitted Phases		8 1			
Detector Phase	8	8 1	2	1	6
Switch Phase					
Minimum Initial (s)	7.0		15.0	4.0	15.0
Minimum Split (s)	29.0		23.0	9.0	20.0
Total Split (s)	29.0		95.0	16.0	111.0
Total Split (%)	20.7%		67.9%	11.4%	79.3%
Yellow Time (s)	3.0		4.0	3.0	4.0
All-Red Time (s)	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0		5.0	4.0	5.0
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?					
Recall Mode	None		C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 26 (19%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated

Splits and Phases: 7: Honoapiilani Highway & Hinau Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	130	125	2050	110	135	2330
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0		4.0	5.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.98	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1551	3512		1770	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1551	3512		1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	136	2228	120	147	2533
RTOR Reduction (vph)	0	7	2	0	0	0
Lane Group Flow (vph)	141	129	2346	0	147	2533
Confl. Peds. (#/hr)		5				
Turn Type	NA	custom	NA		Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8 1				
Actuated Green, G (s)	16.4	32.4	98.6		12.0	114.6
Effective Green, g (s)	16.4	32.4	98.6		12.0	114.6
Actuated g/C Ratio	0.12	0.23	0.70		0.09	0.82
Clearance Time (s)	4.0		5.0		4.0	5.0
Vehicle Extension (s)	3.0		5.0		3.0	5.0
Lane Grp Cap (vph)	207	359	2473		152	2897
v/s Ratio Prot	c0.08		c0.67		0.08	c0.72
v/s Ratio Perm		0.08				
v/c Ratio	0.68	0.36	0.95		0.97	0.87
Uniform Delay, d1	59.3	45.1	18.4		63.8	8.1
Progression Factor	1.00	1.00	0.51		0.98	0.99
Incremental Delay, d2	8.9	0.6	1.1		14.7	0.4
Delay (s)	68.2	45.7	10.6		77.5	8.4
Level of Service	E	D	B		E	A
Approach Delay (s)	57.2		10.6			12.2
Approach LOS	E		B			B

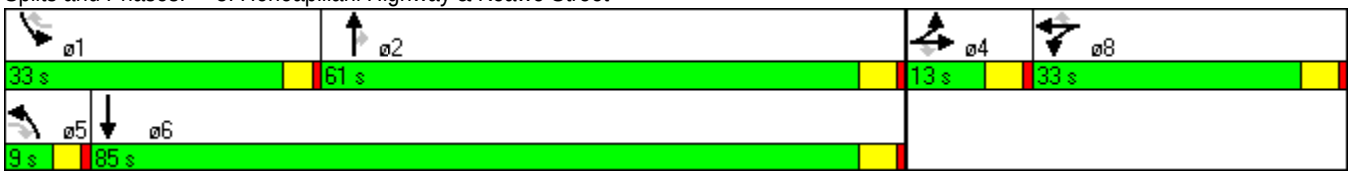
Intersection Summary			
HCM Average Control Delay	13.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	87.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Volume (vph)	90	95	255	55	735	100	1910	260	615	2105
Turn Type	NA	custom	Split	NA	custom	Prot	NA	Perm	Prot	NA
Protected Phases	4		8	8		5	2		1	6
Permitted Phases		4 5			8 1			2		
Detector Phase	4	4 5	8	8	8 1	5	2	2	1	6
Switch Phase										
Minimum Initial (s)	5.0		5.0	5.0		3.0	15.0	15.0	3.0	15.0
Minimum Split (s)	10.0		33.0	33.0		7.0	26.0	26.0	7.0	26.0
Total Split (s)	13.0		33.0	33.0		9.0	61.0	61.0	33.0	85.0
Total Split (%)	9.3%		23.6%	23.6%		6.4%	43.6%	43.6%	23.6%	60.7%
Yellow Time (s)	4.0		4.0	4.0		3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0		1.0	1.0		1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		-1.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0		4.0	5.0		4.0	5.0	5.0	4.0	5.0
Lead/Lag						Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None		None	None		None	C-Max	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 44 (31%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated

Splits and Phases: 8: Honoapiilani Highway & Keawe Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	90	95	255	55	735	100	1910	260	615	2105	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Lane Util. Factor		1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1820	1559	1770	1863	1562	1770	3539	1561	1770	3519	
Flt Permitted		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		1820	1559	1770	1863	1562	1770	3539	1561	1770	3519	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	98	103	277	60	799	109	2076	283	668	2288	71
RTOR Reduction (vph)	0	0	37	0	0	11	0	0	38	0	2	0
Lane Group Flow (vph)	0	185	66	277	60	788	109	2076	245	668	2357	0
Confl. Peds. (#/hr)	1		1	1		1			1			7
Turn Type	Split	NA	custom	Split	NA	custom	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4 5			8 1			2			
Actuated Green, G (s)		8.0	13.0	28.0	28.0	62.0	5.0	56.0	56.0	29.0	80.0	
Effective Green, g (s)		8.0	13.0	29.0	28.0	62.0	5.0	56.0	56.0	29.0	80.0	
Actuated g/C Ratio		0.06	0.09	0.21	0.20	0.44	0.04	0.40	0.40	0.21	0.57	
Clearance Time (s)		5.0		5.0	5.0		4.0	5.0	5.0	4.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		2.0	5.0	5.0	2.0	5.0	
Lane Grp Cap (vph)		104	145	367	373	692	63	1416	624	367	2011	
v/s Ratio Prot		c0.10		0.16	0.03		0.06	c0.59		c0.38	0.67	
v/s Ratio Perm			0.04			c0.50			0.16			
v/c Ratio		1.78	0.45	0.75	0.16	1.14	1.73	1.47	0.39	1.82	1.17	
Uniform Delay, d1		66.0	60.1	52.2	46.3	39.0	67.5	42.0	29.9	55.5	30.0	
Progression Factor		1.00	1.00	1.00	1.00	1.00	0.93	0.87	0.92	1.00	1.00	
Incremental Delay, d2		386.3	2.2	8.5	0.2	79.5	356.8	211.5	0.8	379.7	83.2	
Delay (s)		452.3	62.4	60.7	46.5	118.5	419.4	248.2	28.4	435.2	113.2	
Level of Service		F	E	E	D	F	F	F	C	F	F	
Approach Delay (s)		312.9			100.6			230.5			184.2	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	192.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.52		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	120.1%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	560	20	40	420	20	20	5	70	20	5	95
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	609	22	43	457	22	22	5	76	22	5	103
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		351										
pX, platoon unblocked				0.83			0.83	0.83	0.83	0.83	0.83	
vC, conflicting volume	478			630			1280	1185	620	1253	1185	467
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	478			452			1235	1120	439	1202	1120	467
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			95			78	97	85	80	97	83
cM capacity (veh/h)	1084			920			99	163	513	107	163	596

Direction, Lane #	EB 1	WB 1	NB 1	SB 1	SB 2
Volume Total	630	522	103	27	103
Volume Left	0	43	22	22	0
Volume Right	22	22	76	0	103
cSH	1700	920	257	115	596
Volume to Capacity	0.37	0.05	0.40	0.24	0.17
Queue Length 95th (ft)	0	4	46	22	16
Control Delay (s)	0.0	1.3	28.1	45.7	12.3
Lane LOS		A	D	E	B
Approach Delay (s)	0.0	1.3	28.1	19.3	
Approach LOS			D	C	

Intersection Summary			
Average Delay	4.4		
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	180	445	370	45	55	120
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	196	484	402	49	60	130
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		737				
pX, platoon unblocked					0.87	
vC, conflicting volume	451				1302	427
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	451				1272	427
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	82				55	79
cM capacity (veh/h)	1109				133	628

Direction, Lane #	EB 1	WB 1	SB 1	SB 2
Volume Total	679	451	60	130
Volume Left	196	0	60	0
Volume Right	0	49	0	130
cSH	1109	1700	133	628
Volume to Capacity	0.18	0.27	0.45	0.21
Queue Length 95th (ft)	16	0	50	19
Control Delay (s)	4.1	0.0	52.7	12.2
Lane LOS	A		F	B
Approach Delay (s)	4.1	0.0	24.9	
Approach LOS			C	

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	85	520	700	120	80	60
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	92	565	761	130	87	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		1056				
pX, platoon unblocked						
vC, conflicting volume	891				1293	446
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	891				1293	446
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	88				36	88
cM capacity (veh/h)	756				135	560

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	92	283	283	507	384	87	65
Volume Left	92	0	0	0	0	87	0
Volume Right	0	0	0	0	130	0	65
cSH	756	1700	1700	1700	1700	135	560
Volume to Capacity	0.12	0.17	0.17	0.30	0.23	0.64	0.12
Queue Length 95th (ft)	10	0	0	0	0	86	10
Control Delay (s)	10.4	0.0	0.0	0.0	0.0	70.0	12.3
Lane LOS	B					F	B
Approach Delay (s)	1.5			0.0		45.3	
Approach LOS						E	

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	60	5	40	30	5	0	40	150	20	5	100	145
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	65	5	43	33	5	0	43	163	22	5	109	158
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	462	470	188	505	538	174	266			185		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	462	470	188	505	538	174	266			185		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	87	99	95	93	99	100	97			100		
cM capacity (veh/h)	491	473	855	436	433	870	1298			1390		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	65	49	38	228	272
Volume Left	65	0	33	43	5
Volume Right	0	43	0	22	158
cSH	491	784	436	1298	1390
Volume to Capacity	0.13	0.06	0.09	0.03	0.00
Queue Length 95th (ft)	11	5	7	3	0
Control Delay (s)	13.5	9.9	14.1	1.7	0.2
Lane LOS	B	A	B	A	A
Approach Delay (s)	11.9		14.1	1.7	0.2
Approach LOS	B		B		

Intersection Summary				
Average Delay		3.6		
Intersection Capacity Utilization		44.3%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	65	170	20	0	120	0	10	0	0	0	0	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	71	185	22	0	130	0	11	0	0	0	0	43
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	109	43	22	136	65	0	43			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	109	43	22	136	65	0	43			0		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	91	78	98	100	84	100	99			100		
cM capacity (veh/h)	760	842	1055	676	820	1085	1565			1623		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	71	207	130	11	0	0	43
Volume Left	71	0	0	11	0	0	0
Volume Right	0	22	0	0	0	0	43
cSH	760	861	820	1565	1700	1700	1700
Volume to Capacity	0.09	0.24	0.16	0.01	0.00	0.00	0.03
Queue Length 95th (ft)	8	23	14	1	0	0	0
Control Delay (s)	10.2	10.5	10.2	7.3	0.0	0.0	0.0
Lane LOS	B	B	B	A			
Approach Delay (s)	10.4		10.2	7.3		0.0	
Approach LOS	B		B				

Intersection Summary			
Average Delay	9.3		
Intersection Capacity Utilization	24.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	0	0	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	0			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	1023	1085	1623			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	0	0	0	0
Volume Left	0	0	0	0
Volume Right	0	0	0	0
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS	A			
Approach Delay (s)	0.0	0.0		0.0
Approach LOS	A			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	85	85	1165	1545	25
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	92	92	1266	1679	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3144	1693	1707			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3144	1693	1707			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	40	20	75			
cM capacity (veh/h)	9	115	372			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	98	92	1266	1707
Volume Left	5	92	0	0
Volume Right	92	0	0	27
cSH	70	372	1700	1700
Volume to Capacity	1.40	0.25	0.74	1.00
Queue Length 95th (ft)	201	24	0	0
Control Delay (s)	348.1	17.8	0.0	0.0
Lane LOS	F	C		
Approach Delay (s)	348.1	1.2		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	11.3		
Intersection Capacity Utilization	95.0%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	140	690	90	20	790	45	110	15	10	10	20	145
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	152	750	98	22	859	49	120	16	11	11	22	158
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		353										
pX, platoon unblocked												
vC, conflicting volume	908			848			1745	2054	424	1625	2079	454
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	908			848			1745	2054	424	1625	2079	454
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	80			97			0	61	98	72	47	72
cM capacity (veh/h)	746			785			19	42	579	39	41	553

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	152	500	348	22	572	335	120	27	33	158
Volume Left	152	0	0	22	0	0	120	0	11	0
Volume Right	0	0	98	0	0	49	0	11	0	158
cSH	746	1700	1700	785	1700	1700	19	67	40	553
Volume to Capacity	0.20	0.29	0.20	0.03	0.34	0.20	6.20	0.40	0.81	0.28
Queue Length 95th (ft)	19	0	0	2	0	0	Err	39	76	29
Control Delay (s)	11.1	0.0	0.0	9.7	0.0	0.0	Err	90.9	237.4	14.1
Lane LOS	B			A			F	F	F	B
Approach Delay (s)	1.7			0.2			8164.2		52.4	
Approach LOS							F		F	

Intersection Summary			
Average Delay	533.8		
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	80	595	35	10	760	20	25	5	5	10	0	90
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	87	647	38	11	826	22	27	5	5	11	0	98
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		603										
pX, platoon unblocked												
vC, conflicting volume	848			685			1372	1709	342	1364	1717	424
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	848			685			1372	1709	342	1364	1717	424
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	89			99			66	93	99	88	100	83
cM capacity (veh/h)	785			905			79	79	654	91	78	579

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	87	431	254	11	551	297	33	5	11	98
Volume Left	87	0	0	11	0	0	27	0	11	0
Volume Right	0	0	38	0	0	22	0	5	0	98
cSH	785	1700	1700	905	1700	1700	79	654	91	579
Volume to Capacity	0.11	0.25	0.15	0.01	0.32	0.17	0.41	0.01	0.12	0.17
Queue Length 95th (ft)	9	0	0	1	0	0	41	1	10	15
Control Delay (s)	10.2	0.0	0.0	9.0	0.0	0.0	79.4	10.6	50.0	12.5
Lane LOS	B			A			F	B	E	B
Approach Delay (s)	1.1			0.1			69.5		16.2	
Approach LOS							F		C	

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	470	135	15	645	200	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	511	147	16	701	217	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1287					
pX, platoon unblocked						
vC, conflicting volume			658		967	329
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			658		967	329
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		12	96
cM capacity (veh/h)			926		247	667

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	341	317	16	351	351	217	27
Volume Left	0	0	16	0	0	217	0
Volume Right	0	147	0	0	0	0	27
cSH	1700	1700	926	1700	1700	247	667
Volume to Capacity	0.20	0.19	0.02	0.21	0.21	0.88	0.04
Queue Length 95th (ft)	0	0	1	0	0	184	3
Control Delay (s)	0.0	0.0	9.0	0.0	0.0	73.0	10.6
Lane LOS			A			F	B
Approach Delay (s)	0.0		0.2			66.1	
Approach LOS						F	

Intersection Summary			
Average Delay	10.1		
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	195	15	5	5	90	65	35	5	35	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	5	5	212	16	5	5	98	71	38	5	38	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)			4									
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	345	356	41	446	340	90	43			109		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	345	356	41	446	340	90	43			109		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	99	79	96	99	99	94			100		
cM capacity (veh/h)	571	532	1030	391	544	968	1565			1482		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	223	27	207	49
Volume Left	5	16	98	5
Volume Right	212	5	38	5
cSH	1083	474	1565	1482
Volume to Capacity	0.21	0.06	0.06	0.00
Queue Length 95th (ft)	19	5	5	0
Control Delay (s)	9.5	13.0	3.8	0.9
Lane LOS	A	B	A	A
Approach Delay (s)	9.5	13.0	3.8	0.9
Approach LOS	A	B		

Intersection Summary			
Average Delay	6.5		
Intersection Capacity Utilization	31.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	5	5	5	5	5	5	1255	5	0	1665	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	5	5	5	5	5	5	1364	5	0	1810	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1283				
pX, platoon unblocked	0.84	0.84		0.84	0.84	0.84				0.84		
vC, conflicting volume	2514	3193	908	2291	3193	685	1815			1370		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2421	3230	908	2156	3230	244	1815			1059		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	30	98	43	30	99	98			100		
cM capacity (veh/h)	6	8	278	9	8	636	334			549		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	11	16	5	909	460	1207	609
Volume Left	0	5	5	0	0	0	0
Volume Right	5	5	0	0	5	0	5
cSH	15	13	334	1700	1700	1700	1700
Volume to Capacity	0.72	1.28	0.02	0.53	0.27	0.71	0.36
Queue Length 95th (ft)	44	68	1	0	0	0	0
Control Delay (s)	465.0	760.6	16.0	0.0	0.0	0.0	0.0
Lane LOS	F	F	C				
Approach Delay (s)	465.0	760.6	0.1			0.0	
Approach LOS	F	F					

Intersection Summary			
Average Delay	5.5		
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		

APPENDIX D

LEVEL OF SERVICE CALCULATIONS

- Base Year 2020 with Mitigation Measures AM

HCM Unsignalized Intersection Capacity Analysis
1: Honoapiilani Hwy/Honoapiilani Highway & Aholo Street

12/29/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	5	35	5	130	10	990	10	55	900	15
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	5	5	5	38	5	141	11	1076	11	60	978	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2207	2204	986	2209	2217	1082	995			1076		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2207	2204	986	2209	2217	1082	995			1076		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	55	86	98	0	86	47	98			91		
cM capacity (veh/h)	12	40	300	26	39	265	696			648		

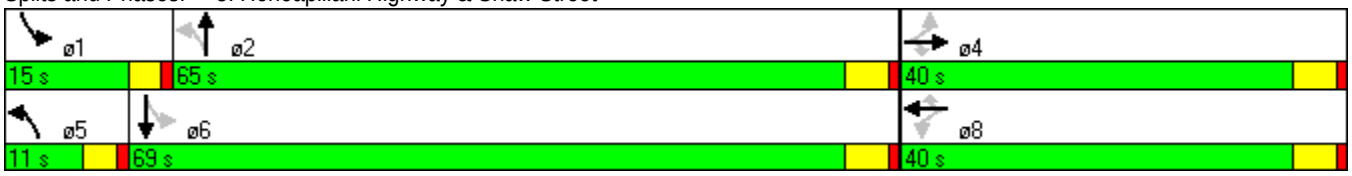
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	16	43	141	11	1087	60	995
Volume Left	5	38	0	11	0	60	0
Volume Right	5	0	141	0	11	0	16
cSH	27	27	265	696	1700	648	1700
Volume to Capacity	0.60	1.63	0.53	0.02	0.64	0.09	0.59
Queue Length 95th (ft)	47	130	72	1	0	8	0
Control Delay (s)	257.9	624.9	33.2	10.3	0.0	11.1	0.0
Lane LOS	F	F	D	B		B	
Approach Delay (s)	257.9	172.4		0.1		0.6	
Approach LOS	F	F					

Intersection Summary			
Average Delay	15.7		
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Volume (vph)	60	45	35	105	85	175	75	1085	95	860
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases		4			8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	4	4	4	8	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	20.0	3.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	7.0	25.0	7.0	25.0
Total Split (s)	40.0	40.0	40.0	40.0	40.0	40.0	11.0	65.0	15.0	69.0
Total Split (%)	33.3%	33.3%	33.3%	33.3%	33.3%	33.3%	9.2%	54.2%	12.5%	57.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0	5.0		5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 113 (94%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 3: Honoapiilani Highway & Shaw Street



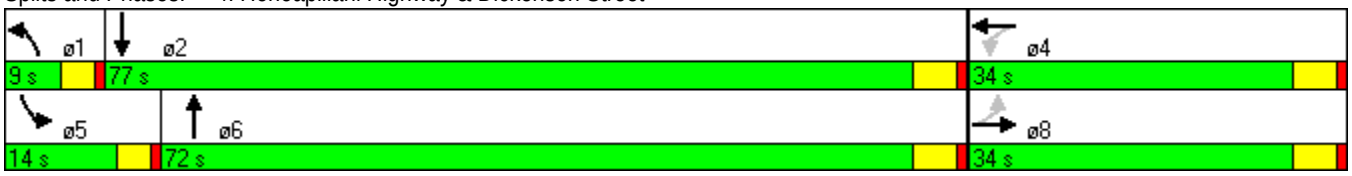
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	45	35	105	85	175	75	1085	50	95	860	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.97	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1811	1583		1813	1583	1770	3516		1770	3516	
Flt Permitted		0.51	1.00		0.71	1.00	0.25	1.00		0.16	1.00	
Satd. Flow (perm)		956	1583		1332	1583	472	3516		307	3516	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	49	38	114	92	190	82	1179	54	103	935	43
RTOR Reduction (vph)	0	0	31	0	0	94	0	2	0	0	2	0
Lane Group Flow (vph)	0	114	7	0	206	96	82	1231	0	103	976	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		23.2	23.2		23.2	23.2	81.2	76.2		84.4	77.8	
Effective Green, g (s)		23.2	23.2		23.2	23.2	81.2	76.2		84.4	77.8	
Actuated g/C Ratio		0.19	0.19		0.19	0.19	0.68	0.64		0.70	0.65	
Clearance Time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	2.0	5.0		2.0	5.0	
Lane Grp Cap (vph)		185	306		258	306	373	2233		296	2280	
v/s Ratio Prot							0.01	c0.35		c0.02	0.28	
v/s Ratio Perm		0.12	0.00		c0.15	0.06	0.14			0.23		
v/c Ratio		0.62	0.02		0.80	0.31	0.22	0.55		0.35	0.43	
Uniform Delay, d1		44.3	39.2		46.2	41.6	7.1	12.3		8.1	10.3	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.60	0.52	
Incremental Delay, d2		6.0	0.0		15.7	0.6	0.1	1.0		0.2	0.5	
Delay (s)		50.3	39.3		61.9	42.1	7.2	13.3		5.1	5.8	
Level of Service		D	D		E	D	A	B		A	A	
Approach Delay (s)		47.5			52.4			12.9			5.8	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM Average Control Delay	17.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	65.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	70	55	55	20	15	1360	60	970
Turn Type	Perm	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases		8		4	1	6	5	2
Permitted Phases	8		4					
Detector Phase	8	8	4	4	1	6	5	2
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	3.0	15.0	3.0	15.0
Minimum Split (s)	10.0	10.0	29.0	29.0	7.0	20.0	7.0	20.0
Total Split (s)	34.0	34.0	34.0	34.0	9.0	72.0	14.0	77.0
Total Split (%)	28.3%	28.3%	28.3%	28.3%	7.5%	60.0%	11.7%	64.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0		5.0	4.0	5.0	4.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 40 (33%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 4: Honoapiilani Highway & Dickenson Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	70	55	20	55	20	140	15	1360	75	60	970	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.91		1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1776			1652		1770	3500		1770	3487	
Flt Permitted		0.53			0.83		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		970			1397		1770	3500		1770	3487	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	76	60	22	60	22	152	16	1478	82	65	1054	114
RTOR Reduction (vph)	0	5	0	0	61	0	0	3	0	0	5	0
Lane Group Flow (vph)	0	153	0	0	173	0	16	1557	0	65	1163	0
Confl. Peds. (#/hr)	8		1	1		8			10			
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		19.9			19.9		2.0	79.1		7.0	84.1	
Effective Green, g (s)		19.9			19.9		2.0	79.1		7.0	84.1	
Actuated g/C Ratio		0.17			0.17		0.02	0.66		0.06	0.70	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		2.0			2.0		1.5	5.0		1.5	5.0	
Lane Grp Cap (vph)		161			232		30	2307		103	2444	
v/s Ratio Prot							0.01	c0.44		c0.04	0.33	
v/s Ratio Perm		c0.16			0.12							
v/c Ratio		0.95			0.75		0.53	0.68		0.63	0.48	
Uniform Delay, d1		49.6			47.6		58.5	12.6		55.2	8.1	
Progression Factor		1.00			1.02		1.23	0.56		1.26	0.38	
Incremental Delay, d2		55.7			10.8		8.0	1.4		7.1	0.5	
Delay (s)		105.3			59.5		79.8	8.5		76.5	3.6	
Level of Service		F			E		E	A		E	A	
Approach Delay (s)		105.3			59.5			9.2			7.5	
Approach LOS		F			E			A			A	

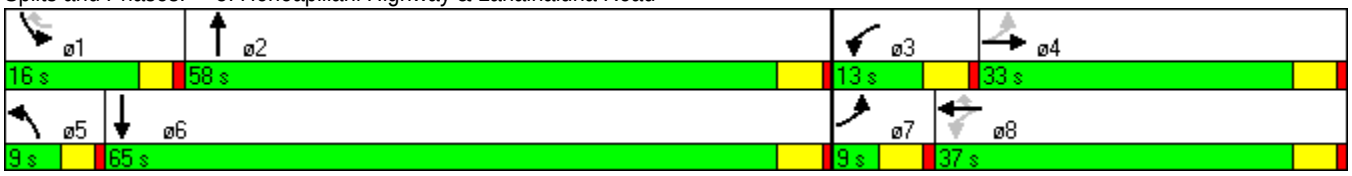
Intersection Summary			
HCM Average Control Delay	17.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	80	255	110	190	290	20	1385	150	990
Turn Type	pm+pt	NA	pm+pt	NA	custom	Prot	NA	Prot	NA
Protected Phases	7	4	3	8		5	2	1	6
Permitted Phases	4		8		8 1				
Detector Phase	7	4	3	8	8 1	5	2	1	6
Switch Phase									
Minimum Initial (s)	4.0	5.0	4.0	5.0		3.0	15.0	3.0	15.0
Minimum Split (s)	9.0	29.0	9.0	29.0		7.0	26.0	7.0	26.0
Total Split (s)	9.0	33.0	13.0	37.0		9.0	58.0	16.0	65.0
Total Split (%)	7.5%	27.5%	10.8%	30.8%		7.5%	48.3%	13.3%	54.2%
Yellow Time (s)	4.0	4.0	4.0	4.0		3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0		4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None		None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 40 (33%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

Splits and Phases: 5: Honoapiilani Highway & Lahainaluna Road



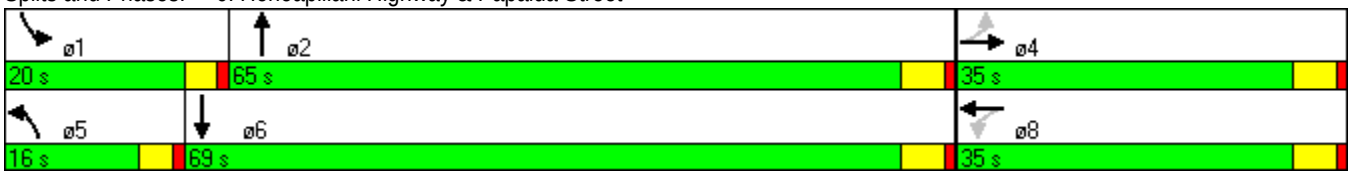
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	255	25	110	190	290	20	1385	75	150	990	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1829		1762	1863	1583	1770	3508		1770	3524	
Flt Permitted	0.38	1.00		0.26	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	711	1829		477	1863	1583	1770	3508		1770	3524	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	100%	100%	100%	150%	150%	200%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	87	277	27	179	310	630	22	1505	82	163	1076	27
RTOR Reduction (vph)	0	3	0	0	0	24	0	3	0	0	1	0
Lane Group Flow (vph)	87	301	0	179	310	606	22	1584	0	163	1102	0
Confl. Peds. (#/hr)			30	30					5			3
Turn Type	pm+pt	NA		pm+pt	NA	custom	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8 1						
Actuated Green, G (s)	32.0	28.0		40.0	32.0	49.0	3.0	53.0		12.0	62.0	
Effective Green, g (s)	32.0	28.0		40.0	32.0	49.0	3.0	53.0		12.0	62.0	
Actuated g/C Ratio	0.27	0.23		0.33	0.27	0.41	0.02	0.44		0.10	0.52	
Clearance Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	2.0		3.0	4.0		2.0	4.5		2.0	4.5	
Lane Grp Cap (vph)	225	427		245	497	646	44	1549		177	1821	
v/s Ratio Prot	0.01	0.16		c0.05	0.17		0.01	c0.45		0.09	0.31	
v/s Ratio Perm	0.09			0.20		c0.38						
v/c Ratio	0.39	0.70		0.73	0.62	0.94	0.50	1.02		0.92	0.60	
Uniform Delay, d1	35.2	42.2		32.9	38.7	34.0	57.8	33.5		53.5	20.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.03	0.76		0.95	0.73	
Incremental Delay, d2	1.1	4.3		10.7	2.8	21.4	2.4	25.6		36.4	1.1	
Delay (s)	36.3	46.5		43.6	41.5	55.5	61.8	51.1		87.3	15.9	
Level of Service	D	D		D	D	E	E	D		F	B	
Approach Delay (s)		44.2			49.7			51.2			25.1	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM Average Control Delay	42.7	HCM Level of Service	D
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	93.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	235	65	45	35	80	1620	135	1145
Turn Type	Perm	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8					
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	15.0	15.0	5.0
Minimum Split (s)	29.0	29.0	29.0	29.0	9.0	23.0	20.0	23.0
Total Split (s)	35.0	35.0	35.0	35.0	16.0	65.0	20.0	69.0
Total Split (%)	29.2%	29.2%	29.2%	29.2%	13.3%	54.2%	16.7%	57.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0		5.0	4.0	5.0	4.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	Max	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated

Splits and Phases: 6: Honoapiilani Highway & Papalua Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	235	65	70	45	35	115	80	1620	70	135	1145	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.92			0.92		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1768	1697			1678		1770	3510		1770	3483	
Flt Permitted	0.51	1.00			0.89		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	946	1697			1518		1770	3510		1770	3483	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	255	71	76	49	38	125	87	1761	76	147	1245	120
RTOR Reduction (vph)	0	32	0	0	43	0	0	3	0	0	6	0
Lane Group Flow (vph)	255	115	0	0	169	0	87	1835	0	147	1359	0
Confl. Peds. (#/hr)	1		8	8		1			10			3
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	30.0	30.0			30.0		9.7	60.0		16.0	66.3	
Effective Green, g (s)	31.0	30.0			30.0		9.7	60.0		16.0	66.3	
Actuated g/C Ratio	0.26	0.25			0.25		0.08	0.50		0.13	0.55	
Clearance Time (s)	5.0	5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	3.0			3.0		2.0	6.0		6.0	3.0	
Lane Grp Cap (vph)	244	424			380		143	1755		236	1924	
v/s Ratio Prot		0.07					0.05	c0.52		c0.08	0.39	
v/s Ratio Perm	c0.27				0.11							
v/c Ratio	1.05	0.27			0.45		0.61	1.05		0.62	0.71	
Uniform Delay, d1	44.5	36.2			38.0		53.3	30.0		49.1	19.7	
Progression Factor	1.00	1.00			0.99		0.81	1.38		0.90	1.02	
Incremental Delay, d2	69.9	0.3			0.8		1.3	25.4		10.5	2.0	
Delay (s)	114.4	36.5			38.5		44.4	66.7		54.8	22.0	
Level of Service	F	D			D		D	E		D	C	
Approach Delay (s)		85.9			38.5			65.7			25.2	
Approach LOS		F			D			E			C	

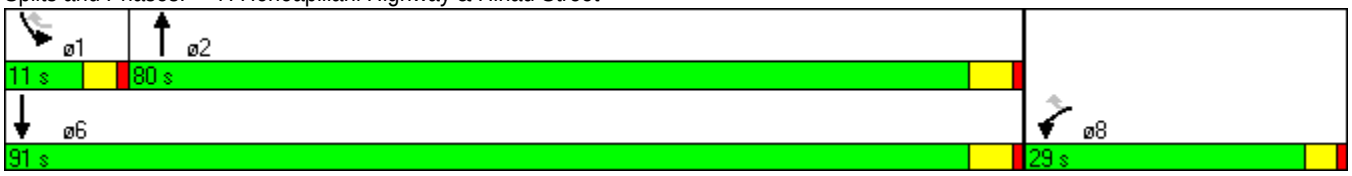
Intersection Summary			
HCM Average Control Delay	51.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	101.8%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations					
Volume (vph)	45	65	1815	50	1440
Turn Type	NA	custom	NA	Prot	NA
Protected Phases	8		2	1	6
Permitted Phases		8 1			
Detector Phase	8	8 1	2	1	6
Switch Phase					
Minimum Initial (s)	7.0		15.0	4.0	15.0
Minimum Split (s)	29.0		23.0	9.0	20.0
Total Split (s)	29.0		80.0	11.0	91.0
Total Split (%)	24.2%		66.7%	9.2%	75.8%
Yellow Time (s)	3.0		4.0	3.0	4.0
All-Red Time (s)	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0		5.0	4.0	5.0
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?					
Recall Mode	None		C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 69 (58%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

Splits and Phases: 7: Honoapiilani Highway & Hinau Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	45	65	1815	70	50	1440
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0		4.0	5.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.98	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1553	3520		1770	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1553	3520		1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	71	1973	76	54	1565
RTOR Reduction (vph)	0	13	1	0	0	0
Lane Group Flow (vph)	49	58	2048	0	54	1565
Confl. Peds. (#/hr)		5				
Turn Type	NA	custom	NA		Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8 1				
Actuated Green, G (s)	8.2	17.8	93.2		5.6	102.8
Effective Green, g (s)	8.2	17.8	93.2		5.6	102.8
Actuated g/C Ratio	0.07	0.15	0.78		0.05	0.86
Clearance Time (s)	4.0		5.0		4.0	5.0
Vehicle Extension (s)	3.0		5.0		3.0	5.0
Lane Grp Cap (vph)	121	230	2734		83	3032
v/s Ratio Prot	c0.03		c0.58		0.03	c0.44
v/s Ratio Perm		0.04				
v/c Ratio	0.40	0.25	0.75		0.65	0.52
Uniform Delay, d1	53.6	45.2	7.2		56.2	2.2
Progression Factor	1.00	1.00	2.71		0.69	2.47
Incremental Delay, d2	2.2	0.6	0.2		12.6	0.5
Delay (s)	55.8	45.8	19.6		51.5	5.9
Level of Service	E	D	B		D	A
Approach Delay (s)	49.9		19.6			7.4
Approach LOS	D		B			A

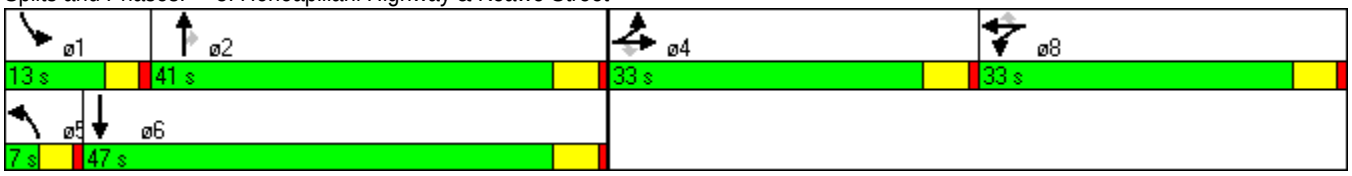
Intersection Summary			
HCM Average Control Delay	15.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	67.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Volume (vph)	35	50	60	140	45	520	50	1680	155	555	1385
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA
Protected Phases	4	4		8	8		5	2		1	6
Permitted Phases			4			8			2		
Detector Phase	4	4	4	8	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	15.0	15.0	3.0	15.0
Minimum Split (s)	33.0	33.0	33.0	10.0	10.0	10.0	7.0	29.0	29.0	7.0	29.0
Total Split (s)	33.0	33.0	33.0	33.0	33.0	33.0	7.0	41.0	41.0	13.0	47.0
Total Split (%)	27.5%	27.5%	27.5%	27.5%	27.5%	27.5%	5.8%	34.2%	34.2%	10.8%	39.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated

Splits and Phases: 8: Honoapiilani Highway & Keawe Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	50	60	140	45	520	50	1680	155	555	1385	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.91	0.95	1.00	0.95	1.00	0.97	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99	0.99	1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.88	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1562	1681	1472	1483	1770	3539	1562	3433	3528	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1562	1681	1472	1483	1770	3539	1562	3433	3528	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	54	65	152	49	565	54	1826	168	603	1505	27
RTOR Reduction (vph)	0	0	61	0	129	259	0	0	20	0	1	0
Lane Group Flow (vph)	38	54	4	137	189	52	54	1826	148	603	1531	0
Confl. Peds. (#/hr)	1		1	1		1			1			7
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8			2			
Actuated Green, G (s)	7.8	7.8	7.8	20.2	20.2	20.2	3.0	64.0	64.0	9.0	70.0	
Effective Green, g (s)	8.8	7.8	7.8	21.2	20.2	20.2	3.0	64.0	64.0	9.0	70.0	
Actuated g/C Ratio	0.07	0.06	0.06	0.18	0.17	0.17	0.02	0.53	0.53	0.08	0.58	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	2.0	5.0	5.0	2.0	5.0	
Lane Grp Cap (vph)	130	121	102	297	248	250	44	1887	833	257	2058	
v/s Ratio Prot	0.02	c0.03		0.08	c0.13		0.03	c0.52		c0.18	0.43	
v/s Ratio Perm			0.00			0.04			0.09			
v/c Ratio	0.29	0.45	0.04	0.46	0.76	0.21	1.23	0.97	0.18	2.35	0.74	
Uniform Delay, d1	52.7	54.0	52.6	44.3	47.6	43.0	58.5	27.0	14.4	55.5	18.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.31	0.51	0.28	1.00	1.00	
Incremental Delay, d2	1.3	2.6	0.2	1.1	13.0	0.4	186.1	11.2	0.3	617.8	2.5	
Delay (s)	53.9	56.6	52.8	45.4	60.6	43.4	262.8	24.8	4.4	673.3	20.9	
Level of Service	D	E	D	D	E	D	F	C	A	F	C	
Approach Delay (s)		54.4			50.9			29.4			205.2	
Approach LOS		D			D			C			F	

Intersection Summary			
HCM Average Control Delay	106.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	93.3%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	455	20	60	665	5	10	5	110	5	5	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	16	495	22	65	1446	5	11	5	120	5	5	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		351										
pX, platoon unblocked				0.86			0.86	0.86	0.86	0.86	0.86	
vC, conflicting volume	1451			516			1405	2120	505	2228	2128	726
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1451			358			1390	2220	345	2346	2229	726
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			94			84	84	79	49	84	97
cM capacity (veh/h)	463			1031			69	33	561	11	33	367

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	16	516	65	964	487	136	11	11
Volume Left	16	0	65	0	0	11	5	0
Volume Right	0	22	0	0	5	120	0	11
cSH	463	1700	1031	1700	1700	255	16	367
Volume to Capacity	0.04	0.30	0.06	0.57	0.29	0.53	0.68	0.03
Queue Length 95th (ft)	3	0	5	0	0	72	43	2
Control Delay (s)	13.1	0.0	8.7	0.0	0.0	34.2	430.2	15.1
Lane LOS	B		A			D	F	C
Approach Delay (s)	0.4		0.4			34.2	222.6	
Approach LOS						D	F	

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	64.5%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	60	445	585	20	25	145
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	65	484	954	22	27	158
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		737				
pX, platoon unblocked					0.98	
vC, conflicting volume	976				1579	965
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	976				1580	965
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				75	49
cM capacity (veh/h)	707				107	309

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	65	484	976	27	158
Volume Left	65	0	0	27	0
Volume Right	0	0	22	0	158
cSH	707	1700	1700	107	309
Volume to Capacity	0.09	0.28	0.57	0.25	0.51
Queue Length 95th (ft)	8	0	0	23	68
Control Delay (s)	10.6	0.0	0.0	49.8	28.1
Lane LOS	B			E	D
Approach Delay (s)	1.3		0.0	31.3	
Approach LOS				D	

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	60	590	540	55	120	85
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	65	641	587	60	130	92
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		1049				
pX, platoon unblocked						
vC, conflicting volume	647				1068	323
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	647				1068	323
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				35	86
cM capacity (veh/h)	935				202	672

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	65	321	321	391	255	130	92
Volume Left	65	0	0	0	0	130	0
Volume Right	0	0	0	0	60	0	92
cSH	935	1700	1700	1700	1700	202	672
Volume to Capacity	0.07	0.19	0.19	0.23	0.15	0.65	0.14
Queue Length 95th (ft)	6	0	0	0	0	96	12
Control Delay (s)	9.1	0.0	0.0	0.0	0.0	50.7	11.2
Lane LOS	A					F	B
Approach Delay (s)	0.8			0.0		34.4	
Approach LOS						D	

Intersection Summary			
Average Delay	5.2		
Intersection Capacity Utilization	36.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	5	10	75	5	5	15	45	20	5	80	65
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	22	5	11	82	5	5	16	49	22	5	87	71
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	234	236	122	239	261	60	158			71		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	234	236	122	239	261	60	158			71		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	99	99	88	99	99	99			100		
cM capacity (veh/h)	704	654	929	694	634	1006	1422			1530		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	22	16	92	87	163
Volume Left	22	0	82	16	5
Volume Right	0	11	5	22	71
cSH	704	815	703	1422	1530
Volume to Capacity	0.03	0.02	0.13	0.01	0.00
Queue Length 95th (ft)	2	2	11	1	0
Control Delay (s)	10.3	9.5	10.9	1.5	0.3
Lane LOS	B	A	B	A	A
Approach Delay (s)	9.9		10.9	1.5	0.3
Approach LOS	A		B		

Intersection Summary			
Average Delay	4.1		
Intersection Capacity Utilization	28.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	70	10	0	175	0	20	0	0	0	0	60
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	22	76	11	0	190	0	22	0	0	0	0	65
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	171	76	33	92	109	0	65			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	171	76	33	92	109	0	65			0		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	91	99	100	75	100	99			100		
cM capacity (veh/h)	635	803	1041	809	770	1085	1537			1623		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	22	87	190	22	0	0	65
Volume Left	22	0	0	22	0	0	0
Volume Right	0	11	0	0	0	0	65
cSH	635	826	770	1537	1700	1700	1700
Volume to Capacity	0.03	0.11	0.25	0.01	0.00	0.00	0.04
Queue Length 95th (ft)	3	9	24	1	0	0	0
Control Delay (s)	10.9	9.9	11.2	7.4	0.0	0.0	0.0
Lane LOS	B	A	B	A			
Approach Delay (s)	10.1		11.2	7.4		0.0	
Approach LOS	B		B				

Intersection Summary			
Average Delay	8.8		
Intersection Capacity Utilization	31.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	0	0	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	0			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	1023	1085	1623			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	0	0	0	0
Volume Left	0	0	0	0
Volume Right	0	0	0	0
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS	A			
Approach Delay (s)	0.0	0.0		0.0
Approach LOS	A			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	40	65	1015	860	10
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	43	71	1103	935	11
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2185	940	946			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2185	940	946			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	76	86	90			
cM capacity (veh/h)	45	320	726			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	54	71	1103	946
Volume Left	11	71	0	0
Volume Right	43	0	0	11
cSH	145	726	1700	1700
Volume to Capacity	0.38	0.10	0.65	0.56
Queue Length 95th (ft)	40	8	0	0
Control Delay (s)	44.1	10.5	0.0	0.0
Lane LOS	E	B		
Approach Delay (s)	44.1	0.6		0.0
Approach LOS	E			

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	45	655	30	10	655	15	20	5	5	5	5	30
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	49	712	33	11	712	16	22	5	5	5	5	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		320										
pX, platoon unblocked												
vC, conflicting volume	728			745			1239	1576	372	1204	1584	364
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	728			745			1239	1576	372	1204	1584	364
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			99			81	95	99	96	95	95
cM capacity (veh/h)	871			859			114	101	625	126	100	633

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	49	475	270	11	475	254	22	11	11	33
Volume Left	49	0	0	11	0	0	22	0	5	0
Volume Right	0	0	33	0	0	16	0	5	0	33
cSH	871	1700	1700	859	1700	1700	114	174	112	633
Volume to Capacity	0.06	0.28	0.16	0.01	0.28	0.15	0.19	0.06	0.10	0.05
Queue Length 95th (ft)	4	0	0	1	0	0	17	5	8	4
Control Delay (s)	9.4	0.0	0.0	9.2	0.0	0.0	44.1	27.0	40.7	11.0
Lane LOS	A			A			E	D	E	B
Approach Delay (s)	0.6			0.1			38.4		18.4	
Approach LOS							E		C	

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	630	10	5	625	10	35	0	10	5	0	20
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	27	685	11	5	679	11	38	0	11	5	0	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		628										
pX, platoon unblocked												
vC, conflicting volume	690			696			1117	1446	348	1103	1446	345
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	690			696			1117	1446	348	1103	1446	345
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			99			75	100	98	97	100	97
cM capacity (veh/h)	900			896			152	126	648	159	126	651

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	27	457	239	5	453	237	38	11	5	22
Volume Left	27	0	0	5	0	0	38	0	5	0
Volume Right	0	0	11	0	0	11	0	11	0	22
cSH	900	1700	1700	896	1700	1700	152	648	159	651
Volume to Capacity	0.03	0.27	0.14	0.01	0.27	0.14	0.25	0.02	0.03	0.03
Queue Length 95th (ft)	2	0	0	0	0	0	23	1	3	3
Control Delay (s)	9.1	0.0	0.0	9.0	0.0	0.0	36.3	10.6	28.5	10.7
Lane LOS	A			A			E	B	D	B
Approach Delay (s)	0.3			0.1			30.6		14.3	
Approach LOS							D		B	

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	36.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	485	230	30	510	100	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	527	250	33	554	109	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1293					
pX, platoon unblocked						
vC, conflicting volume			777		995	389
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			777		995	389
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		53	97
cM capacity (veh/h)			835		232	610

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	351	426	33	277	277	109	16
Volume Left	0	0	33	0	0	109	0
Volume Right	0	250	0	0	0	0	16
cSH	1700	1700	835	1700	1700	232	610
Volume to Capacity	0.21	0.25	0.04	0.16	0.16	0.47	0.03
Queue Length 95th (ft)	0	0	3	0	0	57	2
Control Delay (s)	0.0	0.0	9.5	0.0	0.0	33.4	11.1
Lane LOS			A			D	B
Approach Delay (s)	0.0		0.5			30.5	
Approach LOS						D	

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	37.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	40	50	5	5	30	20	10	5	60	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	5	5	43	54	5	5	33	22	11	5	65	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	179	177	68	217	174	27	71			33		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	179	177	68	217	174	27	71			33		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	99	96	92	99	99	98			100		
cM capacity (veh/h)	759	699	995	689	702	1048	1530			1579		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	11	43	65	65	76
Volume Left	5	0	54	33	5
Volume Right	0	43	5	11	5
cSH	728	995	711	1530	1579
Volume to Capacity	0.01	0.04	0.09	0.02	0.00
Queue Length 95th (ft)	1	3	8	2	0
Control Delay (s)	10.0	8.8	10.6	3.8	0.5
Lane LOS	B	A	B	A	A
Approach Delay (s)	9.0		10.6	3.8	0.5
Approach LOS	A		B		

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	26.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	5	5	5	5	5	5	1345	5	0	1045	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	5	5	5	5	5	5	1462	5	0	1136	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1283				
pX, platoon unblocked	0.81	0.81		0.81	0.81	0.81				0.81		
vC, conflicting volume	1889	2617	571	2052	2617	734	1141			1467		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1622	2525	571	1824	2525	190	1141			1100		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	75	99	82	75	99	99			100		
cM capacity (veh/h)	44	22	464	31	22	661	608			509		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	11	16	5	975	493	757	384
Volume Left	0	5	5	0	0	0	0
Volume Right	5	5	0	0	5	0	5
cSH	42	38	608	1700	1700	1700	1700
Volume to Capacity	0.26	0.43	0.01	0.57	0.29	0.45	0.23
Queue Length 95th (ft)	22	37	1	0	0	0	0
Control Delay (s)	119.2	160.2	11.0	0.0	0.0	0.0	0.0
Lane LOS	F	F	B				
Approach Delay (s)	119.2	160.2	0.0			0.0	
Approach LOS	F	F					

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX D

LEVEL OF SERVICE CALCULATIONS

- Base Year 2020 with Mitigation Measures PM

HCM Unsignalized Intersection Capacity Analysis
1: Honoapiilani Hwy/Honoapiilani Highway & Aholo Street

12/28/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	5	20	20	5	80	25	1145	40	105	1555	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	5	5	22	22	5	87	27	1245	43	114	1690	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	3226	3223	1696	3264	3250	1266	1701			1245		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	3226	3223	1696	3264	3250	1266	1701			1245		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	24	81	0	21	58	93			80		
cM capacity (veh/h)	1	7	115	1	7	206	374			559		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	33	27	87	27	1288	114	1701
Volume Left	5	22	0	27	0	114	0
Volume Right	22	0	87	0	43	0	11
cSH	5	2	206	374	1700	559	1700
Volume to Capacity	6.73	16.92	0.42	0.07	0.76	0.20	1.00
Queue Length 95th (ft)	Err	Err	48	6	0	19	0
Control Delay (s)	Err	Err	34.6	15.4	0.0	13.1	0.0
Lane LOS	F	F	D	C		B	
Approach Delay (s)	Err	2407.1		0.3		0.8	
Approach LOS	F	F					

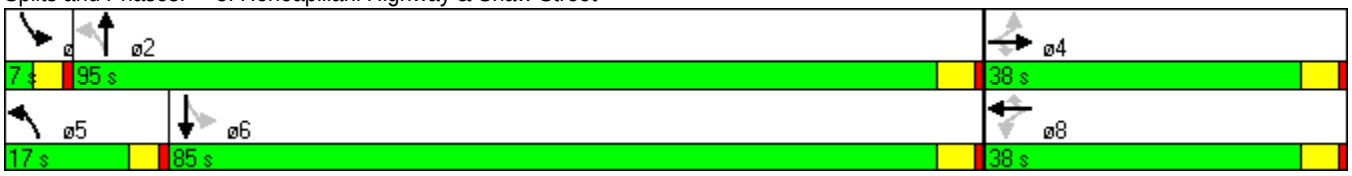
Intersection Summary			
Average Delay	183.9		
Intersection Capacity Utilization	100.1%	ICU Level of Service	G
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Volume (vph)	100	115	145	90	85	195	120	995	205	1420
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases		4			8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	4	4	4	8	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	20.0	3.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	7.0	25.0	7.0	25.0
Total Split (s)	38.0	38.0	38.0	38.0	38.0	38.0	17.0	95.0	7.0	85.0
Total Split (%)	27.1%	27.1%	27.1%	27.1%	27.1%	27.1%	12.1%	67.9%	5.0%	60.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0	5.0		5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max
Act Effct Green (s)		31.9	31.9		31.9	31.9	98.9	91.1	88.9	84.9
Actuated g/C Ratio		0.23	0.23		0.23	0.23	0.71	0.65	0.64	0.61
v/c Ratio		0.96	0.35		0.96	0.47	0.65	0.53	0.87	0.76
Control Delay		101.6	16.4		107.3	24.7	30.2	14.0	31.2	5.4
Queue Delay		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Delay		101.6	16.4		107.3	24.7	30.2	14.0	31.2	5.4
LOS		F	B		F	C	C	B	C	A
Approach Delay		67.3			63.7			15.6		8.6
Approach LOS		E			E			B		A

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 106 (76%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 22.3 Intersection LOS: C
Intersection Capacity Utilization 77.9% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 3: Honoapiilani Highway & Shaw Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	115	145	90	85	195	120	995	115	205	1420	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.98		1.00	0.99	
Flt Protected		0.98	1.00		0.97	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1820	1583		1816	1583	1770	3484		1770	3516	
Flt Permitted		0.57	1.00		0.47	1.00	0.07	1.00		0.19	1.00	
Satd. Flow (perm)		1070	1583		871	1583	132	3484		355	3516	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	125	158	98	92	212	130	1082	125	223	1543	71
RTOR Reduction (vph)	0	0	88	0	0	87	0	6	0	0	2	0
Lane Group Flow (vph)	0	234	70	0	190	125	130	1201	0	223	1612	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		31.9	31.9		31.9	31.9	98.1	91.1		87.9	84.9	
Effective Green, g (s)		31.9	31.9		31.9	31.9	98.1	91.1		87.9	84.9	
Actuated g/C Ratio		0.23	0.23		0.23	0.23	0.70	0.65		0.63	0.61	
Clearance Time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	2.0	5.0		2.0	5.0	
Lane Grp Cap (vph)		244	361		198	361	200	2267		253	2132	
v/s Ratio Prot							c0.04	0.34		0.02	0.46	
v/s Ratio Perm		c0.22	0.04		0.22	0.08	0.41			c0.53		
v/c Ratio		0.96	0.19		0.96	0.35	0.65	0.53		0.88	0.76	
Uniform Delay, d1		53.4	43.7		53.4	45.3	21.9	13.0		23.1	20.0	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00		0.42	0.19	
Incremental Delay, d2		45.7	0.3		51.7	0.6	5.6	0.9		18.1	1.5	
Delay (s)		99.1	43.9		105.1	45.9	27.6	13.9		27.9	5.2	
Level of Service		F	D		F	D	C	B		C	A	
Approach Delay (s)		76.9			73.9			15.3			8.0	
Approach LOS		E			E			B			A	

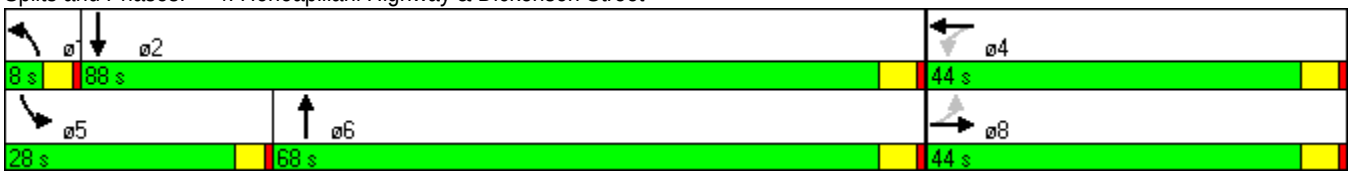
Intersection Summary			
HCM Average Control Delay	23.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	125	45	45	20	25	1080	165	1570
Turn Type	Perm	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases		8		4	1	6	5	2
Permitted Phases	8		4					
Detector Phase	8	8	4	4	1	6	5	2
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	3.0	15.0	3.0	15.0
Minimum Split (s)	10.0	10.0	29.0	29.0	7.0	20.0	7.0	20.0
Total Split (s)	44.0	44.0	44.0	44.0	8.0	68.0	28.0	88.0
Total Split (%)	31.4%	31.4%	31.4%	31.4%	5.7%	48.6%	20.0%	62.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0		5.0	4.0	5.0	4.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	None	C-Max
Act Effct Green (s)		31.3		31.3	4.0	76.9	17.8	93.9
Actuated g/C Ratio		0.22		0.22	0.03	0.55	0.13	0.67
v/c Ratio		0.95		0.54	0.53	0.65	0.79	0.82
Control Delay		97.0		38.3	85.4	31.6	86.1	5.4
Queue Delay		0.0		0.0	0.0	0.1	0.0	0.3
Total Delay		97.0		38.3	85.4	31.6	86.1	5.6
LOS		F		D	F	C	F	A
Approach Delay		97.0		38.3		32.7		12.5
Approach LOS		F		D		C		B

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 69 (49%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.95
Intersection Signal Delay: 25.7 Intersection LOS: C
Intersection Capacity Utilization 90.0% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 4: Honoapiilani Highway & Dickenson Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	125	45	40	45	20	120	25	1080	75	165	1570	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.98		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.97			0.91		1.00	0.99		1.00	0.98	
Flt Protected		0.97			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1750			1651		1770	3489		1770	3479	
Flt Permitted		0.58			0.87		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1046			1452		1770	3489		1770	3479	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	136	49	43	49	22	130	27	1174	82	179	1707	217
RTOR Reduction (vph)	0	6	0	0	50	0	0	3	0	0	6	0
Lane Group Flow (vph)	0	222	0	0	151	0	27	1253	0	179	1918	0
Confl. Peds. (#/hr)	8		1	1		8			10			
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		31.3			31.3		2.4	76.9		17.8	92.3	
Effective Green, g (s)		31.3			31.3		2.4	76.9		17.8	92.3	
Actuated g/C Ratio		0.22			0.22		0.02	0.55		0.13	0.66	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		2.0			2.0		1.5	5.0		1.5	5.0	
Lane Grp Cap (vph)		234			325		30	1916		225	2294	
v/s Ratio Prot							0.02	0.36		c0.10	c0.55	
v/s Ratio Perm		c0.21			0.10							
v/c Ratio		0.95			0.46		0.90	0.65		0.80	0.84	
Uniform Delay, d1		53.5			47.1		68.7	22.2		59.3	18.1	
Progression Factor		1.00			1.07		0.82	1.22		1.32	0.18	
Incremental Delay, d2		43.6			0.4		109.1	1.5		5.5	1.2	
Delay (s)		97.2			51.0		165.7	28.6		84.1	4.5	
Level of Service		F			D		F	C		F	A	
Approach Delay (s)		97.2			51.0			31.5			11.3	
Approach LOS		F			D			C			B	

Intersection Summary			
HCM Average Control Delay	25.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	90.0%	ICU Level of Service	E
Analysis Period (min)	15		

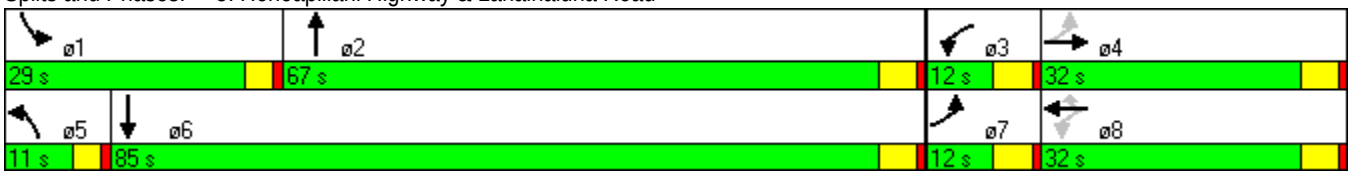
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	175	270	105	150	285	50	1250	240	1765
Turn Type	pm+pt	NA	pm+pt	NA	Perm	Prot	NA	Prot	NA
Protected Phases	7	4	3	8		5	2	1	6
Permitted Phases	4		8		8				
Detector Phase	7	4	3	8	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	4.0	5.0	4.0	5.0	5.0	3.0	15.0	3.0	15.0
Minimum Split (s)	9.0	32.0	9.0	29.0	29.0	7.0	30.0	7.0	30.0
Total Split (s)	12.0	32.0	12.0	32.0	32.0	11.0	67.0	29.0	85.0
Total Split (%)	8.6%	22.9%	8.6%	22.9%	22.9%	7.9%	47.9%	20.7%	60.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max
Act Effct Green (s)	34.0	27.0	34.0	27.0	27.0	6.6	64.0	23.0	82.2
Actuated g/C Ratio	0.24	0.19	0.24	0.19	0.19	0.05	0.46	0.16	0.59
v/c Ratio	0.71	1.00	0.81	0.45	0.58	0.64	0.89	0.90	0.97
Control Delay	59.7	103.4	79.8	54.7	12.5	86.1	30.9	73.3	22.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	23.4
Total Delay	59.7	103.4	79.8	54.7	12.5	86.1	30.9	73.3	45.5
LOS	E	F	E	D	B	F	C	E	D
Approach Delay		88.1		37.3			32.9		48.7
Approach LOS		F		D			C		D

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 57 (41%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 130
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 46.9 Intersection LOS: D
Intersection Capacity Utilization 95.8% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 5: Honoapiilani Highway & Lahainaluna Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	175	270	55	105	150	285	50	1250	70	240	1765	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1796		1766	1863	1583	1770	3507		1770	3510	
Flt Permitted	0.50	1.00		0.15	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	936	1796		275	1863	1583	1770	3507		1770	3510	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	190	293	60	114	163	310	54	1359	76	261	1918	92
RTOR Reduction (vph)	0	6	0	0	0	228	0	3	0	0	3	0
Lane Group Flow (vph)	190	347	0	114	163	82	54	1432	0	261	2007	0
Confl. Peds. (#/hr)			30	30					5			3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	34.0	27.0		34.0	27.0	27.0	5.6	64.0		23.0	81.4	
Effective Green, g (s)	34.0	27.0		34.0	27.0	27.0	5.6	64.0		23.0	81.4	
Actuated g/C Ratio	0.24	0.19		0.24	0.19	0.19	0.04	0.46		0.16	0.58	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	2.0		3.0	4.0	4.0	2.0	4.5		2.0	4.5	
Lane Grp Cap (vph)	269	346		141	359	305	71	1603		291	2041	
v/s Ratio Prot	0.04	c0.19		c0.04	0.09		0.03	0.41		c0.15	c0.57	
v/s Ratio Perm	0.14			0.16		0.05						
v/c Ratio	0.71	1.00		0.81	0.45	0.27	0.76	0.89		0.90	0.98	
Uniform Delay, d1	48.2	56.5		45.6	50.0	48.1	66.5	34.9		57.3	28.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.92	0.68		1.22	0.66	
Incremental Delay, d2	8.2	49.4		27.7	1.2	0.7	27.9	6.5		3.6	3.3	
Delay (s)	56.4	105.9		73.4	51.2	48.8	89.3	30.0		73.4	22.2	
Level of Service	E	F		E	D	D	F	C		E	C	
Approach Delay (s)		88.5			54.2			32.2			28.1	
Approach LOS		F			D			C			C	

Intersection Summary			
HCM Average Control Delay	39.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	95.8%	ICU Level of Service	F
Analysis Period (min)	15		

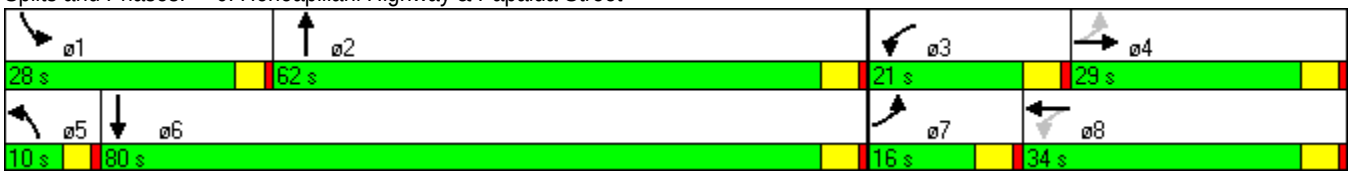
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	300	105	165	150	70	1500	390	1780
Turn Type	pm+pt	NA	pm+pt	NA	Prot	NA	Prot	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8					
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	4.0	5.0	4.0	5.0	5.0	15.0	15.0	5.0
Minimum Split (s)	9.0	29.0	9.0	29.0	9.0	23.0	20.0	23.0
Total Split (s)	16.0	29.0	21.0	34.0	10.0	62.0	28.0	80.0
Total Split (%)	11.4%	20.7%	15.0%	24.3%	7.1%	44.3%	20.0%	57.1%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0		5.0	4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	Max	C-Max
Act Effct Green (s)	45.0	45.0		29.0	6.0	57.0	24.0	75.0
Actuated g/C Ratio	0.32	0.32		0.21	0.04	0.41	0.17	0.54
v/c Ratio	1.25	0.36		2.04	1.00	1.28	1.40	1.16
Control Delay	177.6	34.0		506.4	149.4	152.0	231.7	102.8
Queue Delay	0.0	0.0		0.0	0.0	0.4	0.0	11.5
Total Delay	177.6	34.0		506.4	149.4	152.4	231.7	114.3
LOS	F	C		F	F	F	F	F
Approach Delay		122.0		506.4		152.3		133.5
Approach LOS		F		F		F		F

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 69 (49%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 2.04
Intersection Signal Delay: 182.9 Intersection LOS: F
Intersection Capacity Utilization 137.4% ICU Level of Service H
Analysis Period (min) 15

Splits and Phases: 6: Honoapiilani Highway & Papalua Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	300	105	85	165	150	305	70	1500	165	390	1780	210
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99			0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93			0.93		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1718			1700		1770	3467		1770	3472	
Flt Permitted	0.27	1.00			0.84		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	497	1718			1449		1770	3467		1770	3472	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	326	114	92	179	163	332	76	1630	179	424	1935	228
RTOR Reduction (vph)	0	17	0	0	29	0	0	6	0	0	7	0
Lane Group Flow (vph)	326	189	0	0	645	0	76	1803	0	424	2157	0
Confl. Peds. (#/hr)	1		8	8		1			10			3
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8								
Actuated Green, G (s)	45.0	45.0			29.0		6.0	57.0		24.0	75.0	
Effective Green, g (s)	45.0	45.0			29.0		6.0	57.0		24.0	75.0	
Actuated g/C Ratio	0.32	0.32			0.21		0.04	0.41		0.17	0.54	
Clearance Time (s)	5.0	5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	3.0			3.0		2.0	6.0		6.0	3.0	
Lane Grp Cap (vph)	260	552			300		76	1412		303	1860	
v/s Ratio Prot	c0.10	0.11					0.04	c0.52		c0.24	0.62	
v/s Ratio Perm	0.30				c0.44							
v/c Ratio	1.25	0.34			2.15		1.00	1.28		1.40	1.16	
Uniform Delay, d1	47.9	36.2			55.5		67.0	41.5		58.0	32.5	
Progression Factor	1.00	1.00			1.00		1.13	0.56		1.02	0.86	
Incremental Delay, d2	141.8	0.4			528.0		77.0	127.8		189.5	75.1	
Delay (s)	189.7	36.6			583.7		153.0	151.0		248.4	103.1	
Level of Service	F	D			F		F	F		F	F	
Approach Delay (s)		130.4			583.7			151.1			126.9	
Approach LOS		F			F			F			F	

Intersection Summary			
HCM Average Control Delay	189.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.52		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	137.4%	ICU Level of Service	H
Analysis Period (min)	15		

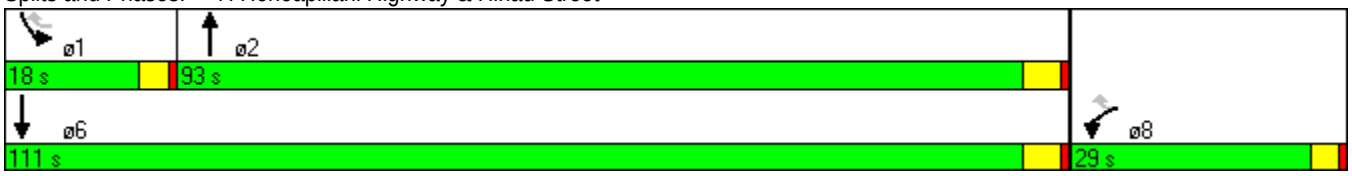
c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations					
Volume (vph)	130	125	2050	135	2330
Turn Type	NA	custom	NA	Prot	NA
Protected Phases	8		2	1	6
Permitted Phases		8 1			
Detector Phase	8	8 1	2	1	6
Switch Phase					
Minimum Initial (s)	7.0		15.0	4.0	15.0
Minimum Split (s)	29.0		23.0	9.0	20.0
Total Split (s)	29.0		93.0	18.0	111.0
Total Split (%)	20.7%		66.4%	12.9%	79.3%
Yellow Time (s)	3.0		4.0	3.0	4.0
All-Red Time (s)	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0		5.0	4.0	5.0
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?					
Recall Mode	None		C-Max	None	C-Max
Act Effct Green (s)	16.4	34.0	97.0	13.6	114.6
Actuated g/C Ratio	0.12	0.24	0.69	0.10	0.82
v/c Ratio	0.68	0.36	0.96	0.85	0.87
Control Delay	75.1	42.9	13.6	49.7	23.8
Queue Delay	0.0	0.0	0.0	0.0	0.1
Total Delay	75.1	42.9	13.6	49.7	23.9
LOS	E	D	B	D	C
Approach Delay	59.3		13.6		25.3
Approach LOS	E		B		C

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 80 (57%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.96
Intersection Signal Delay: 21.9 Intersection LOS: C
Intersection Capacity Utilization 87.6% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 7: Honoapiilani Highway & Hinau Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	130	125	2050	110	135	2330
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0		4.0	5.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.98	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1551	3512		1770	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1551	3512		1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	136	2228	120	147	2533
RTOR Reduction (vph)	0	6	2	0	0	0
Lane Group Flow (vph)	141	130	2346	0	147	2533
Confl. Peds. (#/hr)		5				
Turn Type	NA	custom	NA		Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8 1				
Actuated Green, G (s)	16.4	34.0	97.0		13.6	114.6
Effective Green, g (s)	16.4	34.0	97.0		13.6	114.6
Actuated g/C Ratio	0.12	0.24	0.69		0.10	0.82
Clearance Time (s)	4.0		5.0		4.0	5.0
Vehicle Extension (s)	3.0		5.0		3.0	5.0
Lane Grp Cap (vph)	207	377	2433		172	2897
v/s Ratio Prot	c0.08		c0.67		0.08	c0.72
v/s Ratio Perm		0.08				
v/c Ratio	0.68	0.34	0.96		0.85	0.87
Uniform Delay, d1	59.3	43.8	19.9		62.2	8.1
Progression Factor	1.00	1.00	0.51		0.70	2.51
Incremental Delay, d2	8.9	0.6	1.6		4.0	0.4
Delay (s)	68.2	44.3	11.8		47.4	20.7
Level of Service	E	D	B		D	C
Approach Delay (s)	56.5		11.8			22.2
Approach LOS	E		B			C

Intersection Summary			
HCM Average Control Delay	19.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	87.6%	ICU Level of Service	E
Analysis Period (min)	15		

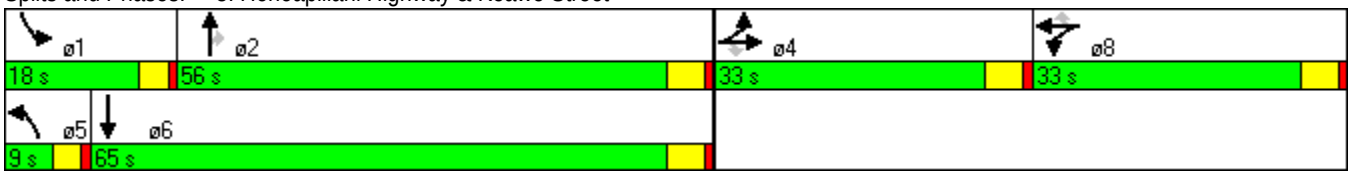
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Volume (vph)	80	90	95	255	55	735	100	1910	260	615	2105
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA
Protected Phases	4	4		8	8		5	2		1	6
Permitted Phases			4			8			2		
Detector Phase	4	4	4	8	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	15.0	15.0	3.0	15.0
Minimum Split (s)	33.0	33.0	33.0	10.0	10.0	10.0	7.0	29.0	29.0	7.0	29.0
Total Split (s)	33.0	33.0	33.0	33.0	33.0	33.0	9.0	56.0	56.0	18.0	65.0
Total Split (%)	23.6%	23.6%	23.6%	23.6%	23.6%	23.6%	6.4%	40.0%	40.0%	12.9%	46.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max
Act Effct Green (s)	13.7	12.7	12.7	29.0	28.0	28.0	5.0	66.3	66.3	14.0	75.3
Actuated g/C Ratio	0.10	0.09	0.09	0.21	0.20	0.20	0.04	0.47	0.47	0.10	0.54
v/c Ratio	0.50	0.58	0.46	0.72	1.12	0.79	1.73	1.24	0.37	1.95	1.25
Control Delay	69.1	74.0	22.2	64.3	118.3	25.5	396.0	132.6	6.9	468.5	145.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	69.1	74.0	22.2	64.3	118.3	25.5	396.0	132.6	6.9	468.5	145.8
LOS	E	E	C	E	F	C	F	F	A	F	F
Approach Delay		54.0			70.6			129.8			217.0
Approach LOS		D			E			F			F

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.95
Intersection Signal Delay: 155.1 Intersection LOS: F
Intersection Capacity Utilization 107.6% ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 8: Honoapiilani Highway & Keawe Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	90	95	255	55	735	100	1910	260	615	2105	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	0.95	0.91	0.95	1.00	0.95	1.00	0.97	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99	0.99	1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.88	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1562	1681	1470	1484	1770	3539	1562	3433	3519	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1562	1681	1470	1484	1770	3539	1562	3433	3519	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	98	103	277	60	799	109	2076	283	668	2288	71
RTOR Reduction (vph)	0	0	80	0	105	258	0	0	32	0	1	0
Lane Group Flow (vph)	87	98	23	249	343	181	109	2076	251	668	2358	0
Confl. Peds. (#/hr)	1		1	1		1			1			7
Turn Type	Split	NA	Perm	Split	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8			2			
Actuated Green, G (s)	12.7	12.7	12.7	28.0	28.0	28.0	5.0	66.3	66.3	14.0	75.3	
Effective Green, g (s)	13.7	12.7	12.7	29.0	28.0	28.0	5.0	66.3	66.3	14.0	75.3	
Actuated g/C Ratio	0.10	0.09	0.09	0.21	0.20	0.20	0.04	0.47	0.47	0.10	0.54	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	2.0	5.0	5.0	2.0	5.0	
Lane Grp Cap (vph)	173	169	142	348	294	297	63	1676	740	343	1893	
v/s Ratio Prot	0.05	c0.05		0.15	c0.23		0.06	0.59		c0.19	c0.67	
v/s Ratio Perm			0.01			0.12			0.16			
v/c Ratio	0.50	0.58	0.16	0.72	1.17	0.61	1.73	1.24	0.34	1.95	1.25	
Uniform Delay, d1	59.9	61.1	58.7	51.7	56.0	51.0	67.5	36.9	23.1	63.0	32.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.17	0.56	0.34	1.00	1.00	
Incremental Delay, d2	2.3	4.8	0.5	6.8	105.7	3.5	355.5	109.7	0.5	436.9	115.1	
Delay (s)	62.2	65.9	59.3	58.5	161.7	54.5	434.2	130.3	8.3	499.9	147.4	
Level of Service	E	E	E	E	F	D	F	F	A	F	F	
Approach Delay (s)		62.4			97.7			129.7			225.2	
Approach LOS		E			F			F			F	

Intersection Summary			
HCM Average Control Delay	163.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	107.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	40	540	20	40	420	20	20	5	70	20	5	95
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	43	587	22	43	913	22	22	5	76	22	5	103
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		351										
pX, platoon unblocked				0.84			0.84	0.84	0.84	0.84	0.84	
vC, conflicting volume	935			609			1334	1707	598	1764	1707	467
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	935			433			1301	1747	420	1816	1747	467
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			95			68	91	84	27	91	81
cM capacity (veh/h)	728			938			69	64	486	30	64	542

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	43	609	43	609	326	103	27	103
Volume Left	43	0	43	0	0	22	22	0
Volume Right	0	22	0	0	22	76	0	103
cSH	728	1700	938	1700	1700	185	33	542
Volume to Capacity	0.06	0.36	0.05	0.36	0.19	0.56	0.82	0.19
Queue Length 95th (ft)	5	0	4	0	0	73	71	17
Control Delay (s)	10.3	0.0	9.0	0.0	0.0	46.4	277.1	13.2
Lane LOS	B		A			E	F	B
Approach Delay (s)	0.7		0.4			46.4	68.2	
Approach LOS						E	F	

Intersection Summary			
Average Delay	7.8		
Intersection Capacity Utilization	52.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	180	445	370	45	55	120
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	196	484	603	49	60	130
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		737				
pX, platoon unblocked						
vC, conflicting volume	652				1503	628
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	652				1503	628
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	79				44	73
cM capacity (veh/h)	934				106	483

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	196	484	652	60	130
Volume Left	196	0	0	60	0
Volume Right	0	0	49	0	130
cSH	934	1700	1700	106	483
Volume to Capacity	0.21	0.28	0.38	0.56	0.27
Queue Length 95th (ft)	20	0	0	67	27
Control Delay (s)	9.9	0.0	0.0	76.1	15.2
Lane LOS	A			F	C
Approach Delay (s)	2.8		0.0	34.3	
Approach LOS				D	

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	55.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	85	520	700	120	80	60
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	92	565	761	130	87	65
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		1056				
pX, platoon unblocked						
vC, conflicting volume	891				1293	446
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	891				1293	446
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	88				36	88
cM capacity (veh/h)	756				135	560

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	92	283	283	507	384	87	65
Volume Left	92	0	0	0	0	87	0
Volume Right	0	0	0	0	130	0	65
cSH	756	1700	1700	1700	1700	135	560
Volume to Capacity	0.12	0.17	0.17	0.30	0.23	0.64	0.12
Queue Length 95th (ft)	10	0	0	0	0	86	10
Control Delay (s)	10.4	0.0	0.0	0.0	0.0	70.0	12.3
Lane LOS	B					F	B
Approach Delay (s)	1.5			0.0		45.3	
Approach LOS						E	

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	60	0	40	30	0	0	40	150	20	5	100	145
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	65	0	43	33	0	0	43	163	22	5	109	158
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	459	470	188	503	538	174	266			185		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	459	470	188	503	538	174	266			185		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	87	100	95	93	100	100	97			100		
cM capacity (veh/h)	498	473	855	442	433	870	1298			1390		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	65	43	33	228	272
Volume Left	65	0	33	43	5
Volume Right	0	43	0	22	158
cSH	498	855	442	1298	1390
Volume to Capacity	0.13	0.05	0.07	0.03	0.00
Queue Length 95th (ft)	11	4	6	3	0
Control Delay (s)	13.3	9.4	13.8	1.7	0.2
Lane LOS	B	A	B	A	A
Approach Delay (s)	11.8		13.8	1.7	0.2
Approach LOS	B		B		

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	65	170	20	0	120	0	10	0	0	0	0	40
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	71	185	22	0	130	0	11	0	0	0	0	43
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	109	43	22	136	65	0	43			0		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	109	43	22	136	65	0	43			0		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	91	78	98	100	84	100	99			100		
cM capacity (veh/h)	760	842	1055	676	820	1085	1565			1623		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	71	207	130	11	0	0	43
Volume Left	71	0	0	11	0	0	0
Volume Right	0	22	0	0	0	0	43
cSH	760	861	820	1565	1700	1700	1700
Volume to Capacity	0.09	0.24	0.16	0.01	0.00	0.00	0.03
Queue Length 95th (ft)	8	23	14	1	0	0	0
Control Delay (s)	10.2	10.5	10.2	7.3	0.0	0.0	0.0
Lane LOS	B	B	B	A			
Approach Delay (s)	10.4		10.2	7.3		0.0	
Approach LOS	B		B				

Intersection Summary			
Average Delay	9.3		
Intersection Capacity Utilization	24.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	0	0	0	0	0	0
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	0	0	0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0	0	0			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	100	100			
cM capacity (veh/h)	1023	1085	1623			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	0	0	0	0
Volume Left	0	0	0	0
Volume Right	0	0	0	0
cSH	1700	1700	1700	1700
Volume to Capacity	0.00	0.00	0.00	0.00
Queue Length 95th (ft)	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0
Lane LOS	A			
Approach Delay (s)	0.0	0.0		0.0
Approach LOS	A			

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	0.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	85	85	1165	1545	25
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	92	92	1266	1679	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3144	1693	1707			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3144	1693	1707			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	40	20	75			
cM capacity (veh/h)	9	115	372			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	98	92	1266	1707
Volume Left	5	92	0	0
Volume Right	92	0	0	27
cSH	70	372	1700	1700
Volume to Capacity	1.40	0.25	0.74	1.00
Queue Length 95th (ft)	201	24	0	0
Control Delay (s)	348.1	17.8	0.0	0.0
Lane LOS	F	C		
Approach Delay (s)	348.1	1.2		0.0
Approach LOS	F			

Intersection Summary			
Average Delay	11.3		
Intersection Capacity Utilization	95.0%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	140	690	90	20	790	45	110	15	10	10	20	145
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	152	750	98	22	859	49	120	16	11	11	22	158
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		320										
pX, platoon unblocked												
vC, conflicting volume	908			848			1745	2054	424	1625	2079	454
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	908			848			1745	2054	424	1625	2079	454
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	80			97			0	61	98	72	47	72
cM capacity (veh/h)	746			785			19	42	579	39	41	553

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	152	500	348	22	572	335	120	27	33	158
Volume Left	152	0	0	22	0	0	120	0	11	0
Volume Right	0	0	98	0	0	49	0	11	0	158
cSH	746	1700	1700	785	1700	1700	19	67	40	553
Volume to Capacity	0.20	0.29	0.20	0.03	0.34	0.20	6.20	0.40	0.81	0.28
Queue Length 95th (ft)	19	0	0	2	0	0	Err	39	76	29
Control Delay (s)	11.1	0.0	0.0	9.7	0.0	0.0	Err	90.9	237.4	14.1
Lane LOS	B			A			F	F	F	B
Approach Delay (s)	1.7			0.2			8164.2		52.4	
Approach LOS							F		F	

Intersection Summary			
Average Delay	533.8		
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	80	595	35	10	760	20	25	5	5	10	0	90
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	87	647	38	11	826	22	27	5	5	11	0	98
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		599										
pX, platoon unblocked												
vC, conflicting volume	848			685			1372	1709	342	1364	1717	424
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	848			685			1372	1709	342	1364	1717	424
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	89			99			66	93	99	88	100	83
cM capacity (veh/h)	785			905			79	79	654	91	78	579

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	87	431	254	11	551	297	33	5	11	98
Volume Left	87	0	0	11	0	0	27	0	11	0
Volume Right	0	0	38	0	0	22	0	5	0	98
cSH	785	1700	1700	905	1700	1700	79	654	91	579
Volume to Capacity	0.11	0.25	0.15	0.01	0.32	0.17	0.41	0.01	0.12	0.17
Queue Length 95th (ft)	9	0	0	1	0	0	41	1	10	15
Control Delay (s)	10.2	0.0	0.0	9.0	0.0	0.0	79.4	10.6	50.0	12.5
Lane LOS	B			A			F	B	E	B
Approach Delay (s)	1.1			0.1			69.5		16.2	
Approach LOS							F		C	

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	470	135	15	645	200	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	511	147	16	701	217	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	1293					
pX, platoon unblocked						
vC, conflicting volume			658		967	329
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			658		967	329
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		12	96
cM capacity (veh/h)			926		247	667

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	341	317	16	351	351	217	27
Volume Left	0	0	16	0	0	217	0
Volume Right	0	147	0	0	0	0	27
cSH	1700	1700	926	1700	1700	247	667
Volume to Capacity	0.20	0.19	0.02	0.21	0.21	0.88	0.04
Queue Length 95th (ft)	0	0	1	0	0	184	3
Control Delay (s)	0.0	0.0	9.0	0.0	0.0	73.0	10.6
Lane LOS			A			F	B
Approach Delay (s)	0.0		0.2			66.1	
Approach LOS						F	

Intersection Summary			
Average Delay	10.1		
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	0	195	15	5	5	90	65	35	5	35	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	5	0	212	16	5	5	98	71	38	5	38	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	345	356	41	549	340	90	43			109		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	345	356	41	549	340	90	43			109		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	100	79	95	99	99	94			100		
cM capacity (veh/h)	571	532	1030	337	544	968	1565			1482		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	SB 1
Volume Total	5	212	27	207	49
Volume Left	5	0	16	98	5
Volume Right	0	212	5	38	5
cSH	571	1030	424	1565	1482
Volume to Capacity	0.01	0.21	0.06	0.06	0.00
Queue Length 95th (ft)	1	19	5	5	0
Control Delay (s)	11.4	9.4	14.1	3.8	0.9
Lane LOS	B	A	B	A	A
Approach Delay (s)	9.4		14.1	3.8	0.9
Approach LOS	A		B		

Intersection Summary				
Average Delay		6.5		
Intersection Capacity Utilization		31.9%	ICU Level of Service	A
Analysis Period (min)		15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	5	5	5	5	5	5	1255	5	0	1665	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	5	5	5	5	5	5	1364	5	0	1810	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1283				
pX, platoon unblocked	0.84	0.84		0.84	0.84	0.84				0.84		
vC, conflicting volume	2514	3193	908	2291	3193	685	1815			1370		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2421	3230	908	2156	3230	245	1815			1060		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	30	98	43	30	99	98			100		
cM capacity (veh/h)	6	8	278	9	8	635	334			549		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	11	16	5	909	460	1207	609
Volume Left	0	5	5	0	0	0	0
Volume Right	5	5	0	0	5	0	5
cSH	15	13	334	1700	1700	1700	1700
Volume to Capacity	0.72	1.28	0.02	0.53	0.27	0.71	0.36
Queue Length 95th (ft)	44	68	1	0	0	0	0
Control Delay (s)	464.5	760.0	16.0	0.0	0.0	0.0	0.0
Lane LOS	F	F	C				
Approach Delay (s)	464.5	760.0	0.1			0.0	
Approach LOS	F	F					

Intersection Summary				
Average Delay	5.4			
Intersection Capacity Utilization	58.1%	ICU Level of Service	B	
Analysis Period (min)	15			

APPENDIX D

LEVEL OF SERVICE CALCULATIONS

- Year 2020 Alternative 1 Front Street Terminus AM

HCM Unsignalized Intersection Capacity Analysis
1: Honoapiilani Hwy/Honoapiilani Highway & Aholo Street

12/28/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	5	0	0	60	0	810	5	0	680	15
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	5	0	0	65	0	880	5	0	739	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								951				
pX, platoon unblocked	0.86	0.86		0.86	0.86	0.86				0.86		
vC, conflicting volume	1188	1628	378	1255	1636	440	755			880		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	887	1400	378	966	1410	16	755			529		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	99	100	100	93	100			100		
cM capacity (veh/h)	190	119	620	178	118	908	851			887		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	5	65	440	440	5	493	263
Volume Left	0	0	0	0	0	0	0
Volume Right	5	65	0	0	5	0	16
cSH	620	908	1700	1700	1700	1700	1700
Volume to Capacity	0.01	0.07	0.26	0.26	0.00	0.29	0.15
Queue Length 95th (ft)	1	6	0	0	0	0	0
Control Delay (s)	10.9	9.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	A					
Approach Delay (s)	10.9	9.3	0.0			0.0	
Approach LOS	B	A					

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	32.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	5	5	5	5	15	5	1075	15	0	835	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	5	5	5	5	16	5	1168	16	0	908	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1267				
pX, platoon unblocked	0.93	0.93		0.93	0.93	0.93				0.93		
vC, conflicting volume	1524	2106	457	1649	2101	592	913			1185		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1413	2039	457	1548	2033	411	913			1048		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	89	99	92	90	97	99			100		
cM capacity (veh/h)	81	52	551	65	52	548	742			613		

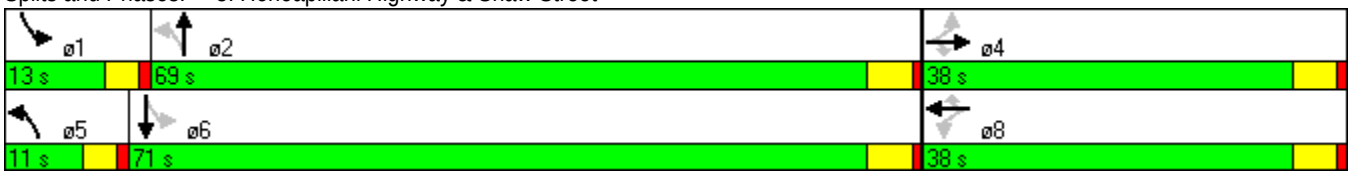
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	11	27	590	601	605	308
Volume Left	0	5	5	0	0	0
Volume Right	5	16	0	16	0	5
cSH	94	125	742	1700	1700	1700
Volume to Capacity	0.12	0.22	0.01	0.35	0.36	0.18
Queue Length 95th (ft)	9	20	1	0	0	0
Control Delay (s)	48.0	41.6	0.2	0.0	0.0	0.0
Lane LOS	E	E	A			
Approach Delay (s)	48.0	41.6	0.1		0.0	
Approach LOS	E	E				

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	46.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Volume (vph)	60	35	35	35	75	110	75	855	70	705
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases		4			8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	4	4	4	8	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	20.0	3.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	7.0	25.0	7.0	25.0
Total Split (s)	38.0	38.0	38.0	38.0	38.0	38.0	11.0	69.0	13.0	71.0
Total Split (%)	31.7%	31.7%	31.7%	31.7%	31.7%	31.7%	9.2%	57.5%	10.8%	59.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0	5.0		5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 23 (19%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 3: Honoapiilani Highway & Shaw Street



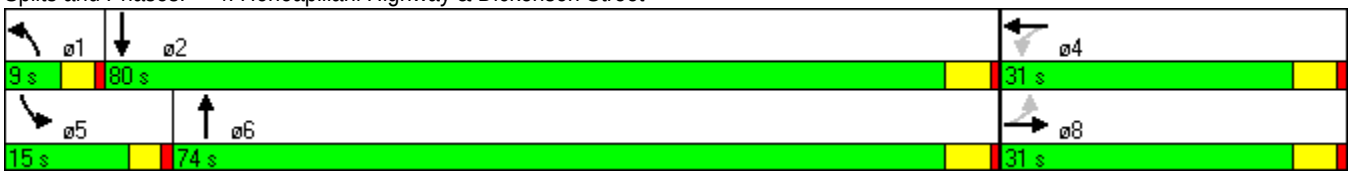
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	35	35	35	75	110	75	855	15	70	705	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected		0.97	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1806	1583		1834	1583	1770	3530		1770	3511	
Flt Permitted		0.61	1.00		0.79	1.00	0.33	1.00		0.28	1.00	
Satd. Flow (perm)		1127	1583		1464	1583	606	3530		515	3511	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	38	38	38	82	120	82	929	16	76	766	43
RTOR Reduction (vph)	0	0	34	0	0	106	0	1	0	0	2	0
Lane Group Flow (vph)	0	103	4	0	120	14	82	944	0	76	807	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		14.2	14.2		14.2	14.2	91.9	87.1		91.7	87.0	
Effective Green, g (s)		14.2	14.2		14.2	14.2	91.9	87.1		91.7	87.0	
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.77	0.73		0.76	0.72	
Clearance Time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	2.0	5.0		2.0	5.0	
Lane Grp Cap (vph)		133	187		173	187	511	2562		443	2545	
v/s Ratio Prot							0.01	c0.27		c0.01	0.23	
v/s Ratio Perm		c0.09	0.00		0.08	0.01	0.12			0.12		
v/c Ratio		0.77	0.02		0.69	0.08	0.16	0.37		0.17	0.32	
Uniform Delay, d1		51.3	46.8		50.8	47.1	3.6	6.2		3.8	5.9	
Progression Factor		1.00	1.00		1.09	1.45	1.00	1.00		0.93	1.13	
Incremental Delay, d2		24.0	0.1		11.4	0.2	0.1	0.4		0.1	0.3	
Delay (s)		75.3	46.8		66.9	68.5	3.6	6.6		3.5	7.0	
Level of Service		E	D		E	E	A	A		A	A	
Approach Delay (s)		67.6			67.7			6.3			6.7	
Approach LOS		E			E			A			A	

Intersection Summary			
HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	65	60	35	25	15	1070	45	780
Turn Type	Perm	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases		8		4	1	6	5	2
Permitted Phases	8		4					
Detector Phase	8	8	4	4	1	6	5	2
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	3.0	15.0	3.0	15.0
Minimum Split (s)	10.0	10.0	29.0	29.0	7.0	23.5	7.0	23.5
Total Split (s)	31.0	31.0	31.0	31.0	9.0	74.0	15.0	80.0
Total Split (%)	25.8%	25.8%	25.8%	25.8%	7.5%	61.7%	12.5%	66.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0		5.0	4.0	5.0	4.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 49 (41%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 4: Honoapiilani Highway & Dickenson Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	60	20	35	25	70	15	1070	40	45	780	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.93		1.00	0.99		1.00	0.98	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1778			1682		1770	3514		1770	3476	
Flt Permitted		0.68			0.83		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1232			1421		1770	3514		1770	3476	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	71	65	22	38	27	76	16	1163	43	49	848	114
RTOR Reduction (vph)	0	5	0	0	38	0	0	2	0	0	6	0
Lane Group Flow (vph)	0	153	0	0	103	0	16	1204	0	49	956	0
Confl. Peds. (#/hr)	8		1	1		8			10			
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		17.7			17.7		2.0	81.9		6.4	86.3	
Effective Green, g (s)		17.7			17.7		2.0	81.9		6.4	86.3	
Actuated g/C Ratio		0.15			0.15		0.02	0.68		0.05	0.72	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		2.0			2.0		1.5	5.0		1.5	5.0	
Lane Grp Cap (vph)		182			210		30	2398		94	2500	
v/s Ratio Prot							0.01	c0.34		c0.03	0.27	
v/s Ratio Perm		c0.12			0.07							
v/c Ratio		0.84			0.49		0.53	0.50		0.52	0.38	
Uniform Delay, d1		49.8			47.0		58.5	9.2		55.3	6.5	
Progression Factor		1.00			0.92		1.05	0.70		1.11	0.46	
Incremental Delay, d2		26.9			0.7		8.5	0.7		2.0	0.4	
Delay (s)		76.7			44.0		70.0	7.2		63.5	3.4	
Level of Service		E			D		E	A		E	A	
Approach Delay (s)		76.7			44.0			8.0			6.3	
Approach LOS		E			D			A			A	

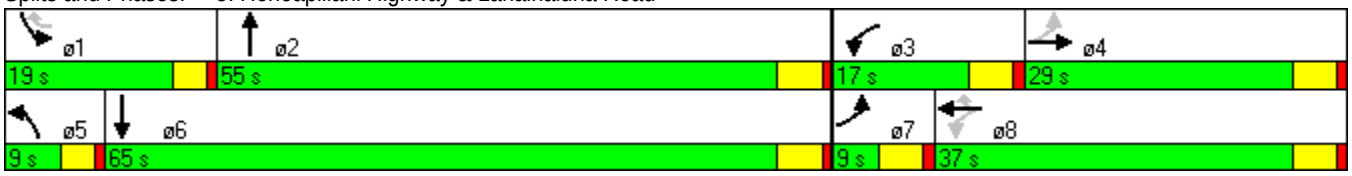
Intersection Summary			
HCM Average Control Delay	13.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	60	250	105	185	110	20	1085	145	820
Turn Type	pm+pt	NA	pm+pt	NA	custom	Prot	NA	Prot	NA
Protected Phases	7	4	3	8		5	2	1	6
Permitted Phases	4		8		8 1				
Detector Phase	7	4	3	8	8 1	5	2	1	6
Switch Phase									
Minimum Initial (s)	4.0	5.0	4.0	5.0		3.0	15.0	3.0	15.0
Minimum Split (s)	9.0	29.0	9.0	29.0		7.0	30.0	7.0	30.0
Total Split (s)	9.0	29.0	17.0	37.0		9.0	55.0	19.0	65.0
Total Split (%)	7.5%	24.2%	14.2%	30.8%		7.5%	45.8%	15.8%	54.2%
Yellow Time (s)	4.0	4.0	4.0	4.0		3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0		4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None		None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 53 (44%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 5: Honoapiilani Highway & Lahainaluna Road



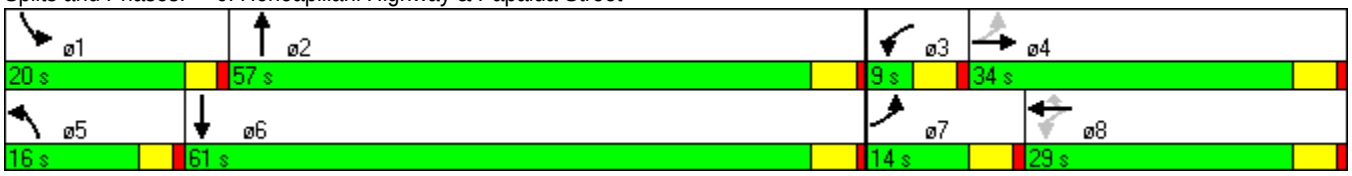
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	250	25	105	185	110	20	1085	50	145	820	25
Ideal Flow (vphpl)	1900	1900	1900	1500	1500	1500	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1828		1394	1471	1250	1770	3513		1770	3521	
Flt Permitted	0.48	1.00		0.18	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	887	1828		263	1471	1250	1770	3513		1770	3521	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	100%	100%	100%	150%	150%	200%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	65	272	27	171	302	239	22	1179	54	158	891	27
RTOR Reduction (vph)	0	3	0	0	0	37	0	3	0	0	2	0
Lane Group Flow (vph)	65	296	0	171	302	202	22	1230	0	158	916	0
Confl. Peds. (#/hr)			30	30					5			3
Turn Type	pm+pt	NA		pm+pt	NA	custom	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8 1						
Actuated Green, G (s)	26.2	23.0		40.0	31.8	50.3	3.0	52.5		13.5	63.0	
Effective Green, g (s)	26.2	23.0		40.0	31.8	50.3	3.0	52.5		13.5	63.0	
Actuated g/C Ratio	0.22	0.19		0.33	0.27	0.42	0.02	0.44		0.11	0.52	
Clearance Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	2.0		3.0	4.0		2.0	4.5		2.0	4.5	
Lane Grp Cap (vph)	217	350		201	390	524	44	1537		199	1849	
v/s Ratio Prot	0.01	0.16		c0.09	0.21		0.01	c0.35		c0.09	0.26	
v/s Ratio Perm	0.06			c0.20		0.16						
v/c Ratio	0.30	0.85		0.85	0.77	0.39	0.50	0.80		0.79	0.50	
Uniform Delay, d1	38.5	46.8		32.3	40.8	24.1	57.8	29.2		51.9	18.3	
Progression Factor	1.00	1.00		1.58	1.20	0.91	1.12	0.67		1.34	0.62	
Incremental Delay, d2	0.8	16.2		23.1	8.0	0.5	2.8	4.0		15.8	0.8	
Delay (s)	39.3	63.0		74.3	57.0	22.5	67.5	23.6		85.5	12.2	
Level of Service	D	E		E	E	C	E	C		F	B	
Approach Delay (s)		58.7			49.6			24.4			22.9	
Approach LOS		E			D			C			C	

Intersection Summary			
HCM Average Control Delay	32.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	225	85	30	35	165	80	1200	125	965
Turn Type	pm+pt	NA	pm+pt	NA	Perm	Prot	NA	Prot	NA
Protected Phases	7	4	3	8		5	2	1	6
Permitted Phases	4		8		8				
Detector Phase	7	4	3	8	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	4.0	5.0	4.0	5.0	5.0	5.0	15.0	15.0	5.0
Minimum Split (s)	9.0	29.0	9.0	29.0	29.0	9.0	23.0	20.0	23.0
Total Split (s)	14.0	34.0	9.0	29.0	29.0	16.0	57.0	20.0	61.0
Total Split (%)	11.7%	28.3%	7.5%	24.2%	24.2%	13.3%	47.5%	16.7%	50.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	None	C-Max	Max	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 63 (53%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated

Splits and Phases: 6: Honoapiilani Highway & Papalua Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	225	85	70	30	35	165	80	1200	45	125	965	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.99	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1768	1718		1759	1863	1562	1770	3516		1770	3474	
Flt Permitted	0.56	1.00		0.65	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1046	1718		1205	1863	1562	1770	3516		1770	3474	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	245	92	76	33	38	179	87	1304	49	136	1049	120
RTOR Reduction (vph)	0	28	0	0	0	161	0	2	0	0	6	0
Lane Group Flow (vph)	245	140	0	33	38	18	87	1351	0	136	1163	0
Confl. Peds. (#/hr)	1		8	8		1			10			3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	26.2	18.8		14.6	12.2	12.2	9.7	63.8		16.0	70.1	
Effective Green, g (s)	27.2	18.8		16.6	12.2	12.2	9.7	63.8		16.0	70.1	
Actuated g/C Ratio	0.23	0.16		0.14	0.10	0.10	0.08	0.53		0.13	0.58	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	2.0	6.0		6.0	3.0	
Lane Grp Cap (vph)	297	269		182	189	159	143	1869		236	2029	
v/s Ratio Prot	c0.07	0.08		0.01	0.02		0.05	c0.38		c0.08	0.33	
v/s Ratio Perm	c0.12			0.02		0.01						
v/c Ratio	0.82	0.52		0.18	0.20	0.11	0.61	0.72		0.58	0.57	
Uniform Delay, d1	43.2	46.5		45.4	49.4	49.0	53.3	21.4		48.8	15.6	
Progression Factor	1.00	1.00		1.01	1.00	1.06	1.17	0.28		1.11	0.55	
Incremental Delay, d2	16.8	1.8		0.5	0.5	0.3	3.5	1.7		9.1	1.1	
Delay (s)	60.0	48.3		46.3	49.8	52.3	65.7	7.7		63.3	9.7	
Level of Service	E	D		D	D	D	E	A		E	A	
Approach Delay (s)		55.2			51.1			11.2			15.3	
Approach LOS		E			D			B			B	

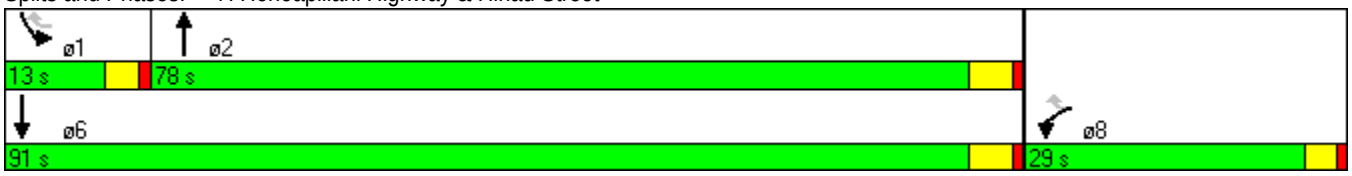
Intersection Summary			
HCM Average Control Delay	21.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations					
Volume (vph)	45	65	1460	50	1245
Turn Type	NA	custom	NA	Prot	NA
Protected Phases	8		2	1	6
Permitted Phases		8 1			
Detector Phase	8	8 1	2	1	6
Switch Phase					
Minimum Initial (s)	7.0		15.0	4.0	15.0
Minimum Split (s)	29.0		23.0	9.0	20.0
Total Split (s)	29.0		78.0	13.0	91.0
Total Split (%)	24.2%		65.0%	10.8%	75.8%
Yellow Time (s)	3.0		4.0	3.0	4.0
All-Red Time (s)	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0		5.0	4.0	5.0
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?					
Recall Mode	None		C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 100 (83%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 7: Honoapiilani Highway & Hinau Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	45	65	1460	70	50	1245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0		4.0	5.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.98	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1553	3515		1770	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1553	3515		1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	71	1587	76	54	1353
RTOR Reduction (vph)	0	27	2	0	0	0
Lane Group Flow (vph)	49	44	1661	0	54	1353
Confl. Peds. (#/hr)		5				
Turn Type	NA	custom	NA		Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8 1				
Actuated Green, G (s)	7.6	18.5	92.5		6.9	103.4
Effective Green, g (s)	7.6	18.5	92.5		6.9	103.4
Actuated g/C Ratio	0.06	0.15	0.77		0.06	0.86
Clearance Time (s)	4.0		5.0		4.0	5.0
Vehicle Extension (s)	3.0		5.0		3.0	5.0
Lane Grp Cap (vph)	112	239	2709		102	3049
v/s Ratio Prot	c0.03		c0.47		0.03	c0.38
v/s Ratio Perm		0.03				
v/c Ratio	0.44	0.18	0.61		0.53	0.44
Uniform Delay, d1	54.1	44.2	6.0		55.0	1.9
Progression Factor	1.00	1.00	0.44		0.76	1.16
Incremental Delay, d2	2.7	0.4	0.7		3.8	0.4
Delay (s)	56.9	44.6	3.4		45.6	2.5
Level of Service	E	D	A		D	A
Approach Delay (s)	49.6		3.4			4.2
Approach LOS	D		A			A

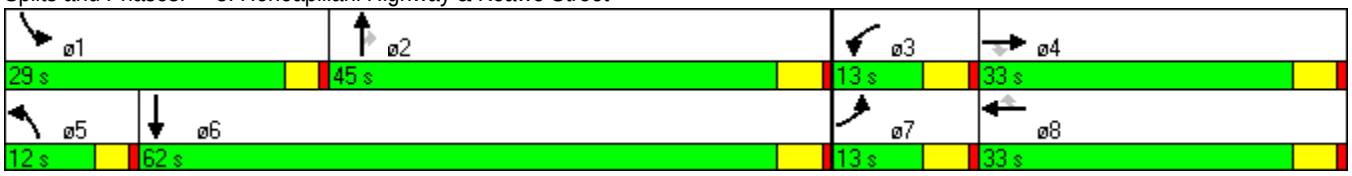
Intersection Summary			
HCM Average Control Delay	5.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Volume (vph)	35	50	60	75	45	760	50	1390	80	570	1255
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases			4			8			2		
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	15.0	15.0	3.0	15.0
Minimum Split (s)	10.0	33.0	33.0	10.0	33.0	33.0	7.0	29.0	29.0	7.0	29.0
Total Split (s)	13.0	33.0	33.0	13.0	33.0	33.0	12.0	45.0	45.0	29.0	62.0
Total Split (%)	10.8%	27.5%	27.5%	10.8%	27.5%	27.5%	10.0%	37.5%	37.5%	24.2%	51.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green, Master Intersection
Natural Cycle: 120
Control Type: Actuated-Coordinated

Splits and Phases: 8: Honoapiilani Highway & Keawe Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	50	60	75	45	760	50	1390	80	570	1255	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99	0.99	1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.87	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1562	1770	1516	1484	1770	3539	1562	3433	3526	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1562	1770	1516	1484	1770	3539	1562	3433	3526	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	54	65	82	49	826	54	1511	87	620	1364	27
RTOR Reduction (vph)	0	0	55	0	259	333	0	0	16	0	1	0
Lane Group Flow (vph)	38	54	10	82	178	105	54	1511	71	620	1390	0
Confl. Peds. (#/hr)	1		1	1		1			1			7
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			
Actuated Green, G (s)	4.8	18.2	18.2	6.4	19.8	19.8	6.1	52.5	52.5	23.9	70.3	
Effective Green, g (s)	5.8	18.2	18.2	7.4	19.8	19.8	6.1	52.5	52.5	23.9	70.3	
Actuated g/C Ratio	0.05	0.15	0.15	0.06	0.17	0.17	0.05	0.44	0.44	0.20	0.59	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	2.0	5.0	5.0	2.0	5.0	
Lane Grp Cap (vph)	86	283	237	109	250	245	90	1548	683	684	2066	
v/s Ratio Prot	0.02	0.03		c0.05	c0.12		0.03	c0.43		c0.18	0.39	
v/s Ratio Perm			0.01			0.07			0.05			
v/c Ratio	0.44	0.19	0.04	0.75	0.71	0.43	0.60	0.98	0.10	0.91	0.67	
Uniform Delay, d1	55.5	44.5	43.5	55.4	47.4	45.0	55.8	33.1	19.9	47.0	17.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.13	0.57	0.49	1.07	1.07	
Incremental Delay, d2	3.6	0.3	0.1	25.0	9.2	1.2	5.8	15.8	0.2	12.5	1.4	
Delay (s)	59.1	44.8	43.5	80.4	56.6	46.2	69.0	34.7	10.0	62.6	19.5	
Level of Service	E	D	D	F	E	D	E	C	A	E	B	
Approach Delay (s)		47.7			53.9			34.5			32.8	
Approach LOS		D			D			C			C	

Intersection Summary			
HCM Average Control Delay	38.1	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	420	20	60	490	15	10	5	20	5	5	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	16	457	22	65	799	16	11	5	22	5	5	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		290			280							
pX, platoon unblocked	0.85			0.85			0.92	0.92	0.85	0.92	0.92	0.85
vC, conflicting volume	815			478			1043	1446	467	1451	1448	408
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	422			303			398	835	290	841	838	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			94			98	98	96	97	98	99
cM capacity (veh/h)	961			1071			452	257	603	212	256	919

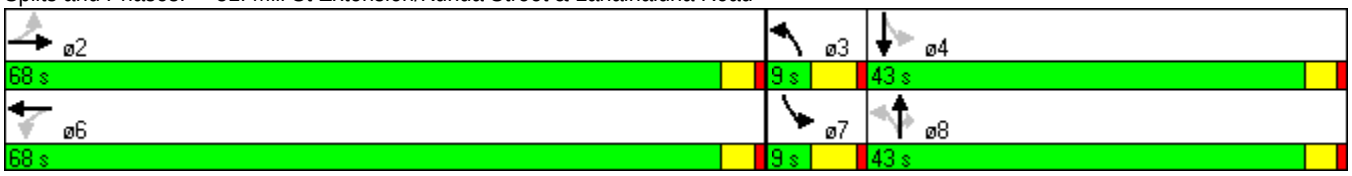
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	16	478	65	533	283	38	11	11
Volume Left	16	0	65	0	0	11	5	0
Volume Right	0	22	0	0	16	22	0	11
cSH	961	1700	1071	1700	1700	468	232	919
Volume to Capacity	0.02	0.28	0.06	0.31	0.17	0.08	0.05	0.01
Queue Length 95th (ft)	1	0	5	0	0	7	4	1
Control Delay (s)	8.8	0.0	8.6	0.0	0.0	13.4	21.3	9.0
Lane LOS	A		A			B	C	A
Approach Delay (s)	0.3		0.6			13.4	15.1	
Approach LOS						B	C	

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	48.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	30	350	65	525	15	380	125	30	355
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	pm+pt	NA
Protected Phases		2		6	3	8		7	4
Permitted Phases	2		6		8		8	4	
Detector Phase	2	2	6	6	3	8	8	7	4
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	25.0	25.0	25.0	25.0	9.0	25.0	25.0	9.0	25.0
Total Split (s)	68.0	68.0	68.0	68.0	9.0	43.0	43.0	9.0	43.0
Total Split (%)	56.7%	56.7%	56.7%	56.7%	7.5%	35.8%	35.8%	7.5%	35.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag					Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?					Yes			Yes	
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 81: Mill St Extension/Kuhua Street & Lahainaluna Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	350	10	65	525	20	15	380	125	30	355	25
Ideal Flow (vphpl)	1900	1900	1900	1500	1500	1500	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		5.0	4.0	4.0	5.0	4.0	
Lane Util. Factor	1.00	1.00			0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00			1.00		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1855			2774		1770	1863	1583	1770	1844	
Flt Permitted	0.24	1.00			0.88		0.20	1.00	1.00	0.18	1.00	
Satd. Flow (perm)	445	1855			2452		367	1863	1583	329	1844	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	100%	100%	100%	100%	150%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	33	380	11	71	856	22	16	413	136	33	386	27
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	53	0	2	0
Lane Group Flow (vph)	33	390	0	0	948	0	16	413	83	33	411	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	71.2	71.2			71.2		35.0	33.4	33.4	36.6	34.2	
Effective Green, g (s)	71.2	71.2			71.2		35.0	33.4	33.4	36.6	34.2	
Actuated g/C Ratio	0.59	0.59			0.59		0.29	0.28	0.28	0.31	0.29	
Clearance Time (s)	4.0	4.0			4.0		5.0	4.0	4.0	5.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	264	1101			1455		126	519	441	129	526	
v/s Ratio Prot		0.21					0.00	0.22		c0.01	c0.22	
v/s Ratio Perm	0.07				c0.39		0.04		0.05	0.07		
v/c Ratio	0.12	0.35			0.65		0.13	0.80	0.19	0.26	0.78	
Uniform Delay, d1	10.7	12.6			16.2		32.2	40.1	33.0	31.7	39.5	
Progression Factor	0.48	0.40			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.7	0.6			2.3		0.5	8.3	0.2	1.1	7.4	
Delay (s)	5.8	5.7			18.5		32.7	48.4	33.2	32.8	46.9	
Level of Service	A	A			B		C	D	C	C	D	
Approach Delay (s)		5.7			18.5			44.3			45.8	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM Average Control Delay	27.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	25	440	30	525	305	90	80	200
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	23.0	23.0	23.0	23.0	9.0	29.0	9.0	29.0
Total Split (s)	23.0	23.0	23.0	23.0	13.0	33.0	9.0	29.0
Total Split (%)	35.4%	35.4%	35.4%	35.4%	20.0%	50.8%	13.8%	44.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	Min	None	None

Intersection Summary
Cycle Length: 65
Actuated Cycle Length: 65
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 82: Kuhua Street & Keawe St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	440	150	30	525	40	305	90	40	80	200	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.99		1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3404		1770	3502		1770	1778		1770	1817	
Flt Permitted	0.37	1.00		0.35	1.00		0.35	1.00		0.67	1.00	
Satd. Flow (perm)	684	3404		654	3502		654	1778		1243	1817	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	27	478	163	33	571	43	332	98	43	87	217	43
RTOR Reduction (vph)	0	42	0	0	7	0	0	30	0	0	13	0
Lane Group Flow (vph)	27	599	0	33	607	0	332	111	0	87	247	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	26.9	26.9		26.9	26.9		27.9	19.9		18.3	15.1	
Effective Green, g (s)	26.9	26.9		26.9	26.9		27.9	19.9		18.3	15.1	
Actuated g/C Ratio	0.41	0.41		0.41	0.41		0.43	0.31		0.28	0.23	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	283	1409		271	1449		418	544		376	422	
v/s Ratio Prot		c0.18			0.17		c0.10	0.06		0.01	0.14	
v/s Ratio Perm	0.04			0.05			c0.24			0.05		
v/c Ratio	0.10	0.42		0.12	0.42		0.79	0.20		0.23	0.59	
Uniform Delay, d1	11.6	13.5		11.8	13.5		14.2	16.7		17.6	22.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	0.9		0.9	0.9		10.0	0.2		0.3	2.1	
Delay (s)	12.3	14.5		12.7	14.4		24.2	16.9		18.0	24.2	
Level of Service	B	B		B	B		C	B		B	C	
Approach Delay (s)		14.4			14.3			22.0			22.7	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	17.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	5	25	75	5	10	30	370	20	5	305	120
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	33	5	27	82	5	11	33	402	22	5	332	130
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								832				
pX, platoon unblocked	0.82	0.82		0.82	0.82	0.82				0.82		
vC, conflicting volume	889	897	397	851	951	413	462			424		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	754	764	397	708	831	174	462			188		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	87	98	96	69	98	98	97			100		
cM capacity (veh/h)	251	264	653	263	242	713	1099			1137		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	33	33	98	33	424	5	462
Volume Left	33	0	82	33	0	5	0
Volume Right	0	27	11	0	22	0	130
cSH	251	524	282	1099	1700	1137	1700
Volume to Capacity	0.13	0.06	0.35	0.03	0.25	0.00	0.27
Queue Length 95th (ft)	11	5	37	2	0	0	0
Control Delay (s)	21.4	12.3	24.4	8.4	0.0	8.2	0.0
Lane LOS	C	B	C	A		A	
Approach Delay (s)	16.9		24.4	0.6		0.1	
Approach LOS	C		C				

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	110	5	45	5	10	15	40	395	40	10	405	15
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	120	5	49	5	11	16	43	429	43	11	440	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											803	
pX, platoon unblocked	0.80	0.80	0.80	0.80	0.80		0.80					
vC, conflicting volume	1008	1030	448	1052	1016	451	457			473		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	886	913	187	940	896	451	197			473		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	37	97	93	97	95	97	96			99		
cM capacity (veh/h)	191	208	685	171	213	608	1102			1089		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	120	54	5	27	43	473	11	457
Volume Left	120	0	5	0	43	0	11	0
Volume Right	0	49	0	16	0	43	0	16
cSH	191	557	171	349	1102	1700	1089	1700
Volume to Capacity	0.63	0.10	0.03	0.08	0.04	0.28	0.01	0.27
Queue Length 95th (ft)	89	8	2	6	3	0	1	0
Control Delay (s)	50.9	12.2	26.7	16.2	8.4	0.0	8.3	0.0
Lane LOS	F	B	D	C	A		A	
Approach Delay (s)	38.8		17.9		0.7		0.2	
Approach LOS	E		C					

Intersection Summary			
Average Delay	6.5		
Intersection Capacity Utilization	49.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	55	20	30	85	75	45	295	15	15	370	50
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	11	60	22	33	92	82	49	321	16	16	402	54
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1008	897	429	913	916	329	457			337		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1008	897	429	913	916	329	457			337		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	77	97	83	64	89	96			99		
cM capacity (veh/h)	134	264	626	194	257	713	1104			1222		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	92	207	49	337	16	457
Volume Left	11	33	49	0	16	0
Volume Right	22	82	0	16	0	54
cSH	270	322	1104	1700	1222	1700
Volume to Capacity	0.34	0.64	0.04	0.20	0.01	0.27
Queue Length 95th (ft)	37	104	3	0	1	0
Control Delay (s)	25.2	34.3	8.4	0.0	8.0	0.0
Lane LOS	D	D	A		A	
Approach Delay (s)	25.2	34.3	1.1		0.3	
Approach LOS	D	D				

Intersection Summary			
Average Delay	8.6		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	5	20	300	445	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	5	22	326	484	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				990		
pX, platoon unblocked						
vC, conflicting volume	864	495	505			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	864	495	505			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	99	98			
cM capacity (veh/h)	318	575	1059			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	11	22	326	505
Volume Left	5	22	0	0
Volume Right	5	0	0	22
cSH	409	1059	1700	1700
Volume to Capacity	0.03	0.02	0.19	0.30
Queue Length 95th (ft)	2	2	0	0
Control Delay (s)	14.0	8.5	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	14.0	0.5		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	34.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	620	20	15	860	35	20	5	5	5	5	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	33	674	22	16	935	38	22	5	5	5	5	27
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		357			692							
pX, platoon unblocked	0.93						0.93	0.93		0.93	0.93	0.93
vC, conflicting volume	973			696			1280	1755	348	1397	1747	486
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	831			696			1159	1668	348	1284	1659	310
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			98			82	94	99	95	94	96
cM capacity (veh/h)	745			896			122	84	648	102	85	641

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	33	449	246	16	623	350	27	5	11	27
Volume Left	33	0	0	16	0	0	22	0	5	0
Volume Right	0	0	22	0	0	38	0	5	0	27
cSH	745	1700	1700	896	1700	1700	112	648	93	641
Volume to Capacity	0.04	0.26	0.14	0.02	0.37	0.21	0.24	0.01	0.12	0.04
Queue Length 95th (ft)	3	0	0	1	0	0	22	1	10	3
Control Delay (s)	10.1	0.0	0.0	9.1	0.0	0.0	47.1	10.6	48.9	10.9
Lane LOS	B			A			E	B	E	B
Approach Delay (s)	0.5			0.1			41.0		21.7	
Approach LOS							E		C	

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	41.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	605	10	5	860	10	35	0	10	10	0	15
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	22	658	11	5	935	11	38	0	11	11	0	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		619			430							
pX, platoon unblocked	0.90						0.90	0.90		0.90	0.90	0.90
vC, conflicting volume	946			668			1201	1663	334	1334	1663	473
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	712			668			996	1511	334	1145	1511	185
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			99			78	100	98	92	100	98
cM capacity (veh/h)	793			917			170	103	662	133	103	741

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	22	438	230	5	623	322	38	11	11	16
Volume Left	22	0	0	5	0	0	38	0	11	0
Volume Right	0	0	11	0	0	11	0	11	0	16
cSH	793	1700	1700	917	1700	1700	170	662	133	741
Volume to Capacity	0.03	0.26	0.14	0.01	0.37	0.19	0.22	0.02	0.08	0.02
Queue Length 95th (ft)	2	0	0	0	0	0	21	1	7	2
Control Delay (s)	9.7	0.0	0.0	8.9	0.0	0.0	32.2	10.5	34.4	10.0
Lane LOS	A			A			D	B	D	A
Approach Delay (s)	0.3			0.1			27.4		19.8	
Approach LOS							D		C	

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	40.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	330	230	30	495	100	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	359	250	33	538	109	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	247					
pX, platoon unblocked			0.91		0.91	0.91
vC, conflicting volume			609		818	304
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			372		602	37
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		71	98
cM capacity (veh/h)			1077		381	934

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	239	370	33	269	269	109	16
Volume Left	0	0	33	0	0	109	0
Volume Right	0	250	0	0	0	0	16
cSH	1700	1700	1077	1700	1700	381	934
Volume to Capacity	0.14	0.22	0.03	0.16	0.16	0.29	0.02
Queue Length 95th (ft)	0	0	2	0	0	29	1
Control Delay (s)	0.0	0.0	8.4	0.0	0.0	18.2	8.9
Lane LOS			A			C	A
Approach Delay (s)	0.0		0.5			17.0	
Approach LOS						C	

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	35.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	20	45	395	10	15	370
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	49	429	11	16	402
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						1181
pX, platoon unblocked						
vC, conflicting volume	870	435			440	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	870	435			440	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	92			99	
cM capacity (veh/h)	317	621			1120	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	71	440	16	402
Volume Left	22	0	16	0
Volume Right	49	11	0	0
cSH	897	1700	1120	1700
Volume to Capacity	0.08	0.26	0.01	0.24
Queue Length 95th (ft)	6	0	1	0
Control Delay (s)	13.1	0.0	8.3	0.0
Lane LOS	B		A	
Approach Delay (s)	13.1	0.0	0.3	
Approach LOS	B			

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	31.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	5	15	50	5	5	15	380	10	5	365	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	27	5	16	54	5	5	16	413	11	5	397	27
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1251				
pX, platoon unblocked	0.90	0.90		0.90	0.90	0.90				0.90		
vC, conflicting volume	875	878	410	878	886	418	424			424		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	805	808	410	808	817	297	424			303		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	90	98	97	79	98	99	99			100		
cM capacity (veh/h)	260	278	641	255	274	668	1135			1131		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	33	16	65	16	424	5	424
Volume Left	27	0	54	16	0	5	0
Volume Right	0	16	5	0	11	0	27
cSH	263	641	270	1135	1700	1131	1700
Volume to Capacity	0.12	0.03	0.24	0.01	0.25	0.00	0.25
Queue Length 95th (ft)	10	2	23	1	0	0	0
Control Delay (s)	20.6	10.8	22.5	8.2	0.0	8.2	0.0
Lane LOS	C	B	C	A		A	
Approach Delay (s)	17.3		22.5	0.3		0.1	
Approach LOS	C		C				

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	37.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	65	10	75	25	105	15	45	5	15	20	5	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	71	11	82	27	114	16	49	5	16	22	5	27
Pedestrians								50				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								4				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		408										
pX, platoon unblocked												
vC, conflicting volume	130			142			441	428	102	348	460	122
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	130			142			441	428	102	348	460	122
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			98			89	99	98	96	99	97
cM capacity (veh/h)	1455			1380			446	464	914	543	445	929

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	71	92	27	130	49	22	22	33
Volume Left	71	0	27	0	49	0	22	0
Volume Right	0	82	0	16	0	16	0	27
cSH	1455	1700	1380	1700	446	736	543	786
Volume to Capacity	0.05	0.05	0.02	0.08	0.11	0.03	0.04	0.04
Queue Length 95th (ft)	4	0	2	0	9	2	3	3
Control Delay (s)	7.6	0.0	7.7	0.0	14.1	10.0	11.9	9.8
Lane LOS	A		A		B	B	B	A
Approach Delay (s)	3.3		1.3		12.8		10.6	
Approach LOS					B		B	

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	26.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	10	5	50	0	95	5	355	10	70	380	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	16	11	5	54	0	103	5	386	11	76	413	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1068	976	416	978	973	391	418			397		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1068	976	416	978	973	391	418			397		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	90	95	99	74	100	84	100			93		
cM capacity (veh/h)	159	234	637	208	235	657	1141			1162		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	33	158	5	397	76	418
Volume Left	16	54	5	0	76	0
Volume Right	5	103	0	11	0	5
cSH	207	377	1141	1700	1162	1700
Volume to Capacity	0.16	0.42	0.00	0.23	0.07	0.25
Queue Length 95th (ft)	14	50	0	0	5	0
Control Delay (s)	25.6	21.3	8.2	0.0	8.3	0.0
Lane LOS	D	C	A		A	
Approach Delay (s)	25.6	21.3	0.1		1.3	
Approach LOS	D	C				

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	70	75	280	25	15	400
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	76	82	304	27	16	435
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	785	318			332	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	785	318			332	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	79	89			99	
cM capacity (veh/h)	356	723			1228	

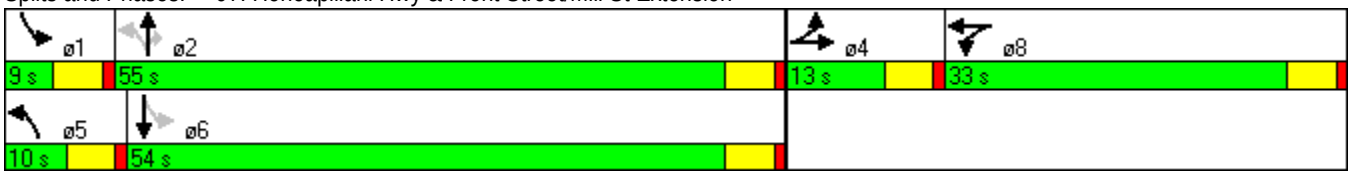
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	158	332	451
Volume Left	76	0	16
Volume Right	82	27	0
cSH	483	1700	1228
Volume to Capacity	0.33	0.20	0.01
Queue Length 95th (ft)	35	0	1
Control Delay (s)	16.0	0.0	0.4
Lane LOS	C		A
Approach Delay (s)	16.0	0.0	0.4
Approach LOS	C		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	48.3%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations								
Volume (vph)	10	435	35	75	800	290	30	605
Turn Type	NA	Split	NA	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	4	8	8	5	2		1	6
Permitted Phases				2		2	6	
Detector Phase	4	8	8	5	2	2	1	6
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	29.0	29.0	9.0	26.0	26.0	9.0	26.0
Total Split (s)	13.0	33.0	33.0	10.0	55.0	55.0	9.0	54.0
Total Split (%)	11.8%	30.0%	30.0%	9.1%	50.0%	50.0%	8.2%	49.1%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag				Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	None	C-Max

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Splits and Phases: 97: Honoapiilani Hwy & Front Street/Mill St Extension



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	10	40	435	35	5	75	800	290	30	605	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00		0.95	0.95		1.00	0.95	1.00	1.00	0.95	
Frt		0.92		1.00	1.00		1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.99		0.95	0.96		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1689		1681	1694		1770	3539	1583	1770	3530	
Flt Permitted		0.99		0.95	0.96		0.34	1.00	1.00	0.27	1.00	
Satd. Flow (perm)		1689		1681	1694		624	3539	1583	495	3530	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	11	43	473	38	5	82	870	315	33	658	11
RTOR Reduction (vph)	0	41	0	0	1	0	0	0	145	0	1	0
Lane Group Flow (vph)	0	29	0	255	260	0	82	870	170	33	668	0
Turn Type	Split	NA		Split	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		5.8		22.4	22.4		63.4	59.4	59.4	60.2	57.8	
Effective Green, g (s)		5.8		22.4	22.4		63.4	59.4	59.4	60.2	57.8	
Actuated g/C Ratio		0.05		0.20	0.20		0.58	0.54	0.54	0.55	0.53	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		89		342	345		401	1911	855	299	1855	
v/s Ratio Prot		c0.02		0.15	c0.15		c0.01	c0.25		0.00	0.19	
v/s Ratio Perm							0.11		0.11	0.06		
v/c Ratio		0.33		0.75	0.75		0.20	0.46	0.20	0.11	0.36	
Uniform Delay, d1		50.2		41.1	41.2		10.8	15.4	13.0	12.0	15.3	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		2.2		8.6	9.0		0.3	0.8	0.5	0.2	0.5	
Delay (s)		52.4		49.7	50.2		11.0	16.2	13.6	12.2	15.8	
Level of Service		D		D	D		B	B	B	B	B	
Approach Delay (s)		52.4			50.0			15.2			15.7	
Approach LOS		D			D			B			B	

Intersection Summary			
HCM Average Control Delay	23.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	57.7%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	15	120	60	5	25	30
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	130	65	5	27	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		204				
pX, platoon unblocked						
vC, conflicting volume	71				231	68
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	71				231	68
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				96	97
cM capacity (veh/h)	1530				749	995

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	147	71	60
Volume Left	16	0	27
Volume Right	0	5	33
cSH	1530	1700	866
Volume to Capacity	0.01	0.04	0.07
Queue Length 95th (ft)	1	0	6
Control Delay (s)	0.9	0.0	9.5
Lane LOS	A		A
Approach Delay (s)	0.9	0.0	9.5
Approach LOS			A

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	23.8%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX D

LEVEL OF SERVICE CALCULATIONS

- Year 2020 Alternative 1 Front Street Terminus PM

HCM Unsignalized Intersection Capacity Analysis
1: Honoapiilani Hwy/Honoapiilani Highway & Aholo Street

12/28/2011

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	20	0	0	30	0	915	15	0	1240	10
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	0	22	0	0	33	0	995	16	0	1348	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								951				
pX, platoon unblocked	0.82	0.82		0.82	0.82	0.82				0.82		
vC, conflicting volume	1851	2348	679	1690	2353	497	1359			995		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1607	2209	679	1412	2216	0	1359			569		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	94	100	100	96	100			100		
cM capacity (veh/h)	56	36	394	76	36	895	502			824		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	22	33	497	497	16	899	460
Volume Left	0	0	0	0	0	0	0
Volume Right	22	33	0	0	16	0	11
cSH	394	895	1700	1700	1700	1700	1700
Volume to Capacity	0.06	0.04	0.29	0.29	0.01	0.53	0.27
Queue Length 95th (ft)	4	3	0	0	0	0	0
Control Delay (s)	14.7	9.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	B	A					
Approach Delay (s)	14.7	9.2	0.0			0.0	
Approach LOS	B	A					

Intersection Summary				
Average Delay	0.3			
Intersection Capacity Utilization	44.6%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	5	5	5	5	10	5	930	30	0	1195	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	5	5	5	5	11	5	1011	33	0	1299	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1267				
pX, platoon unblocked	0.91	0.91		0.91	0.91	0.91				0.91		
vC, conflicting volume	1832	2356	652	1696	2342	522	1304			1043		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1721	2295	652	1572	2280	288	1304			859		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	84	99	91	85	98	99			100		
cM capacity (veh/h)	45	35	410	59	36	648	527			711		

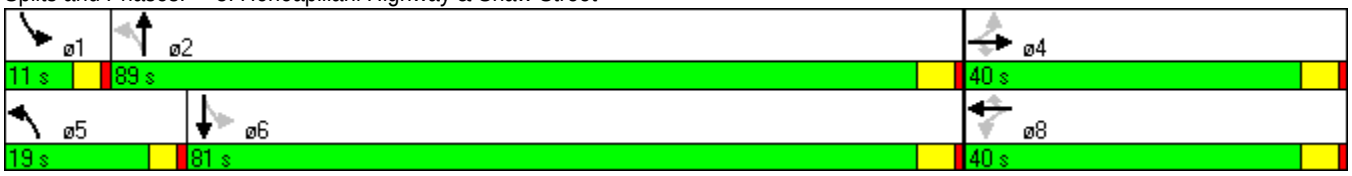
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	11	22	511	538	866	438
Volume Left	0	5	5	0	0	0
Volume Right	5	11	0	33	0	5
cSH	64	83	527	1700	1700	1700
Volume to Capacity	0.17	0.26	0.01	0.32	0.51	0.26
Queue Length 95th (ft)	14	24	1	0	0	0
Control Delay (s)	72.3	63.3	0.3	0.0	0.0	0.0
Lane LOS	F	F	A			
Approach Delay (s)	72.3	63.3	0.1		0.0	
Approach LOS	F	F				

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	45.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Volume (vph)	100	85	145	40	100	125	120	785	125	1050
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases		4			8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	4	4	4	8	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	20.0	3.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	7.0	25.0	7.0	25.0
Total Split (s)	40.0	40.0	40.0	40.0	40.0	40.0	19.0	89.0	11.0	81.0
Total Split (%)	28.6%	28.6%	28.6%	28.6%	28.6%	28.6%	13.6%	63.6%	7.9%	57.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0	5.0		5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 135 (96%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 3: Honoapiilani Highway & Shaw Street



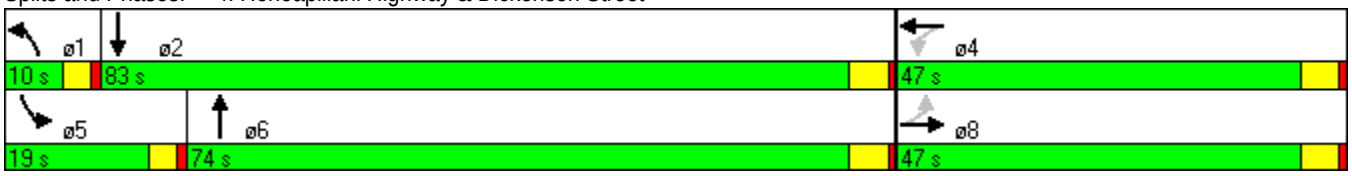
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	85	145	40	100	125	120	785	40	125	1050	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.97	1.00		0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1814	1583		1837	1583	1770	3514		1770	3508	
Flt Permitted		0.60	1.00		0.68	1.00	0.17	1.00		0.28	1.00	
Satd. Flow (perm)		1126	1583		1274	1583	323	3514		519	3508	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	92	158	43	109	136	130	853	43	136	1141	71
RTOR Reduction (vph)	0	0	108	0	0	74	0	2	0	0	2	0
Lane Group Flow (vph)	0	201	50	0	152	62	130	894	0	136	1210	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		27.7	27.7		27.7	27.7	99.3	91.7		97.3	90.7	
Effective Green, g (s)		27.7	27.7		27.7	27.7	99.3	91.7		97.3	90.7	
Actuated g/C Ratio		0.20	0.20		0.20	0.20	0.71	0.66		0.69	0.65	
Clearance Time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	2.0	5.0		2.0	5.0	
Lane Grp Cap (vph)		223	313		252	313	308	2302		420	2273	
v/s Ratio Prot							c0.02	0.25		0.02	c0.34	
v/s Ratio Perm		c0.18	0.03		0.12	0.04	0.28			0.21		
v/c Ratio		0.90	0.16		0.60	0.20	0.42	0.39		0.32	0.53	
Uniform Delay, d1		54.8	46.5		51.1	46.9	9.1	11.2		7.6	13.2	
Progression Factor		1.00	1.00		1.01	1.02	1.00	1.00		0.27	0.22	
Incremental Delay, d2		34.7	0.2		4.0	0.3	0.3	0.5		0.1	0.7	
Delay (s)		89.6	46.7		55.8	48.3	9.4	11.7		2.2	3.7	
Level of Service		F	D		E	D	A	B		A	A	
Approach Delay (s)		70.7			52.2			11.4			3.5	
Approach LOS		E			D			B			A	

Intersection Summary			
HCM Average Control Delay	18.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	105	70	30	55	25	810	125	1125
Turn Type	Perm	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases		8		4	1	6	5	2
Permitted Phases	8		4					
Detector Phase	8	8	4	4	1	6	5	2
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	3.0	15.0	3.0	15.0
Minimum Split (s)	10.0	10.0	29.0	29.0	7.0	23.5	7.0	23.5
Total Split (s)	47.0	47.0	47.0	47.0	10.0	74.0	19.0	83.0
Total Split (%)	33.6%	33.6%	33.6%	33.6%	7.1%	52.9%	13.6%	59.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0		5.0	4.0	5.0	4.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 87 (62%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Splits and Phases: 4: Honoapiilani Highway & Dickenson Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	70	40	30	55	55	25	810	35	125	1125	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.95		1.00	0.99		1.00	0.98	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1761			1727		1770	3509		1770	3459	
Flt Permitted		0.67			0.88		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1202			1528		1770	3509		1770	3459	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	76	43	33	60	60	27	880	38	136	1223	217
RTOR Reduction (vph)	0	6	0	0	19	0	0	2	0	0	8	0
Lane Group Flow (vph)	0	227	0	0	134	0	27	916	0	136	1432	0
Confl. Peds. (#/hr)	8		1	1		8			10			
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		29.0			29.0		3.6	83.7		13.3	93.4	
Effective Green, g (s)		29.0			29.0		3.6	83.7		13.3	93.4	
Actuated g/C Ratio		0.21			0.21		0.03	0.60		0.10	0.67	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		2.0			2.0		1.5	5.0		1.5	5.0	
Lane Grp Cap (vph)		249			317		46	2098		168	2308	
v/s Ratio Prot							0.02	0.26		c0.08	c0.41	
v/s Ratio Perm		c0.19			0.09							
v/c Ratio		0.91			0.42		0.59	0.44		0.81	0.62	
Uniform Delay, d1		54.2			48.2		67.5	15.3		62.1	13.2	
Progression Factor		1.00			0.85		0.83	1.28		1.35	0.21	
Incremental Delay, d2		33.6			0.3		11.0	0.6		16.1	0.8	
Delay (s)		87.8			41.5		66.7	20.3		99.8	3.6	
Level of Service		F			D		E	C		F	A	
Approach Delay (s)		87.8			41.5			21.6			11.9	
Approach LOS		F			D			C			B	

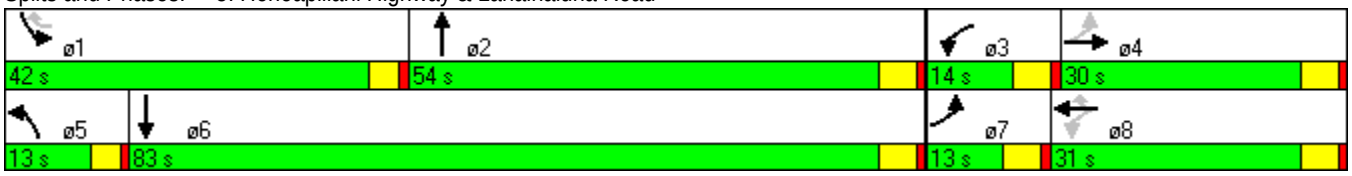
Intersection Summary			
HCM Average Control Delay	22.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	105	205	85	140	230	50	840	325	1310
Turn Type	pm+pt	NA	pm+pt	NA	custom	Prot	NA	Prot	NA
Protected Phases	7	4	3	8		5	2	1	6
Permitted Phases	4		8		8 1				
Detector Phase	7	4	3	8	8 1	5	2	1	6
Switch Phase									
Minimum Initial (s)	4.0	5.0	4.0	5.0		3.0	15.0	3.0	15.0
Minimum Split (s)	9.0	29.0	9.0	29.0		7.0	30.0	7.0	30.0
Total Split (s)	13.0	30.0	14.0	31.0		13.0	54.0	42.0	83.0
Total Split (%)	9.3%	21.4%	10.0%	22.1%		9.3%	38.6%	30.0%	59.3%
Yellow Time (s)	4.0	4.0	4.0	4.0		3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0		4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None		None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 92 (66%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 5: Honoapiilani Highway & Lahainaluna Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	205	55	85	140	230	50	840	25	325	1310	85
Ideal Flow (vphpl)	1900	1900	1900	1500	1500	1500	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1779		1393	1471	1250	1770	3522		1770	3501	
Flt Permitted	0.53	1.00		0.17	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	980	1779		249	1471	1250	1770	3522		1770	3501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	223	60	92	152	250	54	913	27	353	1424	92
RTOR Reduction (vph)	0	7	0	0	0	48	0	1	0	0	3	0
Lane Group Flow (vph)	114	276	0	92	152	202	54	939	0	353	1513	0
Confl. Peds. (#/hr)			30	30					5			3
Turn Type	pm+pt	NA		pm+pt	NA	custom	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8 1						
Actuated Green, G (s)	31.8	23.8		33.4	24.6	61.3	6.8	56.7		31.7	81.6	
Effective Green, g (s)	31.8	23.8		33.4	24.6	61.3	6.8	56.7		31.7	81.6	
Actuated g/C Ratio	0.23	0.17		0.24	0.18	0.44	0.05	0.41		0.23	0.58	
Clearance Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	2.0		3.0	4.0		2.0	4.5		2.0	4.5	
Lane Grp Cap (vph)	268	302		131	258	547	86	1426		401	2041	
v/s Ratio Prot	0.02	c0.16		c0.04	0.10		0.03	0.27		c0.20	c0.43	
v/s Ratio Perm	0.07			0.12		0.16						
v/c Ratio	0.43	0.92		0.70	0.59	0.37	0.63	0.66		0.88	0.74	
Uniform Delay, d1	44.8	57.1		44.7	53.1	26.4	65.4	33.8		52.3	21.4	
Progression Factor	1.00	1.00		1.20	1.16	1.33	1.07	0.57		1.30	0.36	
Incremental Delay, d2	1.1	30.1		15.2	3.9	0.6	9.0	2.2		10.8	1.3	
Delay (s)	45.9	87.2		68.6	65.6	35.6	78.8	21.4		78.9	8.9	
Level of Service	D	F		E	E	D	E	C		E	A	
Approach Delay (s)		75.3			51.0			24.5			22.2	
Approach LOS		E			D			C			C	

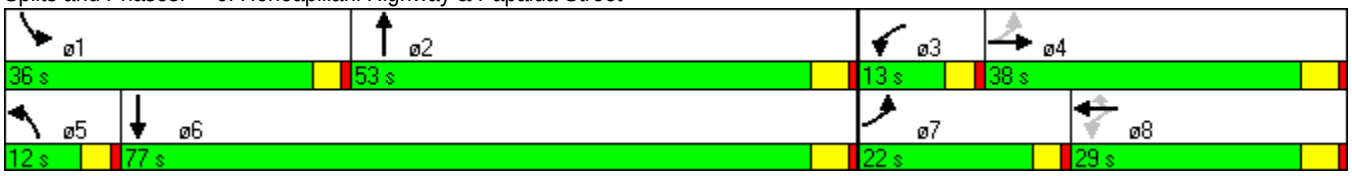
Intersection Summary			
HCM Average Control Delay	32.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	82.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	265	170	110	150	195	70	1070	360	1470
Turn Type	pm+pt	NA	pm+pt	NA	Perm	Prot	NA	Prot	NA
Protected Phases	7	4	3	8		5	2	1	6
Permitted Phases	4		8		8				
Detector Phase	7	4	3	8	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	4.0	5.0	4.0	5.0	5.0	5.0	15.0	15.0	5.0
Minimum Split (s)	9.0	29.0	8.0	29.0	29.0	9.0	23.0	19.0	23.0
Total Split (s)	22.0	38.0	13.0	29.0	29.0	12.0	53.0	36.0	77.0
Total Split (%)	15.7%	27.1%	9.3%	20.7%	20.7%	8.6%	37.9%	25.7%	55.0%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.0	3.0	5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	None	C-Max	Max	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 85 (61%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 100
Control Type: Actuated-Coordinated

Splits and Phases: 6: Honoapiilani Highway & Papalua Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	265	170	85	110	150	195	70	1070	90	360	1470	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	5.0		3.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.99	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1769	1755		1765	1863	1562	1770	3488		1770	3471	
Flt Permitted	0.35	1.00		0.38	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	646	1755		708	1863	1562	1770	3488		1770	3471	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	288	185	92	120	163	212	76	1163	98	391	1598	190
RTOR Reduction (vph)	0	14	0	0	0	176	0	4	0	0	6	0
Lane Group Flow (vph)	288	263	0	120	163	36	76	1257	0	391	1782	0
Confl. Peds. (#/hr)	1		8	8		1			10			3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	39.6	26.7		26.6	17.7	17.7	7.7	54.4		32.0	78.7	
Effective Green, g (s)	40.6	26.7		28.6	17.7	17.7	7.7	54.4		32.0	78.7	
Actuated g/C Ratio	0.29	0.19		0.20	0.13	0.13	0.06	0.39		0.23	0.56	
Clearance Time (s)	4.0	5.0		4.0	5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	2.0	6.0		6.0	3.0	
Lane Grp Cap (vph)	339	335		219	236	197	97	1355		405	1951	
v/s Ratio Prot	c0.11	0.15		0.04	0.09		0.04	0.36		c0.22	c0.51	
v/s Ratio Perm	c0.13			0.07		0.02						
v/c Ratio	0.85	0.79		0.55	0.69	0.18	0.78	0.93		0.97	0.91	
Uniform Delay, d1	42.8	53.9		47.7	58.5	54.7	65.3	40.9		53.5	27.6	
Progression Factor	1.00	1.00		1.02	1.01	1.06	0.91	0.64		0.86	0.78	
Incremental Delay, d2	17.7	11.5		2.8	8.4	0.4	26.5	10.7		29.2	5.7	
Delay (s)	60.5	65.4		51.3	67.7	58.6	86.0	37.0		75.0	27.4	
Level of Service	E	E		D	E	E	F	D		E	C	
Approach Delay (s)		62.9			59.8			39.8			35.9	
Approach LOS		E			E			D			D	

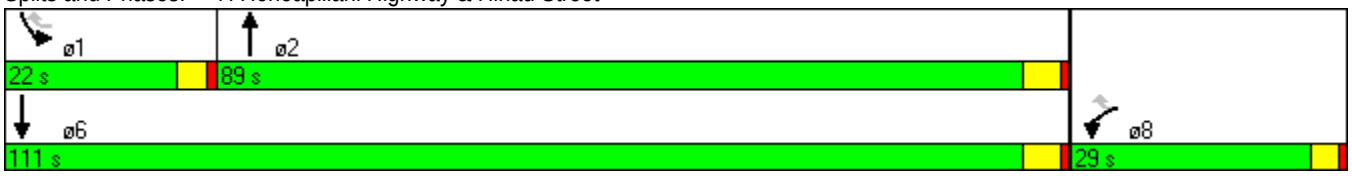
Intersection Summary			
HCM Average Control Delay	43.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	7.0
Intersection Capacity Utilization	90.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations					
Volume (vph)	130	125	1545	135	1970
Turn Type	NA	custom	NA	Prot	NA
Protected Phases	8		2	1	6
Permitted Phases		8 1			
Detector Phase	8	8 1	2	1	6
Switch Phase					
Minimum Initial (s)	7.0		15.0	4.0	15.0
Minimum Split (s)	29.0		23.0	9.0	20.0
Total Split (s)	29.0		89.0	22.0	111.0
Total Split (%)	20.7%		63.6%	15.7%	79.3%
Yellow Time (s)	3.0		4.0	3.0	4.0
All-Red Time (s)	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0		5.0	4.0	5.0
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?					
Recall Mode	None		C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 109 (78%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 7: Honoapiilani Highway & Hinau Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	130	125	1545	110	135	1970
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0		4.0	5.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.98	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1551	3504		1770	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1551	3504		1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	136	1679	120	147	2141
RTOR Reduction (vph)	0	18	3	0	0	0
Lane Group Flow (vph)	141	118	1796	0	147	2141
Confl. Peds. (#/hr)		5				
Turn Type	NA	custom	NA		Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8 1				
Actuated Green, G (s)	16.4	36.0	95.0		15.6	114.6
Effective Green, g (s)	16.4	36.0	95.0		15.6	114.6
Actuated g/C Ratio	0.12	0.26	0.68		0.11	0.82
Clearance Time (s)	4.0		5.0		4.0	5.0
Vehicle Extension (s)	3.0		5.0		3.0	5.0
Lane Grp Cap (vph)	207	399	2378		197	2897
v/s Ratio Prot	c0.08		0.51		0.08	c0.60
v/s Ratio Perm		0.08				
v/c Ratio	0.68	0.30	0.76		0.75	0.74
Uniform Delay, d1	59.3	41.8	14.8		60.3	5.8
Progression Factor	1.00	1.00	0.32		0.74	1.99
Incremental Delay, d2	8.9	0.4	1.4		1.4	0.2
Delay (s)	68.2	42.2	6.0		45.8	11.7
Level of Service	E	D	A		D	B
Approach Delay (s)	55.4		6.0			13.9
Approach LOS	E		A			B

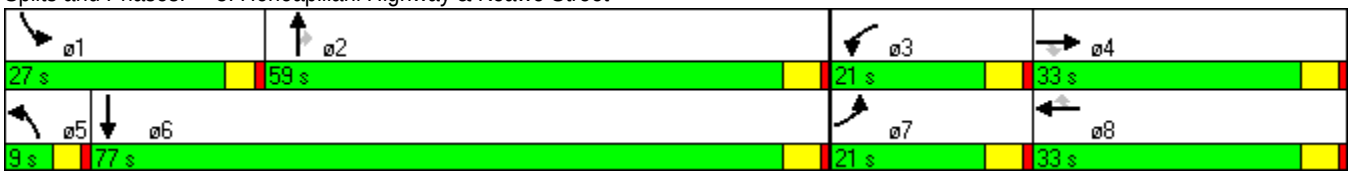
Intersection Summary			
HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Volume (vph)	80	95	95	160	55	890	100	1495	135	750	1920
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases			4			8			2		
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	15.0	15.0	3.0	15.0
Minimum Split (s)	10.0	33.0	33.0	10.0	33.0	33.0	7.0	29.0	29.0	7.0	29.0
Total Split (s)	21.0	33.0	33.0	21.0	33.0	33.0	9.0	59.0	59.0	27.0	77.0
Total Split (%)	15.0%	23.6%	23.6%	15.0%	23.6%	23.6%	6.4%	42.1%	42.1%	19.3%	55.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?											
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated

Splits and Phases: 8: Honoapiilani Highway & Keawe Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	95	95	160	55	890	100	1495	135	750	1920	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99	0.99	1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.87	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1562	1770	1517	1484	1770	3539	1562	3433	3517	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1562	1770	1517	1484	1770	3539	1562	3433	3517	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	103	103	174	60	967	109	1625	147	815	2087	71
RTOR Reduction (vph)	0	0	69	0	194	250	0	0	25	0	2	0
Lane Group Flow (vph)	87	103	34	174	320	263	109	1625	122	815	2156	0
Confl. Peds. (#/hr)	1		1	1		1			1			7
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			
Actuated Green, G (s)	12.0	24.9	24.9	15.5	28.4	28.4	5.0	57.6	57.6	23.0	75.6	
Effective Green, g (s)	13.0	24.9	24.9	16.5	28.4	28.4	5.0	57.6	57.6	23.0	75.6	
Actuated g/C Ratio	0.09	0.18	0.18	0.12	0.20	0.20	0.04	0.41	0.41	0.16	0.54	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	2.0	5.0	5.0	2.0	5.0	
Lane Grp Cap (vph)	164	331	278	209	308	301	63	1456	643	564	1899	
v/s Ratio Prot	0.05	0.06		c0.10	c0.21		0.06	0.46		c0.24	c0.61	
v/s Ratio Perm			0.02			0.18			0.08			
v/c Ratio	0.53	0.31	0.12	0.83	1.04	0.88	1.73	1.12	0.19	1.45	1.14	
Uniform Delay, d1	60.6	50.1	48.4	60.4	55.8	54.1	67.5	41.2	26.3	58.5	32.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.23	0.69	0.53	1.00	1.00	
Incremental Delay, d2	3.3	0.5	0.2	23.7	62.0	23.5	370.9	59.6	0.5	210.1	68.1	
Delay (s)	63.9	50.6	48.6	84.1	117.8	77.5	454.0	87.9	14.4	268.6	100.3	
Level of Service	E	D	D	F	F	E	F	F	B	F	F	
Approach Delay (s)		53.8			95.7			103.3			146.4	
Approach LOS		D			F			F			F	

Intersection Summary			
HCM Average Control Delay	119.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	103.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	35	460	20	40	355	35	20	5	15	20	5	95
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	38	500	22	43	386	38	22	5	16	22	5	103
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		290			280							
pX, platoon unblocked				0.88			0.88	0.88	0.88	0.88	0.88	
vC, conflicting volume	424			522			973	1098	511	1087	1090	212
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	424			393			903	1045	381	1033	1036	212
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			96			87	97	97	85	97	87
cM capacity (veh/h)	1132			1027			165	186	545	148	188	793

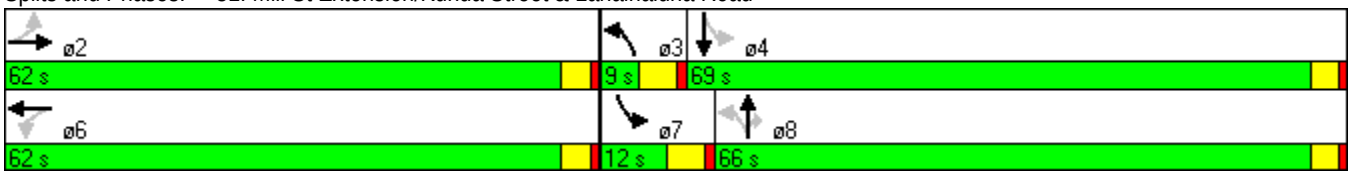
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	38	522	43	257	167	43	27	103
Volume Left	38	0	43	0	0	22	22	0
Volume Right	0	22	0	0	38	16	0	103
cSH	1132	1700	1027	1700	1700	227	154	793
Volume to Capacity	0.03	0.31	0.04	0.15	0.10	0.19	0.18	0.13
Queue Length 95th (ft)	3	0	3	0	0	17	15	11
Control Delay (s)	8.3	0.0	8.7	0.0	0.0	24.5	33.2	10.2
Lane LOS	A		A			C	D	B
Approach Delay (s)	0.6		0.8			24.5	15.0	
Approach LOS						C	C	

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	65	405	50	310	40	540	105	95	480
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	pm+pt	NA
Protected Phases		2		6	3	8		7	4
Permitted Phases	2		6		8		8	4	
Detector Phase	2	2	6	6	3	8	8	7	4
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	25.0	25.0	25.0	25.0	9.0	25.0	25.0	9.0	25.0
Total Split (s)	62.0	62.0	62.0	62.0	9.0	66.0	66.0	12.0	69.0
Total Split (%)	44.3%	44.3%	44.3%	44.3%	6.4%	47.1%	47.1%	8.6%	49.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag					Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?					Yes			Yes	
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 58 (41%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 81: Mill St Extension/Kuhua Street & Lahainaluna Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	405	80	50	310	45	40	540	105	95	480	35
Ideal Flow (vphpl)	1900	1900	1900	1500	1500	1500	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		5.0	4.0	4.0	5.0	4.0	
Lane Util. Factor	1.00	1.00			0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98			0.98		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00			0.99		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1817			2731		1770	1863	1583	1770	1844	
Flt Permitted	0.45	1.00			0.74		0.20	1.00	1.00	0.12	1.00	
Satd. Flow (perm)	831	1817			2026		372	1863	1583	218	1844	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	71	440	87	54	337	49	43	587	114	103	522	38
RTOR Reduction (vph)	0	5	0	0	6	0	0	0	28	0	2	0
Lane Group Flow (vph)	71	522	0	0	434	0	43	587	86	103	558	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	66.9	66.9			66.9		56.3	53.1	53.1	63.9	56.9	
Effective Green, g (s)	66.9	66.9			66.9		56.3	53.1	53.1	63.9	56.9	
Actuated g/C Ratio	0.48	0.48			0.48		0.40	0.38	0.38	0.46	0.41	
Clearance Time (s)	4.0	4.0			4.0		5.0	4.0	4.0	5.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	397	868			968		182	707	600	177	749	
v/s Ratio Prot		c0.29					0.01	c0.32		c0.03	c0.30	
v/s Ratio Perm	0.09				0.21		0.09		0.05	0.24		
v/c Ratio	0.18	0.60			0.45		0.24	0.83	0.14	0.58	0.75	
Uniform Delay, d1	20.9	26.8			24.3		29.0	39.4	28.5	29.1	35.4	
Progression Factor	0.32	0.34			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.7	2.3			1.5		0.7	8.2	0.1	4.8	4.0	
Delay (s)	7.5	11.3			25.8		29.6	47.6	28.6	33.9	39.4	
Level of Service	A	B			C		C	D	C	C	D	
Approach Delay (s)		10.9			25.8			43.6			38.6	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM Average Control Delay	31.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	40	405	60	555	420	195	55	135
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		2		6	3	8	7	4
Permitted Phases	2		6		8		4	
Detector Phase	2	2	6	6	3	8	7	4
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	23.0	23.0	23.0	23.0	9.0	29.0	23.0	29.0
Total Split (s)	24.0	24.0	24.0	24.0	23.0	29.0	23.0	29.0
Total Split (%)	31.6%	31.6%	31.6%	31.6%	30.3%	38.2%	30.3%	38.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	C-Max	C-Max	Min	Min	None	None

Intersection Summary
Cycle Length: 76
Actuated Cycle Length: 76
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Splits and Phases: 82: Kuhua Street & Keawe St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	405	325	60	555	80	420	195	25	55	135	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.98		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3303		1770	3472		1770	1831		1770	1819	
Flt Permitted	0.30	1.00		0.24	1.00		0.42	1.00		0.61	1.00	
Satd. Flow (perm)	559	3303		455	3472		788	1831		1136	1819	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	440	353	65	603	87	457	212	27	60	147	27
RTOR Reduction (vph)	0	155	0	0	12	0	0	6	0	0	11	0
Lane Group Flow (vph)	43	638	0	65	678	0	457	233	0	60	163	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	29.5	29.5		29.5	29.5		36.5	27.0		18.6	14.1	
Effective Green, g (s)	29.5	29.5		29.5	29.5		36.5	27.0		18.6	14.1	
Actuated g/C Ratio	0.39	0.39		0.39	0.39		0.48	0.36		0.24	0.19	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	217	1282		177	1348		603	650		316	337	
v/s Ratio Prot		0.19			c0.20		c0.17	0.13		0.01	0.09	
v/s Ratio Perm	0.08			0.14			c0.19			0.04		
v/c Ratio	0.20	0.50		0.37	0.50		0.76	0.36		0.19	0.48	
Uniform Delay, d1	15.4	17.6		16.6	17.7		14.3	18.1		22.4	27.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.0	1.4		5.8	1.3		5.4	0.3		0.3	1.1	
Delay (s)	17.4	19.0		22.4	19.0		19.7	18.4		22.7	28.8	
Level of Service	B	B		C	B		B	B		C	C	
Approach Delay (s)		18.9			19.3			19.3			27.2	
Approach LOS		B			B			B			C	

Intersection Summary			
HCM Average Control Delay	19.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	76.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	90	5	95	30	5	5	95	520	20	5	480	45
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	98	5	103	33	5	5	103	565	22	5	522	49
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								832				
pX, platoon unblocked	0.74	0.74		0.74	0.74	0.74				0.74		
vC, conflicting volume	1337	1351	546	1421	1364	576	571			587		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1280	1298	546	1394	1317	253	571			267		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	95	81	48	95	99	90			99		
cM capacity (veh/h)	92	107	537	63	104	582	1002			960		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	98	109	43	103	587	5	571
Volume Left	98	0	33	103	0	5	0
Volume Right	0	103	5	0	22	0	49
cSH	92	447	75	1002	1700	960	1700
Volume to Capacity	1.06	0.24	0.58	0.10	0.35	0.01	0.34
Queue Length 95th (ft)	160	24	63	9	0	0	0
Control Delay (s)	194.7	15.6	105.2	9.0	0.0	8.8	0.0
Lane LOS	F	C	F	A		A	
Approach Delay (s)	100.5		105.2	1.3		0.1	
Approach LOS	F		F				

Intersection Summary			
Average Delay	17.3		
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	110	5	120	5	5	20	25	545	40	55	500	50
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	120	5	130	5	5	22	27	592	43	60	543	54
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											803	
pX, platoon unblocked	0.75	0.75	0.75	0.75	0.75		0.75					
vC, conflicting volume	1361	1380	571	1465	1386	614	598			636		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1316	1341	265	1453	1348	614	301			636		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	95	78	90	95	96	97			94		
cM capacity (veh/h)	87	104	582	57	103	492	948			948		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	120	136	5	27	27	636	60	598
Volume Left	120	0	5	0	27	0	60	0
Volume Right	0	130	0	22	0	43	0	54
cSH	87	492	57	281	948	1700	948	1700
Volume to Capacity	1.38	0.28	0.10	0.10	0.03	0.37	0.06	0.35
Queue Length 95th (ft)	227	28	8	8	2	0	5	0
Control Delay (s)	313.9	15.1	75.3	19.2	8.9	0.0	9.1	0.0
Lane LOS	F	C	F	C	A		A	
Approach Delay (s)	154.9		28.6		0.4		0.8	
Approach LOS	F		D					

Intersection Summary			
Average Delay	25.7		
Intersection Capacity Utilization	57.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	100	15	25	70	75	25	435	25	55	360	55
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	22	109	16	27	76	82	27	473	27	60	391	60
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1188	1095	421	1122	1111	486	451			500		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1188	1095	421	1122	1111	486	451			500		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	77	45	97	71	60	86	98			94		
cM capacity (veh/h)	93	197	632	95	192	581	1109			1064		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	147	185	27	500	60	451
Volume Left	22	27	27	0	60	0
Volume Right	16	82	0	27	0	60
cSH	180	225	1109	1700	1064	1700
Volume to Capacity	0.81	0.82	0.02	0.29	0.06	0.27
Queue Length 95th (ft)	140	155	2	0	4	0
Control Delay (s)	78.1	67.8	8.3	0.0	8.6	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	78.1	67.8	0.4		1.0	
Approach LOS	F	F				

Intersection Summary			
Average Delay	18.1		
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	5	15	490	375	15
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	5	16	533	408	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)				990		
pX, platoon unblocked						
vC, conflicting volume	981	416	424			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	981	416	424			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	99	99			
cM capacity (veh/h)	273	637	1135			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	16	16	533	424
Volume Left	11	16	0	0
Volume Right	5	0	0	16
cSH	337	1135	1700	1700
Volume to Capacity	0.05	0.01	0.31	0.25
Queue Length 95th (ft)	4	1	0	0
Control Delay (s)	16.2	8.2	0.0	0.0
Lane LOS	C	A		
Approach Delay (s)	16.2	0.2		0.0
Approach LOS	C			

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	95	785	65	50	905	110	100	15	20	20	20	140
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	103	853	71	54	984	120	109	16	22	22	22	152
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		357			687							
pX, platoon unblocked	0.91						0.91	0.91		0.91	0.91	0.91
vC, conflicting volume	1103			924			1859	2307	462	1815	2283	552
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	925			924			1752	2242	462	1704	2215	322
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	85			93			0	45	96	13	30	75
cM capacity (veh/h)	671			735			14	30	547	25	31	616

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	103	569	355	54	656	447	125	22	43	152
Volume Left	103	0	0	54	0	0	109	0	22	0
Volume Right	0	0	71	0	0	120	0	22	0	152
cSH	671	1700	1700	735	1700	1700	15	547	28	616
Volume to Capacity	0.15	0.33	0.21	0.07	0.39	0.26	8.38	0.04	1.57	0.25
Queue Length 95th (ft)	14	0	0	6	0	0	Err	3	129	24
Control Delay (s)	11.3	0.0	0.0	10.3	0.0	0.0	Err	11.9	591.9	12.7
Lane LOS	B			B			F	B	F	B
Approach Delay (s)	1.1			0.5			8519.4		141.4	
Approach LOS							F		F	

Intersection Summary			
Average Delay	506.3		
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	55	735	35	10	975	20	25	5	5	30	0	70
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	60	799	38	11	1060	22	27	5	5	33	0	76
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		619			425							
pX, platoon unblocked	0.87						0.87	0.87		0.87	0.87	0.87
vC, conflicting volume	1082			837			1565	2041	418	1620	2049	541
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	802			837			1356	1901	418	1419	1910	183
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	92			99			65	90	99	55	100	89
cM capacity (veh/h)	713			793			78	54	583	72	53	723

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	60	533	304	11	707	375	33	5	33	76
Volume Left	60	0	0	11	0	0	27	0	33	0
Volume Right	0	0	38	0	0	22	0	5	0	76
cSH	713	1700	1700	793	1700	1700	73	583	72	723
Volume to Capacity	0.08	0.31	0.18	0.01	0.42	0.22	0.45	0.01	0.45	0.11
Queue Length 95th (ft)	7	0	0	1	0	0	45	1	46	9
Control Delay (s)	10.5	0.0	0.0	9.6	0.0	0.0	90.0	11.2	91.6	10.6
Lane LOS	B			A			F	B	F	B
Approach Delay (s)	0.7			0.1			78.7		34.9	
Approach LOS							F		D	

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	350	135	15	495	200	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	380	147	16	538	217	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	247					
pX, platoon unblocked						
vC, conflicting volume			527		755	264
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			527		755	264
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		36	96
cM capacity (veh/h)			1036		339	735

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	254	274	16	269	269	217	27
Volume Left	0	0	16	0	0	217	0
Volume Right	0	147	0	0	0	0	27
cSH	1700	1700	1036	1700	1700	339	735
Volume to Capacity	0.15	0.16	0.02	0.16	0.16	0.64	0.04
Queue Length 95th (ft)	0	0	1	0	0	105	3
Control Delay (s)	0.0	0.0	8.5	0.0	0.0	32.8	10.1
Lane LOS			A			D	B
Approach Delay (s)	0.0		0.3			30.3	
Approach LOS						D	

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	31.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	15	25	610	20	45	475
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	27	663	22	49	516
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						1178
pX, platoon unblocked						
vC, conflicting volume	1288	674			685	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1288	674			685	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	94			95	
cM capacity (veh/h)	171	455			909	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	43	685	49	516
Volume Left	16	0	49	0
Volume Right	27	22	0	0
cSH	456	1700	909	1700
Volume to Capacity	0.10	0.40	0.05	0.30
Queue Length 95th (ft)	8	0	4	0
Control Delay (s)	19.0	0.0	9.2	0.0
Lane LOS	C		A	
Approach Delay (s)	19.0	0.0	0.8	
Approach LOS	C			

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	95	5	95	15	5	5	40	540	35	5	410	75
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	103	5	103	16	5	5	43	587	38	5	446	82
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1260				
pX, platoon unblocked	0.81	0.81		0.81	0.81	0.81				0.81		
vC, conflicting volume	1179	1209	486	1255	1231	606	527			625		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1105	1141	486	1198	1168	398	527			421		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	27	96	82	84	96	99	96			99		
cM capacity (veh/h)	142	155	581	102	149	529	1040			923		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	109	103	27	43	625	5	527
Volume Left	103	0	16	43	0	5	0
Volume Right	0	103	5	0	38	0	82
cSH	142	581	131	1040	1700	923	1700
Volume to Capacity	0.76	0.18	0.21	0.04	0.37	0.01	0.31
Queue Length 95th (ft)	116	16	19	3	0	0	0
Control Delay (s)	84.6	12.5	39.5	8.6	0.0	8.9	0.0
Lane LOS	F	B	E	A		A	
Approach Delay (s)	49.5		39.5	0.6		0.1	
Approach LOS	E		E				

Intersection Summary			
Average Delay	8.3		
Intersection Capacity Utilization	48.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	215	20	250	75	15	40	190	5	75	40	5	150
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	234	22	272	82	16	43	207	5	82	43	5	163
Pedestrians								50				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								4				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		408										
pX, platoon unblocked												
vC, conflicting volume	60			343			1020	898	208	774	1012	38
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	60			343			1020	898	208	774	1012	38
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	85			93			0	97	90	81	97	84
cM capacity (veh/h)	1544			1165			138	211	798	226	181	1034

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	234	293	82	60	207	87	43	168
Volume Left	234	0	82	0	207	0	43	0
Volume Right	0	272	0	43	0	82	0	163
cSH	1544	1700	1165	1700	138	680	226	897
Volume to Capacity	0.15	0.17	0.07	0.04	1.50	0.13	0.19	0.19
Queue Length 95th (ft)	13	0	6	0	352	11	17	17
Control Delay (s)	7.7	0.0	8.3	0.0	316.9	11.1	24.7	9.9
Lane LOS	A		A		F	B	C	A
Approach Delay (s)	3.4		4.8		226.3		13.0	
Approach LOS					F		B	

Intersection Summary			
Average Delay	61.0		
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	25	5	30	0	80	5	505	20	190	435	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	11	27	5	33	0	87	5	549	22	207	473	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1535	1470	476	1476	1462	560	478			571		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1535	1470	476	1476	1462	560	478			571		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	84	73	99	53	100	84	99			79		
cM capacity (veh/h)	66	100	589	69	102	528	1084			1002		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	43	120	5	571	207	478
Volume Left	11	33	5	0	207	0
Volume Right	5	87	0	22	0	5
cSH	98	188	1084	1700	1002	1700
Volume to Capacity	0.44	0.64	0.01	0.34	0.21	0.28
Queue Length 95th (ft)	47	92	0	0	19	0
Control Delay (s)	68.1	52.6	8.3	0.0	9.5	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	68.1	52.6	0.1		2.9	
Approach LOS	F	F				

Intersection Summary			
Average Delay	7.9		
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	40	70	420	70	45	355
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	76	457	76	49	386
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	978	495			533	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	978	495			533	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	84	87			95	
cM capacity (veh/h)	265	575			1035	

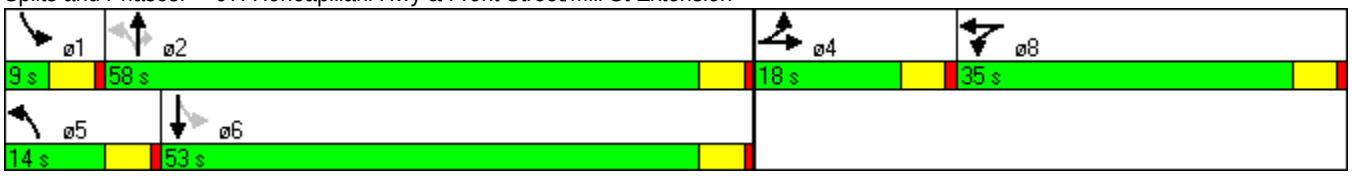
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	120	533	435
Volume Left	43	0	49
Volume Right	76	76	0
cSH	403	1700	1035
Volume to Capacity	0.30	0.31	0.05
Queue Length 95th (ft)	31	0	4
Control Delay (s)	17.7	0.0	1.4
Lane LOS	C		A
Approach Delay (s)	17.7	0.0	1.4
Approach LOS	C		

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		

Lane Group	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations								
Volume (vph)	30	370	15	110	910	455	45	1190
Turn Type	NA	Split	NA	pm+pt	NA	Perm	pm+pt	NA
Protected Phases	4	8	8	5	2		1	6
Permitted Phases				2		2	6	
Detector Phase	4	8	8	5	2	2	1	6
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	29.0	29.0	9.0	26.0	26.0	9.0	26.0
Total Split (s)	18.0	35.0	35.0	14.0	58.0	58.0	9.0	53.0
Total Split (%)	15.0%	29.2%	29.2%	11.7%	48.3%	48.3%	7.5%	44.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag				Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	C-Max	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 31 (26%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 97: Honoapiilani Hwy & Front Street/Mill St Extension



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	30	85	370	15	5	110	910	455	45	1190	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00		0.95	0.95		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	0.92	1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.91		1.00	1.00		1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.99		0.95	0.96		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1689		1681	1686		1770	3539	1463	1770	3523	
Flt Permitted		0.99		0.95	0.96		0.09	1.00	1.00	0.23	1.00	
Satd. Flow (perm)		1689		1681	1686		166	3539	1463	431	3523	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	33	92	402	16	5	120	989	495	49	1293	27
RTOR Reduction (vph)	0	58	0	0	1	0	0	0	225	0	1	0
Lane Group Flow (vph)	0	83	0	213	209	0	120	989	270	49	1319	0
Confl. Peds. (#/hr)	20					20			20			20
Turn Type	Split	NA		Split	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases							2		2	6		
Actuated Green, G (s)		10.2		21.1	21.1		73.7	65.5	65.5	63.7	60.5	
Effective Green, g (s)		10.2		21.1	21.1		73.7	65.5	65.5	63.7	60.5	
Actuated g/C Ratio		0.08		0.18	0.18		0.61	0.55	0.55	0.53	0.50	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		144		296	296		212	1932	799	264	1776	
v/s Ratio Prot		c0.05		c0.13	0.12		c0.04	0.28		0.00	c0.37	
v/s Ratio Perm							0.31		0.18	0.09		
v/c Ratio		0.58		0.72	0.71		0.57	0.51	0.34	0.19	0.74	
Uniform Delay, d1		52.8		46.7	46.5		18.0	17.2	15.2	14.3	23.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		5.5		8.1	7.5		3.4	1.0	1.1	0.3	2.9	
Delay (s)		58.4		54.8	54.0		21.5	18.1	16.3	14.6	26.4	
Level of Service		E		D	D		C	B	B	B	C	
Approach Delay (s)		58.4			54.4			17.8			26.0	
Approach LOS		E			D			B			C	

Intersection Summary			
HCM Average Control Delay	27.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	71.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	15	185	75	5	20	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	201	82	5	22	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		204				
pX, platoon unblocked						
vC, conflicting volume	87				318	84
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	87				318	84
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				97	98
cM capacity (veh/h)	1509				668	975

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	217	87	43
Volume Left	16	0	22
Volume Right	0	5	22
cSH	1509	1700	793
Volume to Capacity	0.01	0.05	0.05
Queue Length 95th (ft)	1	0	4
Control Delay (s)	0.6	0.0	9.8
Lane LOS	A		A
Approach Delay (s)	0.6	0.0	9.8
Approach LOS			A

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	27.2%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX D

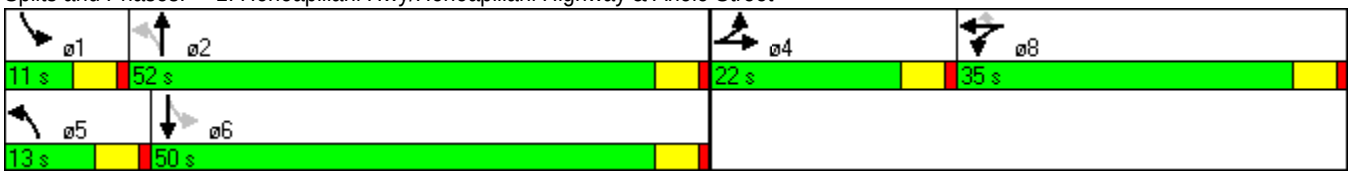
LEVEL OF SERVICE CALCULATIONS

- Year 2020 Alternative 2 Aholo AM

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	10	435	35	65	65	790	30	650
Turn Type	NA	Split	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases	4	8	8		5	2	1	6
Permitted Phases				8	2		6	
Detector Phase	4	8	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	29.0	29.0	29.0	9.0	26.0	9.0	26.0
Total Split (s)	22.0	35.0	35.0	35.0	13.0	52.0	11.0	50.0
Total Split (%)	18.3%	29.2%	29.2%	29.2%	10.8%	43.3%	9.2%	41.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 71 (59%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Splits and Phases: 1: Honoapiilani Hwy/Honoapiilani Highway & Aholo Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	10	5	435	35	65	65	790	5	30	650	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00		1.00	1.00	0.96	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.98		1.00	1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.98		0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1779		1681	1697	1518	1762	3535		1764	3522	
Flt Permitted		0.98		0.95	0.96	1.00	0.31	1.00		0.27	1.00	
Satd. Flow (perm)		1779		1681	1697	1518	574	3535		510	3522	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	11	5	473	38	71	71	859	5	33	707	16
RTOR Reduction (vph)	0	5	0	0	0	44	0	0	0	0	1	0
Lane Group Flow (vph)	0	27	0	255	256	27	71	864	0	33	722	0
Confl. Peds. (#/hr)						20	20		20	20		20
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8	2			6		
Actuated Green, G (s)		5.1		24.1	24.1	24.1	73.1	67.2		68.5	64.9	
Effective Green, g (s)		5.1		24.1	24.1	24.1	73.1	67.2		68.5	64.9	
Actuated g/C Ratio		0.04		0.20	0.20	0.20	0.61	0.56		0.57	0.54	
Clearance Time (s)		5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		76		338	341	305	408	1980		329	1905	
v/s Ratio Prot		c0.02		c0.15	0.15		c0.01	c0.24		0.00	0.21	
v/s Ratio Perm						0.02	0.10			0.05		
v/c Ratio		0.36		0.75	0.75	0.09	0.17	0.44		0.10	0.38	
Uniform Delay, d1		55.9		45.2	45.1	39.0	10.2	15.4		11.8	15.9	
Progression Factor		1.00		0.79	0.79	0.47	1.00	1.00		0.53	0.85	
Incremental Delay, d2		2.9		8.9	8.6	0.1	0.2	0.7		0.1	0.6	
Delay (s)		58.7		44.4	44.2	18.5	10.4	16.1		6.3	14.0	
Level of Service		E		D	D	B	B	B		A	B	
Approach Delay (s)		58.7			41.1			15.6			13.7	
Approach LOS		E			D			B			B	

Intersection Summary			
HCM Average Control Delay	22.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	57.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	5	5	5	5	15	5	1075	15	0	835	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	5	5	5	5	16	5	1168	16	0	908	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1268				
pX, platoon unblocked	0.93	0.93		0.93	0.93	0.93				0.93		
vC, conflicting volume	1524	2106	457	1649	2101	592	913			1185		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1415	2040	457	1549	2034	414	913			1050		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	89	99	92	90	97	99			100		
cM capacity (veh/h)	81	52	551	65	52	547	742			613		

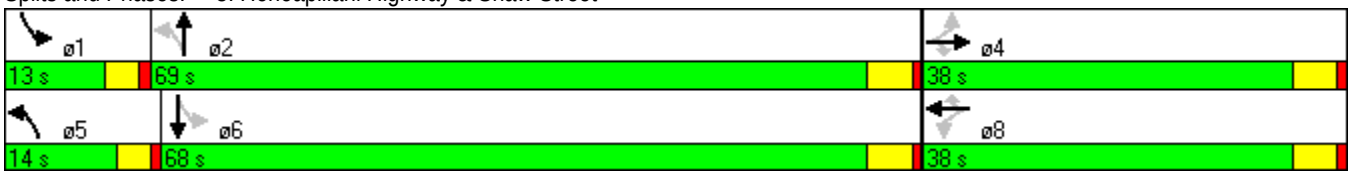
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	11	27	5	779	406	605	308
Volume Left	0	5	5	0	0	0	0
Volume Right	5	16	0	0	16	0	5
cSH	94	125	742	1700	1700	1700	1700
Volume to Capacity	0.12	0.22	0.01	0.46	0.24	0.36	0.18
Queue Length 95th (ft)	9	20	1	0	0	0	0
Control Delay (s)	48.0	41.6	9.9	0.0	0.0	0.0	0.0
Lane LOS	E	E	A				
Approach Delay (s)	48.0	41.6	0.0			0.0	
Approach LOS	E	E					

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	42.8%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Volume (vph)	60	35	35	35	75	110	75	855	70	705
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases		4			8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	4	4	4	8	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	20.0	3.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	7.0	25.0	7.0	25.0
Total Split (s)	38.0	38.0	38.0	38.0	38.0	38.0	14.0	69.0	13.0	68.0
Total Split (%)	31.7%	31.7%	31.7%	31.7%	31.7%	31.7%	11.7%	57.5%	10.8%	56.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0	5.0		5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 13 (11%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 3: Honoapiilani Highway & Shaw Street



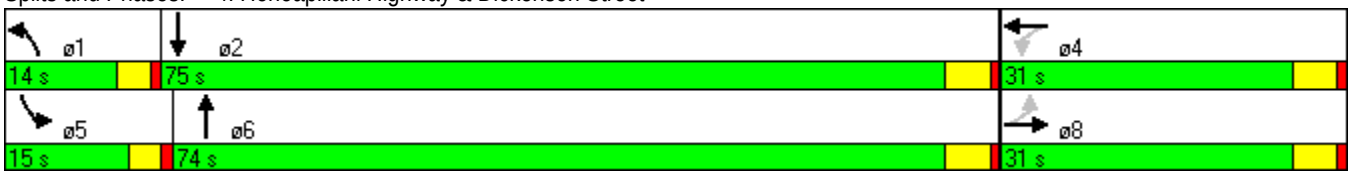
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	35	35	35	75	110	75	855	15	70	705	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected		0.97	1.00		0.98	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1806	1583		1834	1583	1770	3530		1770	3511	
Flt Permitted		0.61	1.00		0.79	1.00	0.33	1.00		0.28	1.00	
Satd. Flow (perm)		1127	1583		1464	1583	606	3530		515	3511	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	38	38	38	82	120	82	929	16	76	766	43
RTOR Reduction (vph)	0	0	34	0	0	106	0	1	0	0	2	0
Lane Group Flow (vph)	0	103	4	0	120	14	82	944	0	76	807	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		14.2	14.2		14.2	14.2	91.9	87.1		91.7	87.0	
Effective Green, g (s)		14.2	14.2		14.2	14.2	91.9	87.1		91.7	87.0	
Actuated g/C Ratio		0.12	0.12		0.12	0.12	0.77	0.73		0.76	0.72	
Clearance Time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	2.0	5.0		2.0	5.0	
Lane Grp Cap (vph)		133	187		173	187	511	2562		443	2545	
v/s Ratio Prot							0.01	c0.27		c0.01	0.23	
v/s Ratio Perm		c0.09	0.00		0.08	0.01	0.12			0.12		
v/c Ratio		0.77	0.02		0.69	0.08	0.16	0.37		0.17	0.32	
Uniform Delay, d1		51.3	46.8		50.8	47.1	3.6	6.2		3.8	5.9	
Progression Factor		1.00	1.00		0.94	0.93	0.46	1.27		0.82	0.86	
Incremental Delay, d2		24.0	0.1		11.4	0.2	0.1	0.4		0.1	0.3	
Delay (s)		75.3	46.8		59.2	44.1	1.7	8.2		3.2	5.4	
Level of Service		E	D		E	D	A	A		A	A	
Approach Delay (s)		67.6			51.7			7.7			5.2	
Approach LOS		E			D			A			A	

Intersection Summary			
HCM Average Control Delay	15.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	65	60	35	25	15	1070	45	780
Turn Type	Perm	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases		8		4	1	6	5	2
Permitted Phases	8		4					
Detector Phase	8	8	4	4	1	6	5	2
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	3.0	15.0	3.0	15.0
Minimum Split (s)	10.0	10.0	29.0	29.0	7.0	23.5	7.0	23.5
Total Split (s)	31.0	31.0	31.0	31.0	14.0	74.0	15.0	75.0
Total Split (%)	25.8%	25.8%	25.8%	25.8%	11.7%	61.7%	12.5%	62.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0		5.0	4.0	5.0	4.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 41 (34%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 4: Honoapiilani Highway & Dickenson Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	60	20	35	25	70	15	1070	40	45	780	105
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.93		1.00	0.99		1.00	0.98	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1778			1682		1770	3514		1770	3476	
Flt Permitted		0.68			0.83		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1232			1421		1770	3514		1770	3476	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	71	65	22	38	27	76	16	1163	43	49	848	114
RTOR Reduction (vph)	0	5	0	0	38	0	0	2	0	0	6	0
Lane Group Flow (vph)	0	153	0	0	103	0	16	1204	0	49	956	0
Confl. Peds. (#/hr)	8		1	1		8			10			
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		17.7			17.7		2.5	81.9		6.4	85.8	
Effective Green, g (s)		17.7			17.7		2.5	81.9		6.4	85.8	
Actuated g/C Ratio		0.15			0.15		0.02	0.68		0.05	0.71	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		2.0			2.0		1.5	5.0		1.5	5.0	
Lane Grp Cap (vph)		182			210		37	2398		94	2485	
v/s Ratio Prot							0.01	c0.34		c0.03	c0.28	
v/s Ratio Perm		c0.12			0.07							
v/c Ratio		0.84			0.49		0.43	0.50		0.52	0.38	
Uniform Delay, d1		49.8			47.0		58.0	9.2		55.3	6.7	
Progression Factor		1.00			0.91		1.20	0.49		1.00	0.66	
Incremental Delay, d2		26.9			0.7		2.8	0.7		2.0	0.4	
Delay (s)		76.7			43.4		72.7	5.2		57.4	4.8	
Level of Service		E			D		E	A		E	A	
Approach Delay (s)		76.7			43.4			6.1			7.4	
Approach LOS		E			D			A			A	

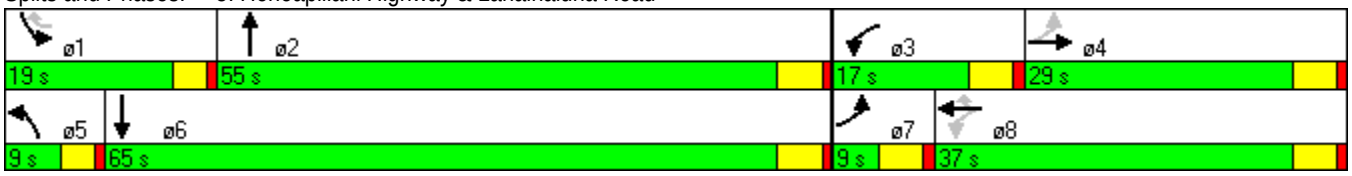
Intersection Summary			
HCM Average Control Delay	13.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	60	250	105	185	110	20	1085	145	820
Turn Type	pm+pt	NA	pm+pt	NA	custom	Prot	NA	Prot	NA
Protected Phases	7	4	3	8		5	2	1	6
Permitted Phases	4		8		8 1				
Detector Phase	7	4	3	8	8 1	5	2	1	6
Switch Phase									
Minimum Initial (s)	4.0	5.0	4.0	5.0		3.0	15.0	3.0	15.0
Minimum Split (s)	9.0	29.0	9.0	29.0		7.0	30.0	7.0	30.0
Total Split (s)	9.0	29.0	17.0	37.0		9.0	55.0	19.0	65.0
Total Split (%)	7.5%	24.2%	14.2%	30.8%		7.5%	45.8%	15.8%	54.2%
Yellow Time (s)	4.0	4.0	4.0	4.0		3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0		4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None		None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 51 (43%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 5: Honoapiilani Highway & Lahainaluna Road



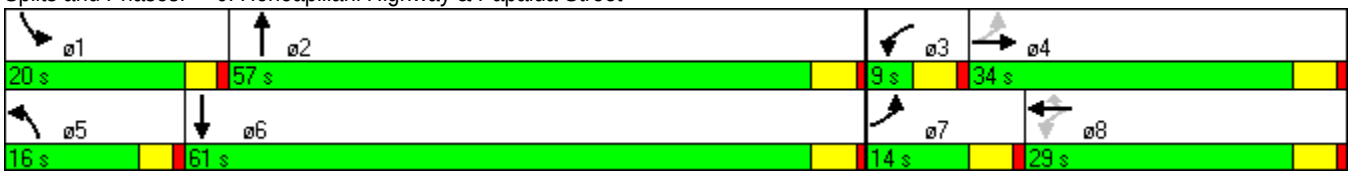
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	250	25	105	185	110	20	1085	50	145	820	25
Ideal Flow (vphpl)	1900	1900	1900	1500	1500	1500	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1828		1394	1471	1250	1770	3513		1770	3521	
Flt Permitted	0.48	1.00		0.18	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	887	1828		263	1471	1250	1770	3513		1770	3521	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	100%	100%	100%	150%	150%	200%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	65	272	27	171	302	239	22	1179	54	158	891	27
RTOR Reduction (vph)	0	3	0	0	0	37	0	3	0	0	2	0
Lane Group Flow (vph)	65	296	0	171	302	202	22	1230	0	158	916	0
Confl. Peds. (#/hr)			30	30					5			3
Turn Type	pm+pt	NA		pm+pt	NA	custom	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8 1						
Actuated Green, G (s)	26.2	23.0		40.0	31.8	50.3	3.0	52.5		13.5	63.0	
Effective Green, g (s)	26.2	23.0		40.0	31.8	50.3	3.0	52.5		13.5	63.0	
Actuated g/C Ratio	0.22	0.19		0.33	0.27	0.42	0.02	0.44		0.11	0.52	
Clearance Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	2.0		3.0	4.0		2.0	4.5		2.0	4.5	
Lane Grp Cap (vph)	217	350		201	390	524	44	1537		199	1849	
v/s Ratio Prot	0.01	0.16		c0.09	0.21		0.01	c0.35		c0.09	0.26	
v/s Ratio Perm	0.06			c0.20		0.16						
v/c Ratio	0.30	0.85		0.85	0.77	0.39	0.50	0.80		0.79	0.50	
Uniform Delay, d1	38.5	46.8		32.3	40.8	24.1	57.8	29.2		51.9	18.3	
Progression Factor	1.00	1.00		1.61	1.24	0.97	1.25	0.46		1.24	0.74	
Incremental Delay, d2	0.8	16.2		23.1	8.0	0.5	2.8	4.0		15.2	0.8	
Delay (s)	39.3	63.0		75.1	58.7	24.0	75.2	17.4		79.4	14.4	
Level of Service	D	E		E	E	C	E	B		E	B	
Approach Delay (s)		58.7			51.0			18.4			23.9	
Approach LOS		E			D			B			C	

Intersection Summary			
HCM Average Control Delay	31.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	225	85	30	35	165	80	1200	125	965
Turn Type	pm+pt	NA	pm+pt	NA	Perm	Prot	NA	Prot	NA
Protected Phases	7	4	3	8		5	2	1	6
Permitted Phases	4		8		8				
Detector Phase	7	4	3	8	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	4.0	5.0	4.0	5.0	5.0	5.0	15.0	15.0	5.0
Minimum Split (s)	9.0	29.0	9.0	29.0	29.0	9.0	23.0	20.0	23.0
Total Split (s)	14.0	34.0	9.0	29.0	29.0	16.0	57.0	20.0	61.0
Total Split (%)	11.7%	28.3%	7.5%	24.2%	24.2%	13.3%	47.5%	16.7%	50.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	None	C-Max	Max	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 61 (51%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 95
Control Type: Actuated-Coordinated

Splits and Phases: 6: Honoapiilani Highway & Papalua Street



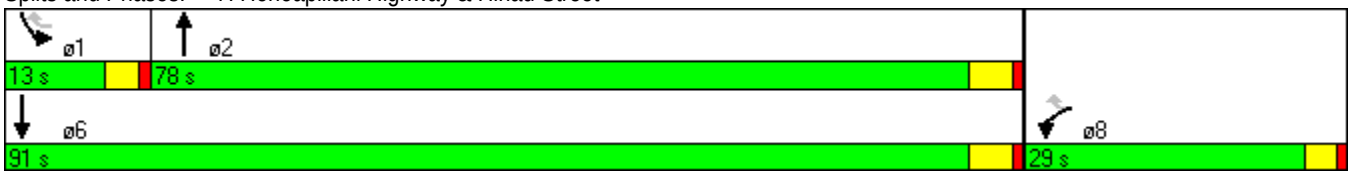
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	225	85	70	30	35	165	80	1200	45	125	965	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.99	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		0.99	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1768	1718		1759	1863	1562	1770	3516		1770	3474	
Flt Permitted	0.59	1.00		0.65	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1101	1718		1205	1863	1562	1770	3516		1770	3474	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	100%	100%	100%	150%	150%	200%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	245	92	76	49	57	359	87	1304	49	136	1049	120
RTOR Reduction (vph)	0	27	0	0	0	190	0	2	0	0	6	0
Lane Group Flow (vph)	245	141	0	49	57	169	87	1351	0	136	1163	0
Confl. Peds. (#/hr)	1		8	8		1			10			3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	31.4	23.2		20.6	17.4	17.4	9.7	58.6		16.0	64.9	
Effective Green, g (s)	32.4	23.2		22.6	17.4	17.4	9.7	58.6		16.0	64.9	
Actuated g/C Ratio	0.27	0.19		0.19	0.14	0.14	0.08	0.49		0.13	0.54	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	2.0	6.0		6.0	3.0	
Lane Grp Cap (vph)	353	332		246	270	226	143	1717		236	1879	
v/s Ratio Prot	c0.06	0.08		0.01	0.03		0.05	c0.38		c0.08	0.33	
v/s Ratio Perm	c0.13			0.03		0.11						
v/c Ratio	0.69	0.43		0.20	0.21	0.75	0.61	0.79		0.58	0.62	
Uniform Delay, d1	38.4	42.5		40.7	45.2	49.2	53.3	25.5		48.8	19.0	
Progression Factor	1.00	1.00		0.99	0.99	0.96	1.26	0.31		0.97	0.67	
Incremental Delay, d2	5.8	0.9		0.4	0.4	12.7	3.5	2.6		9.1	1.4	
Delay (s)	44.2	43.4		40.7	45.0	59.9	70.7	10.6		56.4	14.1	
Level of Service	D	D		D	D	E	E	B		E	B	
Approach Delay (s)		43.9			56.1			14.3			18.6	
Approach LOS		D			E			B			B	

Intersection Summary			
HCM Average Control Delay	24.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations					
Volume (vph)	45	65	1460	50	1245
Turn Type	NA	custom	NA	Prot	NA
Protected Phases	8		2	1	6
Permitted Phases		8 1			
Detector Phase	8	8 1	2	1	6
Switch Phase					
Minimum Initial (s)	7.0		15.0	4.0	15.0
Minimum Split (s)	29.0		23.0	9.0	20.0
Total Split (s)	29.0		78.0	13.0	91.0
Total Split (%)	24.2%		65.0%	10.8%	75.8%
Yellow Time (s)	3.0		4.0	3.0	4.0
All-Red Time (s)	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0		5.0	4.0	5.0
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?					
Recall Mode	None		C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 96 (80%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 7: Honoapiilani Highway & Hinau Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	45	65	1460	70	50	1245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0		4.0	5.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.98	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1553	3515		1770	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1553	3515		1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	71	1587	76	54	1353
RTOR Reduction (vph)	0	27	2	0	0	0
Lane Group Flow (vph)	49	44	1661	0	54	1353
Confl. Peds. (#/hr)		5				
Turn Type	NA	custom	NA		Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8 1				
Actuated Green, G (s)	7.6	18.5	92.5		6.9	103.4
Effective Green, g (s)	7.6	18.5	92.5		6.9	103.4
Actuated g/C Ratio	0.06	0.15	0.77		0.06	0.86
Clearance Time (s)	4.0		5.0		4.0	5.0
Vehicle Extension (s)	3.0		5.0		3.0	5.0
Lane Grp Cap (vph)	112	239	2709		102	3049
v/s Ratio Prot	c0.03		c0.47		0.03	c0.38
v/s Ratio Perm		0.03				
v/c Ratio	0.44	0.18	0.61		0.53	0.44
Uniform Delay, d1	54.1	44.2	6.0		55.0	1.9
Progression Factor	1.00	1.00	0.25		0.74	1.24
Incremental Delay, d2	2.7	0.4	0.7		3.8	0.4
Delay (s)	56.9	44.6	2.2		44.3	2.7
Level of Service	E	D	A		D	A
Approach Delay (s)	49.6		2.2			4.3
Approach LOS	D		A			A

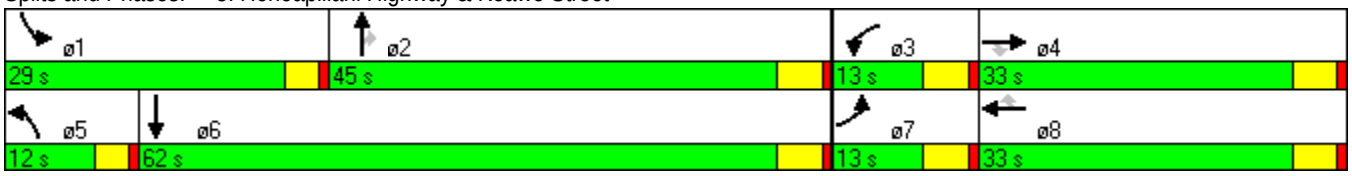
Intersection Summary			
HCM Average Control Delay	4.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Volume (vph)	35	50	60	75	45	760	50	1390	80	570	1255
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases			4			8			2		
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	15.0	15.0	3.0	15.0
Minimum Split (s)	10.0	33.0	33.0	10.0	33.0	33.0	7.0	29.0	29.0	7.0	29.0
Total Split (s)	13.0	33.0	33.0	13.0	33.0	33.0	12.0	45.0	45.0	29.0	62.0
Total Split (%)	10.8%	27.5%	27.5%	10.8%	27.5%	27.5%	10.0%	37.5%	37.5%	24.2%	51.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes								
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green, Master Intersection
Natural Cycle: 120
Control Type: Actuated-Coordinated

Splits and Phases: 8: Honoapiilani Highway & Keawe Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	35	50	60	75	45	760	50	1390	80	570	1255	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99	0.99	1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.87	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1562	1770	1516	1484	1770	3539	1562	3433	3526	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1562	1770	1516	1484	1770	3539	1562	3433	3526	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	38	54	65	82	49	826	54	1511	87	620	1364	27
RTOR Reduction (vph)	0	0	55	0	259	333	0	0	16	0	1	0
Lane Group Flow (vph)	38	54	10	82	178	105	54	1511	71	620	1390	0
Confl. Peds. (#/hr)	1		1	1		1			1			7
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			
Actuated Green, G (s)	4.8	18.2	18.2	6.4	19.8	19.8	6.1	52.5	52.5	23.9	70.3	
Effective Green, g (s)	5.8	18.2	18.2	7.4	19.8	19.8	6.1	52.5	52.5	23.9	70.3	
Actuated g/C Ratio	0.05	0.15	0.15	0.06	0.17	0.17	0.05	0.44	0.44	0.20	0.59	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	2.0	5.0	5.0	2.0	5.0	
Lane Grp Cap (vph)	86	283	237	109	250	245	90	1548	683	684	2066	
v/s Ratio Prot	0.02	0.03		c0.05	c0.12		0.03	c0.43		c0.18	0.39	
v/s Ratio Perm			0.01			0.07			0.05			
v/c Ratio	0.44	0.19	0.04	0.75	0.71	0.43	0.60	0.98	0.10	0.91	0.67	
Uniform Delay, d1	55.5	44.5	43.5	55.4	47.4	45.0	55.8	33.1	19.9	47.0	17.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.17	0.63	0.47	1.00	1.00	
Incremental Delay, d2	3.6	0.3	0.1	25.0	9.2	1.2	5.8	15.8	0.2	15.3	1.8	
Delay (s)	59.1	44.8	43.5	80.4	56.6	46.2	70.9	36.6	9.6	62.3	18.8	
Level of Service	E	D	D	F	E	D	E	D	A	E	B	
Approach Delay (s)		47.7			53.9			36.3			32.2	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM Average Control Delay	38.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	92.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	12	420	20	60	490	15	10	5	20	5	5	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	13	457	22	65	799	16	11	5	22	5	5	11
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		290			280							
pX, platoon unblocked	0.85			0.85			0.92	0.92	0.85	0.92	0.92	0.85
vC, conflicting volume	815			478			1037	1439	467	1445	1442	408
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	422			302			390	826	290	832	829	0
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			94			98	98	96	97	98	99
cM capacity (veh/h)	961			1071			460	261	603	216	260	919

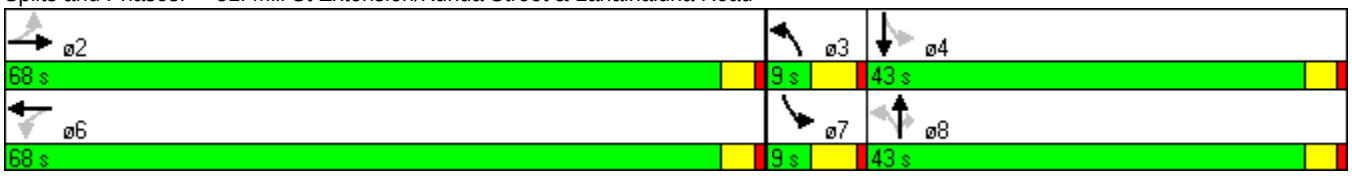
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	13	478	65	533	283	38	11	11
Volume Left	13	0	65	0	0	11	5	0
Volume Right	0	22	0	0	16	22	0	11
cSH	961	1700	1071	1700	1700	472	236	919
Volume to Capacity	0.01	0.28	0.06	0.31	0.17	0.08	0.05	0.01
Queue Length 95th (ft)	1	0	5	0	0	7	4	1
Control Delay (s)	8.8	0.0	8.6	0.0	0.0	13.3	21.0	9.0
Lane LOS	A		A			B	C	A
Approach Delay (s)	0.2		0.6			13.3	15.0	
Approach LOS						B	B	

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	48.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	30	350	65	525	15	380	125	30	355
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	pm+pt	NA
Protected Phases		2		6	3	8		7	4
Permitted Phases	2		6		8		8	4	
Detector Phase	2	2	6	6	3	8	8	7	4
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	26.0	26.0	26.0	26.0	9.0	26.0	26.0	9.0	26.0
Total Split (s)	68.0	68.0	68.0	68.0	9.0	43.0	43.0	9.0	43.0
Total Split (%)	56.7%	56.7%	56.7%	56.7%	7.5%	35.8%	35.8%	7.5%	35.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag					Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None

Intersection Summary
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 81: Mill St Extension/Kuhua Street & Lahainaluna Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	30	350	10	65	525	20	15	380	125	30	355	25
Ideal Flow (vphpl)	1900	1900	1900	1500	1500	1500	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		5.0	4.0	4.0	5.0	4.0	
Lane Util. Factor	1.00	1.00			0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00			1.00		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1855			2774		1770	1863	1583	1770	1844	
Flt Permitted	0.24	1.00			0.88		0.20	1.00	1.00	0.18	1.00	
Satd. Flow (perm)	445	1855			2452		367	1863	1583	329	1844	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor (vph)	100%	100%	100%	100%	150%	100%	100%	100%	100%	100%	100%	100%
Adj. Flow (vph)	33	380	11	71	856	22	16	413	136	33	386	27
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	53	0	2	0
Lane Group Flow (vph)	33	390	0	0	948	0	16	413	83	33	411	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	71.2	71.2			71.2		35.0	33.4	33.4	36.6	34.2	
Effective Green, g (s)	71.2	71.2			71.2		35.0	33.4	33.4	36.6	34.2	
Actuated g/C Ratio	0.59	0.59			0.59		0.29	0.28	0.28	0.31	0.29	
Clearance Time (s)	4.0	4.0			4.0		5.0	4.0	4.0	5.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	264	1101			1455		126	519	441	129	526	
v/s Ratio Prot		0.21					0.00	0.22		c0.01	c0.22	
v/s Ratio Perm	0.07				c0.39		0.04		0.05	0.07		
v/c Ratio	0.12	0.35			0.65		0.13	0.80	0.19	0.26	0.78	
Uniform Delay, d1	10.7	12.6			16.2		32.2	40.1	33.0	31.7	39.5	
Progression Factor	0.36	0.31			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.7	0.6			2.3		0.5	8.3	0.2	1.1	7.4	
Delay (s)	4.5	4.5			18.5		32.7	48.4	33.2	32.8	46.9	
Level of Service	A	A			B		C	D	C	C	D	
Approach Delay (s)		4.5			18.5			44.3			45.8	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM Average Control Delay	27.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	84.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	25	440	30	525	305	90	80	200
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	23.0	23.0	23.0	23.0	9.0	29.0	9.0	29.0
Total Split (s)	23.0	23.0	23.0	23.0	13.0	33.0	9.0	29.0
Total Split (%)	35.4%	35.4%	35.4%	35.4%	20.0%	50.8%	13.8%	44.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	None	None	Min	Min	None	None

Intersection Summary
Cycle Length: 65
Actuated Cycle Length: 65
Offset: 0 (0%), Referenced to phase 4:EBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 82: Kuhua Street & Keawe St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	440	150	30	525	40	305	90	40	80	200	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.99		1.00	0.95		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3404		1770	3502		1770	1778		1770	1817	
Flt Permitted	0.37	1.00		0.35	1.00		0.35	1.00		0.67	1.00	
Satd. Flow (perm)	684	3404		654	3502		654	1778		1243	1817	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	27	478	163	33	571	43	332	98	43	87	217	43
RTOR Reduction (vph)	0	42	0	0	7	0	0	30	0	0	13	0
Lane Group Flow (vph)	27	599	0	33	607	0	332	111	0	87	247	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	26.9	26.9		26.9	26.9		27.9	19.9		18.3	15.1	
Effective Green, g (s)	26.9	26.9		26.9	26.9		27.9	19.9		18.3	15.1	
Actuated g/C Ratio	0.41	0.41		0.41	0.41		0.43	0.31		0.28	0.23	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	283	1409		271	1449		418	544		376	422	
v/s Ratio Prot		c0.18			0.17		c0.10	0.06		0.01	0.14	
v/s Ratio Perm	0.04			0.05			c0.24			0.05		
v/c Ratio	0.10	0.42		0.12	0.42		0.79	0.20		0.23	0.59	
Uniform Delay, d1	11.6	13.5		11.8	13.5		14.2	16.7		17.6	22.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.7	0.9		0.2	0.2		10.0	0.2		0.3	2.1	
Delay (s)	12.3	14.5		12.0	13.7		24.2	16.9		18.0	24.2	
Level of Service	B	B		B	B		C	B		B	C	
Approach Delay (s)		14.4			13.6			22.0			22.7	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM Average Control Delay	17.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	65.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	5	25	75	5	10	30	370	20	5	305	120
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	33	5	27	82	3	11	33	402	22	5	332	130
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								832				
pX, platoon unblocked	0.82	0.82		0.82	0.82	0.82				0.82		
vC, conflicting volume	887	897	397	851	951	413	462			424		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	753	764	397	708	831	174	462			188		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	87	98	96	69	99	98	97			100		
cM capacity (veh/h)	254	264	653	263	242	713	1099			1137		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	33	33	95	33	424	5	462
Volume Left	33	0	82	33	0	5	0
Volume Right	0	27	11	0	22	0	130
cSH	254	524	283	1099	1700	1137	1700
Volume to Capacity	0.13	0.06	0.34	0.03	0.25	0.00	0.27
Queue Length 95th (ft)	11	5	36	2	0	0	0
Control Delay (s)	21.2	12.3	24.0	8.4	0.0	8.2	0.0
Lane LOS	C	B	C	A		A	
Approach Delay (s)	16.8		24.0	0.6		0.1	
Approach LOS	C		C				

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	43.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	110	5	45	5	10	15	40	395	40	10	405	15
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	120	5	49	5	11	16	43	429	43	11	440	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											803	
pX, platoon unblocked	0.80	0.80	0.80	0.80	0.80		0.80					
vC, conflicting volume	1008	1030	448	1052	1016	451	457			473		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	886	913	187	940	896	451	197			473		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	37	97	93	97	95	97	96			99		
cM capacity (veh/h)	191	208	685	171	213	608	1102			1089		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	120	54	5	27	43	473	11	457
Volume Left	120	0	5	0	43	0	11	0
Volume Right	0	49	0	16	0	43	0	16
cSH	191	557	171	349	1102	1700	1089	1700
Volume to Capacity	0.63	0.10	0.03	0.08	0.04	0.28	0.01	0.27
Queue Length 95th (ft)	89	8	2	6	3	0	1	0
Control Delay (s)	50.9	12.2	26.7	16.2	8.4	0.0	8.3	0.0
Lane LOS	F	B	D	C	A		A	
Approach Delay (s)	38.8		17.9		0.7		0.2	
Approach LOS	E		C					

Intersection Summary			
Average Delay	6.5		
Intersection Capacity Utilization	49.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	55	20	30	85	75	45	295	15	15	370	50
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	11	60	22	33	92	82	49	321	16	16	402	54
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1008	897	429	913	916	329	457			337		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1008	897	429	913	916	329	457			337		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	92	77	97	83	64	89	96			99		
cM capacity (veh/h)	134	264	626	194	257	713	1104			1222		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	92	207	49	337	16	457
Volume Left	11	33	49	0	16	0
Volume Right	22	82	0	16	0	54
cSH	270	322	1104	1700	1222	1700
Volume to Capacity	0.34	0.64	0.04	0.20	0.01	0.27
Queue Length 95th (ft)	37	104	3	0	1	0
Control Delay (s)	25.2	34.3	8.4	0.0	8.0	0.0
Lane LOS	D	D	A		A	
Approach Delay (s)	25.2	34.3	1.1		0.3	
Approach LOS	D	D				

Intersection Summary			
Average Delay	8.6		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	0	20	300	0	465
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	0	22	326	0	505
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	370	0	505			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	370	0	505			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	98			
cM capacity (veh/h)	618	1085	1059			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	5	22	326	505
Volume Left	5	22	0	0
Volume Right	0	0	0	505
cSH	618	1059	1700	1700
Volume to Capacity	0.01	0.02	0.19	0.30
Queue Length 95th (ft)	1	2	0	0
Control Delay (s)	10.9	8.5	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	10.9	0.5		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations										
Volume (veh/h)	5	40	15	800	290	0	1040	10	0	0
Sign Control	Stop			Free			Free		Stop	
Grade	0%			0%			0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	43	16	870	315	0	1130	11	0	0
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type				None			None			
Median storage veh)										
Upstream signal (ft)							951			
pX, platoon unblocked	0.90	0.90	0.90						0.90	0.90
vC, conflicting volume	2038	571	1141			870			1514	2043
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	1935	310	942			870			1354	1941
tC, single (s)	6.5	6.9	4.1			4.1			7.5	6.5
tC, 2 stage (s)										
tF (s)	4.0	3.3	2.2			2.2			3.5	4.0
p0 queue free %	91	93	98			100			100	100
cM capacity (veh/h)	57	619	654			771			83	57

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2
Volume Total	49	16	435	435	315	754	388
Volume Left	0	16	0	0	0	0	0
Volume Right	43	0	0	0	315	0	11
cSH	296	654	1700	1700	1700	1700	1700
Volume to Capacity	0.17	0.02	0.26	0.26	0.19	0.44	0.23
Queue Length 95th (ft)	15	2	0	0	0	0	0
Control Delay (s)	19.5	10.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	C	B					
Approach Delay (s)	19.5	0.1				0.0	
Approach LOS	C						

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	39.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	30	620	20	15	860	35	20	5	5	5	5	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	33	674	22	16	935	38	22	5	5	5	5	27
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		357			689							
pX, platoon unblocked	0.93						0.93	0.93		0.93	0.93	0.93
vC, conflicting volume	973			696			1280	1755	348	1397	1747	486
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	826			696			1155	1665	348	1281	1657	305
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			98			82	94	99	95	94	96
cM capacity (veh/h)	746			896			123	84	648	103	85	645

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	33	449	246	16	623	350	27	5	11	27
Volume Left	33	0	0	16	0	0	22	0	5	0
Volume Right	0	0	22	0	0	38	0	5	0	27
cSH	746	1700	1700	896	1700	1700	112	648	93	645
Volume to Capacity	0.04	0.26	0.14	0.02	0.37	0.21	0.24	0.01	0.12	0.04
Queue Length 95th (ft)	3	0	0	1	0	0	22	1	10	3
Control Delay (s)	10.0	0.0	0.0	9.1	0.0	0.0	46.9	10.6	48.8	10.8
Lane LOS	B			A			E	B	E	B
Approach Delay (s)	0.4			0.1			40.9		21.7	
Approach LOS							E		C	

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	41.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	605	10	5	860	10	35	0	10	10	0	15
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	22	658	11	5	935	11	38	0	11	11	0	16
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		619			427							
pX, platoon unblocked	0.90						0.90	0.90		0.90	0.90	0.90
vC, conflicting volume	946			668			1201	1663	334	1334	1663	473
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	709			668			994	1509	334	1142	1509	182
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			99			78	100	98	92	100	98
cM capacity (veh/h)	794			917			171	104	662	133	104	744

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	22	438	230	5	623	322	38	11	11	16
Volume Left	22	0	0	5	0	0	38	0	11	0
Volume Right	0	0	11	0	0	11	0	11	0	16
cSH	794	1700	1700	917	1700	1700	171	662	133	744
Volume to Capacity	0.03	0.26	0.14	0.01	0.37	0.19	0.22	0.02	0.08	0.02
Queue Length 95th (ft)	2	0	0	0	0	0	21	1	7	2
Control Delay (s)	9.7	0.0	0.0	8.9	0.0	0.0	32.1	10.5	34.4	9.9
Lane LOS	A			A			D	B	D	A
Approach Delay (s)	0.3			0.1			27.3		19.7	
Approach LOS							D		C	

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	40.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	330	230	30	495	100	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	359	250	33	538	109	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	247					
pX, platoon unblocked			0.91		0.91	0.91
vC, conflicting volume			609		818	304
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			372		602	37
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		71	98
cM capacity (veh/h)			1077		381	934

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	239	370	33	269	269	109	16
Volume Left	0	0	33	0	0	109	0
Volume Right	0	250	0	0	0	0	16
cSH	1700	1700	1077	1700	1700	381	934
Volume to Capacity	0.14	0.22	0.03	0.16	0.16	0.29	0.02
Queue Length 95th (ft)	0	0	2	0	0	29	1
Control Delay (s)	0.0	0.0	8.4	0.0	0.0	18.2	8.9
Lane LOS			A			C	A
Approach Delay (s)	0.0		0.5			17.0	
Approach LOS						C	

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	35.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	20	45	395	10	15	370
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	49	429	11	16	402
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						1161
pX, platoon unblocked						
vC, conflicting volume	870	435			440	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	870	435			440	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	92			99	
cM capacity (veh/h)	317	621			1120	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	71	440	16	402
Volume Left	22	0	16	0
Volume Right	49	11	0	0
cSH	897	1700	1120	1700
Volume to Capacity	0.08	0.26	0.01	0.24
Queue Length 95th (ft)	6	0	1	0
Control Delay (s)	13.1	0.0	8.3	0.0
Lane LOS	B		A	
Approach Delay (s)	13.1	0.0	0.3	
Approach LOS	B			

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	31.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	25	5	15	50	5	5	15	380	10	5	365	25
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	27	5	16	54	5	5	16	413	11	5	397	27
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1289				
pX, platoon unblocked	0.90	0.90		0.90	0.90	0.90				0.90		
vC, conflicting volume	875	878	410	878	886	418	424			424		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	809	812	410	812	821	304	424			310		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	90	98	97	79	98	99	99			100		
cM capacity (veh/h)	260	278	641	255	274	665	1135			1131		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	33	16	65	16	424	5	424
Volume Left	27	0	54	16	0	5	0
Volume Right	0	16	5	0	11	0	27
cSH	263	641	270	1135	1700	1131	1700
Volume to Capacity	0.12	0.03	0.24	0.01	0.25	0.00	0.25
Queue Length 95th (ft)	10	2	23	1	0	0	0
Control Delay (s)	20.6	10.8	22.5	8.2	0.0	8.2	0.0
Lane LOS	C	B	C	A		A	
Approach Delay (s)	17.3		22.5	0.3		0.1	
Approach LOS	C		C				

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	37.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	65	10	75	25	105	15	45	5	15	20	5	25
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	71	11	82	27	114	16	49	5	16	22	5	27
Pedestrians								50				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								4				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		408										
pX, platoon unblocked												
vC, conflicting volume	130			142			441	428	102	348	460	122
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	130			142			441	428	102	348	460	122
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			98			89	99	98	96	99	97
cM capacity (veh/h)	1455			1380			446	464	914	543	445	929

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	71	92	27	130	49	22	22	33
Volume Left	71	0	27	0	49	0	22	0
Volume Right	0	82	0	16	0	16	0	27
cSH	1455	1700	1380	1700	446	736	543	786
Volume to Capacity	0.05	0.05	0.02	0.08	0.11	0.03	0.04	0.04
Queue Length 95th (ft)	4	0	2	0	9	2	3	3
Control Delay (s)	7.6	0.0	7.7	0.0	14.1	10.0	11.9	9.8
Lane LOS	A		A		B	B	B	A
Approach Delay (s)	3.3		1.3		12.8		10.6	
Approach LOS					B		B	

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	26.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	15	10	5	50	0	95	5	355	10	70	380	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	16	11	5	54	0	103	5	386	11	76	413	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1068	976	416	978	973	391	418			397		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1068	976	416	978	973	391	418			397		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	90	95	99	74	100	84	100			93		
cM capacity (veh/h)	159	234	637	208	235	657	1141			1162		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	33	158	5	397	76	418
Volume Left	16	54	5	0	76	0
Volume Right	5	103	0	11	0	5
cSH	207	377	1141	1700	1162	1700
Volume to Capacity	0.16	0.42	0.00	0.23	0.07	0.25
Queue Length 95th (ft)	14	50	0	0	5	0
Control Delay (s)	25.6	21.3	8.2	0.0	8.3	0.0
Lane LOS	D	C	A		A	
Approach Delay (s)	25.6	21.3	0.1		1.3	
Approach LOS	D	C				

Intersection Summary			
Average Delay	4.5		
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	70	75	280	25	15	400
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	76	82	304	27	16	435
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	785	318			332	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	785	318			332	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	79	89			99	
cM capacity (veh/h)	356	723			1228	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	158	332	451
Volume Left	76	0	16
Volume Right	82	27	0
cSH	483	1700	1228
Volume to Capacity	0.33	0.20	0.01
Queue Length 95th (ft)	35	0	1
Control Delay (s)	16.0	0.0	0.4
Lane LOS	C		A
Approach Delay (s)	16.0	0.0	0.4
Approach LOS	C		

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	48.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	15	120	60	5	25	30
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	130	65	5	27	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		204				
pX, platoon unblocked						
vC, conflicting volume	71				231	68
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	71				231	68
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				96	97
cM capacity (veh/h)	1530				749	995

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	147	71	60
Volume Left	16	0	27
Volume Right	0	5	33
cSH	1530	1700	866
Volume to Capacity	0.01	0.04	0.07
Queue Length 95th (ft)	1	0	6
Control Delay (s)	0.9	0.0	9.5
Lane LOS	A		A
Approach Delay (s)	0.9	0.0	9.5
Approach LOS			A

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	23.8%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX D

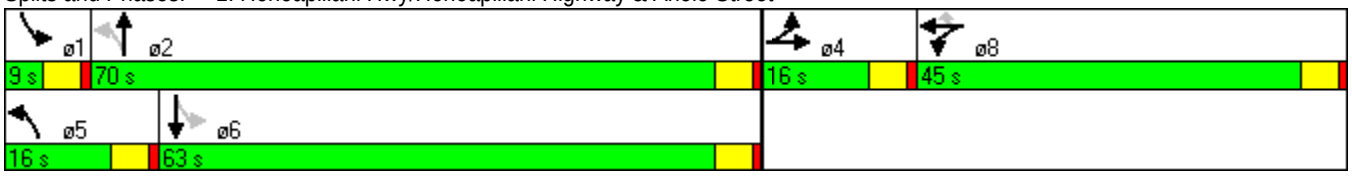
LEVEL OF SERVICE CALCULATIONS

- Year 2020 Alternative 2 Aholo PM

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	30	370	15	35	95	895	45	1195
Turn Type	NA	Split	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases	4	8	8		5	2	1	6
Permitted Phases				8	2		6	
Detector Phase	4	8	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	29.0	29.0	29.0	9.0	23.0	9.0	23.0
Total Split (s)	16.0	45.0	45.0	45.0	16.0	70.0	9.0	63.0
Total Split (%)	11.4%	32.1%	32.1%	32.1%	11.4%	50.0%	6.4%	45.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 31 (22%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated

Splits and Phases: 1: Honoapiilani Hwy/Honoapiilani Highway & Aholo Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	15	30	20	370	15	35	95	895	15	45	1195	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00		1.00	1.00	0.95	1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.96		1.00	1.00	0.85	1.00	1.00		1.00	1.00	
Flt Protected		0.99		0.95	0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1765		1681	1692	1510	1770	3525		1765	3532	
Flt Permitted		0.99		0.95	0.96	1.00	0.12	1.00		0.25	1.00	
Satd. Flow (perm)		1765		1681	1692	1510	217	3525		457	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	16	33	22	402	16	38	103	973	16	49	1299	11
RTOR Reduction (vph)	0	12	0	0	0	27	0	1	0	0	0	0
Lane Group Flow (vph)	0	59	0	209	209	11	103	988	0	49	1310	0
Confl. Peds. (#/hr)						20	20		20	20		20
Turn Type	Split	NA		Split	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8	2			6		
Actuated Green, G (s)		8.1		23.8	23.8	23.8	93.1	84.9		82.6	79.4	
Effective Green, g (s)		8.1		23.8	23.8	23.8	93.1	84.9		82.6	79.4	
Actuated g/C Ratio		0.06		0.17	0.17	0.17	0.66	0.61		0.59	0.57	
Clearance Time (s)		5.0		5.0	5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		102		286	288	257	241	2138		300	2003	
v/s Ratio Prot		c0.03		c0.12	0.12		c0.03	0.28		0.00	c0.37	
v/s Ratio Perm						0.01	0.26			0.09		
v/c Ratio		0.58		0.73	0.73	0.04	0.43	0.46		0.16	0.65	
Uniform Delay, d1		64.3		55.1	55.0	48.6	15.2	15.1		12.7	20.8	
Progression Factor		1.00		1.07	1.07	1.32	1.00	1.00		1.02	0.72	
Incremental Delay, d2		7.7		8.8	8.4	0.1	1.2	0.7		0.2	1.5	
Delay (s)		71.9		67.6	67.1	64.0	16.4	15.8		13.2	16.4	
Level of Service		E		E	E	E	B	B		B	B	
Approach Delay (s)		71.9			67.0			15.8			16.3	
Approach LOS		E			E			B			B	

Intersection Summary			
HCM Average Control Delay	25.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	69.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	5	5	5	5	10	5	930	30	0	1195	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	0	5	5	5	5	11	5	1011	33	0	1299	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1268				
pX, platoon unblocked	0.91	0.91		0.91	0.91	0.91				0.91		
vC, conflicting volume	1832	2356	652	1696	2342	522	1304			1043		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1723	2296	652	1574	2281	291	1304			861		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	84	99	91	85	98	99			100		
cM capacity (veh/h)	45	35	410	58	36	646	527			710		

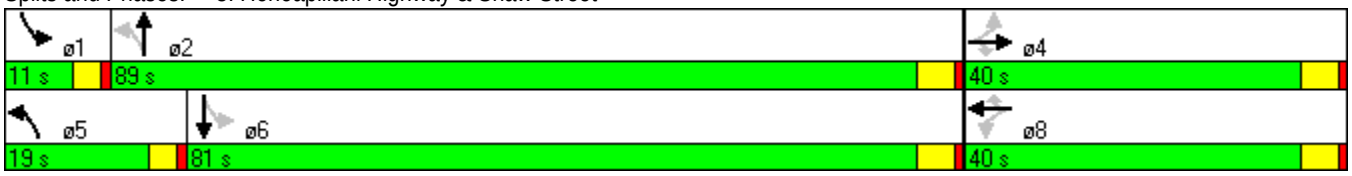
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	11	22	5	674	370	866	438
Volume Left	0	5	5	0	0	0	0
Volume Right	5	11	0	0	33	0	5
cSH	64	83	527	1700	1700	1700	1700
Volume to Capacity	0.17	0.26	0.01	0.40	0.22	0.51	0.26
Queue Length 95th (ft)	14	24	1	0	0	0	0
Control Delay (s)	72.3	63.4	11.9	0.0	0.0	0.0	0.0
Lane LOS	F	F	B				
Approach Delay (s)	72.3	63.4	0.1			0.0	
Approach LOS	F	F					

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	45.4%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Volume (vph)	100	85	145	40	100	125	120	785	125	1050
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases		4			8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	4	4	4	8	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	20.0	3.0	20.0
Minimum Split (s)	29.0	29.0	29.0	29.0	29.0	29.0	7.0	25.0	7.0	25.0
Total Split (s)	40.0	40.0	40.0	40.0	40.0	40.0	19.0	89.0	11.0	81.0
Total Split (%)	28.6%	28.6%	28.6%	28.6%	28.6%	28.6%	13.6%	63.6%	7.9%	57.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0	5.0		5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag							Lead	Lag	Lead	Lag
Lead-Lag Optimize?										
Recall Mode	None	None	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 13 (9%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 3: Honoapiilani Highway & Shaw Street



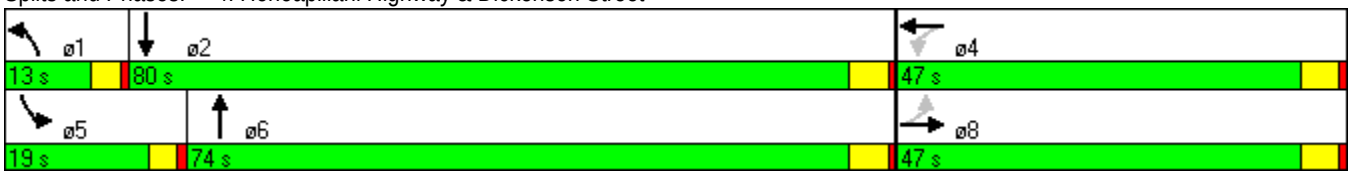
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	100	85	145	40	100	125	120	785	40	125	1050	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95		1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.97	1.00		0.99	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1814	1583		1837	1583	1770	3514		1770	3508	
Flt Permitted		0.60	1.00		0.68	1.00	0.17	1.00		0.28	1.00	
Satd. Flow (perm)		1126	1583		1274	1583	323	3514		519	3508	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	92	158	43	109	136	130	853	43	136	1141	71
RTOR Reduction (vph)	0	0	108	0	0	109	0	2	0	0	2	0
Lane Group Flow (vph)	0	201	50	0	152	27	130	894	0	136	1210	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)		27.7	27.7		27.7	27.7	99.3	91.7		97.3	90.7	
Effective Green, g (s)		27.7	27.7		27.7	27.7	99.3	91.7		97.3	90.7	
Actuated g/C Ratio		0.20	0.20		0.20	0.20	0.71	0.66		0.69	0.65	
Clearance Time (s)		5.0	5.0		5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	2.0	5.0		2.0	5.0	
Lane Grp Cap (vph)		223	313		252	313	308	2302		420	2273	
v/s Ratio Prot							c0.02	0.25		0.02	c0.34	
v/s Ratio Perm		c0.18	0.03		0.12	0.02	0.28			0.21		
v/c Ratio		0.90	0.16		0.60	0.09	0.42	0.39		0.32	0.53	
Uniform Delay, d1		54.8	46.5		51.1	45.8	9.1	11.2		7.6	13.2	
Progression Factor		1.00	1.00		1.04	1.24	2.56	0.87		0.31	0.29	
Incremental Delay, d2		34.7	0.2		4.0	0.1	0.3	0.5		0.1	0.7	
Delay (s)		89.6	46.7		57.3	56.8	23.6	10.2		2.5	4.6	
Level of Service		F	D		E	E	C	B		A	A	
Approach Delay (s)		70.7			57.1			11.9			4.4	
Approach LOS		E			E			B			A	

Intersection Summary			
HCM Average Control Delay	19.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	66.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	105	70	30	55	25	810	125	1125
Turn Type	Perm	NA	Perm	NA	Prot	NA	Prot	NA
Protected Phases		8		4	1	6	5	2
Permitted Phases	8		4					
Detector Phase	8	8	4	4	1	6	5	2
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	3.0	15.0	3.0	15.0
Minimum Split (s)	10.0	10.0	29.0	29.0	7.0	23.5	7.0	23.5
Total Split (s)	47.0	47.0	47.0	47.0	13.0	74.0	19.0	80.0
Total Split (%)	33.6%	33.6%	33.6%	33.6%	9.3%	52.9%	13.6%	57.1%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		5.0		5.0	4.0	5.0	4.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	None	None	None	None	None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 98 (70%), Referenced to phase 2:SBT and 6:NBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated

Splits and Phases: 4: Honoapiilani Highway & Dickenson Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	70	40	30	55	55	25	810	35	125	1125	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes		1.00			0.99		1.00	1.00		1.00	1.00	
Flpb, ped/bikes		1.00			1.00		1.00	1.00		1.00	1.00	
Frt		0.98			0.95		1.00	0.99		1.00	0.98	
Flt Protected		0.98			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1761			1727		1770	3509		1770	3459	
Flt Permitted		0.67			0.88		0.95	1.00		0.95	1.00	
Satd. Flow (perm)		1202			1528		1770	3509		1770	3459	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	76	43	33	60	60	27	880	38	136	1223	217
RTOR Reduction (vph)	0	6	0	0	19	0	0	2	0	0	7	0
Lane Group Flow (vph)	0	227	0	0	134	0	27	916	0	136	1433	0
Confl. Peds. (#/hr)	8		1	1		8			10			
Turn Type	Perm	NA		Perm	NA		Prot	NA		Prot	NA	
Protected Phases		8			4		1	6		5	2	
Permitted Phases	8			4								
Actuated Green, G (s)		29.0			29.0		4.4	83.7		13.3	92.6	
Effective Green, g (s)		29.0			29.0		4.4	83.7		13.3	92.6	
Actuated g/C Ratio		0.21			0.21		0.03	0.60		0.10	0.66	
Clearance Time (s)		5.0			5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)		2.0			2.0		1.5	5.0		1.5	5.0	
Lane Grp Cap (vph)		249			317		56	2098		168	2288	
v/s Ratio Prot							0.02	0.26		c0.08	c0.41	
v/s Ratio Perm		c0.19			0.09							
v/c Ratio		0.91			0.42		0.48	0.44		0.81	0.63	
Uniform Delay, d1		54.2			48.2		66.7	15.3		62.1	13.7	
Progression Factor		1.00			0.80		1.00	0.70		1.36	0.22	
Incremental Delay, d2		33.6			0.3		2.2	0.6		16.0	0.9	
Delay (s)		87.8			38.7		68.9	11.3		100.3	3.8	
Level of Service		F			D		E	B		F	A	
Approach Delay (s)		87.8			38.7			12.9			12.1	
Approach LOS		F			D			B			B	

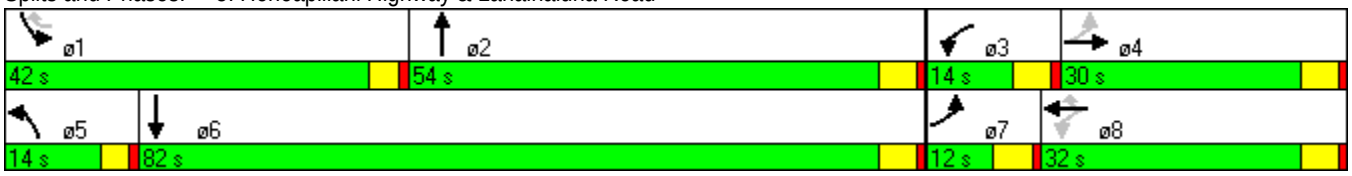
Intersection Summary			
HCM Average Control Delay	19.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	105	205	85	140	230	50	840	325	1310
Turn Type	pm+pt	NA	pm+pt	NA	custom	Prot	NA	Prot	NA
Protected Phases	7	4	3	8		5	2	1	6
Permitted Phases	4		8		8 1				
Detector Phase	7	4	3	8	8 1	5	2	1	6
Switch Phase									
Minimum Initial (s)	4.0	5.0	4.0	5.0		3.0	15.0	3.0	15.0
Minimum Split (s)	9.0	29.0	9.0	29.0		7.0	30.0	7.0	30.0
Total Split (s)	12.0	30.0	14.0	32.0		14.0	54.0	42.0	82.0
Total Split (%)	8.6%	21.4%	10.0%	22.9%		10.0%	38.6%	30.0%	58.6%
Yellow Time (s)	4.0	4.0	4.0	4.0		3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0		4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag		Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None		None	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 103 (74%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 5: Honoapiilani Highway & Lahainaluna Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	105	205	55	85	140	230	50	840	25	325	1310	85
Ideal Flow (vphpl)	1900	1900	1900	1500	1500	1500	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1779		1393	1471	1250	1770	3522		1770	3501	
Flt Permitted	0.56	1.00		0.16	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1036	1779		239	1471	1250	1770	3522		1770	3501	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	114	223	60	92	152	250	54	913	27	353	1424	92
RTOR Reduction (vph)	0	7	0	0	0	44	0	1	0	0	3	0
Lane Group Flow (vph)	114	276	0	92	152	206	54	939	0	353	1513	0
Confl. Peds. (#/hr)			30	30					5			3
Turn Type	pm+pt	NA		pm+pt	NA	custom	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8 1						
Actuated Green, G (s)	30.8	23.8		34.4	25.6	62.3	7.2	56.7		31.7	81.2	
Effective Green, g (s)	30.8	23.8		34.4	25.6	62.3	7.2	56.7		31.7	81.2	
Actuated g/C Ratio	0.22	0.17		0.25	0.18	0.44	0.05	0.41		0.23	0.58	
Clearance Time (s)	5.0	5.0		5.0	5.0		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	2.0		3.0	4.0		2.0	4.5		2.0	4.5	
Lane Grp Cap (vph)	265	302		131	269	556	91	1426		401	2031	
v/s Ratio Prot	0.02	c0.16		c0.04	0.10		0.03	0.27		c0.20	c0.43	
v/s Ratio Perm	0.07			0.13		0.16						
v/c Ratio	0.43	0.92		0.70	0.57	0.37	0.59	0.66		0.88	0.74	
Uniform Delay, d1	45.8	57.1		44.0	52.1	25.8	65.0	33.8		52.3	21.7	
Progression Factor	1.00	1.00		1.32	1.26	0.87	1.04	0.54		1.30	0.29	
Incremental Delay, d2	1.1	30.1		15.2	3.2	0.6	6.1	2.2		10.9	1.3	
Delay (s)	46.9	87.2		73.4	69.1	23.1	74.0	20.5		78.7	7.7	
Level of Service	D	F		E	E	C	E	C		E	A	
Approach Delay (s)		75.6			46.6			23.4			21.1	
Approach LOS		E			D			C			C	

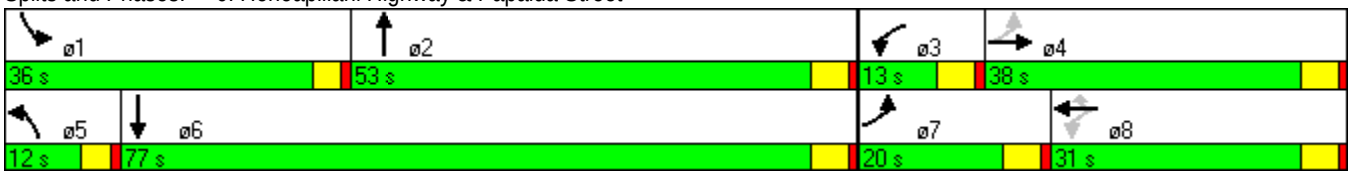
Intersection Summary			
HCM Average Control Delay	30.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	82.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	265	170	110	150	195	70	1070	360	1470
Turn Type	pm+pt	NA	pm+pt	NA	Perm	Prot	NA	Prot	NA
Protected Phases	7	4	3	8		5	2	1	6
Permitted Phases	4		8		8				
Detector Phase	7	4	3	8	8	5	2	1	6
Switch Phase									
Minimum Initial (s)	4.0	5.0	4.0	5.0	5.0	5.0	15.0	15.0	5.0
Minimum Split (s)	9.0	29.0	9.0	29.0	29.0	9.0	24.0	19.0	24.0
Total Split (s)	20.0	38.0	13.0	31.0	31.0	12.0	53.0	36.0	77.0
Total Split (%)	14.3%	27.1%	9.3%	22.1%	22.1%	8.6%	37.9%	25.7%	55.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	4.0	5.0	5.0	4.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	None	C-Max	Max	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 95 (68%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 105
Control Type: Actuated-Coordinated

Splits and Phases: 6: Honoapiilani Highway & Papalua Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	265	170	85	110	150	195	70	1070	90	360	1470	175
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0		4.0	5.0	5.0	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00	0.99	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.95		1.00	1.00	0.85	1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1769	1755		1766	1863	1562	1770	3488		1770	3471	
Flt Permitted	0.35	1.00		0.33	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	657	1755		617	1863	1562	1770	3488		1770	3471	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	288	185	92	120	163	212	76	1163	98	391	1598	190
RTOR Reduction (vph)	0	14	0	0	0	177	0	4	0	0	6	0
Lane Group Flow (vph)	288	263	0	120	163	35	76	1257	0	391	1782	0
Confl. Peds. (#/hr)	1		8	8		1			10			3
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8		8						
Actuated Green, G (s)	39.0	26.0		27.0	19.0	19.0	7.7	55.0		32.0	79.3	
Effective Green, g (s)	40.0	26.0		29.0	19.0	19.0	7.7	55.0		32.0	79.3	
Actuated g/C Ratio	0.29	0.19		0.21	0.14	0.14	0.06	0.39		0.23	0.57	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	2.0	6.0		6.0	3.0	
Lane Grp Cap (vph)	315	326		202	253	212	97	1370		405	1966	
v/s Ratio Prot	c0.10	0.15		0.04	0.09		0.04	0.36		c0.22	c0.51	
v/s Ratio Perm	c0.16			0.09		0.02						
v/c Ratio	0.91	0.81		0.59	0.64	0.16	0.78	0.92		0.97	0.91	
Uniform Delay, d1	45.2	54.6		47.5	57.3	53.5	65.3	40.3		53.5	27.0	
Progression Factor	1.00	1.00		1.02	1.01	1.07	0.93	0.68		0.82	0.86	
Incremental Delay, d2	29.5	13.6		4.6	5.5	0.4	26.5	9.7		29.2	5.3	
Delay (s)	74.7	68.2		52.9	63.7	57.8	87.1	37.1		73.2	28.6	
Level of Service	E	E		D	E	E	F	D		E	C	
Approach Delay (s)		71.5			58.6			40.0			36.6	
Approach LOS		E			E			D			D	

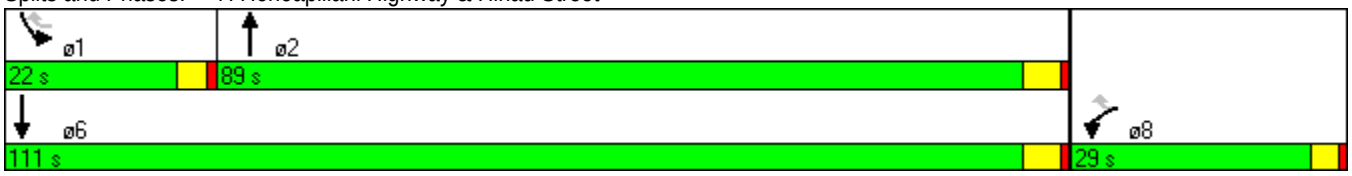
Intersection Summary			
HCM Average Control Delay	44.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	90.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Configurations					
Volume (vph)	130	125	1545	135	1970
Turn Type	NA	custom	NA	Prot	NA
Protected Phases	8		2	1	6
Permitted Phases		8 1			
Detector Phase	8	8 1	2	1	6
Switch Phase					
Minimum Initial (s)	7.0		15.0	4.0	15.0
Minimum Split (s)	29.0		23.0	9.0	20.0
Total Split (s)	29.0		89.0	22.0	111.0
Total Split (%)	20.7%		63.6%	15.7%	79.3%
Yellow Time (s)	3.0		4.0	3.0	4.0
All-Red Time (s)	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0
Total Lost Time (s)	4.0		5.0	4.0	5.0
Lead/Lag			Lag	Lead	
Lead-Lag Optimize?					
Recall Mode	None		C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 117 (84%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

Splits and Phases: 7: Honoapiilani Highway & Hinau Street



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	130	125	1545	110	135	1970
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	5.0		4.0	5.0
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.98	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1770	1551	3504		1770	3539
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	1770	1551	3504		1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	136	1679	120	147	2141
RTOR Reduction (vph)	0	18	3	0	0	0
Lane Group Flow (vph)	141	118	1796	0	147	2141
Confl. Peds. (#/hr)		5				
Turn Type	NA	custom	NA		Prot	NA
Protected Phases	8		2		1	6
Permitted Phases		8 1				
Actuated Green, G (s)	16.4	36.0	95.0		15.6	114.6
Effective Green, g (s)	16.4	36.0	95.0		15.6	114.6
Actuated g/C Ratio	0.12	0.26	0.68		0.11	0.82
Clearance Time (s)	4.0		5.0		4.0	5.0
Vehicle Extension (s)	3.0		5.0		3.0	5.0
Lane Grp Cap (vph)	207	399	2378		197	2897
v/s Ratio Prot	c0.08		0.51		0.08	c0.60
v/s Ratio Perm		0.08				
v/c Ratio	0.68	0.30	0.76		0.75	0.74
Uniform Delay, d1	59.3	41.8	14.8		60.3	5.8
Progression Factor	1.00	1.00	0.31		0.81	1.60
Incremental Delay, d2	8.9	0.4	1.3		1.4	0.2
Delay (s)	68.2	42.2	5.9		50.5	9.5
Level of Service	E	D	A		D	A
Approach Delay (s)	55.4		5.9			12.1
Approach LOS	E		A			B

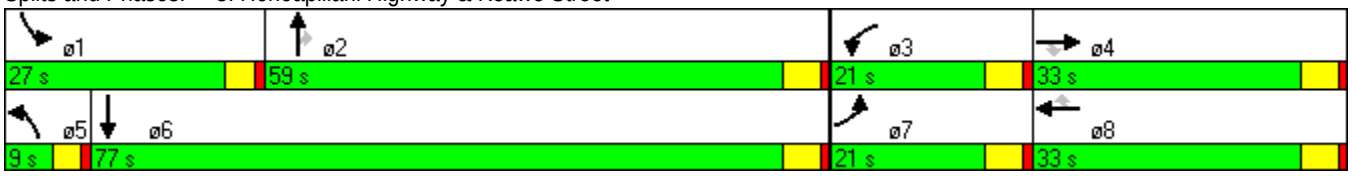
Intersection Summary			
HCM Average Control Delay	12.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Volume (vph)	80	95	95	160	55	890	100	1495	135	750	1920
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA
Protected Phases	7	4		3	8		5	2		1	6
Permitted Phases			4			8			2		
Detector Phase	7	4	4	3	8	8	5	2	2	1	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	15.0	15.0	3.0	15.0
Minimum Split (s)	10.0	33.0	33.0	10.0	33.0	33.0	7.0	29.0	29.0	7.0	29.0
Total Split (s)	21.0	33.0	33.0	21.0	33.0	33.0	9.0	59.0	59.0	27.0	77.0
Total Split (%)	15.0%	23.6%	23.6%	15.0%	23.6%	23.6%	6.4%	42.1%	42.1%	19.3%	55.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0	4.0	3.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	-1.0	0.0	0.0	-1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes								
Recall Mode	None	None	None	None	None	None	None	C-Max	C-Max	None	C-Max

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green, Master Intersection
Natural Cycle: 150
Control Type: Actuated-Coordinated

Splits and Phases: 8: Honoapiilani Highway & Keawe Street



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	95	95	160	55	890	100	1495	135	750	1920	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	1.00	0.97	0.95	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	0.99	0.99	1.00	1.00	0.99	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.87	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1562	1770	1517	1484	1770	3539	1562	3433	3517	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1562	1770	1517	1484	1770	3539	1562	3433	3517	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	87	103	103	174	60	967	109	1625	147	815	2087	71
RTOR Reduction (vph)	0	0	69	0	194	250	0	0	25	0	2	0
Lane Group Flow (vph)	87	103	34	174	320	263	109	1625	122	815	2156	0
Confl. Peds. (#/hr)	1		1	1		1			1			7
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			
Actuated Green, G (s)	12.0	24.6	24.6	15.5	28.1	28.1	5.0	57.9	57.9	23.0	75.9	
Effective Green, g (s)	13.0	24.6	24.6	16.5	28.1	28.1	5.0	57.9	57.9	23.0	75.9	
Actuated g/C Ratio	0.09	0.18	0.18	0.12	0.20	0.20	0.04	0.41	0.41	0.16	0.54	
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	4.0	5.0	5.0	4.0	5.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	2.0	5.0	5.0	2.0	5.0	
Lane Grp Cap (vph)	164	327	274	209	304	298	63	1464	646	564	1907	
v/s Ratio Prot	0.05	0.06		c0.10	c0.21		0.06	0.46		c0.24	c0.61	
v/s Ratio Perm			0.02			0.18			0.08			
v/c Ratio	0.53	0.31	0.12	0.83	1.05	0.88	1.73	1.11	0.19	1.45	1.13	
Uniform Delay, d1	60.6	50.3	48.6	60.4	56.0	54.3	67.5	41.0	26.1	58.5	32.0	
Progression Factor	1.00	1.00	1.00	1.03	0.94	0.98	1.11	0.70	0.68	1.00	1.00	
Incremental Delay, d2	3.3	0.6	0.2	21.8	63.3	23.0	370.9	57.1	0.5	210.1	66.1	
Delay (s)	63.9	50.9	48.8	84.3	116.2	76.0	445.7	85.7	18.2	268.6	98.1	
Level of Service	E	D	D	F	F	E	F	F	B	F	F	
Approach Delay (s)		54.0			94.4			101.3			144.9	
Approach LOS		D			F			F			F	

Intersection Summary			
HCM Average Control Delay	118.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.13		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	103.5%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	35	460	20	40	355	35	20	5	15	20	5	95
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	38	500	22	43	386	38	22	5	16	22	5	103
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		290			280							
pX, platoon unblocked				0.88			0.88	0.88	0.88	0.88	0.88	
vC, conflicting volume	424			522			973	1098	511	1087	1090	212
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	424			393			903	1045	381	1033	1036	212
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			96			87	97	97	85	97	87
cM capacity (veh/h)	1132			1027			165	186	545	148	188	793

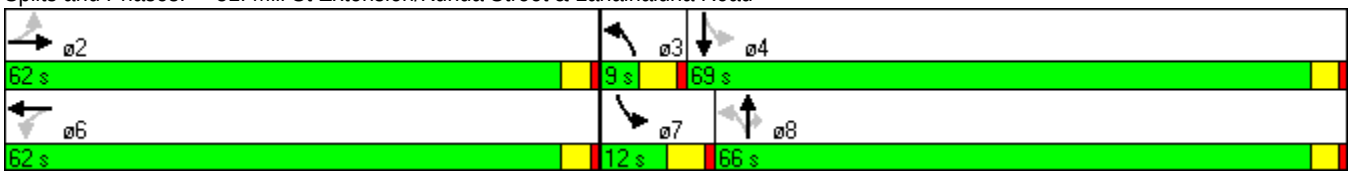
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	SB 1	SB 2
Volume Total	38	522	43	257	167	43	27	103
Volume Left	38	0	43	0	0	22	22	0
Volume Right	0	22	0	0	38	16	0	103
cSH	1132	1700	1027	1700	1700	227	154	793
Volume to Capacity	0.03	0.31	0.04	0.15	0.10	0.19	0.18	0.13
Queue Length 95th (ft)	3	0	3	0	0	17	15	11
Control Delay (s)	8.3	0.0	8.7	0.0	0.0	24.5	33.2	10.2
Lane LOS	A		A			C	D	B
Approach Delay (s)	0.6		0.8			24.5	15.0	
Approach LOS						C	C	

Intersection Summary			
Average Delay	3.1		
Intersection Capacity Utilization	47.7%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Volume (vph)	65	405	50	310	40	540	105	95	480
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	Perm	pm+pt	NA
Protected Phases		2		6	3	8		7	4
Permitted Phases	2		6		8		8	4	
Detector Phase	2	2	6	6	3	8	8	7	4
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	26.0	26.0	26.0	26.0	9.0	26.0	26.0	9.0	26.0
Total Split (s)	62.0	62.0	62.0	62.0	9.0	66.0	66.0	12.0	69.0
Total Split (%)	44.3%	44.3%	44.3%	44.3%	6.4%	47.1%	47.1%	8.6%	49.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	4.0	3.0	3.0	4.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0		4.0	5.0	4.0	4.0	5.0	4.0
Lead/Lag					Lead	Lag	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None

Intersection Summary
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 58 (41%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 81: Mill St Extension/Kuhua Street & Lahainaluna Road



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	405	80	50	310	45	40	540	105	95	480	35
Ideal Flow (vphpl)	1900	1900	1900	1500	1500	1500	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0		5.0	4.0	4.0	5.0	4.0	
Lane Util. Factor	1.00	1.00			0.95		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.98			0.98		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00			0.99		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1817			2731		1770	1863	1583	1770	1844	
Flt Permitted	0.45	1.00			0.74		0.20	1.00	1.00	0.12	1.00	
Satd. Flow (perm)	831	1817			2026		372	1863	1583	218	1844	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	71	440	87	54	337	49	43	587	114	103	522	38
RTOR Reduction (vph)	0	5	0	0	6	0	0	0	28	0	2	0
Lane Group Flow (vph)	71	522	0	0	434	0	43	587	86	103	558	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases		2			6		3	8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	66.9	66.9			66.9		56.3	53.1	53.1	63.9	56.9	
Effective Green, g (s)	66.9	66.9			66.9		56.3	53.1	53.1	63.9	56.9	
Actuated g/C Ratio	0.48	0.48			0.48		0.40	0.38	0.38	0.46	0.41	
Clearance Time (s)	4.0	4.0			4.0		5.0	4.0	4.0	5.0	4.0	
Vehicle Extension (s)	3.0	3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	397	868			968		182	707	600	177	749	
v/s Ratio Prot		c0.29					0.01	c0.32		c0.03	c0.30	
v/s Ratio Perm	0.09				0.21		0.09		0.05	0.24		
v/c Ratio	0.18	0.60			0.45		0.24	0.83	0.14	0.58	0.75	
Uniform Delay, d1	20.9	26.8			24.3		29.0	39.4	28.5	29.1	35.4	
Progression Factor	0.30	0.26			1.00		1.00	1.00	1.00	0.98	1.06	
Incremental Delay, d2	0.7	2.3			1.5		0.7	8.2	0.1	4.7	4.0	
Delay (s)	6.9	9.2			25.8		29.6	47.6	28.6	33.1	41.3	
Level of Service	A	A			C		C	D	C	C	D	
Approach Delay (s)		8.9			25.8			43.6			40.0	
Approach LOS		A			C			D			D	

Intersection Summary			
HCM Average Control Delay	31.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Volume (vph)	40	405	60	555	420	195	55	135
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	23.0	23.0	23.0	23.0	9.0	29.0	9.0	29.0
Total Split (s)	24.0	24.0	24.0	24.0	17.0	29.0	17.0	29.0
Total Split (%)	34.3%	34.3%	34.3%	34.3%	24.3%	41.4%	24.3%	41.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?								
Recall Mode	C-Max	C-Max	C-Max	C-Max	Min	Min	None	None

Intersection Summary
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 5 (7%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated

Splits and Phases: 82: Kuhua Street & Keawe St

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	40	405	325	60	555	80	420	195	25	55	135	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.98		1.00	0.98		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3303		1770	3472		1770	1831		1770	1819	
Flt Permitted	0.32	1.00		0.27	1.00		0.44	1.00		0.61	1.00	
Satd. Flow (perm)	596	3303		495	3472		812	1831		1136	1819	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	440	353	65	603	87	457	212	27	60	147	27
RTOR Reduction (vph)	0	164	0	0	13	0	0	7	0	0	11	0
Lane Group Flow (vph)	43	629	0	65	677	0	457	232	0	60	163	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	29.5	29.5		29.5	29.5		30.5	20.9		18.1	13.5	
Effective Green, g (s)	29.5	29.5		29.5	29.5		30.5	20.9		18.1	13.5	
Actuated g/C Ratio	0.42	0.42		0.42	0.42		0.44	0.30		0.26	0.19	
Clearance Time (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	251	1392		209	1463		518	547		335	351	
v/s Ratio Prot		0.19			c0.20		c0.15	0.13		0.01	0.09	
v/s Ratio Perm	0.07			0.13			c0.23			0.03		
v/c Ratio	0.17	0.45		0.31	0.46		0.88	0.42		0.18	0.46	
Uniform Delay, d1	12.6	14.5		13.5	14.6		16.2	19.7		19.9	25.0	
Progression Factor	0.44	0.66		1.00	1.00		1.16	0.78		1.00	1.00	
Incremental Delay, d2	0.1	0.1		3.8	1.1		15.0	0.5		0.3	1.0	
Delay (s)	5.7	9.6		17.3	15.6		33.9	15.9		20.2	26.0	
Level of Service	A	A		B	B		C	B		C	C	
Approach Delay (s)		9.4			15.8			27.7			24.5	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM Average Control Delay	17.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	90	5	95	30	5	5	95	520	20	5	480	45
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	98	5	103	33	5	5	103	565	22	5	522	49
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								832				
pX, platoon unblocked	0.74	0.74		0.74	0.74	0.74				0.74		
vC, conflicting volume	1337	1351	546	1421	1364	576	571			587		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1280	1298	546	1394	1317	253	571			267		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	95	81	48	95	99	90			99		
cM capacity (veh/h)	92	107	537	63	104	582	1002			960		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	98	109	43	103	587	5	571
Volume Left	98	0	33	103	0	5	0
Volume Right	0	103	5	0	22	0	49
cSH	92	447	75	1002	1700	960	1700
Volume to Capacity	1.06	0.24	0.58	0.10	0.35	0.01	0.34
Queue Length 95th (ft)	160	24	63	9	0	0	0
Control Delay (s)	194.7	15.6	105.2	9.0	0.0	8.8	0.0
Lane LOS	F	C	F	A		A	
Approach Delay (s)	100.5		105.2	1.3		0.1	
Approach LOS	F		F				

Intersection Summary			
Average Delay	17.3		
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	110	5	120	5	5	20	25	545	40	55	500	50
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	120	5	130	5	5	22	27	592	43	60	543	54
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)											803	
pX, platoon unblocked	0.75	0.75	0.75	0.75	0.75		0.75					
vC, conflicting volume	1361	1380	571	1465	1386	614	598			636		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1316	1341	265	1453	1348	614	301			636		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	95	78	90	95	96	97			94		
cM capacity (veh/h)	87	104	582	57	103	492	948			948		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	120	136	5	27	27	636	60	598
Volume Left	120	0	5	0	27	0	60	0
Volume Right	0	130	0	22	0	43	0	54
cSH	87	492	57	281	948	1700	948	1700
Volume to Capacity	1.38	0.28	0.10	0.10	0.03	0.37	0.06	0.35
Queue Length 95th (ft)	227	28	8	8	2	0	5	0
Control Delay (s)	313.9	15.1	75.3	19.2	8.9	0.0	9.1	0.0
Lane LOS	F	C	F	C	A		A	
Approach Delay (s)	154.9		28.6		0.4		0.8	
Approach LOS	F		D					

Intersection Summary			
Average Delay	25.7		
Intersection Capacity Utilization	57.2%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	20	100	15	25	70	75	25	435	25	55	360	55
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	22	109	16	27	76	82	27	473	27	60	391	60
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1188	1095	421	1122	1111	486	451			500		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1188	1095	421	1122	1111	486	451			500		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	77	45	97	71	60	86	98			94		
cM capacity (veh/h)	93	197	632	95	192	581	1109			1064		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	147	185	27	500	60	451
Volume Left	22	27	27	0	60	0
Volume Right	16	82	0	27	0	60
cSH	180	225	1109	1700	1064	1700
Volume to Capacity	0.81	0.82	0.02	0.29	0.06	0.27
Queue Length 95th (ft)	140	155	2	0	4	0
Control Delay (s)	78.1	67.8	8.3	0.0	8.6	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	78.1	67.8	0.4		1.0	
Approach LOS	F	F				

Intersection Summary			
Average Delay	18.1		
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	0	15	490	0	390
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	11	0	16	533	0	424
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	565	0	424			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	565	0	424			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	100	99			
cM capacity (veh/h)	479	1085	1135			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1
Volume Total	11	16	533	424
Volume Left	11	16	0	0
Volume Right	0	0	0	424
cSH	479	1135	1700	1700
Volume to Capacity	0.02	0.01	0.31	0.25
Queue Length 95th (ft)	2	1	0	0
Control Delay (s)	12.7	8.2	0.0	0.0
Lane LOS	B	A		
Approach Delay (s)	12.7	0.2		0.0
Approach LOS	B			

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	NBR	SBL	SBT	SBR	SWL	SWR
Lane Configurations										
Volume (veh/h)	5	85	20	910	455	0	1560	25	0	0
Sign Control	Stop			Free			Free		Stop	
Grade	0%			0%			0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	92	22	989	495	0	1696	27	0	0
Pedestrians										
Lane Width (ft)										
Walking Speed (ft/s)										
Percent Blockage										
Right turn flare (veh)										
Median type				None			None			
Median storage veh)										
Upstream signal (ft)							951			
pX, platoon unblocked	0.73	0.73	0.73						0.73	0.73
vC, conflicting volume	2742	861	1723			989			1976	2755
vC1, stage 1 conf vol										
vC2, stage 2 conf vol										
vCu, unblocked vol	2647	75	1253			989			1599	2665
tC, single (s)	6.5	6.9	4.1			4.1			7.5	6.5
tC, 2 stage (s)										
tF (s)	4.0	3.3	2.2			2.2			3.5	4.0
p0 queue free %	66	87	95			100			100	100
cM capacity (veh/h)	16	710	403			695			32	15

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2
Volume Total	98	22	495	495	495	1130	592
Volume Left	0	22	0	0	0	0	0
Volume Right	92	0	0	0	495	0	27
cSH	206	403	1700	1700	1700	1700	1700
Volume to Capacity	0.47	0.05	0.29	0.29	0.29	0.66	0.35
Queue Length 95th (ft)	58	4	0	0	0	0	0
Control Delay (s)	37.4	14.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	E	B					
Approach Delay (s)	37.4	0.2				0.0	
Approach LOS	E						

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	56.1%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	95	785	65	50	905	110	100	15	20	20	20	140
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	103	853	71	54	984	120	109	16	22	22	22	152
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		357			687							
pX, platoon unblocked	0.93						0.93	0.93		0.93	0.93	0.93
vC, conflicting volume	1103			924			1859	2307	462	1815	2283	552
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	965			924			1775	2257	462	1729	2230	373
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	84			93			0	45	96	11	29	74
cM capacity (veh/h)	661			735			13	30	547	24	31	582

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	103	569	355	54	656	447	125	22	43	152
Volume Left	103	0	0	54	0	0	109	0	22	0
Volume Right	0	0	71	0	0	120	0	22	0	152
cSH	661	1700	1700	735	1700	1700	14	547	27	582
Volume to Capacity	0.16	0.33	0.21	0.07	0.39	0.26	8.80	0.04	1.60	0.26
Queue Length 95th (ft)	14	0	0	6	0	0	Err	3	130	26
Control Delay (s)	11.5	0.0	0.0	10.3	0.0	0.0	Err	11.9	608.9	13.4
Lane LOS	B			B			F	B	F	B
Approach Delay (s)	1.2			0.5			8519.4		145.7	
Approach LOS							F		F	

Intersection Summary			
Average Delay	506.6		
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	55	735	35	10	975	20	25	5	5	30	0	70
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	60	799	38	11	1060	22	27	5	5	33	0	76
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		619			425							
pX, platoon unblocked	0.88						0.88	0.88		0.88	0.88	0.88
vC, conflicting volume	1082			837			1565	2041	418	1620	2049	541
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	830			837			1377	1915	418	1439	1924	219
tC, single (s)	4.1			4.1			7.5	6.5	6.9	7.5	6.5	6.9
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	92			99			64	90	99	53	100	89
cM capacity (veh/h)	705			793			76	53	583	70	53	695

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2	SB 1	SB 2
Volume Total	60	533	304	11	707	375	33	5	33	76
Volume Left	60	0	0	11	0	0	27	0	33	0
Volume Right	0	0	38	0	0	22	0	5	0	76
cSH	705	1700	1700	793	1700	1700	71	583	70	695
Volume to Capacity	0.08	0.31	0.18	0.01	0.42	0.22	0.46	0.01	0.47	0.11
Queue Length 95th (ft)	7	0	0	1	0	0	46	1	47	9
Control Delay (s)	10.6	0.0	0.0	9.6	0.0	0.0	93.4	11.2	94.9	10.8
Lane LOS	B			A			F	B	F	B
Approach Delay (s)	0.7			0.1			81.6		36.1	
Approach LOS							F		E	

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	49.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	350	135	15	495	200	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	380	147	16	538	217	27
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)	247					
pX, platoon unblocked						
vC, conflicting volume			527		755	264
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			527		755	264
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		36	96
cM capacity (veh/h)			1036		339	735

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	254	274	16	269	269	217	27
Volume Left	0	0	16	0	0	217	0
Volume Right	0	147	0	0	0	0	27
cSH	1700	1700	1036	1700	1700	339	735
Volume to Capacity	0.15	0.16	0.02	0.16	0.16	0.64	0.04
Queue Length 95th (ft)	0	0	1	0	0	105	3
Control Delay (s)	0.0	0.0	8.5	0.0	0.0	32.8	10.1
Lane LOS			A			D	B
Approach Delay (s)	0.0		0.3			30.3	
Approach LOS						D	

Intersection Summary			
Average Delay	5.7		
Intersection Capacity Utilization	31.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	15	25	610	20	45	475
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	27	663	22	49	516
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		2				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						1179
pX, platoon unblocked						
vC, conflicting volume	1288	674			685	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1288	674			685	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	90	94			95	
cM capacity (veh/h)	171	455			909	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	43	685	49	516
Volume Left	16	0	49	0
Volume Right	27	22	0	0
cSH	456	1700	909	1700
Volume to Capacity	0.10	0.40	0.05	0.30
Queue Length 95th (ft)	8	0	4	0
Control Delay (s)	19.0	0.0	9.2	0.0
Lane LOS	C		A	
Approach Delay (s)	19.0	0.0	0.8	
Approach LOS	C			

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	95	5	95	15	5	5	40	540	35	5	410	75
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	103	5	103	16	5	5	43	587	38	5	446	82
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)								1281				
pX, platoon unblocked	0.81	0.81		0.81	0.81	0.81				0.81		
vC, conflicting volume	1179	1209	486	1255	1231	606	527			625		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1106	1142	486	1199	1169	400	527			424		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	27	96	82	84	96	99	96			99		
cM capacity (veh/h)	142	155	581	102	150	528	1040			923		

Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	109	103	27	43	625	5	527
Volume Left	103	0	16	43	0	5	0
Volume Right	0	103	5	0	38	0	82
cSH	142	581	131	1040	1700	923	1700
Volume to Capacity	0.76	0.18	0.21	0.04	0.37	0.01	0.31
Queue Length 95th (ft)	115	16	19	3	0	0	0
Control Delay (s)	84.4	12.5	39.4	8.6	0.0	8.9	0.0
Lane LOS	F	B	E	A		A	
Approach Delay (s)	49.4		39.4	0.6		0.1	
Approach LOS	E		E				

Intersection Summary			
Average Delay	8.3		
Intersection Capacity Utilization	48.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	215	20	250	75	15	40	190	5	75	40	5	150
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	234	22	272	82	16	43	207	5	82	43	5	163
Pedestrians								50				
Lane Width (ft)								12.0				
Walking Speed (ft/s)								4.0				
Percent Blockage								4				
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)		408										
pX, platoon unblocked												
vC, conflicting volume	60			343			1020	898	208	774	1012	38
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	60			343			1020	898	208	774	1012	38
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	85			93			0	97	90	81	97	84
cM capacity (veh/h)	1544			1165			138	211	798	226	181	1034

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	234	293	82	60	207	87	43	168
Volume Left	234	0	82	0	207	0	43	0
Volume Right	0	272	0	43	0	82	0	163
cSH	1544	1700	1165	1700	138	680	226	897
Volume to Capacity	0.15	0.17	0.07	0.04	1.50	0.13	0.19	0.19
Queue Length 95th (ft)	13	0	6	0	352	11	17	17
Control Delay (s)	7.7	0.0	8.3	0.0	316.9	11.1	24.7	9.9
Lane LOS	A		A		F	B	C	A
Approach Delay (s)	3.4		4.8		226.3		13.0	
Approach LOS					F		B	

Intersection Summary			
Average Delay	61.0		
Intersection Capacity Utilization	54.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	25	5	30	0	80	5	505	20	190	435	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
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
Hourly flow rate (vph)	11	27	5	33	0	87	5	549	22	207	473	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1535	1470	476	1476	1462	560	478			571		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1535	1470	476	1476	1462	560	478			571		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	84	73	99	53	100	84	99			79		
cM capacity (veh/h)	66	100	589	69	102	528	1084			1002		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	11	33	33	87	5	571	207	478
Volume Left	11	0	33	0	5	0	207	0
Volume Right	0	5	0	87	0	22	0	5
cSH	66	117	69	528	1084	1700	1002	1700
Volume to Capacity	0.16	0.28	0.47	0.16	0.01	0.34	0.21	0.28
Queue Length 95th (ft)	14	26	47	15	0	0	19	0
Control Delay (s)	69.5	47.4	96.8	13.2	8.3	0.0	9.5	0.0
Lane LOS	F	E	F	B	A		A	
Approach Delay (s)	53.0		36.0		0.1		2.9	
Approach LOS	F		E					

Intersection Summary			
Average Delay	6.0		
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	40	70	420	70	45	355
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	43	76	457	76	49	386
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	978	495			533	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	978	495			533	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	84	87			95	
cM capacity (veh/h)	265	575			1035	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	120	533	435
Volume Left	43	0	49
Volume Right	76	76	0
cSH	403	1700	1035
Volume to Capacity	0.30	0.31	0.05
Queue Length 95th (ft)	31	0	4
Control Delay (s)	17.7	0.0	1.4
Lane LOS	C		A
Approach Delay (s)	17.7	0.0	1.4
Approach LOS	C		

Intersection Summary			
Average Delay	2.5		
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	15	185	75	5	20	20
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	16	201	82	5	22	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		204				
pX, platoon unblocked						
vC, conflicting volume	87				318	84
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	87				318	84
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				97	98
cM capacity (veh/h)	1509				668	975

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	217	87	43
Volume Left	16	0	22
Volume Right	0	5	22
cSH	1509	1700	793
Volume to Capacity	0.01	0.05	0.05
Queue Length 95th (ft)	1	0	4
Control Delay (s)	0.6	0.0	9.8
Lane LOS	A		A
Approach Delay (s)	0.6	0.0	9.8
Approach LOS			A

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	27.2%	ICU Level of Service	A
Analysis Period (min)	15		

APPENDIX B-1.

Austin, Tsutsumi & Associates, Inc. Letter Dated June 25, 2012

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

KENNETH K. KUROKAWA, P.E.
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STANLEY T. WATANABE
IVAN K. NAKATSUKA, P.E.
ADRIENNE W. L. H. WONG, P.E., LEED AP

#08-013.1

June 25, 2012

Mr. Nolly Yagin, P.E.
County of Maui
Department of Public Works
Engineering Division
200 S. High Street
Waikluku, Hawaii 96793

Dear Mr. Yagin:

Subject: Kuhua Street Extension
Lahaina, Maui, Hawaii
Traffic Counts

This letter was written in response to your observation that the traffic count data used in the May 2012 Traffic Impact Analysis Report for the Kuhua Street Extension (TIAR) was collected on February 5-7, 2008. We are aware that traffic count data is generally considered "current" by the County for a period of two (2) years from the point of collection.

However, as stated in the TIAR, ATA performed updated traffic counts on the following dates at the following locations:

- **October 21, 2009: Keawe Street/Honoapiilani Highway intersection** – Traffic along Honoapiilani Highway had decreased by approximately 30 percent from 2008 due to the economic downturn. Increased traffic volumes from Keawe Street were incorporated into TIAR.

- **January 26-27, 2010: Front Street (South)/Honoapiilani Highway intersection** – Traffic estimated to be at parity with 2008 counts.

- **May 5-6, 2010: Keawe Street/Honoapiilani Highway Intersection (Villages of Leialii TIAR, Fehr & Peers)** – Through traffic in the northbound and southbound directions were approximately 11% and 21% lower than 2008 counts during the AM and PM peak hours of traffic, respectively.

- **2011: Keawe Street/Honoapiilani Highway intersection** – Through traffic in the northbound and southbound directions virtually unchanged from 2008 values. Overall north-south through traffic increased by a minimal 1.8 percent and 0.0 percent during the AM and PM peak hours, respectively.

We are aware that the widening of Honoapiilani Highway between Aholo Road and Dickenson Street was completed in January, 2011. We are also aware that the forthcoming opening of the

REPLY TO:
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OFFICES IN:
HONOLULU, HAWAII
WAILUKU, MAUI, HAWAII
HILO, HAWAII

Mr. Nolly Yagin, P.E.
Department of Public Works
Engineering Division

June 25, 2012

Keawe Street Extension and the Lahaina Bypass Phases IA and IB1 scheduled for later this year will have a dramatic impact on the flow of traffic throughout Lahaina. All of these improvements were already accounted for in our TIAR in our future projections, analysis, and recommendations.

In our professional opinion, the traffic count data provided in the TIAR remains valid given the relatively small change in traffic between 2008 and 2011.

Should you have any questions or require further information, please feel free to contact me at (808) 533-3646.

Very truly yours,

AUSTIN, TSUTSUMI & ASSOCIATES, INC.

By

MATT K. NAKAMOTO, P.E.
Transportation Engineer

MKN:mkn

cc: Mr. Clifford Mukai, Warren S. Unemori Engineering, Inc.

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APPENDIX C.

Biological Resources Survey

FLORA AND FAUNA SURVEY

FOR THE

PROPOSED KUHUA STREET EXTENSION AND IMPROVEMENTS

FROM VICINITY OF KEAWE STREET TO FRONT STREET

LAHAINA, MAUI, HAWAII

by

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April 2010

Prepared for:
PIONEER MILL COMPANY, LLC.

BIOLOGICAL RESOURCES SURVEY
PROPOSED KUHUA STREET EXTENSION
AND IMPROVEMENTS PROJECT

INTRODUCTION

The proposed Kuhua Street Extension and Improvements Project lies on a 1.5 mile long by 100 foot wide corridor in Lahaina, West Maui. The corridor is located above Honoapi'ilani Highway and extends from the Keawe Street intersection south to Front Street. This study was initiated by Ka'anapali Land Management Corporation in fulfillment of environmental requirements of the planning process.

SITE DESCRIPTION

This proposed road corridor begins on Keawe Steet, follows along the cane haul road above the old Pioneer Mill site, extends southward above the Lahaina Aquatic Center and Ballfield Complex and curves down to the Honoapi'ilani Highway at the Front Street intersection. Elevations range between 12 feet and about 45 feet above sea level. Vegetation consists of dry grasslands with scattered trees and brush. Soils are made up of Ewa Silty Clay Loam (EaA), and Wahikuli and Wainee Very Stony Silty Clays (WdB) and (WxB) which are all deep alluvial soils of lower slopes and coastal plains (Foote et al, 1972). Rainfall averages 15 inches a year with the bulk occurring during winter storms (Armstong, 1983)

BIOLOGICAL HISTORY

In pre-contact times this area would have been a dry native shrubland with a few scattered trees. A good diversity of species would have been present, but with a preponderance of grasses such as *Heteropogon, Eragrostis* and *Panicum*, shrubs such as *Dodonaea, Gouania* and *Hibiscus*, and trees such as *Erythrina* and *Reynoldsia.*

The Hawaiians had an extensive population in the Lahaina area and developed a complex irrigated agricultural system in the lower portions of this area. The area was known for its abundance of taro and breadfruit as well as a diversity of other food and fiber crops.

Sugar production began in the mid 1800s at which time the entire project area was converted to cane agriculture. Besides cane the area contained two plantation villages, Waine'e and Lunaville, as well as a reservoir, irrigation ditches and several large boulder piles. With the cessation of sugar production in the 1990s the fields were no longer irrigated and became dry and barren. The villages were closed down.

Today the land sits idle and has reverted to a dry grassland with a few remnant flowering and fruit trees where the villages were situated. Most of the plant species are non-native weeds.

SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna survey of the proposed Kuhua Street Extension and Improvements – From Vicinity of Keawe Street to Front Street which was conducted in April 2010.

The objectives of the survey were to:

1. Document what plant, bird and mammal 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. 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.

5. Note which aspects of the proposed development pose significant concerns for plants or for wildlife and recommend measures that would mitigate or avoid these problems.

BOTANICAL SURVEY REPORT

SURVEY METHODS

A walk-through botanical survey method was used to cover this 1.5 mile long by 100 foot wide corridor. A special effort was made to examine all habitat types. Notes were made on plant species, distribution and abundance as well as terrain and substrate.

DESCRIPTION OF THE VEGETATION

The vegetation along this corridor is primarily a grassland that is dominated by buffelgrass (*Cenchrus ciliaris*). Also common is the shrubby koa haole (*Leucaena leucocephala*) which is scattered throughout much of the area. A total of 66 plants species were recorded during the survey. Included in this total were 3 native species: 'uhaloa (*Waltheria indica*), 'ilima (*Sida fallax*) and 'a'ali'i (*Dodonaea viscosa*), 10 species of ornamentals planted along portions of the corridor, 4 former crop plants and 49 species of weeds that have taken over these former agricultural lands.

DISCUSSION AND RECOMMENDATIONS

The vegetation throughout the project area is dominated by non-native plants. The three native species: 'uhaloa, 'ilima, and 'a'ali'i are widespread and common throughout Hawaii and many other Pacific islands. No federally listed Threatened or Endangered native plants occur on or near the proposed highway corridor, nor were any species that are candidates for such status found. No critical habitats for any such species were identified within or near the project area.

There are no significant environmental concerns with regard to the botanical resources along this 1.5 mile long corridor. The proposed project is not expected to have a significant negative impact on the plant resources in this part of West Maui.

It is recommended, however, that some native plant species that are adapted to growing in Lahaina's hot climate be incorporated into the landscape design to lend a special accent to this project.

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 are in accordance with Wagner et al. (1999) and Staples & Herbst (2005).

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 introduction = plants introduced to Hawai'i in the course of Polynesian migrations and prior to western contact.
   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
MONOCOTS			
ARECACEAE (Palm Family)			
Washingtonia robusta H. Wendland	Mexican washingtonia	non-native	uncommon
CYPERACEAE (Sedge Family)			
Cyperus rotundus L.	nut sedge	non-native	rare
POACEAE (Grass Family)			
Cenchrus ciliaris L.	buffelgrass	non-native	abundant
Chloris barbata (L.) Sw.	swollen fingergrass	non-native	uncommon
Cynodon dactylon (L.) Pers.	Bermuda grass	non-native	rare
Eleusine indica (L.) Gaertn.	wiregrass	non-native	rare
Eragrostis amabilis (L.) Wight & Arnott	Japanese lovegrass	non-native	rare
Melinis repens (Willd.) Zizka	Natal redtop	non-native	rare
Panicum maximum Jacq.	Guinea grass	non-native	uncommon
Setaria verticillata (L.) P. Beauv.	bristly foxtail	non-native	uncommon
Urochloa mutica (Forssk.) T.Q. Nguyen	California grass	non-native	uncommon
DICOTS			
AIZOACEAE (Fig-marigold Family)			
Carpobrotus edulis (L.) L. Bolus	ice plant	non-native	rare
Trianthema portulacastrum L.	----------	non-native	rare
AMARANTHACEAE (Amaranth Family)			
Amaranthus spinosus L.	spiny amaranth	non-native	uncommon
Atriplex suberecta Verd.	saltbush	non-native	rare
ANACARDIACEAE (Mango Family)			
Mangifera indica L.	mango	non-native	rare
Schinus terebinthifolius Raddi	Christmas berry	non-native	rare
APOCYNACEAE (Dogbane Family)			
Calotropis procera (Aiton) W.T.Aiton	small crownflower	non-native	rare
Plumeria rubra L.	plumeria	non-native	rare
ASTERACEAE (Sunflower Family)			
Bidens pilosa L.	Spanish needle	non-native	rare
Lactuca sativa L.	prickly lettuce	non-native	rare
Pluchea carolinensis (Jacq.) G. Don	sourbush	non-native	uncommon
Pluchea indica (L.) Less.	Indian fleabane	non-native	rare
Tridax procumbens L.	coat buttons	non-native	uncommon
Verbesina encelioides (Cav.) Benth. & Hook.	golden crown-beard	non-native	rare
BIGNONIACEAE (Bignonia Family)			
Spathodea campanulata P. Beav.	African tulip tree	non-native	rare
CONVOLVULACEAE (Morning Glory Family)			
Ipomoea batatas (L.) Lam.	sweet potato	Polynesian	rare
Ipomoea obscura (L.) Ker-Gawl.	----------	non-native	rare
Ipomoea triloba L.	little bell	non-native	rare
Merremia aegyptia (L.) Urb.	hairy merremia	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
CUCURBITACEAE (Gourd Family)			
Cucumis dipsaceus Ehrenb. ex Spach	hedgehog gourd	non-native	rare
Momordica charantia L.	balsam pear	non-native	rare
EUPHORBIACEAE (Spurge Family)			
Chamaesyce hirta (L.) Millsp.	hairy spurge	non-native	uncommon
Chamesyce hypericifolia (L.) Millsp.	graceful spurge	non-native	rare
Euphorbia heterophylla L.	kaliko	non-native	rare
Ricinus communis L.	Castor bean	non-native	uncommon
FABACEAE (Pea Family)			
Albizia lebbeck (L.) Benth.	Siris tree	non-native	rare
Cassia x nealiae H.S. Irwin & Barneby	rainbow shower	non-native	rare
Crotalaria pallida Aiton	smooth rattlepod	non-native	uncommon
Delonix regia (W.J. Hooker) Rafinesque	poinciana	non-native	rare
Desmanthus pernambucanus (L.) Thellung	slender mimosa	non-native	uncommon
Desmodium tortuosum (Sw.) DC.	Florida beggarweed	non-native	rare
Enterolobium cyclocarpum (N.Jaquin) Griesbach	earpod	non-native	rare
Indigofera suffruticosa Mill.	inikö	non-native	rare
Lablab pupureus (L.) Sweet	päpapa bean	non-native	rare
Leucaena leucocephala (Lam.) de Wit	koa haole	non-native	common
Macroptilium atropupureum (DC.) Urb.	siratro	non-native	rare
Pithecellobium dulce (Roxb.) Benth.	opiuma	non-native	uncommon
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe	non-native	rare
Samanea saman (N. Jacquin) Merrill	monkeypod	non-native	uncommon
LAMIACEAE (Mint Family)			
Leonotis nepetifolia (L.) R.Br.	lion's ear	non-native	uncommon
MALVACEAE (Mallow Family)			
Abelmoschus esculentus (L.) Moench	okra	non-native	rare
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	non-native	rare
Malvastrum coromandelianum (L.) Garcke	false mallow	non-native	rare
Sida fallax Walp.	'ilima	indigenous	rare
Sida spinosa L.	prickly sida	non-native	rare
Waltheria indica L.	'uhaloa	indigenous	uncommon
MORINGACEAE (Drumstick Tree Family)			
Moringa oleifera Lamarck	horseradish tree	non-native	rare
MYRTACEAE (Myrtle Family)			
Eucalyptus citriodora Hook.	lemon gum	non-native	rare
Psidium guajava L.	common guava	non-native	rare
Syzygium cumini (L.) Skeels	Java plum	non-native	uncommon
NYCTAGINACEAE (Four-o'clock Family)			
Boerhavia coccinea Mill.	scarlet spiderling	non-native	rare
PASSIFLORACEAE (Passion Flower Family)			
Passiflora foetida L.	love-in-a-mist	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
SAPINDACEAE (Soapberry Family)			
Dodonaea viscosa Jacq.	'a'ali'i	indigenous	rare
SOLANACEAE (Nightshade Family)			
Nicotiana glauca R.C. Graham	tree tobacco	non-native	rare

FAUNA SURVEY REPORT

SURVEY METHODS

A walk-through survey method was conducted in conjunction with the botanical survey. All parts of the corridor 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 the area 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

Three species of mammals were recorded in the project during two site visits. Taxonomy and nomenclature follow Tomich (1986).

Domestic dog (*Canis familiaris*) – Fresh dog tracks were observed in soil along old plantation roads. Dogs wander into this area from nearby homes.

Domestic Cat (*Felis catus)* – Cat tracks were also seen in dirt roads. These cats come during evening hours to hunt for birds and rodents.

Hawaiian hoary bat, Öpe'ape'a – (*Lasiurus cinereus semotus*) – A special effort was made to look for the Hawaiian hoary bat which is a federally listed Endangered species. An evening survey was conducted using both visual and electronic techniques. When present in an area these bats are clearly visible in the glow of twilight as they forage for insects that become active during evening hours. In addition a bat detecting device (Batbox IIID) was used, set to the frequency of 28,0000 hertz at which these bats are known to echolocate. Observations were made at four locations along the corridor, one at the north end along Kahoma Stream, one mauka of Dickenson Street and two on the southern end near the ball field and near Front Street (see Figure 1).

No bat activity was detected at the first three sites. Bats however, were detected at the southernmost site mauka of Front Street. Periodic modulated echolocation "calls" indicated the presence of two or more bats working the area.

A dense grass cover prevented good visibility of other ground dwelling mammals, but a significant population of rats (*Rattus* spp.), mice (*Mus domesticus*) and mongoose (*Herpestes auropunctatus*) would also be expected. Rats and mice consume seeds, fruits and herbaceous vegetation, and mongoose prey on these rodents and birds.

BIRDS

There was good birdlife diversity in this dry area. Fourteen species of non-native birds were seen including thirteen resident species and one migratory species. Taxonomy and nomenclature follow American Ornithologists' Union (2005).

Common myna (*Acridotheres tristis*) - Many mynas, mostly in pairs, were found throughout the corridor.

Spotted dove (*Streptopelia chinensis*) – These large doves were seen frequently in trees and in flight over the corridor.

House finch (*Carpodacus mexicanus*) – Several small flocks of these finches were seen in trees and shrubs.

Japanese white-eye (*Zosterops japonicus*) – Many pairs and small groups of these small green birds were seen in trees.

Zebra dove (*Geopelia striata*) – Several small flocks of these doves were seen, especially during the evening.

Northern cardinal (*Cardinalis cardinalis*) – A number of these red cardinals were seen and heard making their loud calls, especially during the evening.

House sparrow (*Passer domesticus*) – Small flocks of these sparrows were seen in trees and around structures and equipment.

Chicken (*Gallus gallus*) – A few small families of chickens were seen scatching for bugs in litter under trees.

Red-crested cardinal (*Paroaria coronata*) – A few of these red-headed cardinals were seen in openings and calling from trees.

Northern mockingbird (*Mimus polyglottos*) – Three of these long-tailed gray birds were seen in trees.

Gray francolin (*Francolinus pondicerianus*) – A couple of these francolins were heard calling during the evening.

Kolea, pacific golden-plover (*Pluvialis fulva*) – One plover was seen landing in a field during the evening survey.

Java sparrow (*Padda oryzivora*) – One of these colorful birds was seen in a shrub on the northern end of the corridor.

Cattle egret (*Bubulcus ibis*) – A group of three of these egrets were seen during the evening flying toward a roosting area.

A few other non-native birds might be seen in this habitat but the area is unsuitable for Maui's native forest birds which now only occupy good native forests at higher elevations beyond the range of mosquitoes and the avian diseases they carry.

INSECTS

While insects in general were not recorded, they were observed and their status noted. No native insects were seen. This habitat is not suitable for most native species. One Endangered native moth, Blackburn's sphinx moth (*Manduca blackburni*), could occur in this type of habitat. Its host plants are native 'aiea species (*Nothocestrum* spp.) and non-native species of tree tobacco (*Nicotiana glauca*), tobacco (*Nicotiana tabacum*) and tomato (*Solanum lycopersicum*). Of these only a few young tree tobacco plants were found within the corridor. The four tree tobacco plants found were carefully examined and no Blackburn's sphinx moths or their larvae were detected.

DISCUSSION AND RECOMMENDATIONS

The environment within the project corridor is heavily disturbed from over 100 years of intensive agricultural activity that included plowing of the soil, cultivation, burning and harvesting in continuous cycles. Little remains of native habitats and species. No native birds or insects were found and only one native mammal was detected, the Hawaiian hoary bat.

The Hawaiian hoary bat is a federally listed Endangered species under the authority of the Endangered Species Act of 1973. This status requires special analysis and evaluation of its occurrence here.

The Hawaiian hoary bat is currently known from the six largest islands (including recent sightings from Lanai) with the largest populations on the islands of Hawaii, Maui and Kauai. Little is known of population numbers and distributions because of these bats' cryptic nocturnal life styles and high mobility. They have been detected form sea level to our highest mountain peaks and in nearly every conceivable habitat type. Their mobility allows them to move up and down mountain slopes, following temperature changes and insect population spikes with ease. That these bats were detected near sea level in Lahaina is not surprising, although the dry habitat seems less than ideal.

These bats are solitary in lifestyle (as opposed to colonial bats). They roost individually in trees, shrubs or under rock ledges in gulches, and do not necessarily roost in the same spot every day. It is thus difficult to assign distinct habitats for their protection.

It is recommended that the project manager consult the U.S. Fish and Wildlife Service on the best way to address the presence of these Endangered bats within the project corridor and provide adequate protections for them during the construction phase.

No other wildlife concerns are foreseen for this project.

ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged in descending abundance within two groups: Mammals and Birds. 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.

COMMON NAME	SCIENTIFIC NAME	STATUS	ABUNDANCE
BIRDS			
Common myna	*Acridotheres tristis*	non-native	common
Spotted dove	*Streptopelia chinensis*	non-native	uncommon
House finch	*Carpodacus mexicanus*	non-native	uncommon
Japanese white-eye	*Zosterops japonicus*	non-native	uncommon
Zebra dove	*Geopelia striata*	non-native	uncommon
Northern cardinal	*Cardinalis cardinalis*	non-native	uncommon
House sparrow	*Passer domesticus*	non-native	rare
Chicken	*Gallus gallus*	non-native	rare
Red-crested cardinal	*Paroaria coronata*	non-native	rare
Northern mockingbird	*Mimus polyglottos*	non-native	rare
Gray francolin	*Francolinus pondicerianus*	non-native	rare
Kolea, Pacific golden-plover	*Pluvialis fulva*	migratory	rare
Java sparrow	*Padda oryzivora*	non-native	rare
Cattle egret	*Bubulcus ibis*	non-native	rare
MAMMALS			
Ope'ape'a, Hawaiian hoary bat	*Lasiurus cinereus semotus*	endemic	rare
Domestic dog	*Canis familiaris*	non-native	rare
Domestic cat	*Felis catus*	non-native	rare

LEGEND

Kuhua Street Extension - Project Corridor

○ Bat Survey sites - Bats not detected

⊗ Bat Survey site - Bats detected

Figure 1 – Bat Survey

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APPENDIX D.

Archaeological Inventory Survey

Archaeological Inventory Survey for the Proposed Kuhua Street Extension and Improvement Project, Moali'i to Makila Ahupua'a Lāhainā District, Maui Island TMK: [2] 4-5-007, 009, 010: Multiple Parcels and [2] 4-6-013, 014, 015, 016: Multiple Parcels

Prepared for

County of Maui-Department of Public Works

Draft

Prepared by

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Management Summary

Reference	Archaeological Inventory Survey for the Proposed Kuhua Street Extension and Improvement Project, Moali'i to Makila Ahupua'a Lāhainā District, Maui Island TMK: [2] 4-5-007, 009, 010: Multiple Parcels and [2] 4-6-013, 014, 015, 016: Multiple Parcels (McCurdy et al. 2011)
Date	July 2012 (DRAFT)
Project Number (s)	Cultural Surveys Hawai'i Inc. CSH Job Code: LAHAINA 2
Investigation Permit Number	The fieldwork component of the archaeological inventory survey documentation was carried out under archaeological permit # 10-20 (2010) and 11-17 (2011) issued by the Hawai'i State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR), per Hawai'i Administrative Rules (HAR) Chapter 13-282.
Project Location	The project corridor begins north at the Keawe Street and extends *mauka* and parallel to the Honoapi'ilani Highway, connecting to the southeast end of Front Street, Moali'i to Makila Ahupua'a, Lāhainā District, Maui Island, TMK: [2] 4-5-007, 009, 010: Multiple Parcels and [2] 4-6-013, 014, 015, 016: Multiple Parcels (as depicted on the 75 min. USGS Lahaina Quat map).
Land Jurisdiction	Private: Pioneer Mill Co., LLC
Project Proponent	County of Maui, Department of Public Works
Agencies	State: Hawai'i Department of Land and Natural Resources/State Historic Preservation Division (DLNR/SHPD) Maui County: Department of Public Works
Project Description	On behalf of the County of Maui Department of Public Works, Cultural Surveys Hawaii, Inc. (CSH) is conducting an archaeological inventory survey for the proposed Kuhua Street extension and improvements project. As a result of growing demand for roadway capacity in and around Lahaina Town, the subject project has been proposed to improve traffic circulation for surrounding communities and reduce increasing traffic congestion. The proposed Kuhua Street extension will also serve as an alternate route in the event of emergencies or when unplanned closures of Honoapiilani Highway occur.
Project Acreage	ROW: Approximately 6.52 Hecatares (16.1 acres)
Area of Potential Effect (APE) and Survey Acreage	In order to account for areas of cut and fill, the APE covered during the inventory survey (McCurdy et al. 2011) extends out approximately 100 ft east and west from the central line of the Right-of-Way (ROW), approximately 23.5 hectares (58 acres). The entire 58 acre APE was surveyed for this study.

Historic Preservation Regulatory Context	CSH completed this archaeological inventory survey investigation to fulfills the requirements of the Hawai'i Administrative Rules (HAR) Chapter 13-13-276 and was conducted to identify, document, and make Hawaii Register of Historic Places (Hawaii Register) eligibility recommendations for the subject parcel's historic properties. The investigation includes a project-specific effect recommendation and treatment/mitigation recommendations for the parcel's historic properties that are recommended Hawai'i Register eligible. This document is intended to facilitate the proposed project's historic preservation review under Hawai'i Revised Statutes (HRS) Chapter 6E-8 and HAR Chapter 13-13-275, as well as the project's environmental review under HRS Chapter 343. It is also intended to support any project-related historic preservation consultation with stake-holding state, and county agencies and interested Native Hawaiian and community groups."
Fieldwork Effort	The fieldwork component of the archaeological inventory survey was carried out from March 26-27 2010, intermittently between May 3 and July 8 2010, and from April 12 to 19, 2011 by CSH archaeologists, Todd McCurdy, M.A., Robert Hill, B.A., Jonas K. Madeus B.A., and Katie Sprouse, B.A., under the general supervision of Hallett H. Hammatt, Ph.D. The fieldwork required approximately 420 person-hours to complete. The inventory survey included systematic pedestrian survey and subsurface testing.
Number of Historic Properties Identified	Two previously recorded historic property (SIHP 50-50-03-6473 and -6478), eight newly identified historic properties (SIHP 50-50-03-6775 to -6779 and -7101 to -7103) and two artifacts or isolated finds (CSH 3 and CSH 9) were identified. All of the newly identified sites have a total of 12 component features consisting of five plantation era water diversion structures (SIHP -6775,-6776 A-C, and -7103), three WWII utility structures (SIHP -6777 to -6779), three historic walls (SIHP -7101 A-C), a previously disturbed possible pre-contact human burial (SIHP -7102). The two isolated finds or artifacts compose of two concrete block columns or supports (CSH-3) and a concrete utility pole (CSH-9). SIHP-6473, a human burial which was exposed during previous subsurface testing associated with an inventory survey conducted by Xamanek Researches LLC between August 2006 and July 2007, was noted as being located within the present project ROW (Frey and Fredericksen 2009). However, the southern portion of the corridor was realigned to avoid this burial. Now it is 50 ft. outside of the project area.

Newly Identified Historic Properties Recommended Eligible to the Hawai'i Register of Historic Places (Hawai'i Register)

SIHP (50-50-03-)	Site Type	Function	Age	Significance Criteria
6775	Soil irrigation ditch	Water control	Plantation	D
6776 A-C	Metal pipe and concrete irrigation components	Water control	Plantation	D
6777	Historic structure	Shelter/ Storage	WWII	D
6778	Historic structure	Shelter/ Storage	WWII	D
6779	Historic structure	Shelter/ Storage	WWII	D
7101 A-C	Multiple walls	Transportation/ Property boundary	Historic	D
7102	Burial	Burial	Possible Pre-contact	D and E
7103	Ditch	Water control	Plantation	D

Historic Properties Recommended Ineligible to the Hawai'i Register

Temporary Field Number	Site Type	Function	Age	Significance Criteria
CSH 3	Concrete block columns supports	Water control	Historic	N/A
CSH 9	Concrete pole	Utility pole	Historic	N/A

Effect Recommendation	The proposed project has the potential to have negative impacts upon historic properties that are located within the study area. Negative effects could be related to storage of equipment, construction of access roads into the project area, and grubbing, grading and excavation for the proposed project. Two human burials (SIHP-5239 and -6473) were identified during previous subsurface testing associated with two archaeological inventory survey studies conducted by Xamanek Researches LLC (Fredericksen and Fredericksen 2003 and Frey and Fredericksen 2009), both of which were noted as approximately located within the overall APE of the current project corridor (Figure 21). While SIHP -5239 was not identified during the current study, SIHP-6473 was re-identified. GPS location data collected in the field during the course of this study confirmed that SIHP-6473 was within the proposed project ROW which prompted a realignment of the southern portion of the corridor (Figure 22). The proposed project ROW at the southern portion was adjusted creating a 50 ft buffer between the location of the burial and limit of the construction activity; therefore, having no direct adverse effect. Eight historic properties (SIHP Numbers 50-50-03-6775 to -6779 and -6779 and -7101 to -7103) have been documented within the area of potential effect (APE) for the proposed project. Seven out of these eight historic properties (SIHP 50-50-03-6775 to -6779, -7101 and 7103) are exclusively post-contact sites and are recommended as significant only for their information content, under Criterion D. SIHP -7102 is a previously disturbed possible pre-contact burial and it is recommended as significant under multible criteria, Criterion D and E. Cultural Surveys Hawai'i Inc. is recommending the mitigation measures presented below to address the potential adverse effects of future action on documented historic properties within the current project area.

Mitigation Recommendation	Based on the significance assessment and project effects noted above, Cultural Surveys Hawai'i, Inc. recommends no further historic preservation work for the proposed action at this time for SIHP -6775 to -6779, -7101 and -7103. The State Historic Preservation Division-Historic Architecture Branch is not required to be consulted for comments on the Quonset hut structures (SIHP -6777 to -6779) because these structures do not possess integrity of locations or settings. Cultural Surveys Hawai'i Inc. is recommending preservation and avoidance for SIHP -7102. While the current project is not anticipated to have an adverse effect on SIHP -6473, due to the distance of the burial from the proposed limits of construction, preservation and avoidance is recommended with mitigation measures in keeping with those set forth by Xamanek Researches (Frey and Fredericksen 2009). Because SIHP -5239 could not be located during the current study and the current locational information for this burial site is unclear at this time, consultation with Xamanek Researches to pinpoint and survey the location of this historic property is recommended to ensure that the proposed project will not have an adverse effect on this site. While we believe that the current inventory survey investigation has adequately recorded the information for these eight historic properties, through literature research as well as location documentation, written descriptions, photographs, plan view maps to scale, and subsurface testing, precautionary monitoring is recommended for all earthmoving activities that are scheduled to occur within the proposed project ROW. Because the current study, as well as, previous studies have identified both pre-contact and post-contact human remains in the vicinity (Fredericksen and Fredericksen 2003 and Frey and Fredericksen 2009) we believe that archaeological monitoring would be an appropropriate mitigation measure in the event that culturally sensitive subsurface cultural deposits and burials are encountered during ground altering activities associated with the proposed project.

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Section 1 Introduction

1.1 Project Background

On behalf of the County of Maui Department of Public Works, Cultural Surveys Hawai'i, Inc. (CSH) performed an archaeological inventory survey for the Kuhua Street Improvement and Extension Project, which extends for approximately 2.6 miles from Moali'i to Makila Ahupua'a, Lāhainā District, Maui Island (Figure 1 through Figure 9). As a result of growing demand for roadway capacity in and around Lahaina Town, the proposed project has been planned to improve traffic circulation for surrounding communities and reduce increasing traffic congestion. The proposed Kuhua Street extension will also serve as an alternate route in the event of emergencies or when unplanned closures of Honoapiilani Highway occur.

Located immediately east of an old and unimproved cane haul road *mauka* of the Honoapi'ilani Highway, the planned right-of-way (ROW) consists of an approximate 2.6 mile (3.53 km) long corridor to be built in accordance with Maui County standards for urban collector roads that would require width of the road corridor to be 56 ft (17.07 m) wide. The Kuhua Street extension begins north at the intersection of Keawe Street and runs *mauka* parallel to the Honoapi'ilani Highway, ending at the southeast end of Front Street (Figure 1). In addition to the extension of Kuhua Street, connector roads to Honoapi'ilani Highway at Papalaua Street, Lahainaluna Road, Dickenson Street, Shaw Street, and Aholo Road are also planned (Figure 1). The total area of the overall ROW is approximately 6.52 hectares (16.1 acres). In order to account for areas of cut and fill, the area of potential effect (APE) covered during the archaeological inventory survey extends out approximately 100 ft east and west from the road centerline. The total approximate area covered by the APE (hereafter referred to as the "current project area") consists of 23.5 hectares (58 acres) including the ROW.

The proposed road construction would include ground altering activities to include grubbing, grading, excavation and compaction of soils generally associated with construction of road. This inventory survey was prepared to support the proposed project's historic preservation review under HRS Chapter 6E-8, HAR Chapter 13-13-275, and State requirements for archaeological inventory survey [Hawai'i Administrative Rules (HAR) Chapter 13-13-276].

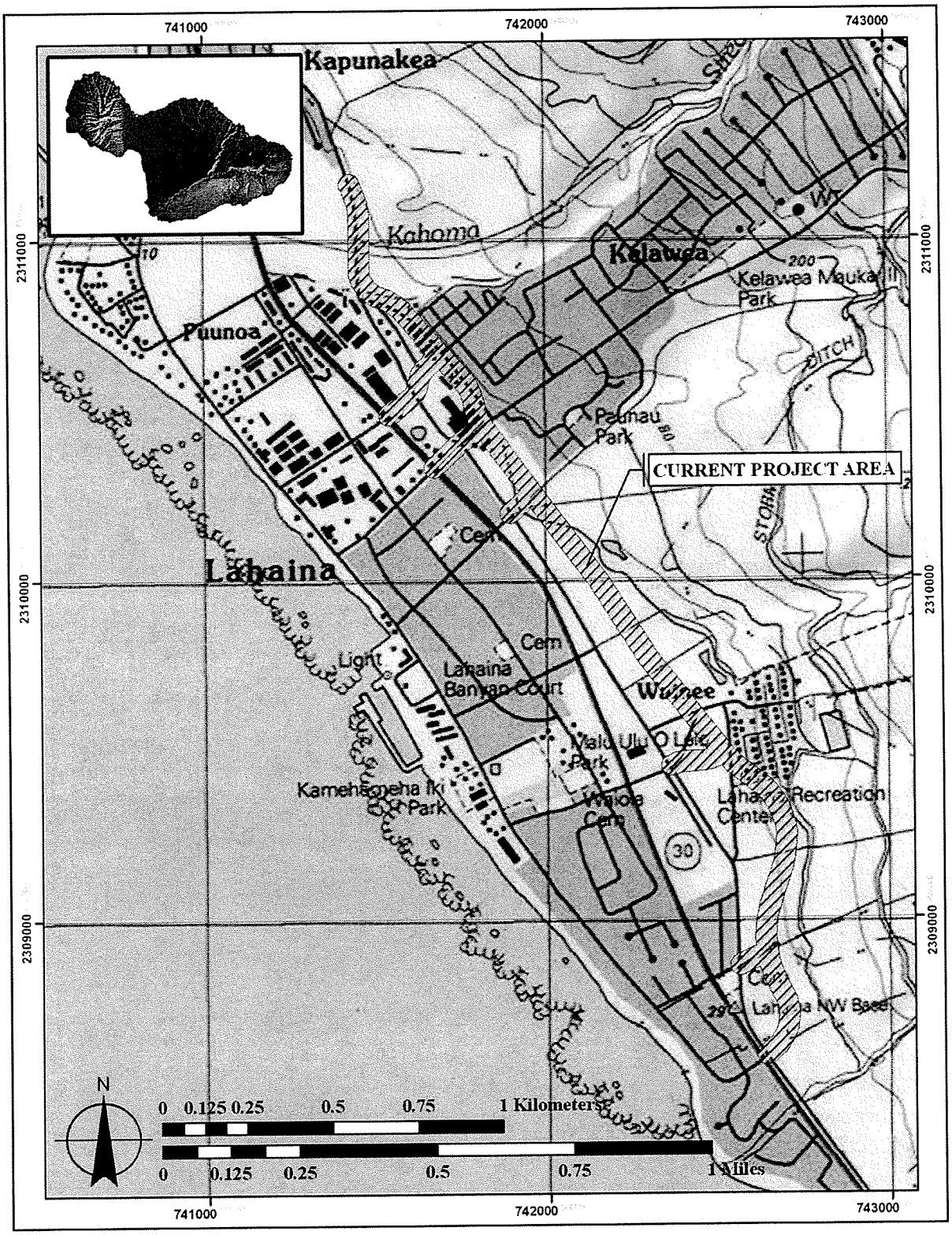

Figure 1. A portion of the USGS 7.5' topographic map, Lāhainā Quadrangle (1992) showing the Kuhua Street Improvement and Extension Project corridor in red cross-hatch.

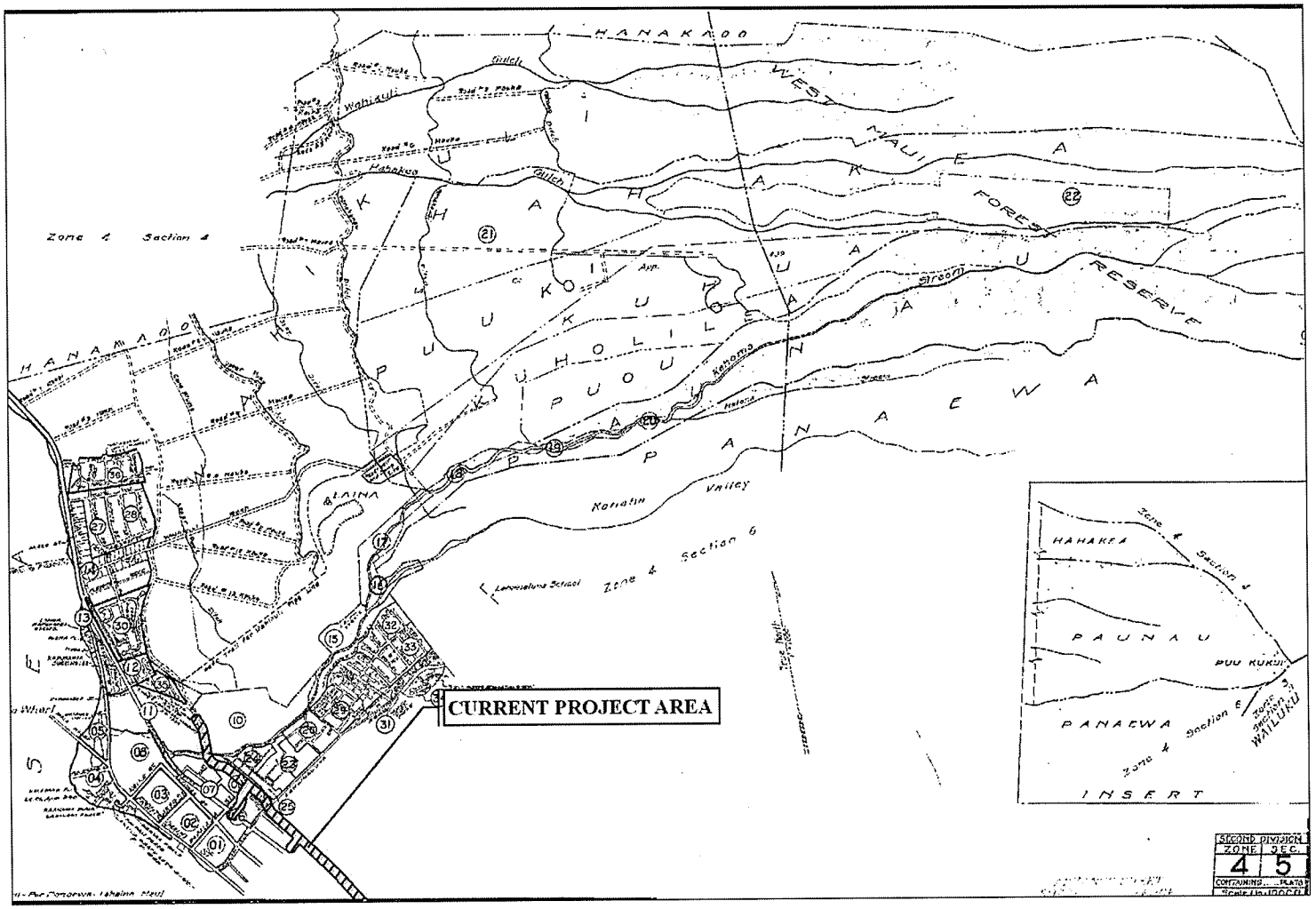

Figure 2. TMK map (2) 4-5 showing the location of the northwest portion of the project area (in red cross-hatch) in relation to other parcel of lands to the northern section of the Kuhua Street Improvement and Extension Project corridor.

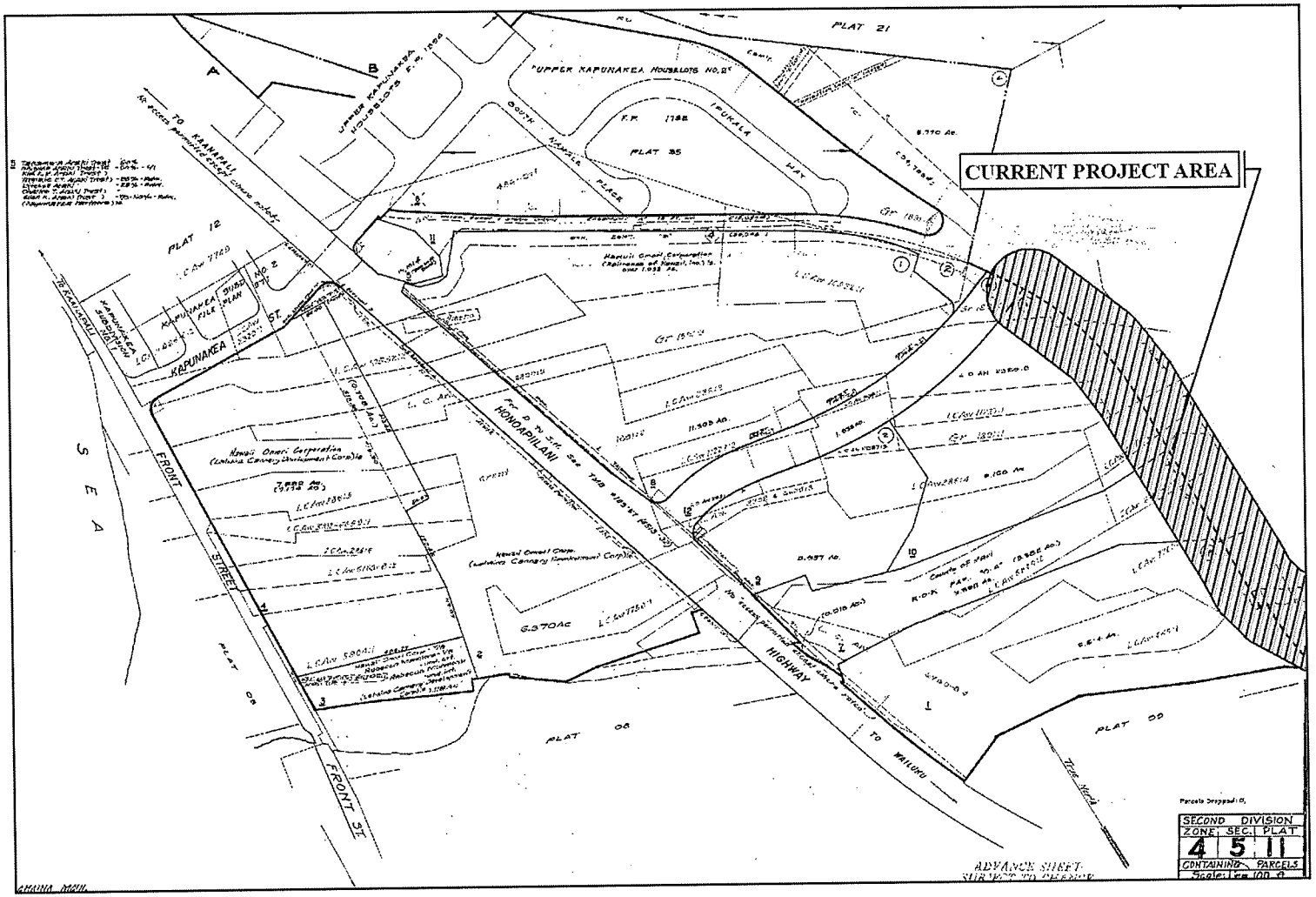

Figure 3. TMK map (2) 4-5-11 showing the location of Land Commission Awards (LCAs) along the north side of Kahoma Stream in relation to the western side of the northern section of the Kuhua Street Improvement and Extension Project corridor (red cross-hatch).

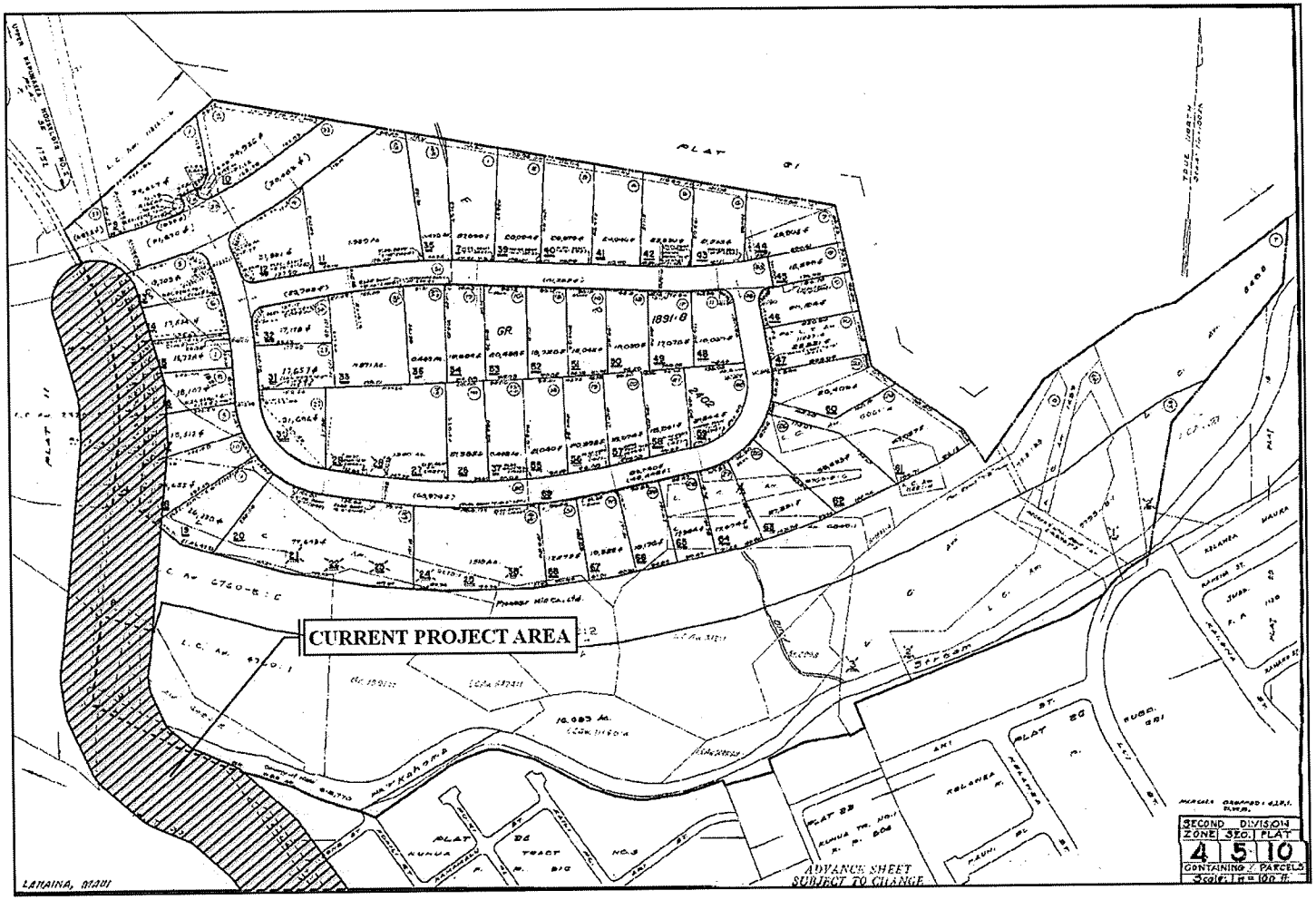

Figure 4. TMK map (2) 4-5-10 showing the location of Land Commission Awards (LCAs) the north side of Kahoma Stream in relation to the eastern side of the northern section of the Kuhua Street Improvement and Extension Project corridor (red cross-hatch).

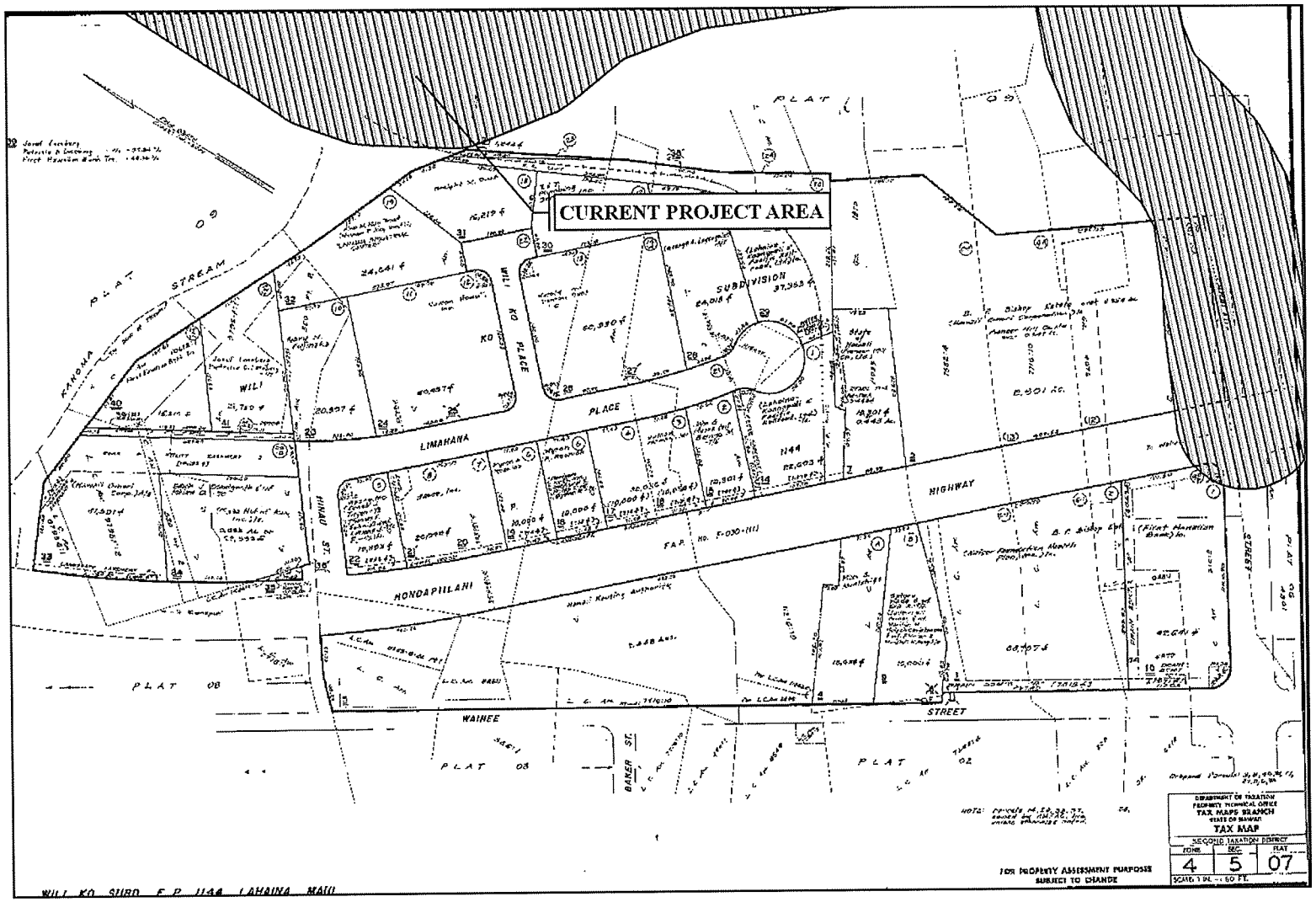

Figure 5. TMK map (2) 4-5-07 showing parcel of lands in relation to the western side of the north central section of Kuhua Street Improvement and Extension Project corridor (red cross-hatch).

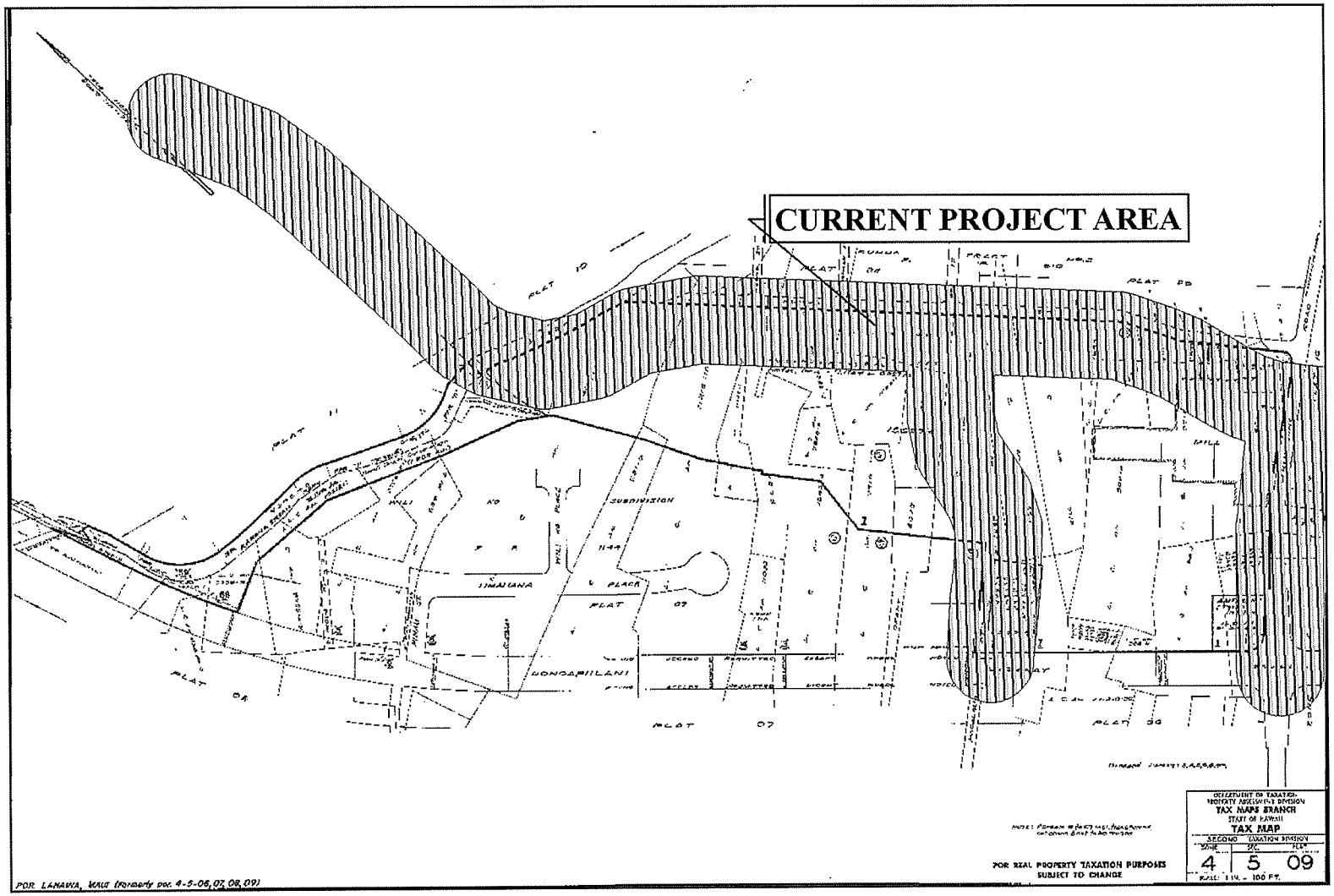

Figure 6. TMK map (2) 4-5-09 showing the northern portion of the Kuhua Street Improvement and Extension Project corridor (red cross-hatch).

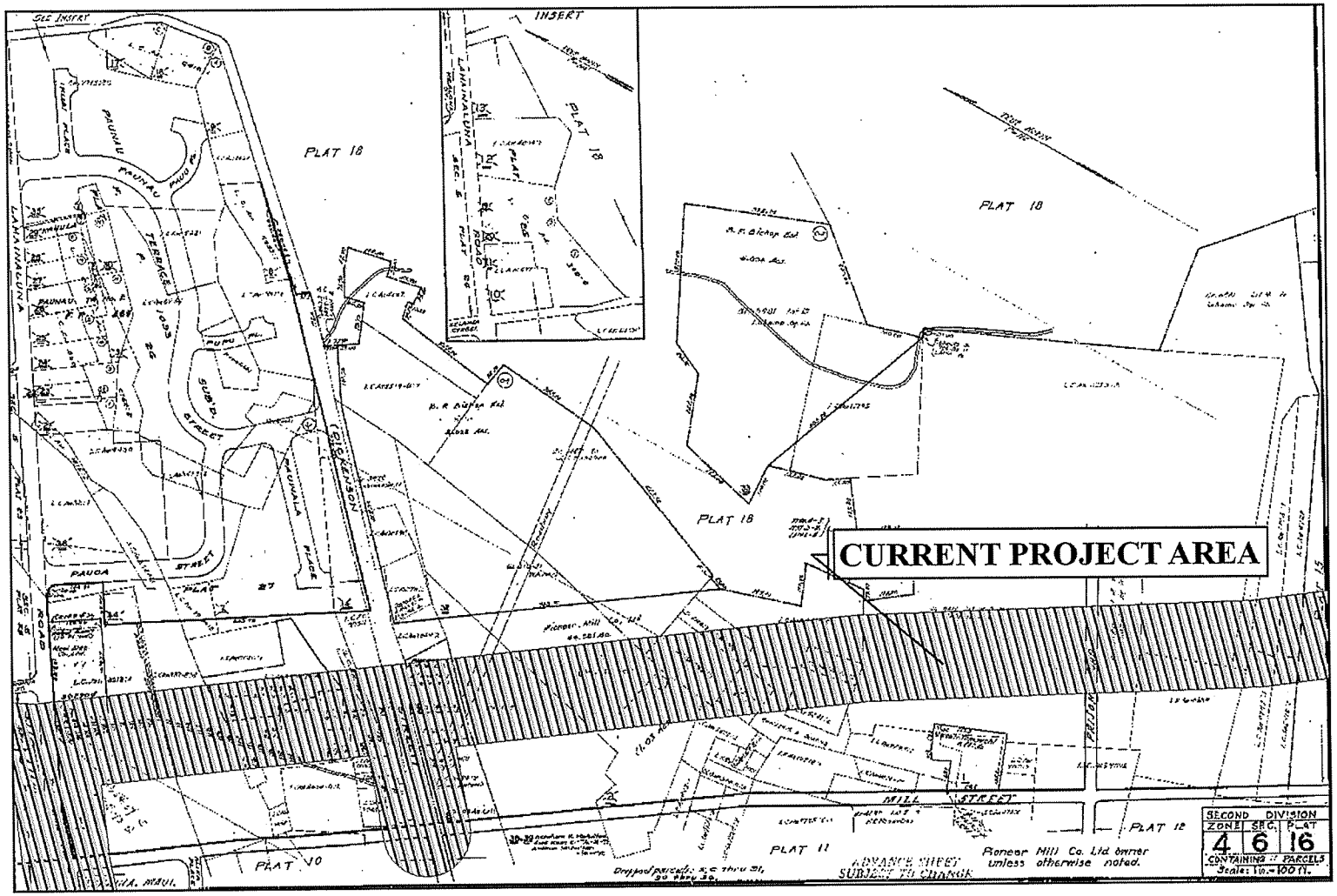

Figure 7. TMK map (2) 4-6-16 showing the central portion of the Kuhua Street Improvement and Extension Project corridor (red cross-hatch).

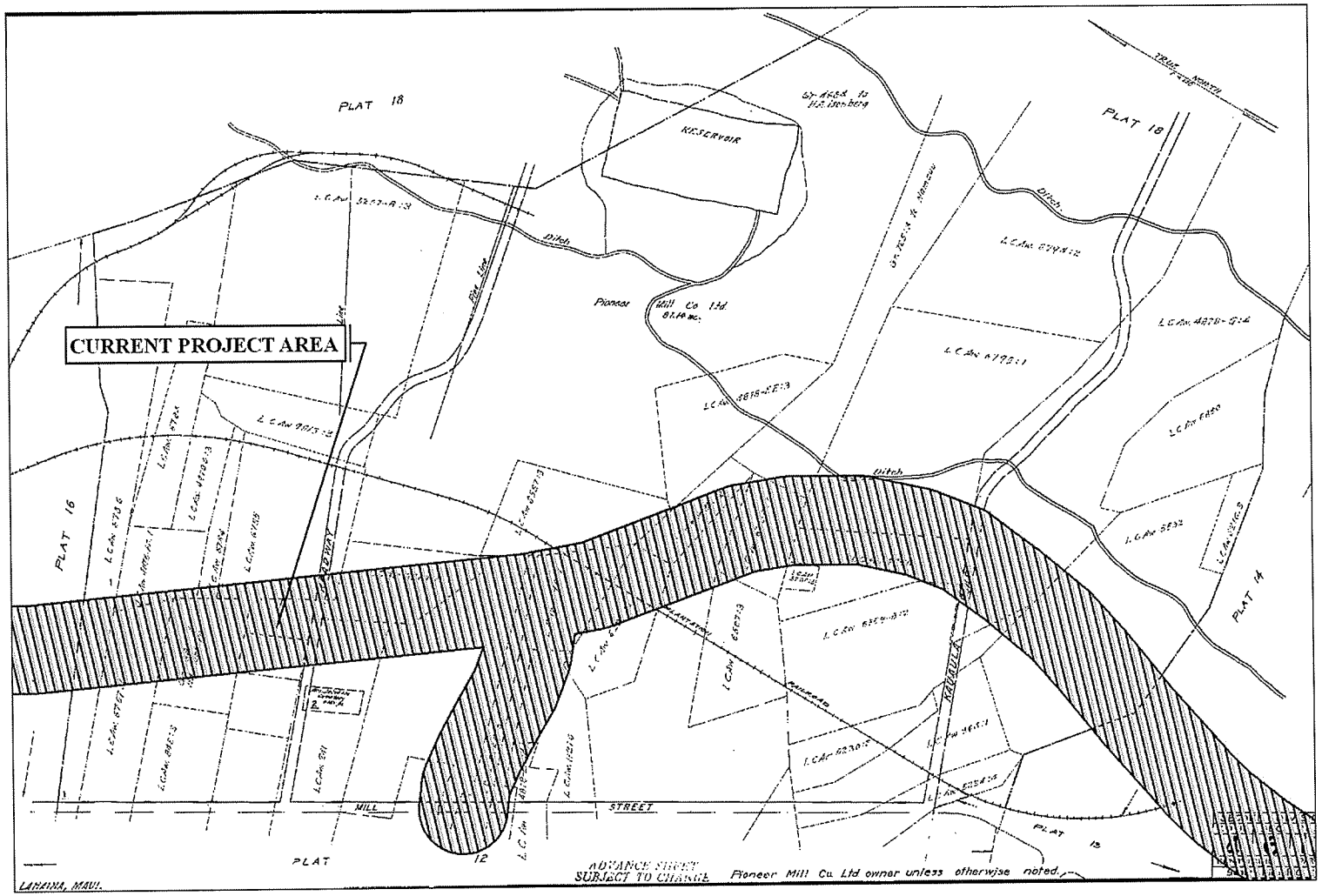

Figure 8. TMK map (2) 4-6-15 showing the south central portion of the Kuhua Street Improvement and Extension Project corridor (red cross-hatch).

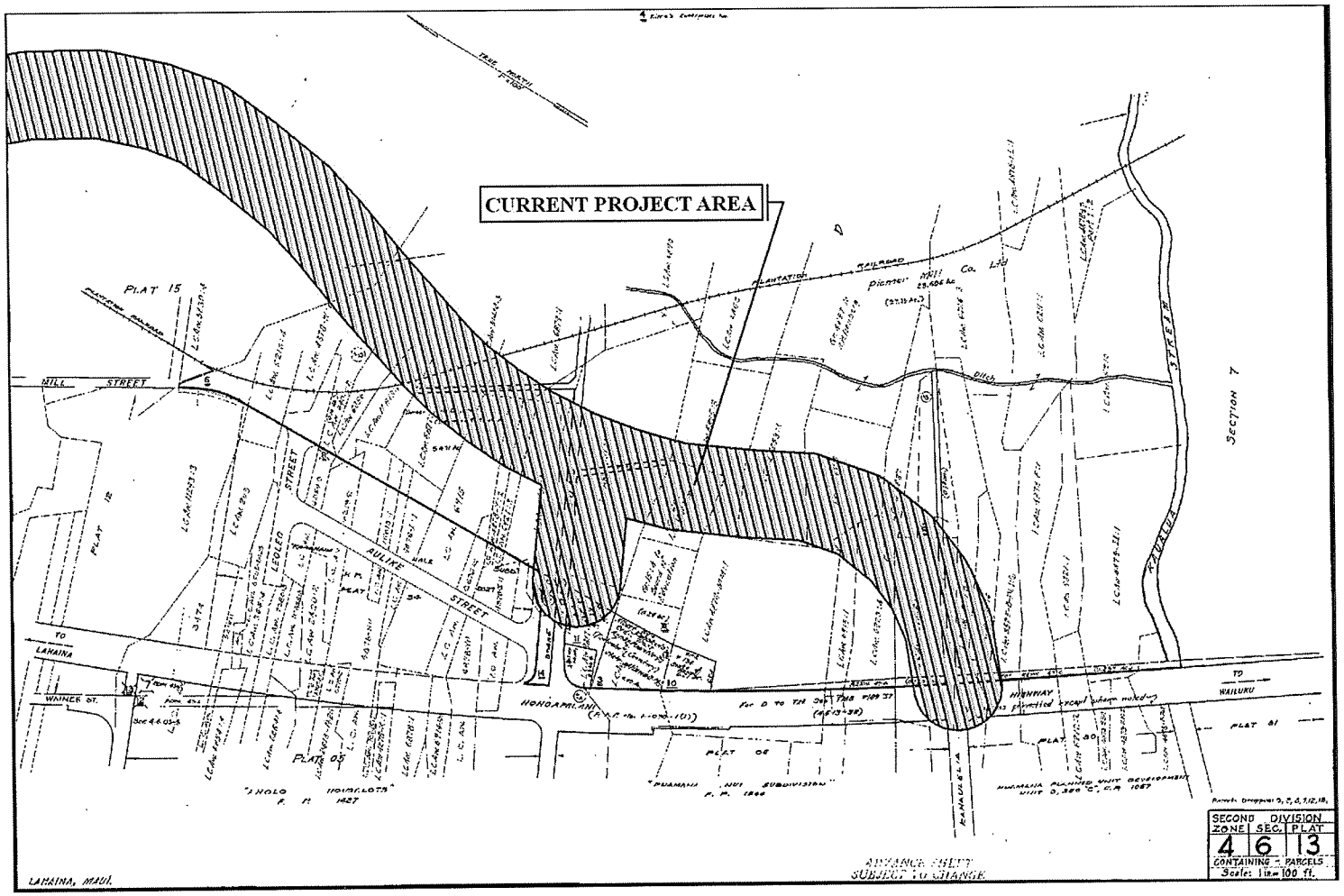

Figure 9. TMK map (2) 4-6-13 showing the southern portion of the Kuhua Street Improvement and Extension Project corridor (red cross-hatch).

1.2 Scope of Work

The following scope of work served as the guidelines for this investigation:

1) Historic and archaeological background research, including a search of historic maps, written records, documents of the *māhele 'aina*, and reports from prior archaeological investigations. This research focused on the specific project area's past land use, with general background on the pre-contact and historic settlement patterns of the *ahupua'a* and district to compile a predictive model for the types and locations of historic properties expected within the project area.

2) A complete (100 %) systematic pedestrian inspection of the project area employing to identify any potential surface historic properties. Surface historic properties were recorded with an evaluation of age, function, interrelationships, and significance. Documentation included photographs, scale drawings, and, where warranted, limited controlled excavation of select sites and/or features.

3) As appropriate, consultation with knowledgeable individuals regarding the project area's history, past land use, and the function and age of the historic properties documented within the project area.

4) As appropriate, laboratory work to process and gather relevant environmental and/or archaeological information from collected samples.

5) Preparation of an inventory survey report, which would include the following:

   a) A project description;
   b) A section of a USGS topographic map showing the project area boundaries and the location of all recorded historic properties;
   c) Historical and archaeological background sections summarizing prehistoric and historic land use of the project area and its vicinity;
   d) Descriptions of all historic properties, including selected photographs, scale drawings, and discussions of age, function, laboratory results, and significance, per the requirements of HAR 13-276. Each historic property will be assigned a Hawai'i State Inventory of Historic Properties number;
   e) If appropriate, a section concerning cultural consultations [per the requirements of HAR 13-276-5(g) and HAR 13-275/284-8(a) (2)].
   f) A summary of historic property categories, integrity, and significance based upon the Hawai'i Register of Historic Places criteria;
   g) A project effect recommendation;
   h) Treatment recommendations to mitigate the project's adverse effect on any historic properties identified in the project area that are recommended eligible to the Hawai'i Register of Historic Places.

This scope of work included full coordination with the State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR) and Maui County relating to archaeological matters. This coordination took place after consent of the owner or representatives.

1.3 Environmental Setting

1.3.1 Natural Environment

The current project corridor varies in elevation from approximately 80 ft (24 m) above mean sea level (amsl) in the northern portion to less than 20 feet (6 m) amsl in the southern portion. The distance of the project corridor from the coastline ranges between 0.7 (0.43 miles) and 0.2 km (0.12 miles).

The soils within the project corridor are generally described as being of the Pulehu-Ewa-Jaucas association (Figure 10). This soil association consists of deep, nearly level to moderately sloping, well-drained soils that have moderately fine textured subsoil on alluvial fans and in basins (Foote et al. 1972:8). More specifically, the soils within the project corridor are a combination of Ewa silty clay loam, 0 to 3% slopes (EaA); Pulehu silt loam, 0 to 3% slopes (PpA); Pulehu cobbly clay loam, 3 to 7% slopes (PtB); Wahikuli stony silty clay, 3 to 7% slopes (WdB); and Wainee Very Stony Silty Clay 3 to 7% slopes (WxB) (Foote et al. 1972: 30-145) (Figure 10). For the most part, at the time of the soil survey conducted by Foote et al. (1972) Ewa, Pulehu, Wahikuli and Wainee series soils were utilized primarily for sugarcane with small acreages used as home sites (USDA Natural Resources Conservation Service 2001).

The average reainfall on the western slope of the West Maui Mountains at this elevation is 15 inches per year (Giambelluca and Schroeder 1998 in T. L. Lee-Greig, Hill et al. 2008) with cooler temperatures and heavier rainfall occurring in the winter months and warmer temperatures and lighter rainfall occurring during the summer months. During the pre-contact era, these soils and level of rainfall would likely have supported a lowland dry and mesic forest, woodland, and shrubland. According to Pratt and Gon (1998: 127), this type of native environment would have provided medicinal plants for *la'au lapa'au* (traditional Hawaiian medicine) and hardwoods for building, tool, and carving material, as well as *pili* grass for use in thatching. Pratt and Gon (1998: 127) go on to point out that some mesic areas were cleared and converted to dryland *kalo* (taro) and *'uala* (sweet potato) agriculture (T. L. Lee-Greig, Hill et al. 2008). After years of historic and modern era sugarcane agriculture, the natural environment of the former cane lands within the current project area now consists entirely of various species of introduced grasses and plants with small stands of *'ilima* (*Sida fallax*) and *koa haole* (*Leucaena and leucocephala*) scattered throughout.

1.3.2 Built Environment

The current project corridor, approximately 3 km (1.9 miles) traverses urban industrial and residential areas as well as fallow sugar cane fields *mauka* of Lāhāina town (Figure 11). The corridor begins in the north at the intersection of Keawe St. and an unimproved road *makai* of Kupuohi St. The unimproved road currently serves as an alternate access to the base yard of the Hawaiian Dredging Construction Co. among other businesses. After crossing the Kahoma Stream the corridor veers towards the east across an open field and connects with Kuhua St, a residential area bordered on the west by various businesses in addition to the previous site of the Pioneer Mill Co. Factory (SIHP 50-50-03-4420/1598). After crossing Lahainaluna the remainder of the corridor is predominately in fallow sugarcane fields.

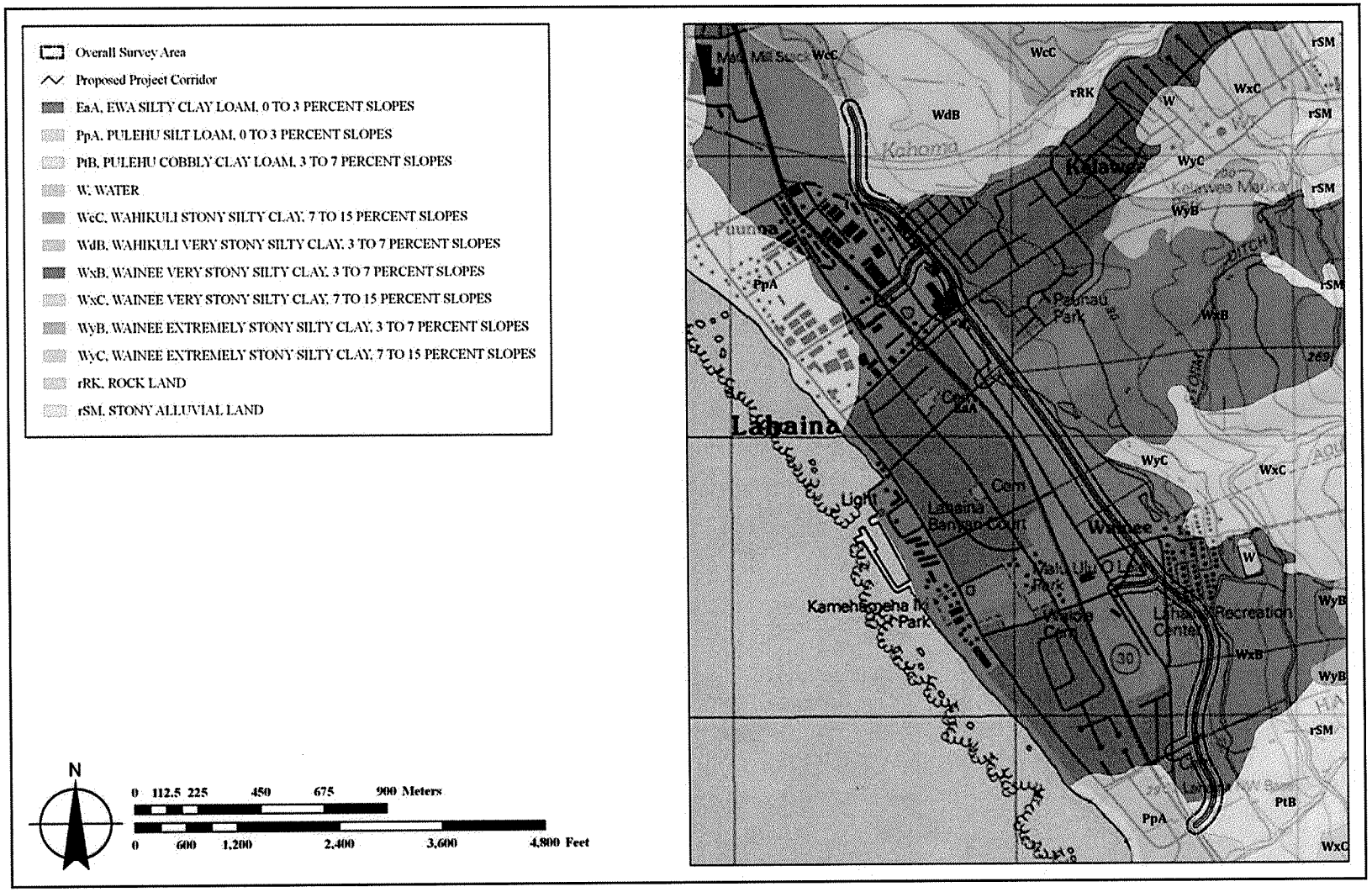

Figure 10. A portion of the 1992 Lāhainā 7.5-minute USGS topographic quadrangles, showing the Kuhua Street Improvement and Extension Project corridor (in red) relative to the local soil series.

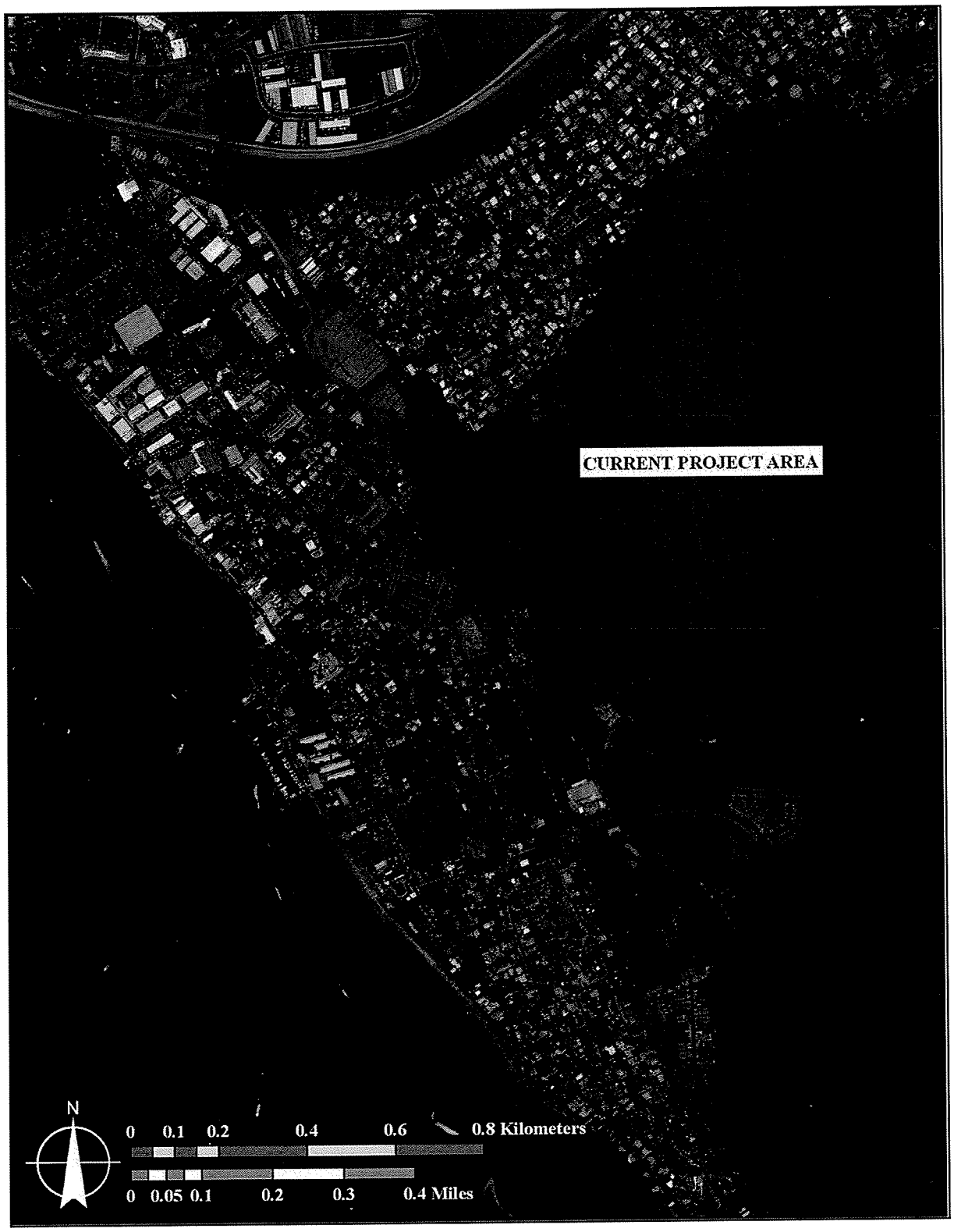

Figure 11. Aerial photo showing the environmental setting in the general area of the Kuhua Street Improvement and Extension Project corridor (red cross-hatch).

Section 2 Methods

2.1 Field Methods

The pedestrian survey component of the archaeological inventory survey was accomplished on March 26-27, 2010, by three CSH archaeologists, Todd McCurdy, M.A., Kate Sprouse, B. A. and Jonas Madeus, B.A., under the general supervision of Hallett H. Hammatt, Ph.D. The fieldwork required approximately 48 person-hours to complete. A complete (100 %) systematic pedestrian inspection of the project area was completed employing 5-10 m (16 to 32 ft) wide transects, depending on the surface visibility, to identify any potential surface historic properties. Surface historic properties, when observed, were recorded with an evaluation of age, function, interrelationships, and significance. Documentation included photographs, scale drawings using tape and compass, detailed written site descriptions and, limited controlled excavation of select sites and/or features. All potential historic properties encountered were recorded using Garmin GPS map 60 CSx (accuracy 5-7 m) and Trimble GPS Pathfinder Version 4.0. The architectural construction patterns, location, site type and subsurface testing were the factors using for site function determination. Site boundaries were determined by the extension of associated cultural material remains around each site or frature.

The subsurface testing was conducted between May 3 and July 8, 2010 by Todd McCurdy, M.A., Robert Hill, B.A., Jonas Madeus, B.A., and Kate Sprouse, B.A., under the general supervision of Hallett H. Hammatt, Ph.D. Follow up subsurface testing was conducted April 12 to 19, 2011 by Robert Hill, B.A., Jonas Madeus, B.A., and Kate Sprouse, B.A. The fieldwork required approximately 217 person-hours to complete. All trenches averaged 6 m (20ft) long by 1m wide (3ft) and were mechanically excavated to either bedrock or C Horizon soils. The soil and trench sidewalls were inspected for cultural remains during and after the excavation process. Documentation for the excavated trenches included: photographing; pinpointing trench location on project area map using Garmin GPS and Trimble GPS Pathfinder Version 4.0; scale drawing of profile wall using tape and compass technique; recordation of soil stratigraphy, with soil attributes described using Munsell soil colors and U.S. Soil Conservation Services terminology; and soil sample were collected for pollen analysis.

Potential diagnostic artifacts and subsurface features and/or cultural deposits encountered from the trenches were collected and recorded. The collected diagnostic artifacts were bagged with all appropriate provenience information and sent to the lab for analysis. The identified subsurface features and/or cultural deposits were documented using the method noted above for documenting surface historic properties.

Further investigations of identified buried A and O Horizons and/or natural deposits were conducted to gain more knowledge of these deposits. In order to gain further insight into the origin, age, function, and etc. of these deposits, a 1 x 1 m test unit was placed on top or over such deposit and excavated through it to assess the potential for cultural materials or objects within the underlying stratigraphy. Control excavation of two 1 x 1 m test units were conducted on 7/12/2010 and 3/9/2011. The manual excavation of these two test units required approximately 16 persons-hours to finish. To accomplish this, a backhoe was employed to remove majority of the disturbed and/or historic and modern strata above the cultural and/or natural deposits, and the

test units were manually excavated in arbitrary 10 cm levels and were terminated within 20 cm of the sterile layer below the cultural deposit and/or when bedrock is encountered below such deposit(s).

All excavated materials from the test units were sifted through 1/8th inch mesh hardware cloth. Recovered portable remains from these units were placed in plastic bags, labeled with the appropriate provenience information, and sent to the lab for analysis.

A previously disturbed possible pre-contact human burial and/or remains (SIHP 50-50-03-7102) was identified in the connection between the project corridor and Aholo Road, in Backhoe Trench 78. These previously disturbed human remains were exposed and identified from the mechanical testing. The back dirt from Trench 78 was sifted through 1/8th inch screen in an effort to recover any human skeletal remains that might have been removed during testing and associated artifacts that might be useful for determining the time period for this previously disturbed burial. The recovered human remains from the back dirt were placed in a plain brown paper bag and replace in the open trench with the *in situ* remains that were identified in the west wall of Trench 78. A total of four working days was required to complete the back dirt sifting. Overall, a total of 420 person-hours were required to complete the field work for this project.

2.2 Laboratory Methods

Laboratory methods involved the following specific procedures:

- Identification, cataloguing, and analysis of all artifact materials were accomplished through measurement and weight information. Artifact form, function and, in the case of historic era items, manufacturing dates were determined using reference texts with representative samples of diagnostic artifacts digitally photographed.
- All artifacts were collected during the excavation and the provenience information of each artifact was recorded. Subsequently all artifacts were identified and categorized according to type and material. Particular attention was given to those artifacts that could be dated to a certain specific time period.

2.3 Document Review

Background research included a review of previous archaeological studies and mitigation plans on file at SHPD/DLNR and a review of documents, books and maps at the Cultural Surveys Hawai'i library. Records of the *mahele 'aina* were researched using the Waihona 'Āina online database and previous reports. Additionally, documents, books and maps were consulted at the Maui Historical Society, Wailuku Public Library, and other private collections. Other sources such as the World Wide Web were utilized when necessary.

Section 3 Background Research

The following section contains summarizes of the rich traditional historic background associated with the District of Lāhainā. In addition, this section details the previous archaeological investigations within and adjacent to the current project corridor. It concludes with a background summary and predictive model.

3.1 Traditional and Historical Background

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 twelve districts or *moku* during traditional times: Kula, Honua'ula, Kahikinui, Kaupō, Kīpahulu, Hāna, Ko'olau, Hāmākua Loa, Hāmākua Poko, Wailuku, Ka'anapali, and Lāhainā (Figure 12). The current project area, comprised of circa 58 acres (approximately 23.5 hectare), is located on the leeward flank of Mauna o E'eka, in the *moku* of Lāhainā, from Moali'i to Makila Ahupua'a.

Due to the unique *ahupua'a* system of Lahaina which contains small *lele* like *ahupua'a*, the proposed roadway will pass through 31 of these *lele*. They include; Aki, Aupokopoko, Panaewa, Kopili, Paeohi, Kuhua, Paunau, Makila, Pulehulehunui, Halakaa, Planui, Kooka, Puaanui, Wainee (Waineenui), Puako, Waianae, Haleu, Kaulalo, Pulehulehuiki, Puunauiki, Puunau, Polaiki, Kamani, Puaaiki (Puaa), Kulahuhu, Puuhoowale, Kapewakua, Opaeula, Uhao, Aupokopoko, Moalii, and Kuholilea

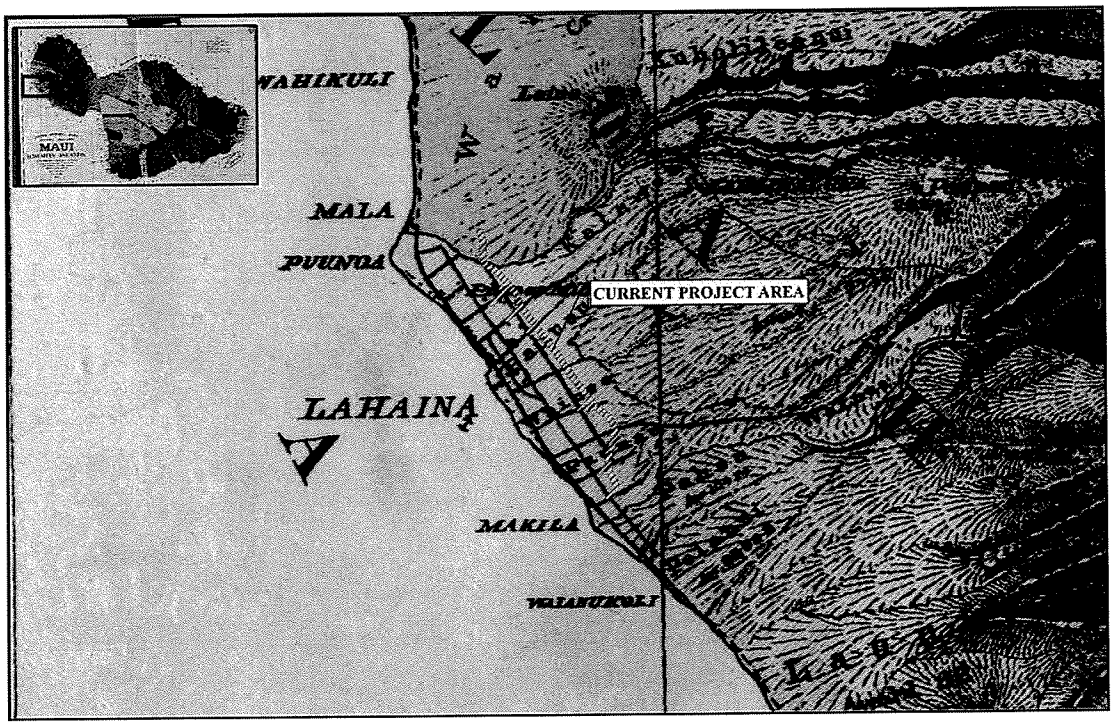

Figure 12. A portion of the F.S Dodge map (1885) showing the project area in relation to the traditional *moku* of Lahaina (crown lands in yellow, government lands in green).

3.1.1 Mythological and Traditional Accounts

The name Lāhainā traditionally refers to the "cruel sun", possibly associated with the drought that has impacted the surrounding area from time to time (Pukui et al. 1974:127). Rich in traditional accounts, Lahaina is associated with the god Kaka'alaeno, who lived in the present Lāhainā district and the goddess Hina, mother of the demigod Maui among others. In regard to Kaka'alaeno, Beckwith (1970) explains:

> Many legends mention the name of Kakaalaneo ([alternate spellings] Kukaalaneo, Kaalaneo), who lived in the present Lahaina district on the hill Keka'a (Black Rock of Sheraton Maui). He also owned fishponds in the Hana district on the opposite end of the island and planted a famous breadfruit grove in Lahaina. His wife was the Molokai chiefess whom Eleio found for him and who brought him the first feather cape ever seen on Maui, and by whom he had the mischievous son Kaululaau who killed off the spirits on Lanai. In his day Lahaina was called Lele.
>
> According to tradition, a group of strangers (*haole*) who later played an active part in court life and whose names (according to Kamakau), kept in memory as late as Captain Cook's day, arrived on Maui in Kakaalaneo's time. Kukanaloa and Kaekae (also Kakae) were the leaders of this group. The "last allusion" in this legend is a pun about chief Lolae of Oahu who abducted the pretty chiefess of Maui, Kelea (sister of Pi'ilani's father), while she was out surfing and carried her away to Oahu in the uplands of Lihue (now Schofield Barracks). She later deserted him for his cousin Kalamakua of Ewa (and Waikiki), by whom she became mother of the high chiefess Laie-lohelohe (the drooping pandanus vine), who became the wife of her Maui cousin Pi'ilani. All these names appear in the chant linked with the coming of Ku-kanaloa, together with the names of a wife and son of Kakaalaneo (Beckwith 1970:384-385).

In W.D. Westervelt's account of "Hina the mother of Maui" (1910), he presents stories of Hina as the mother of Maui, residing in the West Maui Mountains:

> A version of the Maui stories is met with representing him as the son of Hina-lauae and Hina, residing above Lahainaluna, Maui, which relate his venturing forth on mischievous pranks before birth.
>
> Reference is made to his snaring the sun that Hina might have time to dry her kapas. It says, further, that while absent on his duty Hina bore another son, an owl, which he did not treat with contempt. Setting out one day pole-fishing, Maui was to be placed on the altar the following day as a sacrifice by the king. Hina saw in a vision what was being done so she and the owl followed along, Hina staying at a rock by the wayside. The owl flew on to where Maui was guarded and saw that he was tied with cords. The guards were awake, so the owl waited till near dawn, but they would not sleep.
>
> Maui then spoke: "O thou Aina, retard and prolong the night." The night being prolonged, the guards fell asleep, whereupon the owl entered and struck at Maui's bonds till they fell off. They then set off to where Hina was waiting, by which time it was daylight. Hiding Maui under the stone, Hina sat outside of him and spread out

her sleeping garment and looked for fleas as the searching party came up. To their inquiry for the man which was to be sacrificed by the chief, she said that she had not seen him, having just now arisen, and by the warmth of the sun was looking for fleas. At their departure the owl led Maui forth, and Hina followed till they reached home. Thus was Maui saved (Westervelt 1910).

At least two notable *'auwai* (irrigation channels), that span multiple *ahupua'a* between Kaua'ula and Kahoma, are described in native lore. Roughly datable by the chiefs associated with them, the earliest, in the Lahainaluna vicinity, known as 'Auwaiawao, is reportedly named for the Chiefess Wao, sister of Kaululä'au, who ruled a portion of Maui in ca. 1390. Portions of this *'auwai* were subsequently incorporated into the construction of the Lahainaluna Ditch. The second *'auwai*, known as 'Auwai o Pi'ilani, is associated with Pi'ilani, who ruled Maui and the neighboring islands in ca. 1450. The 'Auwai o Pi'ilani has its headwaters in the Kaua'ula Stream and irrigated lands along both sides, with waterways extending to lands below Lahainaluna, Maly and Maly (2007:4).

In regard to subsistence in Lahaina, Handy and others note that the main taro lands of Lahaina were watered by two large streams, the Kahoma Stream (which the project area crosses) and Kanaha Stream (a tributary to the Kahoma Stream) which run far back into the valleys (Handy et al. 1991:492). Early descriptions indicate that both dry-land (*kula*) and pond-field (*lo'i*) methods of cultivation, were equally employed in the Lāhainā area (Handy et al. 1991:492-493 in Lee-Greig et al. 2008:21).

The valley floors and low-lying coastal plain provided a good environment and ample water for agricultural crops, the coastal reefs, off-shore waters, and inland ponds were rich in aquatic resources (E.S.C Handy in Sterling 1998). The inland ponds or *loko* of Aimakalepo, Unahiole, and 'Alamihi near the mouth of Kahoma, and the famed royal fishpond of Mokuhinia at Waine'e likely provided a reliable fish resource that was likely supplemented by off-shore communal or family fishing. As a part of Winslow Walker's 1930 island-wide survey of Maui Island, a *kama'aina* of Lāhainā, J.K. Napaepae noted that the pond at Māla , Alanuhi (Alamihi?) was primarily for mullet (Walker 1931:299.)

Daniel Kahā'ulelio (2006:9) notes a particular fishing ground, Kapuali'ili'i, for *lau* fishing that extended from Keawaiki (present day Lāhainā harbor) to 'Uha'ilio Pt., about ¾ of a mile along the Lāhainā shore. In this manner of communal fishing smaller fish and *kakakī* (a type of *kala* or unicorn fish) were the primary catches. The shoreline of Lāhainā is again singled out for *kala kū* fishing where (Kahā'ulelio 2006:17) notes that this type of fish would feed on the *limu kala* found in the shallow waters and, when seen by fishermen, were quickly surrounded with two or three finger mesh nets. Other types of fish and marine resources often sought in the waters off of Lāhainā include *mahimahi*, *aku*, *iheihei*, *puhiki'i*, *he'e*, *weke*, *akule*, and many others (Kahā'ulelio 2006).

3.1.2 Early Historic Period

The *kalana* of Lāhainā was a favored place of residence for the high chiefs of Maui. The entire *moku,* or traditional district of Lāhainā, could boast of a mild climate all year round, plentiful marine and terrestrial resources, and close proximity to Lana'i and Moloka'i. Lāhainā was the primary seat of the *ali'i* of West Maui (Handy et al. 1991:272). Subsequently, Lāhainā

served as the center of government for the Kingdom of Hawaii as it was centrally located between O'ahu and Hawai'i.

The importance of Lāhainā lands and resources is also reflected in the political and warfare history of the area. During battles fought between Ka-uhi of Maui and Alapa'i of Hawai'i, the Hawai'i Island warriors attacked the food resources of Lāhainā by drying up the streams of Kaua'ula, Kanaha, and Kahoma, and laying waste to the *lo'i* fields and brooks. This action by Alapa'i effectively severed food and freshwater resources from the Maui forces and country people (Kamakau 1992:74).

The "Olowalu Massacre," one of the more infamous events immediately following European contact reveals how conflicts between early western traders and native Hawaiians were easily provoked as western goods became the focus of Hawaiian needs. On February 1790, the Eleanora arrived from Liverpool, England captained by Simon Metcalfe, and anchored off of Honua'ula. Kalola, the widow of Kalaniopu'u, was residing at Honua'ula at the time of the arrival of the ship with her new husband Ka'opuiki when the following events occurred:

> ... Ka-'opu-iki was glad to go on board to trade for iron, muskets, and red cloth; but muskets were the objects he most desire. The people brought in exchange hogs, chickens, potatoes, bananas, and taro. Night fell before they had finished their bargaining, and the next day Ka-'opu-iki and others went out again to trade further; but the strangers were unfriendly and beat them off with ropes. When Ka-'opu-iki heard from the people of Honua'ula about the small boat which it was customary to keep tied to the back of the ship, he determined to steal the boat at night. At midnight when the guard on the skiff and the men of the ship were sound asleep, Ka-'opu-iki and his men cut the rope without being seen from the ship. As they were towing it along, the guard awoke and called out to those on board the ship, but he was too far away to be heard; he was killed and his body thrown into the sea. The boat was taken to Olowalu and broken up, and the iron taken for fishhooks, adzes, drills, daggers, and spear points.
>
> The next morning when the men on the ship awoke and found both skiff and watchman missing and realized that the boat had been stolen and the watchman killed, they shot off the cannon upon Honua'ula and killed some men, among them a peddler from Wailuku, named Ke-aloha, who had come to Honua'ula to peddle his wares. Two men were held on board the ship, one from Honua'ula and one from Olowalu, perhaps because these men had given information about the theft or perhaps because the foreigners suspected that Ka-'opu-iki and the others ... said they were from Olowalu, were responsible for the theft. That evening they sailed to Olowalu, and in the morning Ka-lola declared a tabu restricting canoes from going out to the ship on pain of being burned to death of they disobeyed. "Withered grass" (Mau'uae) was the name of this law...on the fourth the tabu was ended, and canoes in great numbers went out to trade with the foreigners ... Little did they suspect the terrible carnage that was to follow, a carnage without any effort to apprehend and punish the offenders or any pity for the innocent. So these Christians murdered the Hawaiian people without any more mercy than cannibal

> Nukuhivans show, or people of pagan lands. ... At noon that day the *Eleanor* sailed, and the people went out and brought the dead shore ... and the dead were heaped on the sands at Olowalu. Because the brains of many were oozing out where they had been shot in the head, this battle with the ship *Eleanor* and her captain was called "The spilled brains" (Kalolopahu). It was a sickening sight ... (Kamakau 1992:145-146)

The arrival of the Eleanora plays significantly into the history of Hawai'i not only for the atrocity that was the Olowalu Massacre, but for the shipboard presence of John Young, the boatswain of the Eleanor (Alexander 1889) who, along with Isaac Davis, would become a favorite of Kamehameha I and instrumental as leaders in the wars of unification which would bring all of the islands under a single ruler. This push for unity would shift the traditional sociopolitical system from a Chiefdom hierarchy to a Kingdom under the Kamehameha line and make way for rapid changes in the islands.

The nineteenth century brought to Lāhainā and other portions of the present study area a multitude of commercial, social and religious changes that were encouraged by the burgeoning foreign influx. In 1819 the first whaling ships arrived in Hawaiian waters and Lāhainā became one of the primary harbors for provisioning ships in the islands. The whaling trade flourished until the 1860's and gave impetus to the development and growing population of Lāhainā. Between 1824 and 1861, 4747 whale ship arrivals were recorded for Lāhainā, representing 47 percent of the total arrivals in all ports of the Hawaiian Islands. Figures from an 1846 census of Lāhainā document the following changes brought to the area midway through the nineteenth century: 3,445 Hawaiians, 112 foreigners, 600 seamen, 155 adobe houses, 822 grass houses, 59 straw and wooden houses, and 529 dogs. With an increasing population of foreigners entering Lāhainā, there was a need to increase the traditional agricultural surplus, primarily under the control of the *ali'i* class, for economic trade.

The first Protestant missionaries and their families arrived in Lāhainā in 1823. The missionary William Ellis, who visited Lāhainā during the 1820's, described the landscape that had entranced both the Hawaiians themselves and the nineteenth century newcomers:

> The appearance of Lāhainā from the anchorage is singularly romantic and beautiful. A fine sandy beach stretches along the margin of the sea, lined for a considerable distance with houses and adorned with shady clumps of kou-trees, or waving groves of cocoa-nuts. . .The level land of the whole district, for about three miles, is one continued garden, laid out in beds of taro, potatoes, yams, sugar-cane, or cloth-plants. The lowly cottage of the farmer is seen peeping through the leaves of the luxuriant plantain and banana tree, and in every direction white columns of smoke ascend, curling up among the wide-spreading branches of the bread-fruit tree. The sloping hills immediately behind, and the lofty mountains in the interior, clothed with verdure to their very summits, intersected by deep and dark ravines, frequently enlivened by waterfalls, or divided by winding valleys, terminate the delightful prospect. (Ellis 1969:76-77)

After the consolidation of the rulership of the Hawaiian Islands by Kamehameha I early in the nineteenth century, Lāhainā became the "capital" of the kingdom until the 1840's when the

government moved to Honolulu. The sugar cane Ellis observed in the environs of Lāhainā in the 1820's would become the basis for a commercial venture that would reshape the landscape within much of the present study area during the second half of the nineteenth century.

3.1.3 Mid- to late-1800s

With the unification of the Hawaiian Islands in 1791 and the arrival of the first Missionaries in 1820, western commerce and the Christianization of the Native Hawaiian people swept across Lāhainā. The lands surrounding Lāhainā town were cultivated in commercial sugar (Gilmore 1936:198-203), while the whale trade and the establishment of the Lahaina Mission Station and Lahainaluna High School, drew people to the waterfront areas as well as the town itself, ultimately resulting in a population rise (A. E. Haun and D. Henry 2001:12). This trend made Lāhainā one of the main religious and educational centers for the entire island chain (Kamakau 1992:304).

Government censuses during the second half of the 19th century document the diminishing population of West Maui and the Lāhainā District. In 1853 4,833 persons were recorded as living in the Lahaina District. Twenty-five years later, in 1878, the total district population had dropped to 2,448; by 1896, it was 2,398 (Schmitt 1977:12-13).

The whaling industry in the Pacific Ocean reached its peak in 1859. Prices for whale oil collapsed five years later. Since the 1840's, the Hawaiian economy had been dependent primarily on supplying whale ships during their long layovers in the islands. With the dwindling number of ships arriving during the 1860's, the population of Lāhainā Town and neighboring West Maui *ahupua'a* dependent on the prosperity of Lāhainā migrated to other parts of Maui and to other islands.

As the Hawaiian population of West Maui declined during the 19th century, missionaries and entrepreneurs moved into the district, reshaping the landscape for western enterprises and pursuits. Reverend Dwight Baldwin (1798-1886) had arrived in the Hawaiian Islands in 1831 and was stationed at Lāhainā between 1835 and 1870. During the early 1850's, Baldwin had been granted 2,675 acres of land in northwest Maui. This land holding would be the basis for enterprises expanding over areas of West Maui undertaken by his son, Henry Perrine Baldwin, during subsequent decades of the 19th century.

3.1.3.1 Great Mahele

The most significant change in land-use patterns and land allocation came with The Great Māhele and the privatization of land in Hawai'i. The 1839 establishment by Kamehameha III (Kauikeaouli) of a Bill of Rights for the people of Hawai'i, followed by a formal constitution in 1840, hastened the shift of the Hawaiian economy from that of a subsistence-based economy to that of a market-based economy. During the Māhele, all of the lands in the Kingdom of Hawai'i were divided between *mō'ī* (king), *ali'i* and *konohiki* (overseer of an *ahupua'a*), and *maka'āinana* (tenants of the land) and passed into the Western land tenure model of private ownership. On March 8, 1848, Kauikeaouli further divided his personal holdings into lands he would retain as private holdings and parcels he would give to the government. This act paved the way for government land sales to foreigners, and in 1850 the legislature granted resident aliens the right to acquire fee simple land rights (Moffat and Fitzpatrick 1995:41-51).

The *maka'ainana* were offered fee-simple titles for their house lots and lands which they cultivated for themselves. *Kuleana* awards for individual parcels within the *ahupua'a* were subsequently granted through a land commission. These awards were first presented to Native Hawaiian tenants followed by the naturalized foreigners (non-Hawaiians born in the islands) or long-term resident foreigners who could prove occupancy on the parcels before 1845.

Land Commission Awards (LCAs) were granted by ministers representing the Kingdom of Hawaii's Department of the Interior. Native testimony to establish title to real property was recorded by Native Register - wherein claimants would provide traditional proof of ownership - and in like manner foreign testimony by Foreign Register - wherein boundary survey evidence would support traditional claims.

Of the *kuleana* awarded in the Lāhainā District, most land claims were concentrated in the stream valleys along Ukumehame, Olowalu, and Kaua'ula Stream and scattered throughout the alluvial plains and coastline associated with these streams. The primary uses of the land claims in the upper environs were for agricultural with some used as house lots while the land claims in the coastal regions consisted primarily of house sites with home gardens. Figure 13 reflects this general pattern of *kuleana* claims (see also Figure 13 through Figure 17).

There are a total of 64 Land Commission Awards (LCAs) within and/or adjacent to the current project area corridor. Thirty eight out of the 64 LCAs were awarded for agricultural lots and the remaining 26 were awarded for both house lots and small home gardening lots. In addition, a total of six Grant Awards are also within and/or adjacent to the project corridor. Summarized in Table 1 and Table 2, the complete testimony as presented by Waihona 'Aina (2000) is available in Appendix A-1 and Appendix A-2.

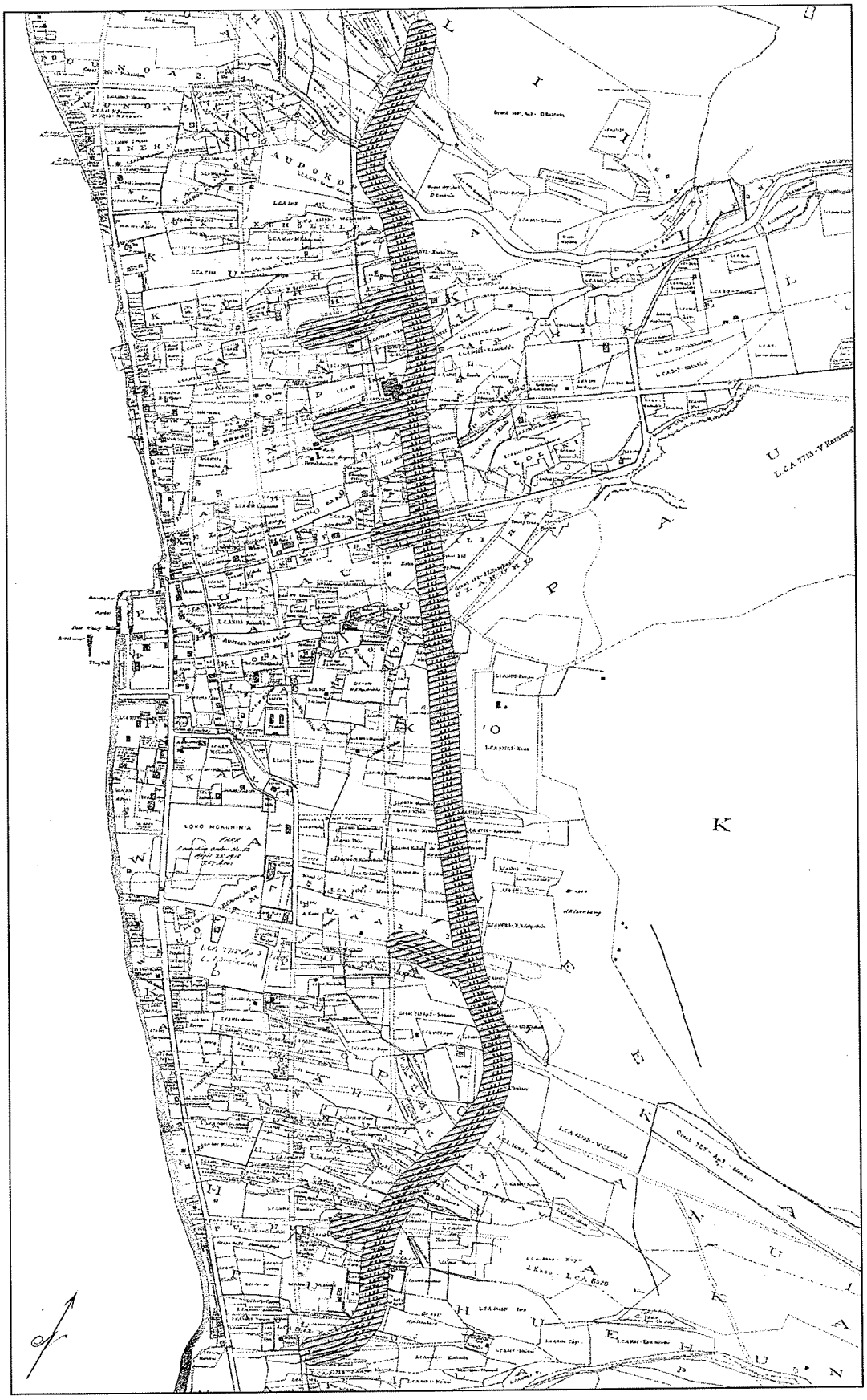

Figure 13. A portion of the 1884 S.E. Bishop map showing the location of Land Commission Awards (LCAs) in relation to the current project corridor in red cross-hatch (adapted from Bishop 1884).

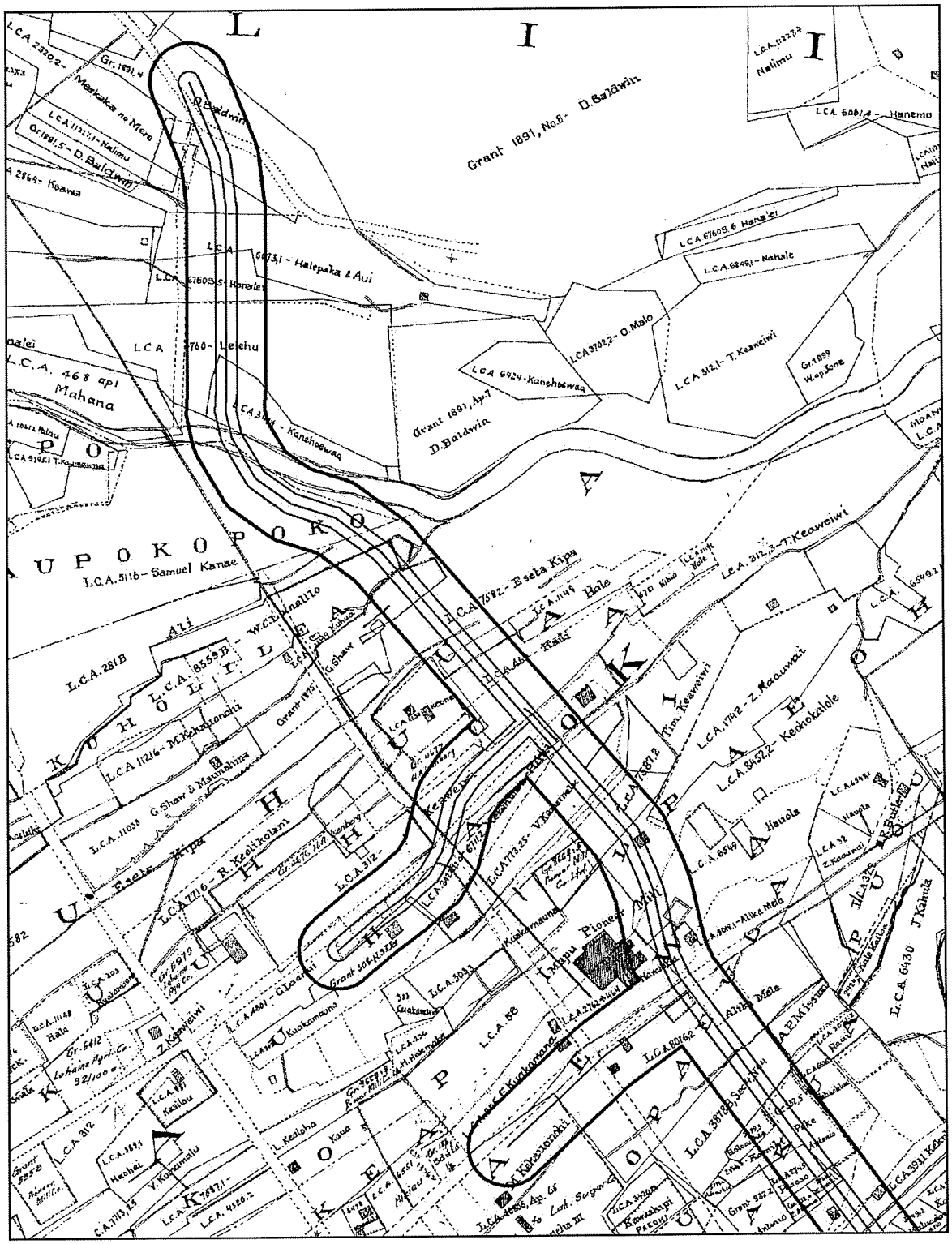

Figure 14 A close-up section of the 1884 S.E. Bishop map showing the concentration of Land Commission Awards (LCAs) within and adjacent to the northern portion of the project corridor (adapted from Bishop 1884).

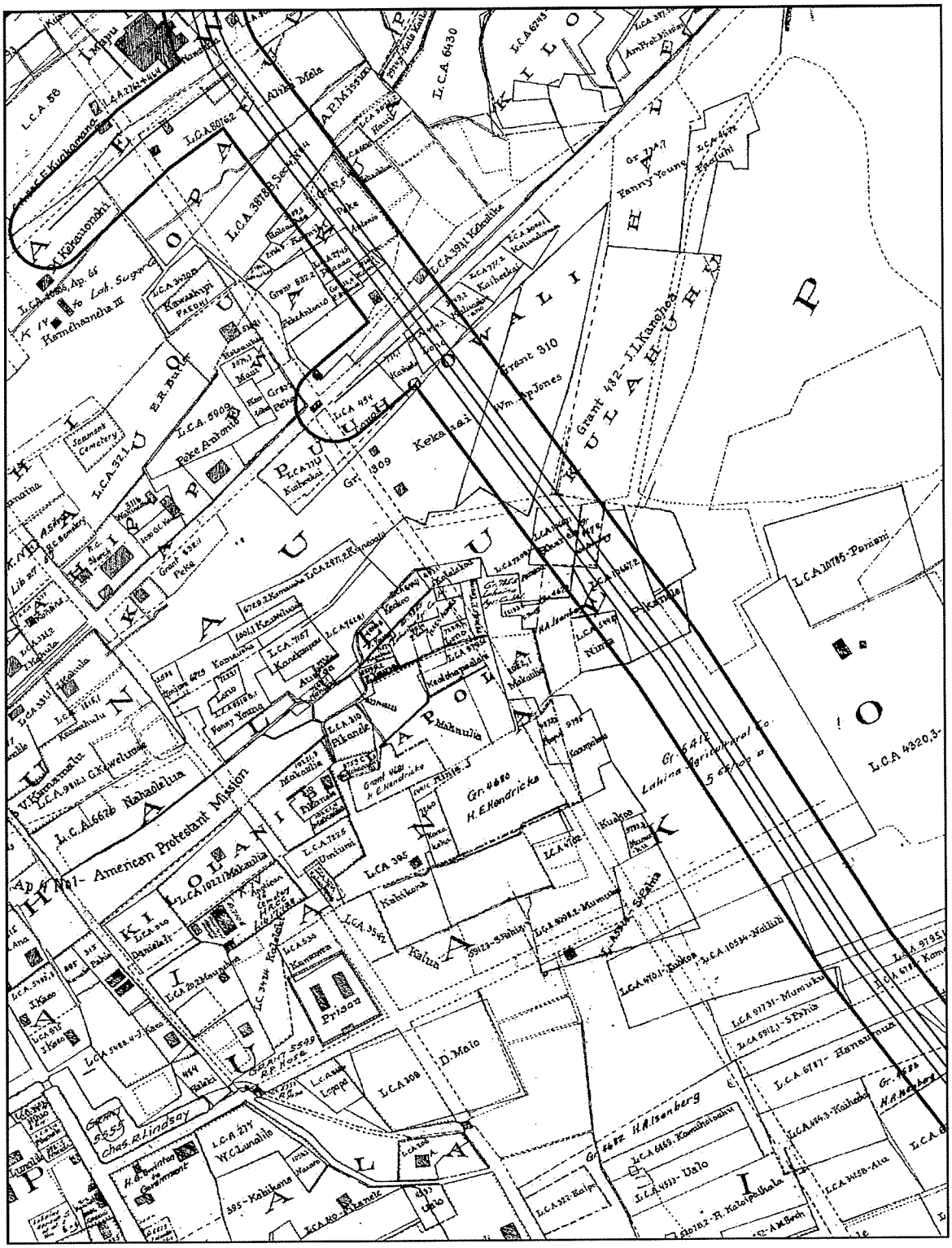

Figure 15. A close-up portion of the 1884 S.E. Bishop map showing Land Commission Awards (LCAs) and other parcel of lands within and adjacent to the central section of the project corridor (adapted from Bishop 1884).

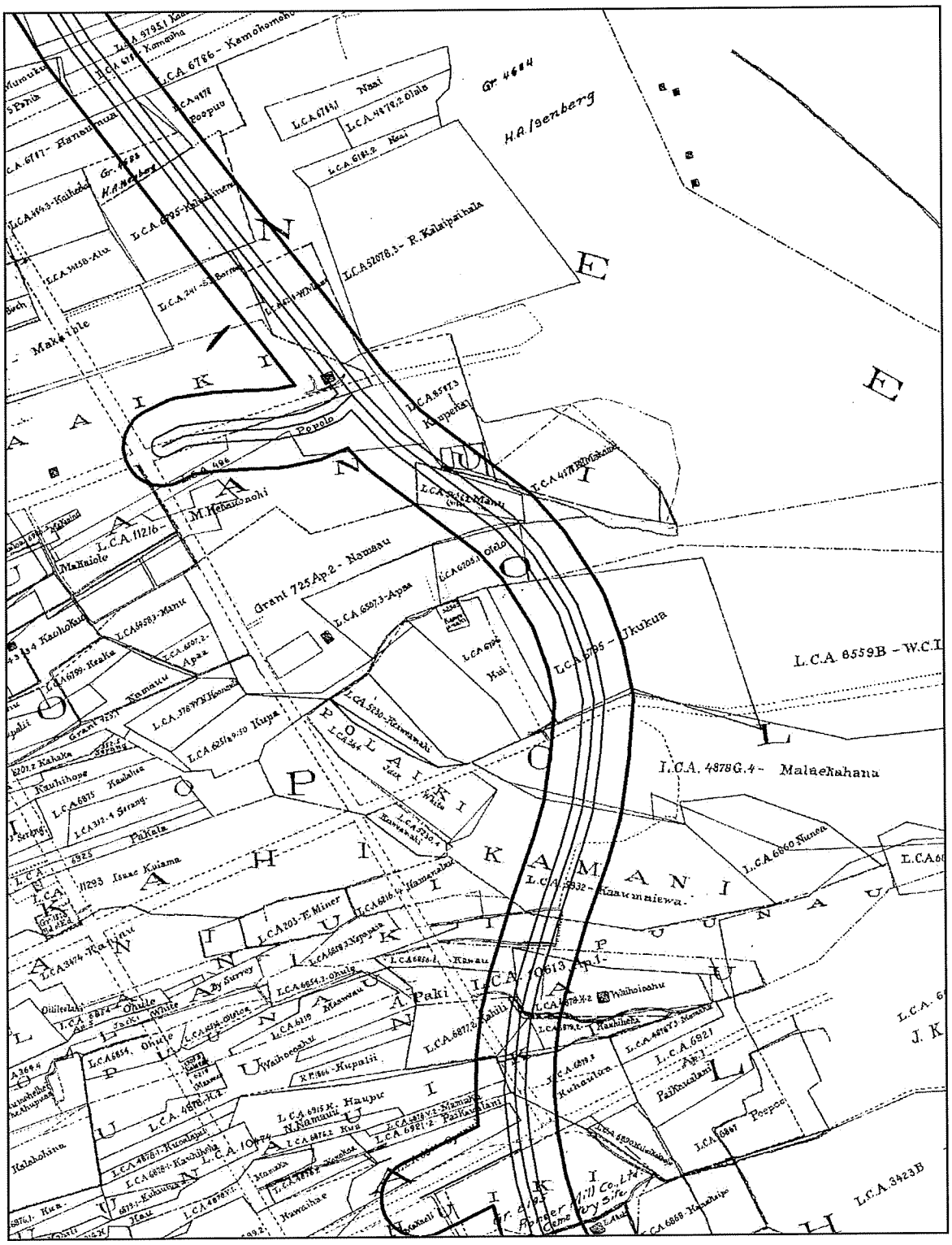

Figure 16. A close-up portion of the 1884 S.E. Bishop map showing Land Commission Awards (LCAs) in relation to the south central section of the project corridor (adapted from Bishop 1884).

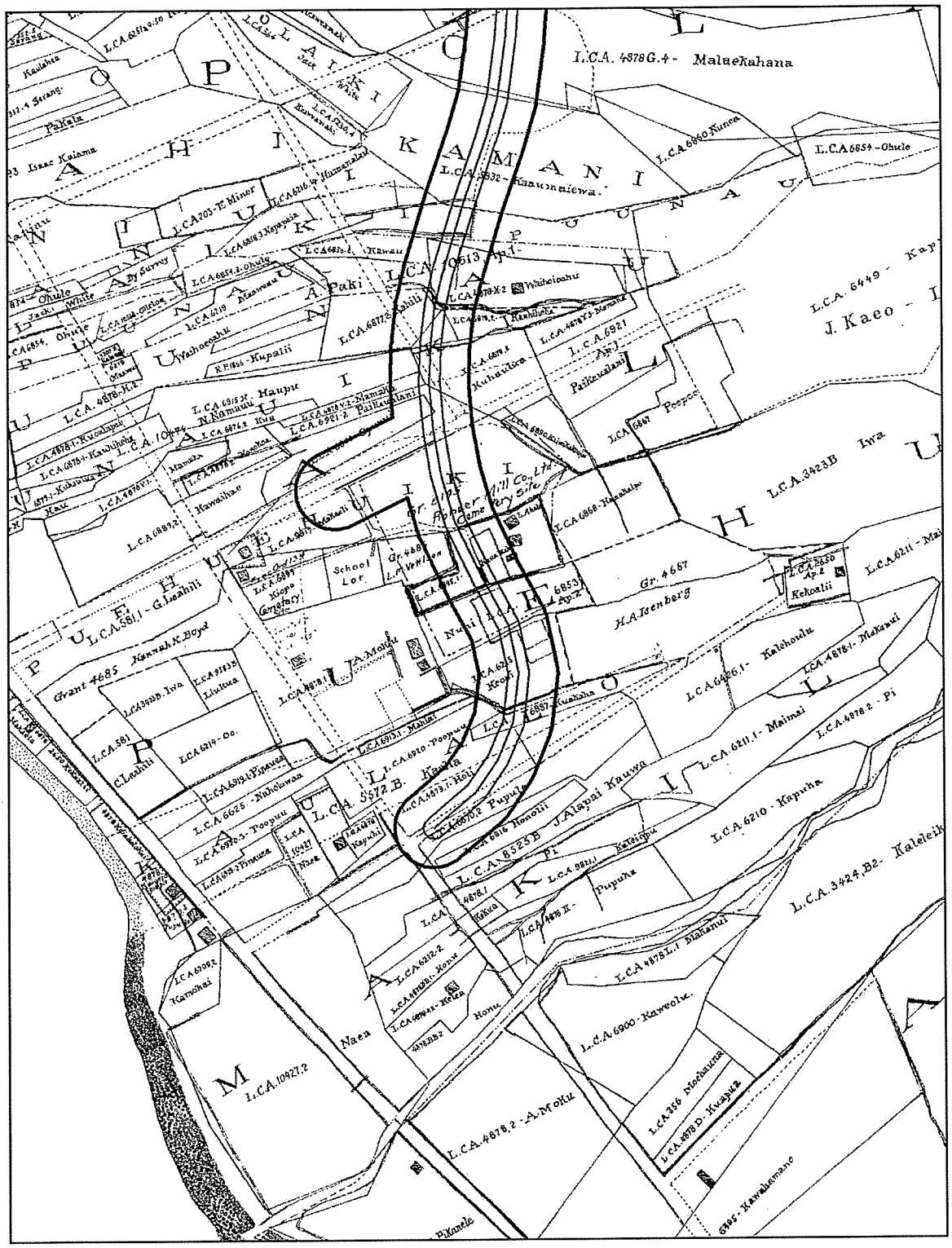

Figure 17. A close-up portion of the 1884 S.E. Bishop map showing Land Commission Awards (LCAs) in relation to the southern most section of the project corridor (adapted from Bishop 1884).

Table 1. Summary of Land Commission Awards (LCAs) identified within or adjacent to the current project area.

LCA #	R.P #	Claimant	Ahupua'a	Land Use
Apana (section), *lo'i* (irrigated terrace), *kula* (dryland agriculture area), *kālo* (taro agriculture area), *kīhāpai/pā kanu* (garden), *'ulu* (breadfruit trees), *niu* (coconut trees), *mai'a* (banana tree)				
241	410	S.D. Burrows	Waine'e	*Apana* = 1, houselot = 1
281	408, 8310	H.L. Ali	Kuholilea	*Apana* = 6, houselot = 1, *lo'i* = 3, *kula* = 1, and *kīhāpai/pā kanu* = 1 at Puehuehunui (2 acres).
464	1160	Nawaakoa, Waine	Panawwa, Moanui	*Apana* = 2, houselot = 2
3422B	1678	Kekahuna	Uhao	*Apana* = 1, houselot = 1, *lo'i* = 17
6424	1840	Kanehoewaa	Moalii	Houselot
9793	1172	Mumuku	Puako	*Apana* = 4, houselot = 1, *lo'i* =4
4878E	1199, 2711	Holi	Makila	*Apana* = 2, *lo'i* = 14
5458	1699	Manu	Kooka	*Apana* = 4, *lo'i* = 27, *kula* = 14
5672B	4515	Kaaha (for H. Kahanawai)	Kaulalo	Apana = 1
6915	5559	Haupu	Paunauiki	*Apana* = 2, *kula* = 2
8452	4388, 7453	M. Keohokalole	Kuhua, Kooka	*Apana* = 10, Mala taro = 1, hala = 1, sweet potatoes = 3, and coconut = 5
6073	1182	Halepaka	Moali'i	Apana = 1
6760B	3453	Hanalei	Moali'i, Kapunakea	*Apana* = 5, houselot = 1, *lo'i* = 11, *ulu* = 8 and *kula* = 1,
4760-2	5666	Lelehu, A	Moali'i	*Apana* = 2. *Lo'i* = 11 and *kula* = 1
3424		Kanehoewa'a		
5116	1833, 1871	Samuela Kanae	Aupokopoko	NA
8559*M	5637, 5639, 5699-2, 7664.	William C. Lunalilo	Kuholilea	*Apana* = 13, houselot = 1,
7582	8393	Eseta Kipa	Kuhua	Apana = 1
469	5613	Kaili	Kuhua	*Apana* = 1, houselot = 1
312	2650, 1180, 1179	Timoteo Kewaeiwi	Aki, Kuhua, Waiokama, Uhao, Moalii, Akiaiole	*Apana* = 8, houselot = 1, *lo'i* = 1 and *kula* = 1, at Puehuehunui (9.9 acres).
1742	NA	Z. Kaauwai	Paeohi	*Kalo* = 1
6549	NA	Hauola	Paeohi	Houselot = 1, *kalo* and *kula* land
2762	1703	Z. Nawaakoa	Paunau	*Apana* = 2, *kalo* land
8018	4560	Alika Mela	Opaeula	Apana = 1
5389	1746	Holoauhee	Kapewakua	*Apana* = 2, houselot =2, *kukui* = 2, *niu* = 2, *'ulu* = 1, and *lo'i* = 3.
2866	5574	S. Kamiki	Kapewakua	*Apana* = 2, houselot = 2,

LCA #	R.P #	Claimant	Ahupua'a	Land Use
2745		Paaoao	Kapewakua, Paunau	*Apana* = 1, houselot = 1
393,1	1672	Kekuelike	Pu'uho'owali	*Apana* = 1, houselot =1 and some *lo'i*
7711	3582	John H. Kaiheekai	Pu'uho'owali	Apana = 2
494,2	3536	Lono	Pu'uho'owali	*Kalo* = 2 and *kula*
3049,2	5595	Kaluaokamano	Pu'uho'owali	*Apana* = 2, houselot =1 *lo'i* = 2
10667,1	2399,2400	Pikanele, K.	Waianae	*Kalo* = 6
10667,2	2399,2400	Pikanele, K.	Waianae	*Kalo* = 5
5441	1751	Nina	Waianae	*Apana* = 3, houselot =1, *lo'i* = 5
10534	None	Nailiili	Puako	*Apana* =1=, house lot = 1, *lo'i* = 6
9795,1	1761	Kaaumaiewa	Puako	NA
6788	1171	Kamauoha	Wainee	NA.
5912,1	1173	Pahia, Simeona	Puako	NA.
6787	1701	Haunaumua	Waineenui	NA.
6786	1183	Kamohomoho	Wainee	*Apana = 1, h*houselot = 1, *kula* = 1
4878FF	2738	Poopuu	Wainee	*Apana* = 4, houselot = 1, kula = 1, lo'i 2
6785	8248	Kaluahinui	Wainee	*Apana* = 3, kula = 1, lo'i = 3
6218	1184	Mauae, Wahine	Waineenui	Houselot = 1
812,1	5563	Kaeo, Asa	Puaaiki	Apana = 3
496	2759/3340	Popolo	Puaanui	Apana = 2, houselot = 1, kula = 1, lo'i = 1, mai'a = 1
8587,3	5580	Kaupena	Puaanui	*Apana* = 4, houselot = 1, *kula* = 1, *lo'i* = 3
6205,1	2723	Olelo	Kooka	Apana = 2, houselot = 1, kula = 3, lo'i = 6
4878	None	Makaiole	Puaanui	NA
6795	8401	Ukukua	Polanui	Apana = 2, kula = 1, lo'i = 1
6796	2728	Kui	Polanui	Lo'i = 3, kula = some
4878,G	1959,2742	Malaekahana	Polanui	Apana = 4, houselot = 1, kula, = 2, lo'i = 1
5832	1157	Kaaumaiewa	Kamani	Apana = 1, kula = 1, lo'i = 1
4878Y	2718	Mamaka	Halakaa	Kula = 2, kula and kalo = 1
6921,2	2717	Paikaualani	Halakaa	Kalo w/poalima lo'i = 2, kula and houselot = 1
6879,2	4556	Kuhaulua	Paunauiki	Apana = 2, kula = 2, lo'i = 7
6878,2	2749/4557	Kauhiheha	Puehuehu	Apana = 4, kula = 2, lo'i= 10
6877,2	5587	Kahili	Paunauiki	Apana = 7, kula = 3, lo'i = 4
9615,H	5559	Haupu	Paunauiki	Apana = 2, kula = 2
6801	4562	Opunui	Halakaa	Apana = 2, kula = 1, lo'i = 12
6895,1	4507	Kauakahi	Puehuehunui	Apana = 4, kula = 3, lo'i = 3
6853	1851	Nuhi	Puehuehunui	Kula = 1, lo'I = 10
6215	1854	Keoni	Puehuehunui	Kula = 1
6887	5703	Kuakaha	Kaulalo	Apana = 1, lo'i = 3
6920	4554	Poopuu, Wahine	Kaulalo	Apana = 4, kula = 1, lo'i = 3

LCA #	R.P #	Claimant	Ahupua'a	Land Use
6870	2714,8266	Pupule, wahine	Makila	Apana = 3, houselot = 1, kula = 1, lo'i = 1
6916	2376	Honolii	Makila	Kula = 1

Table 2. Summary of Grant Awards identified within and/or adjacent to the current project area.

Grant #	R.P #	Grantee	Ahupua'a	Land Use
Apana (section), *lo'i* (irrigated terrace), *kula* (dryland agriculture area), *kalo* (taro agriculture area), *kīhāpai/pā kanu* (garden), *'ulu* (breadfruit trees),				
1875		George Shaw	Kuholea	NA
832		Peke Antonio	Kapewakua	NA
309		Kekauai	Pu'uho'owali	NA
310		Ap Jones, William	Puahaoowale	NA
482		Kanehoa, James Y.	Kalahuhu	NA
4683		Isenberg	Wainee	N/A

3.1.4 Early Sugar Cultivation

Ko (sugarcane) is believed to have been brought to the islands during their initial settlement by the Polynesians. Although there is no reference to its introduction to the islands in the rich oral tradition of Hawai'i, the diversity of the cultigens suggests that it has been here a long time (Handy et al. 1991:183-189).

As foreign entrepreneurs looked to expand their exportable crops and increase their profits sugar became the answer. Farmers first started meeting the demand for sugar brought on by the California gold rush, and by the early 1850's Chinese and Japanese contract labors were brought to Maui to farm the fields. In 1854, Captain P. Edwards brought in two varieties of sugarcane, one from Tahiti and one from Cuba, which flourished. However, the Tahitian variety outperformed the Cuban variety and was named Lāhainā (T. Lee-Greig and Hammatt 2006:37).

In 1849 Judge A.W. Parsons was operating a mill in Lāhainā but the demand for sugar would wane as the gold rush ended (Lee-Greig and Hammatt 2006: 37).With the onset of the American Civil War, the demand for sugar once again skyrocketed as the northern states were now without their southern suppliers, creating a high demand for the commodity. In 1862 the first steam driven mill was constructed on Maui which increased production. Over the next 20 years the sugarcane industry exploded in Hawaii with over 22 plantation or mills operating on the island of Maui by 1884 (Wilcox 1996:2-5). The West Maui Sugar Company and Pioneer Mill Company were the leading operations in the Lāhainā District.

3.1.4.1 West Maui Sugar Company

King Kamehameha V ventured into the sugar industry, creating the West Maui Sugar Company in 1864 along with two established sugar entrepreneurs, F. W. Hutchison and James Makee. Hutchinson owned interest in the Lahaina Sugar Company and Makee owned the Rose Ranch sugar plantation. The King leased the crown lands in Olowalu and Ukumehame to the West Maui Sugar Company. However, without a mill the crop was sent to the Pioneer mill for processing. The mill was steam driven and could process 1200 tons of sugar yearly (Olowalu Town 2008:127).

Late in the 1860's the West Maui Sugar Company took Z.S. Spalding as a partner. As manager, Spalding acquired the Lahaina Sugar Company mill to relieve the reliance on the Pioneer mill for processing. As sugar prices declined in the 1870's, King Kamehameha V held Spalding responsible, ultimately leading to his dismissal. In 1872 King Kamehameha V died, and with his death the land leases under his name were transferred to the West Maui Sugar Company. Within two years the West Maui Sugar Company was sold to the Pioneer Mill Company (Wilcox 1997:127).

3.1.4.2 Pioneer Mill Company

In 1860 James Campbell started a sugar plantation, growing and milling cane for small farmers with his mule powered mill. Two years later Campbell joined with Henry Turton and James Dunbar establishing the Campbell and Turton Company. In 1865 Dunbar pulled out and Campbell and Turton changed the name to the Pioneer Mill Company (University of Hawaii HSPA Plantation Archives 2004). The original lands acquired for the venture belonged to Thomas Phillip in Launiupoko Ahupua'a (Lee-Greig and Hammatt 2006:41). The company expanded quickly after acquiring the West Maui Sugar (Figure 18).

With increasing acreage under cultivation resulting in higher crop yields, the Pioneer Mill Company was one of the first to put in a rail system for hauling cane from the fields to the mill. As the company grew so did the town of Lāhainā; by 1910 the company employed over 1600 workers and cultivated over 8,000 acres of cane. In order to maintain production and the successful growing of sugar cane along the west coast of Maui, further development of water resources was required.

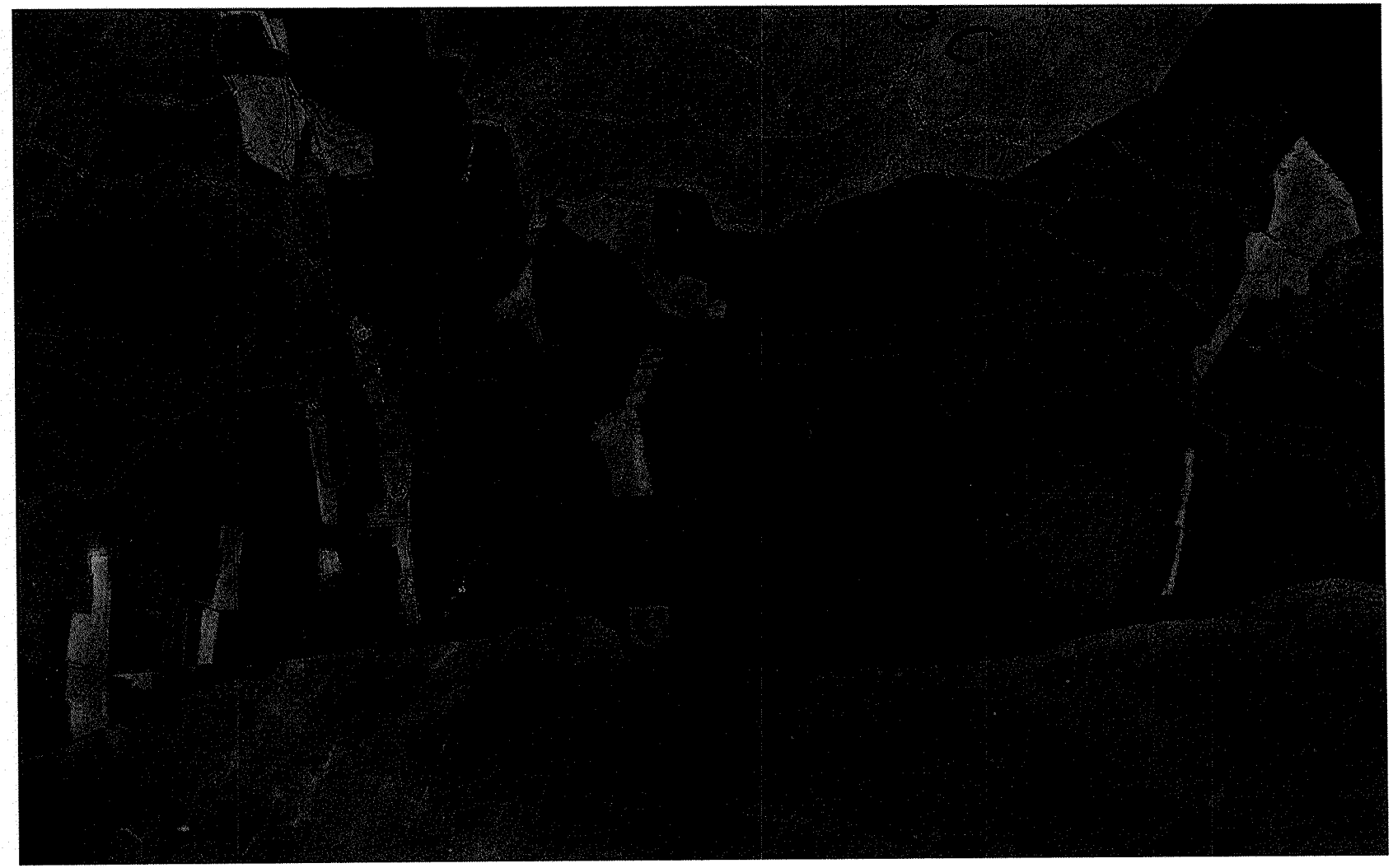

Figure 18. A portion of a 1918 map illustrating lands under cultivation by the Pioneer Mill Company in relation to the current project area (outlined in red), Pioneer Mill Co. lands in red, Government lands in green, Bishop Estate lands in yellow, leasehold and lands under other ownership in blue.

3.1.5 1900s to the Modern Era

By the late 1920's, the Pioneer Mill Company developed a complex of irrigation systems including flumes used to transport cane to railroad "car loading stations". In May of 1931 the Pioneer Mill Company expanded its cane enterprise as far as Ukumehame to the east with the acquisition of the Olowalu Sugar Company (Conde and Best 1973:254-264).

A dramatic technological change to cane production of the Pioneer Mill occurred in 1946 when it became more economical to use trucks to transport the harvested cane instead of railroad carts. As reported in a Pioneer Mill Co. annual, the year of 1953 marked the final elimination of railroad use in the Pioneer Mill Company (in Condé and Best 1973:255). An exhaustive study by the combined staffs of Pioneer Mill Company, and American Factors, Ltd., Plantation Division, resulted in the elimination of the railroad system altogether by 1952. All sugarcane would be hauled by trucks, with the ability to haul 45-65 tons per load, on a shift basis.

After World War II heavy equipment and mechanized farming were introduced, and from the years 1948 to 1951 Pioneer Mill Company started a rock removal program to increase production. The program used heavy equipment to clear the fields of rocks, which were stacked into large piles. These plantation rock piles still dot the landscape today.

The Pioneer Mill Company thrived throughout major dips in the American economy; however, all ventures are susceptible to market change and the Pioneer Mill Company was no exception. Faced with foreign competition, which had lower land and labor cost, the company closed down in 1999 (Kubota 1999). Today, fallow fields, the smoke stack, and a six-mile segment of the track are all that remain of the Pioneer Mill Company. In 1970, the Kaanapali & Pacific Railroad used the six-mile segment of track to create a tourist Sugar Cane Train ride *mauka* of Lāhainā Town. Although the sugarcane industry has disappeared from this area of Maui, the impact of the industry changed the landscape of West Maui and the rest of Hawai'i forever.

3.2 Previous Archaeological Research

This section provides a brief overview of the research and findings of previous archaeological investigations in the general area surrounding the current project (Figure 19). Investigations including the current project area are discussed next followed by a summary of those conducted nearby (Table 3).

Formal archaeological research began on Maui early in the twentieth century when Thomas Thrum began recording the *heiau* of Maui the Hawaiian Annual from 1909 through 1918. At the conclusion Thrum had located 121 *heiaus* on Maui (Thrum 1909-1918). The first attempt at a systematic island –wide survey was undertaken by Winslow Metcalf Walker from 1928 to 1929. The survey was commissioned by the Bishop Museum and focused on large sites and *heiau* around the island.

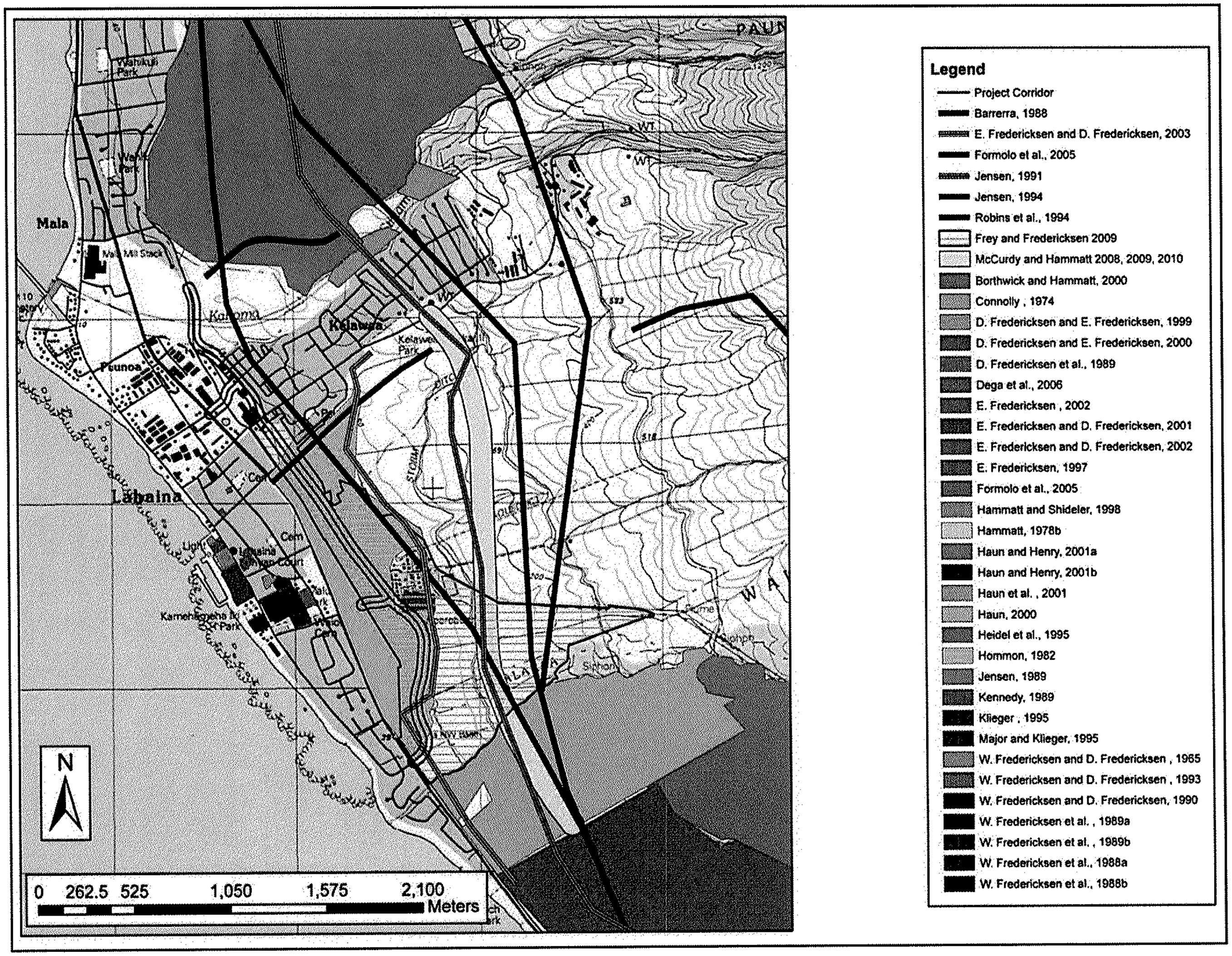

Figure 19. A portion of the USGS 7.5' topographic map, Lāhainā Quadrangle (1992) showing the Current Project Corridor in relation to previous archaeological studies.

Walker identified four *heiau* in the vicinity of the current project area. These include Wailehua, Halekumukalani, Apahua, and Waiie *heiaus*. Wailehua heiau, now destroyed, was located in the *ahupua'a* of Makili, at the shore. According to Thrum (1909) it was built by Kauhi-ai-moku-kama, son of Kekaulike, around 1738. The heiau measured 130 x 80 ft. Subsequently its location served as the residence of the manager of the Pioneer Mill Co. (Walker 1931:64).

Halekumukalani was a small sacrificial *heiau*. Described by Walker (1931:64) as being located in the cane lands of Puehuehunui in the *ahupua'a* of Halekaa, it was likely located in the *ahupua'a* of Puehuehunui. Halekumukalani *heiau* had been destroyed prior to 1931. Apahua *heiau* was located above the cane fields of Wainee. Completely destroyed, its construction was credited o Hua-nui. Waiie heiau located in the Kapaulu district south of Lahainaluna Rd. was destroyed prior to Walkers survey (Walker 1931).

3.2.1 Previous archaeological investigations within the current project area

An archeological survey of a 480 acre parcel of land in Waine'e and other Ahupua'a was conducted by Xamanek Researches that included portions of the current project area (Frey and Fredericksen 2009). The investigation identified eight previously unrecorded sites (SIHP 50-50-03-6471-6478. These include one disturbed post-contact human remains (-6473), five subsurface pre/post contact agricultural sites (-6471, 6472, 6474, 6475, and 6476), one linear rock formation (-6477) and a historic railroad bed (-6478). Of these SIHP-6473 and -6478 were within the current survey corridor.

An Archaeological Inventory Survey of the Lahaina Watershed Flood Control Project Area was conducted by Xamanek Researches for Munekiyo & Hiraga Inc., that spanned portions of the lands of Polanui, Pahoa, Puehuehunui, Halaka'a, Waine'e, and Puako (E. M. Fredericksen and Fredericksen 2003). The investigation consisted of pedestrian survey and subsurface backhoe testing. One previously unrecorded historic property was identified (SIHP 50-50-03-5239), a Native Hawaiian burial. The individual was encountered beneath the plow zone approximately 90 centimeters below surface (cmbs) in LCA 5832 to Ka'aumaiewa. SIHP-5239 was identified within the current survey corridor but approximately 50 feet outside of the ROW.

At the request of Munekiyo, Arakawa and Hiraga, Inc. Xamanek Researches (D. L. Fredericksen and Fredericksen 2000) conducted an archaeological inventory survey of a 5-acre parcel of land located in portions of the lands of Waine'e and Ko'oka. One previously unrecorded historic property was identified consisting of two features (SIHP 50-50-03-5042). Feature A is a stacked stone boundary wall with "PAGODA FAMILY" inscribed on it and Feature B is a stacked stone retaining wall associated with the historic Waine'e Village community.

3.2.2 Previous archaeological investigations in the vicinity of the current project area

William Barrera Jr. (1988) conducted an archaeological reconnaissance survey for alternative routes of the proposed Honoapi'ilani Highway realignment between Lāhainā and Honokowai at the request of Environmental Communications Inc. It consisted of three alternatives, A through C, all beginning near Puamana Park, south of Lāhainā. Two previously unrecorded historic properties were recorded, an agricultural complex where Alternate C crossed Kahoma and a

possible habitation terrace observed where Alternative A crossed Honokowai Stream, neither of these were within the current project corridor.

At the request of Michael T Munekiyo Consulting, Paul H Rosendahl, Inc. (PHRI) conducted an archaeological inventory survey for the Honoapi'ilani Highway Realignment Project, Lahaina Bypass Section-Modified Corridor Alignment (Jenson 1991). This investigation consisted of a 7 mile long corridor, 200 feet wide, and included the current project. Four sites were identified within or adjacent to the PHRI study corridor. Three of the sites were previously identified (SIHP -2484, -2489, and -2490) and one was a new discovery (SIHP -2487). SIHP -2487 is identified as rubble walled enclosure. SIHP -2489 consists of agricultural terraces, foot path, possible habitation features and a potential burial. SIHP -2490 includes walled terraces, a walled enclosure, and agricultural terra remnants. SIHP -2484 is a partial rock enclosure or L-shaped wall. None of these properties are located within or in close proximity to the current project corridor.

PHRI conducted an archaeological inventory survey of approximately 230-acres in Polanui, Puehuehu Iki, and Pahoa Ahupua'a (Haun 2000) at the request of Kauaula LLC. A total of three historic properties were identified, two of which are associated with late pre-contact to early historic agricultural activities (SIHP -4789 and SIHP -4795), as well one property that was attributed to Pioneer Mill sugar operations (SIHP -4787). The current project corridor bisects the western portion of this study area. None of the identified properties are located within the project corridor. Twelve backhoe trenches (BTs) were excavated along the coastal extent of the project area in the approximate locations of six *kuleana* awards that were recorded as houselots and *kula* gardens (BTs 4-9 were situated in Polanui Ahupua'a). No cultural deposits were encountered during the backhoe testing program.

Scientific Consultant Services (SCS) conducted an archaeological inventory survey on 633 acres of undeveloped land in Launiupoko and Polanui Ahupua'a, [TMK (2) 4-7-01:2 por.] for the West Maui Land Company, Inc. (Paraso and Dega 2006). A total of ten historic properties were identified. Five of the ten are associated with the sugar plantation era (SIHP -4787, -5950, -5951, -5952, and -5957). Two (SIHP -2665 and -5954) are rock walls associated with the cattle ranching era. One (SIHP -5953) is a scatter of slag fragments and cores interpreted as a historic work area. The function and age of SIHP -5955 and -5966 are indeterminate and are referred to as activity areas. The Lāhainā Bypass Phase 1B-1 corridor extends approximately 250 m into the northern portion of this study area. None of the aforementioned sites are within the current project corridor.

Table 3. Previous archaeological investigations within and adjacent to the current project area.

Reference	Year	Location	Summary of Work
(Walker 1931)	1931	Island Wide	Walker identifies four heiau in the vicinity of the current project area. These include Wailehua, Halekumukalani, Apahua, and Waiie heiaus
(Walter M. Fredericksen and Fredericksen 1965)	1965	Paunau	Data Recovery: Confirmed the location and construction techniques of the "Brick Palace" of Kamehameha I.
(Connolly 1974)	1974	Kahoma Stream	Inventory Survey of Kahoma Stream Flood-Control Project Area, which identifies the "Kahoma Stream Terrace System Complex" of 33 agricultural terraces and a second complex at a higher elevation: the "Haia Terrace System" that is located outside of the project area.
(Hammatt 1978)	1978	Māla Wharf	Archaeological Investigation and Monitoring: Monitored the exhumation of 90 human burials, three of which were determined to be pre-contact Hawaiian burials, at SIHP 50-50-03-226 (Pu'u Piha Cemetery). Identified a pre-contact cultural material layer likely associated with pre-contact habitation.
(Hommon 1982)	1982	Waine'e	Reconnaissance: No significant finds.
(Barrera 1988)	1988	Multiple Ahupua'a	Archaeological Reconnaissance: Identified historic properties associated with agricultural pursuits.
(Walter M Fredericksen et al. 1988a)	1988b	Panaewa Ahupua'a	Inventory Survey: Excavations of a portion of the "Aus Site" 50-03-1797 were conducted. Based on the scarcity of cultural material remains, initial analysis of the area indicated that it was a low use area.
(Walter M Fredericksen et al. 1988b)	1988a	Waine'e Ahupua'a	Inventory Survey: Phase I inventory survey at Hale Pi'ula. Did not identify features positively associated with Hale Pi'ula (unfinished stone palace of Kamehameha III); however, 2 oblong structures of an indeterminate function and a portion of the foundation from the old armory building was documented
(D. L. Fredericksen et al. 1989)	1989	Panaewa	Data Recovery/ Monitoring: 10 early post-contact to modern-era refuse pits.
(Jensen 1989)	1989	Wahikuli	Inventory Survey: Documentation of 20 agricultural terraces, 13 burial and possible burial features, seven walled habitation enclosures, one temporary shelter, one historic road, one petroglyph panel, and one platform representing both pre-contact and historic-era use of the area.

Reference	Year	Location	Summary of Work
(Kennedy 1989)	1989	Paunau	Limited Subsurface Testing: Artifacts with a time range of early post-contact to modern era.
(Walter M. Fredericksen et al. 1989)	1989a	Panaewa	Inventory Survey: Sparse historic-era cultural materials in a disturbed context.
(Walter M Fredericksen et al. 1989)	1989b	Paunau	Inventory Survey: Determined that the parcel was open space/lakeshore and that a portion was likely submerged under Loko o Mokuhinia
(Walter M Fredericksen and Fredericksen 1990)	1990	Panaewa	Monitoring/ Data Recovery: Out-of-context indigenous artifact. No significant finds.
(Jensen 1991)	1991	Panaewa	Inventory Survey: Four pre-contact historic properties containing 28 component features associated with agriculture, habitation, and burial interment and ceremony.
(Walter M Fredericksen and Fredericksen 1993)	1993	Lāhainā Town	Inventory Survey: Documentation of three historic era disposal pits.
(Jensen 1994)	1994	Hanakao'o and Paunau	Inventory Survey: No significant findings.
(Robins et al. 1994)	1994	Ma'alaea to Paunau	Inventory Survey: Identification of 34 historic properties, including: permanent and non-permanent habitation sites, heiau, shines, travel markers, non-irrigated agricultural sites, historic ranching walls, irrigation canals, burials sites, possible railroad beds from the previous sugar plantation operation.
(Heidel et al. 1995)	1995	Waine'e	Inventory Survey: No significant findings.
(Klieger et al. 1995)	1995	Lower Wane'e Moku'ula	Data Recovery: Verified the location and condition of the inland island, and royal residence of Moku'ula, verified the nature of the surrounding fresh water pond of Loko o Mokuhinia, documented modifications to the inland island and nature of cultural material remains associated with the occupation of Moku'ula.
(Major and Klieger 1995)	1995	Pakala	Inventory Survey: Identified two historic properties SIHP 50-50-03-4118, a subsurface deposit potentially related to pre-contact to early historic habitation of the parcel by Lāhainā *konohiki* Pikanele, and 50-50-03-4119, a historic-era dwelling.
(E. M. Fredericksen	1997	Pioneer Inn	Monitoring Report: No significant finds.

Reference	Year	Location	Summary of Work
1997)			
(Hammatt and Shideler 1998)	1998	Lahaina Courthouse	Archaeological Monitoring: Identified historic era fill deposit and pig remains. The presence of pig remains is indicative of a possible pre-contact cultural deposit.
(D. L. Fredericksen and Fredericksen 2000)	2000a	Waine'e	Inventory Survey: Identified SIHP 50-50-03-5042, two plantation era structural remnants and cultural material associated with the settlement of Waine'e Village.
(Haun 2000)	2000	Pūehuehu Iki, Pāhoa, and Pola Nui	Inventory Survey: A total of three historic properties associated with both traditional and commercial agricultural endeavors from the later pre-contact era to early historic era for the former (SIHP -4789 and -4795), and historic to late historic for the latter (SIHP -4787).
(Borthwick and Hammatt 2001)	2001	Lahaina Courthouse	Subsurface Archaeological Investigation: Documented a pre-contact subsurface cultural deposit (SIHP 50-50-03-4754) at approximately 1-1.2m below surface.
(E. M. Fredericksen and Fredericksen 2001)	2001	Puako	Archaeological Monitoring: Four pre-contact to early post-contact historic properties consisting of traditional Native Hawaiian burial interments and cultural deposits with subsurface features indicative of habitation.
(A. E. Haun and D. Henry 2001)	2001	Launiupoko	Inventory Survey that identified four sites consisting of six component features. One of the sites (SIHP-4787) was previously recorded by PHRI (2000). The other three were new discoveries. SHHP-5187 consisted of two linear rockpiles, SIHP-5188 is a series of low terraces associated with a concrete and mortared stone ditch and the final site consisted of a terrace interpreted as *lo'i* based on appearances and proximity to Kaua'ula Stream. No cultural material was observed during subsequent testing.
(A. E. Haun and J. D. Henry 2001)	2001		Inventory survey that identified six sites consisting of seven component features. Two of the sites were previously recorded by PHRI. SIHP-2665 by Graves et al. (1998) and SIHP-4787 in PHRI (2000). SHIP-5049 and 5050 are cattle walls, SIHP 5051 is a historic roadbed, and SIHP-5052 consisted of linear rock mounds or terraces.
(E. M. Fredericksen 2002)	2002	Paunau, King Kamehameha III Elementary	Archaeological Monitoring: No significant finds.
(Frederickson and Frederickson 2002)	2002	Puako	Inventory Survey: One historic property consisting of four post-contact trash pits and one "backyard" water worn pavement.
(E. M. Fredericksen	2003	Multiple	Inventory Survey: One pre-contact human burial identified below the plow zone (50-50-03-

Reference	Year	Location	Summary of Work
and Fredericksen 2003)		Ahupua'a	5238).
(Formolo et al. 2005)	2005	Hanakao'o Ahupua'a	Archaeological Assessment: No significant historic properties identified.
Paraso and Dega(Paraso and Dega 2006)	2006	Polanui and Launiupoko	Inventory Survey: Identified a total of 10 historic properties, five are associated with historic era commercial sugar cultivation (50-50-03-4787 [Lāhainā Pump Ditch No. 1]; -5950 [17 field clearing mounds]; -5951 [water control features]; -5952 and -5957 [terraces associated with manual sugar cultivation]), two are rock walls associated with historic era ranching activities (50-50-03-2665 and -5954); one is a historic slag scatter (50-50-03-5953); two are activity areas of an indeterminate age (50-50-03-5955 [modified outcrop and coral fragments] and -5956 [cultural material scatter of indigenous and historic era materials])
(McCurdy and Hammatt 2008)	2008	Multiple Ahupua'a	Literature Review and Field Inspection that identified two previously recorded historic properties (State Inventory of Historic Properties ([SIHP] 50-50-03-5950 and 50-50-03-4787) and three previously unrecorded historic properties ([SIHP] 50-50-03-6631, -6632, and -6633).
(McCurdy and Hammatt 2009)	2009	Multiple Ahupua'a	Inventory survey documentation of SIHP -6631, -6632, and 6633. SIHP-6631 is the remnants of a dry stacked basalt stone wall associated with Land Grant 725 (Namauu). SIHP-6132 is a pre-Contact agricultural complex that includes a minimum of 21 terraces and SIHP-6633 is a plantation era irrigation pipe no longer in use.
(Frey and Fredericksen 2009)	2009	Multiple Ahupua'a	Inventory Survey: Identified eight previously unrecorded sites (SIHP 50-50-03-6471-6478. These include one disturbed human burial (-6473), five subsurface pre/post contact agricultural sites (-6471, 6472, 6474, 6475, and 6476), one linear rock formation (-6477) and a historic railroad bed (-6478).
(McCurdy and Hammatt 2010)	2010	Multiple Ahupua'a	Mechanical testing of SIHP 50-50-04-5950 Features 20-23, 25 and 27. Identified a mid 19th century burn deposit beneath feature 25 likely associated with slash and burn deforestation land clearing activities prior to sugarcane cultivation in this area. No significant cultural material or features observed.

3.3 Background Summary and Predictive Model

Based on the historic records, the dense Land Commission Awards in the project area, as well as archaeological evidence and interpretations (see subsection 3.2.1 and 3.2.2 within section 3.2 Previous Archaeological Research), we know that the fertile and resource rich lower coastal plain of Lahaina was home to high ranking *ali'i* during the time period before western contact, and later the seat of government for the Kingdom of Hawai'i following the unification of seven of the eight major Hawaiian Islands in 1791 (T. L. Lee-Greig, Hill et al. 2008). The abundant resources and *ali'i* residential compounds show a rather large pre-contact and post-contact population along the lower reaches of the *kalana* of Lāhainā. Just as important as the coastal resources, the well watered stream valleys also provided a continuous water source for successful agricultural pursuits from the headwaters to the seaward mouth of the stream as evidenced by *kuleana* claims for numerous *lo'i* and sweet potato patches in the native testimony for LCAs within and adjacent to the project right of way as it extends from the north side of Kauaula Stream and crosses Kahoma Stream. The project area falls between the transitional or barren and coastal settlement zones. It appears that this area has great number of Land Commission Awards.

The above summary indicates that traditional settlement pattern would include both temporary and permanent habitation and intensive agricultural cultivation along the slopes, within the stream valleys, and along the coastal plain. The archaeological features likely to identify in these types of land would have included; habitation terraces, enclosures and platforms, cultural material deposits, fishpond remnants, ceremonial structure and fishing shrines, agricultural terraces, agricultural mounds and traditional water control features (Donham 1993, Jensen 1989 and 1991, Hammatt 1978 and Connolly 1974).

Surface indications of the above activities have likely been destroyed or modified during the major land clearing and cultivation activities of the sugar industry, subsurface deposits associated with pre-contact subsistence practices as well as temporary habitation may occur within the area. Pre-contact burials within the types of soil deposit that comprise the project corridor are rare, although the presence of such features should be considered based on the number of LCA's within and adjacent to the project corridor. In addition, Fredericksen and Fredericksen (2003) and Frey and Fredericksen (2009) had identified human remains (SIHP 50-50-04-5239 and -6473) within and adjacent to the project corridor.

Historic-era properties associated with sugar cane cultivation are also anticipated within the project area. Expected site types include remnant irrigation canals and other features associated with industrial water development in the area (e.g. water gates, pump remnant, etc.) as well as the pushpiles that have since crossed the 50-year historic determination threshold.

Section 4 Results of Fieldwork

The following sections summarize the findings of the pedestrian survey and results of the subsurface testing. Additionally, this section seeks to provide a synthesis of the results of this current study with that of the previous Frey and Fredericksen (2009) study as the two project areas overlap.

4.1 Pedestrian Survey Findings

At the conclusion of the pedestrian survey two previously recorded historic properties (SIHP 50-50-03-6473 and -6478) (Frey and Fredericksen 2009:78-81, 99-100), eight previously unrecorded potential historic properties (SIHP 50-50-03-6775 to -6779 and SIHP 50-50-03-7101 to -7103) and two isolated finds or artifacts (CSH 3 and CSH 9) were identified (Figure 20). These newly identified sites have a total of 12 component features and consist of five plantation era water diversion structures, three WWII utility structures, three historic walls and a previously disturbed possible pre-contact human burial (Table 4). The two isolated finds or artifacts are composed of two concrete block columns or supports and a concrete utility pole (

Table 5). In addition, portion of the northeast edge of the foot print or remnant of Pioneer Mill Company is in the project corridor and it appears that there are two State Site numbers associated with the Mill. The SIHP numbers are 50-50-03-1598 and -4420. The smoke-stack, the land mark of the Pioneer Sugar Mill in Lahaina is just outside of the project corridor, and it is preserved.

SIHP-6473, a human burial which was exposed during previous subsurface testing associated with an inventory survey conducted by Xamanek Researches LLC, was noted as being located within the present project ROW (Frey and Fredericksen 2009) (Figure 21). Field confirmation that SIHP -6473 was within the project ROW prompted a realignment of the southern portion of the corridor at the conclusion of the present pedestrian survey (Figure 22). The presence of another previously identified burial (SIHP 50-50-03-5239 [see also Section 3.2.1]) was noted as potentially located within the survey corridor. Although not field verified during the current study, an adjustment of the ROW was made based on previously submitted site location data (E. M. Fredericksen and Fredericksen 2003:76) to account for a 50 ft buffer between the location of the burial and the limits of the construction activity (see also Figure 22).

This section provides both summary tables of all previously identified and newly documented historic properties and isolated finds, as well as detailed site descriptions, photographs, and map illustrations of all newly identified historic properties.

Table 4. Summary of Historic Properties Identified During Pedestrian Survey within the Current Project Area.

SIHP 50-50-03-	Feature	Feature Type	Function	Probable Age	Condition
6473[1]	None	Human Burial	Burial	Historic	Poor – Previously Impacted
6478[1]	None	Historic Railroad Bed	Transportation	Post-contact	Poor
6775	None	Remnant Irrigation Ditch	Water Control	Plantation	Poor
6776	A	3 metal pipelines	Water Control	Plantation	Fair to Good
	B	Concrete box w/24" metal pipe	Water Control	Plantation	Fair to Good
	C	24" metal pipeline	Water Control	Plantation	Good
6777	None	Building Structure/Quonset Hut	Shelter/Habitation	World War II/1940s	Good
6778	None	Building Structure/Quonset Hut	Shelter/Habitation	World War II/1940s	Good
6779	None	Building Structure/Quonset Hut	Shelter/Habitation	World War II/1940s	Good
7101	A	Wall	Transportation	Historic	Good
	B	Wall	Property boundary	Historic	Good
	C	Wall	Transportation	Historic	Good
7102	None	Human remains	Burial	Possible Pre-contact	Poor
7103	None	Ditch/drainage	Water control	Plantation	Good

Table 5. Summary of Isolated Finds within the Current Project Area.

Temporary Site #	Feature	Feature Type	Function	Probable Age	Condition
CSH-3	2	Concrete block columns	Water control	Historic	Good
CSH-9	1	Concrete pole	Utility pole	Historic	Poor

[1] Previously identified

Frey, Jennifer J. and Erik M. Fredericksen
2009 *An Archaeological Inventory Survey of a 480-Acre Parcel of Land in Waine'e and Various Ahupua'a, Lahaina District, Island of Maui (TMK: [2] 4-6-13, 14, 15, 16, 18, and 4-6-01, 02)(**DRAFT**)*. Prepared for Ka'anapali Land Management Corp, Lahaina, Maui. Xamanek Researches, LLC, Pukalani, HI.

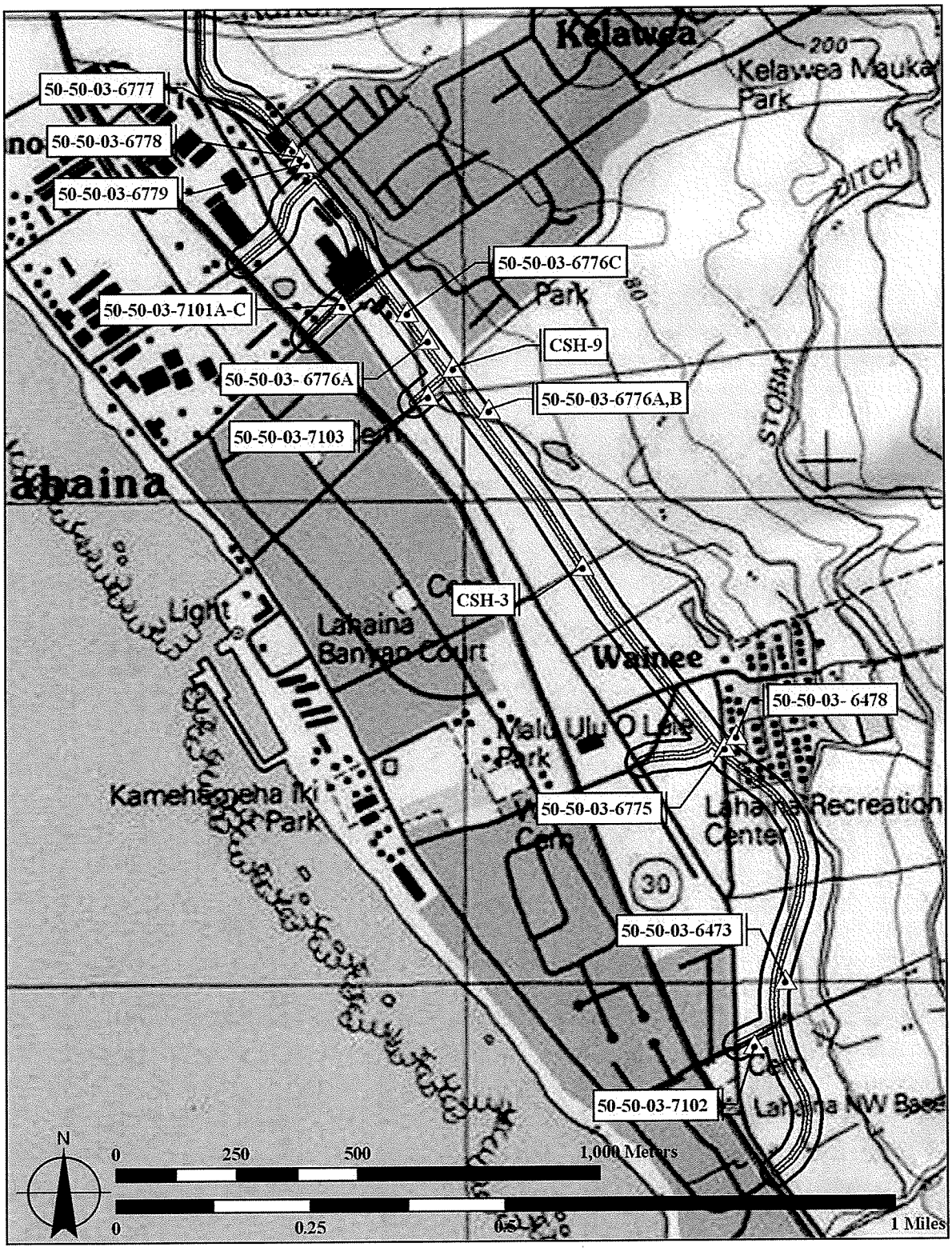

Figure 20. A portion of the USGS 7.5' topographic map, Lahaina Quadrangle (1992) showing the historic properties observed and recorded within the survey corridor.

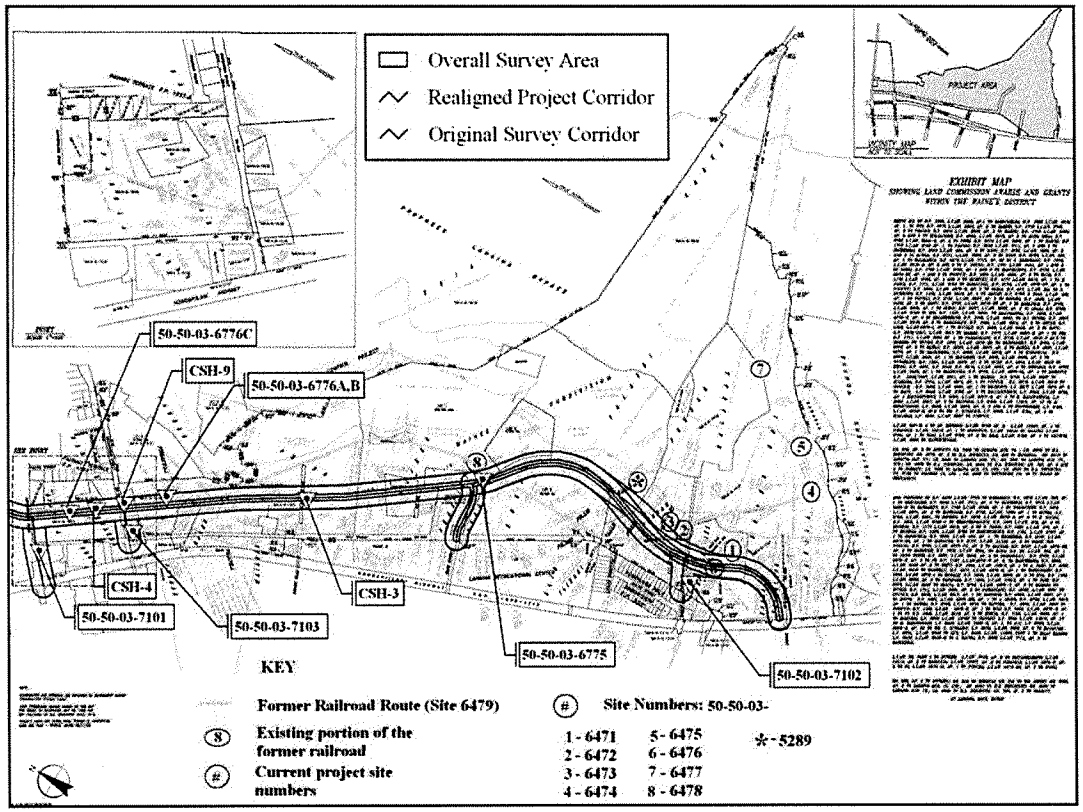

Figure 21. Figure showing the location of the current project corridor in relation to the project area and sites recorded during the Xamanek investigation (Frey and Fredericksen 2009:Figure 12)[2].

[2] Site no. for previously identified burial -5289 should read -5239

Fredericksen, Erik M. and Demaris L. Fredericksen

2003 *An Archaeological Inventory Survey of the Lahaina Watershed Flood Control Project Area Lands of Polanui, Pahoa, Puehuehunui, Halaka'a, Waine'e, and Puako, Lahaina District, Maui Island, TMK: 4-6-13-16, 18, 26, TMK 4-7-001, 002.* Prepared for Munekiyo & Hiraga, Inc., Wailuku, HI. Xamanek Researches, Pukalani, HI.

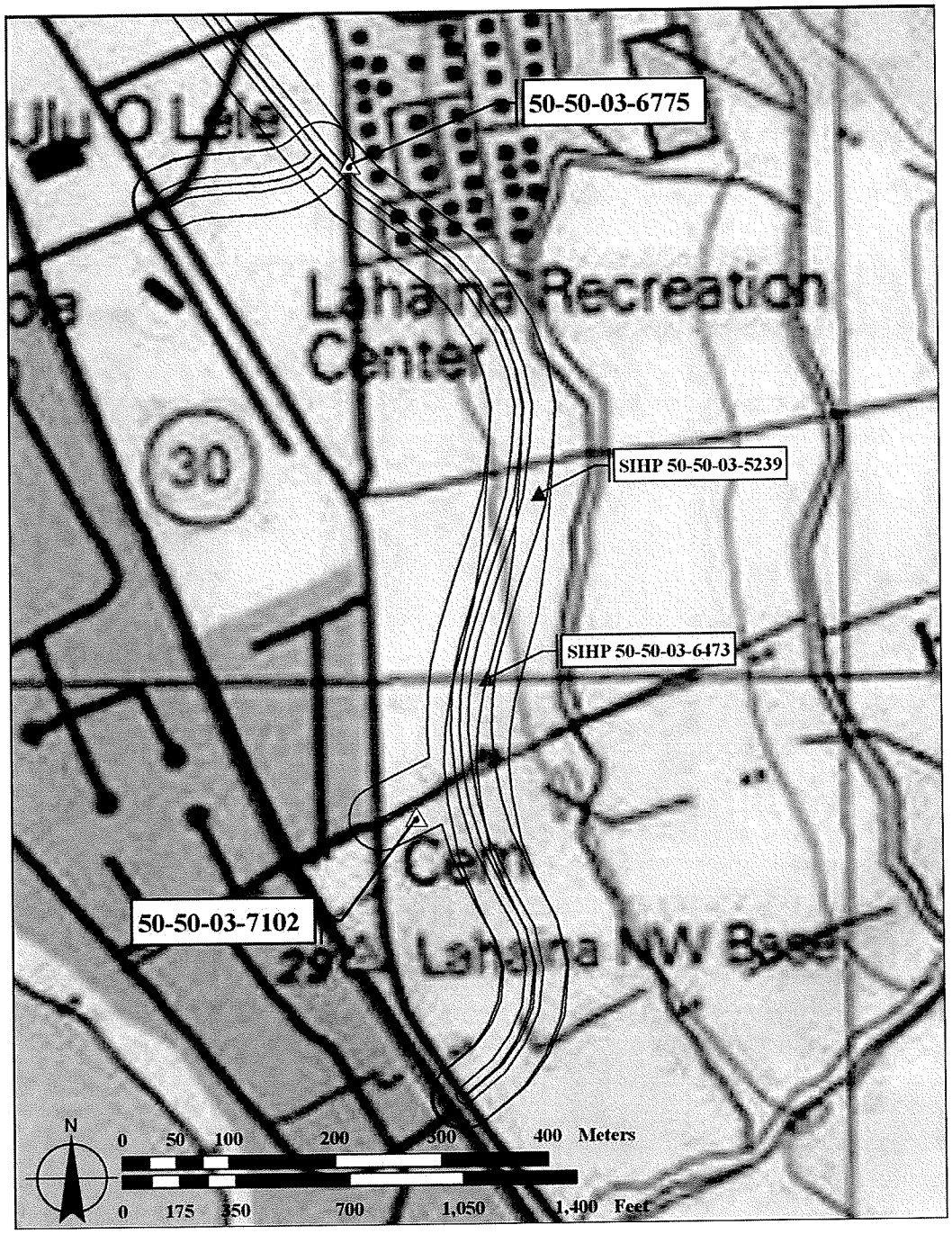

Figure 22. A portion of the USGS 7.5' topographic map, Lahaina Quadrangle (1992) showing the survey corridor and subsequent realignment in relation to SIHP -5239[3] and -6473, -6775, and -7102.

[3] Not re-identified during the current study, location information based on map provided in the report entitled *An Archaeological Inventory Survey of the Lahaina Watershed Flood Control Project Area Lands of Polanui, Pahoa, Puehuehunui, Halaka'a, Waine'e, and Puako, Lahaina District, Maui Island, TMK: 4-6-13-16, 18, 26, TMK 4-7-001, 002.* (Frey and Fredericksen 2009:Figure 12).

4.1.1 Historic Property Descriptions

4.1.1.1 SIHP 50-50-03-6775

TEMP SITE # CSH-2
SIHP # SIHP 50-50-03-6775
SITE TYPE: Irrigation Ditch
FUNCTION: Water Control
DIMENSIONS: 43.3 m length by 1.2-2,2 m width by 0.75 m depth
CONDITION: Poor
AGE Plantation

DESCRIPTION: SIHP 50-50-03-6775 is a section of irrigation ditch that bisects the project corridor west of the historic Waine'e Camp [SIHP -5042 (Frey and Fredericksen 2009:122)] ().. Although we were not able to locate a map showing SIHP-6775, the manner of consruction is consistant with other historic era Pioneer Mill Co. irrigation ditches. SIHP-6775 ends to the south at circa 10 m to the concrete sidewalk that runs along the north side of Shaw St. and continues to the north extends outside of the project area (Figure 23 and Figure 24). Approximately 43.3 m of the ditch is within the project corridor and this section is enitrely soil lined. An eight meter section of this ditch extends to the north, outside of the current project area is constructed from subangular basalt boulders and concrete lining on the west side. The boulders are stacked two to four courses high to a maximum height of 0.6 m. There is also a metal sluice gate with a handle at this section that likely to be lifted to open to allow water onto the lower cane fields (Figure 25). The irrigation ditch is overgrown with non-native grasses, and *koa haole* (*Leucaena leucocephala*) in addition to being partially filled with modern trash (polypropylene tarpaulins, wood beams, plastic, etc.) along with a railroad tie (Figure 24)

In order to understand the relationship of SIHP -6775 to previously identified historic properties, the site location map showing sites identified during the Frey and Fredericksen study (2009:Figure 14) was georeferenced using known points and current spatial data for Maui Island TMK parcels (County of Maui 2009). According to the resulting GIS overlays, it appears that SIHP-6478, a historic railroad bed (Frey and Fredericksen 2009:99-100), is located immediately east of SIHP -6775 (Figure 21). However, when examining the spatial relationship of these historic properties in relation to the Pioneer Mill Co. field map, it should be noted that a portion of a railroad bed is shown as running parrallell and adjacent to the west side of SIHP -6775 (Figure 26), which is consistent with observations made during field work conducted for the current study (Figure 23), thus indicating a possible error in the originating site location data for SIHP -6478.

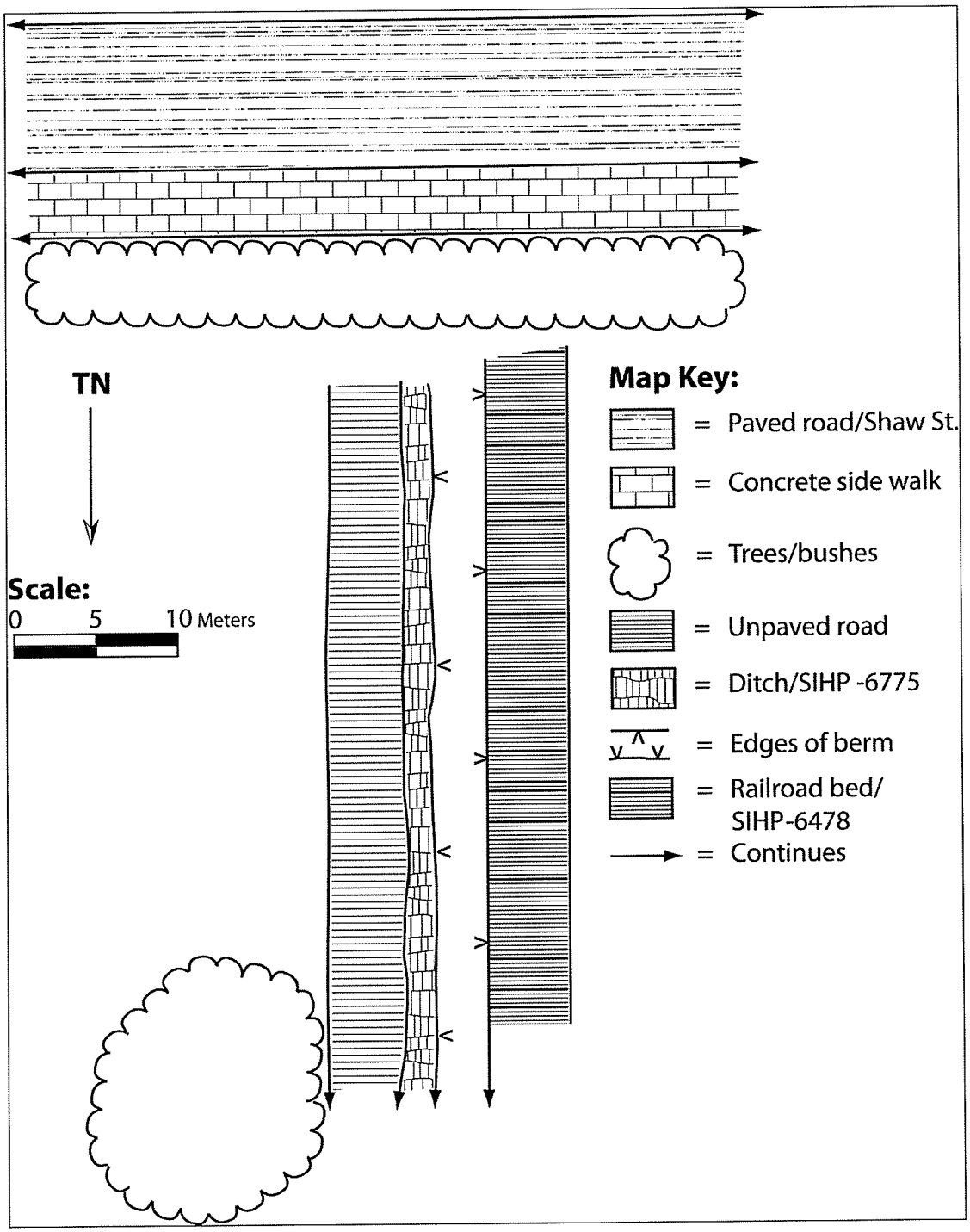

Figure 23. Illustrated field map showing SIHP 50-50-03-6775 in relation to Shaw St. and SIHP -6478.

Figure 24. SIHP 50-50-03-6775, view to the north.

Figure 25. View of the section of SIHP -6775 with boulders and concrete lining, and a metal gate, view to the north. Metal gate is at center left in photo. This section of the ditch is just right outside of the project area to the north.

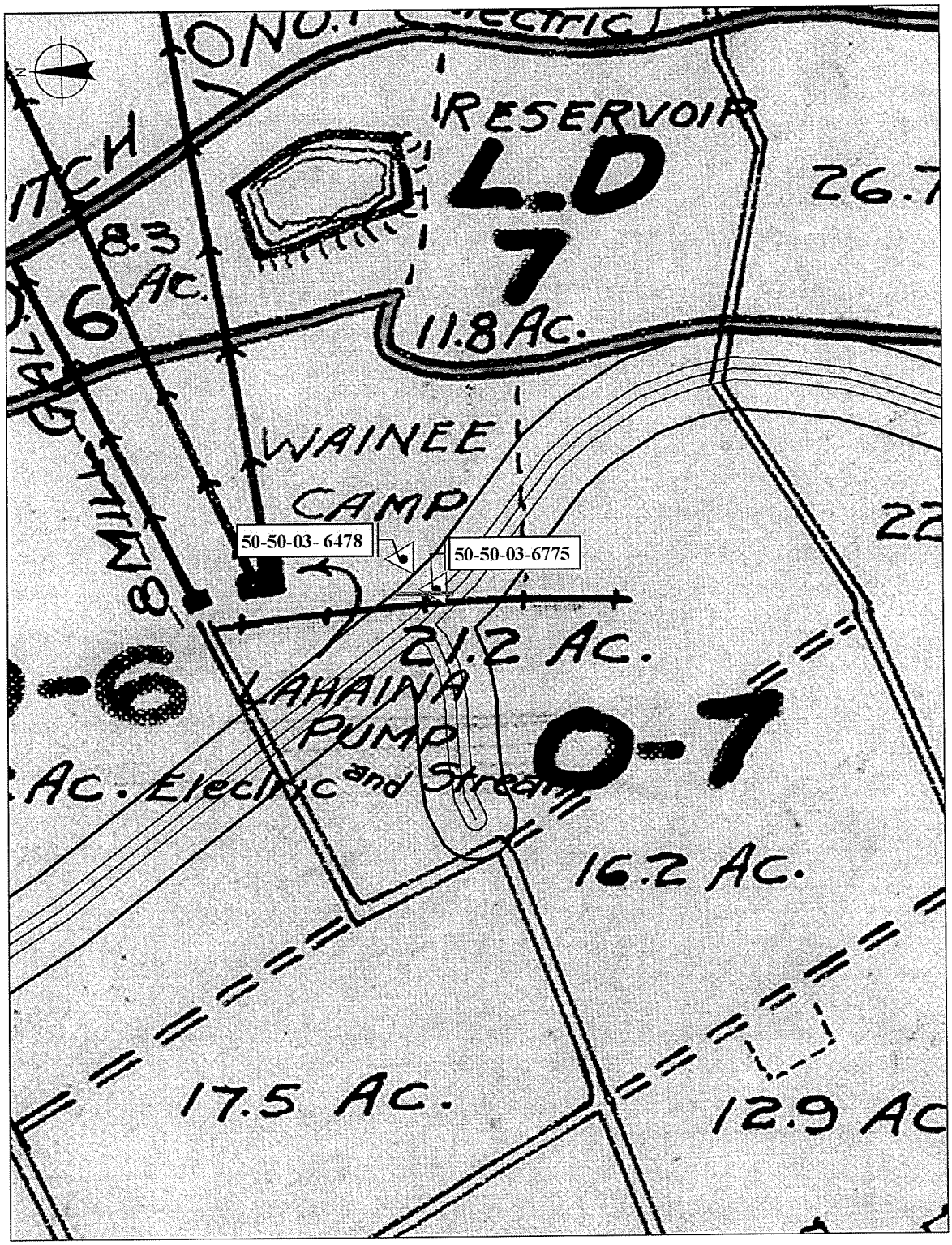

Figure 26. Portion of a Pioneer Mill Co. map showing the location of SIHP 50-50-03-6775 in relation to Waine'e camp and a section of SIHP-6478 (railroad bed) (Pioneer Mill Co n.d). SIHP -6775 is in blue east of railroad bed site

4.1.1.2 SIHP 50-50-03-6776

TEMP SITE #	CSH-4
SIHP #	SIHP 50-50-03-6776, Features A through C
SITE TYPE:	Metal Pipeline
FUNCTION:	Water Control
FEATURES:	3
CONDITION:	Good
AGE	Plantation

DESCRIPTION: SIHP 50-50-03-6776 is a water diversion system consisting of three features related to modifications of the Mill Ditch associated with the Pioneer Mill Company (PMCo). The feature designations represent the order they were encountered not necessarily their date of construction.

Feature A is a pipeline comprised of 3 metal pipes, an 8" pipe atop two 24" (Figure 28). The 8" pipe is partialy encased in a reinforced concrete sleeve. The 24" pipe on the northern side of the pipeline is an irrigation pipe while the other 24" appears to be an overflow pipe as it flows into CMU manhole (CSH-4 Feature B) that diverts the water flow 90° draining it into a nearby dry creekbed.

Feature B measures 1.8 m (6 ft) in length, 1 m (3 ft) wide and 1.75 m (5 ¾ ft) deep covered with a sheet of plywood. A 24" metal pipe runs in from the west and another drains out to the south into a dry creekbed (Figure 29 and Figure 30).

Feature C is a below ground 24" pipe oriented almost north/south (350°/170°), presumably an irrigation pipe that was exposed during subsurface backhoe testing (Figure 31 and Figure 32). It is in the vicinity of the Mill Ditch and shares the same orientation, presumably a modification to the previously mentioned irrigation ditch. This feature was identified at the base of Trench 7 at 1.45 to 1.8 m depth (see appentix B-1 for soil descriptions).

A 1937 PMCo map (Figure 27) shows the Mill Ditch subsequently replaced with underground and aboveground irrigation pipes, presumably after the second World War based on observation of the Concrete Masonary Units (CMU), commonly reffered to as cinder blocks or hollow tile, employed for the construction of Feature B.

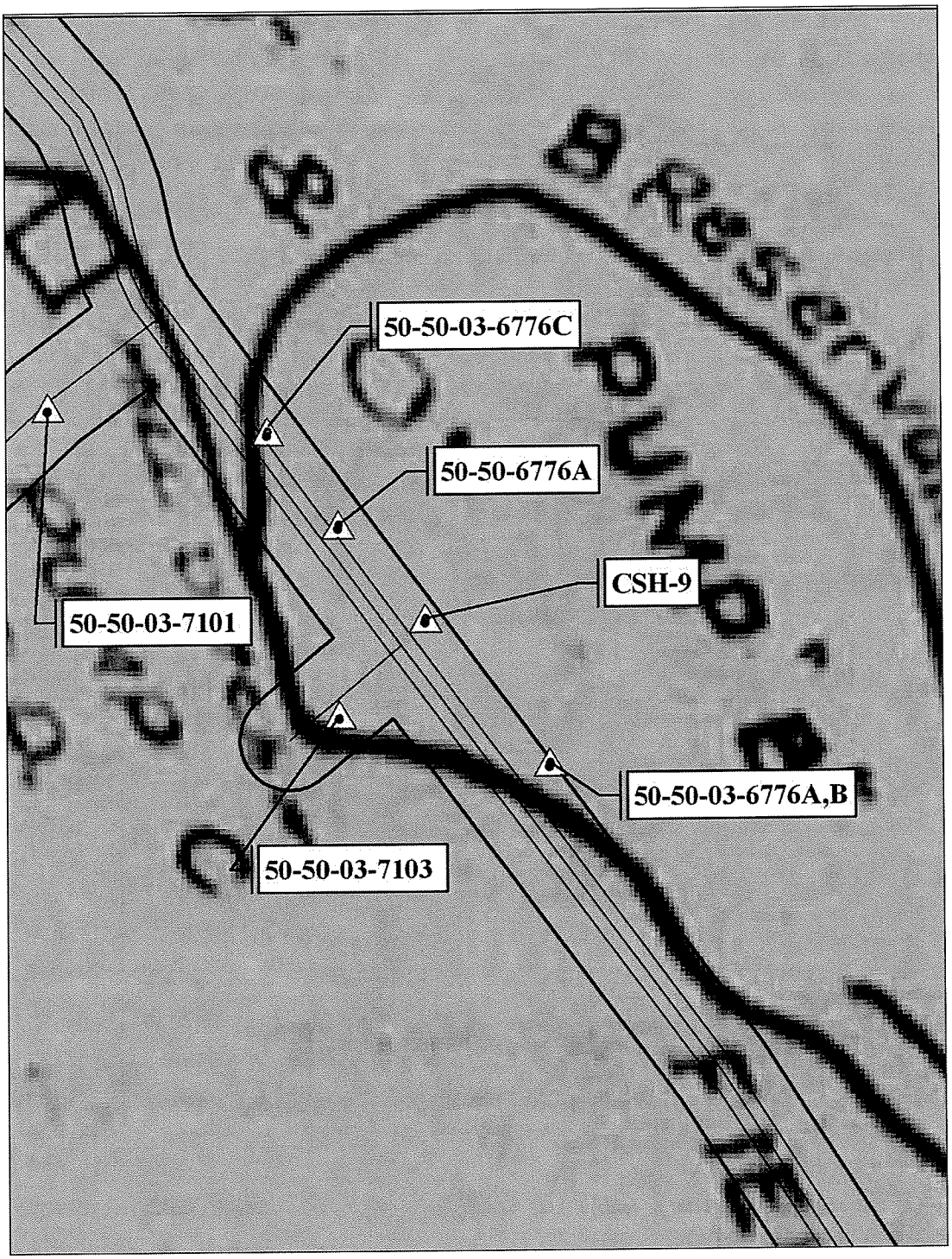

Figure 27. A portion of a PMCo map showing SIHP -6776 A to C in relation to the Mill Ditch (Pioneeer Mill CO Ltd. 1937 (revised 1953)).

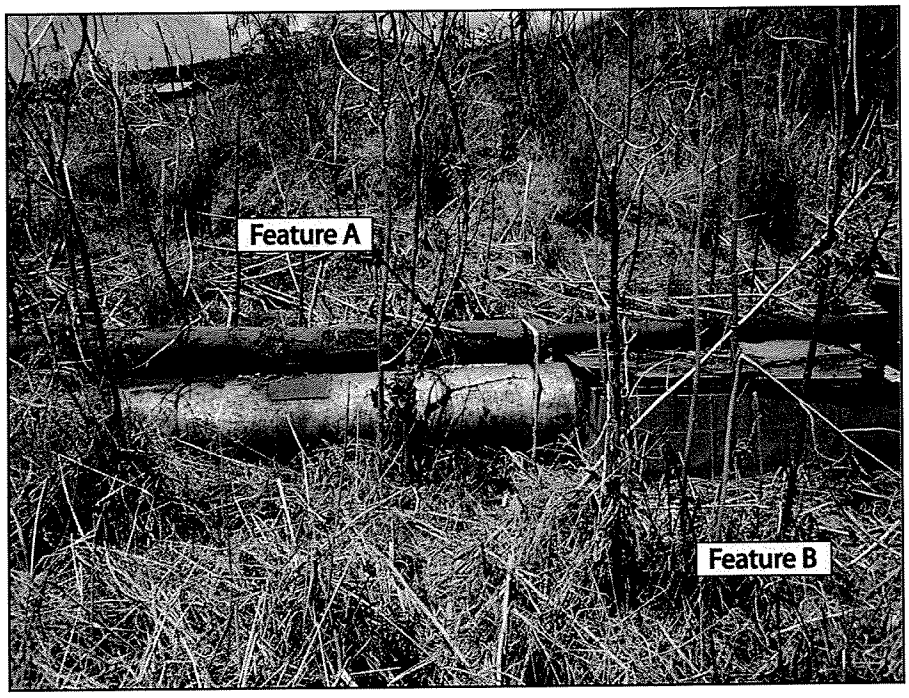

Figure 28. SIHP 50-50-03-6776 Features A and B, view to the north.

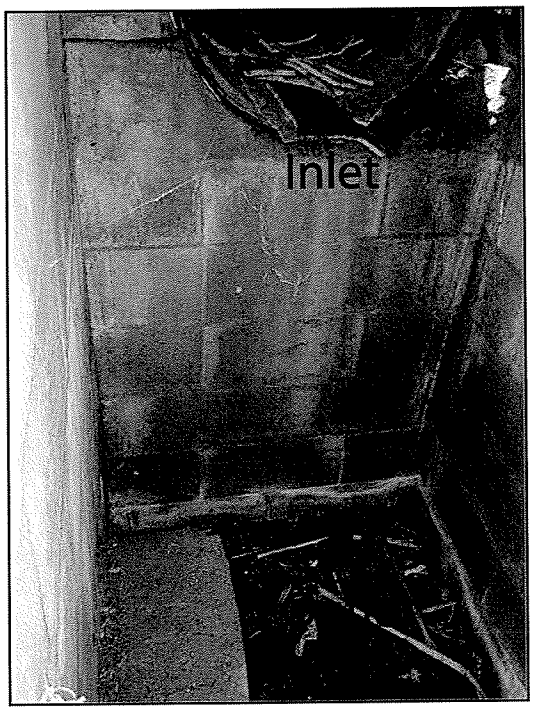

Figure 29. View inside of SIHP 50-50-03-6776 Feature B showing the redirection of the water flow.

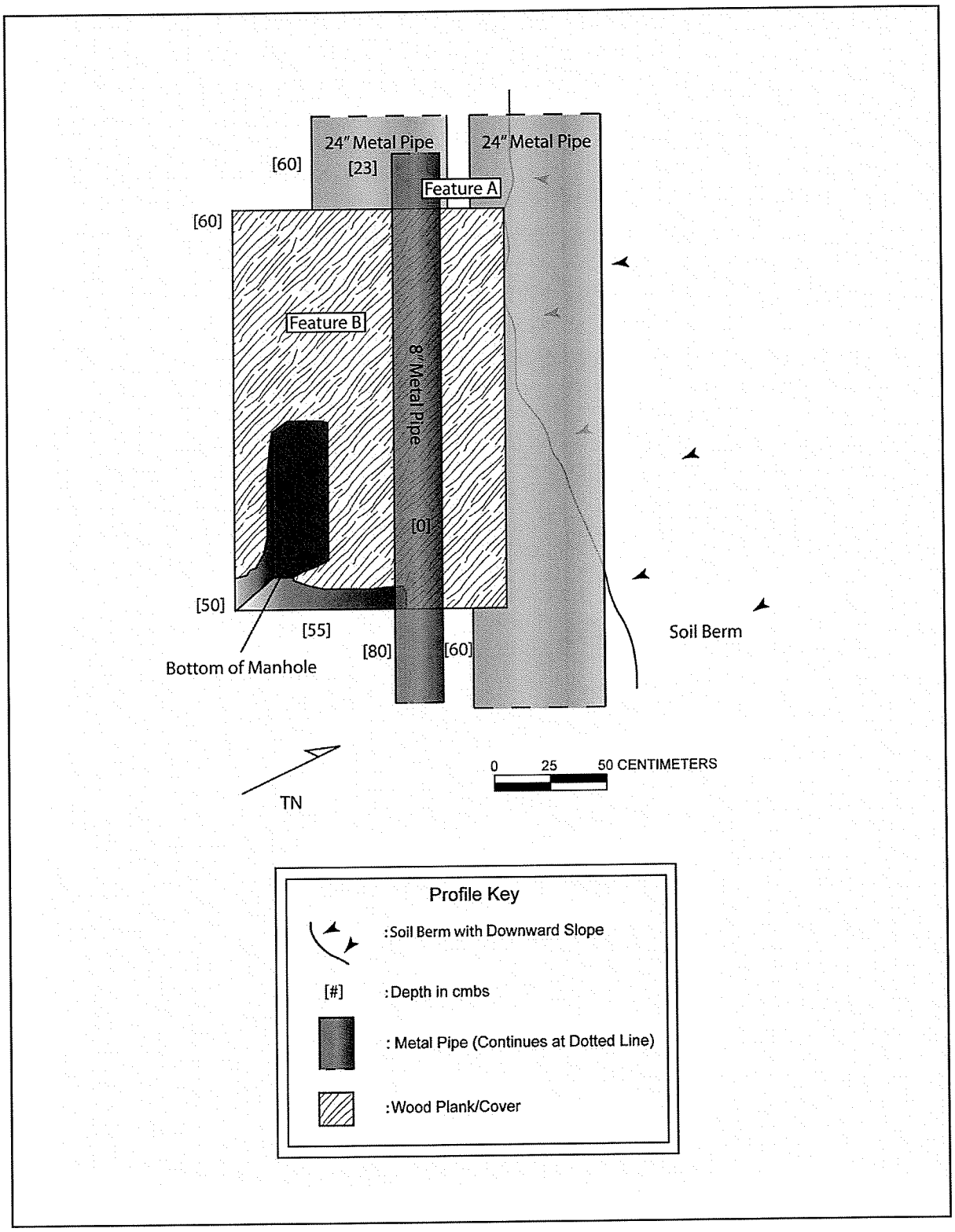

Figure 30. Illustrated field drawing of SIHP 50-50-03-6776 Features A and B, plan view.

Figure 31. Trench 7 view to the east showing SIHP 50-50-03-6776 Feature C at the base.

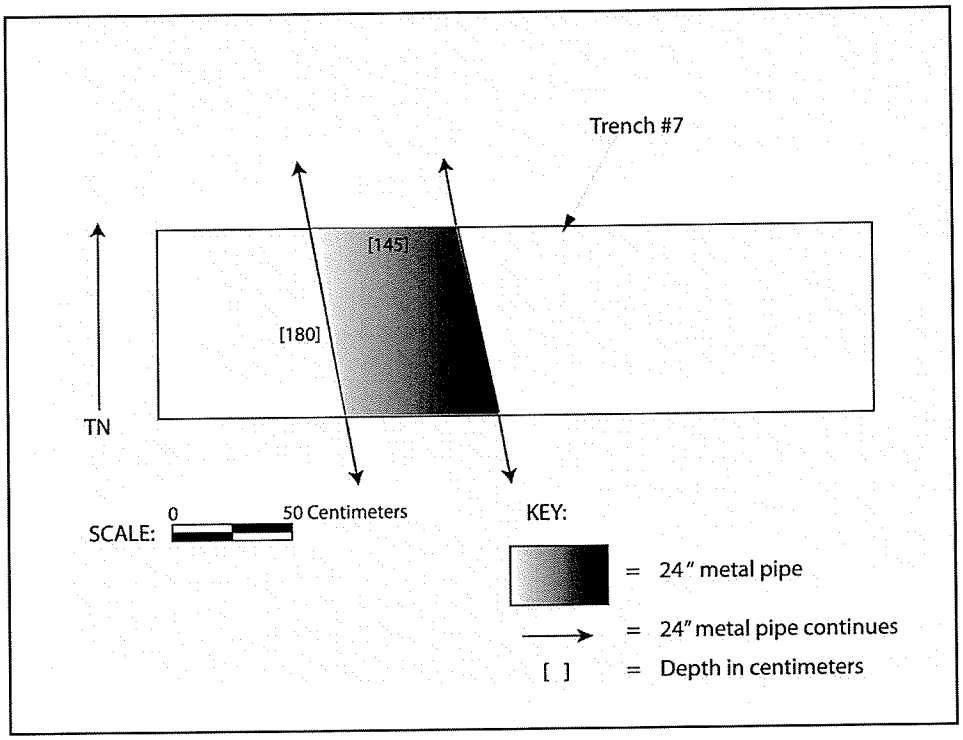

Figure 32. Field drawing of SIHP 50-50-03-6776 Feature C, plan view.

4.1.1.3 SIHP 50-50-03-6777

TEMP SITE #	CSH-5
SIHP #	SIHP 50-50-03-6777
SITE TYPE:	Quonset hut/Building
FUNCTION:	Shelter/Storage
DIMENSIONS:	30 m length by 12 m width
CONDITION:	Good
AGE	Military

DESCRIPTION: SIHP 50-50-03-6777 is one of three quonset huts located on the southwest side of Kuhua St (Figure 20 and Figure 33). All measuring approximately 30 m (100 ft) in length, 12 m in width (40 ft) and 8 m (25 ft) in height.

SIHP 50-50-03-6777 rests atop a concrete foundation approximately 2 m (6 ft) high (Figure 34). It is accessed via two corrogated metal sliding doors at the front of the structure facing Kuhua St and appears to be utilized as a storage facility. A modern carport structure connects SIHP 50-50-03-6777 and SIHP 50-50-03-6778 (Figure 35). This modern structure measures approximately 30 m (100 ft) in length, 13 m (40 ft) in width and 5 m in height. This open ended modern structure is consists of a steel beam frame and corrugated tin roof.

Quonset huts were primarily utilized by the military during the second World War. They were lightweight structures constructed of a corrogated metal over a steel frame that were set directly on the ground or atop concrete foundations dependent on their function. The United States military had little presence in Lahaina during this time as their operations were more restricted to the central isthmus area.

At the conclusion of the second World War the surplus Quonset huts were sold to the public for a nominal fee. These three were most likely purchased from the military and relocated to Lahaina.

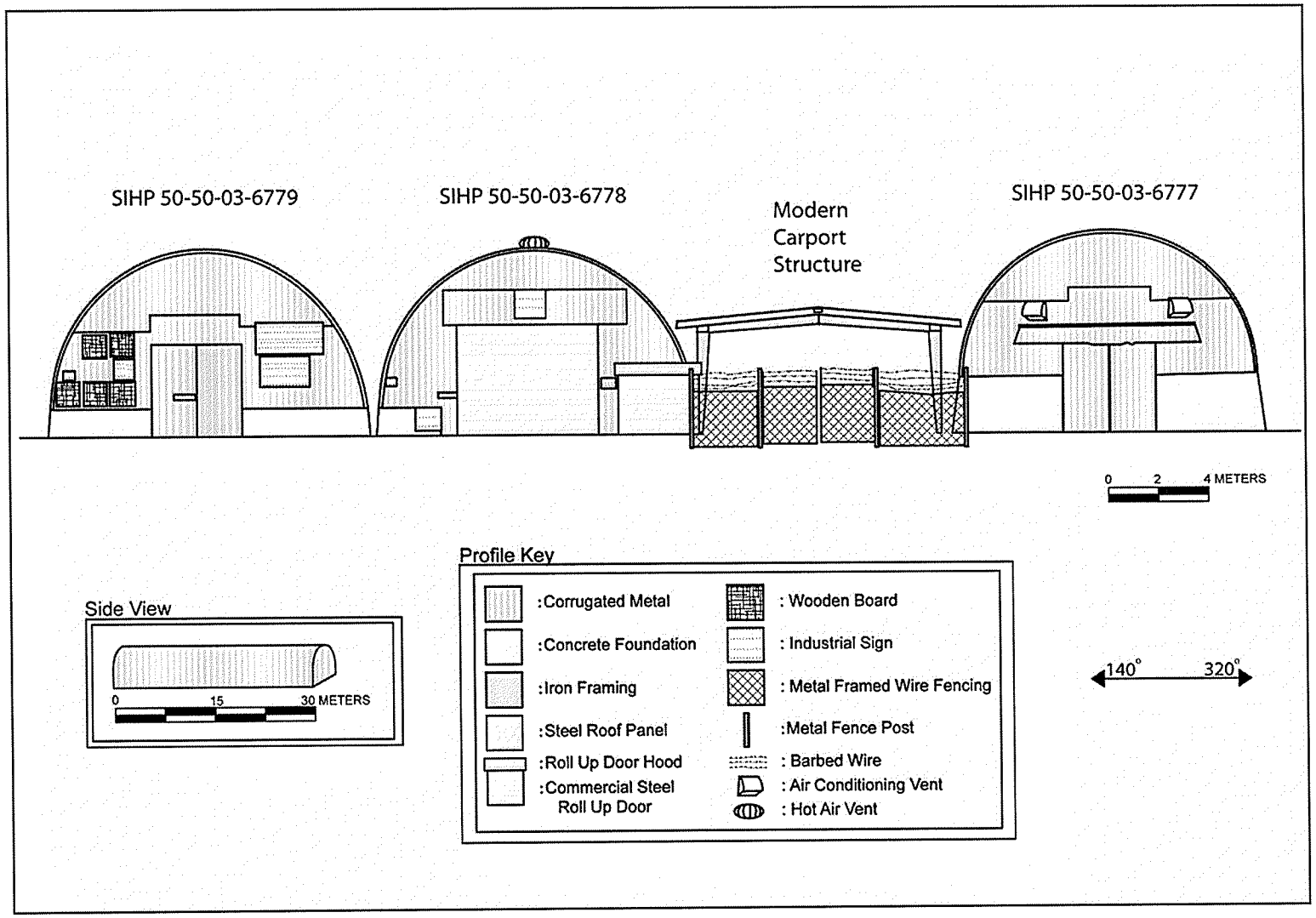

Figure 33. Illustrated field drawing of SIHP 50-50-03-6777, SIHP 50-50-03-6778 and SIHP 50-50-03-6779 viewed south west from Kuhau St.

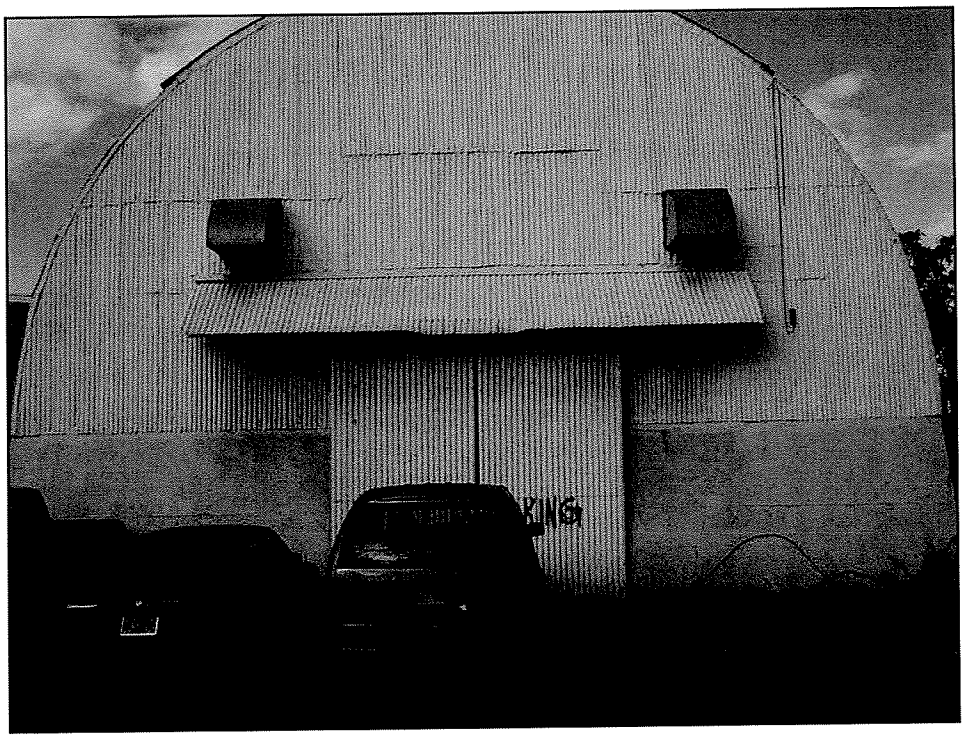

Figure 34. SIHP 50-50-03-6777, view to southwest from Kuhau St.

Figure 35. Modern carport structure located between SIHP 50-50-03-6777 and -6778, view to southwest from Kuhau St.

4.1.1.4 SIHP 50-50-03-6778

TEMP SITE # CSH-7
SIHP # SIHP 50-50-03-6778
SITE TYPE: Quonset hot/Building
FUNCTION: Shelter/Storage/Business
DIMENSIONS: 30.5 m length by 12.5 m width
CONDITION: Good
AGE Military

DESCRIPTION: SIHP 50-50-03-6778 is the second of three quonset huts located along of Kuhua street (Figure 20 and Figure 36). This structure measures approximately 30 m (100 ft) in length, 12 m in width (40 ft) and 7 m (23 ft) in height. SIHP 50-50-03-6778 sits atop a concrete foundation approximately 1 m (3 ft) in height. The front of the building has been modified to accommodate two garage type doors for access and houses the Pacific Paining and Refinishing Co. Similar to SIHP 50-50-03-6777 it was likely purchaced shortly after the second World War from one of the military instalations located on the central isthmus of Maui and relocated to its current location.

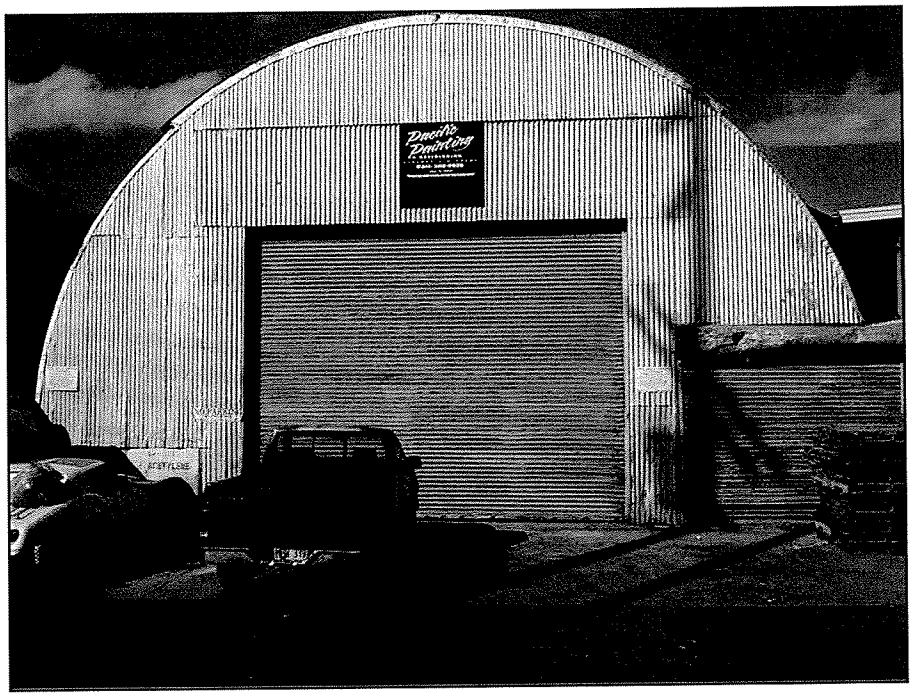

Figure 36. SIHP 50-50-03-6778 view to southwest from Kuhau St.

4.1.1.5 SIHP 50-50-03-6779

TEMP SITE #	CSH-8
SIHP #	SIHP 50-50-03-6779
SITE TYPE:	Quonset hot/Building
FUNCTION:	Shelter/Storage/Business
DIMENSIONS:	30.5 m length by 12.5 m width
CONDITION:	Good
AGE	1940s-Military

DESCRIPTION: SIHP 50-50-03-6779 is the third of a cluster quonset huts facing Kuhua Street (Figure 20 and Figure 37). This structure measures aprproximatley 30 m (100 ft) in length (Figure 38), 12 m in width (40 ft) and 7 m (23 ft) in height. It rests atop a concrete foundation approximately 1 m (3 ft) in height. Its main access is a large set of double doors and currently provides for a number of public services including used furniture sales and auto detailing based on the signs at the front of the building. Like the two nearby quonset huts it was likely purchased form one of the military installation in the central Maui isthmus soon after the end of the second world war and relocated to its current position.

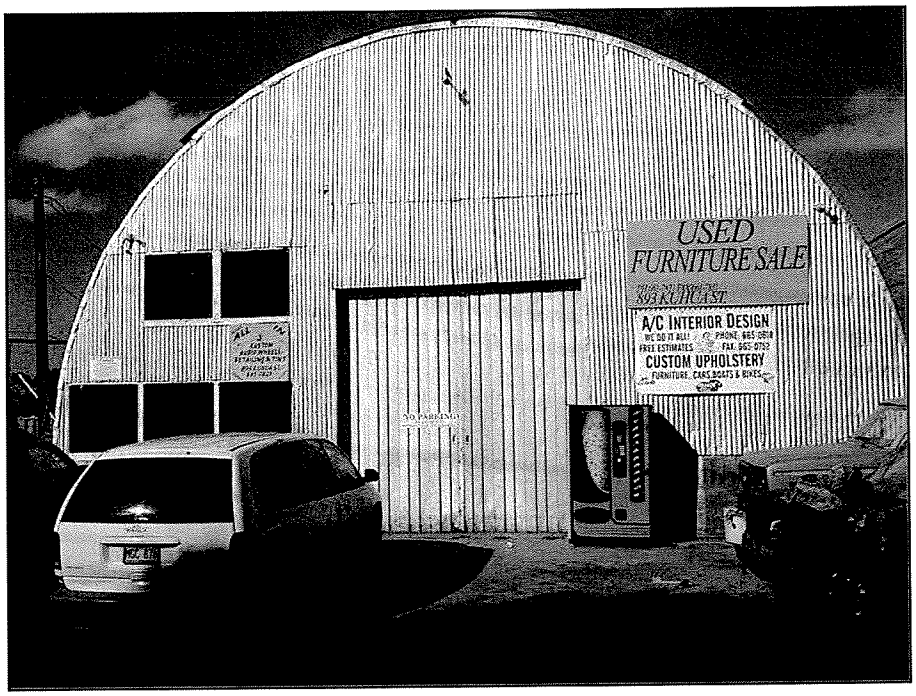

Figure 37. SIHP 50-50-03-6779, view to southwest from Kuhau St.

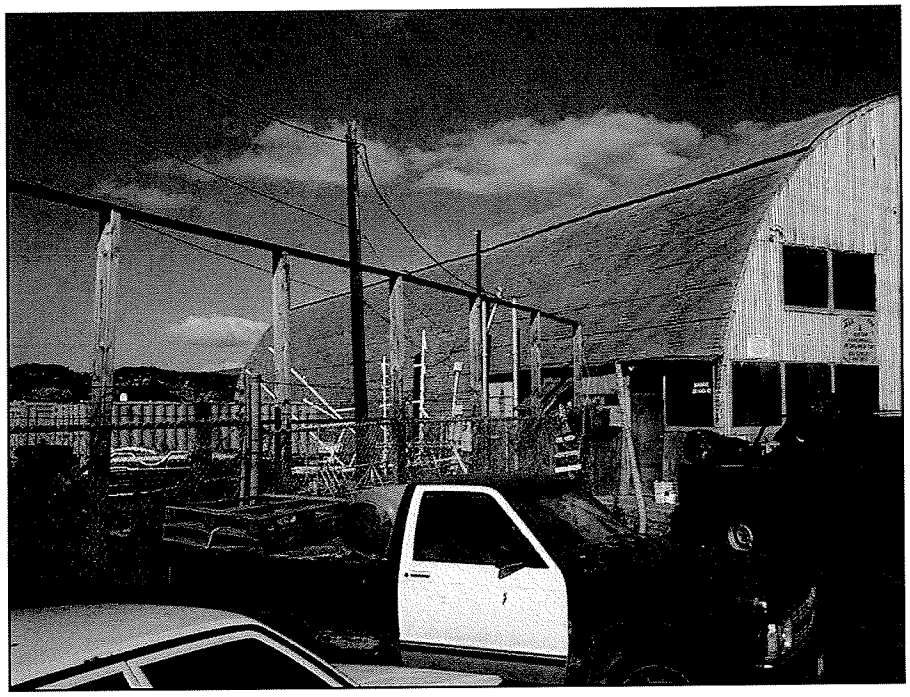

Figure 38. Side view of SIHP 50-50-03-6779, view to west from Kuhau St.

4.1.1.6 SIHP 50-50-03-7101

TEMP SITE #	CSH-10
SIHP #	SIHP 50-50-03-7101 A-C
SITE TYPE:	Walls
FUNCTION:	Transportation/Retaining wall/Property boundary
DIMENSIONS:	Circa 130 m NE/SW by 20.0 m+ NW/SE
CONDITION:	Good
AGE	1944 or early 1900's

DESCRIPTION: SIHP 50-50-03-7101 is a complex consisting of three basalt boulders and concrete or mortar retaining walls that are located within the project corridor on the south side of Lahainaluna Road between Honoapi'ilani Highway and Kuhua Street (Figure 56). These three walls are presumably constructed before or during the second World War based on observation of material used and written dates on the top of one of the walls. This complex measures 130.0 m NE/SW by more than 20.0 m NW/SE.

Feature A consists of a linear and faced retaining wall that extends from the northeast side of Honoapi'ilani Highway to the southwest side of Mill Street along the southeast side of Lahainaluna Road. Feature A measures 82.0 m in length by 0.85 m in width at base of wall and 0.4 m at top of wall. This wall runs roughly in a northeast to southwest direction and is constructed from cut basalt boulders, small subangular basalt boulders and concrete. The cut basalt boulders are stacked up three to six courses high and top off with a single course of small subangular basalt boulders and cobbles with mortar (Figure 39 to Figure 40, and Figure 42). There are two sets of concrete stairs or steps on the south side of the wall, one is 10.0 m

northeast of Honoapi'ilani Highway and the other is stepping down toward a church building. Dates inscribed in the concrete wall read "May 23, 1944" (Figure 41).

Figure 39. Long axis view of SIHP 50-50-03-7101, Feature A, view east northeast.

Figure 40. Profile view of SIHP 50-50-03-7101, Feature A, view northwest.

Figure 41. Top view of SIHP 50-50-03-7101, Feature A with a date, reads "May 23, 1944", view to the southeast.

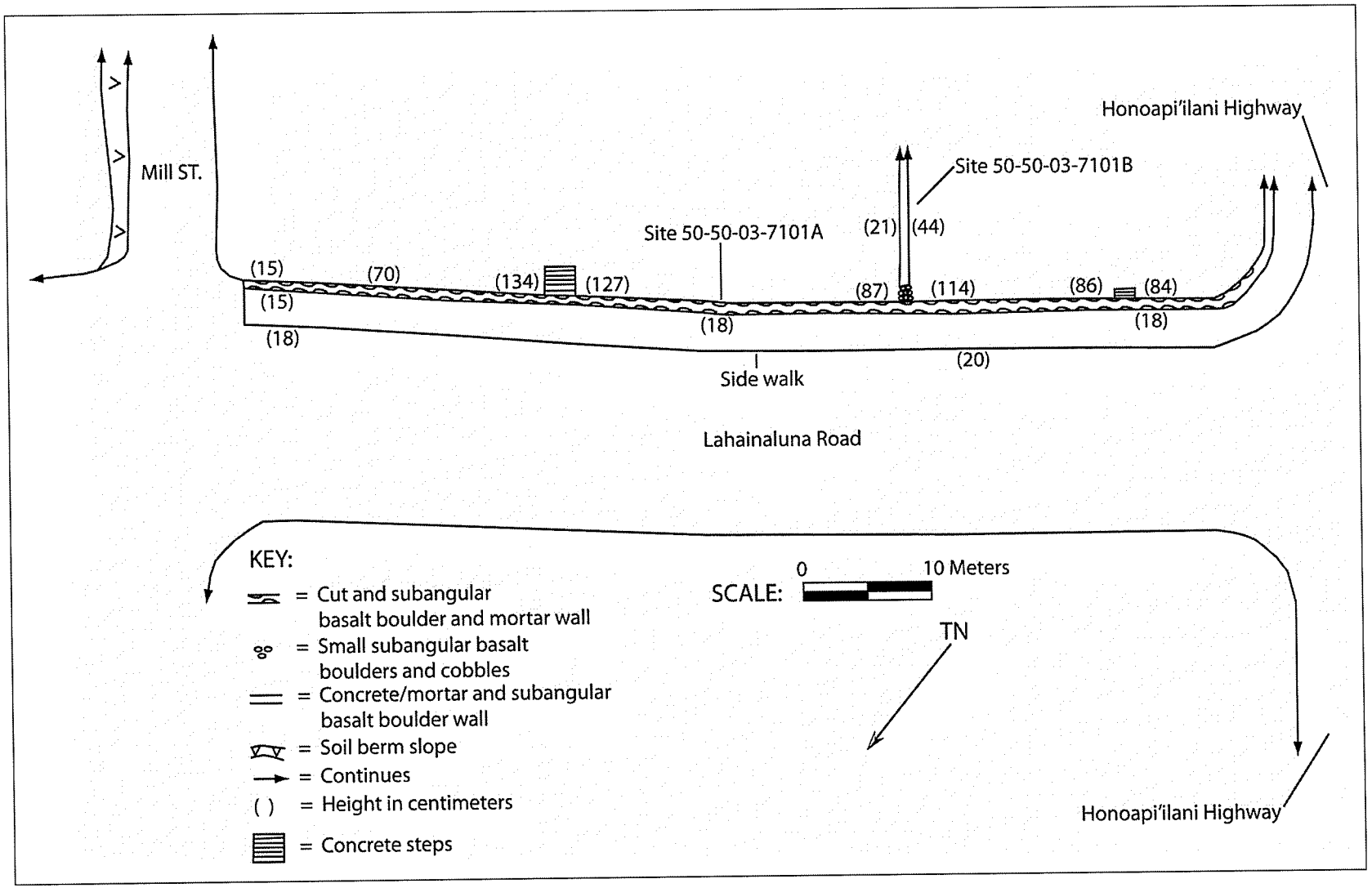

Figure 42. Plan view map of SIHP 50-50-03-7101, Feature A and B

Feature B is located on the south side of Lahainaluna Road between Honoapi'ilani Highway and Mill Street and consists of a linear wall that extends off of the southeast side of Feature A in roughly a northwest to southeast direction. This wall is lower than Feature A and constructed from subangular basalt boulders and concrete. The boulders are stacked up four courses high to a maxim height of 0.44 m on the southwest side and 0.21 m on the northeast side. The width of this wall is 0.65 m at both the base and the top and the top is flat and covered with concrete. There is a roughly 1.5 m space or opening between this feature and Feature A and this space is filled with small subangular basalt boulders (Figure 42 and Figure 43). The function of this wall is probably property boundary wall which might have been associated with the Pioneer Mill.

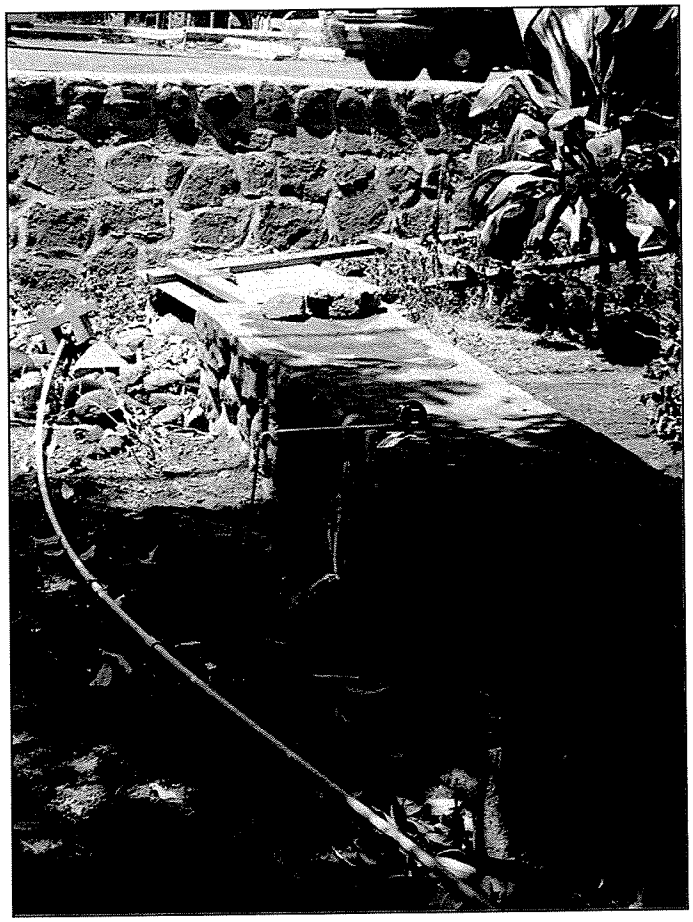

Figure 43. View of SIHP 50-50-03-7101, Feature B, view to the north northeast.

Feature C is located along the southeast side of Lahainaluna Road between Mill Street and Kuhua Street and consists of a very low, linear and partially destroyed wall that runs in roughly a northeast to southwest direction. This wall is constructed from subangular basalt boulders and concrete. The boulders are single course high and topped off with concrete. The maximum height on the northwest side of the wall is 0.13 m and on the southeast side is 0.1 m. A low concrete side walk at the front of the wall on the southwest side of Lahainaluna Road is beneath asphalt (Figure 44 to Figure 45). It appears that there might have been fill around this wall due to that only 0.13 m (13 cm) of this wall is sticking up from the asphalt and ground surface. The fill

might have been related to improvements of resurfacing of Lahainaluna Road and during the demolition of the Mill.

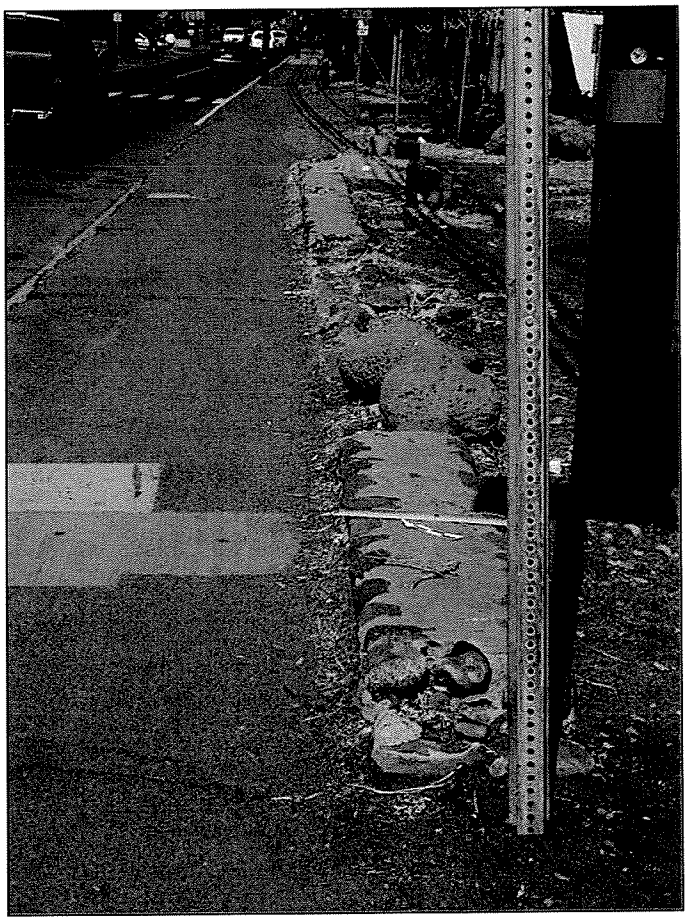

Figure 44. Long axis view of SIHP 50-50-03-7101, Feature C, view to the northeast.

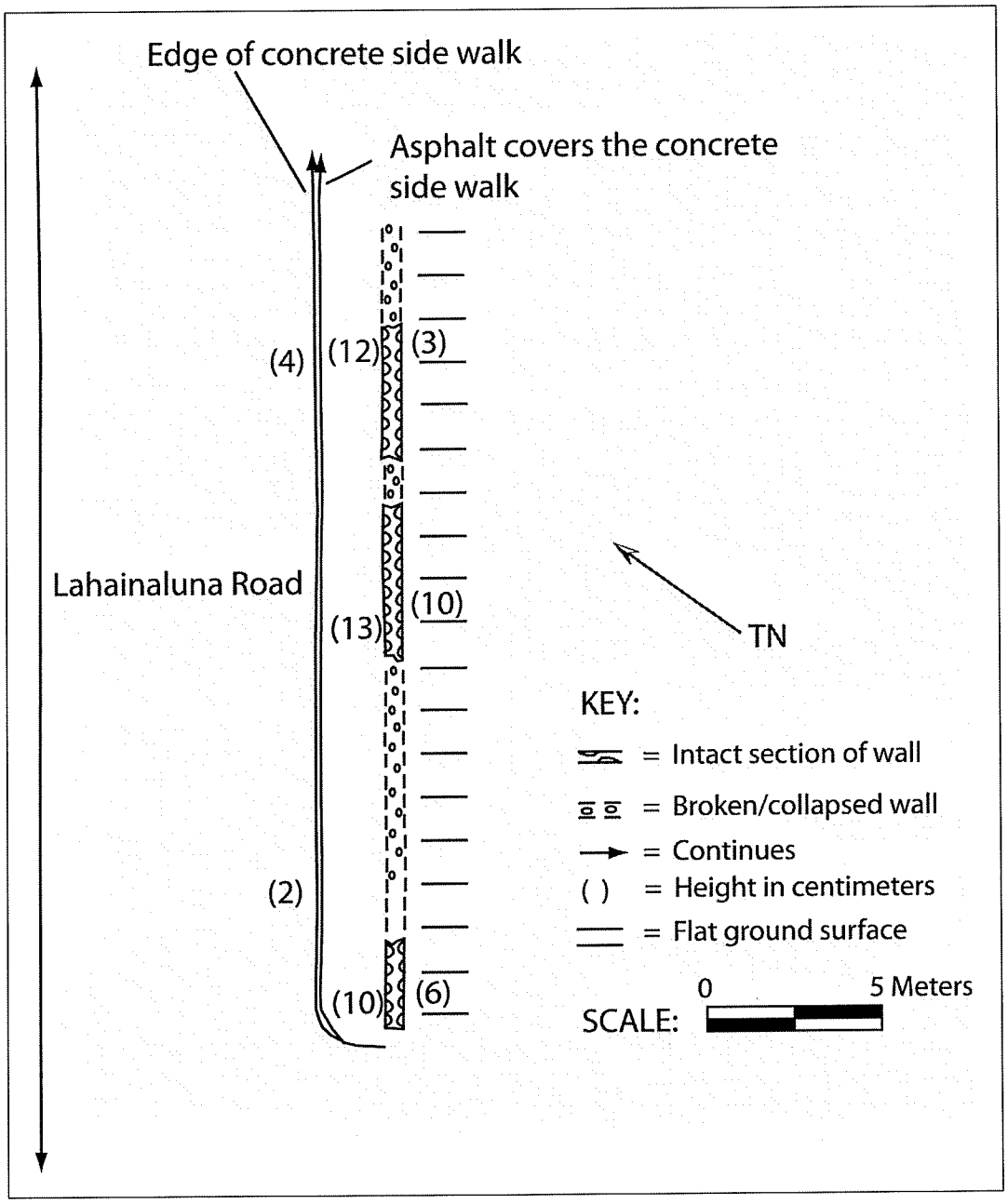

Figure 45. Plan view map of SIHP 50-50-03-7101, Feature C

4.1.1.7 SIHP 50-50-03-7102

TEMP SITE # CSH-11
SIHP # SIHP 50-50-03-7102
SITE TYPE: Human skeletal remains
FUNCTION: Burial
DIMENSIONS: 0.35 m length by 0.2 m in thickness
CONDITION: Poor
AGE: Possible pre-contact

DESCRIPTION: Site 50-50-03 7102 consists of a previously disturbed possible pre-contact burial that was identified during the subsurface testing of the southwest portion of the project corridor (Figure 20 and Figure 22). The *in situ* remains were observed in the west wall of Backhoe Trench 78 at the boundary of Stratum II and III at depth of 1.1 to 1.3 meters below surface (mbs). Both Strata II and III represent a river or flood deposit and contained small to medium sub-angular and sub-rounded water worn basalt boulders, cobbles and gravels. These types of deposits suggest that the remains may have been previously disturbed by river and/or storm deposits. Additionally, there is no visible pit outline associated with the remains in the trench wall. The remains in the west wall of Trench 78 are fragments of an innominate and a femur bone which were recently disturbed from the mechanical testing (Figure 46 to Figure 47).

The back dirt from Trench 78 was screened through 1/8 inch screen with the intention to recover additional human remains as well as any artifacts that might indicate age or time period. Cranium fragments, long bone fragments as well as teeth were recovered from the backdirt screening. Old breakage observed on the edge of the recovered bone fragments suggested that the remains had been previously disturbed. There is no evidence from the sifted soil that would indicate these human skeletal remains were associated with post-contact burial practices. The remains recovered from the screened soil were placed in brown paper bag, placed near the *in situ* portion of the burial in Trench 78 and covered with a thin layer of soil. Trench 78 is located in L.C.A. Award 6177 to Kahili and later Grant Award 8193 to Pioneer Mill Co., Ltd. for a Cemetery Site (see Figure 96 for trench location). However, as noted above there was no evidence that would suggest these human remains were associated to this Pioneer Mill cemetery.

Figure 46. View of section of the east wall of Trench 78, view to the east (note: burial find identified in the west wall of Trench 78).

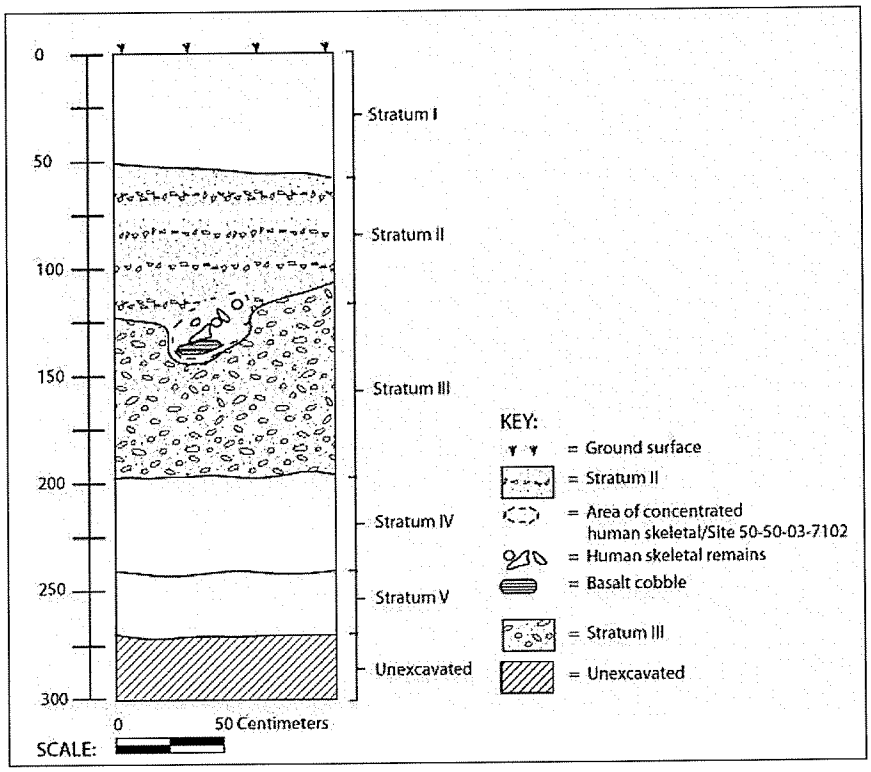

Figure 47. Profile map of the west wall of Trench 78 with SIHP 50-50-03-7102

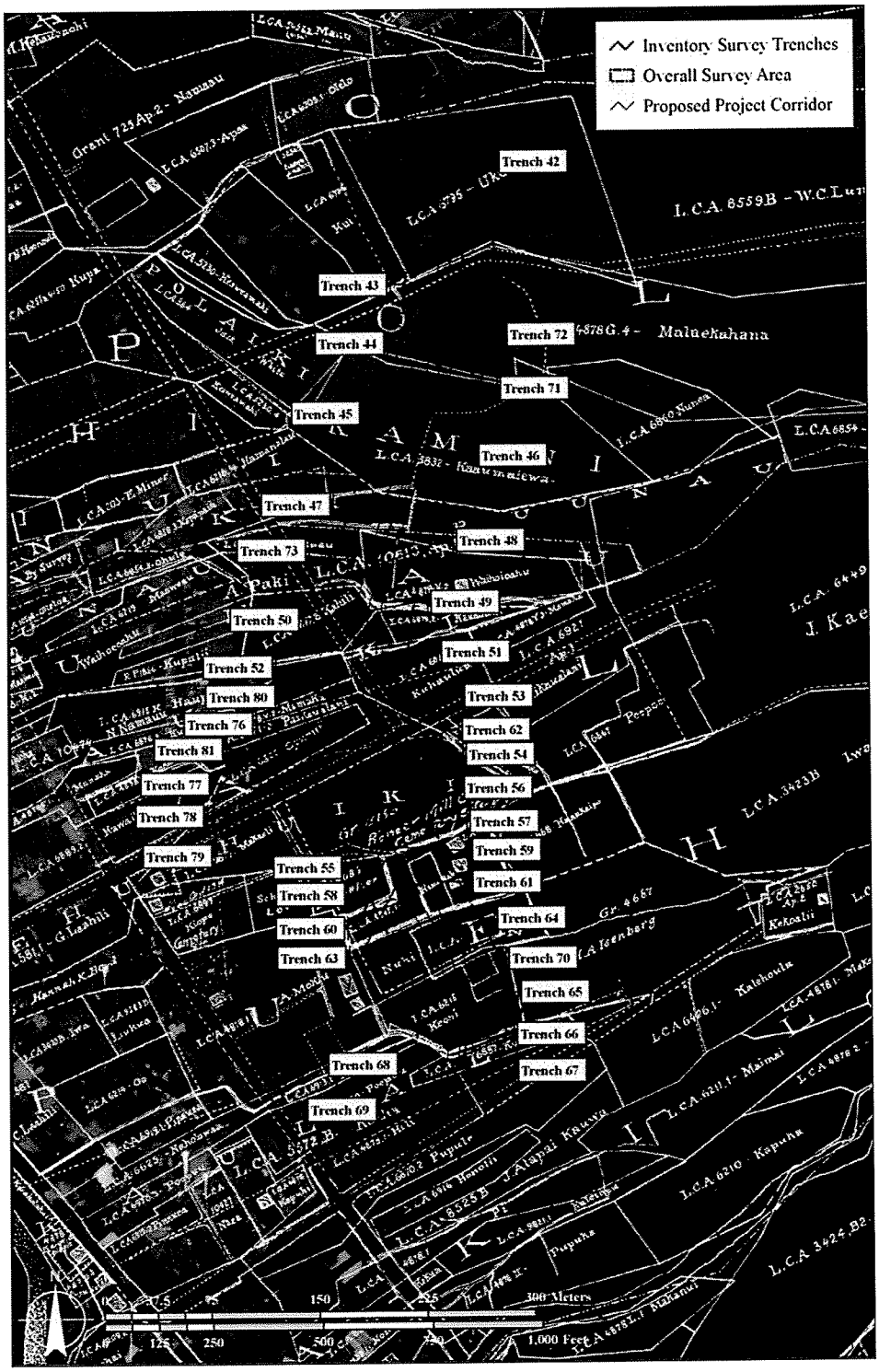

Figure 48. A portion of the 1883 S.E. Bishop map showing the location of backhoe trenches in relation to Land Commission Awards (LCAs) within the southern portion of the current project corridor between Shaw Street and the southeast end of Front Street (adapted from Bishop 1883).

4.1.1.8 SIHP 50-50-03-7103

TEMP SITE #	CSH-12
SIHP #	SIHP 50-50-03-7103
SITE TYPE:	Ditch/drainage
FUNCTION:	Water control
DIMENSIONS:	49.0 m E/W by 1.25 N/S
CONDITION:	Good
AGE	Historic Plantation

DESCRIPTION: SIHP 50-50-03-7103 consists of a roughly linear segment of drainage/ditch that is located on the east end of Dickenson Street (Figure 56). This segment of ditch is constructed from a depression in the soil that is lined with cut basalt boulders and concrete or mortar. The section of this ditch that runs under or beneath the road and extends out 7.3 m to the east and is constructed from cut basalt stones stacked up to three courses high to a maximum height of 0.6 m. Poured concrete caps the cut boulders that extends up for addition 0.6 m. Overall depth of this feature is 1.2 m. A separate 13.5 m section extends further east and is concrete lined with the remaining eastern portions completely filled in.

A low concrete wall is located atop the eastern end of the ditch and capped by a 24" octagonal shaped concrete slab is on top of this wall. The section of ditch on the western side of the road has an L-shaped wall constructed from hollow concrete blocks stacked up two courses high to a maximum height of 0.4 m from the road surface. A semi-rectangular wooden cover tops this L-shape wall. This cover is constructed from milled wood of 2" thick by 11" wide boards. This western side or end of the ditch is completely filled in. There is a 6 inches black rubber or PVC pipeline at the base of ditch in the eastern section (Figure 49 and Figure 50). This ditch is likely a section of the Mill Ditch constructed by Pioneer Mill Co.

Figure 49. View of the eastern end of SIHP 50-50-0-03-7103, view to the southeast.

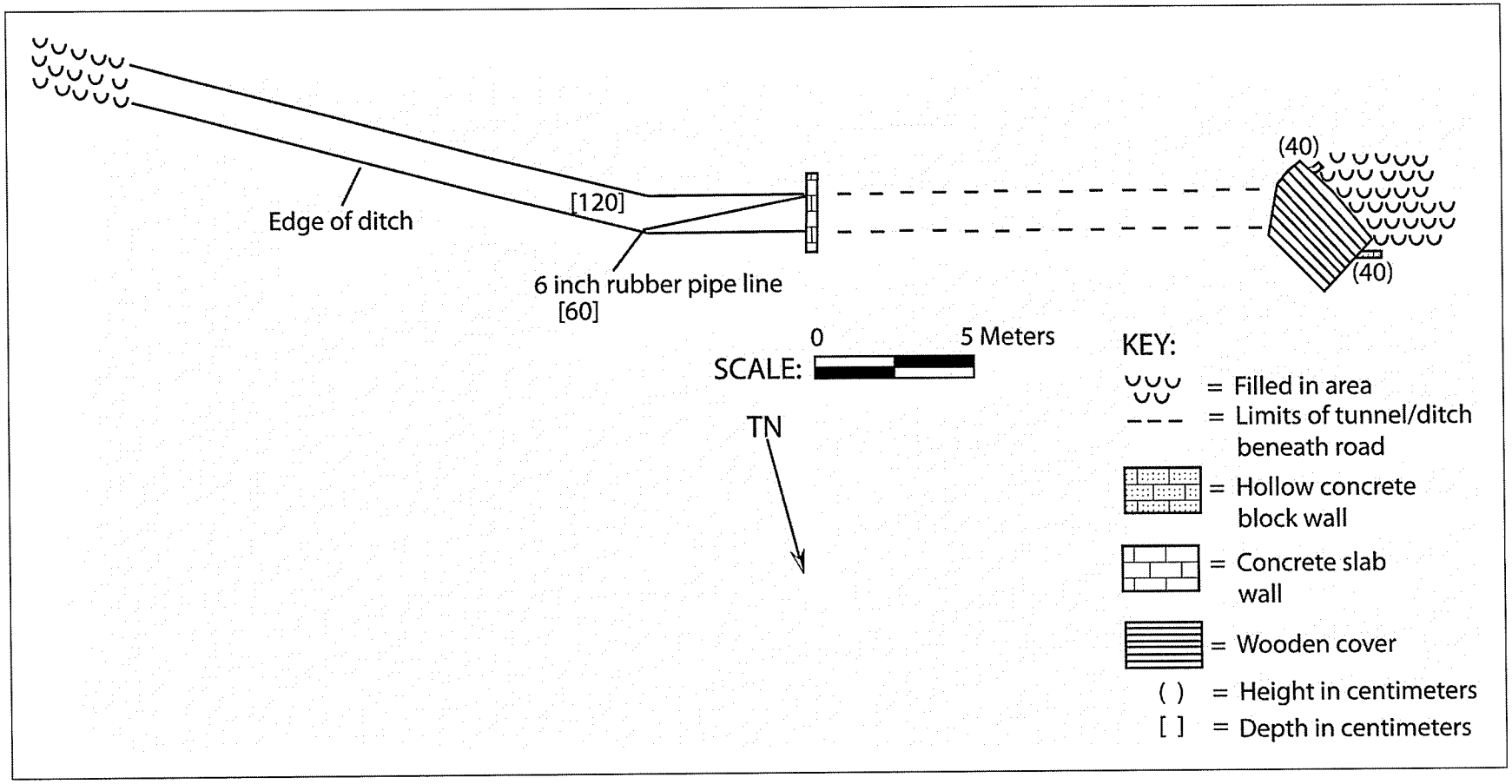

Figure 50. Plan view map of SIHP 50-50-03-7103

4.1.1.9 CSH 3 an isolated find/artifact

TEMP # CSH-3
SITE TYPE: Concrete Block Columns Supports
FUNCTION: Indeterminate
DIMENSIONS: 35 cm m by 70 cm
CONDITION: Good
AGE Indeterminate/Probable modern

DESCRIPTION: CSH-3 consists of two columns constructed of hollow tile concrete blocks observed in an earthen berm just south of an unimproved road that lead to Lunaville Camp. The earthen berm is associated with one of three swales that were dug out as part of flood control efforts by the Army Corp of Engineers in the 1980's (Figure 51). The columns rise nearly two thirds of the way to the top of the ridge and have sustained damge consistent with heavy machinery disturbance that possibly occured during the construction of the berm (Figure 52 and Figure 53). Constructed of Concrete Masonary Units (hollow tile), the colums were most likely constructed after WWII and appear to be supports for a water pipe or similar plantation related structure. Or these columns might have been associated with the construction of the flood control berms during the 1980's, probably some kind of supports for the soil berm.

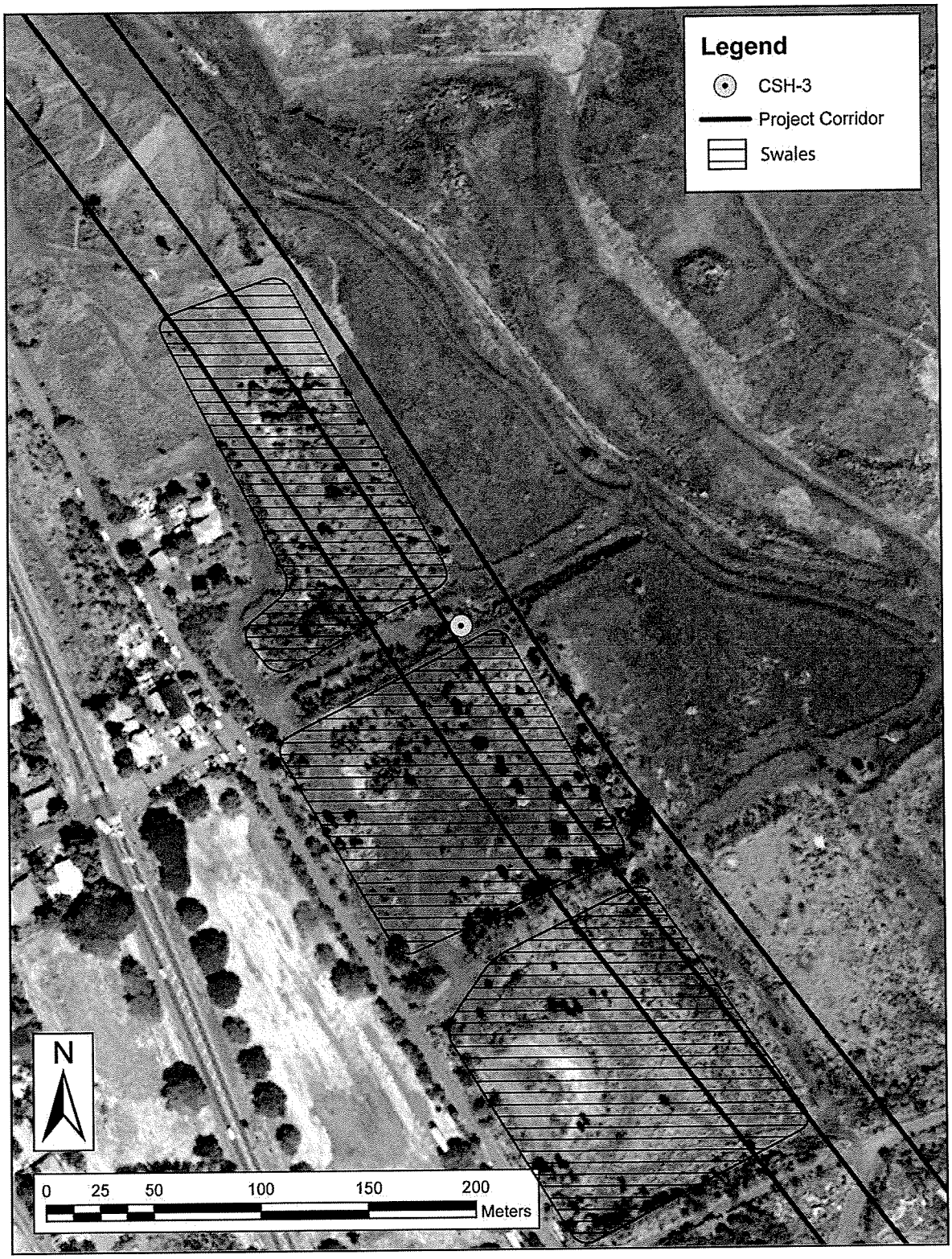

Figure 51. Client supplied aerial view showing the location of CSH-3 in relation to the dugout swales and the survey corridor.

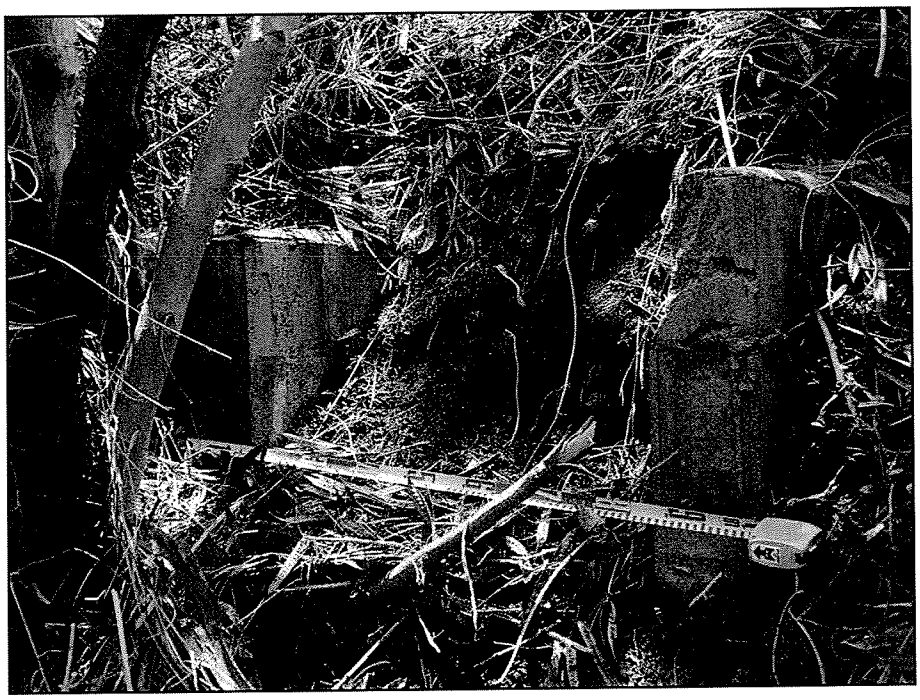

Figure 52. CSH-3, view to the south.

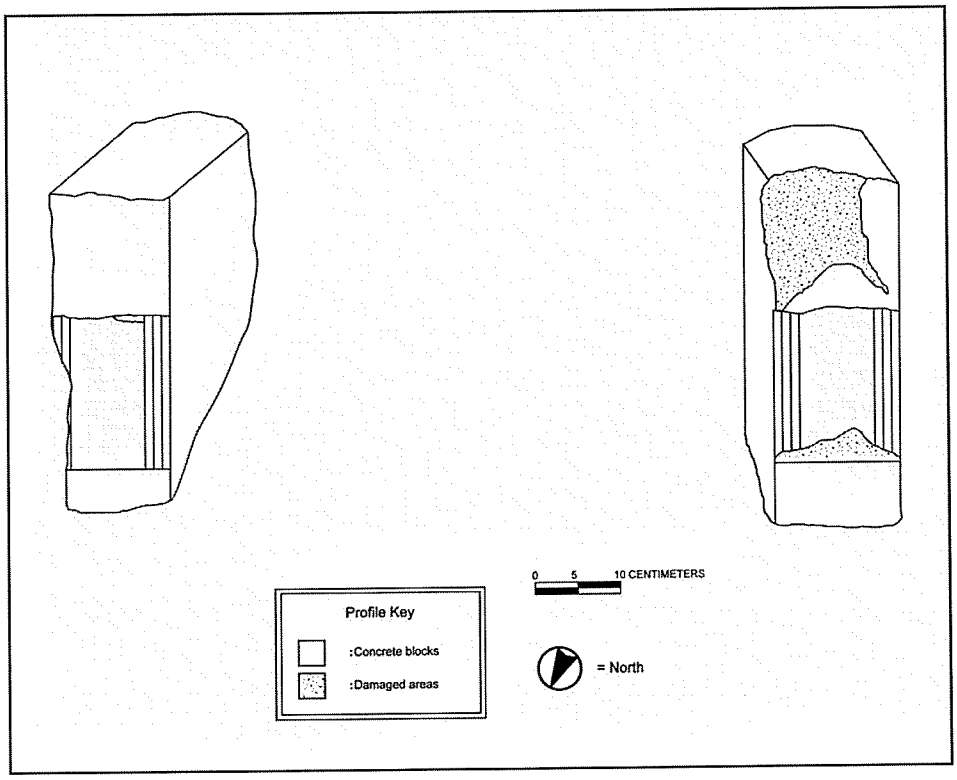

Figure 53. Illustrated field drawing of CSH-3

4.1.1.10 CSH 9 an isolated find or artifact

TEMP # CSH-9
SITE TYPE: Concrete utility pole
FUNCTION: Concrete utility pole
DIMENSIONS: 0.27 m length by 0.19 m width by 2.55 m height
CONDITION: Remnant
AGE Plantation

DESCRIPTION: CSH-9 is the remnant of a rebar reinforced concrete utility pole located on the south east side of an unimproved road leading to Puanau Park (Figure 54 to Figure 56). It is in line with a modern telephone line located further to the notheast. Reminiscent of an obelisk, the utiliy pole is rectangular shape and currently rises 2.55 m (8 ft) in height. An estimate based on the exposed rebar indicates the utility pole was originally at least 9 m (30 ft) in height. The immediate area is overgrown by non-native grasses and koa haole. This concrete pole is sticking up from the top of a linear soil berm. The berm is more than 15.0 m long by 4.5 m width and by 1.0 m in height. This artifact (the concrete utility pole) is associated with the Pioneer Mill Co. and was constructed presumably during the 1920's based on reference to the transmission lines in the Managers report for 1921 stating "replacing wooden poles with concrete as needed" (Pioneer Mill Company 1922:12).

Figure 54. CSH-9, view to the southeast.

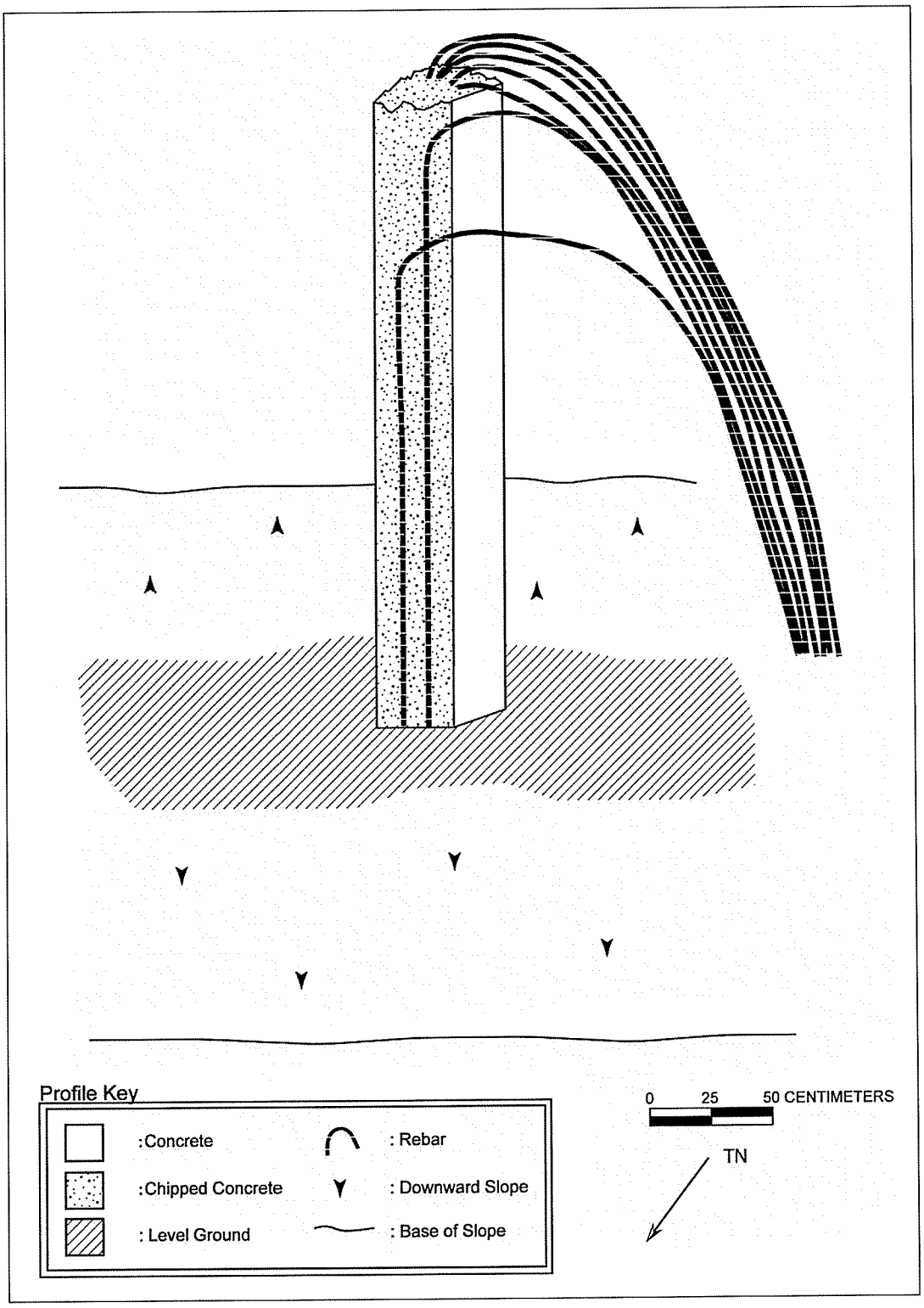

Figure 55. Illustrated field drawing of CSH-9.

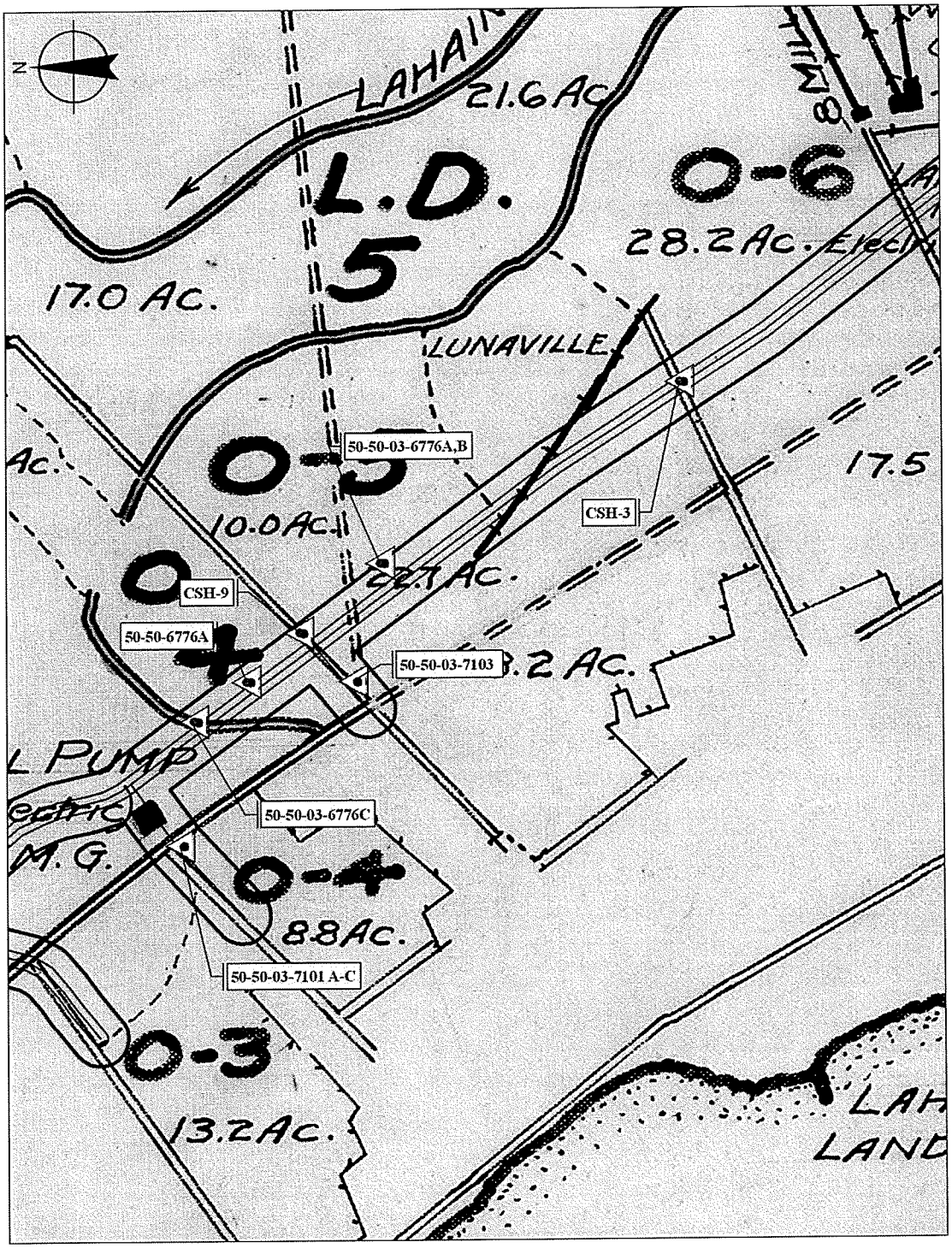

Figure 56. A portion of a Pioneer Mill Co. map showing CSH-3, CSH-9, SIHP -6776 A-C, -7101 A-C, and -7103 in relation to Lunaville.

4.2 Subsurface Testing Results

Due to the numerous LCA's within the project corridor it was our intention to assess each LCA with at least one backhoe trench. Due to existing structures, modern drainage swales, and underground utilities, among other limiting factors only 51 of the 87 planned backhoe trenches within the current project area were excavated. Each trench was oriented in either a north-south or east-west direction in order to obtain the best representative overview of the soil stratigraphy. All trenches averaged 6 m (20ft) long by 1m wide (3ft) and were excavated to either bedrock or C Horizon soils. The soil and trench sidewalls were inspected for cultural remains during and after the excavation process. This section provides a summary of the excavated backhoe trenches as well as explanations for the unexcavated trenches.

For reporting discussion purposes, the project corridor was divided into the following three areas:

- Area 1 is the portion of the corridor from its origin at Keawe St. south to Dickenson St (Figure 57),
- Area 2 extends from Dickenson St. to Shaw St (Figure 79), and
- Area 3 extends from Shaw St to the southern terminus of the project corridor at Front St (Figure 96).

A representative sample of the soil stratigraphy of each area is presented below. A detailed stratigraphic summary of all of the excavated trenches is available in Appendix B.

Results of the subsurface testing of this study will be evaluated along with the results of subsurface testing from Frey and Fredericksen (2009) where applicable, as 26 of their backhoe trenches were located within the current project corridor. The majority of the extent of the current study area overlaps the 2009 investigation.

4.2.1 Area 1 – Keawe Street to Dickenson Street

Area 1 traverses an urban/industrial area of Lahaina (see Figure 11 and Figure 57). Prominent built features include a business complex near Keawe St, the base yard of Hawaiian Dredging Construction Company, storage for Maui Disposal and the previous site of the Pioneer Mill; as well as a residential area along Kuhua St. Twenty four backhoe trenches were planned in the Area 1, only 13 were excavated due to the inaccessibility from buildings, roads, storage areas, etc. A summary of all of the backhoe trenches including explanations as to why some were not excavated is available in Table 6. The following section provides the results of testing with representative soil profiles and stratigraphic descriptions for five backhoe trenches and a manually excavated 1 m by 1 m square test unit. (See Appendix B-1 for full soil descriptions and profile).

Table 6 Summary of Backhoe Trenches Located in Area 1 (Keawe St and Dickenson St.).

Trench ID	Comments	Trench ID	Comments
0	In push pile area.	**12**	Excavated 5/3/10
1	Could not access with machine – Not Excavated	**13**	Maui Disposal container storage area –Not Excavated
2	Excavated 5/5/10	**14**	Maui Disposal container storage area –Not Excavated
3	Excavated 5/5/10	**15**	Could not access area with machine –Not Excavated
4	Located within PMCo settling pond –Not Excavated	**19**	Vehicle and equipment storage area –Not Excavated
5	Excavated 5/5/10	**20A**	Excavated 5/3/10
6	Excavated 5/5/10	**20B**	Ecavated 3/9/11
7	Excavated 5/5/10	**21**	Excavated 5/3/10
8	Hindered by electrical line –Not Excavated	**22**	Excavated 5/3/10
9	Excavated 5/5/10	**23**	Hawaiian Dredging base yard and storage area –Not Excavated
10	Excavated 5/5/10	**24**	Hawaiian Dredging base yard and storage area –Not Excavated
11	Excavated 5/3/10	**25**	Located on access road for Kahoma Stream –Not Excavated

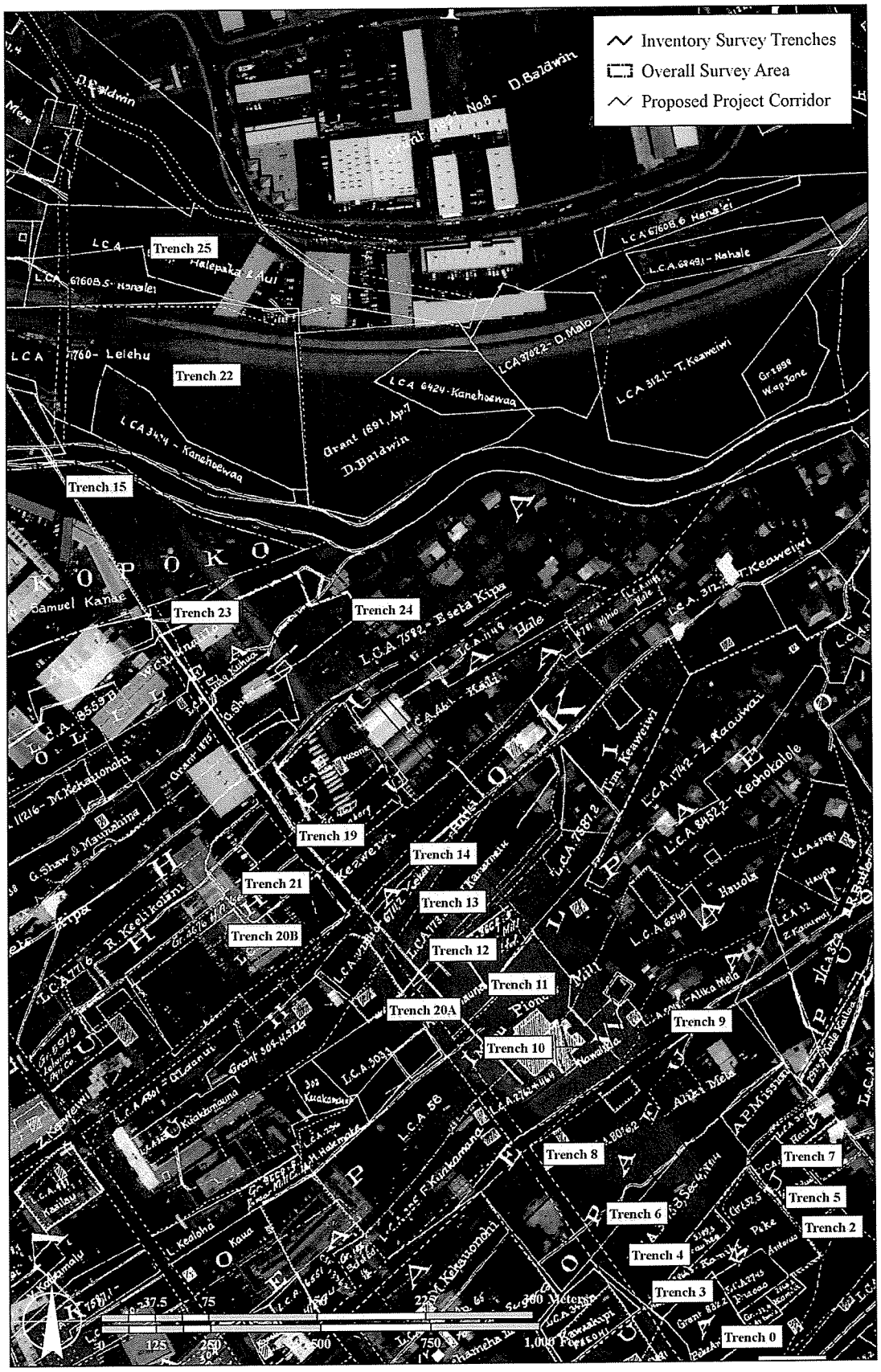

Figure 57. A portion of the 1883 S.E. Bishop map showing the location of backhoe trenches in relation to Land Commission Awards (LCAs) within the northwestern portion of the current project corridor between Keawe Street and Dickenson Street (adapted from Bishop 1883).

4.2.1.1 Backhoe Trench 22

Trench 22 (Figure 57) was located approximately 25 m. south of the Kahoma Flood Control Spillway and excavated to a depth of 240 cmbs (centimeters below surface), Five distinct stratigraphic layers were observed (Figure 58 to Figure 60) within the trench side walls, a modern A horizon (Stratum I) consisting of silty clay approximately 45 cm thick atop a 90 cm thick silty clay A Horizon (Stratum II). Stratum III, approximately 55 cm thick, was a stream bed deposit that consisted of 95 to 98% water worn cobble, gravel, and pebble inclusions. Below, Stratum IV, is approximately 70 cm thick and consists of more silty clay atop another streambed deposit (Stratum V) that is at least 60 cm thick again containing 95-98% water worn cobbles, gravel, and pebbles. No cultural materials or subsurface features were observed during the excavation. A detailed stratigraphic soil summary is available in Table 7.

Figure 58. Overall photograph of Trench 22, view to the east.

Figure 59. Profile of Trench 22, view to south.

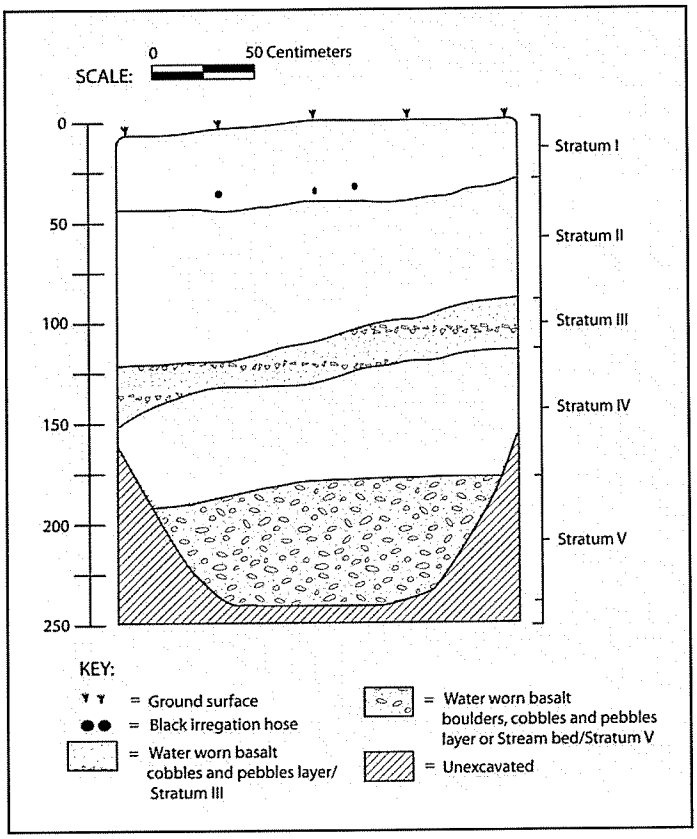

Figure 60. South profile of Trench 22.

Table 7. Stratigraphic Summary of Trench 22

Stratum I: 0-45 cmbs	Ap Horizon; 7.5 YR 4/3, brown; silty clay, strong, prismatic structure; hard dry consistency; firm moist consistency; sticky wet consistency; plastic; weak; abrupt smooth lower boundary; compacted and 15-20% waterworn cobble inclusions.
Stratum II: 30-120 cmbs	A Horizon; 7.5 YR 3/4, dark brown; silty clay, strong, medium, prismatic structure; hard dry consistency; firm moist consistency; sticky wet consistency; plastic; weak; clear smooth lower boundary; compacted and no inclusions.
Stratum III: 95-150 cmbs	A Horizon; 7.5 YR 3/3, dark brown; silty clay, cobbly, and gravelly, moderate, medium, prismatic structure; slightly hard dry consistency; friable moist consistency; sticky wet consistency; plastic; weak; clear wavy lower boundary; probably storm/flood deposit -95-98% of waterworn cobbles, pebbles and gravels.
Stratum IV: 120-190 cmbs	A Horizon; 7.5 YR 3/3, dark brown; silty clay, moderate, fine/medium, prismatic structure; weakly coherent dry consistency; friable moist consistency; sticky wet consistency; plastic; weak; clear wavy lower boundary; moist and semi compacted deposit.
Stratum V: 180-240 cmbs	A Horizon; 7.5 R 7/4, dark brown; silty clay, medium, prismatic structure; weakly coherent dry consistency; friable moist consistency; sticky wet consistency; plastic; weak; not visible none lower boundary; 95-98% of waterworn boulders, cobbles, and pebbles-of a stream bed deposit.

4.2.1.2 Backhoe Trench 20A

Trench 20A (Figure 57) was located on Papalaua St. approximately 30 m northwest of the smoke stack at the Pinoeer Mill (SIHP -1598/4420). Excavated to a depth of 230 cmbs, six distinct stratigraphic layers were observed (Figure 61 and Figure 63). Stratum Ia consisting of dark reddish brown silty clay approximately 45 cm thick overlying a 10 cm thick asphalt layer (Stratum Ib). Stratum Ic, approximately 30 cm thick, was observed atop of another 10-15 cm thick asphalt layer (Stratum Id). Stratum Ie, approximately 95 cm thick a dark reddish brown silty clay consisted of a layer of boulders and gravels with some historic materials. Below, Stratum Ie, approximately 100 cm of very dark silty clay, A Horizon (Stratum II), contains volcanic glass and charcoal. The post-contact materials identified in Stratum Ie consisted of metal, glass bottle fragments, and an unidentified brass object. A detailed stratigraphic summary is available in Table 8. See the results of laboratory analysis in Section 5, 5.1 Artifact Analysis for artifact details.

Figure 61. Overall photograph of Trench 20A, view to the south.

Figure 62. Profile of Trench 20A, view to west.

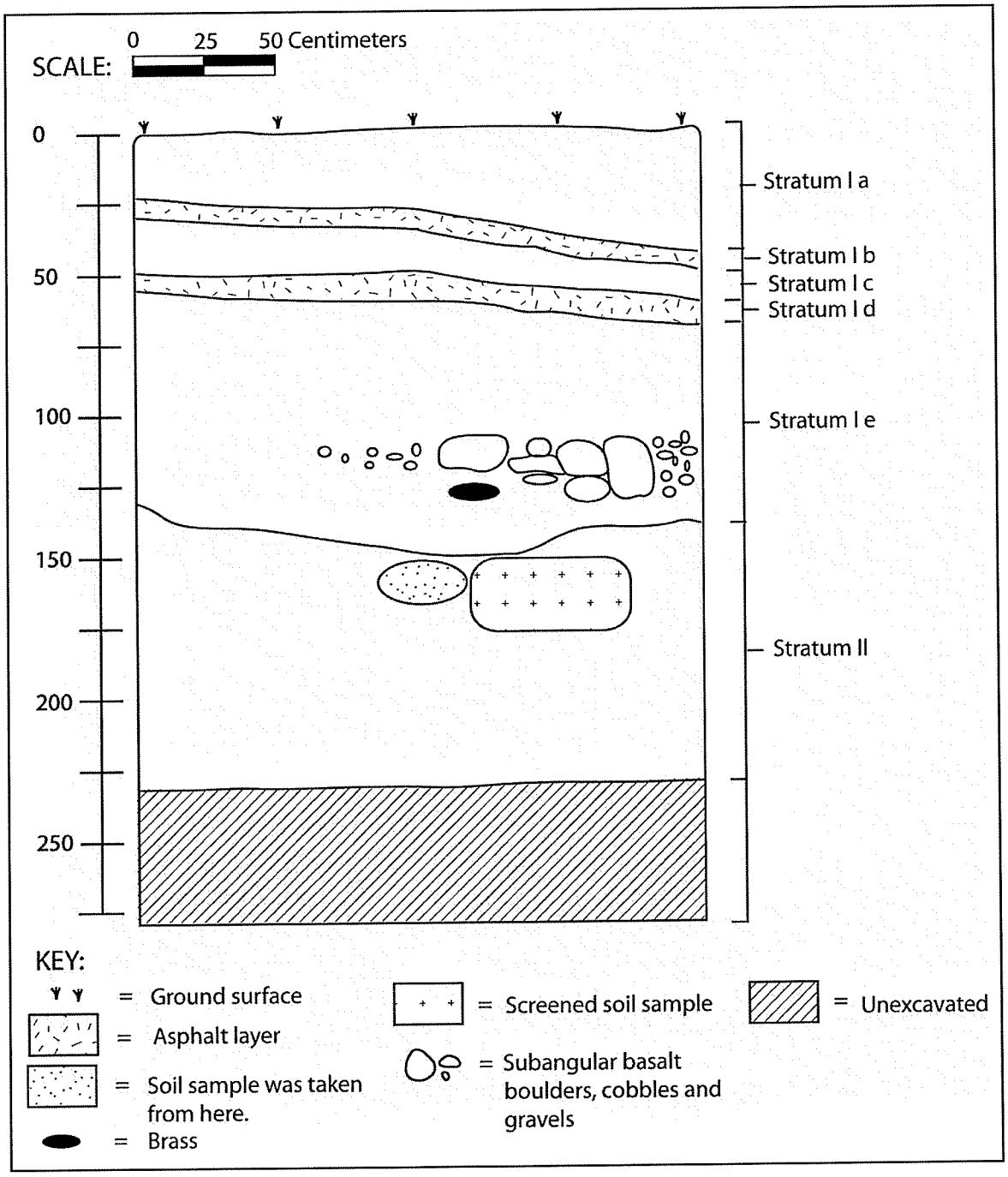

Figure 63. West profile of Trench 20A.

Table 8. Stratigraphic Summary of Trench 20A.

Stratum Ia: 0-45 cmbgs	Fill Horizon; 5 YR 3/3, dark reddish brown; silty clay, strong, fine, prismatic structure; hard dry consistency; firm moist consistency; sticky wet consistency; weak; abrupt smooth lower boundary; very compacted silty clay with 15-20% of inclusions.
Stratum Ib: 25-50 cmbgs	Asphalt
Stratum Ic: 30-60 cmbgs	Fill Horizon; 7.5 YR 5/4, dark reddish brown; silty clay, strong, medium, prismatic structure; hard dry consistency; firm moist consistency; sticky wet consistency; plastic; weak; clear smooth lower boundary; very compacted; contains glass bottle fragments, ceramic sherd and rusted metal fragment.
Stratum Id: 50-70 cmbgs	Asphalt
Stratum Ie: 55-150 cmbgs	Fill Horizon; 5 YR 3/4, dark reddish brown; silty clay, moderate, fine, prismatic structure; slightly hard dry consistency; friable moist consistency; sticky wet consistency; plastic; weak; clear irregular lower boundary; there is a layer of boulders and gravel in this stratum; contains rusted metal fragments, glass bottle fragments, and an unidentified brass object.
Stratum II: 130-230 cmbgs	A Horizon; 10 YR 3/3, very dark grayish brown; silty clay, weak, fine, medium structure; weakly coherent dry consistency; friable moist consistency; non-sticky wet consistency; non-plastic; weak; not visible n/a lower boundary; moist and fine to coarse; contains charcoals and volcanic glass flakes.

4.2.1.3 Backhoe Trench 20B

In regards to the two pieces of tiny volcanic glass and charcoal materials identified in Stratum II of Trench 20A, Trench 20B and Test Unit 2 were excavated in the general area (Figure 57) in order to gain further insight into the origin of Stratum II and assess the potential for cultural deposits or material remains in the underlying stratigraphy. To accomplish this, a backhoe was used to excavate Trench 20B. This trench was oriented in a north to south direction and excavated down into a natural deposit at 160 cm depth, six distinc fill layers in this trench was observed. A 2.0 square meters of these fill layers along the western side of trench 20B was removed in order to conduct a controlled hand excavation of a 1.0 square meter test unit (Test Unit 2) into the natural deposit (Figure 64). The stratigraphy of this trench clearly demonstrated the disturbed nature of this area (Figure 65 to Figure 67). The upper stratum and substrata consists of a fill horizon (Stratum Ia) comprised of light gray gravelly silt approximately 35 cm thick atop a 75 cm thick red cobblely/gravelly clay layer (Stratum Ib). Stratum Ic is a light red gravelly clay, approximately 10 cm thick, and observed overlying a 10 cm thick asphalt layer (Stratum Id). Stratum Ie, approximately 40 cm thick of a mottled layer with white, brown and gray color consisted of angular basalt cobbles with historic metal. Below, Stratum Ie was a 10 cm thick of dark brown silty loam (Stratum II).

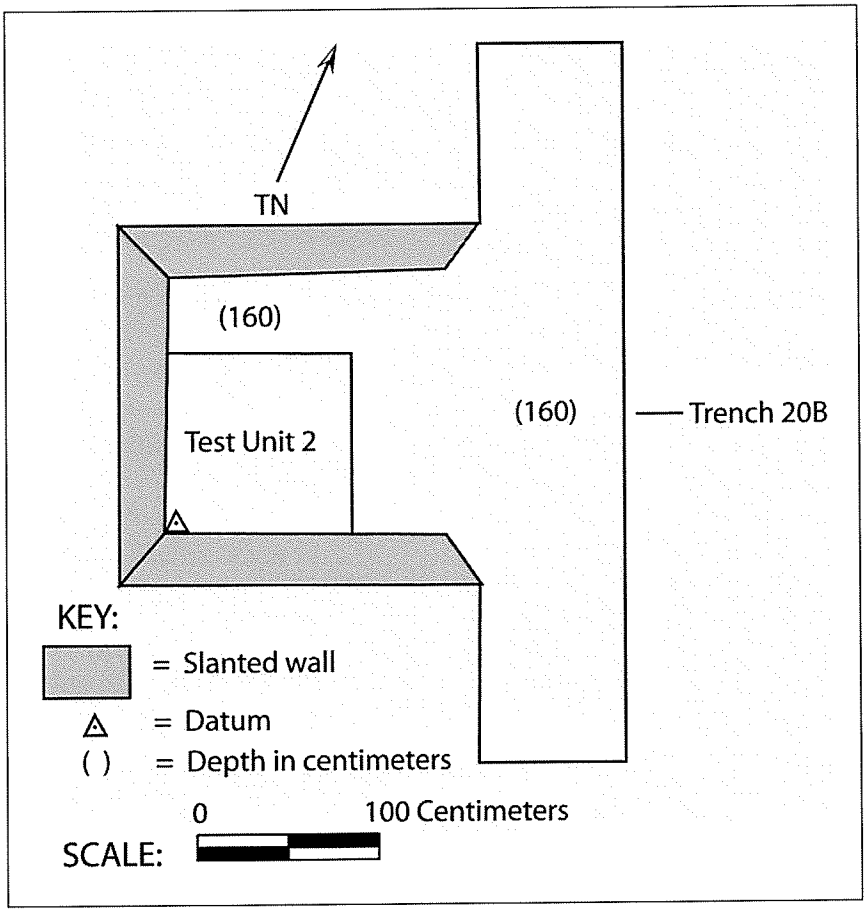

Figure 64. Plan view map of Trench 20B and Test Unit 2.

4.2.1.3.1 Test Unit 2 at the southwest side of Trench 20B

Test Unit 2 (TU-2) was excavated in the southwest corner of the 2.0 square meter trench within the west side of Trench 20B (Figure 64). A unit datum was placed in the southwest corner of the test unit at 160 cmbs and excavated in arbitrary 10 cm levels within the natural stratigraphy to a terminal depth of 80 cmbd (Figure 66). Two distinct stratigraphic layers were observed in Test Unit 2. A 10 cm thick layer (Stratum If) of dark brown silty loam, contains sparse amounts of historic material remains that included three nails, cane slag, glass bottle fragments, charcoal, and a small piece of slate. Stratum If is a transitional layer between Stratum Ie, a historic fill layer and Stratum II, very dark grayish brown, the buried natural layer or A Horizon (Figure 67). The first 30 cm of Stratum II contains a very few of historic material remains, include rusted metal fragments, a nail, cane slag and charcoal. The bottom levels (50 cmbd) Stratum II is sterile. Some bands or lenses of very tiny subangular gravels and pebbles, and water worn basalt cobbles, pebbles and gravels were observed from 30 to 50 cmbd, and are likely present of storm and/or river deposits (Figure 66 and Figure 67) as the characteristics are consistent with that of river beds and pond fields after a stormy. One profile map, the southwest face profile was drawn to scale for both Trench 20B and the Test Unit 2. A detailed stratigraphic summary of southeast face wall of Trench 20B and Test Unit 2 is available in Table 9.

Trench 20A, 20B and Test Unit 2 were placed and excavated in Land Commission Award (LCA) number 3422B Apana 2 which was awarded to Kekahuna (see Figure 57 for LCA, TU, and Trench locations) as a house lot with two houses. Results from the literature review and subsurface testing, indicate that it is possible that Stratum II is associated with a pre-contat *lo'i* or field pond deposit, due to the homogenous and very soft nature of the soil, the tiny gravels and water worn cobbles, pebbles and gravels deposits that were observed in profile. It is further possible that they were carried through *auwai* during storm episodes.

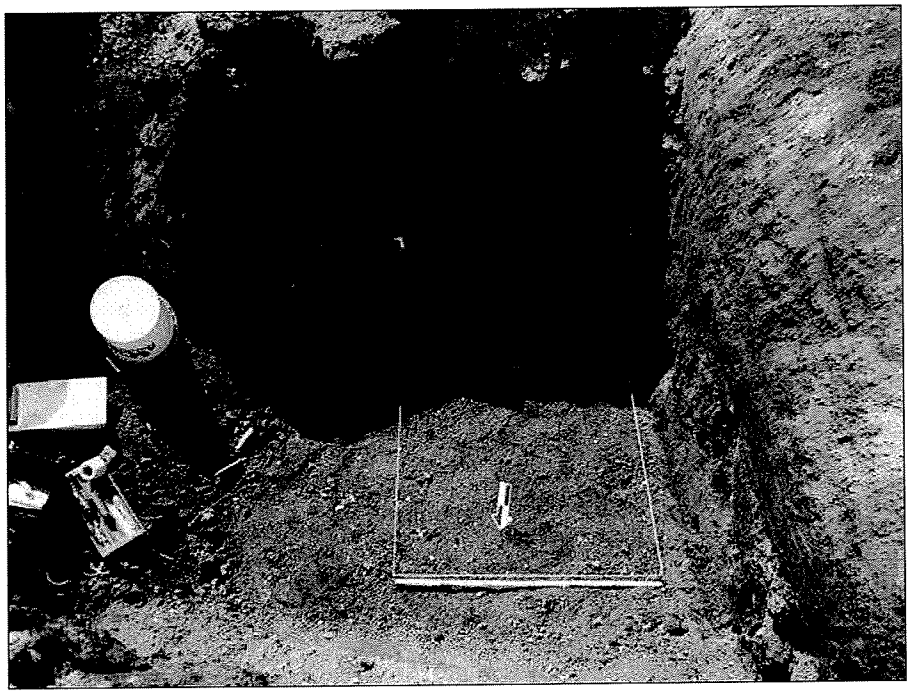

Figure 65. View of south face wall of Trench 20B and Test Unit 2.

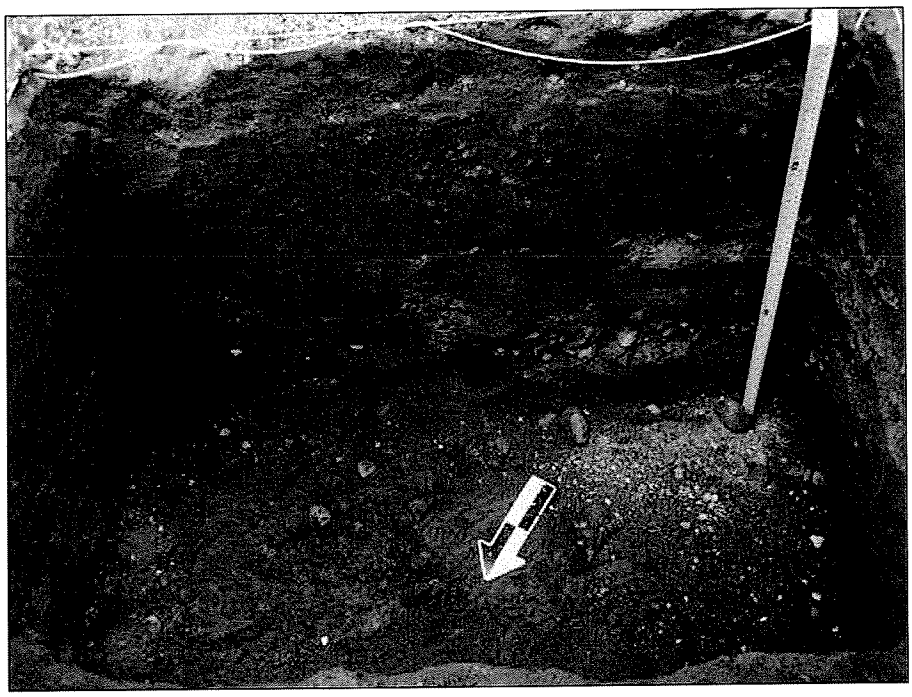

Figure 66. View of the southeast face wall of Test Unit 2

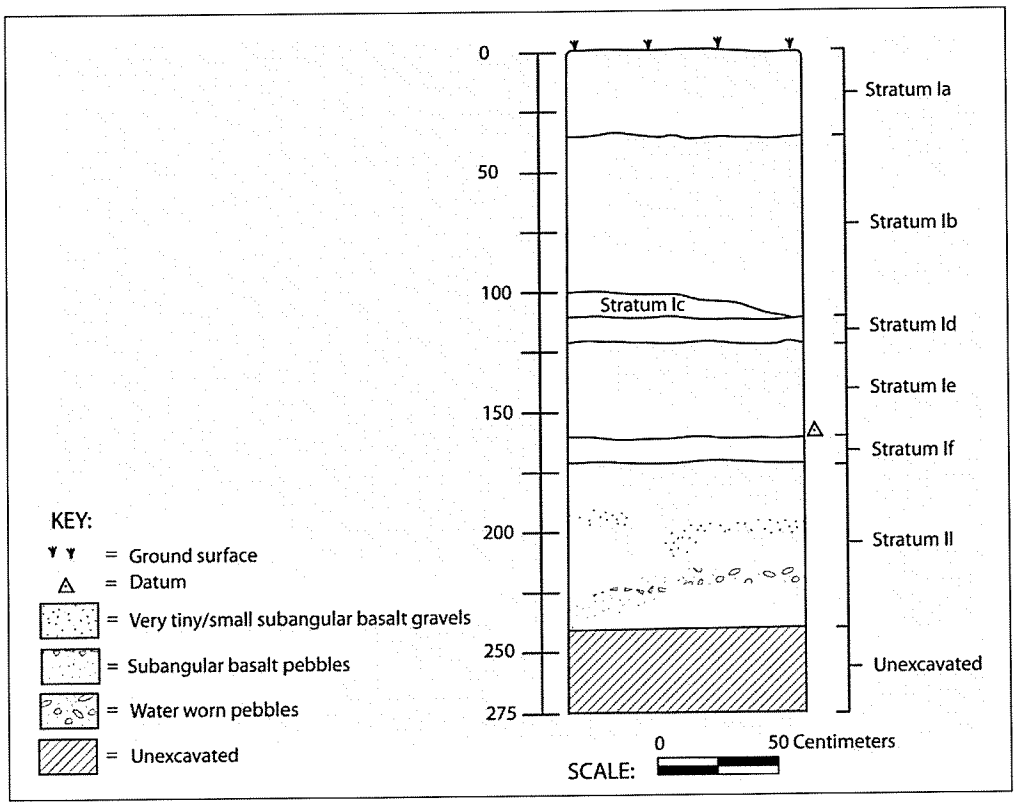

Figure 67. Southeast face wall of Trench 20B and Test Unit 2.

Table 9. Stratigraphic Summary of Trench 20B and Test Unit 2, Southeast Wall.

Stratum Ia: 0-35 cmbd	Fill Horizon; 10 YR 7/1, light gray; gravelly silt, strong, very coarse and fine, granular structure; hard dry consistency; firm moist consistency; non-sticky wet consistency; non-plastic; weak; clear smooth lower boundary; very compacted gravels w/silt and 70-75% of gravel inclusions; contains no cultural material remains.
Stratum Ib: 35-110 cmbd	Fill Horizon; 7.5 R 4/6, red; cobblely/gravelly clay, strong, medium, prismatic structure; hard dry consistency; firm moist consistency; sticky wet consistency; plastic; weak; clear smooth lower boundary; very compacted clay; contains historic metals and glass bottle fragments.
Stratum Ic: 100-110 cmbd	Fill Horizon; 2.5 YR 6/8, light red; gravelly clay, strong, fine to medium, crumb structure; hard dry consistency; firm moist consistency; sticky wet consistency; plastic; weak; clear smooth lower boundary; very compacted clay with gravels and cobbles; contains no cultural materials.
Stratum Id: 110-120 cmbd	Asphalt
Stratum Ie: 120-160 cmbd	Fill Horizon; mottled w/white, brown and gray colors; angular basalt cobbles, clear irregular lower boundary; contains no soil only angular cobbles w/historic metals and very small pieces of brown glass bottle.
Stratum If: 160-170 cmbd	Transitional layer between fill layer and the natural layer; 10 YR 2/2, dark brown; silty loam, moderate, fine, medium structure; weakly coherent dry consistency; friable moist consistency; slightly sticky wet consistency; slightly plastic; weak; clear smooth lower boundary; contains historic material remains (nails, glass bottle frags and cane slag and charcoal).
Stratum II: 170-240 cmbd	A Horizon; 10 YR 3/3, very dark grayish brown; silty clay, weak, fine, medium structure; weakly coherent dry consistency; friable moist consistency; slightly sticky wet consistency; slightly plastic; weak; not visible lower boundary; this stratum contains very low historic material remains in the upper 30 cm thick and the lower 50 cm thick contains no cultural materials.

The transitional layer or Stratum If does not show in the southwest face of Test Unit 2. The bands or lenses of tiny subangular basalt gravels and water worn cobbles, pebbles and gravels were also observed in the southwest wall of Test Unit 2. A detailed stratigraphic summary of the southwest face wall of Test Unit 2 is available in Table 10. See the results of laboratory analysis in Section 5, 5.1 Artifact Analysis for details of findings.

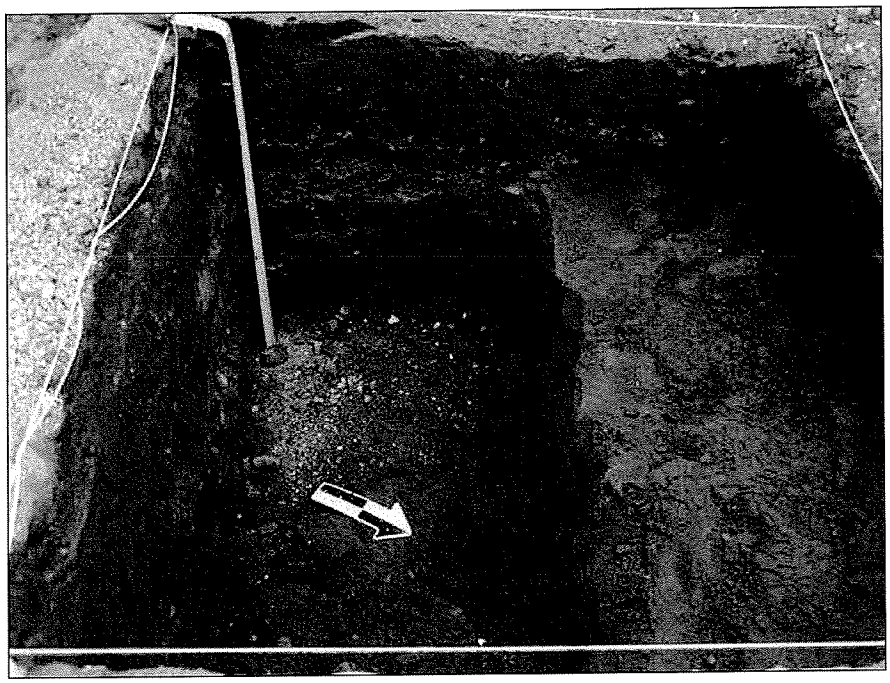

Figure 68. View of the southwest wall of Test Unit 2

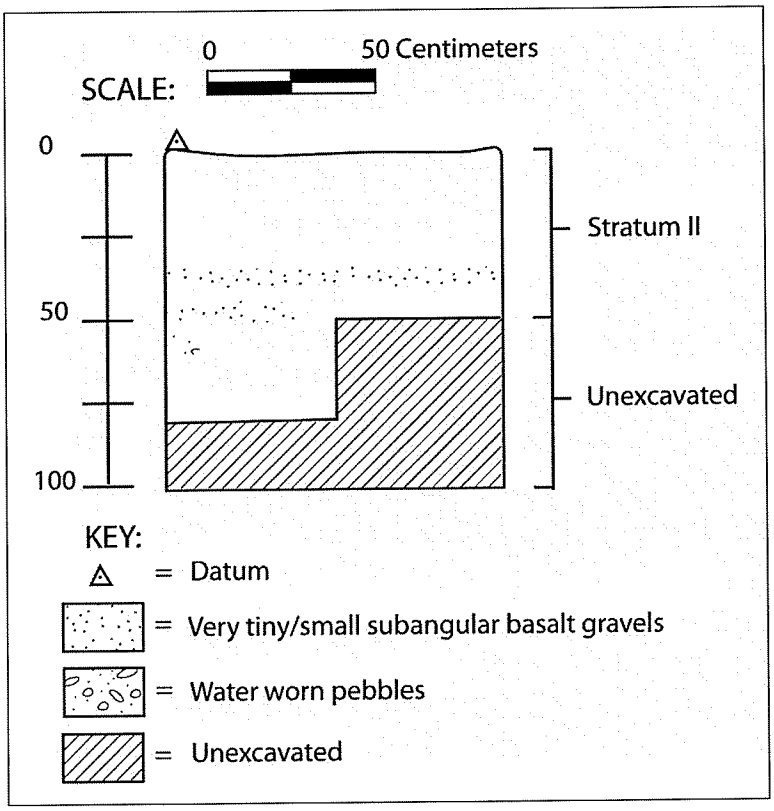

Figure 69. Southwest wall of Test Unit 2.

Table 10. Stratigraphic Summary of Test Unit 2, Southwest Wall[4].

Stratum II: 170-240 cmbd	A Horizon; 10 YR 3/3, very dark grayish brown; silty clay, weak, fine, medium structure; weakly coherent dry consistency; friable moist consistency; non-sticky wet consistency; non-plastic; weak; not visible and n/a lower boundary; contains historic material remains in the upper 30 cm thick of this stratum and the lower 50 cm thick is sterile.

4.2.1.4 Backhoe Trench 11

Trench 11 was excavated in close proximity to the previous location of the historic Pioneer Mill (SIHP 50-50-03-1598/4420) (Figure 57). Excavated to a terminal depth of 200 cmbs, the trench demonstrated the disturbed nature of this area resulting from the long occupation and deconstruction of the sugar cane mill. Excavated to approximately 200 cmbs, two distinct stratigraphic layers were observed. Stratum Ia, approximately 50 cm (1.6 ft) thick was a modern A horizon of silty clay containing 30% basalt cobble inclusions and historic material inclusions, that was predominately construction material associated with the Pioneer Mill and included metal, concrete, and glass fragments. Stratum Ib, was at least 195 cm thick and consisted of silty loam that contained similar historic material inclusions but to a lesser extent. No diagnostic artifacts were observed during the excavation as a result the concentration was noted with no collection of samples.

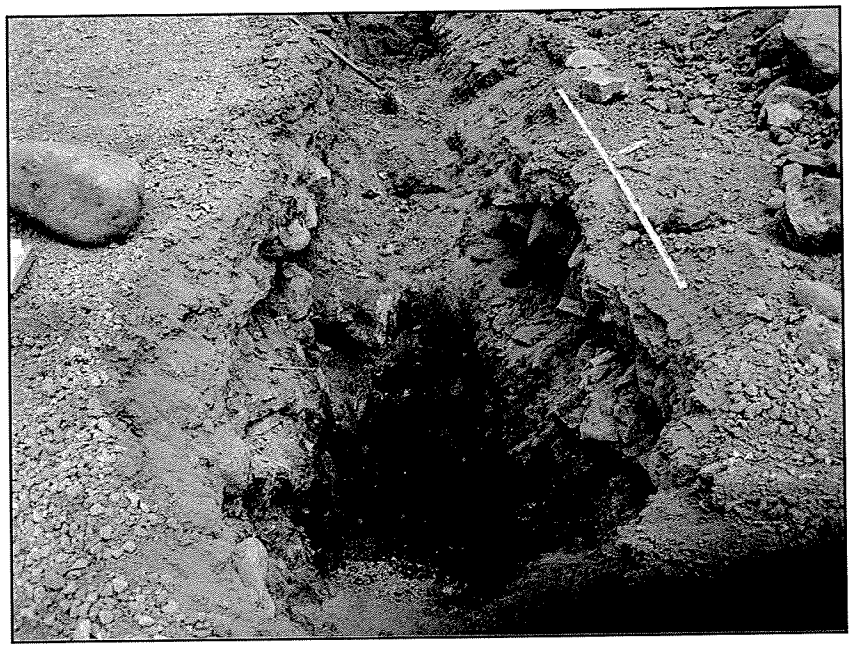

Figure 70. Overall photograph of Trench 11, view to the east.

[4] The Stratum If is not represented in the southwest face wall profile.

Figure 71. Profile of Trench 11, view to the south.

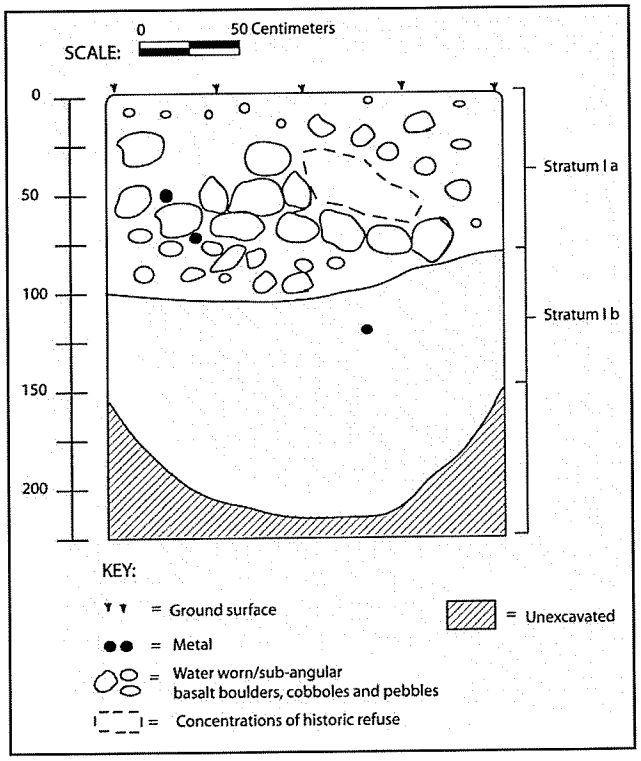

Figure 72. South profile of Trench 11

Table 11. Stratigraphic Summary of Trench 11.

Stratum: Ia 0-50 cmbgs	Fill Horizon; 10 YR 4/1, dark gray; silty clay, strong, fine-medium, prismatic structure; very hard dry consistency; very firm moist consistency; slightly sticky wet consistency; slightly plastic; weak; clear smooth lower boundary; small to large waterworn basalt boulders, cobbles, and pebbles. A lot of historic refuse.
Stratum: Ib: 30-225 cmbgs	Fill Horizon; 10 YR 3/2, dark grayish brown; silty loam, weak, fine, granular structure; weakly coherent dry consistency; very friable moist consistency; non-sticky wet consistency; non-plastic; weak; not visible; historic inclusions including concrete and metal.

4.2.1.5 Backhoe Trench 5

Trench 5 was located within the project corridor approximately 100 m (300 ft) southeast of Lahainaluna Road (Figure 57). Excavated to approximately 220 cmbgs (7.2 ft), two distinct strata were observed in Trench 5 (Figure 73 to Figure 75). Stratum I, a modern A horizon, was approximately 75 cm (2.5 ft) thick and consisted of a loam clay matrix with 3-5% basalt cobble inclusions. Stratum II was at least 170 cm thick and composed exclusively of a fine, black, loose ash associated with sugarcane processing. Subsequent consultation with the landowners confirmed that this area served as a settling pond for the Pioneer Mill at one time (Figure 76). No cultural features or objects were observed during the investigation.

Figure 73. Overall photograph of Trench 5, view to the north.

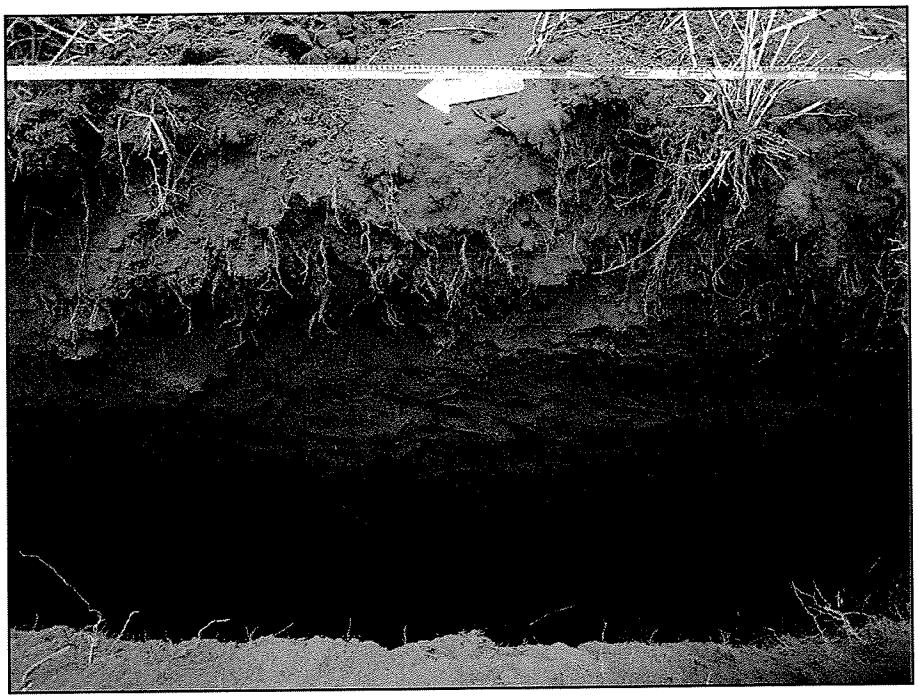

Figure 74. Profile of Trench 5, view to the east.

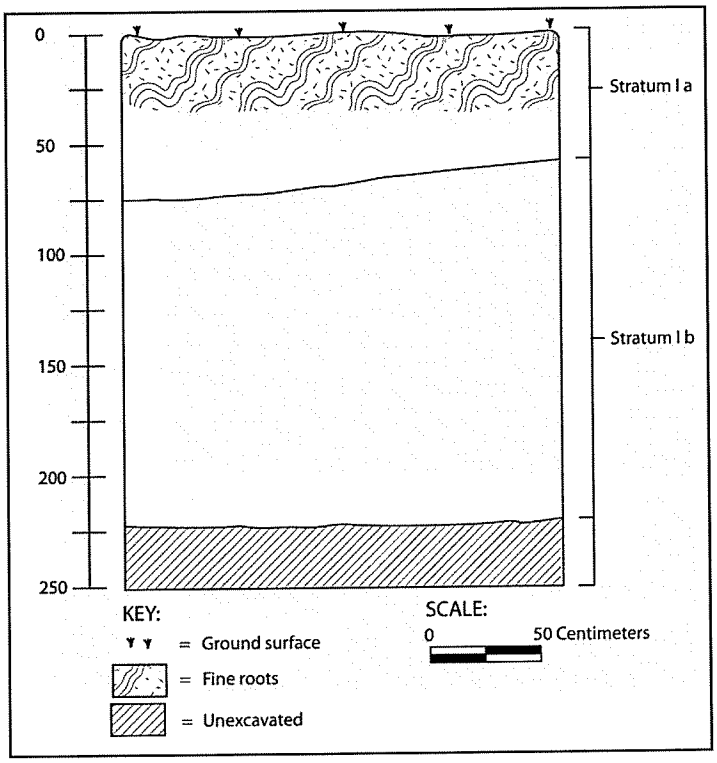

Figure 75. East profile of Trench 5.

Table 12. Stratigraphic Summary of Trench 5.

Stratum: Ia: 0-75 cmbs	Fill Horizon; 10 YR 4/4, dark yellowish brown; clay loam, strong, medium, blocky structure; plastic; clear smooth lower boundary; 3-5 % subangular basalt cobble inclusions.
Stratum Ib: 50-221 cmbs	Fill Horizon; 10 YR 2/1, black; ash, structureless, non-plastic; non visible lower boundary; sugarcane ash deposition as a result of settling ponds

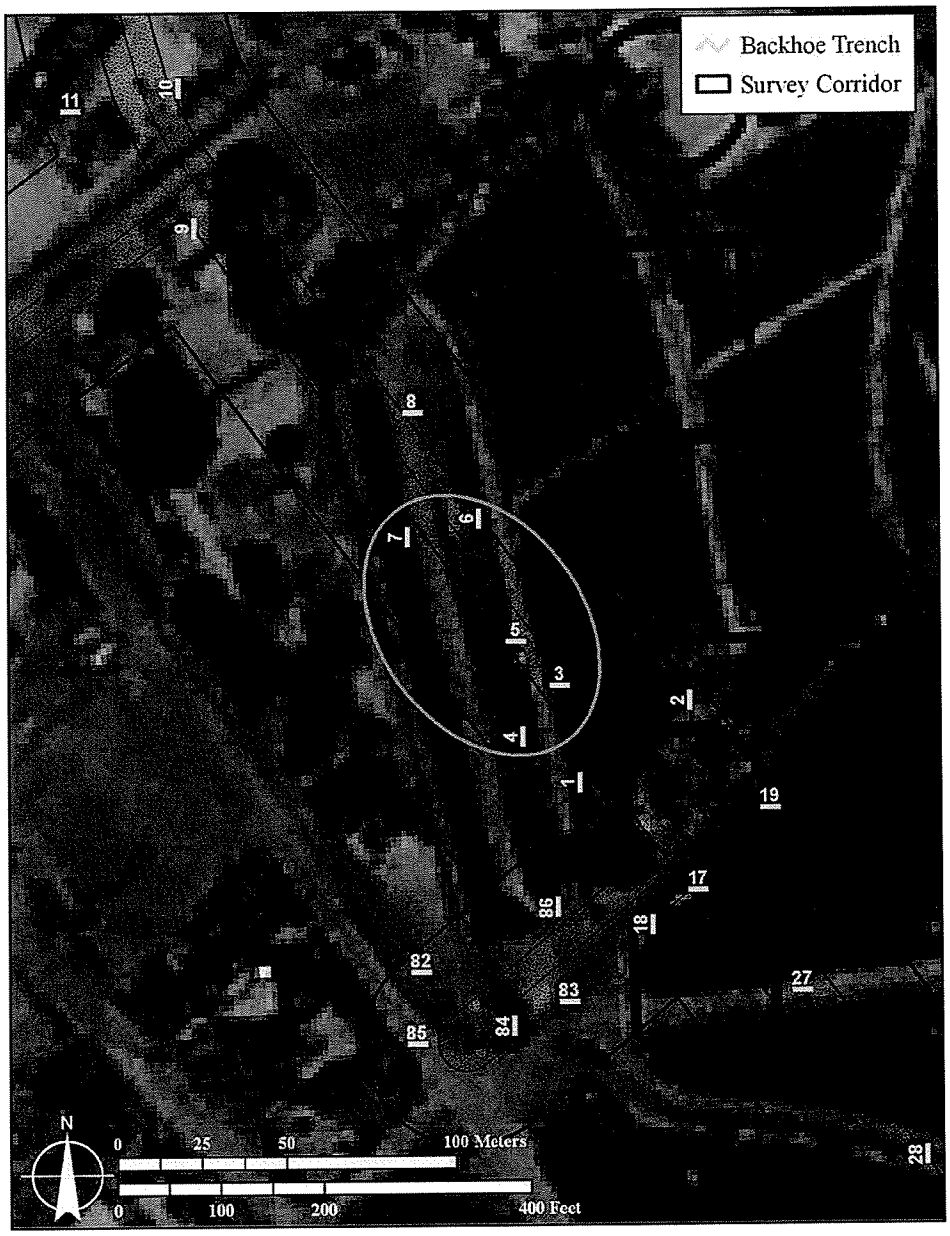

Figure 76. Portion of a 1957 aerial view showing the settling pond in the vicinity of Trenches 3, 4, 5, and 7 (R.M. Towill Corporation 1957).

4.2.1.6 Subsurface Testing in Area 1 in the Context of Previous Subsurface Testing in the Immediate Area

As a portion of the current project area overlaps a section of a previous archaeological inventory survey conducted by Xamanek Researches (Frey and Fredericksen 2009), it is worthwhile to compare and cross correlate the results of subsurface testing from both studies (Figure 77). This current study documented a previously unidentified site in Trench 7, SIHP - 6776 Feature C (a subsurface 24" irrigation steel pipe) that was also identified in Backhoe Trench 162 of the Frey and Fredericksen study (2009:67) at an approximate depth of 110 cmbs. The thick black ash deposits identified at depths ranging from 135 to 230 cmbs in Trenches 3, 5 and 6 of the current study however were not represented in the results of the 2009 inventory survey (Backhoe Trenches 162 and 164) indicating that these deposits are likely confined to horizontally discrete areas. Ash deposits notwithstanding, it appears that the documented stratigraphy of the 2009 study is consistent with the current findings that show a common plow zone depth between 0-60 cmbs and history of fill events that deposited between 1-2 meters (3-61/2 feet) of silty clay and clay loam overlying a buried A Horizon (Frey and Fredericksen 2009:66). Within the soils that characterize these fill events, late historic to modern era trash debris were observed (e.g. remnants of drisco and PVC pipe, metal fragments, and glass shards).

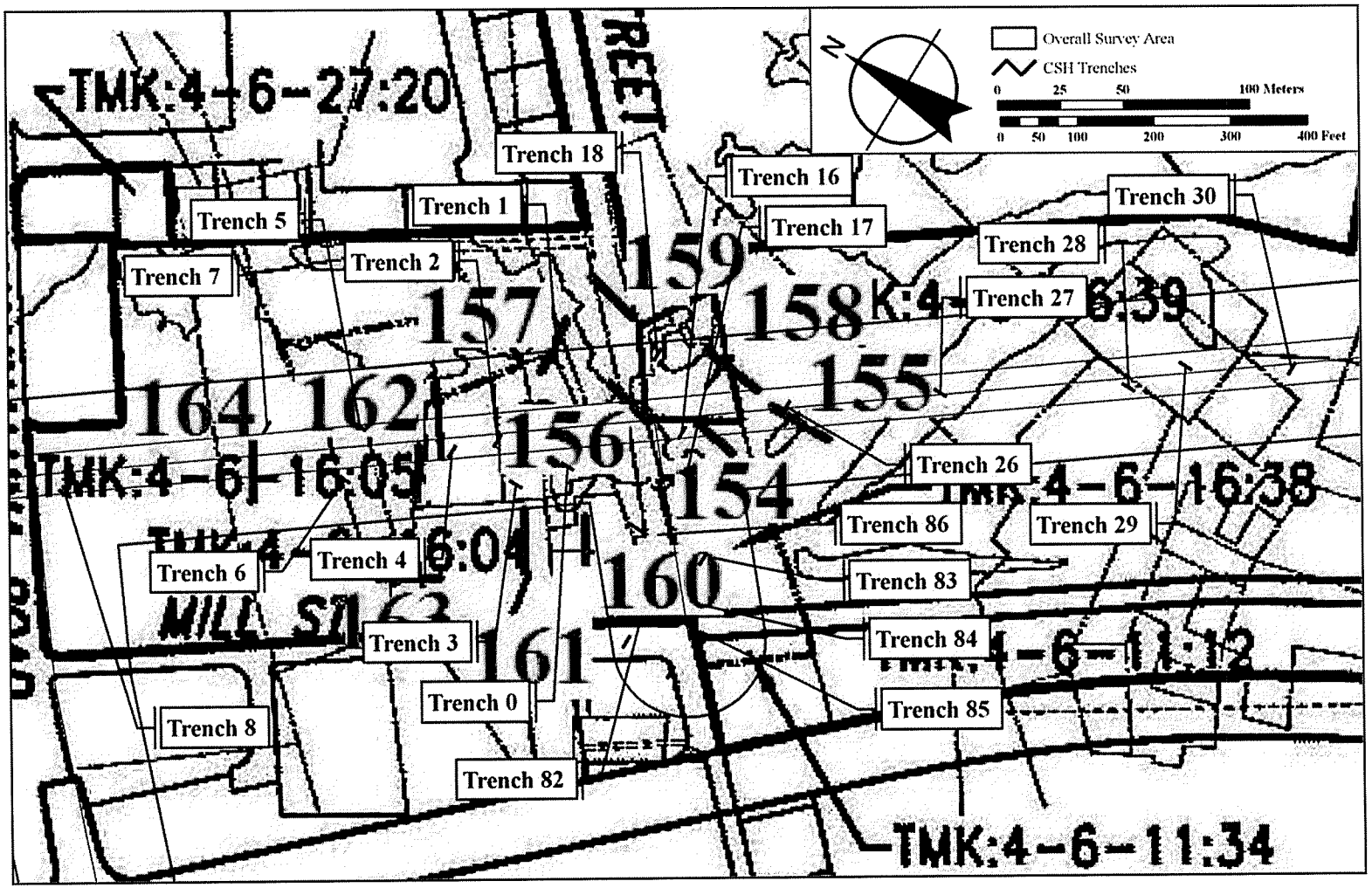

Figure 77. Portion of Xamanek Researches, LLC subsurface testing map, Frey and Fredericksen (2009), in relation to the current survey corridor adjacent to the north and south side of Dickenson Street, Xamanek's backhoe trenches in green are not to scale.

4.2.2 Area 2

Area 2 extends from Dickenson St. to Shaw St across fallow cane fields and massive modern flood control swales dug out by the Army Corps of Engineers during the 1980's (Figure 51). The result of the excavation for the swales was the exposure of underlying clay soils with a strong prismatic structure and a modern ground surface broken by large vertical cracks resulting from the expansion and contraction of the moist clay soils (Figure 78). Additionally 2 to 3 m high earthen berms separating the swales limited the access for the backhoe.

Figure 78. Showing the ground surface within the flood control swales.

As a result, while 25 backhoe trenches were planned for this area but only 12 were excavated due to access issues (Figure 79). The excavated trenches were used to determine the presence/absence of significant cultural deposit and assess the soil stratigraphy in the centrial portion of the project area. Controlled excavation of a 1 m by 1 m square test unit was conducted at Trench 31 in order to gain further insight into the stratigraphy. A summary of the backhoe trenches including explanations as to why some were not excavated is available in Table 13.

The following section also presents soil profiles, photographs and stratigraphic descriptions for four backhoe trenches and a manually excavated 1 m by 1 m square test unit as representative samples from Area 2. This section would also briefly compare and contrast the results of the subsurface testing from this current project and the Frey and Fredericksen (2009) study within Area 2 right adjacent to the south side of Dickenson Street, because three of the 2009 study

backhoe trenches were located within this area (Figure 77). See Appendix B-2 for the remaining eight trenches out of the twelve excavated in Area 2 from this current study.

Table 13.Summary of backhoe trenches located in Area 2 (Dickenson and Shaw Streets).

Trench	Comments	Trench	Comments
16	Excavated 7/8/10	**36**	In flood control swale
17	In push pile area	**37**	In flood control swale
18	Excavated 7/8/10	**38**	In active construction base yard
26	Excavated 7/9/10	**39**	In active construction base yard
27	Could not access with machine	**40**	In active construction base yard
28	Excavated 7/8/10	**41**	In active construction base yard
29	Excavated 7/8/10	**74**	In flood control swale
30	Excavated 7/8/10	**82**	Excavated 4/13/2011
31	Excavated 7/8/10	**83**	Excavated 4/13/2011
32	In flood control swale	**84**	Excavated 4/13/2011
33	In flood control swale	**85**	Excavated 4/13/2011
34	In flood control swale	**86**	Excavated 4/13/2011
35	In flood control swale		

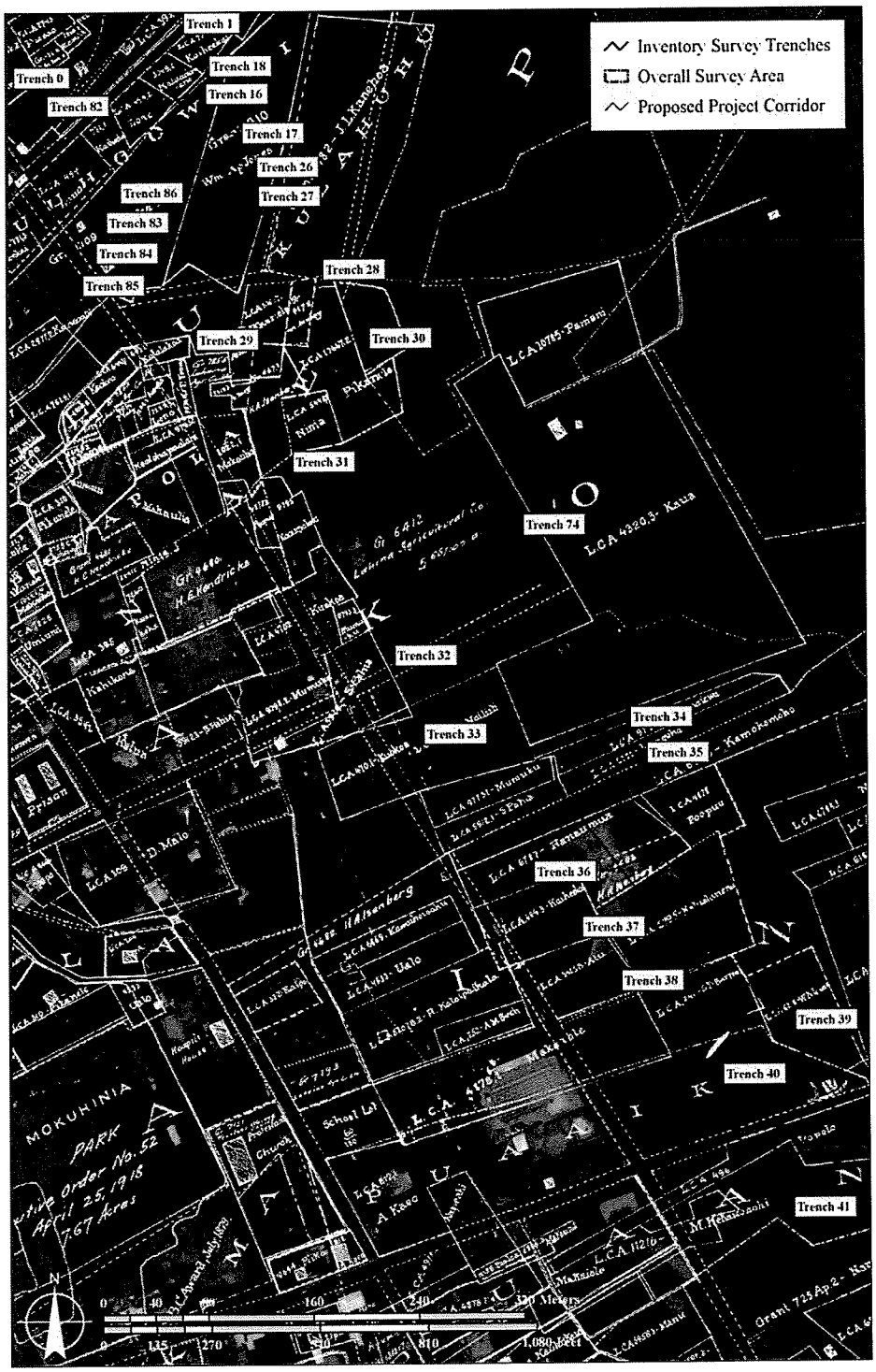

Figure 79. A portion of the 1883 S.E. Bishop map showing the location of backhoe trenches in relation to Land Commission Awards (LCAs) within the centrial portion of the current project corridor between Dickenson Street and Shaw Street (adapted from Bishop 1883).

4.2.2.1 Backhoe Trench 26

Trench 26 represents the general stratigraphy observed in Area 2 (Figure 80). Excavated to 140 cmbs, three distinct strata were observed (Figure 81 to Figure 82). Stratum I, approximately 85 cm thick represents the plow zone, a dark brown silty loam with numerous pieces of Drisco pipe in the matrix. Stratum II a 55 cm thick band of reddish brown clay loam with 30% basalt inclusions was observed atop a reddish yellow clay loam. No significant artifacts or cultural features were observed during the backhoe excavations in Area 2. A detailed stratigraphic summary of Trench 26 is available in Table 14.

Figure 80. Overall photograph of Trench 26, view to the east.

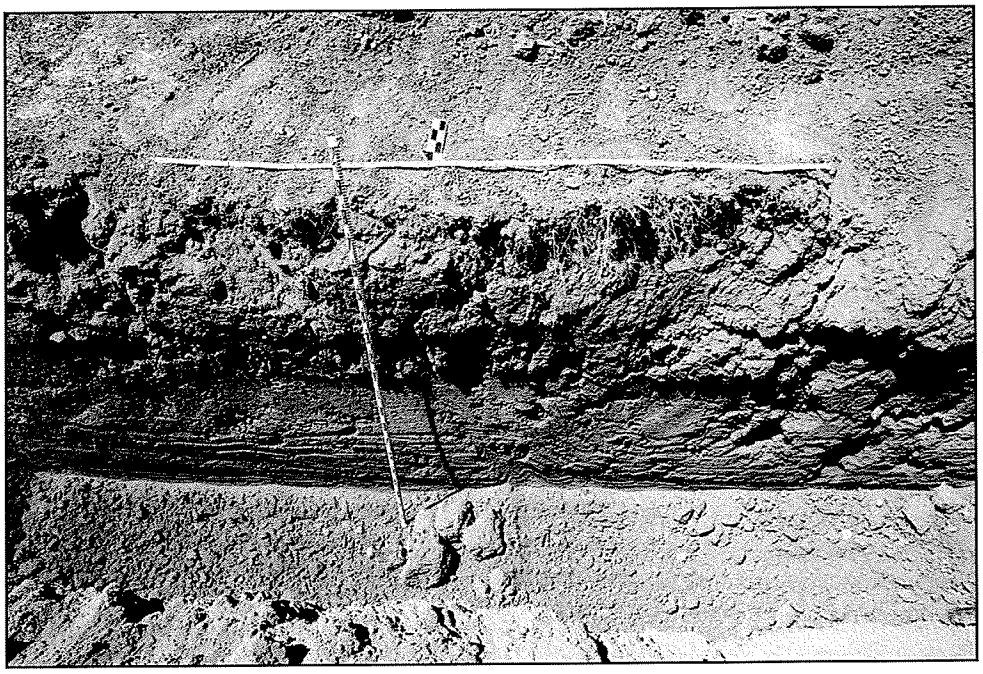

Figure 81. Profile of Trench 26, view to south

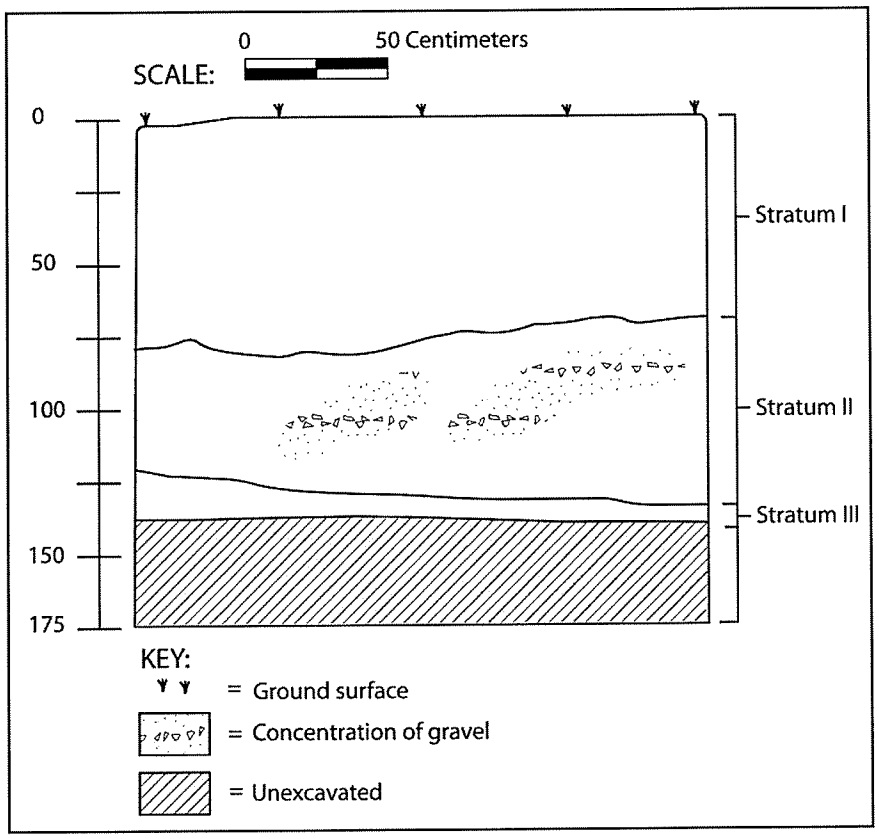

Figure 82. South profile of Trench 26.

Table 14. Stratigraphic Summary of Trench 26.

Stratum I: 0-85 cmbs	Ap Horizon; 7.5 YR 3/3, dark brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous; clear wavy lower boundary; common fine roots; black irrigation tubing, plow zone.
Stratum II: 75-130 cmbs	A Horizon; 5 YR 5/4, reddish brown; clay loam, moderate, medium, blocky structure; hard dry consistency plastic; terrigenous clear smooth lower boundary; common fine roots; 30% decomposing basalt inclusions.
Stratum III: 125-140 cmbs	A Horizon; 5 YR 4/6, reddish brown; clay loam, moderate, medium, blocky structure; hard dry consistency; sticky wet consistency; plastic; terrigenous not visible a Horizon; no observed roots; General Observations; clay loam more pronounced red.

4.2.2.2 Backhoe Trench 31

Trench 31 was excavated just north of a few large flood control swales excavated by the Army Corps of Engineers during the 1980's (Figure 79 and Figure 83). The stratigraphy of this trench demonstrated the disturbed nature of this area. Excavated to 160 cmbgs, Trench 31 contained five distinct strata (Figure 84 and Figure 85). Strata I and II, both modern A Horizons were atop a buried O Horizon, Stratum III. Beneath these, Strata IV and V were both A Horizons. A detailed stratigraphic summary of Trench 31 is available in Table 15. A 1 x 1 meter test unit (Test Unit 1) was excavated to further investigate the buried O and A Horizons.

Figure 83. Overall photograph of Trench 31, view to the east.

Figure 84. Profile of Trench 31, view to the south.

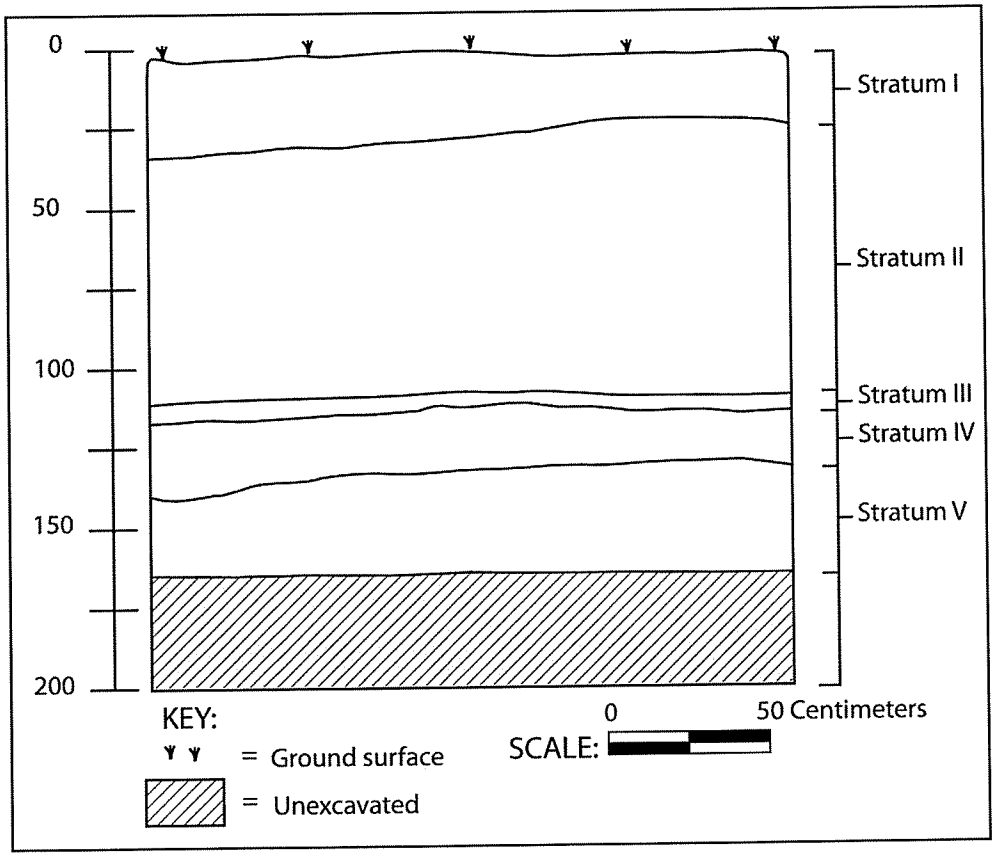

Figure 85. South profile of Trench 31.

Table 15. Stratigraphic Summary of Trench 31.

Stratum I: 0-30 cmbs	Modern A Horizon; 10 YR 7/3, very pale brown; sandy loam, weak, very fine, granular structure; single-grain loose dry consistency; non-plastic; weak; mixed clear smooth lower boundary.
Stratum II: 20-105 cmbs	Modern A Horizon; 7.5 YR 3/3, dark brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary.
Stratum III: 105-115 cmbs	O Horizon; 7.5 YR 2.5/2, very dark brown; organic material, terrigenous clear smooth lower boundary;Figure 89 decomposing organic material.
Stratum IV: 110-135 cmbs	A Horizon; 7.5 YR 5/6, strong brown; silt loam, moderate, fine, crumb structure; weakly coherent dry consistency; non-plastic; weak; terrigenous smooth lower boundary; few fine roots.
Stratum V: 130-160 cmbs	A Horizon; 7.5 YR 4/6, strong brown; silt loam, moderate, fine, crumb structure; weakly coherent dry consistency; non-plastic; weak; few fine roots.

4.2.2.2.1 Test Unit 1 at Northern side of Trench 31

Test Unit 1 was excavated in order to gain further insight into the origin of Stratum III and assess the potential for cultural features or objects in the underlying stratigraphy. To accomplish this, a backhoe was employed to remove the majority of Strata I and II along the northern side of trench 31 (Figure 86). A Unit datum was placed in the northeast corner 10 cm above the ground surface. The test unit was excavated in arbitrary 10 cm levels within the natural stratigraphy to a terminal depth of 45 cmbd (Figure 87).

Figure 86. Opening plan view of Test Unit 1, view to the north.

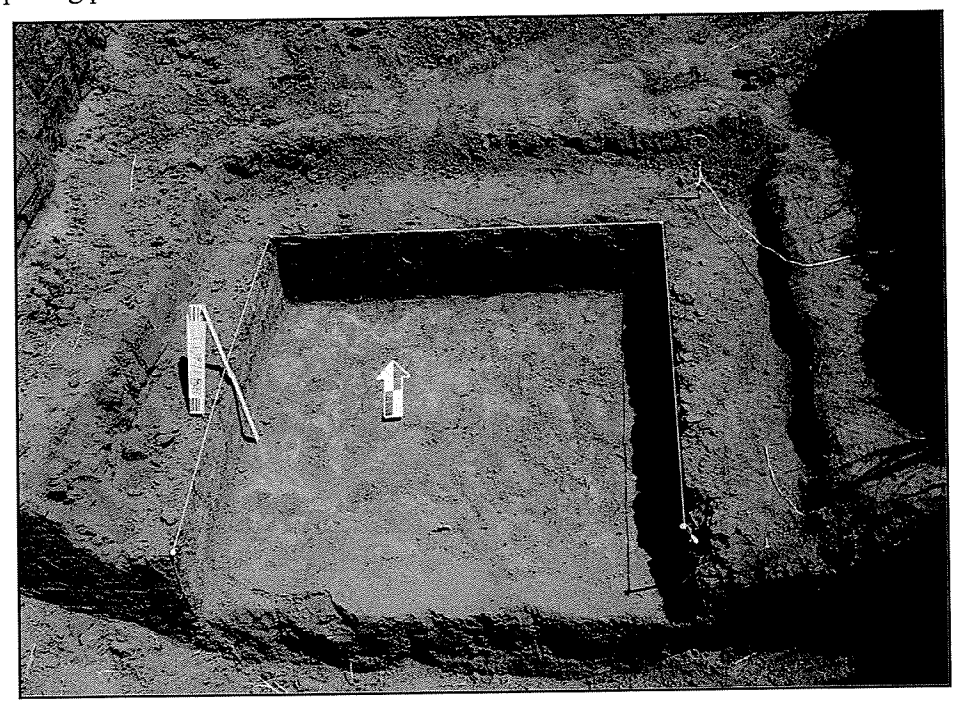

Figure 87. Bottom of excavation, base of level 3, view to the north.

Three distinct strata were observed during the excavation of Test Unit 1, Strata II-IV (Figure 88 and Figure 89). Stratum III was unconsolidated and contained common amounts of plant fiber and floral detritus with rootlets still observable in Stratum IV as opposed to lack thereof in Stratum II. After exposing Stratum III it was evident that this was a modern organic horizon most likely covered during the construction of the nearby flood control swales or a more recent land alteration event in this area. The excavation was terminated after exposing Stratum V. No artifacts or cultural material was observed during the excavation of Test Unit 1. A detailed stratigraphic summary of Test Unit 1 is available in Table 16.

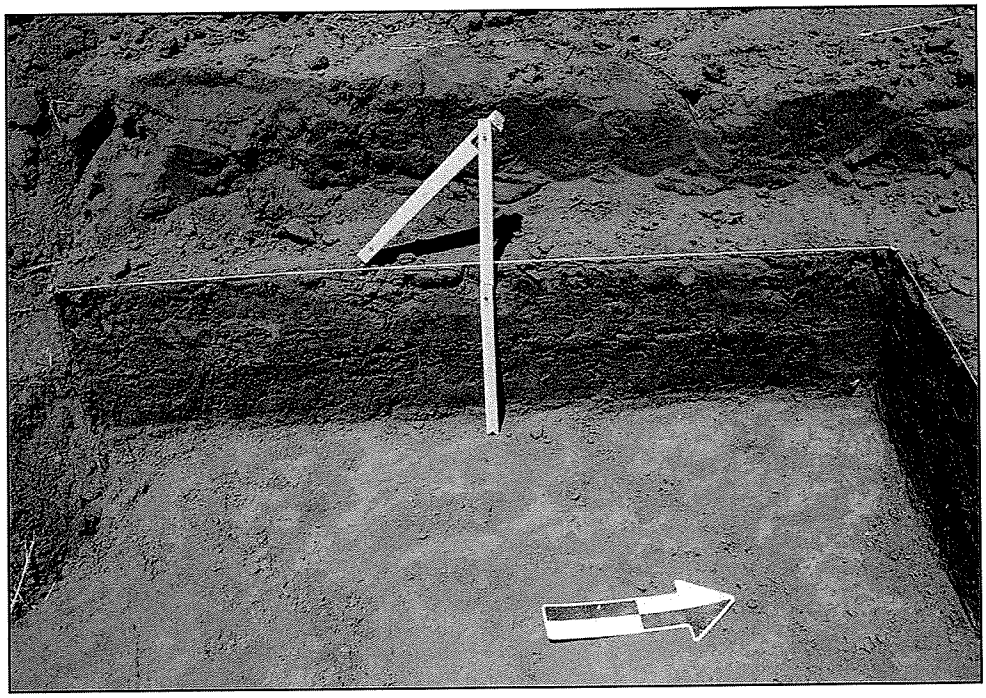

Figure 88. Profile of Test Unit 1, view to west.

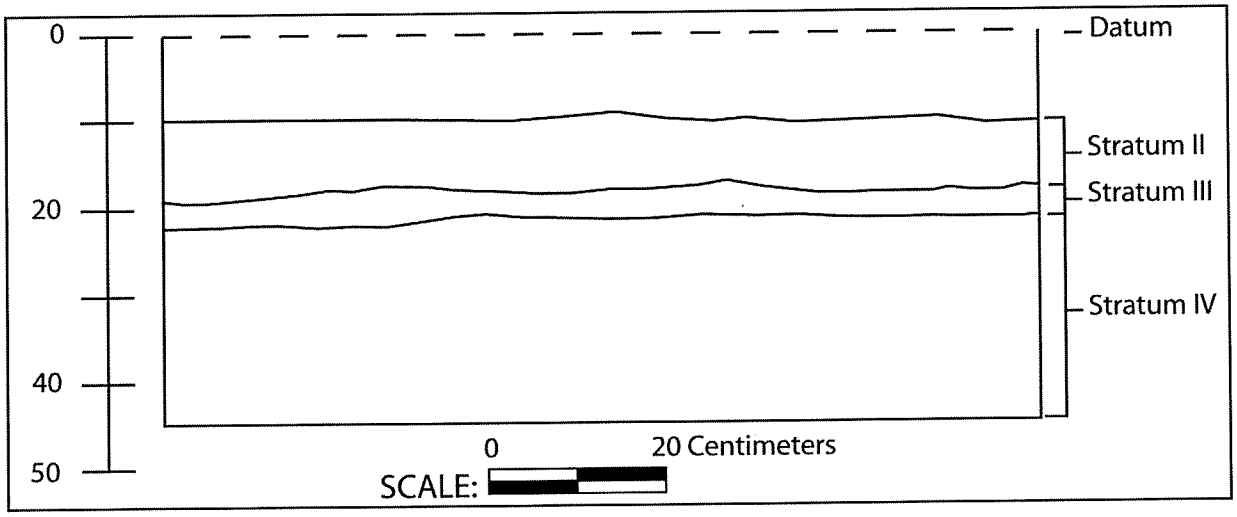

Figure 89. West profile of Test Unit 1. See Table 15 for stratigraphic summary.

Table 16. Stratigraphic Summary of Test Unit 1.

Stratum II: 10-19 cmbud	Modern A Horizon; 7.5 YR 3/3, dark brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary.
Stratum III: 18-24 cmbud	O Horizon; 7.5 YR 2.5/2, very dark brown; organic material, terrigenous clear smooth lower boundary; decomposing organic material.
Stratum IV: 24-44 cmbud	A Horizon; 7.5 YR 5/6, strong brown; silt loam, moderate, fine, crumb structure; weakly coherent dry consistency; non-plastic; weak; terrigenous smooth lower boundary; few fine roots.

4.2.2.3 Backhoe Trench 84

Trench 84 represents the general stratigraphy observed in Area 2 at the connection between the project corridor and the Dickenson Street (Figure 79 to Figure 91). It was excavated to 194 cmbs, three distinct strata were observed (Figure 92). Stratum Ia, approximately 80 cm thick represents a fill layer, a reddish brown compacted silt. Stratum Ib a 10 cm thick band of gravels was observed atop a dark reddish brown silt. There is a water pipe line at the south end of the trench right below a pocket of Stratum Ia. This pocket of Stratum Ia is a back fill soil for this pipe line. This pipe was not excavated or exposed. No other significant artifacts or cultural features observed during the backhoe excavations of this trench. A detailed stratigraphic summary of Trench 84 is available in Table 17.

Figure 90. Long axis view of Trench 84, view to the south.

Figure 91. West face wall of Trench 84, view to the west.

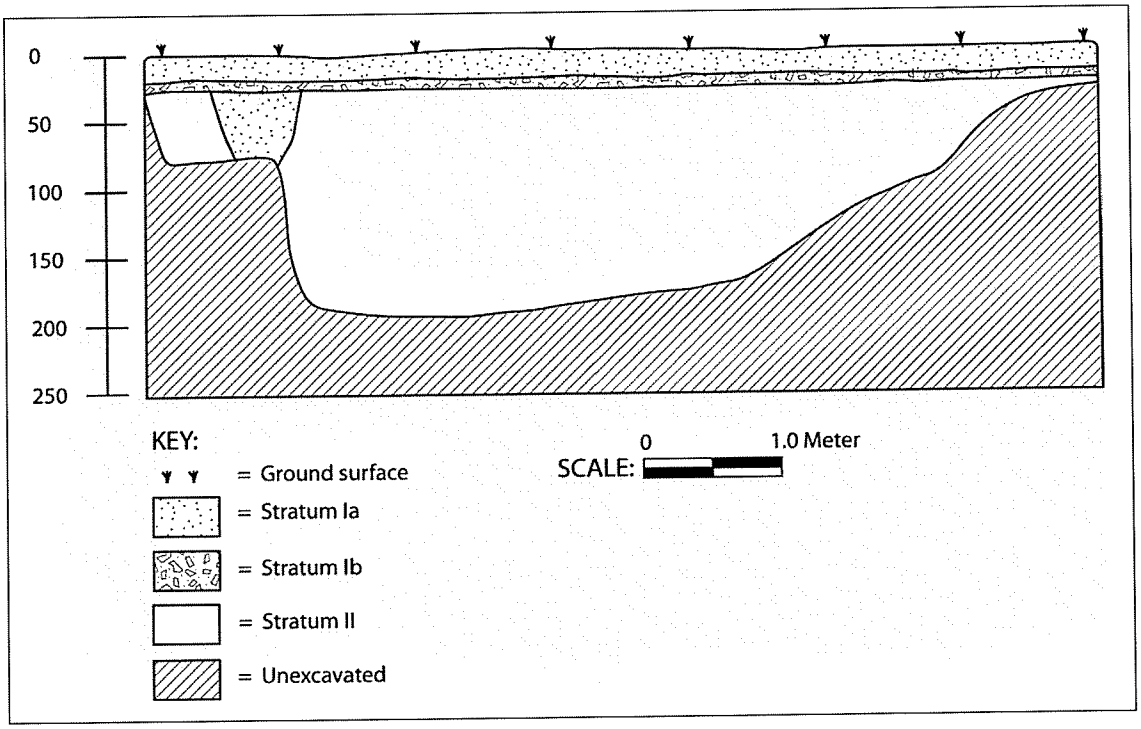

Figure 92. Profile map of the west face wall of TR-84.

Table 17. Stratigraphic Summary of Trench 84.

Stratum Ia: 0 to 80 cmbs	Fill Horizon; 5 YR 4/4, reddish brown; compacted silt, moderate to strong, very fine to fine, granular, structure; firm moist consistency; slightly plastic; very abrupt smooth lower boundary; roots, few, very fine to fine; fill layer above road bed (used as current road).
Stratum Ib: 20 to 28 cmb	Road bed; N/A, gravel layer
Stratum II: 28 to 190 cmb	B Horizon; 2.5 YR 3/4, dark reddish brown; silt, moderate, very fine to fine, granular and crumbs structure; friable moist consistency; slightly plastic; not visible lower boundary; no roots bserved; uniform sterile silt, <5% basalt gravel and cobble inclusions

4.2.2.4 Backhoe Trench 86

Trench 86 is located circa 25 m northeast of Trench 84 (Figure 79), and excavated to 250 cmbs, two distinct strata were observed. Stratum I, approximately 150 cm thick represents a fill layer, reddish brown compacted silt (Figure 93 and Figure 94). There are two pipelines at the south and north ends of this trench right below two pockets of Stratum I sediments. These pockets of Stratum I are the back dirt for these two pipelines and were not excavated or exposed (Figure 95). Stratum II is approximately 250 cm thickness. No other significant artifacts or cultural features were observed during the excavations of this trench. A detailed stratigraphic summary of Trench 86 is available in Table 18.

Figure 93. Long axis view of Trench 86, view to the north.

Figure 94. View of the west face wall of Trench 86, view to the west.

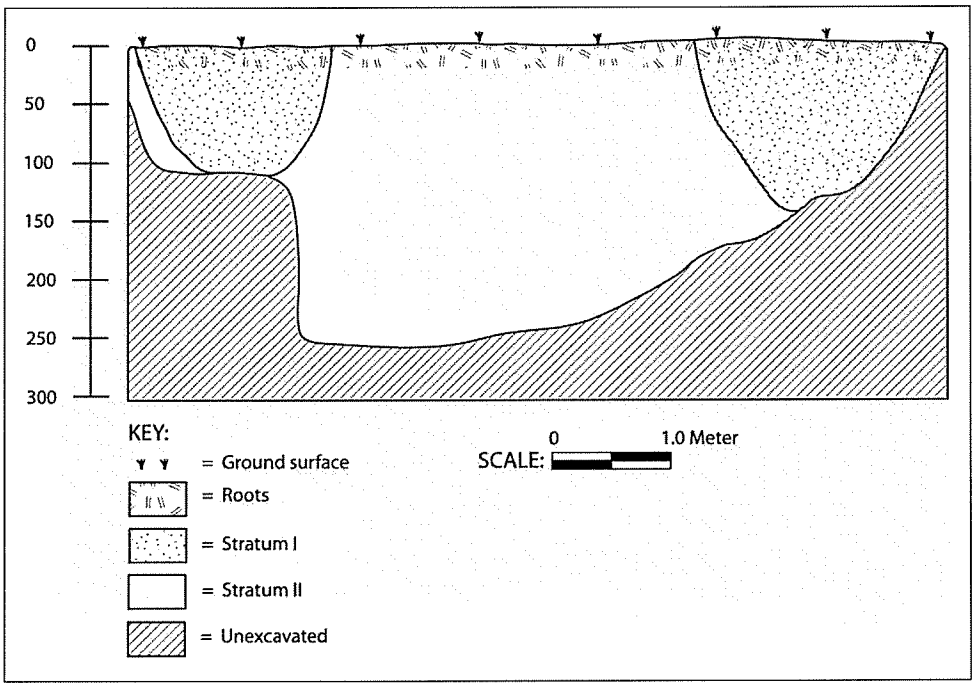

Figure 95. Profile map of the east face wall of Trench 86.

Table 18. Stratigraphic Summary of Trench 86.

Stratum I: 0 to 150 cmb	Fill Horizon; 5 YR 4/4, reddish brown; compacted silt, moderate to strong, very fine to fine, granular and crumb structure; firm moist consistency; slightly plastic; diffuse irregular lower boundary; roots, many, very fine to fine, medium, this layer is fill for existing pipes.
Stratum II: 0 to 250 cmb	B Horizon; 2.5 YR 3/4, dark reddish brown; silt, moderate, very fine to fine, granular and crumb structure; friable moist consistency; slightly plastic; not visible lower boundary; roots, none observed; uniform sterile silt, <5% inclusions.

4.2.2.5 Subsurface Testing in Area 2 in the Context of Previous Subsurface Testing in the Immediate Area

The area at Dickenson Street also overlaps a section of the inventory survey project area for a study that was carried out by Xamanek Researches, LLC, (Frey and Fredericksen 2009). Three of the backhoe trenches from the 2009 study were located within the boundary of this current project area right at Dickenson Street and five were recently excavated during this current study (see also Section 4.2.1.6 and Figure 77).

The three backhoe trenches (BT-154, BT-155 and BT-158) that fall within Area 2 of the current project area documented the presence of plastic irrigation line in (BT-155) at 110-220 cmbs (Frey and Fredericksen 2009:66). This depth suggests substantial disturbed deposit in this area. No other significant cultural material remains identified in this area during the 2009 study.

The five backhoe trenches (Trench 82, Trench 83, Trench 84, Trench 85, and Trench 86) excavated during the current study demonstrated that the disturbed deposit in this area extends as deep as 150 cmbs which a few pipelines were observed in some of these trenches and no other significant cultural material remains were identified. From the results of both studies in this area, it appears that the deposits and materials identified were similar across the tested areas.

4.2.3 Area 3

Area 3 extends from Shaw St. near the Lahaina Recreation Center Park to the southern terminus of the corridor where it connects with Front St. Aside from the plow zone the stratigraphy in this area is quite diverse compared to the other areas. Two known human burials and three previously recorded sites are located within or nearby the project corridor at Area 3.

Thirty eight backhoe trenches were initially planned for Area 3 and 37 of them were excavated as Trench 62 was in close proximity to Trench 53, therefore not excavated. More backhoe trenches were excavated in this area due to the dense concentration of Land Commission Awards (Table 19 and Figure 96) and the potential for identifying significant subsurface deposits.

The general stratigraphy of Area 3 is presented in this section with seven trenches out of the 37 presented as representative samples. See Appendix B-3 for detailed stratigraphic descriptions.

Table 19. Summary of backhoe trenches located in Area 3 (Shaw St. to Front St.

Trench	Comments	Trench	Comments
42	Excavated 7/8/10	**61**	Excavated 6/30/10
43	Excavated 7/8/10	**62**	Was very close to Trench # 53 (within 5 m) decided no further trenches needed in this area.
44	Excavated 7/8/10	**63**	Excavated 6/30/10
45	Excavated 7/8/10	**64**	Excavated 6/30/10
46	Excavated 7/8/10	**65**	Excavated 6/30/10
47	Excavated 7/1/10	**66**	Excavated 6/30/10
48	Excavated 7/1/10	**67**	Excavated 6/30/10
49	Excavated 7/1/10	**68**	Excavated 6/30/10
50	Excavated 7/1/10	**69**	Excavated 6/30/10
51	Excavated 7/1/10	**70**	Excavated 6/30/10
52	Excavated 7/1/10	**71**	Excavated 7/8/10
53	Excavated 6/30/10	**72**	Excavated 7/8/10
54	Excavated 6/29/10	**73**	Excavated 7/1/10
55	Excavated 6/29/10	**76**	Excavated 4/12/11
56	Excavated 6/29/10	**77**	Excavated 4/12/11
57	Excavated 6/29/10	**78**	Excavated 4/12/11
58	Excavated 6/29/10	**79**	Excavated 4/12/11
59	Excavated 6/29/10	**80**	Excavated 4/12/11
60	Excavated 6/29/10	**81**	Excavated 4/12/11

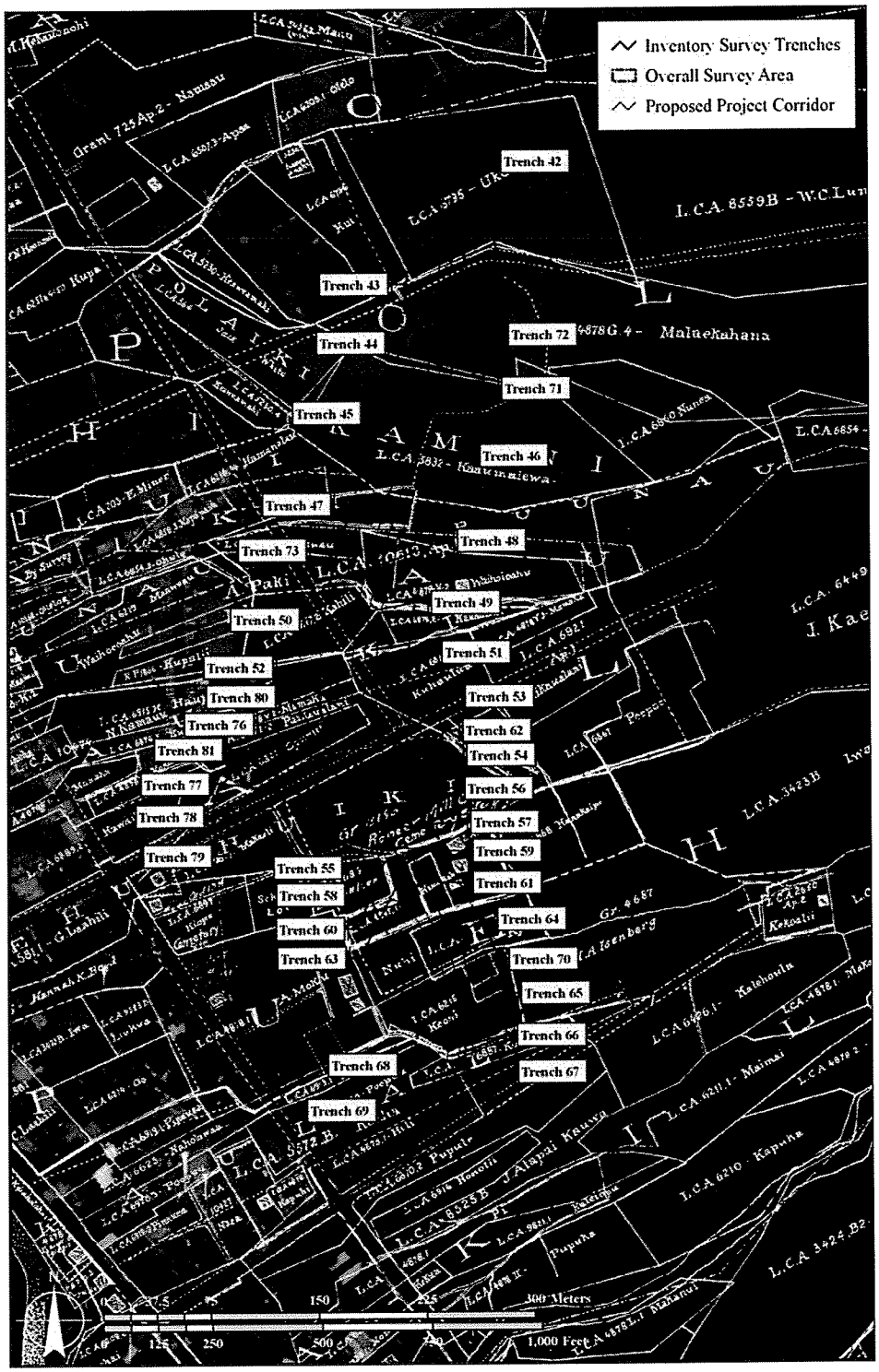

Figure 96. A portion of the 1883 S.E. Bishop map showing the location of backhoe trenches in relation to Land Commission Awards (LCAs) within the southern portion of the current project corridor between Shaw Street and the southeast end of Front Street (adapted from Bishop 1883).

4.2.3.1 Backhoe Trench 43

Trench 43 was located immediately east of the Lahaina Recreation Center Park (Figure 96). Excavated to 160 cmbs, five distinct strata were observed (Figure 97 through Figure 99, Table 20). Stratum I, approximately 40 cm thick represents the plow zone, a dark brown silty loam with remnants of black irrigation line. Stratum II is a 40 cm thick dark brown silty loam layer with a few fine roots and approximately 30% inclusions of basalt boulders. Stratum III a 50 cm thick redish brown silty loam was observed and free of inclusions. Stratum IV, a 20 cm thick brown sandy loam was identified atop of a 30 cm thick, brown silty loam, Stratum V. No cultural materials were encountered from Stratum II through V in this trench.

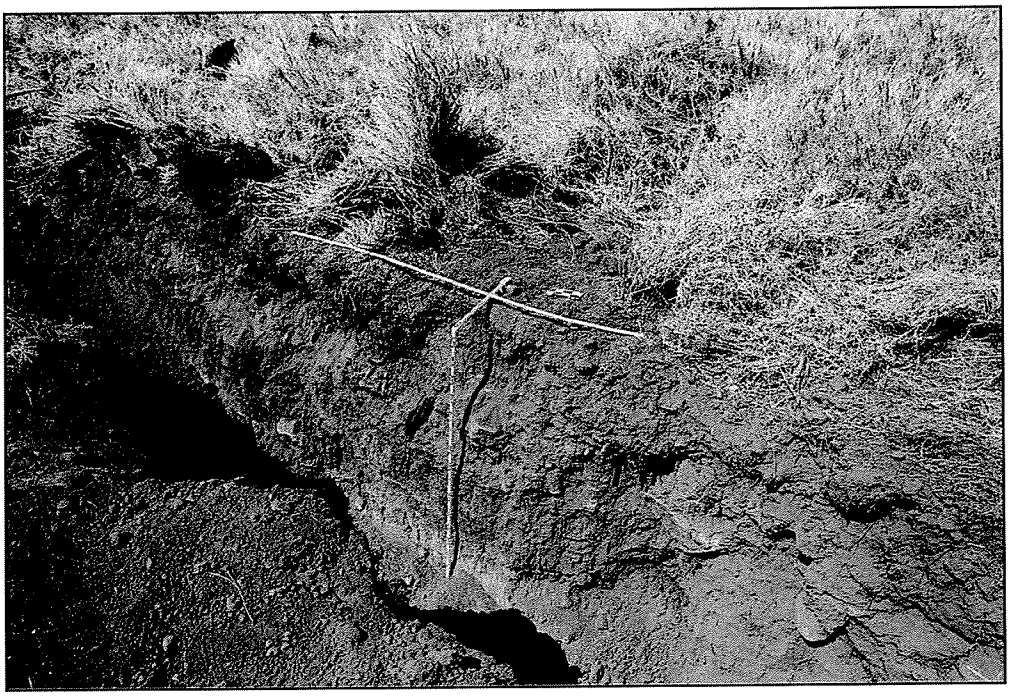

Figure 97. Overall photograph of Trench 43, view to the east.

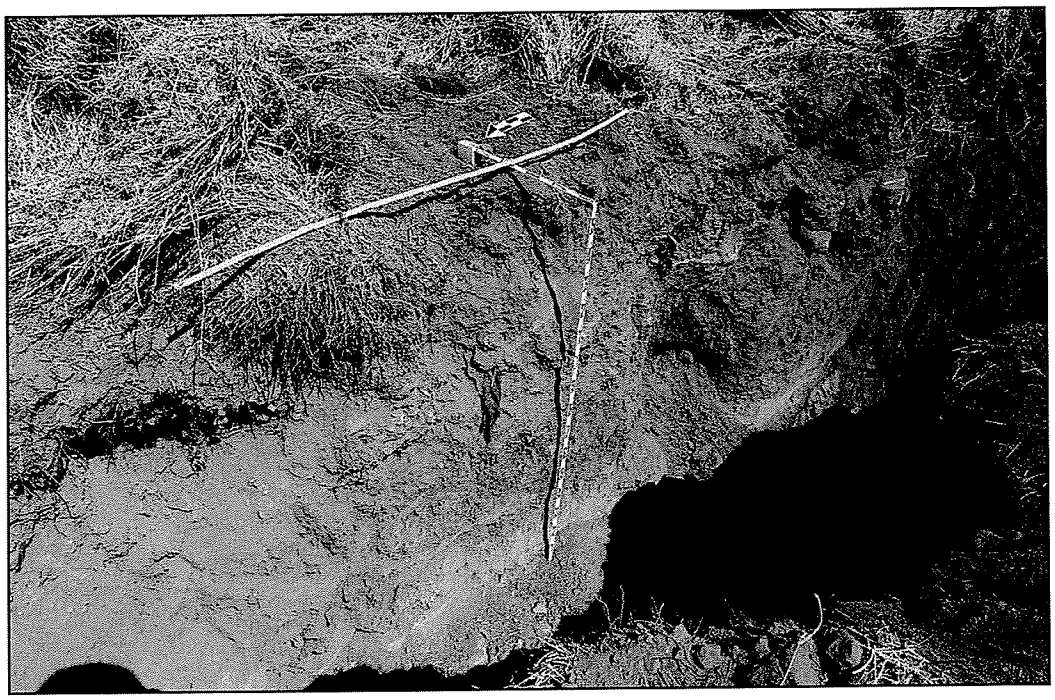

Figure 98. Profile of Trench 43, view to south

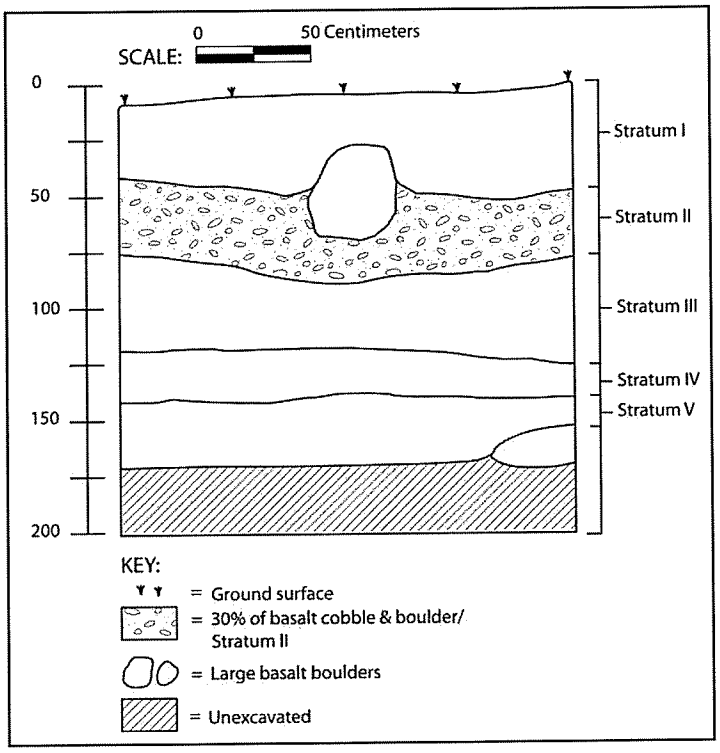

Figure 99. South profile of Trench 43.

Table 20. Stratigraphic Summary of Trench 43.

Stratum I: 0-40 cmbs	Ap Horizon; 7.5 YR 3/3, dark brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous clear wavy lower boundary; common fine roots. Plow zone with modern inclusions including Drisco irrigation pipe.
Stratum II: 40-85 cmbs	A Horizon; 7.5 YR 3/3, dark brown; silt loam, medium, crumb structure; loose dry consistency; non-plastic; weak; terrigenous clear wavy lower boundary; few fine roots and 30% boulder inclusions.
Stratum III: 60-110 cmbs	A Horizon; 5 YR 5/3, reddish brown; silt loam, medium, crumb structure; loose dry consistency; non-plastic; weak; terrigenous clear smooth lower boundary.
Stratum IV: 110-130 cmbs	A Horizon; 7.5 YR 5/3, brown; sandy loam, weak, fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous clear smooth lower boundary.
Stratum V: 130-160 cmbs	C Horizon; 10 YR 4/3, brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous; lateritic soil turning yellow.

4.2.3.2 Backhoe Trench 49

Trench 49 was located approximately 30 m west of a previously identified human burial (SIHP -6473) and south of the Lahaina Recreation Center Park (Figure 96). Excavated to 180 cmbs, three distinct strata were observed (Figure 100 to Figure 102). Stratum I, approximately 75 cm thick represents the plow zone, a brown silty loam with inclusions that include black irrigation tubing. Stratum II is a 70 cm thick light brown silty loam layer with a few fine roots. Stratum III a 45 cm thick light yellowish brown silty loam was observed with 50% of basalt boulder and cobble inclusions. No cultural materials or features were encountered during the excavation of this trench. A detailed stratigraphic summary is available in Table 21.

Figure 100. Overall photograph of Trench 49, view to the east.

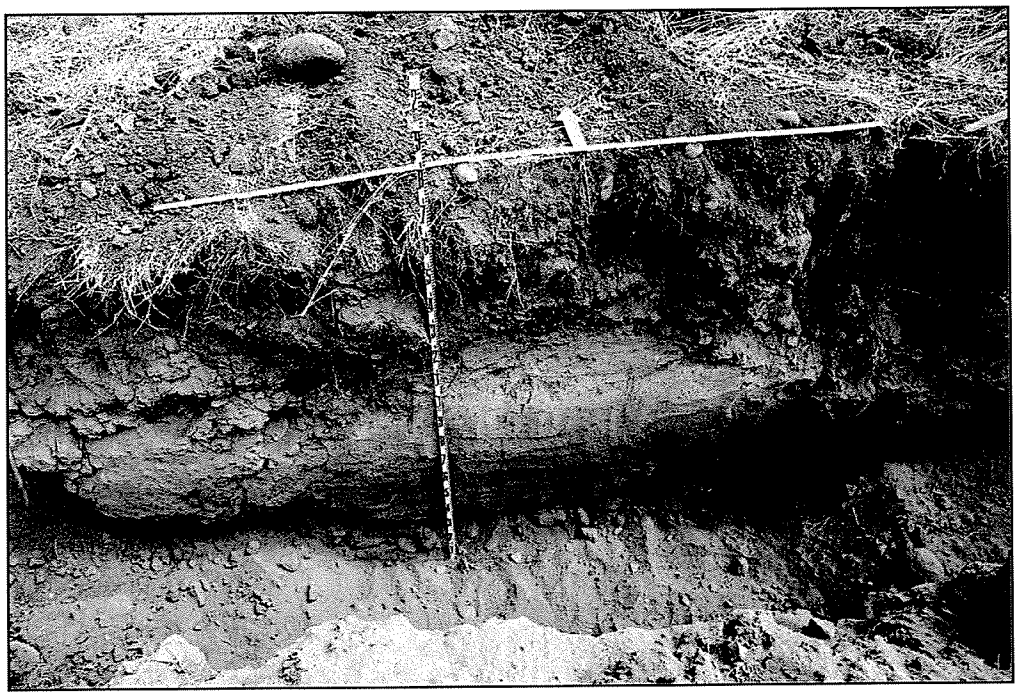

Figure 101. Profile of Trench 49, view to north

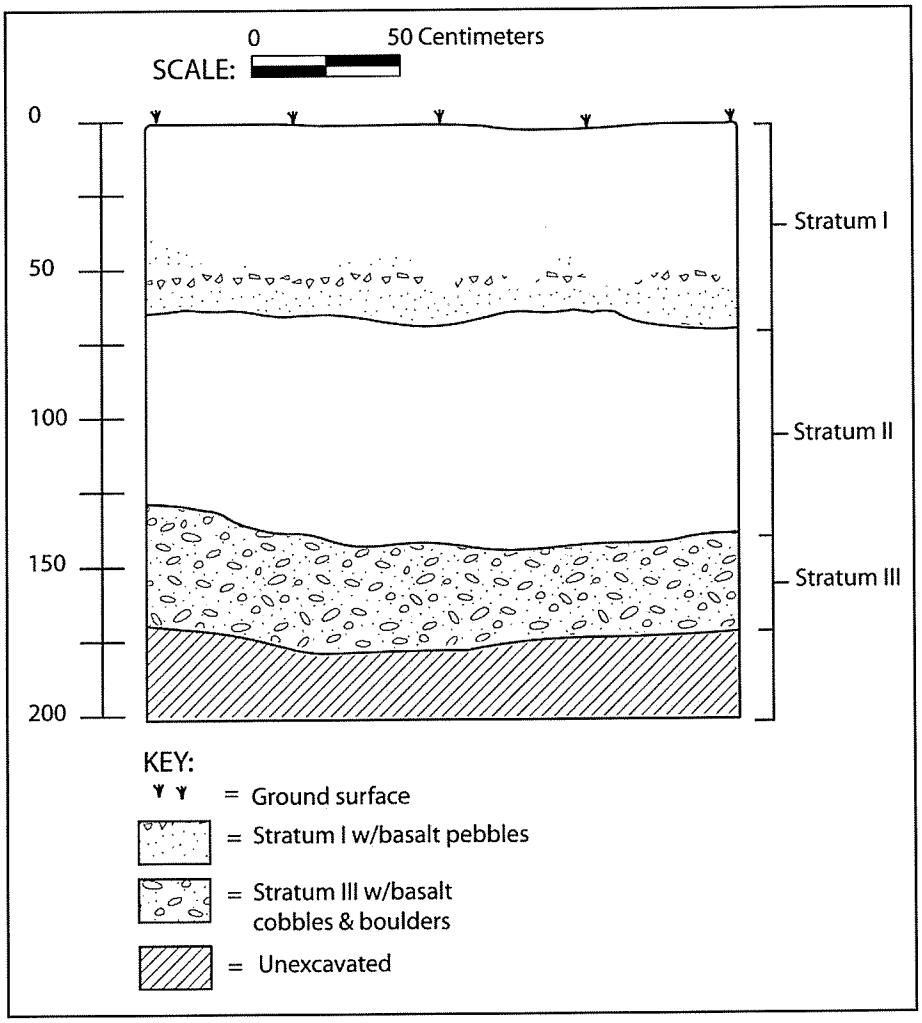

Figure 102. North profile of Trench 49.

Table 21. Stratigraphic Summary of Trench 49.

Stratum I: 0-75 cmbs	Ap Horizon; 7.5 YR 4/3, brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; common fine roots. Plow zone, Drisco irrigation tubing present.
Stratum II: 70-140 cmbs	A Horizon; 7.5 YR 6/3, light brown; silt loam mixed with basalt sand, weak, medium, crumb structure; loose dry consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; common fine roots.
Stratum III: 135-180 cmbs	A Horizon; 10 YR 6/4, light yellowish brown; weak, very fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous not visible. Approximately 50% basalt cobble and boulder inclusions.

4.2.3.3 Backhoe Trench 56

Trench 56 was located approximately 125 m west of a previously identified human burial (SIHP -6473) and south of the Lahaina Recreation Center Park (Figure 96). Excavated to 160 cmbs, three distinct strata were observed (Figure 103 through Figure 105). Stratum I, approximately 90 cm thick represents the plow zone, a dark reddish gray silty loam. Stratum II, a 70 cm thick light yellowish brown silty loam layer was observed atop Stratum III, a 10 cm thick dark grayish brown blue basalt rock layer. Stratum II contains 50% of basalt boulder and cobble inclusions. No cultural materials and features encountered during the excavation of this trench. A detailed stratigraphic summary is available in Table 22.

Figure 103. Overall photograph of Trench 56, view to the north.

Figure 104. Profile of Trench 56, view to west.

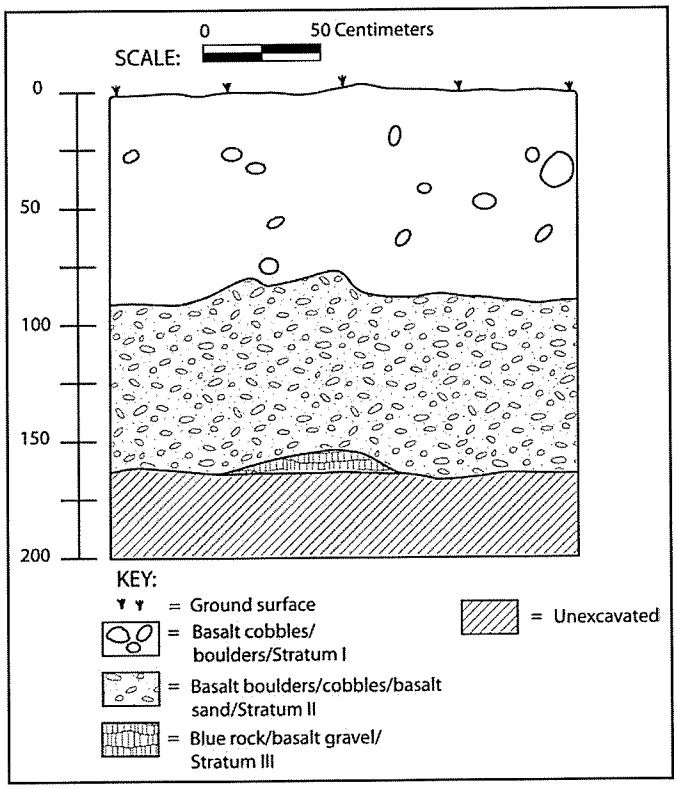

Figure 105. West profile of Trench 56.

Table 22. Stratigraphic Summary of Trench 56

Stratum I: 0-90 cmbs	Ap Horizon; 5 YR 4/2, dark reddish gray; silt loam, weak, fine, crumb structure; loose dry consistency; non-plastic; none; terrigenous clear smooth lower boundary.
Stratum II: 90-160 cmbs	A Horizon; 10 YR 6/4, light yellowish brown; sand, coarse, granular structure; loose dry consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; 80 % basalt boulders and cobble inclusions
Stratum III: 150-160 cmbs	R Horizon; 2 Y 4/2, dark grayish brown; blue basalt rock.

4.2.3.4 Backhoe Trench 61

Trench 61 (Figure 96) was located approximately 175 m south of a previously identified human burial (SIHP -6473) and south of the Lahaina Recreation Center Park. Excavated to a depth of 200 cmbs, seven distinct stratigraphic layers were observed (Table 23, Figure 106 through Figure 108). An Ap horizon (Stratum I) consisting of dark brown silty loam approximately 75 cm thick atop a 45 cm thick, brown silty clay A Horizon (Stratum II). Stratum III, approximately 30 cm thick, a brown silty loam was observed atop a reddish yellow silt loam, approximately 50 cm thick (Stratum IV). Stratum III contained 65-75 % of subanular/rounded basalt cobbles and pebbles. Stratum V, brown basalt sand, approximately 20 cm thick, was identified atop a 10 cm thick, dark gray basalt sand layer, Stratum VI. Stratum VI contains 50-60 % of subangular/rounded basalt cobbles and pebbles. Below, Stratum VI, approximately 30 cm thick yellow brown silty loam (Stratum VII) contained very few subangular/rounded cobble inclusions. While Stratum I contained a few glass and ceramic fragments and black irrigation tubing, no other cultural materials or features were observed within the lower strata.

Figure 106. Overall photograph of Trench 61, view to the south.

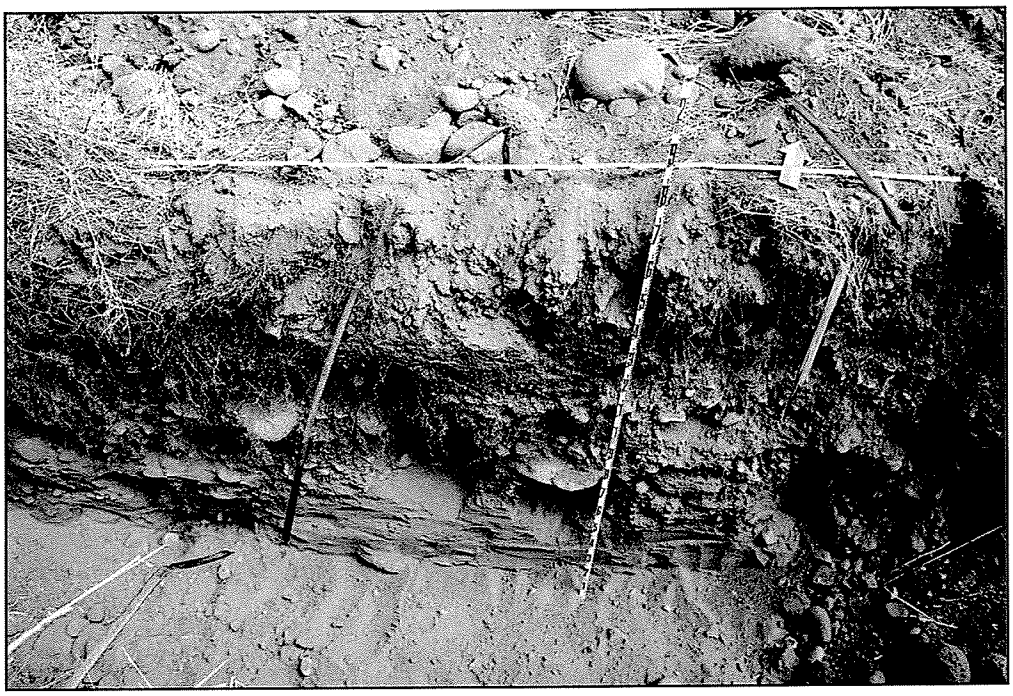

Figure 107. Profile of Trench 61, view to west.

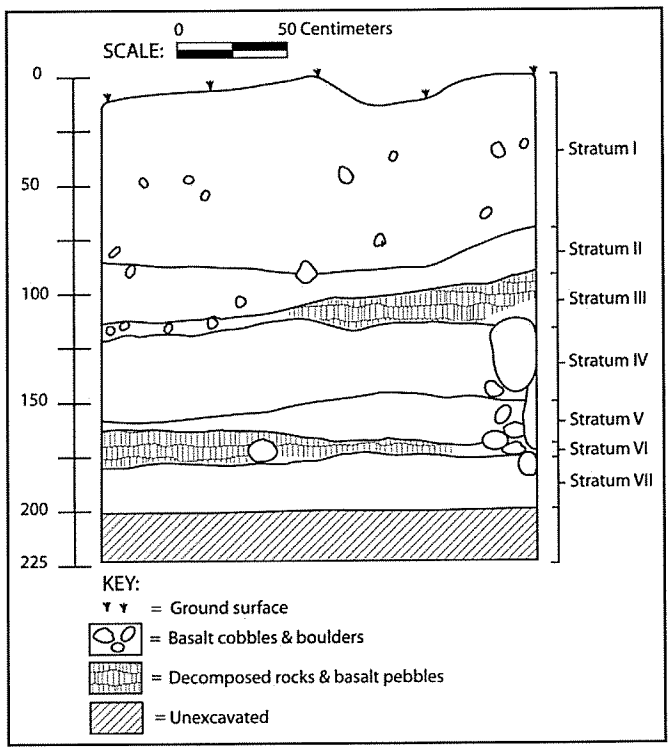

Figure 108. West profile of Trench 61.

Table 23. Stratigraphic Summary of Trench 61.

Stratum I: 0-75 cmbs	Ap Horizon; 7.5 YR 3/3, dark brown; silt loam, weak, very fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous clear smooth lower boundary; Historic artifact including glass and ceramic whiteware fragments.
Stratum II: 70-115 cmbs	A Horizon; 10 YR 4/3, brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous clear smooth lower boundary; few fine roots.
Stratum III: 90-120 cmbs	A Horizon; 7.5 YR 4/4, brown; silt loam/ basalt sand, weak, medium/coarse, crumb structure; loose dry consistency; non-plastic; weak; terrigenous clear smooth lower boundary.
Stratum IV: 120-170 cmbs	A Horizon; 7.5 YR 6/6, reddish yellow; silt loam, weak, very fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary.
Stratum V: 150-170 cmbs	A Horizon; 7.5 YR 4/2, brown; basalt sand, coarse, granular structure; single-grain loose dry consistency; non-plastic; weak; terrigenous very abrupt smooth lower boundary.
Stratum VI: 160-170 cmbs	A Horizon; 7.5 YR 4/1, dark gray; basalt sand, coarse, granular structure; single-grain loose dry consistency; non-plastic; weak; terrigenous very abrupt smooth lower boundary.
Stratum VII: 170-200 cmbs	A Horizon; 10 YR 4/4, yellow brown; silt loam, weak, very fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous.

4.2.3.5 Backhoe Trench 69

Trench 69 was located at the southern most end of the project corridor, approximately 75 m. east of the Honoapi'ilani Highway (Figure 96). Excavated to a depth of 165 cmbs (centimeters below surface), six distinct stratigraphic layers were observed (Figure 109 to Figure 111), a dark brown silty loam (Stratum I), approximately 80 cm thick atop a 45 cm thick, brown silty clay A Horizon (Stratum II), contained a few fine roots. Stratum III a brown silty loam, approximately 30 cm thick,was observed atop an approximately 50 cm thick reddish yellow silty loam (Stratum IVa). Stratum III contained 65-75 % of subanular/rounded basalt cobbles and pebbles. Stratum IVb is a lens of reddish yellow silty loam within Stratum IVa, and it is approximately 15 cm thick. Below, Stratum IVb is a brown basalt sand, approximately 50 cm thick which contained 20-30% of decomposed parent bedrock. Stratum I contained some black irrigation tubing. No other cultural materials or features observed in the lower strata during the excavation of the trench. A detailed stratigraphic summary is available in Table 24.

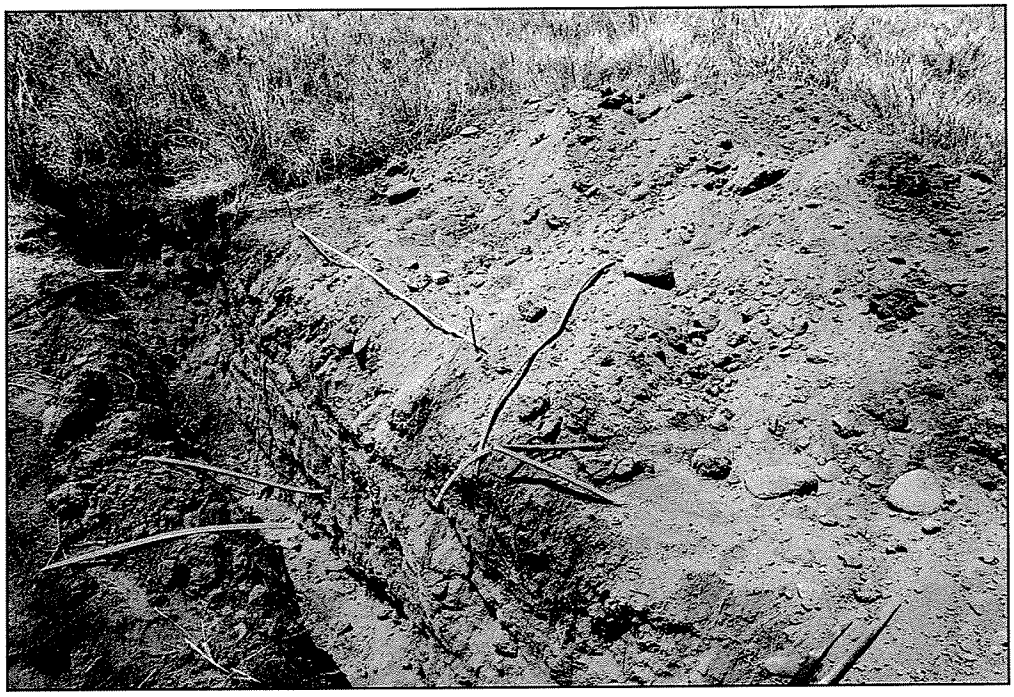

Figure 109. Overall photograph of Trench 69, view to the north.

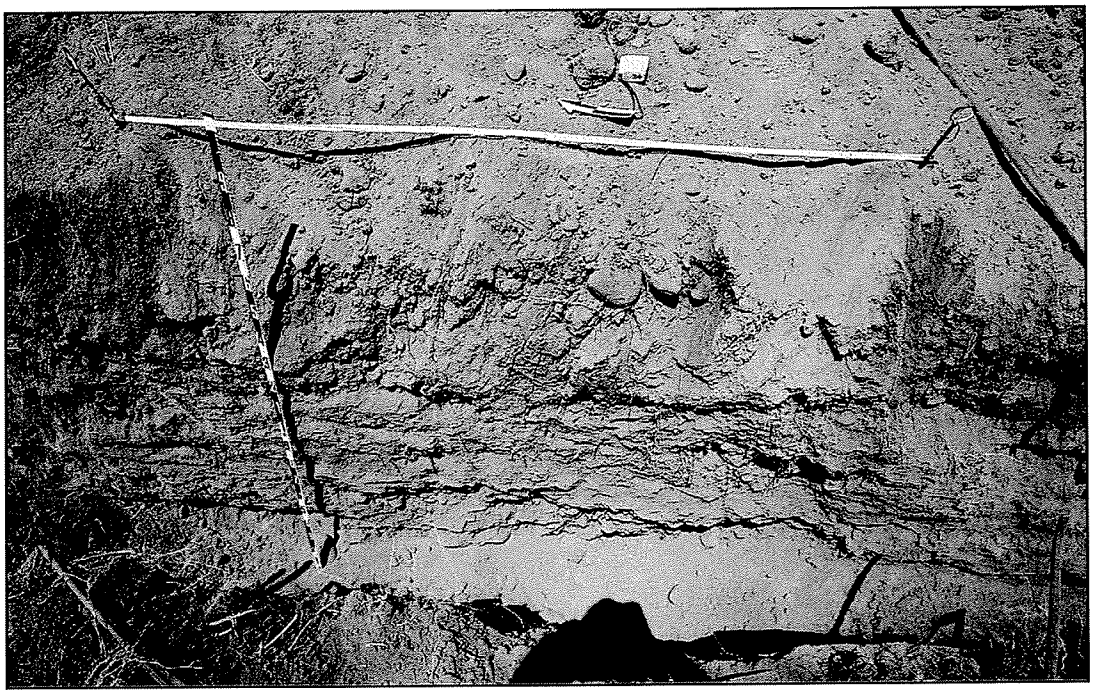

Figure 110. Profile of Trench 69, view to the east.

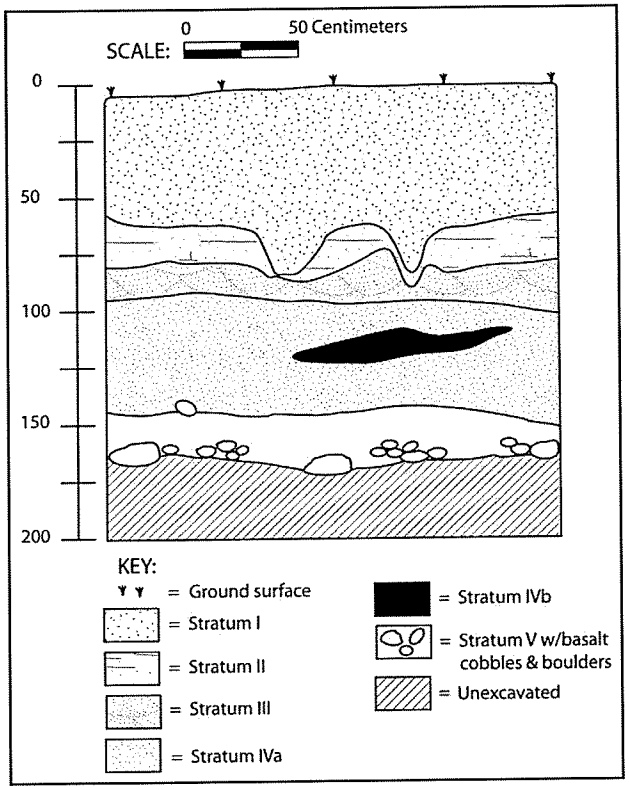

Figure 111. East profile of Trench 69.

Table 24. Stratigraphic Summary of Trench 69

Stratum I: 0-80 cmbs	7.5 YR 3/3, dark brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear wavy lower boundary; a Horizon; common fine roots; Cultural Material; black irrigation tubing General Observations; plow zone
Stratum II: 60-85 cmbs	Ap Horizon; 7.5 3/3, dark brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous clear wavy lower boundary; few fine roots.
Stratum III: 70-95 cmbs	A Horizon; 5 YR 4/3, reddish brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous clear smooth lower boundary; few fine roots.
Stratum IVa: 90-145 cmbs	A Horizon; 7.5 YR 4/2, brown; basalt sand, weak, coarse, granular structure; single-grain loose dry consistency; non-plastic; weak; terrigenous clear smooth lower boundary.
Stratum IVb: 105-120 cmbs	A Horizon; 7.5 YR 6/6, reddish yellow; silt loam, weak, very fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous clear smooth lower boundary; silt loam lens.
Stratum V: 145-165 cmbs	C Horizon; 10 YR 5/4, yellowish brown; weak, fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous; lateritic soil/sapprolite.

4.2.3.6 Backhoe Trench 78

Trench 78 was located approximately 115 m. south of a previously identified human burial (SIHP -6473) and south of the Lahaina Recreation Center Park in the connection of the corridor between the Honoapi'ilani Mini Bypass and the Aholo Road (Figure 96). Excavated to a depth of 270 cmbs (centimeters below surface), five distinct stratigraphic layers were observed (Figure 112 to Figure 114), plow zone layer (Stratum I) consisting of dark brown clay loam approximately 60 cm thick overlying a 100 cm thick, grey boulder, cobbe, gravel and coarse silt and sand that appears to represent a storm or river deposit (Stratum II). Stratum II contains 45-50% of subangular and rounded boulders, cobbles and gravels or pebbles, as well as the remains of a previously disturbed human burial. Stratum III, approximately 80 cm thick of storm and/or rever deposit atop a light olive brown silt (Stratum IV). Stratum III contains of 50-55% of subangular and rounded basalt boulders, cobbles and gravels or pebbles, and no cultural material remains. Stratum IV contains no inclusions and no cultural material remains. Below, Stratum IV, approximately 30 cm thick a dark gray silt (Stratum V) contained no inclusions and no cultural material remains. A detailed stratigraphic summary is available in Table 25.

Figure 112. Long axis view of Trench 78, view to the south.

Figure 113. View of section of the east face wall of Trench 78, view to the east.

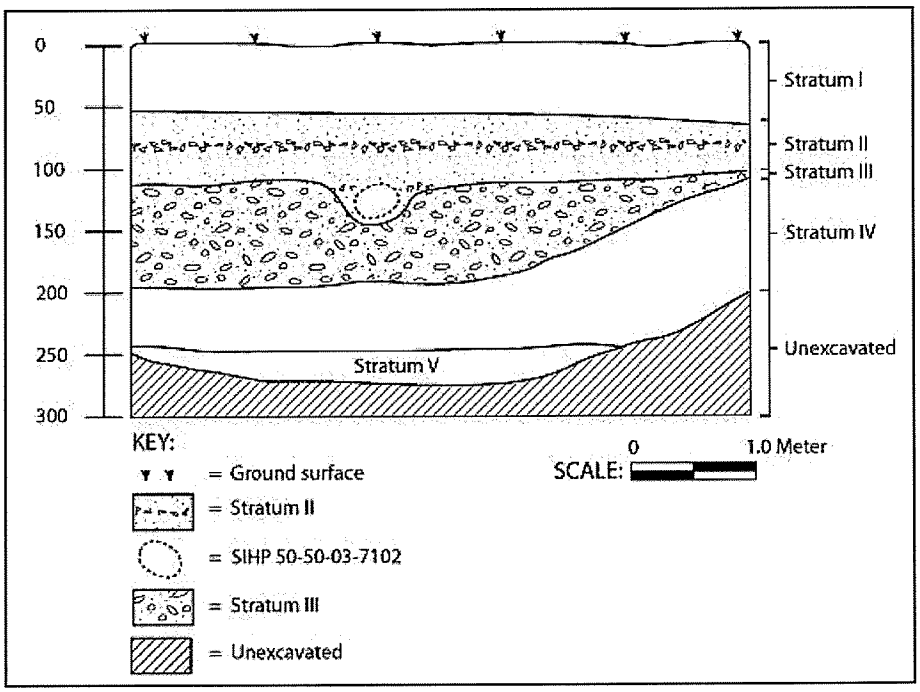

Figure 114. Profile map of the west face wall of Trench 78 with SIHP 50-50-03-7102.

Table 25. Stratigraphic Summary of Trench 78.

Stratum I: 0 to 60 cmbs	Plow zone layer; 7.5 YR 3/3, dark brown clay loam; hard and compacted dry consistency; slightly ferm moist consistency; slightly plastic; abrupt and diffuse lower boundary; roots, common, fine to medium; inclusions 15-20% subangular basalt boulders and cobbles; contains some post-contact cultural material remains.
Stratum II: 50 to 150 cmbs	Storm/river deposit; 10 YR 6/1, grey; boulderly/cobbely/gravelly/ coarse silt and sand, hard and compacted dry consistency; non plastic; abrupt; roots: few to common, fine to medium, 45-50% subangular and rounded gravels, cobbles, and boulders; contains previously disturbed human burial.
Stratum III: 110 to 190 cmbs	Storm/rever deposit; 7.5 YR 4/1, drak gray boulderly/cobbely/gravelly/ and coarse silt sand, hard and compacted dry consistency; non-plastic; clear and smooth lower boundary; roots, few and fine, 50 to 55% subangular and rounded gravels, cobbles, and boulders; contains no cultural material remains.
Stratum IV: 120 to 240 cmbs	B Horizon; 2.5 Y 4/5, light olive brown silt, slightly hard dry consistency; friable moist consistency; slightly plastic; diffuse and broken lower boundary; roots, few and fine; no inclusions and cultural materialremains.
Stratum V: 240 to 270 cmbs	B Horizon; 2.5 Y 6/1, dark gray silt; weak, very fine, and granular structure; loose dry consistency; very friable moist consistency; non-sticky wet consistency; non-plastic; weak; not visible n/a lower boundary; roots, none observed; contains no inclusions and cultural materials.

4.2.3.7 Backhoe Trench 79

Trench 79 was located at approximately 20.0 m west of Trench 78 and circa 20.0 m east of a Chinese cemetery on the south side of Aholo Road (Figure 96). Excavated to a depth of 330 cmbs (centimeters below surface), four distinct stratigraphic layers were observed (Figure 115 to Figure 117), the plow zone layer (Stratum I) consisting of dark brown clay loam approximately 80 cm thick atop a 70 cm thick, grey coarse silt and sand with a high boulder, cobble, and gravel content that likely represents a storm and/or river deposit (Stratum II). The plow zone is beneath a pushed pole or berm that contains modern refuse. This soil berm is approximately 110 cm thick in cross section and Stratum II contains 45-50% of subangular and rounded boulders, cobbles and gravels or pebbles. Stratum III, approximately 70 cm thick consists of light olive brown silt and contains no inclusions or cultural material remains. A detailed stratigraphic summary is available in Table 26.

Figure 115. Long axis view of Trench 79, view to the west.

Figure 116. View of section of the north face wall of Trench 79, view to the north.

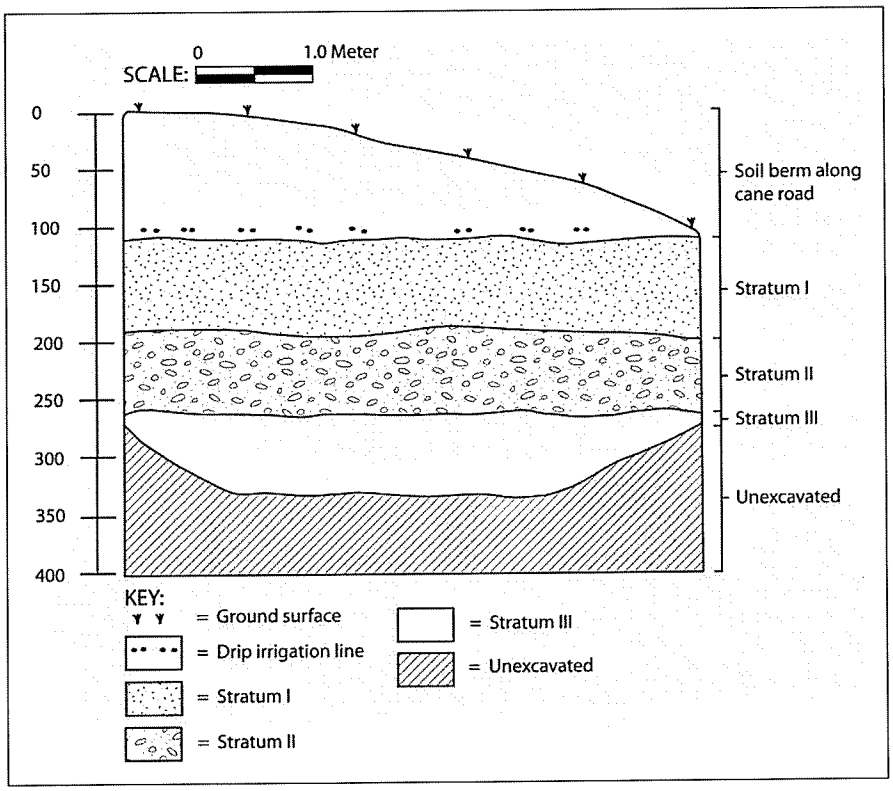

Figure 117. Profile map of the north face wall of Trench 79

Table 26. Stratigraphic summary of Trench 79.

Stratum I: 0 to 110 cmbs	A disturbed dirt pile along the east side of the cane road. This disturbed soil berm is 110 cm thick and contains modern refuse.
Stratum II: 110 to 190 cmbs	A plow zone layer; 7.5 YR 3/3, dark crown clay loam; hard and compacted dry consistency; firm moist consistency; slightly plastic; abrupt and diffuse; roots, common, fine, medium, and large; contains 15-25% subangular basalt cobblles and boulders
Stratum III: 190 to 260 cmbs	Storm an/or river deposit; 10 YR 6/1, grey boulderly, cobbley and gravelly coarse silt, hard to compacted dry consistency; very ferm moist consistency; non-plastic; abrupt and clear lower boundary; roots, few to common, fine and medium; 45-50% subangular and rounded gravels, cobbles, and boulders; contains no cultural material remains.
Stratum IV: 260 to 330 cmbs	B Horizon; 2.5 Y 4/5, light olive brown silt, slightly hard dry consistency; friable moist consistency; slightly plastic; lower boundary not visible; roots, few and fine; contains no cultural material remains.

4.2.3.8 Subsurface Testing in Area 3 in the Context of Previous Subsurface Testing in the Immediate Area

The lands of Area 3 are culturally sensitive with a dense concentration of Land Commission Awards that promoted the excavation of several backhoe trenches in this area during both the current study and 2009 inventory survey (Frey and Fredericksen 2009). Nineteen (BT-7 to BT-8, BT-11, BT-14 to BT-18, BT-23, BT-26, BT-29, BT-31 to BT-32, BT-35, BT-184 to BT-186, BT-190 and BT-192)o f the 193 backhoe trenches excavated during the 2009 study were located in the vicinity of Aholo Road, and 37 were excavated during the current study (Figure 118).

Four (BT-15, BT-26, BT-186 and BT-191) of ninteen backhoe trenches that were located within the project corridor in this area from the 2009 study documented subsurface post-contact and pre-contact cultural material deposits. During the excavation of BT-15 a subsurface feature/site (SIHP 50-50-03-6471) was identified. This site consists of a post-contact refuse pit that was identified at 120-180 cmbs in Layer III of BT-15. Test Unit 3 was excavated to further investigate this feature/deposit. The majority of the cultural material remains identified from Test Unit 3 were post-contact cultural materials remains with a very small amount of coral and basalt fragments. SIHP 50-50-03-6473 was identified during the excavation of BT-26 in Layer II at 64-96 cmbs and Test Unit 1 was excavated at this trench to further investigate this site. SIHP -6473 consists of a previously disturbed post-contact burial. SIHP 50-50-03-6476 was documented during the excavation of BT-186 in Layer I from 0-60 cmbs and Test Unit 2 and 7 were excavated to further investigate this deposit. As a result of the control excavation of the two 1 m x 1 m square test units at BT-186, Frey and Fredericksen (2009) interpreted this site as a subsurface agricultural feature with possible pre-contact and post-contact use. Coral and marine shell midden were identified during the excavation of BT-191. All the 19 backhoe trenches documented the plow zone which suggests that this area was used during both the post-contact and pre-contact time period.

Thirty seven trenches (Trench 42 to Trench 61, Trench 63 to Trench 73 and Trench 76 to Trench 81) were recently excavated in the same area by this current study. The majority of these 37 trenches contain the plow zone but very few have the black plastic irrigation driplines. SIHP 50-50-03-7102 was identified in Trench 78 within Stratum II at 1.1 to 1.3 mbs (meters below surface). A very light scatter of historic bottle glass fragments, stoneware sherds, rusted metal fragments and the black plastic irrigation dripline was observed in the plow zone of this trench.

The thickness of the plow zone in this area recorded during the 2009 study varies between 0-40 to 0-90 cmbs while the current study documented it as between 0-35 to 0-130 cmbs. The river or storm deposit(s) also vary in the trenches from both investigations. The Frey and Fredericksen study (2009:53, 69-70) noted river deposits in BTs -23, -184, -198, and -192 that varied in depth from c. 40-210 cmbs. The current study documented that majority of the trenches in this area contain at least one river or storm deposit while two trenches contain two river or storm depositional episodes. The trenches that contain two river or storm deposits are Trench 61 and 78 (see subsection 4.2.5). The single and/or top river or storm deposit layer in the trenches at this area varies in depth between c. 40-80 and 130-180 cmbs, while the second layer appears between 165-180 and 105-195 cmbs. As noted above SIHP -7102 was identified within the matrix of the upper river or storm deposit at 110-130 cmbs.

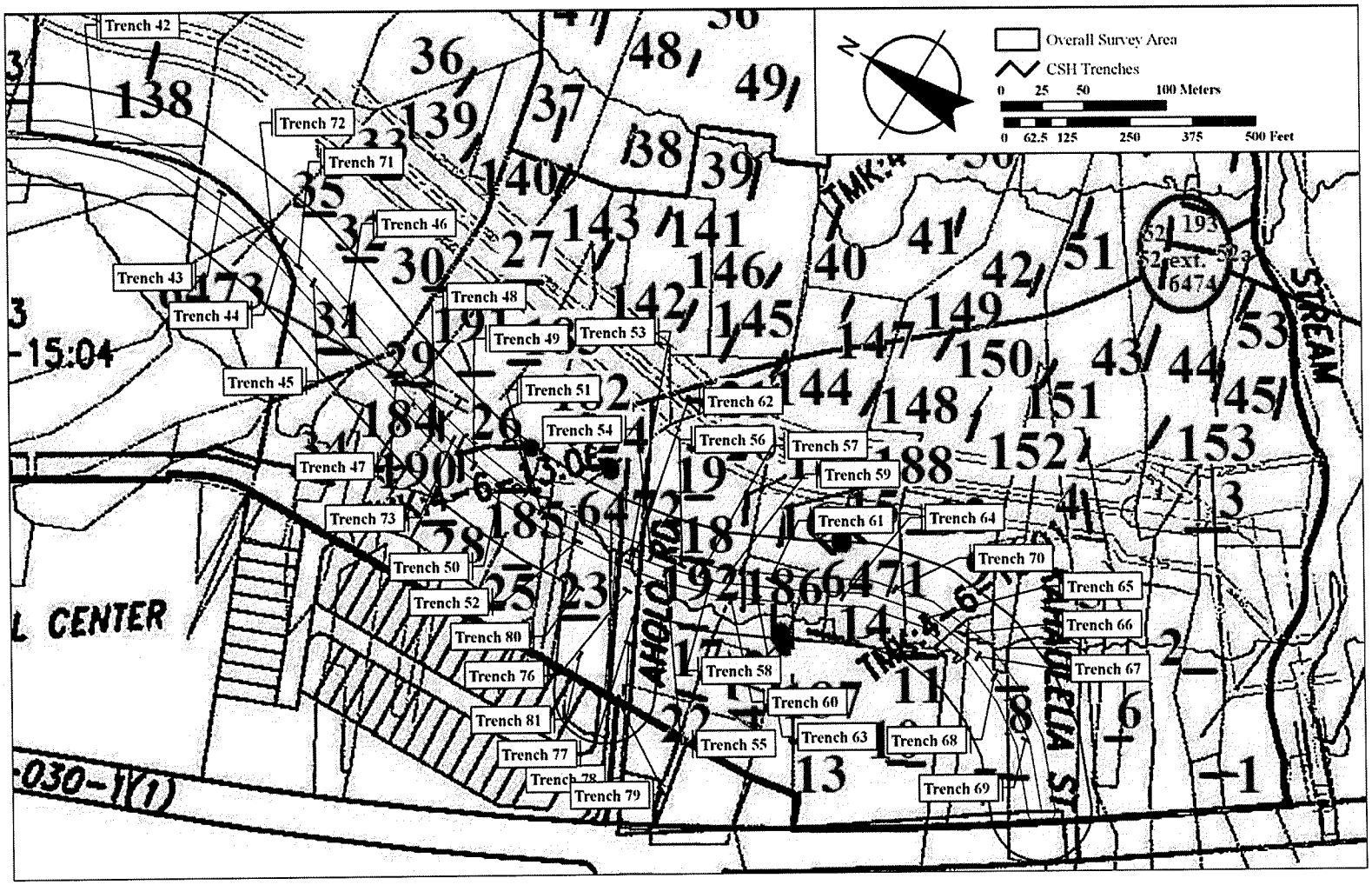

Figure 118. Portion of Xamanek Researches, LLC subsurface testing map, Frey and Fredericksen (2009), in relation to the current survey corridor around the Aholo Road, Xamanek backhoe trenches in green are not to scale.

Section 5 Results of Laboratory Analysis

By far the most common category of cultural materials recovered during the recordation and subsurface testing of the current inventory survey area consisted mainly of post-contact materials. In addition, a very small assemblage of lithic debitage consisting of two flakes of volcanic glass and a basalt flake, as well as a small assemblage of faunal remain and water worn pebbles and coral were recovered and analyzed. The following section summarizes the results of laboratory analysis of recovered artifacts and faunal remains with the full artifact catalog and analysis sheets available in Appendix C.

5.1 Artifact Analysis

5.1.1 Indigenous and/or Hawaiian Traditional Artifacts

Indigenous artifacts are traditional Hawaiian tools that are manufactured from available local raw materials, such as volcanic glass, basalt rock, bone, coral, and shell using traditional Hawaiian methods and techniques (Kirch 1983 in T. L. Lee-Greig, O'Hare et al. 2008). These indigenous tools or artifacts usually indicated that the Hawaiian traditional way of life was once practiced in an area.

5.1.1.1 Lithics, Volcanic Glass and Basalt Flakes

Volcanic glass flakes and basalt flakes are produced by forcefully removing them from a larger piece of core and/or from the original source of the raw material, intentionally. The removal of these materials could also be related to accidental and/or natural means. However, characteristics of flakes that are intentionally produced often exhibit the distinctive morphological attributes illustrated in Figure 119 (T. L. Lee-Greig, O'Hare et al. 2008:79).

Volcanic glass (n=2; wt = less than 0.1 g) debitage were recovered during the excavations of Trench 20A in Stratum II at depths ranging from 150 to 170 cmbs (centimeters below surface). See Table 27 for the summary of attributes for volcanic glass debitage collected and analyzed during this study. The two very small pieces of volcanic glass do not exhibit any signs of usewear or modification along their edges, and therefore, they are considered lithic debitage or waste, or are natural glass flakes (Figure 120). Basalt flake or debitage (n=1; wt = 2.14) was recovered during the control excavation of Test Unit 2 in Stratum II at the depth of 20-30 cmbd (centimeters below datum). This flake does not exhibit any signs of usewear or modification along its edges, and is considered as flake debitage or natural flake. See Table 27 for detail attributes of analyzed volcanic glass and possible natural basalt flake.

Table 27. Lithic Flakes/debitage Recovered from Trench 20A and Test Unit 2.

Excavation Unit	Stratum	Depth	No.	Weight (g)	Material Type	Comments
BT-20A	II	150-170 cmbs	2	< 0.1	Volcanic glass	debitage/fragments
TU- 2	II	20-30 cmbd	1	2.14	Basalt	debitage/fragment

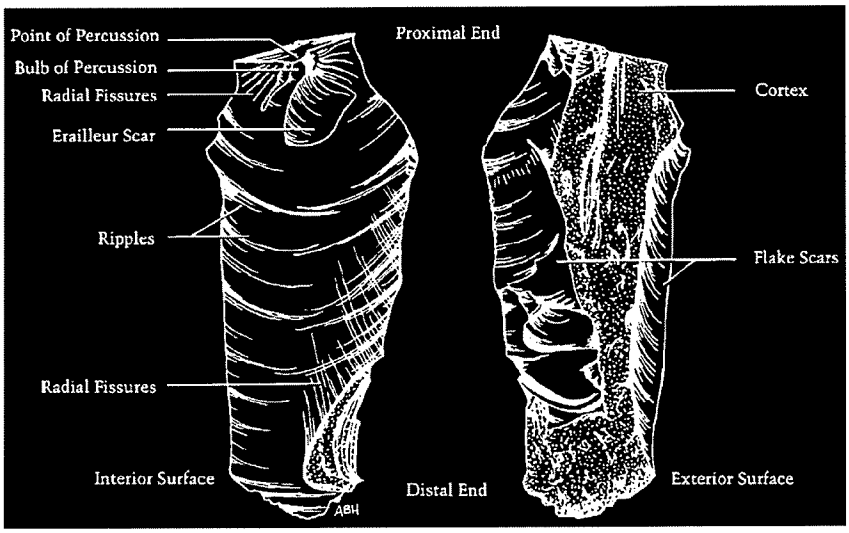

Figure 119. Detailed characteristics of a culturally produced flake. (Sketch adapted from Lee-Greig et. al., 2008: 80)

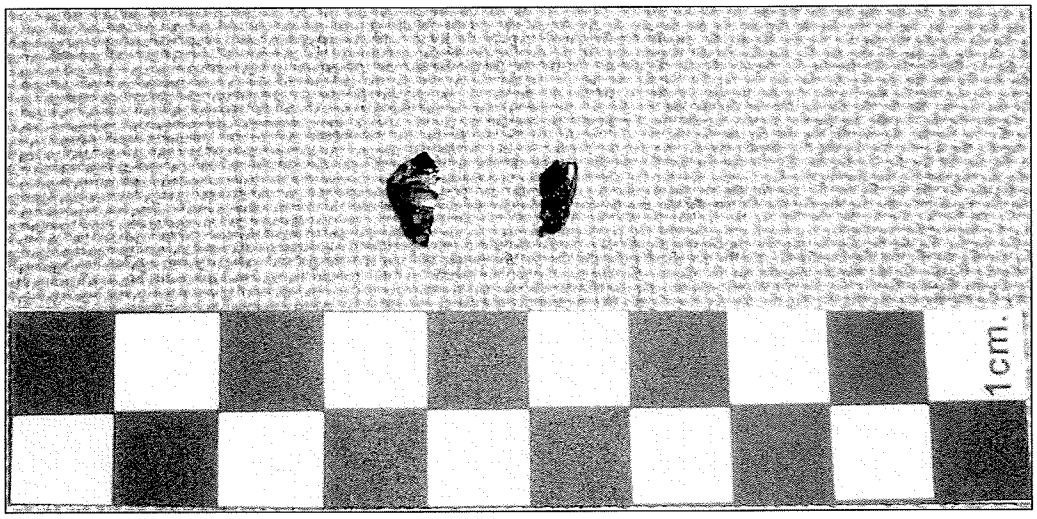

Figure 120. Accession 2011.01, Catalogue no. 18B and 18A from left to right; collected from Trench 20A in Stratum II at the depth of 150-170 cmbs.

The basalt flake, Accession 2011.01, Catalogue no. 10 is not photographed because it is a natural flake. It is not an artifact.

5.1.2 Post-Contact Artifacts

Post-contact artifacts are manufactured from non-native materials (e.g glass, ceramic, metal, plastic, rubber, and etc). Artifacts identified as post-contact from this current study consist of fragments of glass bottles, ceramic tableware, nails, slate and cane slags. Post-contact artifacts are often indication of post-contact influence present in an area.

5.1.2.1 Glass Analysis from the Entire Project Area

All terminology used to describe bottle traits and all bottle dating information discussed in this section follows the information from the U.S. Department of the Interior Bureau of Land Management/Society of Historic Archaeology "Historic Glass Bottle Identification and Information Website" (http://www.blm.gov/historic_bottles/ index.htm). Additional information on bottle dating was made with the use of Newman (1971) and Elliott (1971).

The attributes of each bottle and/or glass fragment were recorded on a spreadsheet and include: portion (complete or fragment portion); color; functional class (containers, unidentifiable objects, domestic items); category (bottle, window component, household fixture, flatware, hollowware, other); content (soda, medicine, food, cosmetic, wine/beer/ale, other); manufacturing technique (bottle machine, pressed glass, cup-bottom mold, two-piece mold); bottle closure (crown top, cork, screw top-exterior thread); base marks (bare iron pontil, sand pontil); type of labels (embossing, ACL-applied color label, paper label, stamped), glass manufacturer's marks, and brand marks/labels.

A total of 68 glass bottle fragments were collected during the current investigation. The first three of these 68 glass bottle shards in Table 28 were from Trench 20A in Stratum I at the depth of 100-150 cmbs, and are probably from one aqua green soda bottle (Table 28). The following seven glass bottle shards in this assemblage are from Test Unit 2 in Stratum If at the depth of 0-10 cmbd. The next three glass bottle shards were recovered from Trench 61 in Stratum I at the depth of 0-75 cmbs. The final 58 shards were collected from Trench 78 during screening of excavated material. See Table 28 and (Figure 121 to Figure 123) for detail attributes of the analyzed glass shards.

Table 28. Summary of Glass Fragments Attributes Analyzed and Collected

Excavation Unit	Stratum	Depth (cmbs/ cmbd)	Type	Content	N	Color	Portion	Date
BT-20A	Ic	100-150 cmbs	Bottle	Soda	1	Aqua green	Finish	1903
BT-20A	Ic	100-150 cmbs	Bottle	Soda	1	Aqua green	Neck and shoulder	1903
BT-20A	Ic	100-150 cmbs	Bottle	Soda	1	Aqua green	Neck and shoulder	1903
TU-2	If	0-10 cmbd	Bottle	Unknown	1	Olive green	Indeterminate	Indeterminate
TU-2	If	0-10 cmbd	Bottle	Unknown	1	Olive green	Body	Indeterminate
TU-2	If	0-10 cmbd	Miscellaneous	Unknown	1	Amber	Indeterminate	Indeterminate
TU-2	If	0-10 cmbd	Miscellaneous	Unknown	1	Clear	Indeterminate	Indeterminate
TU-2	If	0-10 cmbd	Miscellaneous	Unknown	1	Clear	Indeterminate	Indeterminate
TU-2	If	0-10 cmbd	Miscellaneous	Unknown	1	Clear	Indeterminate	Indeterminate

Excavation Unit	Stratum	Depth (cmbs/ cmbd)	Type	Content	N	Color	Portion	Date
TU-2	If	0-10 cmbd	Miscellaneous	Unknown	1	Clear	Indeterminate	Indeterminate
BT-61	I	0-75 cmbs	Bottle	Unknown	1	Amber	Body	Early to mid 20th century
BT-61	I	0-75 cmbs	Bottle	Unknown	1	Clear	Base	Early to mid 20th century
BT-61	I	0-75cmbs	Bottle	Unknown	1	Clear	Body	Early to mid 20th century
BT-78	-	0-270 cmbs	Bottle	Unknown	10	Dark green	Neck and lip, base, and body	Early to mid 20th century
BT-78	-	0-270 cmbs	Bottle	Unknown	1	Aqua	Lip	Early to mid 20th century
BT-78	-	0-270 cmbs	Bottle	Unknown	3	Aqua	Body	Early to mid 20th century
BT-78	-	0-270 cmbs	Bottle	Unknown	14	Aqua-green	Body	Early to mid 20th century
BT-78	-	0-270 cmbs	Bottle	Unknown	4	Amber	Body	Early to mid 20th century
BT-78	-	0-270 cmbs	Bottle	Unknown	18	Olive Green	Body	Early to mid 20th century
BT-78	-	0-270 cmbs	Bottle	Unknown	5	Clear	Body	Early to mid 20th century

Figure 121. Accession 2011.01, Catalogue no. 14A, 14B, and 15, from left to right, recovered from Trench 20A in Stratum Ic at 100 to 150 cmbs

Figure 122. Two olive green and amber glass fragments on the left, Accession 2011.01, Catalogue no. 1, Specimen A, B & C, clock wise from the far left; and four clear glass fragments to the right, Accession 2011.01, Catalogue no. 1, Specimen C, D, E and F, clock wise from the bottom left, collected from Test Unit-2 in Stratum If at 0-10 cmbs.

Figure 123. Accession 2011.01, Catalogue no. 23, 22 and 21, from left to right, recovered from Trench 61 in Stratum I at 0-75 cmbs.

5.1.2.2 Ceramic Analysis from the Entire Project Area

There are four types of post-contact ceramic tableware that are commonly encountered in archaeological sites. The four types of ceramic tableware are as follow: common pottery, (coarse or unrefined earthenware, terra cotta); earthenware (creamware, pearlware, most varieties of Ironestone); stoneware; and porcelain/Chinese porcelain. Ceramic ware types can sometimes be reflective of historic property use and, potentially, social status of the individuals associated with a particular site. Earthenware vessels were primarily utilitarian in nature and common to most households, stoneware items were considered to be of a higher quality ware, and vitreous china and porcelains were considered to be luxury items and used by those of a significantly higher status (Cunningham 2002; Pogue 1994). Earthenware and stoneware vessels were imported to Hawai'i as early as the late 18th century from Great Britain and from the mid-20th century from the United States.

Thirteen ceramic sherds were recovered and analyzed during this inventory survey, 9 of which were identified as stonewares and 4 earthenware. A stoneware sherd (wt = 7.5 g) (Figure 124) was recovered from Trench 20A in Stratum Ie at 150-180 cmbs and two other stoneware sherds (n = 2; wt. = 13.6 g) (Figure 125) were collected from Trench 61 in Stratum I at the depth of 0-75 cmbs. 6 stoneware sherds and 4 earthenware sherds were collected from Trench 78 at a depth of 0-270 cmbs. See Table 29 for detail attributes of analyzed ceramic sherds.

Table 29. Summary of Ceramic Sherds Attributes Analyzed and Collected from Trench 20A and 61.

Excavation Unit	Stratum	Depth (cmbs)	Type	WT (g)	Ware Type	SFC Treatment	Element	Comments
BT-20A	Ie	150-180	Holloware	7.5	Stoneware	Clear	Body	Crackled on white paste.
BT-61	I	0-75	Holloware	12.8	Stoneware	Clear	Body	Blue transfer print on whiteware.
BT-61	I	0-75	Holloware	0.8	Stoneware	Clear	Body	Blue transfer print on whiteware
BT-78	-	0-270	Holloware	14.3	Stoneware	Clear	Base	Clear glaze on white paste.
BT-78	-	0-270	Holloware	3.6	Stoneware	Clear	Rim	Blue on white feather edge.
BT-78	-	0-270	Holloware	5.1	Stoneware	Clear	Body	Blue monochrome design on blue tinted glaze.
BT-78	-	0-270	Holloware	2.1	Stoneware	Clear	Body	Crackled on white paste.
BT-78	-	0-270	Holloware	59.3	Earthenware	Clear	Body and rim	Crackled on beige paste.
BT-78	-	0-270	Holloware	8.0	Stoneware	None	Body	Electrical insulator.

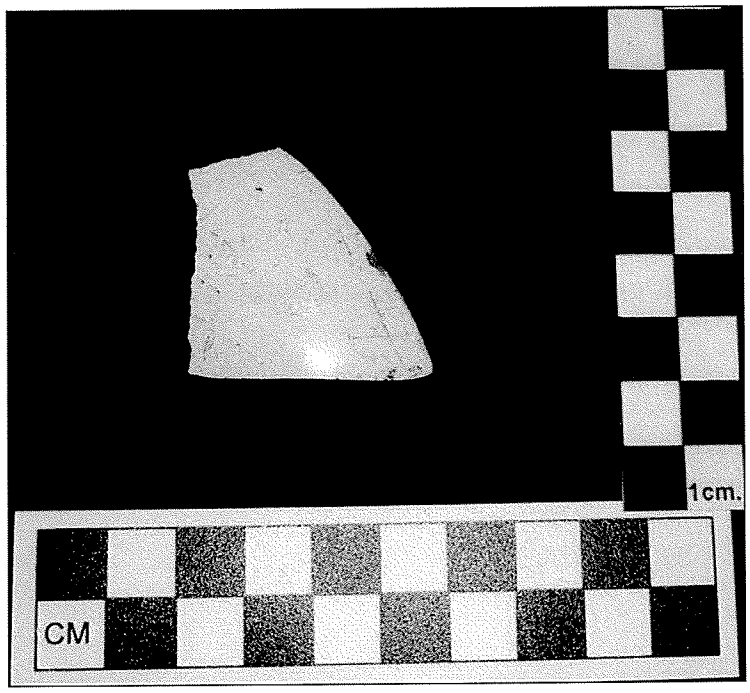

Figure 124. Accession 2011.01, Catalogue no. 16; collected from Trench 20A in Stratum If at 150-180 cmbs.

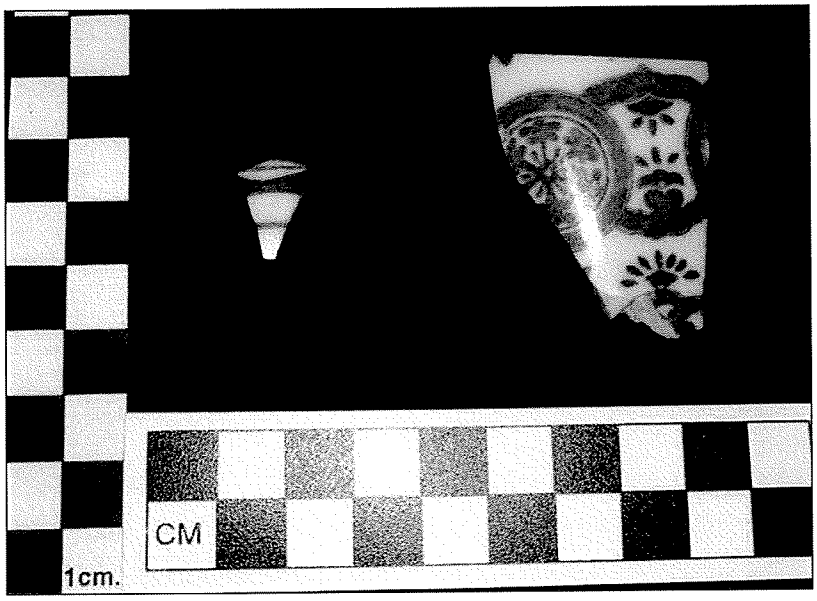

Figure 125. Accession 2011.01, Catalogue no. 24 and 25 from left to right; sherds were collected from Trench 61 in Stratum I at 0-75 cmbs.

5.1.2.3 Nail Analysis from Test Unit 2

Dating the relative age of a remnant historic era structure or deposit with remnant structural elements can be aided by an analysis of the type of nails that may have been used in during initial construction. The U.S. National Park Service has developed some research techniques to

determine age based on nail chronology (Nelson 1968). Hand-wrought nails were used throughout the 17th and 18th centuries and into the earliest part of the 19th century. These types of nails were cast and hand-headed by placing the nail in an anvil and pounding out the top of the nail with a hammer while the nail was still heated (Nelson 1968:Figure 1).

Machine-cut nails, simply referred to as "cut nails", are manufactured by feeding a nail plate across a stationary die, or bed, into a shearer (Nelson 1968:Figure 2) that was initially operated by hand power and later by steam power. The nails would then be either hand-headed in a similar manner as the hand wrought nails (circa 1790-mid 1820s), or machine headed where the nail was gripped immediately after cutting and pressure applied to the end of the nail (1815 to late 1830s and late 1830s to present).

The transition of cut nails to wire nails was gradual and were not the dominant nail type until the 1890s as many builders preferred cut nails well into the 20th century (Nelson 1968). Unfortunately, unlike cut nails, there are no clearly defined evolutionary landmarks that make it useful as a dating element. All of the nails recovered from the excavation of Test Unit 2 were of the wire nail variety.

Wire nails (n=4; wt = 45.2 g) were recovered and analyzed during this inventory survey and are exclusively from Test Unit 2. Three (wt. = 43.1 g) were collected from Stratum If at depths ranging from the surface to 10 cmbd (centimeters below datum) while one (wt = 2.1 g) was recovered from Stratum II at the depth of 20-30 cmbd. The occurance of this artifact in Stratum II might have been trickled down or intruded into this natural layer as this layer is very fine and soft deposit. See Table 30 and Figure 126 for detail attributes of analyzed nails. The presence of both types of nails indicates that the earliest possible date associated with Stratum I of this test unit, as extrapolated from the nail data, is circa 1890.

Table 30. Summary of Nails Attributes Analyzed and Collected from Test Unit 2.

Depth (cmbd)	Stratum	N	Length (cm)	Width (cm)	Thickness (cm)	Weight (g)	Formal Type
0-10	If	1	6.8	1.23	0.64	9.9	Wire
0-10	If	1	8.09	0.85	0.48	8.5	Wire
0-10	If	1	11.02	1.43	0.76	24.7	Wire
20-30	II	1	3.83	0.74	0.5	2.1	Wire

Figure 126. Accession 2011.01, Catalogue no. 2, Spec. C, B and A, from left to right, contents of Stratum If at 0-10 cmbd; and Accession 2011.01, Catalog no. 8, far right was collected from Stratum II at 20-30 cmbd.

5.1.3 Faunal and Other Cultural Material Remains from Test Unit 2

5.1.3.1 Faunal Remains

Faunal remains representing marine shell, marine vertebrate, or small mammal were recovered from Test Unit 2 and Trench 78 within the project area. Six fragments of marine shellfish (wt = 28.8 g) were collected from Stratum If at the depth of 0-10 cmbd, one of which was identified as *Nerita picea.* This shell was intermixed with post-contact cultural material remains recovered from a transitional layer and therefore likely associated with the post-contact period. An unidentified fish vertebra was collected from Trench 78 between 0 and 270 cmbs. A rodent rib bone was recovered from Test Unit 2 in Stratum II at 10-20 cmbd, though it was likely a natural rather than cultural remnant.

5.1.3.2 Other CulturalMaterial Remains

Other cultural material remains collected from Test Unit 2 include fragments of slate, cane slag, charcoal, and coral, as well as water worn basalt pebbles. These materials were observed in both Stratum If and Stratum II within the project area. Two pieces of slate (wt = 1.6 g) and a collection of charcoal and cane slag (wt = 29.8 g) were recovered from Stratum If at 0-10 cmbd (Figure 127 and Figure 128). One slate fragment (wt. = 0.8 g), a collection of cane slag fragments and charcoal (wt = 0.4 g), and two water worn pebbles (wt = 18.8 g) were recovered from Stratum II at 10-20 cmbd. The water worn basalt pebbles were likely due to natural processes as they were lightly scattered through out the test unit. The presence of the majority of the slate fragments, cane slag, and charcoal in Stratum If rather than in Stratum II, likely

indicates that the material originated in the fill layer and migrated through the transitional layer and into the natural deposit. The charcoal collection from this test unit was not sent out to Beta for radiocarbon dating as it was intermixed with post-contact materials.

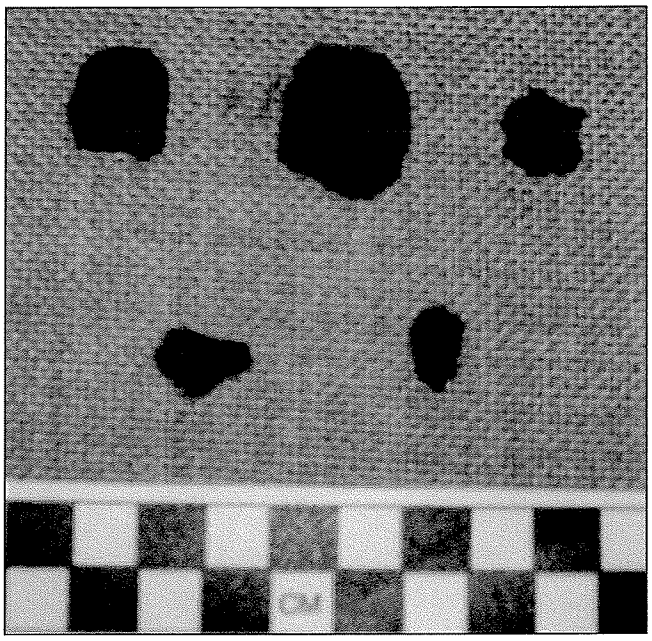

Figure 127. Accession 2011.01, Catalogue no. 5 representative samples from collection of Cane Slag from Test Unit 2, Stratum If, at 0-10 cmbd.

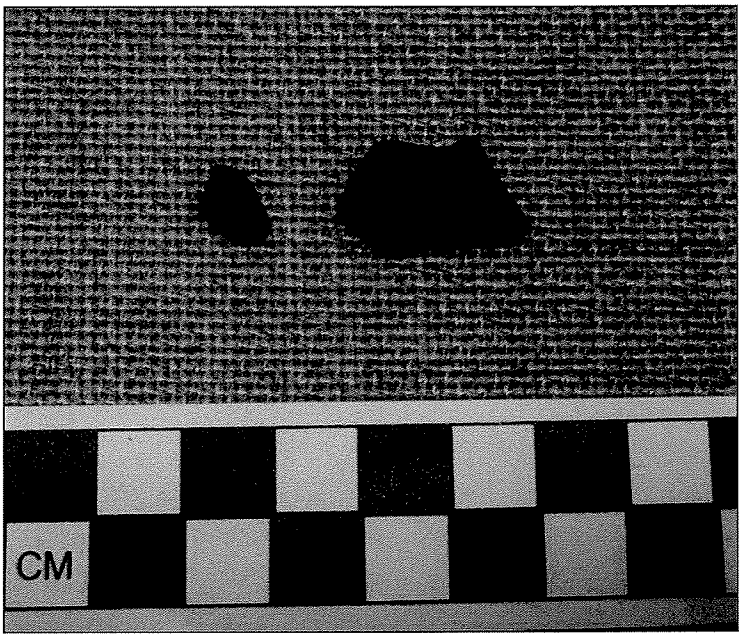

Figure 128. Accession 2011.01, Catalogue no. 3, Slate fragments from Test Unit 2 in Stratum If at 0-10 cmbd.

The representative samples of cultural material remains in the photographs above (Figure 126 to Figure 128) are primerly from Stratum If at 0-10 cmbd. Accession 2011.01, Catalogue no. 8 is from Stratum II at 20-30 cmbd.

5.2 Radiocarbon Dating Analyses

During the inventory survey, one charcoal sample was collected and sent out to Beta Analytic Radiocarbon Dating Laboratory for analysis (Appendix D). This sample was recovered from Trench 20A in the west face wall between 130 and 230 cm depth. This sample was of sufficient size and weight for an accurate measurement and analysis. It was sent out with the hope of obtaining answers to basic questions concerning the approximate age of a possible cultural deposit. Beta was assigned a number to this sample (Beta 282352).

The calibration of radiocarbon age to calendar years by Beta Analitic for this sample was yielded a conventional radiocarbon age of 180±40 BP. When calibrated by the probability method using the OxCal v4.1.3, the highest probability of the 2 Segma results in 1720-1820 (47.6%) with a calibrated mean date of AD 1770 (Table 31 and Figure 129). This date is comparable with radiocarbon ages of charcoal from other studies in the Lahaina area (e. g. McCurdy and Hammatt 2010:53-55).

Post-contact materials were found right on top of Layer II and from the results of radiocarbon analysis, it is inferred that this area was first used during the pre-contact period with subsequent post-contact usage. However, given that the area was heavily used since the plantation era to more recent development for residential housing, commercial buildings, environmental erosion control soil berms and water retention basin, and small scale agriculture within the project corridor and on the adjacent property, it is not surprising that the area appears to have been continual used since the pre-contact period. This is also indicated from the radiocarbon date below (see Table 31 and Figure 129).

Table 31. Radiocarbon date acquired from Trench # 20A

Beta-	^{14}C Age Assay	Calibrated Date Range (2σ) (%) = probability	Calibrated Mean Date (2σ)	Trench #	Stratum	Depth in CM
282352	180±40	AD 1720-1820 (47.6%) AD 1648-1706 (20.4%) AD 1914-1954 (17.8%) AD 1832-1883 (9.6%)	AD 1770 AD 1678 AD 1934 AD 1857	Trench 20A	II	130-230 cmbs

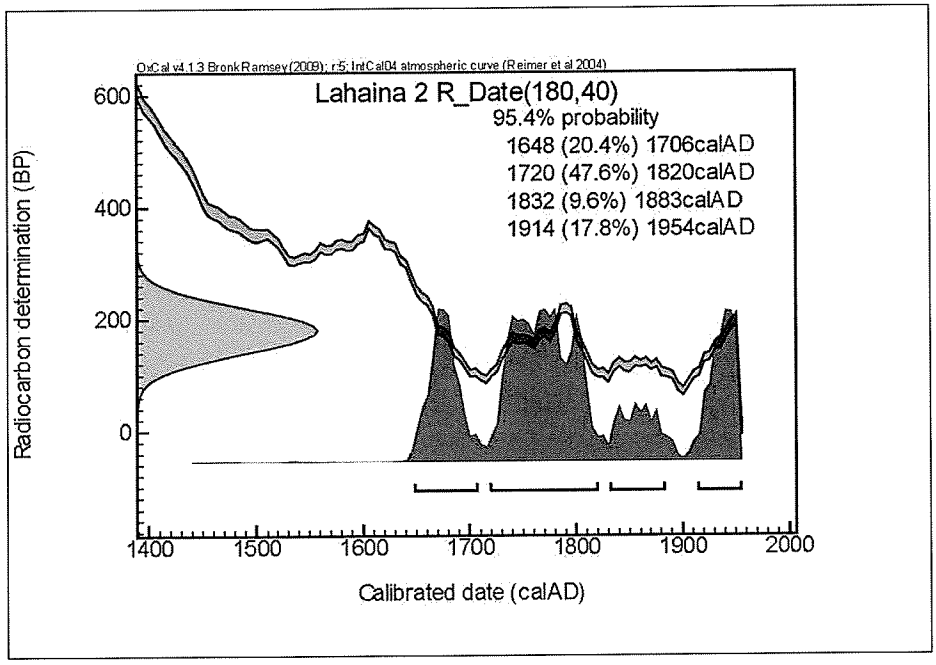

Figure 129. OxCal v4.1.3 results for Beta-282352.

Section 6 Summary and Interpretation

From the results of this inventory survey, it is clear that the entire project area has been heavily modified by either large scale commercial sugar cane agriculture and small private agriculture activities that occurred from the mid to late post-contact period and into the modern era. Further modifications to the ground surface within the current project area include the presence of some large water retention basins, erosion soil control berms, and residential and commercial buildings, which cover majority of the project area.

Clear evidence of pre-contact habitation and agricultural use of the project area were not identified. The absence of pre-contact historic properties might be attributed to many factors: the lands within and around the current project area have undergone heavy landscape modifications by historic commercial sugar cane cultivation, small scale commercial and private agricultural activities, residential and commercial building developments, roads and other infrastructure development.

Eight new State Inventory of Historic Places (SIHP) site numbers were assigned within the current project area during the course of this archaeological inventory survey. Seven out of the eight sites are composed of post-contact features and one is probably a precontact site. The State Site numbers assigned to these newly identified sites are SIHP 50-50-03-6775 to -6779 and SIHP 50-50-03-7101 to -7103. These eight sites have a total of 12 component features and are consisted of five water control features, three shelter/storage features, two transportation retaining wall features, a property boundary wall feature and a previously disturbed pre-contact human burial feature.

6.1 Water Control Features

Five water control features were documented during the course of the inventory survey. SIHP -6775 to -6776 (Feature A to C) and SIHP -7103 are interpreted as post-contact water control features. SIHP -6775 is remnant of an old soil ditch probably associated to the early plantation era. SIHP -6776 consists of three component features, Feature A to C. Feature A is comprised of 3 metal pipes, an 8" pipe atop two 24". These pipes had probably used for irrigation, overflow as well as diversion pipes. Feature B is a concrete rectangular box with a 24" metal pipe used for water diversion and drainage. Feature C is a below ground 24" pipe presumably an irrigation pipe that was exposed during subsurface backhoe testing. SIHP -7103 is a segment of ditch that is constructed from cut basalt boulders and concrete and probably associated to the mid-plantation era. All of the features of SIHP -6776 are in the vicinity of the Mill Ditch, share the same orientation, and presumably were parts of the Mill Ditch and associated to the late plantation era.

6.2 Shelter/Storage Features

Three shelter or storage sites were identified during the current inventory survey of the project area and consist of three quonset huts located on the southwest side of Kuhua Street. SIHP -6777 to -6779 are interpreted as post-contact or World War II shelter and/storage features. The United States military had little presence in Lahaina during this time as their operations were more

restricted to the central section of Maui. Therefore, we believe that these structures were relocated to this area sometimes in the past and they are not in their natural or original settings.

6.3 Transportation Features

Two transportation features of SIHP 50-50-03-7101 (Feature A and C) were identified during the course of this current inventory survey. These two features are located along the southeast side of Lahainaluna Road and are the reinforcement or retaining walls of the southeast side of the road. These walls are interpreted as post-contact transportation features.

6.4 Property Boundary Wall Feature

Feature B of SIHP 50-50-03-7101, was noted and recorded as historic resource with boundary wall function. This subangular basalt boulder and concrete wall might have been associated to the Pioneer Mill because it is in close proximity to the foot print of the Mill, and therefore, this feature is interpreated as post-contact boundary wall.

6.5 Unmarked Burial Feature

One previously unidentified and previously disturbed human burial (SIHP 50-50-03-7102) was identified and documented during the course of this study. These human remains appeared to be a previously disturbed pre-contact burial that was displaced by natural force such as storm and/or river wash. This assumption is based on the soil matrix surrounding the skeletal remains within the west face wall of Trench 78 (see Section 4; 4.1.1.9). Based on stratigraphic context, it is believed that these remains were likely washed into this area and out of their original context.

6.6 Conclusions

The results of the archaeological inventory survey of the project area generally conform to most of the expectations derived from the historical and archaeological background research. As mentioned above in the Background Summary and Predictive Model, Subsection 3.3, it was expected that there was a slight possibility that the survey might identify human burials. This current study identified previously disturbed human remains SIHP -7102 which was encountered during the subsurface testing of the project area.

Predictions also included the identification of traditional Hawaiian agricultural and habitation sites, along with post-contact habitation deposits. Research of historic documents, which included early maps, documentation of the *māhele 'aina*, works of Hawaiian scholars, and narratives from early European explorers and missionary settlers, clearly recounts a strong Native Hawaiian population and thriving traditional agriculture in the area; however, with the exception of the previously disturbed human burial (SIHP -7102), additional archaeological evidence of traditional Hawaiian habitation and agricultural was not identified within the study corridor. This paucity of pre-contact cultural material remains, and *in situ,* post-contact deposits is likely due to the long history of commercial sugarcane cultivation and processed sugar production in this area and associated ground disturbing activities.

Section 7 Significance Assessments and Recommendations

In accordance with the State Department of Land and Natural Resources (DLNR) Chapter 13-284, Hawai'i Administrative Rules (HAR), entitled "Rules Governing Procedures for Historic Preservation Review to Comment on Section 6E-42, Hawai'i Revised Statutes (HRS), Projects," Chapter 13-284-6, entitled "Evaluation of Significance", states:

> To be significant, a historic property shall possess integrity of location, design, setting, materials, workmanship, feeling, and association and shall meet one or more of the following criteria:
>
> A. Sites that are associated with events that have made a significant contribution to broad patterns of our history; or
>
> B. Sites that are associated with the lives of persons significant in our past; or
>
> C. Sites that embody the distinctive characteristics of a type, period, or method of construction, or that represents the work of a master, or that possesses high artistic values, or that represents a significant or distinguishable entity, whose components may lack individual distinction; or
>
> D. Sites which have yielded, or may be likely to yield, information important in prehistory or history; or
>
> E. Sites which have an important value to the native Hawaiian people or to another ethnic group of the State due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events, or oral accounts-these associations being important to the groups' history and cultural identity.

7.1 Significance Assessments

The archaeological inventory survey discussed in this report was designed and completed to meet DLNR-SHPD requirements for permit for grabbing, grading and construction of a road. The significance assessment for each site recorded (SIHP -6775 to -6779 and SIHP -7101 to -7103) during the course of the current inventory survey within the project area retain the potential to yield additional information pertaining to the history of Hawai'i and are thus significant according to Criterion D (Table 32).

Although, SIHP -6775 to -6776 and SIHP -7103 are associated with an irrigation system that represent broad patterns of the economic history of Maui, and as an example of irrigation system that was employed during the plantation era in West Maui. SIHP -6775 to -6776 and SIHP -7103 are remnants of irrigation system in Lahaina and are not currently in use. There are better examples of irrigation system that are still in use (e.g. Piilani Ditch and the Honokowai Ditch). This portion of plantation infrastructure has yielded information important to the understanding of water diversion techniques and structures employed by the Pioneer Mill Company. For this

reason, SIHP -6775 to 6776, and SIHP -7103 are considered significant only under Criterion D. Sufficient information concerning these sites was collected during this investigation.

The World War II Quonset huts, SIHP -6777 to -6779 do not possess integrity of locationas these structures were moved to this area from some where else. Therefore, these sites qualify for significant only under Criterion D. Sufficient information concerning these sites was collected during this investigation.

SIHP 50-50-03-7101, Feature A and C are very important in the sense that they are reinforcment or retaining walls for the southeast side of Lahainaluna Road. In addition, it has yielded information about the method of construction of cut and subangular basalt stone and concrete walls. These features are identified significant under Criterion D, because they have yielded or have the potential to yield information important for research and history of Hawai'i. CSH has collected sufficient information concerning Feature A and C of SIHP -7101 during this investigation.

Feature B of SIHP 50-50-03-7101, was noted and recorded as historic resource with boundary wall function. This historic property has yielded information about the method of construction of subangular basalt stone and concrete. For these reasons this Feature B of SIHP -7101 is considered significant under Criterion D. Sufficent data on this feature was collected by CSH during this current inventory survey.

SIHP 50-50-03-7102 qualifies for significance under multiple criteria. It is interpreted as a previously disturbed possible pre-contact burial. It is significance under Criterion D, because it has yielded or has the potential to yield information important about the history and prehistory of Hawai'i. It also qualifies for significant under Criterion E, because of its cultural value to the Hawaiian people.

Table 32. Significance Assessments for Historic Properties Identified During Inventory Survey.

SIHP 50-50-03-	Feature	Age	Function	Significance Recommendation
6775	--	Plantation	Water Control	D
6776	A	Plantation	Water Control	D
	B	Plantation	Water Control	D
	C	Plantation	Water Control	D
6777	--	World War II/1940s	Shelter/Storage	D
6778	--	World War II/1940s	Shelter/Storage	D
6779	--	World War II/1940s	Shelter/Storage	D
7101	A	Historic	Transportation	D
	B	Historic	Property boundary	D
	C	Historic	Transportation	D
7102	--	Possible Pre-contact	Burial	D and E
7103	--	Plantation	Water Control	D

Section 8 Project Effect and Mitigation Recommendations

8.1 Project Effect

The proposed project has the potential for adverse effect upon historic properties that are located within the study area. Negative effects could be related to equipment staging areas, construction of equipment access roads into the project area, as well as grubbing, grading and excavation associated with road construction and utility installation.

Two human burials (SIHP-5239 and -6473) were encountered during previous subsurface testing associated with two archaeological inventory survey studies conducted by Xamanek Researches LLC. (E. M. Fredericksen and Fredericksen 2003) and noted as within the APE of the current study. Confirmation that SIHP-6473 was within the project ROW and area of direct effect prompted a realignment of the southern portion of the corridor at the conclusion of the present pedestrian survey. The ROW at the southern portion was adjusted creating a 50 ft buffer between the location of the burials and the limits of the construction activity (Figure 22); therefore placing SIHP -6473 outside of the proposed County ROW.

Eight historic properties (SIHP Numbers 50-50-03-6775 to -6779 and SIHP 50-50-03-7101 to -7103) have been documented within the area of potential effect (APE) for the proposed project during the current inventory survey work. Seven post-contact sites out of the eight historic properties are recommended as significant only for their information content (Criterion D) while SIHP -7102 is recommended as significant under multible criteria (Criterion D and E). We believe that the current inventory survey investigation has adequately recorded the information for these eight historic properties, through literature research as well as location documentation, written descriptions, photographs, plan view maps to scale, and subsurface testing.

8.2 Mitigation Recommendations

Based on the significance assessment and project effects noted above, Cultural Surveys Hawai'i Inc. recommends no further historic preservation work for the proposed action at this time for SIHP -6775 to -6779, -7101 and -7103 (Table 33) as this study has adequately recorded the information available from these properties through location documentation, written descriptions, photographs, plan view maps to scale, and oblique view renderings.

While the current project is not anticipated to have an adverse effect on SIHP -6473, due to the distance of the burial from the proposed limits of construction, preservation and avoidance is recommended with mitigation measures in keeping with those set forth by Xamanek Researches (Frey and Fredericksen 2009). Because SIHP -5239 could not be located during the current study and the current locational information for this burial site is unclear at this time, consultation with Xamanek Researches to pinpoint and survey the location of this historic property is recommended to ensure that the proposed project will not have an adverse effect on this site.

With regard to SIHP -7102, the previously disturbed pre-contact burial find documented during the current archaeological study, Cultural Surveys Hawai'i, Inc. recommends preservation in place and avoidance (Table 33) along with the preparation of a Burial Treatment Plan for,

written in accordance with HAR 13-300-33 for review and determination by the Maui/Lana'i Islands Burial Council.

Table 33. Summary of Mitigation Recommendations for Historic Properties Identified within the Current Project Area.

SIHP 50-50-03-	Feature	Age	Function	Significance	Mitigation Recommendation
6775	None	Plantation	Water Control	D	No Further Work
6776	A	Plantation	Water Control	D	No Further Work
	B	Plantation	Water Control	D	No Further Work
	C	Plantation	Water Control	D	No Further Work
6777	None	World War II/1940s	Shelter/Storage	D	No Further Work
6778	None	World War II/1940s	Shelter/Storage	D	No Further Work
6779	None	World War II/1940s	Shelter/Storage	D	No Further Work
7101	A	Historic	Transportation	D	No Further Work
	B	Historic	Property Boundary	D	No Further Work
	C	Historic	Transportation	D	No Further Work
7102	None	Possible Pre-contact	Burial	D and E	Preservation and Avoidance
7103	None	Plantation	Water control	D	No Further Work

Lack of clearly defined *in situ* cultural deposits notwithstanding, given the findings of unmarked human burials within the current project APE (SIHP -7102) and adjacent lands (SIHP -5239 and -6473) (E. M. Fredericksen and Fredericksen 2003; Frey and Fredericksen 2009), as well as significant pre-contact and post-contact cultural deposits (SIHP-6471, -6472, -6474, -6475, and -6476) precautionary archaeological monitoring is the recommended for all ground disturbing activities that would be scheduled to occur within the project area corridor. Accordingly, an Archaeological Monitoring Plan should be prepared per HAR 13-279-4 and submitted to SHPD for review and approval. As a part of this monitoring plan, it is further recommended that the monitoring provisions include the placement of orange construction fencing around the previously identified burial sites (SIHP -5239 and -6473) in consultation with the adjacent landowners of record; as well SIHP -7102 identified during the current study in order to avoid any inadvertent staging of equipment or materials on these historic properties.

8.3 Disposition of Materials

All of the data gathered and generated during the course of documenting SIHPs -6775 to -6779, and SIHP -7101 and -7103, and the cultural material remains that are collected and analyzed are currently being curated and housed at the Maui Office of Cultural Surveys Hawai'i, Inc. (1860 Main Street, Wailuku, HI 96793). All skeletal remains associated with SIHP -7102

were placed in a plain brown paper bag which remained with the *in situ* portions of the burial within Trench 78 and covered with a steel plate for security and protection.

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Appendix A Land Commission Awards and Grant Awards within and/or adjacent to the Project Corridor (Waihona 'Aina Corporation 2000)

Appendix A-1 Land Commission Awards

No. 241, S.D. Burrows

Claim Number:	**00241**		
Claimant:	**Burrows, S.D.**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Wainee**		
Ili:			
Apana:	**1**	Awarded:	**1**
Loi:		FR:	136v1
Plus:		NR:	
Mala Taro:		FT:	**139v1**
Kula:		NT:	**66v2**
House lot:	**1**	RP:	**410**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**

Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	**survey included**

No. 241, Solomon D. Burrows, Claimant, Honolulu, October 24 1841.
F.R. 157-158v1

Gentlemen:
I take this opportunity of soliciting your attention relative to the quieting of my title to my land.
I would inform you that I acquired my land called Wainee from Governor Hoapili in December 1839 in part payment for my building his house in the Fort.
The Honorable Board of - Your attention will much oblige Sir Land Commissioners, &c &c &c, Signed, S. D. Burrows

Note: Survey of the above recorded in Page 163

F.R. 163-164v1
No. 241, Survey of Claim 241, Recorded on Page 157

Notes of a survey of a building spot in Waihee (Wainee) Lahaina Maui for Soloman Burrows.

Commencing at stake north corner of this land, on boundary line between this, and a land owned by Kuakiniopio and on south side of Alanui, and running
South 60° West, 3 chains 40 ½ feet along south side of Alanui to stake. Thence
South 33° East 2 chains 8 inches along boundary line between this and Kuakiniopio's land on makai side of this. Thence
north 65° 30' East 3 chains 57 feet along North side of mud wall, the boundary line between this and a land said to be owned by Kaaio to stake. Thence
North 35° West 2 chains 22 ½ feet along line between this land and Kuakiniopio & on mauka to place of commencement - including an area of 988 square fathoms
Lahaina Oct 27, 1846.

Note - 1210 square fathoms make one acre 66 feet make 1 chain.

[DIAGRAM]

F.T. 136v1
Claim No. 241, S.D. Burrows, Maui

I. Nowlien, sworn deposed, I know that S.D. Burrows is in possession of a land in Lahaina up back of the Church and just below Kekauonohi's former house. Burrows is my son-in-law. I went with him to Hoapili about 1839 and I heard Hoapili give orders to one of his men to go and measure off the piece which Burrows now has - perhaps an acre - and he did so. He has held possession of it down to the present time. I supposed that it was given to him for having built a house for Hoapili.

N.T. 66-67v2
No. 241, Solomon D. Borrows, Lahaina, December 25, 1846, See B

Kimo, sworn: I have [know] Solomon's property in Lahaina here, mauka of the church. Solomon is a son-in-law for me. My son-in-law and I went together to Hoapili in the year 1836 and I heard Hoapili tell a certain man to go with us and survey a land for Solomon. I have heard that Hoapili gave (land) to Solomon for building a house.

[Award 241; R.P. 410; Wainee Lahaina; 1 ap.; .81 Ac.]

No. 312, Timoteo Kewaeiwi

Claim Number:	**00312**			
Claimant:	**Keaweiwi, Timoteo**			
Other claimant:				
Other name:				
Island:	**Maui**			
District:	**Lahaina**			
Ahupuaa:	**Aki, Kuhua, Waiokama, Uhao, Moalii, Akiaiole**			
Ili:				
Apana:	**8**		Awarded:	**1**
Loi:	**0**		FR:	
Plus:			NR:	**76v2**
Mala Taro:		0	FT:	
Kula:		0	NT:	**195v2**
House lot:	**1**		RP:	**2650, 1180, 1179**
Kihapai/Pakanu:		0	Number of Royal Patents:	**3**
Salt lands:		0	Koele/Poalima:	**No**
Wauke:	**0**		Loko:	**No**

Olona:	0	Lokoia:	**No**
Noni:	**0**	Fishing Rights:	**No**
Hala:	0	Sea/Shore/Dunes:	**No**
Sweet Potatoes:	0	Auwai/Ditch:	**No**
Irish Potatoes:	0	Other Edifice:	**No**
Bananas:	**0**	Spring/Well:	**No**
Breadfruit:	**0**	Pigpen:	**No**
Coconut:	0	Road/Path:	**No**
Coffee:	0	Burial/Graveyard:	**No**
Oranges:	0	Wall/Fence:	**Yes**
Bitter Melon/Gourd:	0	Stream/Muliwai/River:	**No**
Sugar Cane:	0	Pali:	**No**
Tobacco:	0	Disease:	**No**
Koa/Kou Trees:	0	Claimant Died:	**No**
Other Plants:	0	Other Trees:	0
Other Mammals:	**No**	Miscellaneous:	

No. 312, T. Keaweiwi
N.R. 76-77v2

To the Land Commissioners, Greetings: I hereby tell you of my right, at Lahaina. Aki and Kuhua are the lands where my lot is, and this is my residence.

A portion has been occupied from ancient times and a portion is new. It has not been surveyed - it is for you to survey it.
Farewell, and thank you
TIM. KEAWEIWI
Witnesses: Imiwale, Kaleoku

N.T. 12v15
No. 312, Timoteo Keaweiwi, Lahaina 15. November 1852

Ahuli, sworn, says he knows the House Lot of Claimant in Waiokama, Lahaina. Witness has lived there under Claimant for the last ten years. Claimant received this Lot from Kekahiko about 1836, and there is no dispute to his title.

The Lot is bounded:

Mauka by Nalehu
Olowalu by Malokuakea
Makai by Nalehu
Kaanapali by Napahi's house Lot.

N.T. 87v2
No. [312], Keaweili, Lahaina, January 1847

Postponed - work to be resumed when (he) returns.

N.T. 195v2
No. 312, Timoteo Keaweiwi, See T.

Hoohei, sworn by the Word of God, This place which Timoteo is claiming is at Aki and are small sections of land. It was acquired during the time of Kalehu and the right was received from Kalehu, who was the konohiki of Aki, who had received his interest from Kalaimoku and Kalaimoku had received his interest from Kamehameha. Imiwale and Kaiahua both have a small piece of that place. He (Timoteo) has two lots there which have been enclosed with a fence. There is a mud house standing in there, also another enclosure and he is living there now. No one has objected to him.

It (claim) is postponed and will resume when a witness is found.

[Award 312; R.P. 2650; Waiokama Lahaina; 1 ap.; 16 rods; Kuhua Lahaina; 1 ap.; .43 Ac. & Uhao (See 11146) Lahaina; 3 ap.; 1.36 Acs; R.P. 1180; Moalii Lahaina; 2 ap.; 7.62 Acs; Aki Lahaina; 1 ap.; 6 Acs 2 roods 10 rods; R.P. 1179; Akiaiole Lahaina; 1 ap.; 3.47 Acs; See also Award 11146]

No. 393, Kekuelike

Claim Number:	**00393**		
Claimant:	**Kekuelike**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Puukoowali, Kelawea**		
Ili:			
Apana:	**3**	Awarded:	**1**
Loi:	**15**	FR:	
Plus:		NR:	**127v2**

Mala Taro:		FT:	**156v7**
Kula:		NT:	**38v5**
House lot:	**1**	RP:	**1672**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**Yes**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**Yes**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**Yes**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**Yes**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	**Awarded 2 apana, 1 in Puuhoowali & one in Kelawea, Creek of Moalii bounds one side of 1 piece, govenrment road**

No. 393, Kekuelike
N.R. 127v2

I, Kekuelike, hereby tell you of my right to my lot at Lahaina. It is at Puukoowali on the northwest of the Government Road, which I enter before the Land Commissioners.
Farewell to the Honorable Ones of the Government.
January 11, 1847, Lahaina.

KEKUELIKE

F.T. 156v7
Cl. 393, Kekuelike

Kaluokamano, sworn, I know the lands of the claimant. They consist of a house lot with some lois in Puuhoowali, Lahaina, and a kula land in two pieces in Kelawea, Lahaina.

The claimant received it from Kapiiwi[?] in the days of King Liholiho in 1821, and has held it without dispute ever since.

It is bounded:
Mauka by the Government road leading to Lahaina
Olowalu by the same
Makai by the same
Kaanapali by the Creek of Paunau.
It is fenced and it is the correct boundary.

Claimant received this land of lois, 15 in number, from Pikanele and his grandfather in 1838 and enjoyed them in peace until 1847, when Pikanele took away 3 of them, because the man having them in charge was too old to go to the poalima work.

The piece of 14 lois is bounded:
Mauka by Kalaikini
Olowalu by Kaheekai's land
Makai and Kaanapali by the creek of Moalii.

The piece of 1 lois is bounded:
Mauka by Pikanele's loi
Olowalu by the pali
Makai by Liu's land
Kaanapali by the creek of Moalii.

There is still one new piece, a lot in Kelawea; a very small lot. The claimant received it from Pikanele in 1833 and he has held it without dispute to the present day.

It is bounded:
Mauka by Liu's lot
Olowalu by the pali
Makai by the street
Kaanapali by the creek of Kanaha.

See page 38v5 N.T.

N.T. 38v5
No. 393, Kekuelike, SEE page 157 vol. 7

Kaluokamano, sworn, He has seen 4 sections belonging to Kekuelike consisting of a house lot at Puuhoowali and 3 sections at Kelawea, here are the boundaries:

Section 1 - House lot.
Mauka, Olowalu, and Makai by Government road
Kaanapali by Adjoining Paunau ditch.

Section 2 - 14 patches.
Mauka and Olowalu Kalaikini's land
Makai by big stream
Kaanapali by stream.

Section 3 - 1 patch.
Mauka by Pikanele's land
Olowalu by pali
Makai by Liu
Kaanapali by big stream.

Section 4 - Farming lot.
Mauka by Liu
Olowalu by oali
Makai by Alanini or Alanui
Kaanapali by Kanaha big stream

1st section had been from Kaiheekai (he is new) at the time of Kamehameha II in 1821, no one has objected to him.

Pikanele has taken 2 patches out of 14, at the same time he had taken Kaluaokamano's first section in 1847.

The 4th section also had been from Pikanele at the time of Hoapili in 1839, no one has objected to the 3rd section.

[Award 393; R.P. 1672; Puuhoowali & Kelawea Lahaina; 2 ap.; 1.21 Acs]

No. 464, Nawaakoa, Wahine

Claim Number: **00464**

Claimant: **Nawaakoa, wahine**

Other claimant:

Other name:

Island: **Maui**

District:	**Lahaina**			
Ahupuaa:	**Panaewa, Moanui**			
Ili:				
Apana:	**2**		Awarded:	**1**
Loi:	**0**		FR:	
Plus:			NR:	**184v2**
Mala Taro:		0	FT:	**160v7**
Kula:		0	NT:	**43v5**
House lot:	**3**		RP:	**1160**
Kihapai/Pakanu:		0	Number of Royal Patents:	**1**
Salt lands:		0	Koele/Poalima:	**No**
Wauke:	**0**		Loko:	**No**
Olona:		0	Lokoia:	**No**
Noni:	**0**		Fishing Rights:	**No**
Hala:		0	Sea/Shore/Dunes:	**Yes**
Sweet Potatoes:		0	Auwai/Ditch:	**No**
Irish Potatoes:		0	Other Edifice:	**Yes**
Bananas:	**0**		Spring/Well:	**No**
Breadfruit:	**0**		Pigpen:	**No**
Coconut:		0	Road/Path:	**Yes**
Coffee:		0	Burial/Graveyard:	**No**
Oranges:		0	Wall/Fence:	**Yes**
Bitter Melon/Gourd:		0	Stream/Muliwai/River:	**No**
Sugar Cane:		0	Pali:	**No**
Tobacco:		0	Disease:	**No**
Koa/Kou Trees:		0	Claimant Died:	**No**
Other Plants:		0	Other Trees:	0
Other Mammals:	**No**		Miscellaneous:	

No. 464, Nawaakoa

N.R. 184-185v2

To the Land Commissioners: here is my thought to you. Act quickly and enter in the Book and quickly survey in order to properly record this right. These to lots are, one at Pana'ewa, and one at the wharf on one side of the Fort at the blacksmith's house.

Here are the accurate witnesses: The lot at Pana'ewa, Kamakini, the lot at the wharf, Nahau, Polea. They are the proper witnesses for these houselots.
I am, NAWAAKOA
The one who was settled here at Lahaina by Ulunahele, just under Ulunahele, is the true and correct witness.
Lahaina, January 22, 1847.

F.T. 160-161v7
Cl. 464, Nawaakaa, Wahine

A. Moku, sworn, I know the lands of the claimant. They are in Lapakea, Lahaina. They consist of 3 pieces & formerly it was all in one piece, but the road has made two of it. The claimant received it from Hikiau about 1837 through her brother. Her title has never been disputed.

The makai piece is bounded:
Mauka by the Alanui Aupuni
Olowalu by Ladana's lot
Makai by the sea shore
Kaanapali by the Government House.

The other piece is bounded:
Mauka by Hikiau's lot
Olowalu by the same
Makai by Alea's land
Kaanapali by Wahie's lot.

Z. Kaauwai, sworn, I know the house lot of the claimant in "Panaewa," Lahaina. The claimant received it through her brother Ulunahele from Kamakini in 1838 and there is no dispute about her title. It is fenced and the fence is the correct boundary.

It is bounded:
Mauka by Keaka's lot
Olowalu by the road leading to Lahainaluna
Makai by Kuakamauna's lot
Kaanapali by Ladana's lot.

N.T. 43v5
No. 464, Z. Nawaakaa, See 394 page 69 /can't figure this one out/ [See page 69]

[Left blank], sworn, He has seen 2 house lots at Lapakea, there is a separation here made by the government road. Hikiau had given this to Ulunahele in 1827, no one had objected.

The boundaries are:

Section 1 - the makai lot.
Mauka by Government road
Olowalu by Ladana
Makai by beach
Kaanapali by Government building.

Section 2 - Mauka lot.
Mauka and Olowalu by Hikiau's lot
Makai by Ahia's lot
Kaanapali by Wahia's lot.

Z. Kaauwai, sworn, He has seen the land at Panaewa, it has been enclosed and was given by Kamakini to Ulunahele in 1838, no one had objected.

Section 1:
Mauka by Jack's (black foreigner) land
Olowalu by Government road
Makai by Kuakamauna's land
Kaanapali by Ladana.

[Award 464; R.P. 1160; Panaewa Lahaina; 1 ap.; 1 Ac. 19 rods; Moanui Lahaina; 1 ap.; 1 rood 19 rods]

No. 469, Kaili

Claim Number:	**00469**		
Claimant:	**Kaili**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Kuhua**		
Ili:			
Apana:	**1**	Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**186v2**

Mala Taro:		FT:	
Kula:		NT:	**61v5**
House lot:	**1**	RP:	**5613**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 469, Kaili, Januaary 2, 1846
N.R. 186v2

Greetings to the Land Commissioners: The survey of the lot at Kuhua has been completed.
KAILI

N.T. 61v5
No. 469, Kaili

Kekahuna, sworn, he has seen this land section at Kuhua which was idle land, no one has objected. Kaili is now residing there.

[It is bounded]:
Mauka by Haole's land
Olowalu by Aki ahupuaa
Makai by Keone
Kaanapali by Kuhuanui.

[Award 469; R.P. 5613; Kuhua Lahaina;1 ap.; 1.8 Acs]

No. 496, Popolo

Claim Number:	**00496**		
Claimant:	**Popolo**		
Other claimant:	Kaiuli, son, heir		
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Puaanui**		
Ili:			
Apana:	**2**	Awarded:	**1**
Loi:	**1**	FR:	
Plus:		NR:	
Mala Taro:		FT:	**10-11v16**
Kula:	1	NT:	**10-11v16**
House lot:	**1**	RP:	**2759/3340**
Kihapai/Pakanu:		Number of Royal Patents:	**2**
Salt lands:		Koele/Poalima:	**Yes**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**

Irish Potatoes:		Other Edifice:	**No**
Bananas:	**1**	Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**Yes**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**Yes**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	**Aina kalo, government road**

Helu 496, Popolo
F.T. 10-11v16

Upai, hoohikiia, Nau no i kakau i kona palapala kuleana, a hoouna i ua Luna Honua ka M.H. 1847.

Ualo, hoohikiia, Ua ike au i kona mau Apana aina ma Puaanui, Lahaina, 2 Apana.

Ap. 1 Kahuahale & Kula kanu maia.

Mauka, aina o Kaupena
Kaanapali aina o Pauloa & Alanui Aupuni
Makai aina o Kaha
Olowlalu aina o Kawelohea & Kalua & Kahaka.

Ap. 2 - Aina Kalo.
Mauka he poalima me ka aina o Kalua
Kaanapali aina o Makaiole
Olowalu he pali me ka poalima
Makai aina o Makaiole.

Ua loaa ia ia keia mau Apana aina no Kapeleaumoku mai mamua aku o ka haunaele o Kaomi i ka M.H. 1829, a ua noho oluolu oia ma keia wahi, a hiki i kona make ana i ka M.H. 1948, hooili i keia mau Apana aina no Kaiuli kana keiki, a ke noho nei no a keia wa, aole mea keakea.

Kalua (Hope Konohiki) hoohikeia, a olelo mai la, ua pololei kona kuleana, aole ma keakea

F.T. 10-11v16
No. 496, Popolo

Upai, sworn, It was I who wrote his claim and sent it to the Land Commissioners in 1847.

Ualo, sworn, I know his parcels of land at Puaanui, Lahaina. There are 2 apana.

Apana 1: House site and kula planted in bananas.
Mauka by land of Kaupena
Kaanapali by land of Pauloa & Government Road
Makai by land of Kaha
Olowalu by land of Kawelohea and Kalua and Kahaka.

Apana 2: Taro land.
Mauka by a po`alima and the land of Kaha
Kaanapali by land of Makaiole
Olowalu by a pali and the po`alima
Makai by land of Makaiole.

He received these parcels from Kapeleaumoku before the commotion over Kaomi in 1829, and had quiet possession until his death in 1848. These parcels were bequeathed to Kaiuli, his keiki, who has had undisputed possession until this time.

Kalua (Deputy Konohiki, sworn, confirms claim and says there are no objections.

N.T. 10-11v16
No. 496, Popolo

Upai, sworn, he wrote Popolo's claim and forwarded to the Land Commissioners in 1847.

Ualo, sworn, he knows Popolo's land in Puaanui of Lahaina in 2 sections.

Section 1 - House lot and banana planting kula.
Mauka by Kaupena's land
Kaanapali by Pauloa's land Government road
Makai by Kaha's land
Olowalu by Kawelohea's land/Kalua's land/Kahaka's land.

Section 2 - Taro land.
Mauka by A poalima and Kaha's land
Kaanapali by Makaiole's land
Olowalu by A poalima and a pali
Makai by Makaiole's land.

Land from Kapeleaumoku before Kaomi's upheaval in 1829. Popolo lived undisturbed until his death in 1849, he bequested this land to his son Kaiuli. He has lived undisputed to the present.

Kalua, sworn, (assistant konohiki) Popolo's claim is correct, no objections.

Land from Kapeleaumoku before Kaomi's upheaval in 1829. Popolo lived undisturbed until his death in 1849, he bequested this land to his son Kaiuli. He has lived undisputed to the present.

Kalua, sworn, (assistant konohiki) Popolo's claim is correct, no objections.

[Award 496; R.P. 2759; Puaanui Lahaina; 2 ap.; 1 Ac. 2 roods; R.P. 3340]

No. 2745, Paaoao

Claim Number:	**02745**		
Claimant:	**Paaoao**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Kapewakua, Paunau**		
Ili:			
Apana:	**2**	Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**15v6**
Mala Taro:		FT:	**148v6**
Kula:		NT:	**31v5**
House lot:		RP:	**1691 & 1716**
Kihapai/Pakanu:		Number of Royal Patents:	**2**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**

Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 2745, Paaoao
N.R. 15-16v6

I, Paaoao, hereby petition you, the Land Commissioners /for my/ house lot at Ilikaha and my kihapai in the Ahupua`a of Kapewakua in Lahaina, Island of Maui.

The dimensions of this houselot for which I petition are: on the north 81 feet, on the east 66 feet, on the south 91 feet, on the west 42 feet. The dimensions of the kihapai are: on the south 138 feet, on the west 90 feet, on the north 120 feet, on the east 84 feet. That is the size of my claims for which I petition you.

My occupancy of this place for which I petition you has been for a long time, from the time of Mahiole Haole until this day.

It was I who built the house and the fence and who planted everything. That is my petition, to be entered in the Award Book.
Farewell to you all,
PAAOAO X
Lahaina, Maui, January 8, 1848

F.T. 148v6
Cl. 2745, Paaoao

Kamana, sworn, the claimant has one house lot in "Ilikahi," Lahaina and one piece of cultivated land in Paanau, Lahaina. The claimant received the house lot from his ancestors in the days of Kamehameha I,

and the same may be said of his land in Paunau. His title has never been disputed. The house lot has 3 houses on it and is fenced.

It is bounded:
Mauka by the yard of Kaino
Olowalu by the yard of Kahula
Makai by Kekuanaoa's land
Kaanapali by Keaweluaole.

The other piece is bounded:
Mauka and Olowalu sides by the pali of Paunau
On the other two sides by the creek of Paunau.

N.T. 31v5
No. 2745, Paaoao, June 12, 1849

Kamana, sworn, He has seen Paaoao's interest of a house lot at Ilikahi and a land section at Paunau, this was bequested land from Paaoao's parents during the time of Kamehameha I, no one has objected.

Section 1 - House lot.
Mauka by Kaino
Olowalu by Kahula
Makai by Kekuanaoa's patch
Kaanapali by Keaweluaole's land.

Section 2 - Taro land.
Mauka and Olowalu by Paunau pali
Makai and Kaanapali by Paunau stream.

No houselot at Kapewakua.

[Award 2745; R.P. 1691; Kapewakua Lahaina; 3 ap.; .74 Ac.; R.P. 1716; Paunau Lahaina; 1 ap.; .27 Ac.]

No. 2866, Kamiki, S.

Claim Number:	**02866**
Claimant:	**Kamiki, S.**
Other claimant:	
Other name:	
Island:	**Maui**
District:	**Lahaina**
Ahupuaa:	**Kapewakua**

Ili:			
Apana:	**4**	Awarded:	**0**
Loi:		FR:	
Plus:		NR:	**18v6**
Mala Taro:		FT:	
Kula:		NT:	
House lot:		RP:	**5574**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 2866, S. Kamiki
N.R. 18v6

With respect, to the Land Commissioners who quiet titles to land and house lots of the Hawaiian Islands: I, Samuela Kamiki, have six lo`i and a house lot. On the northeast it is 75 feet wide. On the southwest the length is 97 feet. The northwest side is 97 feet. Those are my claims for your information, which I wish to have entered in your book. Farewell to you all.
I am, respectfully,
S. KAMIKI
Kapewakua, Lahaina, January 7, 1848

F.T. 168-167v7
Cl. 2866, S. Kamiki

Kanahoa, sworn, I know the lands of the claimant. They are in Kapawakua, Lahaina. They consist of two pieces.

No. 1 consists of kalo land in 3 pieces and
No. 2 consists of house lot.

The claimant received it from Peke in the year 1834. His title has never been disputed.

The first piece of 3 lois is bounded:
Mauka by Peke's land
Makai by Kaina's lot
Olowalu by Mr. Butler's lot
Kaanapali by Mr. Baldwin's lot.

The 2nd piece of house lot is bounded:
Mauka by Peke's lot
Olowalu by Pukoa, the ahupuaa
Makai by Mr. Butler's lot
Kaanapali by the same.

The 3d piece of 2 lois is bounded:
Mauka by Naia's land
Olowalu by Puuhoowahi, the ahupuaa
Makai by Kani
Kaanapali by Kaehukulani.

The last piece of 1 loi is bounded:
Mauka by Kaehukulani
Olowalu by Kaina
Makai by Kaehukulani
Kaanapali by Kaina.

N.T. 51-52v5
No. 2866, Kamiki

Kahahoa, sworn, He has seen 4 sections at Kapawakua. It was from Peke in 1834. No one had objected.

Section 1 - House lot.
Mauka by Peke's land
Olowalu by Puou ahupuaa
Makai and Kaanapali (?) by Mr. Patava (?).

Section 2 - 3 patches
Mauka by Peke's land
Olowlau by Kaiawa
Makai by Mr. Parava's land
Kaanapali by Rev. P. Baldwin's land.

Section 3 - 2 patches
Mauka by Naia
Olowalu by Puuhoowahi
Makai by Kani
Kaanapali by Kaehukulani.

Section 4 - 1 patch
Mauka by Kaehukulani
Olowalu by Kaiawa
Makai by Kaehukulani
Kaanapali by Kaiawa.

[Award 2866; R.P. 5574; Kapewakua Lahaina; 3 ap.; 1 rood 27 rods]

No. 3422B, Kekahuna

Claim Number:	**03422B**		
Claimant:	**Kekahuna**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Uhao**		
Ili:			
Apana:	**1**	Awarded:	**1**
Loi:	**17**	FR:	

Plus:		NR:	**50v9**
Mala Taro:		FT:	**133v13/19v15**
Kula:		NT:	
House lot:	**1**	RP:	**1678**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**Yes**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	**2 houses**

Cl. 3422B, Kekahuna, Lahaina Maui
F.T. 376v3

Kenaoe of Lahaina, Maui being sworn before W. Ap. Jones, P. Magistrate, made oath that Kekahuna put into deponant's hands a land claim for a kuleana on "Uhai" (Ahlupuaa) in Lahaina, and that he took the claim to Honolulu and gave it to Namauu, Commissioners, which claim was written by a schoolmaster "Nahia."

The above signed in presence of H.W. Daniels, 31 August

Nahia, sworn, made oath that he wrote a claim as above described & saw it put into Kenaoe's hands to take to the Land Commission and he also swears that he wrote another claim at the same time for Opunui which was given to Kanaoe has since been found to have been delivered. Signed before W. Ap. Jones 3 September 1852.
<>
No. 3422B, Kekahuna

Napohaku, sworn, says he knows the land of Claimant in Uhao, Lahaina. It consists of two pieces.

The first piece is a House Lot bounded:
Mauka and Olowalu by "Aki"
Makai and Kaanapali by the Konohiki.

The second piece is bounded:
Mauka and Olowalu by "Aki"
Makai by the Konohiki
Kaanapali by a stream.

Claimant derived the land through his wife about 1842 (or through her sister) and has occupied it in peace up to a short time since when Puuki has disputed his claim.

Timoteo Keaweiwi, sworn, says he knows the land claimed by Kekahuna. He has occupied and cultivated it the same as all other Hoaainas, since he got it in the time of Kinau, and held the land in peace till lately, when Puuki raised a counter claim. There are no poalima patches in it.

N.T. 112v10
Kekahuna, 4 February 1852
[No number given]

Kainawe, sworn, I have seen his land sections in the ahupuaa of Uhao, Lahaina, Maui.

Section 1 - 17 taro patches.
Section 2 - 1 house lot with two houses.

Section 1:
Mauka and Olowalu by Namauu's land
Makai by Puuki's land, government land
Kaanapali by Kaleipaihala's land.

Land from Luukia in 1841, when Kaenaena had been tax assessor, no objections.

Napohaku, sworn, every statement above is true, I have known in the same way.

[Award 3422B; R.P. 1678; Uhao Lahaina; 2 ap.; 1.25 Acs]

No. 4878FF, Poopuu, wahine

Claim Number:	**04878FF**		
Claimant:	**Poopuu, wahine**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Puako, Wainee, Waianae 1 & 2**		
Ili:			
Apana:	**4**	Awarded:	**1**
Loi:	**2**	FR:	
Plus:		NR:	**215v6**
Mala Taro:		FT:	**40v7**
Kula:	1	NT:	
House lot:	**1**	RP:	**2738**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**

Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

Cl. 4878FF, Poopuu [wahine], Part 28
F.T. 40-41v7

Umiumi, sworn, I know the lands of claimant. They are [sic] consist of one large loi in Waianae 1. One large loi on Waianae 2, a House lot and kula on Waineenui, all in Lahaina.

The first large loi was obtained by claimant from Kaaimalalo in 1824 and he has held in peace until about three weeks since, when the head man, John Hoolulu, the King's agent disputed it.

The next large loi the claimant received from the same source at the same time, and her title to it has never been disputed.

THe first loi is bounded:
Mauka by the land of Pikanele
Olowalu by the lois of Ninia
Makai by the loi of Paupau
Kaanapali by the land of Pikanele.

The last piece is bounded:
Mauka by "Puako"
Olowalu by the lois of Kunalo
Makai by the loi of Kauiloihi [?]
Kaanapali by the land of Napuakale [?]

Olala, sworn, I know the house lot and kula of the claimant. It is in "Waineenui." The claimant obtained this land from me in the days of Pricess Nahienaena before 1836, and she has had the quiet possession of it ever since.

It is bounded:
Mauka by my land
Olowalu by the land of Kaai
Makai by Hanaunau's [?] and my own land
Kaanapali by the land of Kamehameha.

[Award 4878FF; R.P. 2738; Wainee Lahaina; 3 ap.; .87 Ac.; See 4878 for Native Register document; See also Award 6920]

No. 4878G, Malaekahana

Claim Number:	**04878G**		
Claimant:	**Malaekahana**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Polanui**		
Ili:			
Apana:	**4**	Awarded:	**1**
Loi:	**1**	FR:	
Plus:		NR:	**215v6**
Mala Taro:		FT:	**29v7**
Kula:	2	NT:	
House lot:	**1**	RP:	**1959,2742**
Kihapai/Pakanu:		Number of Royal Patents:	**2**
Salt lands:		Koele/Poalima:	**Yes**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**

Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

Cl. 4878G, Malaekahana, part 6
F.T. 29v7

Mahaulea, sworn, I know the land of claimant. They are in Polanui, Lahaina, and consist of three distinct pieces. One kalo land and two patches of kula. There is a house lot beside this.

Claimant has these lands from a woman, Kamane's wife. This was in 1835, I think, and he has never been disputed in his title to the present time. I am the head man of Polanui under Kanaina.

One piece of kula containing two moos is makai and is bounded:
Mauka by Kanaina poalima lois
Olowalu by the land of Makuwahine
makai by the yard of Kaoo
On the other side by the same.

The mauka piece of kula is fenced, and the fence is the correct boundary
Mauka of it is the kula of mine
Olowalu is Puunoa
Makai is Polaiki's land
on the other side is the land of Koalakai.

The house lot has two houses on it and is bounded:
Mauka by the land of Makuwahine's land
Olowalu by John White's land
Makai the road to Olewalu
On the other side by the land of Kapuwanui.

The kalo land contains 10 lois and it is bounded:
Mauka by Alio
Olowalu by the same
Makai by the poalima lois of Kanaina
Kaanapali by Kaiwi.

[Award 4878G; R.P. 1959; Polanui Lahaina; 3 ap.; 8 Acs 49 rods; R.P. 2742; Polanui Lahaina; 1 ap.; 13 rods; See 4878 for Native Register document; (Awardee index lists R.P. 1959 as 2 Acs 49 rods?)]

No. 5116*M, Kanae, Samuela

Claim Number:	**05116*M**		
Claimant:	**Kanae, Samuela**		
Other claimant:	Kekaula, wife & heir		
Other name:	Keleuila		
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Panaewa, Aupokopoko**		
Ili:			
Apana:		Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**239v6**
Mala Taro:		FT:	**33v16**
Kula:		NT:	**35v5**
House lot:		RP:	**1833, 1871**
Kihapai/Pakanu:		Number of Royal Patents:	**2**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**

Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**Yes**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 5116*M, S. Kanae
N.R. 239v6

Greetings to you, Z. Kaauwai: I hereby tell you of a claim for a lot, which you may have written in the Government's Depository of Claims. If you have not entered it, then enter this claim.

If you wish to know the boundaries you may ask B. Manakaeha.

Furthermore, Aupopoko should be entered with it. It is a little land in Lahaina.
Farewell to you and everyone in your house.
I am, respectfully,
S. KANAE
Lahaina, Maui, 19 January 1848

F.T. 152v7
Cl. 5116, S. Kanae (is dead)

Z. Kaauwai, sworn, The claimant's land they consist of one ili of land called Kiokapu in Waikiki, Oahu and an Ahupuaa in Lahaina called Aupokopoko and one house lot in Lahaina also.

Kiokapu and Aupokopoko he received from the king at the recent division. There are 7 lands. Claimant's living on Kiokapu and on Aupokopoko.

The claimant had the house lot from Hoapili Kane in 1835 and his title has never [been] disputed. He died in 1848. He left a widow named Keleuila and one daughter.

He has a house lot also in Honolulu, Oahu. He received this from his wives in olden time in 1837 and he has held it but not without dispute. William Smith disputed his title to this lot and so does Noihonua.

The house lot at Lahaina is bounded:
Mauka by Kapaakea's lot
Olowalu by the same
Makai by the Alanui Aupuni
Kaanapali by Kuakamauna's lot.

I don't know the bounds of the house lot in Honolulu, but it is the one near Mr. Woods, claimed by William Smith.

See page 32v15

F.T. 32v15
No. 5116, S. Kanae, (Deceased) from page 152v7

The widow of Claimant presented the following Certificate of Division.

"No Samuela Kanae"
Aupokopoko, Ahupuaa, Lahaina, Maui
Kiokapu, Ili no Waikiki, Kona, Oahu
E hookomo i ka Hoona Kuleana
(Signature) S.P. Kalama
Hale Alii
Feberuari, 7, 1848, See P. 53 [sic: See 33]

F.T. 33v15
No. 5116, Samuela Kanae, (Deceased) from page 152v7

Hauola, sworn, says, he knows the House Lot in dispute between Kanae and Kaolulo. This place was occupied by Kanae from the time of Nahienaena up to the time of his death, about 1840. Kanae built the house which now stands on the Lot, in the time of Hoapili, and rented it out to some foreigners. Kanae's first wife got the place from her brother Kaolulo, deceased, and when she died, it came to Kanae and now belongs to his heirs. (Decided in favor of S. Kanae.)

N.T. 35-36v5
No. 5116, S. Kanae

Z. Kaauwai, sworn, He has seen Kanae's land on Oahu, Kiokapu in Waikiki and the house lot in Honolulu; Aupokopoko in Lahaina and the house lot, 4 sections. These are farming sections in Aupokopoko was from Hoapili in 1835, no one had objections for that land until his (Kanae) death in 1848. 2 servants are at Aupokopoko with their claim.

Moehonua and a half Caucasian have objected to the lot in Honolulu. The district officers of Maui have enforced these lots for Kekaula, wife and heir of Kanae. The house lots on Oahu have been from Kanae's wives, Pulehu and I, in 1837. The boundaries to the Lahaina lot are:

[It is bounded]:
Mauka and Olowalu by Kapaakea's land
Makai by Government road
Kaanapali by E. Kuakamauna's land.

No. 2. Kaauwai has not known the boundaries of the house lot in Honolulu, Oahu.

N.T. 414v10
No. 5116, L. [S] Kanae, 7 October 1854

COPY
L. Kanae's land distribution
Aupokopoko ahupuaa, Lahaina, Maui.
TRUE COPY
A.G. Thruston, Chief Clerk, Interior department, 7 October 1854

[Award 5116; R.P. 1833; Panaewa ; Panaewa Lahaina; 1 ap.; .07 Ac.; R.P. 1871; Aupokopoko Lahaina; 1 ap.; 6.58 Acs]

No. 5441, Ninia

Claim Number:	**05441**		
Claimant:	**Ninia**		
Other claimant:	Naiahelu, wife		
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Waianae**		
Ili:	**Kaluokiha**		
Apana:	**3**	Awarded:	**1**
Loi:	**5**	FR:	
Plus:	+	NR:	**293v6**
Mala Taro:		FT:	**4v7**
Kula:		NT:	**27v5**
House lot:	**1**	RP:	**1751**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**

Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:	**2**	Spring/Well:	**No**
Breadfruit:	**4**	Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:	1	Wall/Fence:	**Yes**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:	1	Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:	2	Other Trees:	1
Other Mammals:	**No**	Miscellaneous:	**Naiahelu got this land from Hoapiliwahine, her aikane, government road, ti leaves, 2 grape vines, 4 houses, 13 kukui trees**

No. 5441, Ninia, Lahaina, Maui
N.R. 293-294v6

Waianae: Kanele is the one from whom I received my right in 1842. I have five lo,i, five kukui trees, two taro patch banks planted with sugar cane, and one taro patch planted with ti leaf plants. One /dried out/ lo`i is planted in bananas. The witness is Kaeo. The head is Kanele.

Puaa: There are 12 mo`o, planted with sugar cane, bananas, four breadfruit trees, two grape vines, eight kukui trees. There are four houses in this parcel. The witness is Kaeo, he is the head. /There is/ an orange tree.

Hoapili was the one from whom I received my right, in 1842. He has died, and at this time Kanaina is at the head. The house lot claim is from him. Those are the claims of occupancy in Lahaina, for your information, O Land Commissioners.
NINIA

F.T. 4-5v7
No. 5441, Ninia, See page 115 volume 10, & 105 volume 15.

Keaweluaole, sworn, I know the house lot of Claimant in Lahaina. It is now occupied by Victor Chancerot as an eating house &c. It is fenced. The fence is the correct boundary.

Claimant got this land from Hoapili Kane and built the house on it & fence. I never heard the title disputed. Claimant has had peaceable possession and now rents the premises. I do not know of his other lands.

Kalaikini, sworn, confirmed the preceding testimony and new of no counter claimant.

F.T. & N.T. 105-106v15
No. 5441, Ninia, Disputed by Kanaina, Lahaina, 15th September 1853, from page 4, vol. 7

Pikanele, sworn, says he knows the house lot now in dispute. Ninia built his first house on the lot in 1842 and has occupied it up to the present time. I do not know who gave him the lot or who allowed him to build on it. He rented his house lot different times. This lot is in the Ahupuaa of Puako which belonged to Kalaimoku and afterwards to Kahalaia. Kekauluohi made the lane which runs from the main road to the sea side, and which cut through Ninia's lot. Ninia built the enclosure around the lot. After Kahalaia's death Puako came to Kekauonohi to whose heirs it now belongs.

Hihio, sworn, says Hoapili gave this lot to Ninia in the year 1842. Ninia and his wife Naiahelu lived on the place a year or two previous to the gift by Hoapili. I was present when Hoapili gave the lot to them. I think the Ahupuaa of Puako belonged to Kekauonohi at that time. There was a grass house there before which was occupied by a man belonging to Hoapili, named Luhiluhi, who died about the time Ninia got the lot. Luhiluhi had a wooden fence round the lot and when that fell down Ninia replaced it with an adobe wall.

Naiahelu was an aikane of Hoapiliwahine, which probably was the reason of the gift. Hoapiliwahine told Naiahelu, in my hearing, to pull down the old grass house then standing on the lot and erect a good house on it for her and her husband Ninia. Ninia then went to work and built his house on that lot. I was one of Kaaimalaia's retainers. She gave Naiahelu a small piece of land mauka at the same time.

Kaleikini, sworn, I was Luna for Hoapiliwahine in 1842 and was present when she gave this lot to Naiahelu (her aikane) the wife of Ninia. Naiahelu was the bosom friend of Hoapiliwahine. When Ninia got the lot he pulled down the old grass house then standing there and erected a house of stone and mud. There were several chiefs present when Hoapiliwahine gave the lot to Naiahelu. The reason of the gift was that Hoapili wished to have her friend Naiahelu close to her own residence. I understood the gift to be absolute and lila loa.

N.T. 115-117v10
No. 5441, Ninia, 5 February 1852, vs. C. Kanaina 277 (from page 4, volume 7)

Makaulia, sworn, I have seen this house lot at Kaluokiha, adjoining with Luaehu. There is a dispute over this land in Lahaina, Maui between Ninia and C. Kanaina.

Mauka by Government road

Olowalu leading into Luaehu, a small patch
Makai by Luaehu's lot
Kaanapali by Pikanele's house lot.

Land to Puhipuhi, Makaulia's wife from Hoapili as a house dweller in 1841, but no house was built and after the death of Mrs. Hoapili, it seemed as if Naaihelu had previously asked for the place.

When it was time to present a property report to M. Kekauluohi who is the heir of Mrs. Hoapili, I showed them the place Hoapili had given me, and Naaihelu said that Hoapili (Mrs.) had given him that house permanently, then I gave it to him saying, "the estate is mine, together with the lumber and the loss for supplying the needs of the house is mine only." He lived there to 1846, then Mr. Richards came to work on claims and at this time C. Kanaina offered objections for the heir of M. Kekauluohi.

C. Kanaina had this place in question because he had been a tenant there and a house dweller. He claimed that the land was for the chiefs, therefore, they should have the same privileges living under hoapili's heirs as they had under Hoapili, however, I believe that Ninia has a claim on the house and C. Kanaina has the right to the land, together, they should reap the value of the land and should Ninia buy C. Kanaina's half interest, then all of it should be for Ninia.

Pelupelu, sworn, I have seen that place over which there is a dispute between C. Kanaina and Ninia. Mrs. Hoapili gave this place to Puhipuhi, the wife of Makaulia before she (Mrs. Hoapili) died. 'It was a place for them to live under her and they did live there peacefully. I had not heard in the least that it was given to Naahelu, the wife of Ninia because I had always lived with Mrs. Hoapili until she died. Ninia and relatives lived close to the Hoapilis to enable them to have their meals with them and this was protection only for them, he did not get the ground (land). When M. Kekauluohi died, C. Kanaina opposed as an heir of M. Kekauluohi. Ninia did not get the ground, this is for the heirs of Mrs. Hoapili.

Ninia (Question): Did you always live with Hoapili?
Pelupelu (Answer): Yes, I have always lived with him and was with him at the time of his death, but I had not heard that he had given to you both permanently, but it was protection that you would have. M. Kekauluohi had placed you there and she let you build a house, but the land was reserved for her heirs.

[Award 5441; R.P. 1751; Waianae Lahaina; 3 ap.; .63 Ac.; See Award 392 for other Foreign and Native Testimony documents]

No. 5832, Kaaumaiewa

Claim Number: **05832**

Claimant: **Kaaumaiewa**

Other claimant:

Other name:

Island: **Maui**

District: **Lahaina**

Ahupuaa:	**Kamani**			
Ili:				
Apana:	**1**		Awarded:	**1**
Loi:	**1**		FR:	
Plus:	+		NR:	**334v6**
Mala Taro:		0	FT:	**5v7**
Kula:		1	NT:	
House lot:	**0**		RP:	**1157**
Kihapai/Pakanu:		0	Number of Royal Patents:	**1**
Salt lands:		0	Koele/Poalima:	**No**
Wauke:	**0**		Loko:	**No**
Olona:		0	Lokoia:	**No**
Noni:	**0**		Fishing Rights:	**No**
Hala:		0	Sea/Shore/Dunes:	**No**
Sweet Potatoes:		0	Auwai/Ditch:	**No**
Irish Potatoes:		0	Other Edifice:	**No**
Bananas:	**0**		Spring/Well:	**No**
Breadfruit:	**0**		Pigpen:	**No**
Coconut:		0	Road/Path:	**No**
Coffee:		0	Burial/Graveyard:	**No**
Oranges:		0	Wall/Fence:	**No**
Bitter Melon/Gourd:		0	Stream/Muliwai/River:	**No**
Sugar Cane:		0	Pali:	**No**
Tobacco:		0	Disease:	**No**
Koa/Kou Trees:		0	Claimant Died:	**No**
Other Plants:		0	Other Trees:	0
Other Mammals:	**No**		Miscellaneous:	

No. 5832, Kaaumaiewa, 22 January 1848
N.R. 334v6

To the Land Commissioners, Greetings: I, Kaaumaiewa am a petitioner for my land claim. It is a pauku of land, one mo'o, and a kula. It is finished, except for a portion in another place. That is my land claim which is stated to you. The name /of the land/ is Kamani. It is in Lahaina waena, adjoining Polanui. KAAUMAIEWA

F.T. 5v7
Cl. 5832, Kaaumaiewa

Claimant said his only proper witness was Kaniau now in Hamakua from whom he has the land.

Moku, sworn, I am luna ahau of Lahaina. I know claimant's land. It is in one piece and a section in the ahupuaa of Kamani.

Bounded:
Mauka by Kanaina's Polanui
Olowalu by Punau
Makai by Kanaian's
Kaanapali by Polanui.

[Award 5832; R.P. 1157; Kamani Lahaina; 1 ap.; 4.35 Acs]

No. 6073, Halepaka

Claim Number:	**06073**		
Claimant:	**Halepaka**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Moalii**		
Ili:	**Kapaahu**		
Apana:	**1**	Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**346v6**
Mala Taro:		FT:	**120v7**
Kula:		NT:	**11v5**
House lot:		RP:	**1182**

Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 6073, Halepaka, Lahaina, Maui
N.R. 346v6

Greetings to the Land Commissioners: I have a claim at Moalii, in Lahaina, Maui, a house lot in the kula. My right /was from/ Kaliiliiai, who died, and Kaaaa /is in charge/ at this time. It was given and conveyed absolutely. There is no opposition.
Farewell to you all, in peace.
HALEPAKA
January 27, 1848

F.T. 120-121v7
Cl. 6073, Halepaka

The claimant has gone to California, but his wife Aue appeared and answered for him.

Kaaa, sworn, the land of the claimant they are one house lot in Puunoa, the claim for which was heard by Mr. Richards and a piece of kula with a house thereon, in Moalii, Lahaina.

The claimant received part of this named land, i.e., 3 moos from me between 1836 and 1839 and at the same time received the remaining part, Liiliiai. There was no dispute about his possession until about a week ago, when a man disputed with him, but it was a matter of no consequence. A little thing not affecting the claimant's rights.

It is bounded:
Mauka by the land of Kaulaohukai
Olowalu by the land of Paakai
Makai by the land of Moakaka
Kaanapali by Keawe's land.

N.T. 11-12v5
No. 6073, Halepaka and Aui's wife [Aue is wife]

Kaaa, sworn, He has seen Halepaka's interest in the `ili of Kapaaku of the Moalii ahupuaa which Kaaa had given. There are farming moos and a house lot, some of which had belonged to Kaliihiai who had lived there before 1839, no one had objected. At the time there has been a slight objection but the claim is secure.

The boundaries are:
Mauka by Kaulokukui's land
Olowalu by Paakai's land
Makai by Mioakaka's land
Kaanapali by Keawe's land.

[Award 6073; R.P. 1182; Kapaahu Moalii Lahaina; 1 ap.; 2 Acs 2 roods 21 rods]

No. 6218, Mauae, Wahine

Claim Number: **06218**

Claimant: **Mauae, wahine**

Other claimant:

Other name:

Island: **Maui**

District: **Lahaina**

Ahupuaa: **Waineenui**

Ili:

Apana:		Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**355v6**
Mala Taro:		FT:	**187v7**
Kula:		NT:	
House lot:		RP:	**1184**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 6218, Mauae
F.T. 187v7

Waihele, sworn, I know the lands of the claimant is in "Waineenui," in 2 pieces.

No. 1 is a house lot and 4 moos.

No. 2 is a piece of kalo land.

The claimant received this land from me in 1841 and I had it from Kuakini in 1838. His title nor mine was ever disputed.

No. 1 is bounded:
Mauka by Maio's land
Olowalu by Puaa and Kaeo
Makai by J. Nowlein's lot
Kaanapali by Waineeiki.

No. 2 is bounded:
Mauka by Helelualani's land
Olowalu by Puaa
Makai by Aa's land
Kaanapali by Waineeiki.

N.T. 68v5
No. 6218, Mauae

Waihele sworn He has seen 2 sections at Waineenui Land from Kuakini through Waihele in 1838, no opposition.

Section 1 - House.
Mauka by Maii's land
Olowalu by Kaeo's eleele land
Makai by Kimo Iaolene's land
Kaanapali by Waineeiki land.

Section 2 - Taro.
Mauka by Helelualani's land
Olowalu by Puaa of Kuakamauna land
Makai by AA
Kaanapali by Wainee of Kalipaihala land.

[Award 6218; R.P. 1184; Waineenui Lahaina; 4 ap.; 1.46 Acs; See 6203, N.R. 555v6 for Native Register document]

No. 6424, Kanehoewaa

Claim Number: **06424**

Claimant: **Kanehoewaa**

Other claimant:

Other name:				
Island:	**Maui**			
District:	**Lahaina**			
Ahupuaa:	**Moalii**			
Ili:				
Apana:	**0**		Awarded:	**1**
Loi:	**0**		FR:	
Plus:			NR:	**370v5**
Mala Taro:		0	FT:	**18v7**
Kula:		0	NT:	
House lot:	**0**		RP:	**1840**
Kihapai/Pakanu:		0	Number of Royal Patents:	**1**
Salt lands:		0	Koele/Poalima:	**No**
Wauke:	**0**		Loko:	**No**
Olona:		0	Lokoia:	**No**
Noni:	**0**		Fishing Rights:	**No**
Hala:		0	Sea/Shore/Dunes:	**No**
Sweet Potatoes:		0	Auwai/Ditch:	**No**
Irish Potatoes:		0	Other Edifice:	**No**
Bananas:	**0**		Spring/Well:	**No**
Breadfruit:	**0**		Pigpen:	**No**
Coconut:		0	Road/Path:	**No**
Coffee:		0	Burial/Graveyard:	**No**
Oranges:		0	Wall/Fence:	**No**
Bitter Melon/Gourd:		0	Stream/Muliwai/River:	**No**
Sugar Cane:		0	Pali:	**No**
Tobacco:		0	Disease:	**No**
Koa/Kou Trees:		0	Claimant Died:	**No**

Other Plants:	0	Other Trees:	0
Other Mammals:	**No**	Miscellaneous:	

No. 6424, Kanehoewaa, Lahaina, February 4, 1848
N.R. 371v6

Greetings to the Commissioners of the Mo`i: I have a little claim for a lot, at Moalii, adjoining the flowing stream; it is 68 fathoms long by 68 fathoms wide.

[DIAGRAM a]

Furthermore, there is a kihapai for planting sweet potatoes, 11 fathoms in length and 24 fathoms in width /sic/.

This is its diagram

[DIAGRAM b]

This is its diagram, adjoining the stream of Moalii in Lahaina on the Island of Maui.
KANEHOEWAA

F.T. 18v7
Cl. 6424, Kanehoewaa

for house lot and farm

Lelehu, sworn, I know these lands. Claimant had them from Hoaai who had them from me about 10 years since. I had them from Kaahumanu. I never head claimant's title disputed.

The house lot is in Lahaina, the part called Moalii.
Mauka is David Malo's land
Olowalu is Kaulakukui's
Makai is my land
Kaanapali is my yard.
The fence is the true boundary.

The farm lot is bounded:
Mauka by my land
Olowalu by Moalii Creek
Makai by my land and Kaanapali.

[Award 6424; R,P. 1840; Moalii Lahaina; 1 ap.;. 1.6 Acs]

No. 6549, Hauola

Claim Number:	**06549**	
Claimant:	**Hauola**	
Other claimant:		
Other name:		
Island:	**Maui**	
District:	**Lahaina**	
Ahupuaa:	**Panaewa, Paeohi**	
Ili:		
Apana:	Awarded:	**1**
Loi:	FR:	
Plus:	NR:	**400v6**
Mala Taro:	FT:	**22v7**
Kula:	NT:	**25v15**
House lot:	RP:	**1731, 3584**
Kihapai/Pakanu:	Number of Royal Patents:	**2**
Salt lands:	Koele/Poalima:	**No**
Wauke:	Loko:	**No**
Olona:	Lokoia:	**No**
Noni:	Fishing Rights:	**No**
Hala:	Sea/Shore/Dunes:	**No**
Sweet Potatoes:	Auwai/Ditch:	**No**
Irish Potatoes:	Other Edifice:	**No**
Bananas:	Spring/Well:	**No**
Breadfruit:	Pigpen:	**No**
Coconut:	Road/Path:	**No**
Coffee:	Burial/Graveyard:	**No**
Oranges:	Wall/Fence:	**No**
Bitter Melon/Gourd:	Stream/Muliwai/River:	**No**

Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 6549, Hauola, Lahaina, Maui, February 4, 1848
N.R. 400-401v6

To the Honorable land Commissioners of Hawaii, Greetings: I, Hauola, hereby state my claim for a lot in the ahupua`a of Paeohi in Lahaina, Maui. That is my claim for a lot and its basis is that I received it from Waiki, and he is the witness.
HAUOLA X, His Mark

F.T. 22v7
Cl. 6549, Hauola

Claim for 1 piece "Paeohi" Lahaina
Kahea, sworn, I know claimant's land in "Paeohi," Lahaina, consisting of a house lot, kalo land & kula in one piece and the fence is the true boundary. Claimant had it from Waiki in time of Kamehameha I and has held undisputed claim till very lately when Z. Kaauwai set up a claim as head man of this land. He has since been superseded by Kapuonui who has not disputed it.

N.T. 25v15
No. 6549, Hauola, from Page 22v7

Kaaka, sworn, says she knows the land of Hauola in "Panaewa" Lahaina. It consists of a House Lot and a piece of land for cultivation. He derived it from his parents who held it from the time of Kamehameha I. His title was never disputed until the time his land was measured when the Konohiki disputed his claim to the cultivated land. The House Lot is undisputed. Claimant has always cultivated the piece in dispute and held possession of it. When the present Konohiki came into office, she put some new man on this place as lopas, but they have no right there. The land has been Hauola's land his ancestors' from ancient times.

Waiki, sworn, says he knows the piece of land in dispute, and corroborates the testimony of the last witness in full. The lopas spoken of are new people and have no right whatever to the land.

Kaaikaula, sworn, says he is a stranger in Panaewa & not a Kamaaina.
(Decided in favor of Hauola).

[Award 6549; R.P. 1731; Panaewa Lahaina; 2 ap.; 2.13 Acs (Ap.2); R.P. 3584; Paeohi Lahaina; 2 ap.; 1 Ac. 5 roods 18 rods]

No. 6786, Kamohomoho

Claim Number:	**06786**		
Claimant:	**Kamohomoho**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Wainee**		
Ili:			
Apana:	**1**	Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**424v6**
Mala Taro:		FT:	**56v7**
Kula:	1	NT:	
House lot:	**1**	RP:	**1183**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**

Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

Cl. 6786, Kamohomoho
F.T. 56v7

Kaluahinenui, sworn, I know the lands of the claimant. They are in Waineenui. They consist of one piece of kula land, with a house thereon

The claimant received this land from Pikanele in the days of Hoapili and his title has never been disputed.

It is bounded:
Mauka by the kula land of Kaleipaihala
Olowalu by the same
Makai by the land of David Malo
Kaanapali by "Puako."

[Award 6786; R.P. 1183; Waineenui Lahaina; 1 ap.; 2.52 Acs; See 6781 for Native Register document]

No. 6870, Pupule, Wahine

Claim Number:	**06870**		
Claimant:	**Pupule, wahine**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Makila**		
Ili:			
Apana:	**3**	Awarded:	**1**
Loi:	**1**	FR:	
Plus:	+	NR:	**427v6**
Mala Taro:		FT:	**71v6/8v16**

Kula:	1	NT:	
House lot:	**1**	RP:	**2714,8266**
Kihapai/Pakanu:		Number of Royal Patents:	**2**
Salt lands:		Koele/Poalima:	**Yes**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**Yes**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**Yes**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**Yes**
Sugar Cane:		Pali:	**Yes**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

Cl. 6870, Pupule [wahine]
F.T. 71-72v6

Kainokane, sworn, I know the lands of the claimant. It is in two pieces; one a kula of 2 moos, and the other a section of kalo land. The claimant received these lands from Kaulunae in 1838 and she has had [them] in peaceably [peaceable] possession ever since.

It is bounded:
Mauka by the land of Kelehoula
Olowalu by the poalima land
Makai by the alanui Aupuni
Kaanapali by the land of Holi.

The kalo land is bounded:
Mauka by the land of Kahulanui
Olowalu by the creek of Kanaula
Makai by the land of Holi
Kaanapali by the high pali.

There are two poalima lois in this kalo section.

There is a house lot which is bounded:
Mauka by the Alanui Aupuni
Olowallu by the lot of Kane
Makai by the sea beach
Kaanapali by the land of Kaiwiopiopio.

F.T. 8v16
No. 6870, Apana 2, Pupule

Pupuka, hoohikiia, Ua ike au i kona Apana aina ma "Makila" iuka o Kauaula, Lahaina, Maui.

1 Apana kalo.
Mauka aina o Kukui me Kahulanui
Kaanapali he pali
Makai aina o Holi
Olowalu he Kahawai me aina o Konohiki.

Ua loaa ia ia keia aina no Kalalea kana kane mai i ka makahiki 1834 a 1835 paha, a ua noho oluolu a keia wa, aole mea keakea.

Kawelo, hoohikeia, Ua like pu kou ike me kona, aole keakea.

[Award 6870; R.P. 2714; Makila Lahaina; 2 ap. 2.07 Acs; R.P. 8266; Makila Lahaina; 1 ap.; 2 roods 20 rods; See No. 6851 Kahula ma for Native Register document; See also Award 3491B]

No. 8018, Mela

Claim Number: **08018**

Claimant: **Mela, Alika**

Other claimant:

Other name:

Island: **Maui**

District: **Lahaina**

Ahupuaa:	**Opaeula 1**		
Ili:			
Apana:	**1**	Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**476v5**
Mala Taro:		FT:	
Kula:		NT:	**188v10**
House lot:		RP:	**4560**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	**ahupuaa**

No. 8018, Alika Mela, Honolulu, 8 February 1848
N.R. 476-477v5

Greetings to the Land Commissioners: I hereby quit title to my land claim, named Opaeula, an Ahupua`a at Lahaina, Maui. This land was for my makua, from the `li`i, and also this land was gotten from the `li`i, Kamehameha III. I have occupied it with no opposition from any one until this time and I request that you award it to me. My witness is the Mahele Book of the Mo`i, and the people who know of my occupancy. I also have a house lot at Opaeula.
With a respectful farewell,
ALIKA MELA

N.T. 188v10
No. 8018, Alika Mela

Copy
Alika Mela's land in Mahele Registry.
Opaeula ahupuaa in Lahaina, Maui.
True Copy
A.G. Thruston, Secretary, K.K.
Department of Interior, 25 December 1852

[Award 8018; R.P. 4560; Opaeula Lahaina; 2 ap.; 4.75 Acs 2 rods]

No. 8587, Kaupena

Claim Number:	**08587**		
Claimant:	**Kaupena**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Puaanui**		
Ili:			
Apana:	**4**	Awarded:	**1**
Loi:	**3**	FR:	
Plus:	+	NR:	**470v6**
Mala Taro:		FT:	**491v7**

Kula:	1	NT:	**678v9**
House lot:	**1**	RP:	**5580**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**Yes**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**Yes**
Sugar Cane:		Pali:	**Yes**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 8587, Kaupena, Lahaina, Mar. 5, 1848
N.R. 470v6

Hear ye, Land Commissioners of the Government: I hereby state my claim to you, which was given by the konohiki. There are one taro mo`o and a house lot. They are at Puaa. Kuakamauna gave his consent. That is my claim.
Respectfully,
KAUPENA

F.T. 174-175v7
Cl. 8587, Kaupena

Waikele wahine, sworn, I know the lands of the claimant. They are in Puaanui, Lahaina. Four pieces.

No. 1 House lot and kula
No. 2 A section of kalo land
No. 3 of one loi
No. 4 of one lo.

The claimant received these lands from Kauheauanui, the konohiki of Puaanui in 1845, and he has possessed them in peace ever since.

No. 1 is bounded:
Mauka by Waineenui
Olowalu by "Kooka"
Makai by Popolo's land
Kaanapali by Waineenui.

No. 2 is bounded:
Mauka by Kaheananui's land
Olowalu by the creek of Kanaula
Makai and Kaanapali sides by the pali of Puaanui.

No. 3 is bounded:
Mauka by Maluae's land
Olowalu by the creek of Kanaula
Makai and Kaanapali by Kupa's land.

No. 4 is bounded:
Mauka by Kalua's poalima
Olowalu by Keokehana's land
makai by Lupahoilani's land
Kaanapali by Kuakamauna's land.

N.T. 57v5
No. 8587, Kaupena

Waihole, sworn, He has seen 4 sections at Puaanui, this interest was from Kaheauanui in 1845, no one has objected to Kaupena and the boundaries are:

Section 1 - House lot and pasture.
Mauka by Waineenui
Olowalu by Kooka land
Makai by Popoolo
Kaanapali by Waineenui.

Section 2 - Taro.
Mauka by Kaheananui's land

Olowalu by Kanaula land
Makai and Kaanapali by Puaanui pali.

Section 3 - 1 patch.
Mauka by Mahiae
Olowalu by Keohokana
Makai by Lupaoholani
Kaanapali by Kuakamauna's land.

[Award 8587; R.P. 5580; Puaanui Lahaina; 3 ap.; 1.5 Acs 10 rods]

No. 9793, Mumuku

Claim Number:	**09793**			
Claimant:	**Mumuku**			
Other claimant:				
Other name:				
Island:	**Maui**			
District:	**Lahaina**			
Ahupuaa:	**Puako**			
Ili:				
Apana:	**4**		Awarded:	**1**
Loi:	**4**		FR:	
Plus:			NR:	**507v6**
Mala Taro:		0	FT:	**189v7**
Kula:		2	NT:	**70v5**
House lot:	**1**		RP:	**1172**
Kihapai/Pakanu:		0	Number of Royal Patents:	**1**
Salt lands:		0	Koele/Poalima:	**No**
Wauke:	**0**		Loko:	**No**
Olona:		0	Lokoia:	**No**
Noni:	**0**		Fishing Rights:	**No**
Hala:		0	Sea/Shore/Dunes:	**No**
Sweet Potatoes:		0	Auwai/Ditch:	**No**

Irish Potatoes:	0	Other Edifice:	**No**
Bananas:	**0**	Spring/Well:	**No**
Breadfruit:	**0**	Pigpen:	**No**
Coconut:	0	Road/Path:	**Yes**
Coffee:	0	Burial/Graveyard:	**No**
Oranges:	0	Wall/Fence:	**No**
Bitter Melon/Gourd:	0	Stream/Muliwai/River:	**No**
Sugar Cane:	0	Pali:	**No**
Tobacco:	0	Disease:	**No**
Koa/Kou Trees:	0	Claimant Died:	**No**
Other Plants:	0	Other Trees:	0
Other Mammals:	**No**	Miscellaneous:	

No. 9793, Mumuku
N.R. 506-507v6

Hear ye, ye land Commissioners: There are three of us in this letter who state their claims. Here is the first:

I, Mumuku have a claim for a house lot and two lo'i and one mo'o. Here is a claim which is mauka, for one mo'o and one lo'i.
That is my claim.
MUMUKU

F.T. 189v7
Cl. 9793, Mumuku

Kamaiewa, sworn, I know the lands of the claimant is [are] in Puako, Lahaina. They consist of 4 pieces.

No. 1 is a house lot an 2 lois and kula.
No. 2 is one loi.
No. 3 one moo of kula.
No. 4 one pauku of kalo.

The claimant received these lands from Kuakoa, the konohiki, before 1837, and there has been no dispute of his title since.

No. 1 is bounded:
Mauka by Pahia's land
Olowalu by the Government road

Makai by Pahia's land
Kaanapali by the Konohiki of Puako.

No. 2 is bounded:
Mauka by Ku's land
Olowalu by Pahia's land
Makai y Kunuku's land
Kaanapali by the same.

No. 3 is bounded:
Mauka by waste kula of the Konohiki
Olowalu by Pahia's land
Makai by Judge Parson's land
Kaanapali by my land.

No. 4 is bounded:
Mauka by Kanuku's land
Olowalu by Puunoa of Namauu
Makai by Kanuku's land
Kaanapali by "Kuholilea".

N.T. 70v5
No. 9793, Mumuku

Kamaiewa, sworn, he has seen 4 sections at Puako and interest which was given by Kuokoa in 1837, no one had objected. The boundaries are:

Section 1 - 2 patches and pasture.
Mauka by Pahia's land
Olowalu by Government road
Makai by J. Pahia's land
Kaanapali by konohiki.

Section 2 - 1 patch.
Mauka by Ku's land
Olowalu by J. Pahia's land
Makai and Kaanapali by Kanuku's land.

Section 3 - 1 Moo.
Mauka by konohiki
Olowalu by Pahia's land
Makai by A.W. Pasana's land
Kaanapali by Kamaiewa's land.

Section 4 - Land section.
Mauka by Kanuku Kamaiewa's land

Olowalu by Puunoa land
Makai by Kanuku's land
Kaanapali by Kuholilea.

[Award 9793; R.P. 1172; Puako Lahaina; 4 ap.; 1.7 Acs]

No. 10534, Nailiili

Claim Number:	**10534**			
Claimant:	**Nailiili**			
Other claimant:				
Other name:				
Island:	**Maui**			
District:	**Lahaina**			
Ahupuaa:	**Puako**			
Ili:				
Apana:	**1**		Awarded:	**1**
Loi:	**6**		FR:	
Plus:	+		NR:	
Mala Taro:			FT:	**129v7**
Kula:		1	NT:	
House lot:	**1**		RP:	
Kihapai/Pakanu:			Number of Royal Patents:	
Salt lands:			Koele/Poalima:	**No**
Wauke:			Loko:	**No**
Olona:			Lokoia:	**No**
Noni:			Fishing Rights:	**No**
Hala:			Sea/Shore/Dunes:	**No**
Sweet Potatoes:			Auwai/Ditch:	**No**
Irish Potatoes:			Other Edifice:	**No**
Bananas:			Spring/Well:	**No**
Breadfruit:			Pigpen:	**No**

Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 10534, Nailiili, Lahaina, 3 February 1848
N.R. 523v6

Greetings to the Land Commissioners: I hereby petition for my claims for house lot and lo`i at Puako. There are five lo`i and six mo`o at Puako. Also at Kapili, are four lo`i for which /I pay/ $350 per year. Those are my claims, under Kaua.
NAILIILI

/Translator's note: Claimant may have meant $3.50 per year but I did not see a decimal point./

F.T. 129v7
No. 10534, Nailiili

Kunano[?], sworn, I know the land of the claimant in "Puako," Lahaina. They consist of a house lot and 6 lois and a piece of kula land, all in one piece.

The claimant received them from Kawaa, the luna in the days of Hoapili before 1839, and has held them without dispute, but Kawaa, who is his foster father, owns two of the lois and 3 of the moos.

It is bounded:
Mauka by the kula of Paunau
Olowalu by Kuokoa's land
Makai by the same
Kaanapali by Pelupelu's land.

See page 65 volume 15.

F.T. 65v15
No. 10534, Nailiili, from page 129v7

J.W. Austin presents the award of the Land Commission to Kaua No. 4320 Apana 3, dated 18th February 1851, awarding to him 9 Acres 1 Rood and 24 Rods in one piece of land in "Puako," Lahaina. He presents at the same time a warranty Deed from Kaua to J.B. Hubble dated August 2nd, 1851, conveying to the said Hubble the same piece of land mentioned in the above award showing the same area and same boundaries, and he further presents a warranty deed from the said Hubble and his wife, Halo to A.H. Parsons, conveying to him the same piece of land, dated 15th December 1851; and he further presents a quit claim Deed from J.W. Austin as administrator of the Estate of A.W. Parsons, conveying to T.B Cummings all the right title and interest of the said Parsons to the part of the land remaining in his possession at the time of his death, he having previously sold a portion of it to B.F. Bolles quit claim deed dated 29th day of October 1852. And he further presents a quit claim Deed from T.B. Cummings to F.W. Hutchinson dated 29th October 1852. It appears that Nailiili lived on a portion of the land awarded to Kaua (which he subsequently conveyed to Hubble as above). Nailiili has accepted from F.W. Hutchinson a life estate for the part he now occupies, the land having been originally sold by Kaua on condition that the (Nailiili) should not be disturbed during his life.

(Nailiili and Kaua both state that the land in question belonged wholly to Kaua, and Nailiili lived under him, having no claim to the soil. And Nailiili says he is satisfied to hold the place he occupies during his life and then leave it to the purchaser).

[Award 10534; Puako Lahaina; 1 ap.; 1.25 Acs 28 rods]

No. 10667, Pikanele, K.

Claim Number:	**10667**		
Claimant:	**Pikanele, K.**		
Other claimant:	konohiki, counter		
Other name:			
Island:	**Maui**		
District:	**Lahaina, Wailuku**		
Ahupuaa:	**Kelawea, Waianae, Polapola, Wanaloa, Waihee**		
Ili:	**Luaehu, Kapoho**		
Apana:	**9**	Awarded:	**1**
Loi:	**39**	FR:	
Plus:		NR:	**531v6**
Mala Taro:		FT:	**132v7/97v15**

Kula:	1	NT:	**17v5**
House lot:	**1**	RP:	**2399, 2400**
Kihapai/Pakanu:		Number of Royal Patents:	**2**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**Yes**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	**government road, Section 9 bounded by uhi patch,houses on house lot**

No. 10667, K. Pikanele, Lahaina, 8 February 1848
N.R. 531-532v6

Hear ye, ye Land Commissioners: I, Pikanele, hereby petition for my parcels of land in various `ilis in Lahaina.

Their names are Kelawea, Waianae, Polapola and Pahoa. My kihapai lo`i are in these `ilis. When you send a surveyor I will point out the boundaries of all my places within these `ilis.

Also, at Waihee there is a land named Kapoho which lies as follows: from the sea to the mountain, bounded on the north by a Pu`uone /pond/, on one side is Hakaaka, the two sides adjoin in one place. It will not be obscure to you when the time comes and you have it property surveyed.
I am, with aloha.
K. PIKANELE

F.T. 132v7
Cl. 10667, Pikanele, Part 1 (See Cl. 7777) page 170

Kauhiwahine, sworn, I know this land. It is an ili of land in "Waihee" near Wailuku, the name of the ili is "Kapoho."

The claimant had this land from Hoapili kane and now hold it under Kekuanaoa, paying him therefore the sum of 5 dollars per year, and if he does not pay him, the five dollars yearly then his title will be pau. But he has to fish ponds in this, that belong to Pikanele alone.

The two fish ponds lie together and are bounded:
Mauka by the poalima fish ponds
Olowalu by Kimikeo's land, the head man of Kekuanaoa
Makai by the government lois
North by Mileka's land.

See page 97 volume 15.

F.T. 132-134v7
Cl. 10667, Part 2, Pikanele

Kauhiwahine, sworn, I know the lands of the claimant is [are] in Kelawea, lahaina. 6 lois in one piece up mauka, 8 lois in another piece makai. He received these lands from Kekuanaoa in 1840 and he has held them without dispute ever since. He likewise has 2 pieces of poalima lois, each of 3 lois, which he holds under Kekuanaoa paying therefore the sum of 15 dollars per years [year].

The piece of 6 lois up mauka that belongs to Pikanele truly is bounded:
Mauka by the pali
Olowalu by the same and the kula of Kanaina
Makai by Keawehuali's land
Kaanapali by the creek of Kelawea.

The piece of 8 lois, makai, is bounded:

Mauka by Kalaikini's land
Olowalu by the land occupied by Keaweluaoli
Makai by the lot of Kualike
Kaanapali by the creek of Kelawea.

The land of the claimant in Waianae, Lahaina, consists of 3 pieces. The first piece up mauka loa has 6 lois. The second piece up mauka contains 5 lois. The third piece down makai, contains 2 lois.

The claimant had this land from Kaemalolo, Kaeo's mother in 1834, and he has held them in peace ever since.

The piece of 6 lois up mauka loa is bounded:
Mauka by Kauwa's land
Olowalu by Palani's land
Makai by the same
Kaanapali by the pali of Waianae.

The second piece of 5 lois, is bounded:
Mauka by Kaulu's lot
Olowalu by Waianaeiki
Makai by the King's land
Kaanapali by "Kulahuhu."

The 3d piece is bounded:
Mauka by Kaihukai's land
Olowalu by Puako and Kaihukai's land
Makai by "Puako"
Kaanapali by Kaihukai's land.

The lands of the claimant in Boabola were heard in the time of Mr. Richards.

His lands in "Pahoa," Lahaina, consist of 2 pieces of kalo land, one piece of kula land.

One piece of kalo land contains 7 lois, the other piece has 5 lois. The claimant received these lands from Kaele, the luna, in 1849. His title to the kalo lands has never been disputed. But Nalehu has disputed the title to the kula. When Kaele died in Febuary 1845, her brother, Nalehu took this kula from him and gave it to Kua. Kua and three otheres living on the land have put in their claims for the kula, which have been heard. The land was tkaen from him for some cause, known [unknown?] to me, perhaps becasue Kaele died.

The piece of kallo land of 7 lois is bounded:
Mauka by Upai's land
Olowalu by Nalehu's land
Makai by the same
Kaanapali by the high pali.

The piece of 5 lois is bounded:
Mauka by the high pali
Olowalu by Nalehu's land
Makai by Nalehu's kula
Kaanapali by the creek and the pali.

The kula piece is bounded:
Mauka by Kapua's little village
Olowalu by Keohokalole's lois
Makai by the Government road
Kaanapali by the land of the heirs of Namauu.

Nalehu, sworn, I am the brother of Kaele, now dead. The kula land in dispute between Pikanele and Moku and others was the property of Moku and others before Kaele gave it to Pikanele. Consequently, it was their land, and Kaele had no right to give it away. She might give away poalima land, but not the land of the tenants. It was very wrong for her to dispose of this land, and consequently it was restored to them.

F.T. 97v15
No. 10667, Pikanele, Waihee, September 10, 1853, Kue Konohiki, from page 132v7

He mau loko keia ma ka Ili o Kapoho, Waihee, Maui.

Kealoha, hoohikiia, ua ike au i na loko o Kaiwiau a me Kealiika ma ka Ili o Kapoho, Waihee. Ua maopopo iau he mau loko no ke konohiki ua hana mau ia o ma ua la o konohiki mai ka wa mamua mai a hiki i keia manawa.

Kaihumua, hoohikiia, Ua oiaio no he mau loko keia no konohki a Pikanele e hookohu nei i kuleana nona, ua hanaaia ma na la hana o ke konohiki a hiki i keia manawa.

(Hooholoia, ua nele o Pikanele, ua pono o konohiki)

F.T. 97v15
No. 10667, Pikanele, Waihee, September 10, 1853, See page 132 volume 7, counter konohiki

These are ponds in the `Ili of Kapoho, Waihee, Maui.

Kealoha, sworn, I know of the ponds of Kaiwiau and Kealuka in the `Ili` of Kapoho, Waihee. I understood these ponds were for the konohiki; they were always worked on the /labor/ days of the konohiki from formerly until the present.

Kaihumua, sworn, It is true that these ponds which Pikanele is assuming as a claim for himself are for the konohiki. They have been worked on on the labor days of the konohiki until the present.

(It was decided that Pikanele's claim was deificient and the konohiki was right.)

N.T. 17-19v5
No. 10667, K. Pikanele, (No. 819667)

Kauhiwahine, sworn, He has seen Pikanele's interest in Kapoho at Waihee and two parcels at Kelawaa in Lahaina here. Land had been from Mrs. Hoapili previously, however it is now under Kekuanaoa. 2 ponds

are there. Land at Kelawea from Kekuanaoa in 1840. There will be separations from the land should there [be?] no $5.00 for Kapoho at Waihee and $15.00
for Kelawaa in Lahaina, the boundaries are:

Section 1 - Kapoho.
Mauka by Friday pond
Kahukuloa by Timoteo's land
Makai by Kiao patch
Wailuku by Makaaka's land.

Section 2 - 6 patches in uplands of Kelawea.
Mauka by Stream
Olowalu by C. Kanaina's land
Makai by Keaweluaole's land
Kaanapali by Stream.

Section 3 - 8 patches.
Makai by Kelawea land
Mauka by J. Kalaihini's land
Olowalu by Keaweluaole's lot
Makai by Kekulike's lot.
Kaanapali by Kelawea stream.

3 land sections at Waianae, Lahaina

Section 4 - 6 patches in uplands.
Mauka by Kana
Olowalu by Palau
Makai and Kaanapali by Waianae pali.

Section 5 - 5 patches.
Mauka by Kanaulu's lot
Olowalu by Waianaeiki
Makai by Kaihukai
Kaanapali by Kulahuhu's land.

Section 6 - 2 patches.
Mauka and Olowalu by Kaihukai of Puako
Makai by Puako land
Kaanapali by Kaihukai.

Land from Kaaimalolo in 1834, no objections to all of these parcels.

Section 7 - 7 patches by the stream.
Mauka by Upai
Olowalu and Makai by Nalehu

Kaanapali by Pali.

Section 8 - 5 patches by the stream.
Mauka by pali
Olowalu and Makai by Nalehu
Kaanapali by stream and pali.

Section 9 - Pasture.
Mauka by Kapua's house
Olowalu by Keohokalole's uhi (shell fish) patch
Makai by Government road
Kaanapali by Maele's sugar cane moo.

These sections in Pahoa from Maele in 1840-41?, no one has objected to the 2 taro sections. Nalehu had objected to the pasture. Nawaa and some other people had filed this pasture as a claim. Nalehu, A. Moku, Muwaa and others as witnesses. Maele did not give that pasture because people were already living there. It would have been well to give it, if the pasture had been a Friday area.

Lui, sworn, He has seen that single patch which belongs to Kaluaokamano at Kelawaa, it is for Pikanele now. He had taken it because of non-attendance on Friday.

N.T. 113v10
No. 10667, K. Pikanele

Kana, sworn, I have seen his house lot in Lahaina, Maui, also his land sections.

Section 1 - House lot at "Kaluaokiha".
Mauka by Government road
Olowalu by Ninia's house lot
Makai by C. Kanaina's lot
Kaanapali by Hihio's lot.

Section 2:
Mauka by Mahoe's lot
Olowalu by "Mokuhinia," pond
Makai by Kaiheekai's house lot
Kaanapali by Namauu's land.

Section 3:
Mauka by Kanaulu's land
Olowalu by Waianaeiki ahupuaa
Makai by Kaiheekai's land
Kaanapali by "Kulahuhu" pasture.

Section 4:
Mauka by Kaiheekai's land

Olowalu by Ninia's land
Makai by "Haleu," Rikeke's land
Kaanapali by Government land.

Section 1 was a vacant and idle land in 1823, Pikanele built houses since and had lived there to the present time without disputes. Section 2 from Kalaiwohi in 1823, no disputes. Section 3 and 4 from Kaaimalolo in 1835, no objections.

Kaiheekai, sworn, every statement above is true. Kaiheekai's land sections in Waiauaenui are his own property. I have known this for I am the assistant konohiki of this land, therefore I will not oppose to his claim there.

POSTPONED: Until T. Keaweiui returns for his claim at Kelawea.

[Award 10667; R.P. 1729; Waianaenui Lahaina; 2 ap. 1.63 Acs; Luaehu Waianae Lahaina; 1 ap.; 1.087 Acs; (See also Award 310); R.P. 2399; Waianae Lahaina; 1 ap.; 8 rods; Kelawea Lahaina; 1 ap. 2 roods 25 rods; Kelawea Lahaina; 1 ap. 1 Ac.; R.P. 1729; Polapola Lahaina; 2 ap.; .505 Ac.; R.P. 2400, Wanaloa Lahaina; (amount unknown)]

No. 281, H.L. Ali

Claim Number:	**00281B**		
Claimant:	**Ali, H.L.**		
Other claimant:	Kauonohi, wife		
Other name:			
Island:	**Maui**		
District:	**Lahaina, Kula**		
Ahupuaa:	**Kuholilea, Puunoa, Omaopio 1**		
Ili:			
Apana:	**6**	Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**56v2**
Mala Taro:		FT:	**14v16**
Kula:		NT:	**165v10/39v15**
House lot:	**1**	RP:	**408, 8310**
Kihapai/Pakanu:		Number of Royal Patents:	**2**

Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**Yes**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:	1	Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**Yes**	Miscellaneous:	**cattle, cane grinding, sugar cane lands**

No. 281B, Ali
N.R. 56-57v2

The land was given me by Kauonohi /wife/. The year 1835. /The land is/ Kuholilea. Here are the witnesses that the land was given me: Eyewitnesses: Pualinui, Kamakini, Maluo. The length of the land is 131, the width, 36.

The lot is at Lahaina and the land at Kula. /In the year/ 33 Aikanaka gave me Omaopio these four lands - at the time the sugar cane began at Kula. I asked for and was given them. Here are the witnesses: W. Keohokalole, H. Kapaakea. The dimensions are not clear.

A houselot at Puunoa, Namauu, was formerly given me by Kanemaikou to build a house for him. The length is 28 and the breadth is 8 /fathoms?/.
ALI

F.T. 587-589v3
No. 281B, Ali, 30 December 1854, See p. 39v15

Disputed by the Government. The award made to this claimant on the 4th of May last, having been objected to by the Government as a Counter claimant, Ali has returned it in order that the claim may be re-adjudicated by the Board.

Due notice was sent to the Home Office of the time for hearing but no one appeared on behalf of the Government.

Z. Kaauwai, sworn, says, on examining the plan of Ali's claim, made by E. Bailey, that the portion of the land lying mauka of the road is clear to him as belonging to Ali, but the portion lying makai of the road is not clear to his mind. Does not know that Ali has occupied the makai part either by cultivation or for grazing purposes. It is very stony land. The mauka part of the land is good and has been used by Ali in various ways, since he got it from Kamaunawa, a chief, over 20 years ago. When I was Luna Auhau of the District about 1830 to 40 the taxes for the land were paid by Ali. I was konohiki of these lands up to the Division of 1848, and I never knew of any dispute about Ali's' title up to that time. I do not know the boundaries between the several lands called "Omaopio." but I do know that Ali has held the land he claims mauka of the road. The makai part of that land has not been occupied by anyone in particular to my knowledge, but the mode of cultivation in that region is, to plant a few years in the mauka land & then to plant for a while in the makai land, as is now being done on the same land claim by Ali. The whole of the land claimed by Ali, both mauka & makai of the road, is called Omaopio."

Kuihelani, sworn says, he knows the land claimed by Ali. I was tax [sic] have been Tax Officer of the District since 1841, and during that time Ali has paid the taxes for the land called Omaopio 1, 2nd, 3rd & 5th, which are now claimed by him. I do not know how long Ali has occupied this land, but I know that since 1841 he has held & cultivated the land & grazed his cattle on it, and lived on it, without dispute from anyone.

Ioane Ii, sworn, I am not well acquainted with the land claimed by Ali, but I heard about the year 1842, that this land had been given him by Kamanawa. In 1851 I visited the place and found him in possession of it. I do not know how many Omaopios belong to him.

(On considering the above testimony the Commissioners ordered the award to be delivered to Ali, subject of course to appeal.

F.T. 165v10
[See N.T. 165v10 below]

F.T. 39v15
Cl. 281B, Ali, Wailuku, December 19, 1852, from page 165v10

Kamaka, sworn, The claim of Ali in "Omaopio 1, 2, 3, 4. Claimant received these lands from Kamanaawa when Aikanaka was headman in Kula. He got them in consideration of grinding cane for Aikanaka.

I was tenant on these 4 lands under Kamanawa when he gave them to Ali and became the tenant under Ali as I had been under Kamanawa.

Since the transfer was made the lands have paid taxes to the Lunaauhau only.

Claimant has held these lands without dispute as far as I know from the time he first received them.

F.T. 14v16
No. 281!, Ali, Lahaina, 11 February 1854
[Should be 281B]

Hanemo, sworn, witness knows the house lot claimed by Ali, it is situated in the ahupuaa of Puunoa 3, Lahaina, and is the same as described in the survey now produced.

It is bounded by:
Mauka by Namauu's land
Kaanapali by Kenui's lot
Makai by sea beach
Olowalu by Piikoi's land.

Claimant received this piece of land from Kamaka about the year 1831, and has held it without dispute up to the present time.

Mahoe sworn confirms in full the testimony of the former witness.

N.T. 77-78v2
No. 281B, Property of Ali, Lahaina, December 29, 1846

Kamakini, sworn, I have known that Kekauonohi did give to him because the land was in my possession and that person had asked, and it was given and no one had objected.

Maluo, sworn, I have known that it was for Kamakini, then it as given to me and after me it was for Ali. Kamakini's rights ended, which places him under Kekauonohi. No one had objected until the present time.
See page 84

N.T. 84-85v2
No. 281B, Ali, from page 77

Kanana, sworn, During the time of Kanemaikou, Ali asked for and had received a village and he built a house. I have not known that anyone has objected.

N.T. 146-147v10
No. 281B, Ali (from page 84 N.T), Wailuku, Maui, 26 February 1852, vs 8864, Kumoa (See page 106, volume 7

Ali and Kapono who is the substitute and son of Kumoa, have appeared before me in Wailuku here to settle a problem between them. The surveyor had surveyed more land than the government had given for a tenant.

Kapono, son of Kumoa - before the death of Kinau in 1838, to the present time, my father has never done Friday work for the konohiki, he has done lele cultivation, that is, doing work from place to place. Later the leles were enjoyed without the konohiki's knowledge and 121 land acres were realized, therefore I would be pleased if Ali would give me a goodly amount of land acres out of his compassion for me.

Ali, related - I have no thought that he should establish a claim on my land, but, I think he should relinquish his interest for me, then I shall permit him to farm on that and this place as he so desires. He shall compensate me in the amount of $4.50 as a tenant. I shall not make objections until his death, then all of that land would be for Ali.

Kapono responds: I have indeed agreed, I shall live under the konohiki, Ali and I shall cultivate all of the places I would want to do so until my death. I shall pay $4.5 yearly and he shall not evict me without just reason.
J. Kekaulahao

The signature below are for the both of us, therefore, see all people by this document that: I, H.L. Ali, the konohiki of the lands called Omaopio ahupuaa in Kula of East Maui, do hereby agree to let Kapono, the own son of Kumoa live on this land under me as a tenant without establishing a claim and to farm on any available area of said land as he so desires until his death. He shall make a payment yearly of $4.50 for the konohiki Friday days, for as long as he shall live on the land. I, Kapono, do hereby agree exactly in the same way as Ali has stated and hereby relinquish the establishing of my father's interest in that land. I shall live under the konohiki as is usual in Hawaii here. I shall do work for the konohiki on Fridays in addition to regular work, then I shall pay the amount of $4.50 for a year annually until my death. My claim shall cease at this time.
We pen our names for the truth on this 26th day of February, 1852, in Wailuku, Maui.
H.L. Ali, D. Kapono
Witnesses: J. Kekaulahao, Kalama
Continued See page 165

N.T. 165v10
No. 281B, Ali, (from page 146), 22 June 1852

Z. Kaauwai, sworn, I have seen his land in Omaopio I, an ahupuaa in Kula, Maui.

[It is bounded]:
Honuaula by Pulehunui
Makai, Makawao of Omaopio II, pasture
Mauka by mountain.

Land from Aikanaka in 1832, Ali had worked with sugar cane there and this land has been for him since that time to the present without disputes.

Postponed until Kapaakea is available.

Continued on Page 39, vol. 15.

N.T. 39v15
No. 281B, Ali, (from page 165 vol. 10)
[See Foreign Testimony, 39v15 above]

[Award 281B; no R.P.; Omaopio 1,2,3,4, Kula, 4 ap.; 1052.72 Acs (ahupua`a); R.P.; 408; Kuholilea Lahaina; 1 ap.; 2.82 Acs (Awardee index); 2.75 Acs (Location index); Land Patent 8310; Puunoa, Lahaina; 1 ap.; 14 rods; Location index corroborates this number, but general index does not]

No. 494, Lono

Claim Number:	**00494**		
Claimant:	**Lono**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Puuhoowali**		
Ili:			
Apana:	**2**	Awarded:	**1**
Loi:	**2**	FR:	
Plus:		NR:	
Mala Taro:		FT:	**10v16**
Kula:	1	NT:	**10v16**
House lot:	**1**	RP:	**3536**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**

Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**Yes**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	**government road**

Helu 494, Lono, Lahaina, December 26, 1853
F.T. 10v16, N.T. 10v16

Kekela, sworn, Knows the land claimed by Lono. Z. Kaauwai wrote out the claim for him and gave it to Mr. Richards when he was hearing Land claims at Lahaina in the year 1847.

Kaiheekai, sworn, says he knows the piece of land claimed by Lono at "Puuhoowali," Lahaina.

Apana 1 House Lot.
Apana 2 2 Kalo patches & Kula.

The first piece is bounded:
Mauka by the Konohiki's land
Olowalu by Kekauai's land
Makai by the Konohiki
Kaanapali by the Government Road.

The second piece is bounded:
Mauka by Kaluaokamano's land
Olowalu by Kekauai's land
Makai by the konohiki
Kaanapali by public road.

Claimant received these pieces of land from me in the year 1834 and has held them in peace ever since. I am the Deputy Konohiki of the Land.

Keoni Luite, sworn, confirms in full the statement of the former witness.

[Award 494; R.P. 3536; Puuhoowali Lahaina; 2 ap.; 4 roods 18 rods]

No. 1742, Kaauwai, Z.

Claim Number:	**01742*M**		
Claimant:	**Kaauwai, Z.**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Wailuku,Lahaina**		
Ahupuaa:	**Wailuku, Olowalu**		
Ili:	**Paeohi, Papohaku, Kailoaiki, Wailoanui, Kamani, Kaluaahoo, Owa**		
Apana:	**8**	Awarded:	**1**
Loi:	**27**	FR:	
Plus:	+	NR:	**235v3**
Mala Taro:	0	FT:	**215v3**
Kula:	3	NT:	**235-236v3,651v9**
House lot:	**0**	RP:	**2154, 5531, 8453**
Kihapai/Pakanu:	0	Number of Royal Patents:	**3**
Salt lands:	0	Koele/Poalima:	**Yes**
Wauke:	**1**	Loko:	**No**
Olona:	0	Lokoia:	**No**
Noni:	**0**	Fishing Rights:	**No**
Hala:	0	Sea/Shore/Dunes:	**Yes**
Sweet Potatoes:	0	Auwai/Ditch:	**No**
Irish Potatoes:	0	Other Edifice:	**No**
Bananas:	**0**	Spring/Well:	**No**

Breadfruit:	**0**	Pigpen:	**No**
Coconut:	0	Road/Path:	**No**
Coffee:	0	Burial/Graveyard:	**No**
Oranges:	0	Wall/Fence:	**No**
Bitter Melon/Gourd:	0	Stream/Muliwai/River:	**No**
Sugar Cane:	0	Pali:	**Yes**
Tobacco:	0	Disease:	**No**
Koa/Kou Trees:	0	Claimant Died:	**No**
Other Plants:	0	Other Trees:	0
Other Mammals:	**No**	Miscellaneous:	

No. 1742*M, Z. Kaauwai
N.R. 235-236v3

Concerning my remaining claims which I state before the court of the Land Commissioners. Greetings: I hereby state my remaining claims, which are in the Ahupua`a of Wailuku on the Island of Maui, within the `ili of Papohaku. I got this land in the year 1843. Also, in Olowalu are two `ilis for my wahine, which she got before the death of Kamehameha I.

Also there are some mo`os of mine in the `ili of Paeohi in Lahaina which I got in the year 1842. Also in Honolulu, at Pauoa, one half of Kamooakua which I got from my Kaikaina, Kaapuiki. There is where my punalua, Nohoua, is living. I got this land in the year 1844. Those are my remaining claims.
I am, with thanks,
Z. KAAUWAI
Waikiki, Oahu, Dec. 14, 1847

F.T. 215-216v3
No. 1742, Z. Kaauwai

Nohohua, sworn, This land is in Pauoa Honolulu aina, kalo 16 patches and some kula, 1 house.

Mauka by Kaapuiki's kula
Waititi by Government fence and I.I.
Makai by Nohomua & Koane
Ewa by Koana & Kaapuiki.

Claimant had this from Kaapuiki in 1846 and has held it undisputed. It wa a gift of friendship.

See page 180 volume 7.

F.T. 180-181v7

Cl. 1742, Z. Kaauwai, See page 215 volume 3 and 187 volume 7

This is a claim for Kaauwai and his wife separately.

Keawelauole, sworn, I know the lands of the claimant, Kaauwai in part. He has two pieces of lands in "Paeohi," Lahaina. The 1st piece, this is a pauku of kalo land called Waiea and the other a pauku of kalo land. There is one poalima loi in the first piece.

The 1st piece is bounded:
Mauka by the land of Kaimunui
Olowalu by Kekuelike's land
Makai by Kaaua's land
Kaanapali by "Wahikuli."

The 2nd piece is bounded:
Mauka by Hauola land and Kimokeo's
Olowalu by Neuneu's land
Makai by Pakea's land
Kaanapali by Kimokeo's land

For his wife's lands, Kaauwai said her witness was at Olowalu and requested that it be postponed until the Commission visits Olowalu.

F.T. 187-188v7
Cl. 1742, Z. Kaauwai, from page 180

This claim was partly heard this forenoon. The part remaining to be heard is that which belongs to Kaauwai's wife, Sale.

Maui, sworn, I know the lands of Sale. They consist of 2 ilis of land in Olowalu. They are called "Kailoaiki," and "Wailoanui."

The claimant received them from her first husband, Kauhane in the year 1814. and she has ever held them without dispute.

They are 4 pieces. I should say that Haole and myself have titles within these ilis.

No. 1 is a kalo land and kula land with one poalima loi within.
No. 2 is a kula land.
No. 3 is a kula land up mauka.
No. 4 is a kula land up mauka.

No. 1 is bounded:
Mauka by Kamani, an ili
Hana by the same
Makai by the sea shore

Lahaina by Kaluaokahui, an ili.

No. 2 is bounded:
Mauka by Maomao, an ili
Hana by the high pali
Makai by Kaumukukahi, an ili
Lahaina by the creek of Olowalu.

No. 3 is bounded:
Mauka by the mountains
Hana by "Kaumukukahi"
Makai and Lahaina sides by the creek of Olowalu.

No. 4 is bounded:
Mauka by the mountain
Hana by Kamani
Makai by the creek of Olowalu
Kaanapali by the same.

Resumed page 561.

F.T. 561v7
Cl. 1742, Z. Kaauwai, from page 188

Holana, sworn, the claimant's lands in Wailuku, so far as I know, consists of 7 pieces with ili of Papohaku.

No. 1 is 6 lois.
No. 2 is 4 moos of lois and a kula wauke.
No. 3 is 5 lois and 3 moos of kalo.
No. 4 is 1 loi.
No. 5 is 2 moos of kalo land
No. 6 is 6 moos of kalo land.
No. 7 is 3 pauku or section of lois.

The claimant received these lands from Governor Namakeha in the year 1843 and with the exception of No. 7 which he received in 1837, Namakeha received them from Kauohua in 1839. His title was never disputed.

No. 1 is bounded:
Mauka by Kuole's land
Waihee by Naea's land
Makai by Anakalanui's land
Maalaea by Kaulahea's land.

No. 2 is bounded:
Mauka by Kaaina's land

Waihee by the creek of Wailuku
Makai by Kamahiai's land
Maalaea by Naea's land.

No. 3 is bounded:
Mauka by Moo's land
Waihee by Kepui's land
Makai by Naea's land
Maalaea by Koloku's land.

No. 4 is bounded:
Mauka by Lihi's land
Waihee by Naea's land
Makai by Moo's land
Maalaea by Kawahie's land.

No. 5 is bounded:
Mauka by Pepe's land
Waihee by Naea's land
Makai by Lihi's land
Maalaea by the King's Eka.

No. 6 is bounded:
Mauka by Piohia's land
Waihee by Piohia's land and the creek
makai by Kaili's land
Maalaea by the King's Eka.

No. 7 is bounded:
Mauka by "Owa" and the paahao lois
Waihee by Piohia's land
Maalaea by the King's Eka
Waihee [makai?] side by the creek of Wailuku.

Resumed page 85 volume 15

F.T. 85v15
No. 1742, Z. Kaauwai, Olowalu, Maui, Apana 2, September 2, 1853, Disputed by the King, from 215v3

Kaiwi, sworn, Knows the place in dispute, situated in the ili of "Kaluaahoo," Olowalu. Some time before Kinau's death, Claimant enclosed the place in dispute by a mud fence. He has had possession of it ever since without interruption. The place was given to claimant by Maui and Mailehewa. Some time in the year 1852 when the place was measured by Ua (the Surveyor) Naea (the King's Agent) objected to its being surveyed. Witness does not know of any Poalima being inside of this lot. Kahalepuhi owned one half of the disputed lot, and he gave it to Maui in the year 1848, who enclosed with the other piece and gave it to Claimant. The place belonged to Kahalepuhi from the time of Kamehameha II.

It is bounded:
Mauka by the Konohiki land
Ukumehame side by the same
Makai by the sea beach & Nahua's lot
Lahaina side by Kalupaihala's lot.

It is still in possession of Claimant's family.

Cross examined
The place belongs to Z. Kaauwai.

Kama and Peekauai, being sworn, confirmed in full the statement made by the former witness.

N.T. 544v3
No. 1742, Z. Kaauwai

Nohona, sworn, I have seen his place at Kamooakua in Pauoa.

16 taro patchs and a pasture, 1 house
Mauka by Kaapuiki
Waikiki by a lot and Ii
Makai by Nohomua and Kawana
Ewa by Kawana and Kaapuiki.

Kaapuiki had given him his land in 1846 and he has lived unmolested to this time. He had received this by his relationship as a cousin.

See page 63 volume 5 and page 651 volume 9.

N.T. 63v5
No. 1742, Z. Kaauwai, /Pg. 544, vol. 3/ (See pg. 69)

Keawelauole, sworn, he has seen 2 sections in the Paeohi ahupuaa, here are the boundaries:

Section 1 - Taro section.
Mauka by Kaimunui, Kelawea
Olowalu by Kekuelike
Makai by Kaaua
Kaanapali by Ahikuli land.

Section 2 - Taro.
Mauka by Hauola and Timoteo's land
Olowalu by Neuneu
Makai by Kapaakea
Kaanapali by Poki and Timoteo's land

These two sections are at Waie, no objections. This interest from Keohokalole in 1842.

N.T. 69v5
No. 1742, Z. Kaauwai, From page 63

E. Maui, sworn, He has seen these 4 sections of ? lale and folks. It was from her first husband Kauhane in 1814, no one has objected to Maui and Haole and their interests.

The boundaries are:

Section 1 - path and pasture.
Mauka and Hana by Kamani
Makai by Beach
Kaanapali by Kaluaokahui.

Section 2 - Taro.
Mauka by Maomao
Hana by Pali
Makai by Kaumukukahi
Kaanapali by Olowalu stream.

Section 3 - Mauka pasture.
Mauka by Mountain
Hana by Kaumukukahi
Makai and Kaanapali by Olowalu stream.

Section 4 - Pasture.
Mauka by Mountain
Hana by Kamani
Makai and Kaanapali by Olowalu stream.

N.T. 651-652v9
No. 1752!, Z. Kaauwai, Wailuku, July 23, 1849
[Should be 1742]

Holoua, sworn, I know his land in the `Ili of Papaohaku, in Wailuku, with seven parcels.
Parcel 1 - 6 Lo`i.
Parcel 2 - 4 Mo`o and kula wauke (this is 1 acre).
Parcel 3 - 5 Lo`i and 2 taro mo`o.
Parcel 4 - 1 Lo`i.
Parcel 5 - 2 Taro mo`o.
Parcel 6 - 6 Taro mo`o.
Parcel 7 - 3 Taro pauku.

Parcels 1, 2, 3, 4, 5 and 6 were from Namakeha in 1843, and parcel 7 was from Kaunuohua in 1837. Namakeha got his parcels in 1837 from Kaunuohua. No opposition.

No. 1. is bounded:
Mauka by the land of Ihuole
Waihee by the land of Naea
Makai by the land of Auimakalani
Maalaea by the land of Laulahea.

No. 2. is bounded:
Mauka by the land of Kaaena
Waihee by the Wailuku stream
Makai by the land of Kawahie
Maalaea by the land of Naea.

No. 3. is bounded:
Mauka by the land of Moo
Waihee by the land of Kepio
Makai by the land of Naea
Maalaea by the land of Holoku and Moo.

No. 4. is bounded:
Mauka by the land of Alihi
Waihee by the land of Naea
Mauka by the land of Moo
Maalaea by the land of Kawahie.

No. 5. is bounded:
Mauka by Peepee
Waihee by the land of Naea
Makai by the land of Alihi
Maalaea by the land of the Mo`i.

No. 6. is bounded:
Mauka by the land of Piohia
Waihee by the land of Kawahie and Kahawai
Makai by the land of Kaili
Maalaea by the land of the Mo`i.

No. 7. is bounded:
Mauka by the `Ili of Ala and Pa`ahao
Waihee by Wailuku Stream
Makai by the land of Piohia
Maalaea by an Acre of the Mo`i.

[Award 1742; R.P. 2154; Kaluaahoo Olowalu Lahaina; 1 ap.; 3 Acs 1 rood 22 rods; Kamani Olowalu Lahaina; 1 ap.; 2 Acs 3 roods 36 rods; R.P. 5531; Koloa Wailuku; 1 ap.; 15 1/25 Acs; Papohaku Wailuku; 4 ap.; 18.28 Acs; no R.P. Owa, Paiki Wailuku; 1 ap.; 5.26 Acs; & 8453 in Wailuku; See also Award 407]

No. 2762, Nawaakoa, Z., wahine

Claim Number:	**02762**		
Claimant:	**Nawaakoa, Z., wahine**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Paunau**		
Ili:	**Pohakuou**		
Apana:	**2**	Awarded:	**1**
Loi:	**0**	FR:	
Plus:		NR:	**16v6**
Mala Taro:	0	FT:	**161v7**
Kula:	0	NT:	**44v5**
House lot:	**0**	RP:	**1703**
Kihapai/Pakanu:	0	Number of Royal Patents:	**1**
Salt lands:	0	Koele/Poalima:	**No**
Wauke:	**0**	Loko:	**No**
Olona:	0	Lokoia:	**No**
Noni:	**0**	Fishing Rights:	**No**
Hala:	0	Sea/Shore/Dunes:	**No**
Sweet Potatoes:	0	Auwai/Ditch:	**No**
Irish Potatoes:	0	Other Edifice:	**No**
Bananas:	**0**	Spring/Well:	**No**
Breadfruit:	**0**	Pigpen:	**No**
Coconut:	0	Road/Path:	**No**

Coffee:	0	Burial/Graveyard:	**No**
Oranges:	0	Wall/Fence:	**No**
Bitter Melon/Gourd:	0	Stream/Muliwai/River:	**No**
Sugar Cane:	0	Pali:	**No**
Tobacco:	0	Disease:	**No**
Koa/Kou Trees:	0	Claimant Died:	**No**
Other Plants:	0	Other Trees:	0
Other Mammals:	**No**	Miscellaneous:	

No. 2762, Z. Nawaakoa
N.R. 16v6

To the Land Commissioners, respectfully: I, Nawaakoa, hereby explain my claim, an `Ili named Pohakuou in the Ahupua'a of Paunau in Lahaina, Island of Maui. However, there are two pauku /small sections/ in this land. One side is at Paunau kai and one is at Paunau uka. The 'Ili tax No. 3 is $1.50. My claim for which I petition you is that I have given my annual poll tax and have gone to the po`alima work.

For your information I received my right of occupancy as follows: From Pualinui to Ulunahele, and from Ulunahele to me. Therefore I have a long standing right in this `Ili. I am with aloha to you all.
Z. NAWAAKOA
Lahaina, January 7, 1848

F.T. 161v7
Cl. 2762, Nawaakoa [wahine], Part 2

Kamanoha sworn, The land here claimed is in Paunau, Lahaina. It is an Ili of land known by the name of "Pohakunui." It is in two pieces; one up mauka, and the other makai. The claimant received these land from Poalinui, the luna that time in 1837, and her title has never been disputed.

The piece up mauka is kalo land and is bounded:
Mauka by Kekahuna's land
Olowalu by the creek of Kahoma
Makai by Kaiki
Kaanapali by the pali.

The piece makai is bounded:
Mauka by Kapena's lot
Olowalu by Kaohie's lot
Makai by Olekaua's
Kaanapali by the poalima of Kekuanaoa.

Kaumauma, sworn, I know the claimant's loi in Moanui, Lahaina. the claimant received it from Ulunahele in 1833 and held it to 1841 in peace when Kuakini [?] knows the konohiki took it away because he was konohiki, and has held it to the present time.

It is bounded:
Mauka by "Aki"
Olowalu by Palau's land
Makai by J. Armas' land
Kaanapali by "Aki."

N.T. 44v5
No. 2762, Nawaakoa

Kamanoha, sworn, he has seen 2 sections of land in Pohakuou at Paunau from Pualinui to Ulunahele in 1837, no one had objected.

Section 1 - Taro land.
Mauka by Kekahuna
Olowalu by Kahoma stream
Makai by Kaiki
Kaanapali by Pali.

Section 2 - makai land.
Mauka by Kapena
Olowalu by Kaohie
Makai by Hoolekaua
Kaanapali by Kekuanaoa's Friday land.

Kaumauma, sworn, He has seen 1 patch at the Moanui ahupuaa which had been received from Ulunahele in 1823, and was taken by Huakini [Kuakini] in 1841, here are the boundaries:

Mauka by Aki ahupuaa
Olowalu by Palau
Makai by Huakini's land
Kaanapali by Aki ahupuaa.

[Award 2762; R.P. 1703; Paunau Lahaina; 2 ap.; 1 Ac. 17 rods; See also Award 464]

No. 3049, Kaluaokamano

Claim Number: **03049*M**

Claimant: **Kaluaokamano**

Other claimant:

Other name:

Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Puahoowali, Kelawea**		
Ili:			
Apana:	**3**	Awarded:	**1**
Loi:	**2**	FR:	
Plus:		NR:	**32v6**
Mala Taro:		FT:	**136v7**
Kula:		NT:	**9v5**
House lot:	**1**	RP:	**5578, 5595**
Kihapai/Pakanu:		Number of Royal Patents:	**2**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	

Other Mammals: **No** Miscellaneous: **government road**

No. 3049*M, Kaluaokomano, January 11, 1849
N.R. 32-33v6

Greetings to the Land Commissioners: I, Kaluaokamano, hereby petition for my kihapai claims. Two flourishing lo`i are at Puahoowali; some mo`os also, 90 in length, 17 in width. Also, there is a mountain area; my land is on Molokai. I hereby state that it is four miles the outside area /circumference?/. That is my claim which I petition to have entered in the Book of the Land Commissioners.
KALUAOKAMANO
Lahaina, Maui

F.T. 136v7
Cl. 3049, Kaluaokamano, June 9, 1849

Kuelike, sworn, I know the lands of the claimant in Puuhoowali, Lahaina. it consists of one kula land and 3 lois, one house lot and kalo land, and one loi in Kelawea, Lahaina.

The claimant received this land from me, his father, in the days of Hoapili. He has held the land without dispute except the one in Kelawea, which Pikanele took away form him in 1847, without any other cause than this that I was an old man, and exempted by law from going to poalima work.

The lot of 2 lois is bounded:
Mauka by Kaihukai's land
Olowalu by "Puuhoowali 2"
Makai by Lono's lot
Kaanapali by the Government Road.

The house lot and kula is bounded:
Mauka by "Puako"
Olowalu by "Puuhoowali"
Makai by Kaihukai's land
Kaanapali by the Government Road.

The loi in Kelawea is bounded: On all sides by Pikanele's lois.

Liu, sworn, I know the loi in dispute between Kaluaokamanu and Pikanele. This loi was given to the claimant's father by Pikanele, and taken away recently because the claimant's father, who had it in charge was old and did not go to the poalima work.

N.T. 19v5
No. 3049, Kaluaokamano

Kuelike, sworn, He has seen Kaluaokamano's interest of 2 patches, 1 pasture, a house lot at Puuhoowali and 1 patch at Kelawaa. These were received at the time of Hoapili, from Kuelike. No one has objected

to the sections at Puuhoowali. Pikanele has objected to the patch at Kelawaa because of the failure of the old man Kuelike to attend the Friday detail.
The sections of these parcels of land:

Section 1 - 2 patches.
Mauka by Kaihukai's land
Olowalu by Puuhoowali 2 land
Makai by Lono's land
Kaanapali by Road.

Section 2 - House lot.
Mauka by Puako land
Olowalu by Puuhoowali 2 land
Makai by Kaihukai's land
Kaanapali by Road.

Section 3 - 1 patch at Kelawaa.
Mauka by Pihenui
Olowalu, Makai & Kaanapali by Pikanele's land.

[Award 3049; R.P. 5578; R.P. 5595; Puuhoowali Lahaina; 2 ap.; 1 rood 32 rods; Land on Molokai awarded?]

No. 4760-2, Lelehu, A.

Claim Number:	**04760-2**		
Claimant:	**Lelehu, A**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Moalii**		
Ili:			
Apana:	**2**	Awarded:	**1**
Loi:	**7**	FR:	
Plus:		NR:	**116v9**
Mala Taro:		FT:	**144v12**
Kula:	1	NT:	

House lot:		RP:	**5666**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**Yes**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**Yes**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 4760-2, A. Lelehu
F.T. 129v7

Hanalei, sworn, I know the land of Lelehu in "Moalii," Lahaina. They are 7 lois, and one kula in one piece. The claimant received it from Hoapili wahine before 1839 and has held them without dispute ever since.

It is bounded:
Mauka by the creek of Moalii
Olowlau by the same
Makai by my land
Kaanapali by Heano's land.

[Award 4760-2; R.P. 5666; Moalii Lahaina; 2 ap.; 5 Acs 1 rood 22 rods; There is another 4760 award on Kauai to another person]

No. 4878, Makaiole

Claim Number:	**04878!**		
Claimant:	**Makaiole**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:			
Ili:			
Apana:		Awarded:	**x**
Loi:		FR:	
Plus:		NR:	
Mala Taro:		FT:	**167v7**
Kula:		NT:	
House lot:		RP:	
Kihapai/Pakanu:		Number of Royal Patents:	
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**

Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	**See 4878EE**

No. 4878!, Makaiole, Part 28
F.T. 167-168v7

[See Award 4878EE]

No. 4878E, Holi

Claim Number:	**04878E**			
Claimant:	**Holi**			
Other claimant:				
Other name:				
Island:	**Maui**			
District:	**Lahaina**			
Ahupuaa:	**Makila**			
Ili:				
Apana:	**2**		Awarded:	**1**
Loi:	**14**		FR:	
Plus:			NR:	**215v6**
Mala Taro:		0	FT:	**28v7**
Kula:		0	NT:	
House lot:	**0**		RP:	**1199,2711**
Kihapai/Pakanu:		0	Number of Royal Patents:	**2**
Salt lands:		0	Koele/Poalima:	**No**
Wauke:	**0**		Loko:	**No**
Olona:		0	Lokoia:	**No**

Noni:	**0**		Fishing Rights:	**No**
Hala:		0	Sea/Shore/Dunes:	**No**
Sweet Potatoes:		0	Auwai/Ditch:	**No**
Irish Potatoes:		0	Other Edifice:	**No**
Bananas:	**0**		Spring/Well:	**No**
Breadfruit:	**0**		Pigpen:	**No**
Coconut:		0	Road/Path:	**No**
Coffee:		0	Burial/Graveyard:	**No**
Oranges:		0	Wall/Fence:	**No**
Bitter Melon/Gourd:		0	Stream/Muliwai/River:	**No**
Sugar Cane:		0	Pali:	**Yes**
Tobacco:		0	Disease:	**No**
Koa/Kou Trees:		0	Claimant Died:	**No**
Other Plants:		0	Other Trees:	0
Other Mammals:	**No**		Miscellaneous:	

Cl. 4878E, Holi, Part 4
F.T. 28v7

Pi, sworn, the lands of Holi are in Makila Lahaina and consist of four moos or ridges of land in one piece and 14 lois - uka. Claimant received these lands from the konohiki, Kamaihina in the days of Hoapili before 1839. From that time to this he has possessed these lands without dispute.

The kula piece is bounded:
Mauka by the yard of Kalohoula
Olowalu by the land of Pupae
Makai by the land of Naea
Kaanapali by "Kaulalo."

The lois 14 in number are all in one piece, which is bounded:
Mauka by the land of Pupule
Olowalu by the creek
Makai by the land lois of Hookoekoe
Kaanapali by a pali.

[Award 4878E; R.P. 1199; Makila Lahaina; 1 ap.; .70 Ac.; R.P. 2711; Makaila Lahaina; 1 ap.; .58 Ac.; See 4878 for Native Register document]

No. 4878Y, Mamaka

Claim Number:	**04878Y**		
Claimant:	**Mamaka**		
Other claimant:	Muolo, widow & heir		
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Halakaa**		
Ili:			
Apana:		Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**215v6**
Mala Taro:		FT:	**38v7**
Kula:		NT:	
House lot:		RP:	**2718**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**

Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**Yes**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 4878Y, Mamaka, Part 22, June 1, 1849
F.T. 38v7

Waihoioaku, sworn, I know the lands of the claimant. They consist of 2 pieces of kula and one piece of both kula and kalo land. They are all in "Halakaa."

Claimant received these lands from Unele in 1845 and he has been [in] undisturbed possession ever since. The Lord of this land is Kaeo.

The makai kula is bounded:
Mauka by the yard of Kapu
Olowalu by the land of Paikaualani
Makai by the land of Hulu
Kaanapali by Paunau ekolu.

The next piece is bounded:
Mauka by the land of Kaiwikaola
Olowalu by the land of Kupalii
Makai by the lois of Paikaualani
Kaanapali by the creek.

See page 77 V. 15

F.T. 77v15
No. 4878Y, Mamaka, Lahaina, 24th August 1853, from page 38v7

Unele, sworn, says he knows the three first pieces set forth in the survey of this claim made by W.P. Alexander. The claimant received these pieces of land from the witness who is Luna of "Halakaa," under Kaeo, in the year 1844 and no one disputes the claim.

Witness as Luna objects to apana 4 situated in "Kauaula."

(Muolo, the widow and heir of claimant withdraws all claim to Apana 4)

[Award 4878Y; R.P. 2718; Halakaa Lahaina; 3 ap.; 1.19 Acs; Mamaka for Muolu; See 4878 for Native Register document]

No. 5389, Holoauhee

Claim Number:	**05389**		
Claimant:	**Holoauhee**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Kapewakua**		
Ili:			
Apana:		Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**281v6**
Mala Taro:		FT:	**4v7**
Kula:		NT:	**33v5**
House lot:		RP:	**1746**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**

Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 5389, Holoauhee, Lahaina, Maui
N.R. 281v6

Kapaoakua is the name of the land, Apeke is the claim, with two houses, two kukui trees, two coconut trees, one breadfruit tree, three lo`i, two mo`o. Those are my claims which are stated to you, the Land Commissioners, which I occupy in Lahaina.
HOLOAUHEE

F.T. 4-5v7
No. 5389, Holoauhee, present without witness, See 150B.

F.T. 150v7
Cl. 5389, Holoauhee, from page 4

Kaiawa, sworn, I know the claimant's land. It is in "Kapewakua," Lahaina, and conisists of a house lot and a cultivated land. The claimant received them from Hoapili before 1839 and his title to them has never been disputed.

The house lot is bounded:
Mauka by Beke's land
Olowalu by Hani's land
Makai by Mr. Butler's
Kaanapali by the same.

The other piece is bounded:
Mauka by the poalima of Beke
Oloalu by Kamiki's land
Makai by the same
Kaanapali by Dr. Baldwin's land.

N.T. 33v5
No. 5389, Holoauhee

G. Kaiawa, sworn, He has seen Holoauhee's 2 sections at Kapewakua, a house lot and a parcel of land, Hoapili had given in 1839/ below of this land is Peke's land.

Here are their boundaries:

Section 1 - House lot.
Mauka by Peke's land
Olowalu by Hani's land
Makai and Kaanapali by Mr. Pa ? (can't make it out).

Section 2 - Land section.
Mauka by Peke's land
Olowalu and Makai by Kamiki's land
Kaanapali by Mr. Baldwin's.

[Award 5389; R.P. 1746; Kapewakua Lahaina; 3 ap.; .62 Ac.]

No. 5458, Manu

Claim Number:	**05458**		
Claimant:	**Manu**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Kooka, Lahaina**		
Ili:			
Apana:	**4**	Awarded:	**1**
Loi:	**27**	FR:	
Plus:		NR:	**296v6**
Mala Taro:		FT:	**13v7**
Kula:	14	NT:	
House lot:		RP:	**1699**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**Yes**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**

Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**Yes**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 5458, Manu
N.R. 296-297v6

Greetings to the Land Commissioners: I have some lo`is and some mo`o kulas which were given by Namauu, my konohiki, at the time when Kaenaena was the Tax Official for Lahaina.

There are a total of 27 lo`i, they are not large ones but are small.

Furthermore, there are a total of 14 mo`o kula. These mo`os are not long, they are short.

The boundaries of these lo`is and the mo`o kulas are understood by us.

Also, the explanation of the giving of this land to me by Namauu, if this is not clear to you, you can see in the letter claiming land by Namauu.
MANU
Lahaina, Maui, 28 January 1848

F.T. 13v7
Cl. 5458, Manu

Namauu Witness absent, postponed. Resumed page 45.

F.T. 45-46v7

Cl. 5458, Manu, from page 13

Kuaana, sworn, I know the land of the claimant consists of a piece of kula and 5 lois lying together and 17 lois comprising a section of kalo land mauka. They are all in "Kooka" Lahaina. The claimant received these lands in the days of Hoapili in the early days (of that great man) and he has been in undisputed possession ever since.

The kula piece is bounded:
Mauka by the land of Kamamoku
Oloalu by the land of Kalena
Makai by the land of Opunui
Kaanapali by Puaa.

The kalo section is bounded:
Mauka by the poalima of Namauu Ehu
Olowalu by the creek
Makai by my lois
Kaanapali by the land of Oleloa.

[Award 5458; R.P. 1699; Kooka Lahaina; 4 ap.; 1.5 Acs 20 rods]

No. 5672B, Kaaha

Claim Number:	**05672B**		
Claimant:	**Kaaha (for H. Kahanawai)**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Kaulalo**		
Ili:			
Apana:	**1**	Awarded:	**1**
Loi:		FR:	
Plus:		NR:	
Mala Taro:		FT:	
Kula:		NT:	
House lot:		RP:	**4515**

Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	**See 1280**

No. 5672B, Kaaha for Hiram Kahanawai

[Award 5672B; R.P. 4515; Kaulalo Lahaina; no 5672B documents yet located, but Kaaha gets Kaulalo Lahaina in 1280*M]

No. 5912, Pahia, Simeona

Claim Number: **05912**

Claimant: **Pahia, Simeona**

Other claimant:

Other name:

Island: **Maui**

District:	**Lahaina**		
Ahupuaa:	**Puako**		
Ili:	**Luahoomu**		
Apana:	**0**	Awarded:	**1**
Loi:	**0**	FR:	
Plus:		NR:	**336v6**
Mala Taro:	0	FT:	**117v7**
Kula:	0	NT:	**9v5**
House lot:	**0**	RP:	**1173**
Kihapai/Pakanu:	0	Number of Royal Patents:	**1**
Salt lands:	0	Koele/Poalima:	**No**
Wauke:	**0**	Loko:	**No**
Olona:	0	Lokoia:	**No**
Noni:	**0**	Fishing Rights:	**No**
Hala:	0	Sea/Shore/Dunes:	**No**
Sweet Potatoes:	0	Auwai/Ditch:	**No**
Irish Potatoes:	0	Other Edifice:	**No**
Bananas:	**0**	Spring/Well:	**No**
Breadfruit:	**0**	Pigpen:	**No**
Coconut:	0	Road/Path:	**No**
Coffee:	0	Burial/Graveyard:	**No**
Oranges:	0	Wall/Fence:	**No**
Bitter Melon/Gourd:	0	Stream/Muliwai/River:	**No**
Sugar Cane:	0	Pali:	**No**
Tobacco:	0	Disease:	**No**
Koa/Kou Trees:	0	Claimant Died:	**No**
Other Plants:	0	Other Trees:	0
Other Mammals:	**No**	Miscellaneous:	

No. 5912, S. Pahia, Lahaina, 26 January 1848

N.R. 336-337v6

To the Land Commissioners: I hereby state my claim for land to you, in the ahupua'a of Puako, 'ili of Luahoomu. It is bounded on the north by the land of Kuokoa, on the east, south and west by the land of Kalua.

Here is another claim, bounded on the north by the land of Kupele and Mumuku, on the east and west by the land of Kalua, on the south by the land of Kuokoa.

Here is another claim, bounded on the north by kula, on the east by the land of Kaleipaihala, on the south by the land of Davida, on the west by the land of Mumuku.

Here is another claim, bounded on the north by the pali, on the east by the land of Kalua, on the south and west by the land of Kuokoa. It is finished.
Respectfully,
S. PAHIA

F.T. 117v7
Cl. 5212, Simeona Pahia

Mumuku, sworn, The land of the claimant is in "Puuako," Lahaina. They consist of 5 pieces. They were received from Kuakea in the year 1840 and he has held them without dispute ever since.

The first piece is bounded:
Mauka by my lois
Olowalu by the road from the sea mauka
Makai and Kaanapali by the land of Kahea.

The second piece is bounded:
Mauka by Kalua's land
Olowalu by the same road spoken of above
Makai by my land
Kaanapali by Kanuku's land.

The third piece is bounded:
Mauka by Kalua's land
Olowalu by Judge Parsons' land
Makai by Kamuku's land
Kaanapali by a road or street.

The fourth piece is bounded:
Mauka by Kamehai's land
Olowalu by Waineenui
Makai by D. Malo's land
Kaanapali by my own land.

The 5th piece is bounded:
Mauka by Kalua's land
Olowalu by Kamuku's land
Makai by Kalua's land
Kaanapali by the pali. This last piece is way up mauka.

N.T. 9v5
No. 5912, Simeona Pahia

Mumuku, sworn, He has seen Pahia's interest in the Puako ahupuaa of 5 sections, the boundaries are:

Section 1 - Taro section.
Mauka by Mumuku's land
Olowalu by Road
Makai and Kaanapali by Konohiki.

Section 2 - Taro.
Mauka by Kalua's land
Olowalu by road
Makai by Mumuku's land
Kaanapali by Kanuku's land

Section 3 - Taro.
Mauka by Kalua's land
Olowalu by Haole's land
Makai by Kanuku's land
Kaanapali by road.

Section 4 - Taro.
Mauka by Kamauoha's land
Olowalu by Waineenui's land
Makai by D. Malo's land
Kaanapali by Mumuku's land.

Section 5 - Pasture.
Mauka, Olowalu and Makai by konohiki
Kaanapali by Lauhoomoe moo.

Land received in 1840. No objections.

[Award 5912; R.P. 1173; Puako Lahaina; 4 ap.; 2.27 Acs; See also 10767]

No. 6205, Olelo

Claim Number:	**06205**			
Claimant:	**Olelo**			
Other claimant:				
Other name:				
Island:	**Maui**			
District:	**Lahaina**			
Ahupuaa:	**Kooka**			
Ili:				
Apana:	**2**		Awarded:	**1**
Loi:	**6**		FR:	
Plus:			NR:	**355v6**
Mala Taro:			FT:	**102v7**
Kula:		3	NT:	
House lot:	**1**		RP:	**2723**
Kihapai/Pakanu:			Number of Royal Patents:	**1**
Salt lands:			Koele/Poalima:	**No**
Wauke:			Loko:	**No**
Olona:			Lokoia:	**No**
Noni:			Fishing Rights:	**No**
Hala:			Sea/Shore/Dunes:	**No**
Sweet Potatoes:			Auwai/Ditch:	**No**
Irish Potatoes:			Other Edifice:	**No**
Bananas:			Spring/Well:	**No**
Breadfruit:			Pigpen:	**No**
Coconut:			Road/Path:	**No**
Coffee:			Burial/Graveyard:	**No**
Oranges:			Wall/Fence:	**No**
Bitter Melon/Gourd:			Stream/Muliwai/River:	**No**

Sugar Cane:		Pali:	**Yes**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

Cl. 6205, Olelo
F.T. 102v7

Lazaro Namauu, sworn, I know the lands of the claimant. They are in "Kooka," Lahaina. They consist of 3 kula and 6 lois in one piece and one house lot.

The claimant received them from me in the year 1842 and his title has never been disputed. The lois on my half of "Kooka" mentioned in the claim above [10533].

This land is bounded:
Mauka by "Puehuehuiki"
Olowalu by Pahoa
Makai by the pali
Kaanapali by "Waineenui."

The house lot is bounded:
Mauka by my land
Olowalu by "Polanui"
Makai by my land
Kaanapali by "Puaanui"

[Award 6205; R.P. 2723; Kooka Lahaina; 2 ap.; 1.25 Acs 26 rods; See 6203, N.R. 555v5 for Native Register document]

No. 6215, Keoni

Claim Number:	**06215**
Claimant:	**Keoni**
Other claimant:	
Other name:	
Island:	**Maui**
District:	**Lahaina**
Ahupuaa:	**Puehuehunui, Lahaina**

Ili:

Apana:	**0**		Awarded:	**1**
Loi:	**0**		FR:	
Plus:			NR:	**355v6**
Mala Taro:		0	FT:	**105v7**
Kula:		0	NT:	
House lot:	**0**		RP:	**1854**
Kihapai/Pakanu:		0	Number of Royal Patents:	**1**
Salt lands:		0	Koele/Poalima:	**No**
Wauke:	**0**		Loko:	**No**
Olona:		0	Lokoia:	**No**
Noni:	**0**		Fishing Rights:	**No**
Hala:		0	Sea/Shore/Dunes:	**No**
Sweet Potatoes:		0	Auwai/Ditch:	**No**
Irish Potatoes:		0	Other Edifice:	**No**
Bananas:	**0**		Spring/Well:	**No**
Breadfruit:	**0**		Pigpen:	**No**
Coconut:		0	Road/Path:	**No**
Coffee:		0	Burial/Graveyard:	**No**
Oranges:		0	Wall/Fence:	**No**
Bitter Melon/Gourd:		0	Stream/Muliwai/River:	**No**
Sugar Cane:		0	Pali:	**No**
Tobacco:		0	Disease:	**No**
Koa/Kou Trees:		0	Claimant Died:	**No**
Other Plants:		0	Other Trees:	0
Other Mammals:	**No**		Miscellaneous:	

No. 6215, Keani
F.T. 105v7

A. Moku, sworn, I know the land of the claimant is in Puehuehunui, Lahaina and is in one piece of kula land.

The claimant had this land from Mimai, the blind man in 1847. Maimai had it from Maimai in 1845 and these titles have never been disputed.

It is bounded:
Mauka by the land of Kaleimikio[?]
Olowalu by Kaalalo
Makai by my land
kaanapali by the poalima land.

The claimant has gone to California.

[Award 6215; R.P. 1854; Puehuehunui lahaina; 1 ap.; .88 Ac.; See 6203, N.R. 555v6 for Native Register document]

No. 6760B, Hanalei

Claim Number:	**06760B**			
Claimant:	**Hanalei**			
Other claimant:				
Other name:				
Island:	**Maui**			
District:	**Lahaina**			
Ahupuaa:	**Moalii, Kapunakea**			
Ili:				
Apana:	**5**		Awarded:	**1**
Loi:	**41**		FR:	
Plus:	+		NR:	**418v6**
Mala Taro:		0	FT:	
Kula:		1	NT:	**129v7**
House lot:	**1**		RP:	**3453**
Kihapai/Pakanu:		0	Number of Royal Patents:	**1**
Salt lands:		0	Koele/Poalima:	**No**
Wauke:	**0**		Loko:	**Yes**

Olona:	0	Lokoia:	**No**
Noni:	**0**	Fishing Rights:	**No**
Hala:	0	Sea/Shore/Dunes:	**Yes**
Sweet Potatoes:	0	Auwai/Ditch:	**No**
Irish Potatoes:	0	Other Edifice:	**No**
Bananas:	**0**	Spring/Well:	**No**
Breadfruit:	**8**	Pigpen:	**No**
Coconut:	0	Road/Path:	**Yes**
Coffee:	0	Burial/Graveyard:	**No**
Oranges:	0	Wall/Fence:	**No**
Bitter Melon/Gourd:	0	Stream/Muliwai/River:	**No**
Sugar Cane:	0	Pali:	**No**
Tobacco:	0	Disease:	**No**
Koa/Kou Trees:	0	Claimant Died:	**No**
Other Plants:	0	Other Trees:	0
Other Mammals:	**No**	Miscellaneous:	

No. 6760B, Hanalei, Lahaina, February 5, 1848
N.R. 418v6

Hear ye, ye Land Commissioners: Here are my 11 lo`i, 30 mo`o, 6 groves*, 1 house lot, 8 breadfruit trees. Here is my name below.
HANALEI

/*Claimant does not say what groves are/

F.T. 129v7
Cl. 6760B, Hanalei, June 8, 1849

Lehulehu, sworn, I know the lands of Hanalei in "Moalii," Lahaina. They are in three pieces, one a house lot, one a kalo land of 8 lois, and one a kula land.

The claimant received these lands from a son of the land, Puhi by name, in 1831. His parents had the land [from a] time out of mind. His title has never been disputed.

The house lot is bounded:
Mauka by the Government road

Olowalu by the pond of Victoria
Makai by the sea
Kaanapali by the konohiki's land.

The kalo land is bounded:
Mauka by the konohiki's land
Olowalu by "Makalii"[?]
Makai by my land
Kaanapali by "Kapahuiki" name of ili

The kalo piece is bounded:
Mauka by my land
olowalu by "Moalii"
Makai by Polea
Kaanapali by the konohiki's land.

[Award 6760B; R.P. 3453; Moalii & Kapunakea Lahaina; 6 ap.; 6 Acs 2 roods 32 rods]

No. 6785, Kaluahinui

Claim Number:	**06785**			
Claimant:	**Kaluahinui**			
Other claimant:				
Other name:				
Island:	**Maui**			
District:	**Lahaina**			
Ahupuaa:	**Wainee**			
Ili:				
Apana:	**3**		Awarded:	**1**
Loi:	**3**		FR:	
Plus:			NR:	**424v6**
Mala Taro:			FT:	**56v7**
Kula:		1	NT:	
House lot:			RP:	**8248**
Kihapai/Pakanu:			Number of Royal Patents:	**1**
Salt lands:			Koele/Poalima:	**No**

Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

Cl. 6785, Kaluahinui, June 2, 1849
F.T. 56v7

Kamohomoho, sworn, I know the lands of the claimant. They are in Waineenui, Lahaina. They consist of one piece of kalo and two pieces of kalo land and one of one loi, and the other of two. The claimant received these lands from Kahekaihala, the lord of this land some time in the days of Hoapili in ancient times. And he has possessed them without dispute ever since.

The kula piece is bounded:
Mauka by the land of Namaka
Olowalu by the land of Kuakini
Makai by the land of Kahuna
Kaanapali by the kula of Naleipaihai.

The makai loi is bounded:
Mauka by the lois of Mamaka
Olowalu by the lois of Nau
Makai by the lois of Kaniho
Kaanapali by the land of Ualo.

The other piece is bounded: On all sides by the land of Kalapaihala.

[Award 6785; Land Patent 8248; Waineenui Lahaina; 1 ap.; 2 Acs 12 rods; See 6781 for Native Register document]

No. 6787, Haunaumua

Claim Number:	**06787**	
Claimant:	**Haunaumua**	
Other claimant:		
Other name:		
Island:	**Maui**	
District:	**Lahaina**	
Ahupuaa:	**Waineenui, Moanui**	
Ili:		
Apana:	Awarded:	**1**
Loi:	FR:	
Plus:	NR:	**424v6**
Mala Taro:	FT:	**56v7**
Kula:	NT:	
House lot:	RP:	**1701**
Kihapai/Pakanu:	Number of Royal Patents:	**1**
Salt lands:	Koele/Poalima:	**No**
Wauke:	Loko:	**No**
Olona:	Lokoia:	**No**
Noni:	Fishing Rights:	**No**
Hala:	Sea/Shore/Dunes:	**No**
Sweet Potatoes:	Auwai/Ditch:	**No**
Irish Potatoes:	Other Edifice:	**No**
Bananas:	Spring/Well:	**No**
Breadfruit:	Pigpen:	**No**

Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

Cl. 6787, Haunaumua
F.T. 57-57v7

Kamanoha, sworn, I know the lands of the claimant. They are two in number. One is a kula land in "Waineenui," and the other a kalo land in Moanui. The land in Moanui is the same which the claimant has claimed in No. 6805.

The land in Waineenui he received from Kaipaihala in the days of Hoapili and in the same olden days he received his kalo land in Moanui from Wahinepu, and his title to them has never been disputed.

The kula land consists of 4 moos and is bounded:
Mauka by the auwai dividing it from Kaleipaihala's land
Olowalu by the land of John K [illegible]
Makai and Kaanapali by the land of Kaleipaihala.

The kalo land is bounded:
Mauka by the land of Kuakini
Olowalu by the creek called Kapaula
Makai by the pali
Kaanapali by the same creek.

[Award 6787; R.P. 1701; Waineenui Lahaina; 2 ap.; 1.75 Acs; See 6781 for Native Register document]

No. 6788, Kamauoha

Claim Number: **06788**

Claimant: **Kamauoha**

Other claimant:

Other name:

Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Wainee**		
Ili:			
Apana:		Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**424v6**
Mala Taro:		FT:	**57v7**
Kula:		NT:	
House lot:		RP:	**1171**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	

Other Mammals: **No** Miscellaneous:

Cl. 6788, Kamauoha, June 2, 1849
F.T. 57v7

Hanaumue, sworn, I know the land of the claimant. It is a piece of kula land in "Puako," Lahaina.

The claimant received this land from Pahia at the time they put taxes on the dogs two years ago. Pahia received it from Kalua in the days of Hoapili. He holds his land without dispute.

It is bounded:
Mauka by the kula of "Puako"
Olowalu by "Waineenui"
Makai by the kula of Puako
Kaanapali by the same.

[Award 6788; R.P. 1171; Puako Lahaina; 1 ap.; .8 Ac.; See 6781 for Native Register document]

No. 6795, Ukukua

Claim Number:	**06795**			
Claimant:	**Ukukua**			
Other claimant:				
Other name:				
Island:	**Maui**			
District:	**Lahaina**			
Ahupuaa:	**Polanui**			
Ili:				
Apana:	**2**		Awarded:	**1**
Loi:	**1**		FR:	
Plus:	+		NR:	**424v6**
Mala Taro:			FT:	**59v7**
Kula:		1	NT:	
House lot:			RP:	**8401**
Kihapai/Pakanu:			Number of Royal Patents:	**1**
Salt lands:			Koele/Poalima:	**No**

Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**Yes**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

Cl. 6795, Ukukua
F.T. 59v7

Makaulia. sworn, I know the lands of the claimant. it is in "Polanui," Lahaina. It consists of two pieces, one a kula land and the other a kalo land.

The claimant received these lands from me about the year 1840 and he has enjoyed them in peace ever since.

The kula land is bounded:
Mauka by the land of a Koolakai
Olowalu by the Malaekahana
Makai by the land of Malaekahana and Kua
Kaanapali by "Kooka."

The kalo land is bounded:
Mauka by my lois
Olowalu by the same
Makai by the land of Kekaawi

Kaanapali by the stream of "Polanui."

[Award 6795; Land Patent 8401; 2 ap.; 4 Acs 2 roods 13 rods; See No. 6781 for Native Register with multiple claims and 6654 for claim with wrong number in Keokea]

No. 6801, Opunui

Claim Number:	**06801**			
Claimant:	**Opunui**			
Other claimant:				
Other name:				
Island:	**Maui**			
District:	**Lahaina**			
Ahupuaa:	**Halakaa**			
Ili:				
Apana:	**2**		Awarded:	**1**
Loi:	**12**		FR:	
Plus:			NR:	**424v6**
Mala Taro:			FT:	**52v7**
Kula:		1	NT:	
House lot:			RP:	**4562**
Kihapai/Pakanu:			Number of Royal Patents:	**1**
Salt lands:			Koele/Poalima:	**Yes**
Wauke:			Loko:	**No**
Olona:			Lokoia:	**No**
Noni:			Fishing Rights:	**No**
Hala:			Sea/Shore/Dunes:	**No**
Sweet Potatoes:			Auwai/Ditch:	**No**
Irish Potatoes:			Other Edifice:	**No**
Bananas:			Spring/Well:	**No**

Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**Yes**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

Cl. 6801, Opunui, June 2, 1849
F.T. 52v7

Kaeo,, sworn, I know the lands of the claimant. They are in "Halakaa." They consist of 3 moos of kula in one piece and 12 lois of kalo land in one piece. The luna or konohiki Kahua Kaeo has a poalima loi, however, in the middle of this kalo land.

The claimant received these lands from Kauku [[?] the luna of Halakaa in the days of Hoapili, and he has held them in peace ever since.

The kula land is bounded:
Mauka by the land of Kaoeno
Olowalu by Puehuehu iki
Makai by the land of Paikaualani
Kaanapali by the land of Puneauna.

The kalo land is bounded:
"Haleu" by Mauka side
Olowalu by the creek of Paunaula
Makai by "Paunau"
Kaanapali by the same.

[Award 6801; R.P. 4562; Halakaa Lahaina; 2 ap.; 1 Ac. 15 rods; See 6781 for Native Register document]

No. 6853, Nuhi

Claim Number: **06853**

Claimant: **Nuhi**

Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Puehuehunui**		
Ili:			
Apana:		Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**427v6**
Mala Taro:		FT:	**63v7**
Kula:		NT:	
House lot:		RP:	**1851**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**

Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

Cl. 6853, Nuhi
F.T. 63v7

Moku, sworn, I know the lands of the claimant. They are in "Puehuehunui," Lahaina and consist of one kula land and one kalo land of 10 lois. The claimant received these lands from Kalahuna, the luna of Puehuehunui in 1841 and he has held them without dispute to the present day.

The kula land is bounded:
Mauka by the lot of Ana[?]
Olowalu by the poalima land
Makai by my land
Kaanapali by the land of Kanahele.

the kalo land is bounded:
Mauka by the high pali
Olowalu by the land of Umiumi
Makai by the land of Luikaa
Kaanapali by the land of Kainakaoo.

[Award 6853; R.P. 1851; Puehuehunui Lahaina; 1 ap.; 1.40 Acs.; See No. 6851 Kahula ma for Native Register document]

No. 6877, Kahili

Claim Number:	**06877**		
Claimant:	**Kahili**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Paunauiki**		
Ili:			
Apana:	**7**	Awarded:	**1**
Loi:	**4**	FR:	

Plus:	+	NR:	**427v6**
Mala Taro:		FT:	**75v7**
Kula:	3	NT:	
House lot:		RP:	**5587**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**Yes**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**Yes**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**Yes**
Sugar Cane:		Pali:	**Yes**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	**government road**

No. 6877, Kapili [Kahili]
F.T. 75-76v7

Kua, sworn, I know the lands of the claimant. They are in Paunauiki," Lahaina. They consist of 3 pieces of kula and 4 of kalo. The claimant received these lands from the King in the days of Hoapili in ancient times. His title has never been disputed.

The piece of kula of 6 moos is bounded:
Mauka by the land of Kuhaopao

Olowalu by the poalima land
Makai by Haupu and my land
North by Paunaunui."

The kula of one moo is bounded:
Mauka by the land of Kahaulua
Olowalu by "Halakaa"
Makai by the creek of Paunauiki
North by the poalima kula and the same creek.

The other piece of kula is bounded:
Mauka by the road leading to Olowalu
Olowalu by the land of Haupu
makai by the great Government road
North by the poalima land.

The first piece of kalo land of 2 lois is bounded:
Mauka by the land of Powai[?]
Olowalu by the high pali
Makai by the land of Hekona
Kaanapali y the poalima land.

The 2d kalo patch is bounded:
Mauka by the poalima loi
Olowalu by the pali
Makai by the land of Hai
North by the land of Hekona.

The 3d piece of kalo is bounded:
Mauka by my land
Olowalu by the high pali
Makai by the poalima land
kaanapali by my land.

The last piece of kalo is bounded:
Mauka by the poalima land
Olowalu by the pali
Makai by Hae's land
Kaanapali by Poonui's land.

[Award 6877; R.P. 5587; Paunauiki & Kauaula; 6 ap.; 1 Ac. 26 rods; See No. 6851 Kahula ma for Native Register document]

No. 6878, Kauhiheha

Claim Number:	**06878**		
Claimant:	**Kauhiheha**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Puehuehu**		
Ili:			
Apana:	**4**	Awarded:	**1**
Loi:	**10**	FR:	
Plus:	+	NR:	**427v6**
Mala Taro:		FT:	**76v7**
Kula:	2	NT:	
House lot:		RP:	**2749, 4557**
Kihapai/Pakanu:		Number of Royal Patents:	**2**
Salt lands:		Koele/Poalima:	**Yes**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**Yes**
Coffee:		Burial/Graveyard:	**Yes**
Oranges:		Wall/Fence:	**No**
Bitter		Stream/Muliwai/River:	**No**

Melon/Gourd:			
Sugar Cane:		Pali:	**Yes**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	**Road leading to meeting house**

No. 6878, Kauhiheha [Kauhihape]
F.T. 76v7

Kua, sworn, I know the lands of the claimant. They are in "Paunauiki," Lahaina. They consist of 4 pieces, 2 of kula land and 2 of kalo land one containing 4 lois, the other 6 lois.

The claimant received these lands from me in the days of King Kamehameha II and he has held the without dispute up to the present day.

The first piece of kula is 2 moos is bounded:
Mauka by Haupu's land
Olowalu by the land of Kuhaulua
Makai by the road leading mauka of the meeting house to Olowalu
Kaanapali by "Paunaunui."

The second piece of kula likewise contains 2 moos and is bounded:
Mauka by the pali
Olowalu by Kuhaulua's land
Makai by the grave yard
Kaanapali by "Paunaunui."

The kalo land of 6 lois is bounded:
Mauka by the poalima lois
Olowalu by the poalima and Moos and my land
Makai by Poonui's land
Kaanapali by the same.

The kalo land of 4 lois is bounded:
Mauka by Poonui's land
Olowalu by Kapili's land
Makai by the poalima lois
Kaanapali by Poonui's land.

[Award 6878; R.P. 4557 Paunauiki Lahaina; 2 ap.; 3 roods 25 rods; Kauaula Lahaina; 3 ap.; 19 rods; & R.P. 2749; Paunauiki & Kauaula Lahaina; 5 ap.; 1.21 Acs; See No. 6851 Kahula ma for Native Register document]

No. 6879, Kuhaulua

Claim Number:	**06879**			
Claimant:	**Kuhaulua**			
Other claimant:				
Other name:				
Island:	**Maui**			
District:	**Lahaina**			
Ahupuaa:	**Paunauiki**			
Ili:				
Apana:	**2**		Awarded:	**1**
Loi:	**7**		FR:	
Plus:	+		NR:	**427v6**
Mala Taro:			FT:	**78v7**
Kula:		2	NT:	
House lot:			RP:	**4556**
Kihapai/Pakanu:			Number of Royal Patents:	**1**
Salt lands:			Koele/Poalima:	**No**
Wauke:			Loko:	**No**
Olona:			Lokoia:	**No**
Noni:			Fishing Rights:	**No**
Hala:			Sea/Shore/Dunes:	**No**
Sweet Potatoes:			Auwai/Ditch:	**No**
Irish Potatoes:			Other Edifice:	**No**
Bananas:			Spring/Well:	**No**
Breadfruit:			Pigpen:	**No**
Coconut:			Road/Path:	**Yes**

Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**Yes**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	**government road**

No. 6879, Kuhaulua [Kauhielua]
F.T. 78v7

Kua, sworn, I know the lands of the claimant. They are in "Paunauiki," Lahaina. They consist of 2 pieces of kula land, one containing 7 moo, the oher 2 moo. The claimant received these lands in the days of King Kamehameha [II] in 1844 from me as luna and he possessed them in peace ever since.

The first piece contains of 7 moos is bounded:
Mauka by "Halakaa"
Olowalu by the same
Makai by the same and Haliili's land
Kaanapali by Hekona's land.

The other piece is bounded:
Mauka by the creek of Paunau
Olowalu by Haupu's land
Makai by the Government road leading to Olowalu
Kaanapali by Kauhiheha's land.

[Award 6879; R.P. 4556; Paunauiki Lahaina; 2 ap.; 1 Ac. 1 rood 33 rods; See No. 6851 Kahula ma for Native Register document]

No. 6887, Kuakaha

Claim Number:	**06887**
Claimant:	**Kuakaha**
Other claimant:	
Other name:	
Island:	**Maui**
District:	**Lahaina**

Ahupuaa:	**Kaulalo**		
Ili:			
Apana:	**1**	Awarded:	**1**
Loi:	**3**	FR:	
Plus:		NR:	**427v6**
Mala Taro:		FT:	**82v7**
Kula:		NT:	
House lot:		RP:	**5703**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**Yes**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 6887, Kuakaha, June 4, 1849
F.T. 82v7

Kamohai, sworn, I know the land of the claimant; [It] is in "Kaulalo," Lahaina and consists of 3 lois in one piece. The claimant received it from Pinauea in the days of Namakeha, and his title has never been disputed.

It is bounded:
Mauka by Pinauea's land
Olowalu by Poopuu's land
Makai by Makakuia's land
Kaanapali by the high pali.

[Award 6887; R.P. 5703; Kauaula Lahaina; 1 ap.; 2 roods 14 rods; See No. 6851 Kahula ma for Native Register document]

No. 6895, Kauakahi

Claim Number:	**06895**			
Claimant:	**Kauakahi**			
Other claimant:				
Other name:				
Island:	**Maui**			
District:	**Lahaina**			
Ahupuaa:	**Puehuehunui**			
Ili:				
Apana:	**4**		Awarded:	**1**
Loi:	**3**		FR:	
Plus:	+		NR:	**427v6**
Mala Taro:			FT:	**96v7**
Kula:		3	NT:	
House lot:			RP:	**4507**
Kihapai/Pakanu:			Number of Royal Patents:	**1**
Salt lands:			Koele/Poalima:	**Yes**
Wauke:			Loko:	**No**

Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**Yes**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 6895, Kauakahi
F.T. 96v7

Moku, sworn, I know the lands of the claimant. They are in "Puehuehunui," Lahaina and it consists of 3 pieces of kula and 3 of kalo.

The claimant received these lands from Nalima in the year 1832 and has possessed them i peace ever since.

The first piece of kula has no lois and is bounded:
Mauka by Hanakaipo's land
Olowalu by Kuhi's land
Makai by my land
Kaanapali by Puehuehuiki.

The second piece of kula has 2 lois connected with it and is bounded:
Mauka by Keliuhua's land
Olowalu by the creek of Puehuehu
Makai by Hanakaoo's land
Kaanapali by "Halakaa."

The 3d piece of 2 lois is bounded:
Mauka by Umi's land
Olowalu by the creek of Puehuehu
Makai by Keliuhua's land
Kaanapali by Kokino's land

The 4th piece is bounded:
Mauka by "Waineenui"
Olowalu by Kanakoa's land
Makai by the poalima land
Kaanapali by Waineenui.
There are seen lois in this piece.

[Award 6895; R.P. 4507; Puehuehunui Lahaina; 3 ap.; 1.25 Ac. 39 rods; Puehuehunui Lahaina; 1 ap.; 13 Acs; See No. 6851 Kahula ma for Native Register document]

No. 6915, Haupu

Claim Number:	**06915**		
Claimant:	**Haupu**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Paunauiki**		
Ili:			
Apana:	**2**	Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**427v6**
Mala Taro:		FT:	**77v7**
Kula:	2	NT:	
House lot:		RP:	**5559**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**Yes**

Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**Yes**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	**government road**

No. 6915, Haupu, H
F.T. 77-78v7

Kua, sworn, I know the lands of the claimant. They are in "Paunauiki," Lahaina. and consist of two pieces of kula land.

The claimant received this land from me in my capacity of luna of Paunauiki in 1843 or 4 and from that time to the present, he has been undisturbed. The King is the great Lord of Paunauiki.

The first piece of kula contains 2 moos is bounded:
Mauka y the poalima land
Olowalu by my land
Makai by Kauhihehe's land
Kaanapali y the land of Kaulanae.

The other piece is bounded:
Mauka by Halakaa
Olowalu by the same
Makai by the Alanui Aupuni

Kaanapali by Kahili's land.

[Award 6915; R.P. 5559; Paunauiki Lahaina; 1 ap.; 1 Ac. 1 rood 2 rods; See No. 6851 Kahula ma for Native Register document]

No. 6916, Honolii

Claim Number:	**06916**
Claimant:	**Honolii**
Other claimant:	
Other name:	
Island:	**Maui**
District:	**Lahaina**
Ahupuaa:	**Makila**
Ili:	

Apana:	Awarded:	**1**
Loi:	FR:	
Plus:	NR:	**427v6**
Mala Taro:	FT:	**80v7**
Kula:	NT:	
House lot:	RP:	**2376**
Kihapai/Pakanu:	Number of Royal Patents:	**1**
Salt lands:	Koele/Poalima:	**No**
Wauke:	Loko:	**No**
Olona:	Lokoia:	**No**
Noni:	Fishing Rights:	**No**
Hala:	Sea/Shore/Dunes:	**No**
Sweet Potatoes:	Auwai/Ditch:	**No**
Irish Potatoes:	Other Edifice:	**No**
Bananas:	Spring/Well:	**No**
Breadfruit:	Pigpen:	**No**

Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 6916, Honolii
F.T. 80v7

Keawe, sworn, I know the land of the claimant. They are in "Makila," Lahaina. It is one piece of kula which he received from Kaulanae in the days of Hoapili before 1839 and his title has never been disputed.

It is bounded:
Mauka and Kaanapali by the poalima land
Olowalu and Makai by Kalehoula's land.

[Award 6916; R.P. 2376; Makila Lahaina; 1 ap.; 2 roods 5 rods; See No. 6851 Kahula ma for Native Register document]

No. 6920, Poopuu, wahine

Claim Number:	**06920**		
Claimant:	**Poopuu, wahine**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Kaulalo**		
Ili:			
Apana:	**4**	Awarded:	**1**
Loi:	**3**	FR:	

Plus:	+	NR:	**427v6**
Mala Taro:		FT:	**83v7**
Kula:	1	NT:	
House lot:		RP:	**4554**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**Yes**
Sugar Cane:		Pali:	**Yes**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 6920, Poopuu, Wahine, June 4, 1849
F.T. 83v7

Kamohai, sworn, I know the lands of the claimant. They are in "Kaulalo," Lahaina, and consist of 4 pieces; 3 pieces of kalo, and one of kula land. One of the kalo lands has 8 lois, and one kula. Another 1 loi. Another 2 lois. The claimant received them from Kanehiwa in the days of Namakeha and she has never been disturbed in her possessions.

[No.] 1. The first piece of kalo is bounded:

Mauka by Umi's land
Olowalu by Ilikahi
Makai by Makaiwa's land
Kaanapali by the same.

[No.] 2. The next piece is bounded:
Mauka by Kanaula's Creek
Olowalu by Pahoa
Makai by Umi's land
Kaanapali by the pali.

[No.] 3. The last piece is bounded:
Mauka by Pinauea's land
Olowalu by Makila
Makai by Pinauea's land
Kaanapali by Makahiwa's land.

[No.] 4. The kula land is bounded:
Mauka by Puehuehu nui
Olowalu by Makiai's
Kaanapali by Moku's land.

[Award 6920; R.P. 4554; Kaulalo Lahaina; 3 ap.; 1.75 Ac. 24 rods; See No. 6851 Kahula ma for Native Register document]

No. 6921, Paikaualani

Claim Number:	**06921**		
Claimant:	**Paikaualani**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Halakaa**		
Ili:			
Apana:		Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**427v6**
Mala Taro:		FT:	**86v7**

Kula:		NT:	**14v15**
House lot:		RP:	**2717**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 6921, Paikaualani
F.T. 86v7

Kaiwikuheole, sworn, I know the land of the claimant. They are in "Halakaa," Lahaina. They consist of 2 pieces, one piece of kalo land with two poalima lois inside and one piece of kula makai consisting of 2 moos. There is a house on this last piece.

The claimant received it from Naea, in 1844 and has held quiet possession ever since.

The kalo land is bounded:
Mauka by Kamaka's land
Olowalu bh the high pali

Makai by Punaiwaa's land
Kaanapali by "Haleu.

The other piece is bounded:
Mauka by Kapeke's land
Olowalu by the pali
Makai by Punaiwaa's land
Kaanapali by "Halei."

See page 14 v15

N.T. 14v15
No. 6921, Paikaualani, from Page 86v7

Kaanaana, sworn, says he knows the House Lot of claimant in Lahaina. He is without dispute.

The Lot is bounded:
Mauka by Kukahiko's land
Olowalu by the land called "Alio"
Makai by the public land
Kaanapali by Kaanaana's land.

Kapule, sworn, confirmed the testimony of Kaanaana.

[Award 6921; R.P. 2717; Halakaa Lahaina; 3 ap.; 1.7 Acs; See No. 6851 Kahula ma for Native Register document]

No. 7582, Kipa ,Eseta

Claim Number:	**07582**		
Claimant:	**Kipa, Eseta**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Kuhua**		
Ili:			
Apana:	**1**	Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**358v5**

Mala Taro:	FT:	**458v10**
Kula:	NT:	
House lot:	RP:	**8393**
Kihapai/Pakanu:	Number of Royal Patents:	**1**
Salt lands:	Koele/Poalima:	**No**
Wauke:	Loko:	**No**
Olona:	Lokoia:	**No**
Noni:	Fishing Rights:	**No**
Hala:	Sea/Shore/Dunes:	**No**
Sweet Potatoes:	Auwai/Ditch:	**No**
Irish Potatoes:	Other Edifice:	**No**
Bananas:	Spring/Well:	**No**
Breadfruit:	Pigpen:	**No**
Coconut:	Road/Path:	**No**
Coffee:	Burial/Graveyard:	**No**
Oranges:	Wall/Fence:	**No**
Bitter Melon/Gourd:	Stream/Muliwai/River:	**No**
Sugar Cane:	Pali:	**No**
Tobacco:	Disease:	**No**
Koa/Kou Trees:	Claimant Died:	**No**
Other Plants:	Other Trees:	
Other Mammals: **No**	Miscellaneous:	

No. 7582, Esela Kipa, Honolulu, February 9, 1848
N.R. 358v5

To the Land Commissioners, greetings to you all: I hereby enter my claim for land, from the Mo`i, at Lahaina, Maui, of the entire Ahupua`a from the upland to the sa, and all the unused places of the land. That is my claim. The name of this land of mine is Kuhuanui.
It is finished,
Aloha, I am, respectfully,
ESELA KIPA X

N.T. 458v10

No. 7582, E. Kipa

Kuhua ahupuaa, Lahaina, Maui
This distribution is correct and the land written above is for Kipa, he shall present it before the land officers who settle claims.
(sign) Kamehameha
28 January 1848

[Award 7582; R.P. 8393, Kuhua Lahaina (ahupua`a); 1 ap.]

No. 7711, Kaiheekai

Claim Number:	**07711**		
Claimant:	**Kaiheekai, John H.**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Puuhoowali**		
Ili:			
Apana:	**2**	Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**440v6**
Mala Taro:		FT:	**126v7**
Kula:		NT:	
House lot:		RP:	**3582**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**

Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 7711, Kaiheekai, I.H.
N.R. 440v6

To the Land Commissioners: Here is my claim for land in Lahaina: Puahoowali Ahupua`a. That is my claim.
Respectfully,
I.H. KAIHEEKAI
Honolulu, Feb 8, 1848

F.T. 126v7
Cl. 7711, John H. Kaiheekai, 8 June 1849

The claimant offered in evidence a paper showing that at the recent division of lands with the King, he was permanently confirmed in his possession and ownership of the Ahupuaa of "Puahoowali" in Lahaina. There are only three men living on this land. Their names are: Kauailipi and Lono and ....

The name of the land given to the King by the claimant is "Polapola," in Kipahulu.

[Award 7711; R.P. 3582; Puuhoowali Lahaina; 3 ap.; 3 roods 17 rods; See also Awards 484 & 11086]

No. 7713*M, Kamamalu

Claim Number: **07713*M**

Claimant: **Kamamalu, Victoria**

Other claimant:	
Other name:	
Island:	**Maui**
District:	**Lahaina, Wailuku, Hamakualo**
Ahupuaa:	**Waihee, Paunau, Aki, Kelawea, Moalii, Kalua, Haiku, Makapuu, Kawela, Onouli, Kaumanu, Kahalehili, Kaeleku, Honokolani, Kawaipapa, Niumalu, Palemo, Pakakia, Kahuakamalii, Ihuula, Oloewa, Papalauhau, Mokae, Puekahi, Puuiki, Kapohoe, Pukuilua, Kaou, Hal**
Ili:	

Apana:	**55**	Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**440v5,569v5**
Mala Taro:		FT:	**408v3**
Kula:		NT:	**650v1**
House lot:		RP:	**4475**
Kihapai/Pakanu:		Number of Royal Patents:	**1**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**No**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**

Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

No. 7713*M, Victoria Kamamalu, Land Division, See Page 569
N.R. 440-444v5

Opukaula, `Ili, Waimano, Ewa, Oahu
Kilauluna, `Ili, Waimano, Ewa, Oahu
Hananau, `Ili, Waimano, Ewa, Oahu
Kanenelu, `Ili, Waimano, Ewa, Oahu
Pohe, `Ili, Waimano, Ewa, Oahu
Kaulu, `Ili, Waimano, Ewa, Oahu
Kapuna, `Ili, Waimano, Ewa, Oahu
Poupouwela, `Ili, Manaiki, Ewa, Oahu
Kapaloa, `Ili, Waiawa, Ewa, Oahu
Panio, `Ili, Waiawa, Ewa, Oahu
Kuhialoko, `Ili, Waiawa, Ewa, Oahu
Kahoaiai, `Ili, Waiawa, Ewa, Oahu
Papaa, `Ili, Waiawa, Ewa, Oahu
Kaohai, `Ili, Waiawa, Ewa, Oahu
Kalona, `Ili, Waiawa, Ewa, Oahu
Kuhiawaho, `Ili, Waiawa, Ewa, Oahu
Kapuaihalulu, `Ili, Waiawa, Ewa, Oahu

2.
Haleaka, `Ili, Waiawa, Ewa, Oahu
Piloaumoa, `Ili, Waiawa, Ewa, Oahu
Kionaole, `Ili, Waiawa, Ewa, Oahu
Hanakehau, `Ili, Waiawa, Ewa, Oahu
Kapopou, `Ili, Waiawa, Ewa, Oahu
Kalimukele, `Ili, Waiawa, Ewa, Oahu
Kumuulu, `Ili, Waiau, Ewa, Oahu
Hapuna, `Ili, Kalihi, Kona, Oahu
Waiaula, `Ili, Kalihi, Kona, Oahu
Kalaepohaku, `Ili, Kapalama, Oahu
Kauluwela, `Ili, Honolululu land, Oahu
Kanewai, `Ili, Waikiki, Oahu
Kapaakea, `Ili, Waikiki, Oahu
Komoawaa, `Ili, Waikiki, Oahu

Waialae, `Ili, Waikiki, Oahu

3.
Halawa, Ahupua`a, Koolau, Molokai

Kaa, Ahupua`a, Lanai

Kelawea, Ahupua`a, Lahaina, Maui
Moalii, Ahupua`a, Lahaina, Maui
Aki, Ahupua`a, Lahaina, Maui
Paunau, Ahupua`a, Lahaina, Maui
Waihee, Ahupua`a, West Puali, Maui
Kalua, `Ili, Wailuku, Maui
Haiku, Ahupua`a, Hamakualoa, Maui
Makapuu, Ahupua`a, Hana, Maui
Kawela, Ahupua`a, Hana, Maui
Onouli, Ahupua`a, Hana, Maui
Kaumanu, Ahupua`a, Hana, Maui
2 Kahalehili, Ahupua`a, Hana, Maui
3 Kaeleku, Ahupua`a, Hana, Maui
Honokalani, Ahupua`a, Hana, Maui
Kawaipapa, Ahupua`a, Hana, Maui
5 Niumalu, Ahupua`a, Hana, Maui
2 Palemo, Ahupua`a, Hana, Maui
3 Pakakia, Ahupua`a, Hana, Maui
2 Kahuakamalii, Ahupua`a, Hana, Maui
Ihuula, Ahupua`a, Hana, Maui
Oloewa, Ahupua`a, Hana, Maui
4 Papalauhau, Ahupua`a, Hana, Maui
4 Mokae, Ahupua`a, Hana, Maui
Puekahi, Ahupua`a, Hana, Maui
Puuiki, Ahupua`a, Hana, Maui
3 Kapohoe, Ahupua`a, Hana, Maui
Pukuilua, Ahupua`a, Hana, Maui
2 Kaou, Ahupua`a, Hana, Maui
Halehana, Ahupua`a, Hana, Maui
Kaukuhalahala, Ahupua`a, Hana, Maui
2 Piapia, Ahupua`a, Hana, Maui
Koakapuna, Ahupua`a, Hana, Maui
Kawaalua, Ahupua`a, Hana, Maui
Pueokahi, Ahupua`a, Hana, Maui
Pueokauiki, Ahupua`a, Hana, Maui
Pohakanele, Ahupua`a, Hana, Maui
Ahuakaio, Ahupua`a, Hana, Maui
Kihapuhala, Ahupua`a, Hana, Maui
Papahawahawa, Ahupua`a, Hana, Maui

Muolea, Ahupua`a, Hana, Maui
Puuhaoa, Ahupua`a, Hana, Maui
Kahalawe, Ahupua`a, Hana, Maui
Ohia, Ahupua`a, Hana, Maui
Kolokole, Ahupua`a, Hana, Maui
Kapuuomahuka, Ahupua`a, Hana, Maui
Mahulua, Ahupua`a, Hana, Maui
Poopoo, Ahupua`a, Hana, Maui
Lapalapaiki, Ahupua`a, Hana, Maui
Waieli, Ahupua`a, Hana, Maui
Paihala, Ahupua`a, Hana, Maui
Kalihi, Ahupua`a, Hana, Maui
Kakiweka, Ahupua`a, Hana, Maui
Kailihiakoko, Ahupua`a, Hana, Maui
Puukohola, Ahupua`a, Hana, Maui
Kahalawe, Ahupua`a, Hana, Maui
Puaaluu, Ahupua`a, Hana, Maui

Kahua, Ahupua`a, Kohala, Hawaii
Honokane, Ahupua`a, Kohala, Hawaii
Holualoa 1,2, Ahupua`a, Kona, Hawaii
Kahaluu, Ahupua`a, Kona, Hawaii
Keopunui, Ahupua`a, Kona, Hawaii
Keauhou, Ahupua`a, Kona, Hawaii
Honuaino, Ahupua`a, Kona, Hawaii
2 Honokua, Ahupua`a, Kona, Hawaii
Haukalua 1, 2, Ahupua`a, Kona, Hawaii
Pakini, Ahupua`a, Kau, Hawaii
Keauhou, `Ili, KapapalaKau, Hawaii
Kahuai, Ahupua`a, Puna, Hawaii
Kauhaleau, Ahupua`a, Puna, Hawaii
Kauaea, Ahupua`a, Puna, Hawaii
Piopio, Ili in Waiakea, Puna, Hawaii
Kalalau, Ahupua`a, Puna, Hawaii
Honohononui, `Ili in Waiakea, Puna, Hawaii
Pahoehoe, Ahupua`a, Puna, Hawaii
Onomea, Ahupua`a, Puna, Hawaii
Alae, Ahupua`a, Puna, Hawaii
Kekelani, `Ili in Waimanu, Hamakua, Hawaii
Kuilei, Ahupua`a, Puna, Hawaii

N.R. 569v5
0No. 7713, Victoria Kamamalu, from page 440

Victoria Kamamalu's lands in the Mahele by the Mo`i, in the month of January 1848, continued:

Huleia, a district of Kauai, however, the Government cattle shall graze there.
Makaweli, Ahupua`a, Kona, Kauai
Places unsuitable for the soldiers and the fort
Maunalua, `Ili, Waimanalo, Koolaupoko, Oahu
Pahoa, `Ili, Waianae, Waianae, Oahu
Kaluanui, Ahupua`a, Koolauloa, Oahu
Kawailoa, Ahupua`a, Waialua, Oahu
Paalaa, Ahupua`a, Waialua, Oahu
Kaelepulu, `Ili, Kailua, Koolaupoko, Oahu
Kikiwelawela, `Ili, Kaneohe, Koolaupoko, Oahu

F.T. 408-411v3
No. 7713, V. Kamamalu
No. 10474, N. Namauu
No. 7716, R. Keelikolani
No. 7714B, M. Kekuaiwa
No. 7712, M. Kekuanaoa [7712B]
A True Copy
(Sig). A. G. Thurston
Clerk Interior Department.
Copy of the Division of Lands agreed upon in Privy Council August 27, 1850

Kekuanaoa and his children to receive Fee simple titles for those lands here set off to them- they resigning to the Gov. all title to the other lands granted them in the Buke Mahele.

No. 7713, Ko Victoria Kamamalu mau aina ma ke ano Alodio

Honokane, Ahupuaa, Kohala, Hawaii
Kahua, Ahupuaa, Kohala, Hawaii
Keopu, Ahupuaa, Kona, Hawaii
2 Holualoa, Ahupuaa, Kona, Hawaii
Kahaluu, Ahupuaa, Kona, Hawaii
Keauhou, Ahupuaa, Kona, Hawaii
Honuaino, Ahupuaa, Kona, Hawaii
Honokua, Ahupuaa, Kona, Hawaii
Pakini, Ahupuaa, Kau, Hawaii
Keauhou, Ili is Kapapala, Kau, Hawaii
Kahuwai, Ahupuaa, Puna, Hawaii
Kauwalehau, Ahupuaa, Puna, Hawaii
Kauaea, Ahupuaa, Puna, Hawaii
Honohononui, ili o Waiakea, Hilo, Puna, Hawaii
Piopio, ili o Waiakea, Hilo, Puna, Hawaii
Kalalau, Ahupuaa, Puna, Hawaii
Pahoehoe, Ahupuaa, Hilo, Hawaii
Alae, Ahupuaa, Puna, Hawaii
Onomea, Ahupuaa, Puna, Hawaii

Kuilei, Ahupuaa, Hamakua, Hawaii
Kekelani, ili no Waimanu, Hamakua, Hawaii

Kalua, Ahupuaa, Wailuku, Maui
Waihee, Ahupuaa, Puali, Kom. [Komohana]

Aki, Ahupuaa, Lahaina, Maui
Paunau, Ahupuaa, Lahaina, Maui
Kelawea, Ahupuaa, Lahaina, Maui

Halawa, Ahupuaa, Koolau, Molokai

Kaa, Ahupua, Kona, Lanai

Maunalua, ili no Waimanalo, Koolaupoko, Oahu
Kaelepulu, ili no Kailua, Koolaupoko, Oahu
Kikiwelawela, Ahupuaa, Heeia, Koolaupoko, Oahu
Kaluanui, Ahupuaa, Koolauola, Oahu
Kawailoa, Ahupuaa, Wailalua, Oahu
Paalaa, Ahupuaa, Waialua, Oahu
Waiawa, Ahupuaa, Ewa, Oahu
Pahoa, ili no Waianae, Waianae, Oahu
He mau ili ma Waimano, Ewa, Oahu
Poupouwela, ili in Mananaiki, Ewa, Oahu
Kumuulu, no Waiau, Ewa, Oahu
Kapuna no Kalihi, Kona, Oahu
Waiaula no Kalihi, Kona, Oahu
Kalaepohaku no Honolulu, Kona, Oahu
Kauluwela no Honolulu, Kona, Oahu
Kapaakia no Waikiki, Kona, Oahu
Komowaa no Waikiki, Kona, Oahu
Kanewai no Waikiki, Kona, Oahu
Waialae no Waikiki, Kona, Oahu

Makaweli, Ahupuaa, Kauai
Huleia, Puna, Kauai
Kikiaola, Waimea, Kauai

Ko ke Aupuni hapakolu loko o ko V. Kamamalu mau aina. Makapuu, Kawela, Oniuli, Kaumanu, 2 Kahalehili, Kaeleku, Honokalani, Kawaipapa, 5 Niumalu, 2 Palemo, 2 Pakakea, Nahuakamaii, Ihuuloi, Hoewaa, 2 Papauhau, Hamoa, 3 Mokae, Puekahi, Puuiki, 3 Pohue, Pukuilua, Haou, Halehana, Kaukuhalahala, Peapea, Koakupuna, Kawalua, Pueokauiki, Pohakanele, Ahuakaio, Kihapuhala, Papahawahawa, Muolea (The above ahupuaa in Hana, Maui) Moalii Ahupuaa Lahaina Maui.

F.T. 538-539v3
No. 7713, M. Kekuanaoa (for Victoria), 1 April 1854, Counter the government

A. Paki, sworn, for the Government, Knows that the fish pond called "Kawa", in Honolulu, was broken up in the year 1847 & the materials of the wall taken to help to construct the wall or breakwater erected by the Government on the west side of the harbor. The Government got permission from M. Kekuanaoa to take the materials of the wall of "Kawa" to make the Breakwater. He did not give the Government any portion of the soil of "Kawa," or of "Kaakaukukui." The land on which now stands the Government slaughter House, occupied by John Meek, is a portion of the ili of "Kalui."[?] I do not know what title the Government has to that place, but I have heard that Kekualoa had given it to the Government - this I state as hearsay only.

G.P. Judd, sworn, for Government, says, I was the Hawaiian Minister of Finance in the year 1847, and remember when the wall was built from the present lime kiln House running over to the land of sea & Sumner, Known as Kohololoa." It was built to prevent the filling up of the Harbor of Honolulu. It was thought advisable to remove a part of the wall of a fish pond in "Kawa," which I supposed belonged to the Government. Finding, however, that it was claimed by M. Kekuanaoa, for Victoria, Mr. Young and I applied to him for the privilege of removing it, which he granted to us, and accordingly it was removed under the direction of Piikoi and the stones put into the new wall first named, and my impression is that we built a new partition wall for the Governor's fishpond. I will not be certain however. Piikoi will know. Piikoi ran a plow through the fish pond to give direction to the stream and divert it from the harbor. I never knew of any definite cession of the fish pond or other land to the Government, but I think Kekuanaoa consented that the Government should divide the fish pond, in Privy Council. I didn't know that he claimed the land where the wall runs from the Lime Kiln, but I don't recollect that he said anything particular about it.

See P. 548. [about Pearl Harbor]

F.T. 548v3
No. 7713, M. Kekuanaoa (V. Kamamalu), Aprila 19, 1854, counter the Government, from page 538

Keone Ana, sworn says, I have nothing to testify to in reference at the claim of M. Kekuanaoa in Kaakuukukui, pertaining to the wall built to protect the harbor from filling in, which wall runs from the Lime Kiln to Sea & Sumner's land.

I am sure he gave it to Government in 1847, but I will not swear anything about it until I have laid the matter before the Privy Council, as to "Kaliu," he said he had nothing to say.

To page 555

F.T. 555-557v3
No. 7713, M. Kekuanaoa (for V. Kamamalu) from page 538, counter the Government

Keoni Ani, sworn, presents a plan which he says was made by Order of the King in Council, in the year 1848, perhaps, and placed in my charge, as minister of the Interior. The plan shows two rows of lots laid out from the Beach seaward. The Government built the wall or breakwater in the year 1847, I think. The Government claimed no more land as I understood the matter than what is shown on the plan. When the wall was built by the Government no opposition was made to its erection by any private party. The

wall was erected by the Government to prevent the harbor from being filled up with the mud washed down by the Nuuanu River. When this wall was built the wall of the loko called "Kawa" was taken down and the size of the loko reduced. After the wall was built, this plan was made by the Government and laid before the Privy Council, who resolved to sell the lots as laid out for the benefit of the Treasury. Two of the lots were accordingly disposed of with the approval of the Privy Council, to Louis Gravier. After that, a proposition was made in Privy Council to sell some of the lots to a steam boat company, but at the suggestion of M. Kekuanaoa, the proposition was dropped. Kekuanaoa advising the Council that they were disposing of the Government property too fast. After the report of a committee appointed by the Privy Council on the subject of the filling up of the harbor, the Council resolved to remove the wall of the loko called "Kawa" and M. Kekuanaoa assented.

I do not know to whom the land really belonged. I have always seen this, that when the government wanted a piece of land for their purposes, the konohikis have always given their consent. A. Paki, who had charge of Kaliu, and M. Kekuanaoa, who had charge of Kaakaukukui were both in Privy Council at the time referred to. I consider that the place where this wall is built belonged to the Government previous to that time, because by law, the papakoa and the harbor belongs [sic] to the Government. All the chiefs were in Council at the time these things were transacted. The place where the wall is built is papa koa, perhaps, mud perhaps.

Iona Kapena, sworn, says the names of the land lying between the wall of the Government and the loko called "Kawa" are Kaakaukukui and Kaliu. I pointed out the boundary line between Kaakaukukui and Kaliu a few days ago to Messers Lee and Robertson. The boundary has been well known to me ever since I was a boy. The breakwater or wall is built on the land of Kaakaukukui.

M. Kekuanaoa states that he never understood before that the Government meant to take this place now in dispute. I have heard the testimony of Young, who says the Government took it. I gave my consent to the Government to remove the wall of Kawa and for the materials, but I did not intend that the Government should take away any part of Kaakaukukui.

N.T. 598-599v3
No. 7713, V. Kamamalu - protest

M. Kekuanaoa and Mahuka were the persons who settled the land of V. Kamamalu with objections to C. Kanaina's rights to that property over which there was a dispute. Below are the statements of witnesses clarifying their /two/ rights.

Kumuhonua, sworn, I have seen the place over which there is a dispute between C. Kanaina and V. Kamamalu, Kaanaenui is the name. I have seen that it is the center for Waialae. The boundaries as I have seen from Kaiahaki to Kauhaki, from there to Pohakuaumiumi, then to Kaananiau and run directly to Puukuaka; from there to Kalohupale; Kapahulu is on this side and from there run directly to Kupikipikio point.

Mt. Leahi is for Kapahulu.

The boundaries of the land Kekio: on the mauka direction of Makahuna road is the taro land, detached and following to the sea of Kapua and the coconut grove.

Poo wahine: I am a native of Waiale and since I was very young and at the time of Kahekili, I have known that place over which there is a dispute. Keanaenui is the name and it is the center of Waialae. I have known the boundaries as they are at Kuialauahi to Aumeume Rock, to Kaananiau, to Mount Kuaka and from there to Kalahu to the lae of Kupikipikio. Those are the boundaries which separate Waialae from Kapahulu. Mt Leahi is for Kapahulu.

The land Kekio runs from mauka of Makahuna Street, then separated to the extreme makai to the sea and the coconut grove.

Kuapuu, sworn, I am a land child of Waialae and I have seen the boundaries of Waialae as they were pointed out to me by my parents, from Kuahaki to Kauhaki, therefrom to Aueume Rock and so on just as Poo has related here.

The boundaries of Kekio run from mauka of Makahuna road, then it separates until the extreme makai of Kapua sea and a road called Kukii. The report given of this survey is imperfect because he had taken Waialae's pasture.

Kaula, sworn, I have not been a native very long, but I have heard the same thing from my older brother whose name is Hanakinau, as the reports given by those people above. I had heard these things after the death of Kaahumanu I.

Hehea, sworn, I am a land child of Waialae and have seen the boundaries of Waialae exactly as those witnesses have related above.

The boundaries of the land, Kekio by name, of Keekapu, are exactly as the statements given

N.T. 373-375v10
No. 7713, Victoria Kamamalu, Waianae, 17 August 1854

Testimony on the boundary between the ahupuaa of Waianae and the ili of "Pahoa."

Nahinu, sworn, says the ili of Pahoa is but small. The loko, makai, belongs to this ili. The boundary of the piece is dispute runs along to the eastward of an enclosure belonging to Kaapuiki, and up through the coconut grove and along a stone wall to some hau trees, and then up mauka and across to the east corner of the land, and from thence running makai to the loko.

This ili consists of three pieces, first, the fish pond; second, the piece which I have tried to describe; third, the mauka piece undisputed.

I learned these boundaries from my ancestors who lived here from ancient times.

Cross examined. I accompanied Kekuanaoa and M. Hopkins when they suspected [inspected?] the boundary line in question. I saw the marks made at that time on the coconut trees by order of Kekuanaoa, in presence of M. Hopkins. The line marked out by them on the northwest side, runs farther mauka than that described by me in my testimony.

Ohule, sworn, says he knows the middle Mana of Pohao about which the present dispute exists. It is only of late that I have heard that the boundary was disputed. This middle piece is bounded: Mauka by a stone wall. The western boundary runs up through the coconut grove and then runs to the southward, and then at the corner of what used to be a wauke patch, turns seaward and runs down to the hau trees and the stone wall. I was born on this land. The land on which stand the church and parsonage belongs to the ahupuaa of Waianae.

Kaapuiki, sworn, says when I came here to live, the boundaries of the middle piece of Pahoa were nearly the same as have been described by the preceding witnesses. Afterwards, when the law was made to restore the ancient boundaries of all the lands, Kulepe, the then tax officer, gave to "Pahoa" the land now claimed by Victoria, on the southeast side of the coconut grove, and disputed by the King. I was luna of Waianae when that arrangement was made by Kulepe. I was under Kekuanaoa. The people who live on the disputed land formerly went to the labor days on Waianae," but of late they labor on "Pahoa."

Kulepe, sworn, says, "Pahoa" consists of two pieces; the fish pond forming the part of the mauka piece. I have lived here about 15 years. I was appointed tax officer of Waianae in 1841. In 1850, the boundaries of the makai piece of "Pahoa" were pointed out to me by three kamaainas, who are all now dead. In the same year, Hopkins and Kekuanaoa came down here but I did not accompany them when they went round this land. I do not know anything myself of the true boundary, except what I heard from these kamaainas in 1850. About 1841, I restored a lihi of "Pahoa," which lies between the fish pond and the stone wall, and was claimed for "Pahoa," on account of some coconut trees. This was the only lihi of "Pohoa" restored by me. The people who formerly lived on the land now in dispute used to do konohiki labor for the ahupuaa of "Waianae."

Molea, sworn, confirms in full, the testimony of Nahinu and Ohule.

[Award 7713; (Maui) R.P. 4475; Kalua Waihee Wailuku, 1 ap. (Ap. 23); Iliaina; Puali Waihee Wailuku; R.P. 4475; Paunau Lahaina; 1 ap.; ahupua`a (Ap. 26); Aki Lahaina; 1 ap.; ahupua`a (Ap. 25); Kelawea Lahaina; 1 ap.; ahupua`a (Ap. 27); (Island of Hawaii) R.P. 4475; Keopu, Honuaino, Holualoa, Keauhou Kona and Keauhou Kau, Kuilei Hamakua, Honokane & Kahua Kohala, Honohononui, Piopio, Kalalau; Kekelani, R.P. 4475 & 6856, Kahaluu; R.P. 6857, Honokua; R.P. 6865, Haukalua; R.P. 4475, 6883 & 8220, Kauaea R.P. 6884, Kahuwai Puna; R.P. 4475 & 6887 Pakini nui Kau; R.P. 4475 & 8117 Onomea; R.P. 4475 & 8199 Kaueleau; R.P. 4475 & 6860 Pahohoe Hilo; R.P. 4475 & 6864 Alae Hilo; (Molokai) R.P. 4475 Halawa, Molokai 1 ap. Ahupuaa; (Oahu) R.P. 227 Kamoaaa, Waikiki; no R.P. for Kanewai Manoa; R.P. 4475, Waialaenu, Maunalua, Waiawa, Poupouwela, Mananaiki, Hapuna & Waialua Kalihi; Waimano, Waiau; R.P. 4475 & 7834, Kalaepohaku Kapalama; R.P. 4475 & 7805 Kaluanui; R.P. 4775 & 7793, Kauluwela; R.P. 4475 & 7789, Kapaakea; R.P. 4475, Kikiwelawela Heeia, Kawailoa Waialua, Paalaa Waialua, Kaelepulu Koolaupoko; (Lanai) R.P. 4475, Kaa; (Kauai) Kikiaola Waimea, R.P. 4476 Makaweli; R.P. 4477, Haiku, Nawiliwili, Niumalu; R.P. 4480, Kalapaki, R.P. 4481, Hanamaulu; R.P. 4482 Kipu & Mahaulepu; See 7713 for Oahu, Kauai, Lanai, Hawaii and Molokai]

No. 8452*M, Keohokalole

Claim Number:	**08452*M**
Claimant:	**Keohokalole, A. wahine**
Other claimant:	
Other name:	
Island:	**Maui**
District:	**Kula, Lahaina, Hana**
Ahupuaa:	**Aapueo, Alae 3, Kamehame, Kealahou 3 & 4, Koheo 2, Kukuiaeo, Paeohi, Hana, Kuhua, Kooka**
Ili:	**Paeohi, Pahoa, Muolea**

Apana:	**10**		Awarded:	**1**
Loi:	**0**		FR:	
Plus:			NR:	**567v5**
Mala Taro:		1	FT:	**573v3**
Kula:		0	NT:	**326v10**
House lot:	**0**		RP:	**4388,7453**
Kihapai/Pakanu:		0	Number of Royal Patents:	**2**
Salt lands:		0	Koele/Poalima:	**No**
Wauke:	**0**		Loko:	**No**
Olona:		0	Lokoia:	**No**
Noni:	**0**		Fishing Rights:	**No**
Hala:		1	Sea/Shore/Dunes:	**Yes**
Sweet Potatoes:		3	Auwai/Ditch:	**No**
Irish Potatoes:		0	Other Edifice:	**No**
Bananas:	**0**		Spring/Well:	**No**
Breadfruit:	**0**		Pigpen:	**No**
Coconut:		5	Road/Path:	**No**
Coffee:		0	Burial/Graveyard:	**No**
Oranges:		0	Wall/Fence:	**No**

Bitter Melon/Gourd:	0	Stream/Muliwai/River:	**No**
Sugar Cane:	0	Pali:	**No**
Tobacco:	0	Disease:	**No**
Koa/Kou Trees:	0	Claimant Died:	**No**
Other Plants:	0	Other Trees:	0
Other Mammals:	**No**	Miscellaneous:	

No. 8452*M, Keohokalole, Waikiki, Oahu, February 5, 1848
N.R. 567-568v5

I, the one whose name is below, hereby state my claims in my lands to enter in the lands of the Mo'i. These are things done by my own hands, with my people.

At Waiomao, one orange tree and my cultivated valley, an `Ili in Waikiki, with seven lo'i.
At Kapiwai are two mala of coffee and one mala of lauhala, one lo'i, and also a cultivated lot. This in an 'Ili in the Ahupua'a of Honolulu, Island of Oahu.
At Makua, on the Island of Oahu, one orange tree.

At Aamakao, an Ahupua'a on the Island of Hawaii, is one lo'i, and a house lot and an orange tree.
In the District of Kau, Ahupua'a of Wailau, is a house lot in the land.
In the Ahupua'a of Kaalaiki is a lot like that /in Wailau/. These are on the Island of Hawaii.

At Lahaina, in Kuhua Ahupua'a, is a mala of lauhala.

At Honouliwai, an Ahupua'a on the Island of Molokai are two orange trees.

At Kula, Island of Maui, Keokea Ahupua'a, there are three small mala of sweet potatoes and one mala of taro, made by our own hands, not by /those of/ the /people of the/ land.
At Kooka, an Ahupua'a in Lahaina, are four coconut trees and a single coconut tree at the shore in the lot of Kualaula, in Kiika, a /total of/ five coconut trees, and some kou trees at Pahoa, which have not been counted, also a hala clump is there, at the seashore.
I am with aloha, respectfully,
KEOHOKALOLE, who affirms this is my name, signed by Z. Kaauwai

F.T. 573v3
No. 8452, Keohokalole

Awahua, sworn, says he knows the House lots claimed by Keahokalole at Kaawaloa, Hawaii. The first one is fenced all round with a stone wall.

It is bounded:
Makai by the sea shore
On Kailua side by the Government land

Mauka by the land of Kahaku and Awahua
and on the other side by the road.

Claimant derived this lot from her ancestors, who held it from very ancient times. There is a stone house and several grass houses in it, belonging to claimant, besides a Tomb.

The second Lot is called "Aeoili" and is fenced all round.
It is bounded:
Makai by Government land
On Kailua side by the same
Mauka the same
On the side next the Pali by the Road.

Claimant derived this lot from her ancestor, who held it from olden times.

Witness knows the three House Lots in Kealakeakua claimed by Keohokalole. The first Lot is called "Kulou" and is fenced in.

It is bounded:
Makai by the Sea beach
Kaawaloa side by Government land
Mauka by the Road
South Kona side by a lot belonging to T. Cummings.

The second Lot is called "Kaahaloa" it is enclosed all round, and [is] bounded on:
Kona Hema by a lot belonging to T. Cummings
Mauka by the lot of Nakoko
North Kona by an old Heiau
Makai by the Road.

The third Lot is called "Hailokoalii" and is bounded on:
The south Kona side by an old Heiau
Mauka by a Government Lot & the lot of Ialua
Makai by the Sea Beach
On the other side by a pali.

Claimant inherited these Lots from her ancestors by the mother's side, who possessed them from ancient times.

Kekaalua, sworn, says he knows there lots perfectly & confirms in full the testimony of Awahua.

N.T. 326-327v10
No. 8452, A. Keohokalole; K. Kapaakea

To His Highness, John Young, Minister of Interior
Greetings:

This is to inform you and the Privy Council of my desire to convey some of my lands for the Governments one third in the land which remain as mine. Grant me this, of course, with the approval of the Privy Council

Below is a list of the lands I wish to convey to the government.

Aapueo ahupuaa, Kula, Maui
5 Omaopio ahupuaa, Kula, Maui.
Makehu ahupuaa, Kula, Maui
Kuikuiaeo ahupuaa, Kula, Maui
2 Kailua ahupuaa, Kula, Maui
2 Pukalani ahupuaa, Kula, Maui.
Kukuiula ahupuaa, Kipahulu, Maui.
Alaakua ahupuaa, Kaupo, Maui.

Kanakau ahupuaa, Kona, Hawaii.
Kaipuhao ahupuaa, Kohala, Hawaii.
Halaula ahupuaa, Kohala, Hawaii,
Keahakea ahupuaa, Hamakua, Hawaii.
Kaioula ahupuaa, Kau, Hawaii.
2 Makahakupa ahupuaa, Kau, Hawaii.
Kouhuhuula ahupuaa, Kau, Hawaii.
Pohina ahupuaa, Kau, Hawaii.
Puhalanui ahupuaa, Kau, Hawaii.
Wiliwilinui ahupuaa, Kau, Hawaii.
2 Papohaku ahupuaa, Kau, Hawaii.

The boundaries of all of these lands above have been established.
With appreciation,
(sign) A. Keohokalole

Honolulu, Jan. 3, 1850
To Your Highness, John Young, Minister of Interior
Greetings:

Here is a list of the names of my lands which has been left for me pending for an approval of its distribution.

Kahana ahupuaa, Koolauloa, Oahu.
Hamohamo ili, Waikiki, Oahu.
Malaekahana ahupuaa, Koolauloa, Oahu.

Paeohi ahupuaa, Lahaina, Maui.
2 Koheo ahupuaa, Kula, Maui.
3 Alae ahupuaa, Kula, Maui.
2 Kealahou 3,4, ahupuaaa, Kula, Maui.

Aapueo ahupuaa, Kula, Maui.
Kamehame ahupuaa, Kula, Maui.
Kuikuiaeo ahupuaa, Kula, Maui.
Muolea, Hana, Maui.

Kealakekua, Kona, Hawaii.
Kaawaloa ahupuaa, Kona, Hawaii.
Onouli ahupuaa, Kona, Hawaii.
Keahuolu ahupuaa, Kona, Hawaii.
Pau ahupuaa, Kohala, Hawaii.
Paauhau ahupuaa, Hamakua, Hawaii.
Puna ahupuaa, Puna, Hawaii.
Keaiwa ahupuaa, Kau, Hawaii.
Kawela ahupuaa, Kau, Hawaii.

With appreciation,
A. Keohokalole,
Honolulu, Jan. 3, 1850

Resolved, that the Minister of the Interior be and is hereby authorized to transfer to the list of lands belonging to Keohokalole, Kaapuna, Kona, Hawaii, and Aapueo 2, Kula, Maui, and transfer to the Government and list one of the Alae's in Kula, Maui, in lieu of Aapueo 2, sold by Kapaakea through mistake.

By order of Privy Council
December 22, 1850
Resolved, that the Government shall accept the division of lands of the chiefs as made by them, and those laid off for the Government shall be the government third of their lands.
By order of the King and Council
August 27th, 1850

I hereby certify the foregoing to be true copies of the original documents now on file in this Department.
(sign) A.G. Thruston, Chief Clerk, Interior Department
November 9th, 1853

[Award 8452 (Maui); R.P. 4388; 1 ap. Aapueo Kula Ahupuaa; Alae 3 Kula 1 ap. (ahupuaa), Kamehame Kula, R.P. 4388 & 7453 Kealahou 3-4 Kula (Apana 6); R.P. 7453; Kamehamenui Kula (Apana 21) together 5067 Acres; Koheo 2 Kula Ahupuaa Ap. 19; R.P. 4388; Kukuiaeo Kula; Muolea Hana; 1 ap.; ahupuaa; Paeohi Lahaina; Kukuiokaea Kula Ahupuaa Ap. 7; (Hawaii): Kealakekua S. Kona R.P. 7533 & 3607; Honohina Hilo R.P. 4386 & 7693; Kaawaloa S Kona R.P. 7532 & 4386, & 4385; Onouli S Kona R.P. 4386 & 7146; Keahuolo N. Kona R.P. 6886; Paauhau Hamakua R.P. 87123; Pau N. Kohala R.P. 8083; Puua Puna R.P. 7788; Kawela Kau R.P. 6886; Keaiwa Kau; (Oahu) R.P. 4386 & 7876; Malaekahana Koolauloa R.P. 5616; Kapiwai Pauoa R.P. 4389; Hamohamo Waikiki R.P. 5588 & 8330; Kahana Koolauloa R.P. 4387; See Award MA 3 for Hamoa Hana award]

No. 8559B*M, Lunalilo

Claim Number:	**08559B*M**		
Claimant:	**Lunalilo, William C.**		
Other claimant:	Kanaina, Charles for King		
Other name:			
Island:	**Maui**		
District:	**Lahaina, Kaanapali, Wailuk**		
Ahupuaa:	**Polanui, Kalimaohe, Kuholilea, Aki, Paeohi, Waianae, Honolua, Pepee, Waiehu 2, Kaapahu**		
Ili:	**Luaehu, Ahikuli**		
Apana:	**13**	Awarded:	**1**
Loi:		FR:	
Plus:		NR:	
Mala Taro:		FT:	**82v16**
Kula:		NT:	
House lot:	**1**	RP:	**5637, 5639, 5699-2, 7664,**
Kihapai/Pakanu:		Number of Royal Patents:	**13**
Salt lands:		Koele/Poalima:	**No**
Wauke:		Loko:	**No**
Olona:		Lokoia:	**No**
Noni:		Fishing Rights:	**No**
Hala:		Sea/Shore/Dunes:	**No**
Sweet Potatoes:		Auwai/Ditch:	**No**
Irish Potatoes:		Other Edifice:	**No**
Bananas:		Spring/Well:	**No**
Breadfruit:		Pigpen:	**No**
Coconut:		Road/Path:	**Yes**
Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**

Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	**government road**

No. 8559B*M, (W.C. Lunalilo) C. Kanaina
F.T. 551-552v3

W.H. Uana, sworn, says he knows the house lot of Lunalilo, in Kaluaaha, Molokai. It is bounded:

Mauka by the public road
On the Halawa side by a fish pond of the government called "Neaupala"
Makai by the sea beach
On Kaluaakoi side by a government fish pond called "Kaluaaha."

This lot formerly was ordered to be enclosed by Hoapili wahine and Kekauluohe when Eseta Kipa was Governess of Molokai. The people of Kekauluohi's lands erected a stone house on this lot in the year 1835. It is now in possession of Lunalilo as heir of Kekauluohi.

E. Kipa, sworn says, she knows the lot. I was Governess of Molokai under Hoapili wahine & Kekauluohi in former times, and by their orders enclosed this lot and built a stone house on it with the labor of the people of their own lands. When the government sold the land of "Kaluaaha" to the Missionaries, I heard Kalolou come and ask permission from Kanaina to live in the stone house, which permission she got.

(A. Paki sets up a claim for this lot as heir of Kalaolou.)

L. Haalelea, sworn says, he knows the house lot claimed by Lunalilo in Kailua, Hawaii. It is bounded:

On Kiholo side by the church lots
Makai by the public road
On Keauhou side by a road leading mauka
Mauka by some house lots.

It is enclosed by a wall. This lot I have heard belonged formerly to Keaho, the father of Mahuka. I have heard that when Keaho died he left this lot to Kekauluohi, and I have recently seen a letter from Mahuka to W.C. Lunalilo requesting him to allow Mahuka to retain charge of this lot under Lunalilo. In 1843 I was at Kailua & Kekauluohi was there. I then saw the later Governor Adams give her some money which he said was rent received for this same lot. Part of this lot is claimed by the heir of W.P. Leleiohoku. There is a fence remaining though and dividing the lot into two parts.

F.T. 82-84v16 and N.T. 82-84v16
No. 8559B, William C. Lunalilo

Polea, sworn says, he knows the lots claimed by William C. Lunalilo, at Lahaina, Maui.

The first called Luaehu, is bounded as follows:
Mauka by Kaiheekai and Hiram's land
Olowalu by King's land
Makai by Sea beach
Kaanapali by Polea and M.J. Nouliau [Nowlien].

The second in Pakala is bounded as follows:
Mauka by Public street
Olowalu by Kaiheekai's land
Makai by H.S. Swinton's and others' land
Kaanapali by Public road.

The third lot called Hawaikaekea is also bounded as follows:
Mauka by Kalaleikio's land
Olowalu by Public road
Makai by Alaloa Kahiko street
Kaanapali by Daniela Ii's land.

This lot is disputed by Maunahina the wife of George Shaw, whose claim in right of her father. She has already got an award for a part of this lot.

The fourth lot in Paunau is bounded as follows:
Mauka by Keaweiheuhu's and Ka
Olowalu by Keaweluaole's land
Makai by Old road
Kaanapali by Street leading to Lahainaluna.

hula's land
The fifth lot called Loinui is bounded as follows:
Mauka by Keaweluaole; Kauhi and Kalolou's land
Olowalu by Mr. Baldwins
Makai by Old road
Kaanapali by Kamakinui's land.

The sixth lot in Aki is bounded as follows:
Mauka by Kaweka's land
Olowalu by Wahie's land
Makai by Main road
Kaanapali by M.I. Nowlein's land.

The seventh lot in Puunoa is bounded as follows:

Mauka by Main road
Olowalu by Iosua Kaeo
Makai by Iosua Kaeo
Kaanapali by King's land.

The eighth lot in Kelawea is bounded as follows:
Mauka by Lahainaluna
Olowalu by Road from the beach
Makai by Keleikini and Kahookano's lands
Kaanapali by A stream.

All these lots have descended to William C. Lunalilo from his mother, Kekauluohi, and are now in the hands of his lunas. The lot in "Pakala" is disputed by Paki and others.

N.T. 185-187v10
No. 8559B, William Charles Kanaina, [for Lunalilo], Honolulu, 24 April 1850

COPY
Greetings to you Highness, John Young, the Minister of Interior.
My desire is to have the government claim separated from my lands; therefore I hereby give some of my land for the government to have forever and the same shall apply to mine. Here are the names of my lands:

Kawela ahupuaa, Hamakua, Hawaii.
Waikaekoe ahupuaa, Hamakua, Hawaii.
Makapala ahupuaa, Kohala, Hawaii.
Kehena ahupuaa, Kohala, Hawaii.
Puhau ili of Iole, Kohala, Hawaii.
Puakoa ili of Waimea, Kohala, Hawaii.
Honuainonui ahupuaa, Kona, Hawaii.
Puapuanui ahupuaa, Kona, Hawaii.
Lehuulanui ahupuaa, Kona, Hawaii.
Kawainui ahupuaa, Kona, Hawaii.
Lanihaunui ahupuaa, Kona, Hawaii.
Pakiniili ahupuaa, Kau, Hawaii.
Hanuapo ahupuaa, Kau, Hawaii.
Kahanalea ahupuaa, Puna, Hawaii.
Keahialaka ahupuaa, Puna, Hawaii.
Keaau ahupuaa, Puna, Hawaii.
Makahanaloa ahupuaa, Hilo, Hawaii.
Pepekeo ahupuaa, Hilo, Hawaii.

Kaapuhu ahupuaa, Kipahulu, Maui.
2 Waiehu, Puali, West Maui.
Ahipuli [Ahikuli] ili for Waiehu, West Maui.
Pepee ili for Wailuku, West Maui.

Honolua ahupuaa, Kaanapali, Maui.
Kalimaohe ahupuaa, Lahaina, Maui.
Polanui ahupuaa, Lahaina, Maui.
Kuholilea ahupuaa, Lahaina, Maui.

Waialua ahupuaa, Kona, Molokai.
Kawela ahupuaa, Kona, Molokai.

Pau ili for Waikiki in Manoa, Kona, Oahu.
Kamoku ili for Waikiki in Manoa, Kona, Oahu.
Kaluaokau ili for Waikiki in Manoa, Kona, Oahu.
Kapahulu ili for Waikiki in Manoa, Kona, Oahu.
Kaalaea ahupuaa, Koolaupoko, Oahu.
Kapaka ahupuaa, Koolauloa, Oahu.
Laiewai ahupuaa, Koolauloa, Oahu.
Laiemaloo ahupuaa, koolauloa. Oahu.
Pahipahialua, Koolauloa, Oahu.

Kahili, Koolauloa [sic], Koolau, Kauai.
Kalihiwai, Koolauloa [sic], Koolau, Kauai.
Pilauwai, Koolauloa [sic], Koolau, Kauai.
Manuahi ili, Kona, Kauai.
Waipouli ahupuaa, Puna, Kauai.

These lands listed above shall be for me fee simple forever, it would not be right for the government to claim my land.

The following lands, I shall give to the government fee simple forever.
Kapulena ahupuaa, Hamakua, Hawaii.
Kukuihaele ahupuaa, Hamakua, Hawaii.
Auau ahupuaa, Kohala, Hawaii.
Keopuhuikahi ahupuaa, Kona, Hawaii.
Papaakoko ili of Honokohau, Kona, Hawaii.
Ninole ahupuaa, Kau Hawaii.
Laepaoo ahupuaa, Puna, Hawaii.
Koae 1 ahupuaa, Puna, Hawaii.
Koae 2 ahupuaa, Puna, Hawaii.
Laeapuki ahupuaa, Puna, Hawaii.
Kaiuiiki ahupuaa, Hilo, Hawaii.
Kahuku ahupuaa, Hilo, Hawaii.

Waiakoa ahupuaa, Kula, Maui.
Kou ili of Waiehu Puali, Komohana Maui.
Kapoino ili of Waiehu Puali, Komohana, Maui.
Halelena ili of Waiehu Puali, Komohana, Maui.
Keokamu ili of Waiehu Puali, Komohana, Maui.

Wainee ahupuaa, Lahaina, Maui.

Mahana ahupuaa, Lanai.

Kamalomalo ahupuaa, Puna, Kauai.
Kumukumu ahupuaa, Koolau, Kauai.

I've given the lands listed above to the government forever, all of them are for the government.
Please consider my request with compassion for me.
With appreciation, I am,
William Charles Lunalilo, Charles Kanaina (child guardian)
Department of Interior, 6 April 1852.

This is a try copy of Lunalilo's division with the government,
A.G. Thruston, Secretary

N.T. 450v10
No. 8559B, William C. Lunalilo, Protested by Kaai

Mahuna, sworn, it is true my own place was written in the bill of sale to C. Kanaina, the place is just mauka of the land in Kailua of Kona, Hawaii, over which there is a dispute by Kaai. That is the lot I have transmitted to him, Kanaina, but I have not seen the property Kaai has at this present time; however, I had seen my parents living on this land at the time [of] Kaahumanu I. I had gone on a tour. Houses had been built, but I have not lived there since that time to the present, nor have I seen this lot over which there is a dispute with Kaai.

C. Kanaina, relates - the witnesses for this land on which Kaai and I are working are dead; although, I had thought they (two) would be my witnesses, but today they have denied by claim to this place. It is true this place had been for their father, Keoho, where he lived until he had died and they (two) are his own children, but I am demanding according to the old bequest of Keaho to M. Kekauluohi as well as by many other statements.

Naea, sworn, I have seen Kaai's place in Keopu of Kona, Hawaii, which is a house lot.

Mauka by Mahuka's lot
South Kona by a road
Makai by Government road
Kohala by vacant lot.

Land from Keoho (his father) upon his (Keoho) death in 1833. Keoho had obtained it long ago as idle land.

Kaai has always lived there peacefully to the present time.

Now C. Kanaina has offered a protest, I do not know the reason for it.

Kioloa, sworn, all of the statements above are true. I have known in the same way. I have not known the place was for C. Kanaina. It had been for Keoho, Kaai's father and now Kaai is the true claimant of this place.

[Award 8559B; (Maui) Land Patent 8395; Polanui Lahaina; 1 ap.; 440 Acs (apana 25); Land Patent 8129; Honolua Kaanapali; 1 ap.; 3860 Acs (ahupua`a, apana 23); R.P. 7664; Pepee Wailuku (apana 22); 4 ap.; 255.70 Acres; Land Patent 8396; 1 ap.; 255.7 Acs; Kalimaohe Lahaina; 2 ap.; 4.93 Acs; (apana 24); Land Patent 8397; Kuholilea Lahaina; 2 ap.; 184. 5 Acs; (apana 26); R.P. 5637; Paunau Lahaina; 1 ap.; 2 roods 24 perkas (apana 4); R.P. 5639; Aki Lahaina; 1 ap.; 16 perkas (apana 6); no R.P.; Paeohi Lahaina; 1 ap.; 1 Ac. 52 rods; R.P. 5699; Loiniu (Luaehu Waianae) Lahaina; 2 ap.; 2.75 Acs 37 rods; Land Patent S-8597; Kaapahu Kipahulu; 1 ap.; (ahupuaa, apana 19);1480 Acres; no R.P. Ahikuli Waiehu (apana 21); Land Patents 8537; Waiehu Wailuku; Por. apana 20; .205 Ac; Land Patent 8546; Waiehu Wailuku, Portion Apana 20, .41 Ac.; Land Patent S-8654; 2 Waiehu Wailuku, Por. apana 20; 27,797 square feet;(Hawaii) R.P. 478; Pakiniiki Kau; 1 ap.; 2357 Acs; Makanaloa Hilo; 2 ap.; 7600 Acs; R.P. 7049; Honuapo Kau; 1 ap.; ahupuaa 2200 Acs; Honuaino nui; 1 ap.; 262 Acs; R.P. 7454; Kawainui iki Kona; 1 ap.; 380 Acs; R.P. 7455; Lehuula nui; 1 ap.; 290 Acs; Lehuula nui; 1 ap.; 2840 Acs; Puapuaanui Kona; 1 ap.; 370 Acs; R.P. 7680; Kahena 2 N. Kohala; 1 ap.; (ap.4); ahupuaa; Puako S. Kohala; 1 ap.; Iliaina (Ap.6); Kahaualea Puna; 1 ap.; 26,000; Keahialaka Puna; 1 ap.; 5562 Acs; Pepeekeo Hilo; Keaau Puna; 1 ap.; 64.275 Acs; Kawela Hamakua; R.P. 7434 Honuainonui N. Kona; R.P. 7456; Lanihau Nui Kona; Land Patent 8452; Waikoekoe Hamakua; no R.P.; Makapala Kohala; R.P. 7192 Makanaloa Hilo; 2 ap.; 7600 Acs; (Molokai) R.P. 7655; Waialua; R.P. 7656 Kawela; (Oahu); R.P.; 7635; Kamoku Waikiki; Land Patents 8193, 8311 & 8416; Pau Waikiki; Land Patent 8124 & 8165 (see Kapahulu award); Land Patent 8124; Kapahulu Kona; 1 ap.; 31.50 Acs; Land Patent 8165; Kapahulu Kona; 2 ap.; 2,184.44 Acs; R.P. 7652; Kalauakou Waikiki; R.P. 7531; Kaalaea Koolaupoko; R.P. 7494; Laie-wai Koolauloa; Laie-maloo Koolauloa; R.P. 5688; Pahipahialua Koolauloa; no R.P.; Kapaka Koolauloa; (Kauai) Land Patent 8173; Kalihiwai Halelea; no R.P. Manuahi Hanapepe; Land Patent 8323; Kahili Koolau; R.P. 7060; Pilaa Koolau; R.P. 7373; Waipouli Puna; See 8559 to C. Kanaina who is awarded a property at Ukumehame under 8559B; see also Award 277]

No. 9795, Kaaumaiewa

Claim Number:	**09795**		
Claimant:	**Kaaumaiewa**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Puako**		
Ili:			
Apana:		Awarded:	**1**
Loi:		FR:	

Plus:	NR:	**507v6**
Mala Taro:	FT:	**190v7**
Kula:	NT:	**70v5**
House lot:	RP:	**1763**
Kihapai/Pakanu:	Number of Royal Patents:	**1**
Salt lands:	Koele/Poalima:	**No**
Wauke:	Loko:	**No**
Olona:	Lokoia:	**No**
Noni:	Fishing Rights:	**No**
Hala:	Sea/Shore/Dunes:	**No**
Sweet Potatoes:	Auwai/Ditch:	**No**
Irish Potatoes:	Other Edifice:	**No**
Bananas:	Spring/Well:	**No**
Breadfruit:	Pigpen:	**No**
Coconut:	Road/Path:	**No**
Coffee:	Burial/Graveyard:	**No**
Oranges:	Wall/Fence:	**No**
Bitter Melon/Gourd:	Stream/Muliwai/River:	**No**
Sugar Cane:	Pali:	**No**
Tobacco:	Disease:	**No**
Koa/Kou Trees:	Claimant Died:	**No**
Other Plants:	Other Trees:	
Other Mammals: **No**	Miscellaneous:	

No. 9795, Kaaumaiewa, Lahaina
N.R. 507v6

I, Kaaumaiewa, hereby state to you that I have one mo`o and one mo`o planted in gourd. Three lo`i are mauka. These are our claims for land which are petitioned for to you.
KAAUMAIEWA

F.T. 190v7
Cl. 9795, Kumaiewa

Mumuku, sworn, I know the lands of the claimant. They are in Puako, Lahaina. There are 4 pieces.

No. 1 a house lot and 6 lois.
No. 2 is one moo of kula
No. 3 is 2 lois.
No. 4 of 1 loi.

The claimant received these lands from Kuekoa, the konohiki of Puako in 1833 and has held the same without dispute.

No. 1 is bounded:
Mauka by Waianae
Olowalu by the konohiki's land
Makai by Waianae
Kaanapali by the konohiki's land.

No. 2 is bounded:
Mauka by Paunau
Olowalu by my land
Makai by Judge Parson's land
Kaanapali by Kuokoa's land.

No. 3 is bounded:
Mauka by the konohiki land
Olowalu by Kuokoa's land
Makai by my land
Kaanapali by "Kuholilea."

No. 4 is bounded:
Mauka by Kuokoa's land
Olowalu by the creek of Kahoma
Makai by my land
Kaanapali by Kuokoa's land.

N.T. 70-72v5
No. 9795, Kumaiewa

Mumuku, sworn, He has seen Kumaiewa's 4 sections at Puako which was from Kuokoa in 1833, no one has objected. The boundaries are:

Section 1 - 6 Patches and a house.
Mauka by Waianaenui
Olowalu by konohiki
Makai by Waianae
Kaanapali by konohiki.

Section 2 - Moo.
Mauka by Paunau pasture
Olowalu by Mumuku's land
Makai by A.W. Pasana's land
Kaanapali by Kuokoa's land.

Section 3 - 2 patches.
Mauka by konohiki
Olowalu by land - Kuokoa's
Makai by Kuhohilea land
Kaanapali by Mumuku land.

Section 4 - 1 patch.
Mauka by Kuokoa's land
Olowalu by Stream
Makai by Mumuku's land
Kaanapali by Kuokoa's land.

[Award 9795; R.P. 1763; Puako Lahaina; 4 ap.; 1.06 Acs]

No. 812, Kaeo, Asa

Claim Number:	**00812*M**		
Claimant:	**Kaeo, Asa**		
Other claimant:			
Other name:			
Island:	**Maui**		
District:	**Lahaina**		
Ahupuaa:	**Puaa, Lahainalalo**		
Ili:			
Apana:	**3**	Awarded:	**1**
Loi:		FR:	
Plus:		NR:	**452v2**

Mala Taro:	FT:	**104v16**
Kula:	NT:	**104v16**
House lot:	RP:	**5563**
Kihapai/Pakanu:	Number of Royal Patents:	**1**
Salt lands:	Koele/Poalima:	**No**
Wauke:	Loko:	**No**
Olona:	Lokoia:	**No**
Noni:	Fishing Rights:	**No**
Hala:	Sea/Shore/Dunes:	**No**
Sweet Potatoes:	Auwai/Ditch:	**No**
Irish Potatoes:	Other Edifice:	**No**
Bananas:	Spring/Well:	**No**
Breadfruit:	Pigpen:	**No**
Coconut:	Road/Path:	**No**
Coffee:	Burial/Graveyard:	**No**
Oranges:	Wall/Fence:	**No**
Bitter Melon/Gourd:	Stream/Muliwai/River:	**No**
Sugar Cane:	Pali:	**No**
Tobacco:	Disease:	**No**
Koa/Kou Trees:	Claimant Died:	**No**
Other Plants:	Other Trees:	
Other Mammals: **No**	Miscellaneous:	**government road**

No. 812*M, Kaeo, Honolulu, 25 October 1847
N.R. 447-449v2

The President of the Land Commissioners and the Commissioners appointed by the Mo`i, greetings: I hereby tell you of my house lots and my claims for them.

1. House lot in Honolulu on Oahu. On the north is the lot of Kahikona, on the west is the lot of Wm. Beckley, on the south is the lot of B. Namakeha and the road. This is my lot and I occupy it, together with B. Namakeha.

2. House lot at Lahaina, Maui. The place of A. Paki is on the south and the sea is on the west. The Halekamani is on the north and the pond is on the east. This is my place, where my makuahine lived, and on her death I inherited it.

3. House lot at Lahaina, Maui, at Puaa, mauka of the church. These house lots are submitted by me at this time.

4. House lot at Punahoa, Hilo, purchased by me from Wm. Beckley. These house lots 4 & 5 were mentioned by me in my letter to the Land Commissioners last year, in 1846.

6. House lot at Lahaina, Maui, which is situated as follows: The road is on the east, the house of Pikanele on the south, and the smithy and the lot of Baea on the west, and the stream on the north. This place belonged to my makuas and I inherited it.

I am prepared to bring the witnesses for these places mentioned herein when the proper time comes.

The 6 mentioned in this letter was given by me to I.W.H. Kaunahi and all my rights and benefits were conveyed to him.
I am, with thanks,
ASA KAEO, Eleele

F.T. 201v3 [See 976 to William Beckley]

F.T. 233-234v3
Cl. 812, A. Kaeo, 1849

Z. Kaauwai, sworn, Part I. I know this house lot. It is in Apana 2 of Honolulu nui. It belonged to nobody in olden times. it being waste land, but it was taken up in 1825 by the Claimant. Naeo and [he] fenced it. He has possessed it in peace ever since and I never heard his claim disputed.

It is bounded:
Mauka by Wm Beckley's lot
On the Waikiki sides by the lot of Kahilona and the lot of Bent & Co.
Makai by Broadway Street
Ewa by Corso street. [Cross Street?]

No one lived on this lot except those who live under Kaeo.

A. Paki, sworn, I have heard the testimony of Kaauwai, and it is strictly correct.

Part II. This is a House lot at Lahaina, Maui.
Z. Kaauwai, sworn, I know this lot. The Claimant received it from his mother, and she had it from Kahikili before the year 1820. Her title nor his has ever been disputed. Some of Kaeo's people live there but they have no claim for this land. It has always had a fence around it.

It is bounded:

Mauka by a small land dividing it from the land of Kekuanaoa and the Government
Olowalu by A. Paki's lot
Makai by the sea shore
Kaanapali by Kekuanaoa's lot.

A. Paki, sworn, I know this lot and have heard the testimony of Z. Kaauwai respecting it. This testimony is correct.

Part III. House lot in Lahaina.
Z. Kaauwai, sworn, I know this lot. it is in Lahaina, mauka of the church Lot of the Protestant Mission. I first knew this lot in 1836, when it was possessed by Manono under Kaaimalolo the mother of the claimant, who made claimant her heir. Manono's title was never disputed until 1846, until that time he had it in peaceable possession. Manono entered his claim for it very early, and it was heard by Mr. Richards at Lahaina. Keaupuni is Manono's heir, he being dead at this time. He died soon after entering his claim in 1846, I think. Keaupuni is a Counter Claimant to Kaeo, Kuakamauna took possession of the lot for Keaupuni on the death of Manono and the claim stands registered in his name (See Claim 3030 to 307 and testimony taken concerning this lot).

This lot is in Puaa, Lahaina. Kaaimalelo gave this land to Manono, and that Keaupuni is Manono's heir. But I know nothing of the merits of the controversy between Kaeo and Keaupuni. I always understood that Kaaimalulo gave this lot to Manono to take care of for Keaupuni at the time of her death.

A. Paki, sworn, I know but little about this title. I cannot say with any certainty who is entitled to it.

Auwaa, sworn, I reside in Honolulu, but resided in Lahaina until 1845. I know the lot in dispute between Kaeo and Keaupuni. This witness stated nothing new or positive.

N.T. 569-572v3
No. 812, A. Kaeo, Dec. 26, 1849

Z. Kaauwai, sworn, I have seen his house lot in Honolulu here.
1. This had been an idle land; it was he who had worked on it in 1825. he enclosed it completely around the lot and has lived there to the present; no one has objected.

The boundaries are:
Mauka by Wm. Bekele's land
Waikiki by Kahikona's house lot
Makai by government road
Ewa by road leading to Mr. Palani's (French) place.

There are people living there; however, they live under Kaeo.

A. Paki, sworn, We have known similarly; no one has objected.

Section II house lot on the beach in Lahaina. Laaimalolo, his /Kaeo/ brother had given him his land in 1844. She had received it from Kahekili before the year 1820 and it has been this way; no one has

objected. The people who are living there are no claim, they live under Kaeo. It has been enclosed. The boundaries are:

Mauka by Kekuanaoa, also the government's pond
Olowalu by Paki's house lot
Makai by the beach
Kaanapali by Kekauonohi's house lot.

A. Paki, sworn, We have known in the same way; no one has objected.

Section III house lot: mauka of the church at Puaa in Lahaina. This lot has been opposed by the son of Manono, Keaupuni. I had first seen Manono living there in 1832 and he had received it from Kaaimalolo. He built a fence and he lived there to 1842. No one had objected to him to 1845 at which time he died and the land was bequested to his son, Keaupuni. Both Keaupuni and Kaeo's servants are on this land where they are quarreling one with another. Keaupuni has filed his claim as No. 307 in the name of Kuakamauna. This was done at the time Mr. Richard was alive on Maui.

I have not know the reason Kaaimalolo had given Manono land and whether it had been without cost or as a sale, perhaps. I had managed Kaaimalolo's bequest for he had told me the house lot was his and Manono was living under him and his (Kaaimalolo) son was living under Kaeo.

A. Paki, stated, "I had distinctly heard Manono, as he was preparing to leave for Kauai, say to Laaimalolo, `You may have the lot and my son shall be under you.' That is what I had heard."

Auwaa, sworn, I have seen this place over which there is a dispute. I had seen Kaaimalolo enclose this lot and Manono was living makai. When the chiefs acquired the lot, Manono asked Kaaimalolo to allow him to live there and his request was granted, but when he went to kauai, he let Kalua live there. Kaaimalolo complained to the tax assessor, but before the case could be heard, Manono died on Kauai. It was never taken before the tax assessor again. I have never known Keaupuni has an interest there; however, Kaaimalolo had specified Manono's interest there. The words are: "Puaa has that lot, the lot Manono has is the third (lot). This is all of your rights of living just as I am living."

Section V - This has been completed.

Section VI - Z. Kaauwai, sworn, I have seen this house lot in Lahaina, Maui. Kaeo had received this interest from Kaaimalolo, who had obtained it as an idle land in the year 1835, where Puaa had lived through Kaaimalolo. In the year 1834 or 1835 perhaps, Puaa died and his wife, Kamailohi, inherited his interest. In 1846 Kamailohi died and she had bequested to her brother, Hihio, and he is living there at the present time. Hihio has filed his interest as done for him by Mr. L. Lee.

Auwaa, sworn, Kaaimalolo owns all of that place, according to what I have heard and seen. Kamailohi lived under Kaaimalolo. I had seen the court hearing before Kekauluohi and Kaaimalolo had placed Hihio on this place under him because he was Hihio's guardian.

Later Kamailohi remarried to Ulunahele, then Kaaimalolo died in Hana. Hihio did not know about this. The bequest also was not known.

[Award 812; (Maui) R.P. 5563; Puaa Lahaina; 1 ap.; 1 Ac. 39 rods; (Oahu) R.P. 308; King St. Honolulu; 1 ap.; .49 Ac.]

No. 6796, Kui

Claim Number:	**06796**
Claimant:	**Kui**
Other claimant:	
Other name:	
Island:	**Maui**
District:	**Lahaina**
Ahupuaa:	**Polanui**
Ili:	

Apana:	Awarded:	**1**
Loi:	FR:	
Plus:	NR:	**424v6**
Mala Taro:	FT:	**59v7**
Kula:	NT:	
House lot:	RP:	**2728**
Kihapai/Pakanu:	Number of Royal Patents:	**1**
Salt lands:	Koele/Poalima:	**No**
Wauke:	Loko:	**No**
Olona:	Lokoia:	**No**
Noni:	Fishing Rights:	**No**
Hala:	Sea/Shore/Dunes:	**No**
Sweet Potatoes:	Auwai/Ditch:	**No**
Irish Potatoes:	Other Edifice:	**No**
Bananas:	Spring/Well:	**No**
Breadfruit:	Pigpen:	**No**
Coconut:	Road/Path:	**No**

Coffee:		Burial/Graveyard:	**No**
Oranges:		Wall/Fence:	**No**
Bitter Melon/Gourd:		Stream/Muliwai/River:	**No**
Sugar Cane:		Pali:	**No**
Tobacco:		Disease:	**No**
Koa/Kou Trees:		Claimant Died:	**No**
Other Plants:		Other Trees:	
Other Mammals:	**No**	Miscellaneous:	

Cl. 6796, Kui
F.T. 59-60v7

Kawau, sworn, I know the land of the claimant. They are in Polanui, Lahaina. It consists [of] one piece 3 lois, and some kula.

He received that land from Kealakai in the days of Hoapili and his title has never been disputed.

It is bounded:
Mauka by the land of Kukua
Olowalu by the land of Malaekahana
Makai by the poalima of Kukualohi
Kaanapali by Keaka.

[Award 6796; R.P. 2728; Polanui Lahaina; 1 ap.; 1.25 Acs; See 6781 for Native Register document]

Appendix A-2 Grant Awards

No. 309,Kekauai

Grant Number(LG)	**00309**	Source Book:	**1**
Grantee:	**Kekauai**	Acreage::	**3** Acs
Ahupua`a	**Puahoowale**	Year	
District:	**Lahaina**	Cancelled	**False**
Island	**Maui**	TMK	**2-4-6-11, 16**
Miscellaneous			

No. 309, Kekauai, Puahoowale Ahupuaa, District of Lahaina, Island of Maui, Vol. 2, pps. 246-247 [LG Reel 1, 00803-00804.tif]

No. 309
Royal Patent

Kamehameha III, By the Grace of God, King of the Hawaiian Islands, by this Royal Patent, makes known, unto all men, that he has for himself and his successors in office, this day granted and given, absolutely, in Fee Simple unto [left blank] his faithful and loyally disposed subject for the consideration of [left blank] Dollars, paid into the Royal Exchequer, all that certain piece of Land situated at [left blank] in the Island of [left blank] and described as follows:

Received of Kekauai the sum of Five Dollars for land as per Patent No. 309
Treasury Office, September 17th, 1850
For The Minister of Finance, William Jarrett

Containing [left blank] Acres, more or less, excepting and reserving to the Hawaiian Government, all mineral or metallic mines of every description.

To have and to hold the above granted Land in Fee Simple, unto the said [left blank], Heirs and Assigns forever, subject to the taxes to be from time to time imposed by the Legislative Council equally, upon all landed Property held in Fee Simple.

In Witness whereof, I have hereunto set my Hand, and caused the Great Seal of the Hawaiian Islands to be affixed, at Honolulu, this [left blank] day of [left blank], 18[left blank]

[page 247]

Helu 309
Palapala Sila Nui

Ma keia palapala sila nui ke hoike aku nei o Kamehameha III, ke Alii nui a ke Akua i kona lokomaikai i hoonoho ai maluna o ko Hawaii Pae Aina, i na kanaka a pau, i keia la, nona iho; a no kona mau hope alii, ua haawi lilo loa aku oia ma ko ano alodio ia Kekauai i kona wahi kanaka i manao pono ia ia i kela apana aina a pau e waiho la ma Puahoowale, Lahaina ma ka Mokupuni o Maui, a penei hoi ka waiho ana o na Mokuna.

E hoomaka ana ma ke kihi Akau Komohana o ua aina nei, a penei aku la
Akau 34 3/4° Hikina 1.30 Kaulahao
Hema 45 1/2° Hikina 0.26 Kaulahao
Akau 50° Hikina 0.26 Kaulahao
Akau 45 1/2° Komohana 0.30 Kaulahao
Akau 34° Hikina 4.75 Kaulahao
Akau 39° Hikina 5.13 Kaulahao i ka pahu hoailonaia [?] ma ke kii
Hema 8° Komohana 9.20 Kaulahao ma ka mokuna e mahele ana ua aina nei a hiki i ka pahu hoailonaia B. ma ke kii

Hema 82° Komohana 0.83 Kaulahao
Hema 7° Komohana 0.47 Kaulahao
Akau 80° Komohana 0.90 Kaulahao
Hema 34 3/4° Komohana 0.86 Kaulahao
Akau 60 1/2° Komohana 0.68 Kaulahao
Hema 40° Komohana 1.14 Kaulahao
Akau 51 3/4° Komohana 2.56 Kaulahao i kahi i hoomaka'i.

Ua koe ke kuleana o na kanaka

A maloko o ia mau Apana 3 eka a oi iki aku, emi iki mai paha.
Eia ke kumu o ka lilo ana; ua haawi mai oia iloko o ka waihona waiwai o ke Aupuni i na Dala he $5.00.
Aka, ua koe i ke Aupuni na mine minerala a me na mine metala a pau.

No Kekauai, ua aina la i haawiia, no na mau loa aku no, ma ke ano alodio, a no ko na mau hooilina, a me ko na waihona, ua pili nae ka auhau a ka Poe Ahaolelo e kau like ai ma na aina alodio a pau i kela manawa i keia manawa.

A i mea e ikea'i ua kau wau i ko'u inoa, a me ka sila nui o ko Hawaii Pae Aina ma Honolulu i keia la 12 o June, 1850

(Inoa) Kamehameha
(Inoa) Keoni Ana

[Land Patent Grant No. 309, Kekauai, Puahoowale Ahupuaa, District of Lahaina, Island of Maui, 3 Acres, 1850]

No. 310, Ap Jones

Grant Number(LG)	**00310**	Source Book:	**1**
Grantee:	**Ap Jones, William**	Acreage::	**3** Acs
Ahupua`a	**Puahoowale**	Year	
District:	**Lahaina**	Cancelled	**False**
Island	**Maui**	TMK	**2-4-6-16**

Miscellaneous

No. 310, Ap Jones, William, Puahoowale Ahupuaa, District of Lahaina, Island of Maui, Vol. 2, pps. 248-249 [LG Reel 1, 00805-00806.tif]

No. 310

Royal Patent

Kamehameha III, By the Grace of God, King of the Hawaiian Islands, by this Royal Patent, makes known, unto all men, that he has for himself and his successors in office, this day granted and given, absolutely, in Fee Simple unto William Ap Jones, his faithful and loyally disposed subject for the consideration of Puahoowale Fifteen Dollars, paid into the Royal Exchequer, all that certain piece of Land situated at Puahoowale Lahaina in the Island of Maui and described as follows:

Beginning a the post marked A on the plot near a spreading cactus and running
North 33 1/2° East 4.68 chains
South 6.65 chains
South 5 1/4° West 5.77 chains
North 86° West 2.22 chains
South 53 1/2° West 1.30 chains
North 8° East 9.20 chains along line of Kekauai to beginning.

The rights of Native Tenants are reserved.

Containing Three Acres, more or less, excepting and reserving to the Hawaiian Government, all mineral or metallic mines of every description.

To have and to hold the above granted Land in Fee Simple, unto the said William Ap Jones, his Hawaiian Heirs and Assigns forever, subject to the taxes to be from time to time imposed by the Legislative Council equally, upon all landed Property held in Fee Simple.

In Witness whereof, I have hereunto set my Hand, and caused the Great Seal of the Hawaiian Islands to be affixed, at Honolulu, this 12 day of September, 1850.

Received of William Ap Jones the sum of Fifteen Dollars for the above land.

Treasury Office, September 17, 1850
For The Minister of Finance, William Jarrett

[page 249]

Helu 310
Palapala Sila Nui

Ma keia palapala sila nui ke hoike aku nei o Kamehameha III, ke Alii nui a ke Akua i kona lokomaikai i hoonoho ai maluna o ko Hawaii Pae Aina, i na kanaka a pau, i keia la, nona iho; a no kona mau hope alii, ua haawi lilo loa aku oia ma ko ano alodio ia William Ap Jones i kona wahi kanaka i manao pono ia ia i kela apana aina a pau e waiho la ma Puahoowale, Lahaina ma ka Mokupuni o Maui, a penei hoi ka waiho ana o na Mokuna.

E hoomaka ma ka pahu i hoailonaia A, kokoke i kahi pa pipi kolo, a e holo
Akau 33 1/2° Hikina 4.68 Kaulahao

Hema 6.65 Kaulahao
Hema 5 1/4° Komohana 5.77 Kaulahao
Akau 86° Komohana 2.22 Kaulahao
Hema 53 1/2° Komohana 1.30 Kaulahao
Akau 8° Hikina 9.20 Kaulahao ma kahi o Kekauai a hiki i kahi i hoomaka'i.

Ua koe ke kuleana o na kanaka

A maloko o ia mau Apana 3 eka a oi iki aku, emi iki mai paha.
Eia ke kumu o ka lilo ana; ua haawi mai oia iloko o ka waihona waiwai o ke Aupuni i na Dala he $15.00.
Aka, ua koe i ke Aupuni na mine minerala a me na mine metala a pau.

No William Ap Jones, ua aina la i haawiia, no na mau loa aku no, ma ke ano alodio, a no ko na mau hooilina, a me ko na waihona, ua pili nae ka auhau a ka Poe Ahaolelo e kau like ai ma na aina alodio a pau i kela manawa i keia manawa.

A i mea e ikea'i ua kau wau i ko'u inoa, a me ka sila nui o ko Hawaii Pae Aina ma Honolulu i keia la 12 o June, 1850

(Inoa) Kamehameha
(Inoa) Keoni Ana

[Land Patent Grant No. 310, Ap Jones, William, Puahoowale Ahupuaa, District of Lahaina, Island of Maui, 3 Acres, 1850]

No. 482, Kanehoa

Grant Number(LG)	**00482**	Source Book:	**3**
Grantee:	**Kanehoa, James Y.**	Acreage::	**4.47** Acs
Ahupua`a	**Kulahuhu**		
		Year	
District:	**Lahaina**		**False**
		Cancelled	
Island	**Maui**	TMK	**2-4-6-16**

Miscellaneous

No. 482, Kanehoa, James Young, Kulahuhu, Ahupuaa, District of Lahaina, Island of Maui, Vol. 3, p. 173
[LG Reel 1, 01309-01310.tif]

Helu 482
Palapala Sila Nui

Ma keia palapala Sila Nui ke hoike aku nei o Kamehameha III, ke Alii nui a ke Akua i kona lokomaikai i hoonoho ai maluna o ko Hawaii Pae Aina, i na kanaka a pau, i keia la, nona iho, a no kona mau hope Alii, ua haawi lilo loa aku oia ma ko ano alodio ia James Young Kanehoa i kona wahi kanaka i manao pono ia ia, i kela apana aina a pau e waiho la ma Kulahuhu, Lahaina ma ka Mokupuni o Maui, a penei hoi ka waiho ana o na Mokuna.

E hoomaka ma ke kihi Komohana Hema o ua aina nei, mailaila aku ka moe ana o kahi oi o ka Hale pule o Baluina i Lahaina, Hema 1° Hikina a me kahi oi o ka hale Kula o Lahainaluna Akau 35° Hikina, a e holo ana penei
Hema 86 3/4° Hikina 3.59 Kaulahao e pili ana me Puako,
Akau 11 1/4° Hikina 3.56 Kaulahao e pili ana me Paumau,
Akau 12 1/2° Hikina 3.19 Kaulahao e pili ana me Paumau,
Akau 3 1/2° Komohana 3.68 Kaulahao e pili ana me Paumau,
Hema 88 3/4° Komohana 4.36 Kaulahao e pili ana me Paumau,
Hema 3 1/4° Komohana 3.82 Kaulahao e pili ana me Puahoawale,
Hema 1 3/4° Komohana 6.19 Kaulahao e pili ana me Puahoawale a hiki i kahi i hoomaka'i.

Ua koe ke Kuleana o na Kanaka

a maloko o ia Apana Eha 468/1210 eka a oi iki aku, emi iki mai paha.
Eia ke kumu o ka lilo ana; ua haawi mai oia iloko o ka waihona waiwai o ke Aupuni i na Dala he Iwakaluakumamalua. Aka, ua koe i ke Aupuni na mine minerala a me na mine metala a pau.

No James Y. Kanehoa, ua aina la i haawiia, no na mau loa aku no, ma ke ano alodio, a no ko na mau hooilina, a me ko na waihona, ua pili nae ka auhau a ka Poe Ahaolelo e kau like ai ma na aina alodio a pau i kela manawa i keia manawa.

A i mea e ikea'i ua kau wau i ko'u inoa, a me ka Sila Nui o ko Hawaii Pae Aina ma Honolulu i keia la 29 o Novemaba, 1850.

(Inoa) Kamehameha
(Inoa) Keoni Ana

[Insert]

Treasury Office, 17 of Dec 1850
Received of J. Y. Kanehoa the sum of Twenty two Dollars for land as per Patent No. 482 and four dollars, the fees of patenting.
For Minister of Finance, William Jarrett

[End of Insert]

[Land Patent Grant No. 482, Kanehoa, James Young, Kulahuhu, Ahupuaa, District of Lahaina, Island of Maui, 4.47 Acres, 1850]

No. 832, Antonio

Grant Number(LG)	**00832**	Source Book:	**4**
Grantee:	**Antonio, Peke**	Acreage::	**2.3** Acs
Ahupua`a	**Kapewakua**	Year	
District:	**Lahaina**	Cancelled	**False**
Island	**Maui**	TMK	**2-4-6-11, -16**

Miscellaneous

No. 832, Antonio, Peke, Kapewakua Ahupuaa, District of Lahaina, Island of Maui, Vol. 5, pps. 69-70 [LG Reel 2, 00634-00635.tif]

Helu 832
Palapala Sila Nui

Ma keia palapala sila nui ke hoike aku nei o Kamehameha III, ke Alii nui a ke Akua i kona lokomaikai i hoonoho ai maluna o ko Hawaii Pae Aina, i na kanaka a pau, i keia la, nona iho; a no kona mau hope alii, ua haawi lilo loa aku oia ma ko ano alodio ia Peke Antonio i kona wahi kanaka i manao pono ia ia i kela apana aina a pau e waiho la ma Kapewakua, Lahaina ma ka Mokupuni o Maui, a penei hoi ka waiho ana o na Mokuna.

Apana 1.
E hoomaka ana ma ke kihi Komohana Hema, a e holo ana
Akau 53 1/2° Hikina 0.37 Kaulahao e pili ana me ko Kekuanaoa
Akau 37° Hikina 1.90 Kaulahao e pili ana me ko Kekuanaoa
Akau 54° Komohana 0.35 Kaulahao e pili ana me ko Keoni Alulu
Hema 28 1/2° Komohana 2.27 Kaulahao e pili ana ala i Lahainaluna
Hema 57 1/4° Hikina 0.33 Kaulahao e pili ana me ko Kaio a hiki i kahi i hoomaka'i.
15 Roda

Apana 2
E hoomaka ana ma ke kihi Hikina Hema o ka pahale o ua Antonio Sylva nei, a e holo ana
Akau 38 3/4° Hikina 5.71 Kaulahao e pili ana me ke alanui i Lahainaluna
Akau 56 1/4° Komohana 0.45 Kaulahao e pili ana me ko Kaaiawahia
Hema 36 1/2° Komohana 1.43 Kaulahao e pili ana me ko Haui
Akau 49 1/4° Komohana 1.09 Kaulahao e pili ana me ko Haui
Akau 38 1/2° Komohana 0.77 Kaulahao e pili ana me ko Kapena
Akau 45° Hikina 2.33 Kaulahao e pili ana me ko Kapena

Akau 43 3/4° Komohana 2.60 Kaulahao e pili ana me ko Kapena
Hema 42 1/2° Komohana 2.20 Kaulahao e pili ana me ko Kamiki
Hema 36 1/4° Hikina 2.59 Kaulahao e pili ana me ko Holoauhu
Hema 53° Komohana 0.90 Kaulahao e pili ana me ko Holoauhu
Hema 32° Hikina 0.63 Kaulahao e pili ana me ko Haui
Hema 53° Komohana 0.77 Kaulahao e pili ana me ko Haui
Hema 40 3/4° Hikina 1.55 Kaulahao e pili ana me ko Haui
Hema 54 1/2° Komohana 1.96 Kaulahao e pili ana me ko Haui & Mi Sylva
Hema 37 1/2° Hikina 1.07 Kaulahao a hiki i kahi i hoomaka'i.
1 Eka 38 Roda

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Apana 3
E hoomaka ana ma ke kihi Hema, a e holo ana
Akau 48° Komohana 0.66 Kaulahao e pili ana me ko Kamiki
Akau 39° Hikina 0.44 Kaulahao e pili ana me ko Kapena
Hema 56 3/4° Hikina 0.48 Kaulahao e pili ana me ko Kapena
Hema 17 1/2° Komohana 0.51 Kaulahao e pili ana me ko Kapena a hiki i kahi i hoomaka'i.
4 Roda

Apana 4
E hoomaka ana ma ke kihi Komohana Akau, a e holo ana
Hema 47° Hikina 0.84 Kaulahao e pili ana me ka apana 2 maluna ae nei
Akau 47 1/2° Hikina 1.15 Kaulahao e pili ana me ko Kapena
Akau 41 1/2° Komohana 0.84 Kaulahao e pili ana me ko Kamiki
Hema 47° Komohana 1.23 Kaulahao a i kahi i hoomaka'i.
20 Roda

Apana 5
E hoomaka ana ma ke kihi Hikina Hema, a e holo ana
Akau 15 3/4° Hikina 1.15 Kaulahao e pili ana me ko Kekuanaoa
Akau 20° Hikina 1.69 Kaulahao e pili ana me ko Kekuanaoa
Akau 48 1/2° Komohana 0.54 Kaulahao e pili ana me ko Kekuanaoa
Hema 41 1/2° Komohana 1.41 Kaulahao e pili ana me ko Fanny
Akau 46 1/2° Komohana 2.98 Kaulahao e pili ana me ko Fanny
Hema 25° Komohana 1.95 Kaulahao e pili ana me ko Baluina
Hema 47 1/2° Hikina 1.90 Kaulahao e pili ana me ko Kamiki
Akau 62 1/4° Hikina 0.27 Kaulahao e pili ana me ko Kapena
Hema 53 1/2° Hikina 2.14 Kaulahao e pili ana me ko Kapena i kahi i hoomaka'i.
3 Ruda 11 Roda

Koe ke kuleana o na kanaka

A maloko o ia Apana 2 34/100 eka a oi iki aku, emi iki mai paha.

Eia ke kumu o ka lilo ana; ua haawi mai oia iloko o ka waihona waiwai o ke Aupuni i $1.00. Aka, ua koe i ke Aupuni na mine minerala a me na mine metala a pau.

No Peke P. Antonio, ua aina la i haawiia, no na mau loa aku no, ma ke ano alodio, a no ko na mau hooilina, a me ko na waihona, ua pili nae ka auhau a ka Poe Ahaolelo e kau like ai ma na aina alodio a pau i kela manawa i keia manawa.

A i mea e ikea'i ua kau wau i ko'u inoa, a me ka sila nui o ko Hawaii Pae Aina ma Honolulu i keia la 19 o Julai, 1852

(Inoa) Kamehameha
(Inoa) Keoni Ana

[Land Patent Grant No. 832, Antonio, Peke, Kapewakua Ahupuaa, District of Lahaina, Island of Maui, 5 Apana, 2.34 Acres, 1852]

No. 1875, Shaw

Grant Number(LG)	**01875**	Source Book:	**10**
Grantee:	**Shaw, George**	Acreage::	**1.28** Acs
Ahupua`a	**Kuholilea, Miana**	Year	
District:	**Lahaina**	Cancelled	**False**
Island	**Maui**	TMK	**4-5-07**

Miscellaneous

No. 1875, Shaw, George, Kuholilea, Miana Ahupuaa, District of Lahaina, Island of Maui, Vol. 10, pps. 151-152 [LG Reel 3, 01289-01290.tif]

Helu 1875
Palapala Sila Nui

Ma keia palapala sila nui ke hoike aku nei o Kamehameha IV, ke Alii nui a ke Akua i kona lokomaikai i hoonoho ai maluna o ko Hawaii Pae Aina, i na kanaka a pau, i keia la, nona iho; a no kona mau hope alii, ua haawi lilo loa aku oia ma ko ano alodio ia George Shaw i kona wahi kanaka i manao pono ia ia i kela apana aina a pau e waiho la ma Kuholilea, Miana, Lahaina ma ka Mokupuni o Maui, a penei hoi ka waiho ana o na Mokuna,

E hoomaka ana ma ke kumu ulu i ke kihi Hema, Hema o keia aina, alaila ma ko Goerge Shaw ma Maunahina
Akau 44 1/2° Hikina 2.09 Kaulahao alaila ma Kuholilea nui
Akau 24° Hikina 1.89 Kaulahao

Akau 29 1/2° Komohana 0.24 Kaulahao
Akau 43 1/2° Hikina 2.22 Kaulahao
Akau 17 1/2° Hikina 0.87 Kaulahao alaila ma Kuholilea o Mark Robinson
Akau 38° Hikina 1.68 Kaulahao alaila ma Kuhua
Akau 52 1/2° Hikina 1.12 Kaulahao
Hema 32° Hikina .86 Kaulahao
Hema 411/2° Komohana 2.41 Kaulahao
Hema 51 1/2° Komohana 1.56 Kaulahao
Hema 33 1/2° Hikina .22 Kaulahao
Akau 50° Hikina 1 Kaulahao
Hema 27° Hikina 1.72 Kaulahao
Hema 70° Komohana .84 Kaulahao
Hema 48° Komohana 1.76 Kaulahao
Hema 40° Komohana 1 Kaulahao
Hema 19° Komohana 1.46 Kaulahao hiki i ke kihi mua.

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A maloko o ia Apana 1.28 eka a oi iki aku, emi iki mai paha.
Eia ke kumu o ka lilo ana; ua haawi mai oia iloko o ka waihona waiwai o ke Aupuni i na dala he $32.00. Aka, ua koe i ke Aupuni na mine minerale a me na mine metala a pau.

No George Shaw, ua aina la i haawiia, no na mau loa aku no, ma ke ano alodio, a no kona mau hooilino, a me kona waihona, ua pili nae ka auhau a ka Poe Ahaolelo e kau like ai ma na aina alodio a pau i kela manawa i keia manawa.

A i mea e ikea'i ua kau wau i ko'u inoa, a me ka Sila Nui o ko Hawaii Pae Aina ma Honolulu i keia la 22 o Okatoba, 1855.

Kamehameha

[Land Patent Grant No. 1875, Shaw, George, Kuholilea, Miana Ahupuaa, District of Lahaina, Island of Maui, 1.28 Acres, 1855]

No. 4683, Isenberg

Grant Number(LG)	**4683**	Source Book:	**23**
Grantee:	**Isenberg, H.A.**	Acreage::	**0.5** Ac.
Ahupua`a	**Wainee**		
		Year	
District:	**Lahaina**		**False**
		Cancelled	
Island	**Maui**	TMK	**Reel 9,**

Miscellaneous

No. 4683, Isenberg, H.A., Wainee Ili, Ahupuaa, District of Lahaina, Island of Maui, Volume 22, pps. 205-207 [Reel 9, 01242-01244.tif]

Land Patent No. 4683
(Grant)

On Cash Purchase

By this Patent the Governor of the Territory of Hawaii, in conformity with the laws of the United States of America and of the Territory of Hawaii, makes known to all men that he has this day granted and confirmed unto H. A. Isenberg, for the consideration of Thirty Two 00/100 Dollars, $32 00/100 paid into the Treasury. And in conformity with section 17 of Part IV of the Land Act of 1895. all of the land situate at Wainee in the District of Lahaina, Island of Maui bounded and described as follows:

Sold at Public Auction September 13th 1902. Lot 8
Beginning at a point which is the West corner of this piece, and the North corner of L.C.A. 484, 3. Kaiheekai as shown on Government Survey Registered Map No. 1262, and running by true bearings
1. North 70° 20' East 266.5 feet along L.C.A. 6787 Hanaumua
2. South 42° 40' East 55.0 feet L.C.A. 4818, Poopuu;
3. South 59° 00' West 285.0 feet along L.C.A. 6785 Kaluahinenui;
4. North 24° 00' West 107.5 feet along L.C.A. 484, 3. Kaiheekai to initiated point. Area 50/100 Acre.

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[Diagram]

6787 Hanaumua, 4818 Poopuu, 6785 Kaluahinenui, 484-3 Kaiheekai, Lot 8 .50 Acres

Scale 200 feet = 1 Inch

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Containing 50/100 Acres, more or less.

To Have and to Hold the above granted Land unto the said H. A. Isenberg and his heirs and assigns forever.

In Witness whereof, The Governor of the Territory of Hawaii has hereto set his hand and caused the Great Seal of the Territory to be hereunto affixed, this 25th day of Feberuary, A.D. 1903.

(Great Seal)

By the Governor, (Signed) Sanford B. Dole
Commissioner of Public Lands, (Signed) Edward S. Boyd

[Land Patent Grant No. 4683, Isenberg, H.A., Wainee,Ahupuaa, District of Lahaina, Island of Maui, .50 Acre, 1903]

Appendix B Stratigraphic Summaries of the Remaining Backhoe Trenches at Area 1-Area 3

Appendix B-1 Area 1

The eight remaining trenches of the 13 trenches excavated in Area 1 within portion of the project corridor traverses a relatively urban area in Lahaina at the northern portion of the project area are presented here in Appendix B-1.

Table 34. Summary of the remaining eight backhoe trenches excavated in Area 1

Trench	Wall Profile	Stratum	Depth (cmbs)	Stratigraphic Descriptions	Cultural materials
2	South	IA	0-60	Fill Horizon; 7.5 YR 4/4, Brown; clay, strong, medium, blocky structure; firm moist consistency; plastic; weak; terrigenous clear smooth lower boundary; few fine roots; contains driscol pipe; 4-6% subangular basalt boulder and cobble inclusions.	Modern or late-historic refuse, driscol pipe.
		IB	55-165	Ap Horizon; 7.5 YR4/3, Brown; clay, strong, medium, blocky structure; firm moist consistency; plastic; weak; terrigenous clear smooth lower boundary; roots; contains metal; 2-3% subangular basalt cobble inclusions.	Historic metal
		II	160-220	Weak B Horizon; 7.5 YR 3/3, dark brown; clay, strong, medium, blocky structure; firm moist consistency; plastic; weak; terrigenous clear smooth lower boundary; no observed roots; no inclusions observed.	None
		III	220-275	B Horizon; 2.5 YR 4/2, very dark grayish brown; silt, single-grain loose moist consistency; non-plastic; weak; terrigenous not visible no roots observed; no inclusions.	None
3	East	IA	0-90	Fill Horizon; 10 YR 4/4, dark yellowish brown; clay, strong, medium, blocky structure; firm moist consistency; plastic; weak; terrigenous clear smooth lower boundary; many fine roots; concrete, rebar, and driscol pipe fragments. 5-8% rounded basalt boulder, cobble, and pebble inclusions.	Historic materials; concrete, rebar and pipe fragments
		IB	90-135	Other Horizon; 10 YR 2/1, black; ash, single-grain loose moist consistency; non-plastic; weak; terrigenous not visible deposition accumulated in setting ponds. few fine roots; none observed deposit likely resulted from cane ash/field burning activities	None
6	West	IA	0-40	Fill Horizon; 10 YR 4/2, dark grayish brown; very gravelly silt clay, strong, medium, blocky structure; plastic; weak; mixed clear smooth lower boundary; many fine roots; historic mix; 40-50% gravel inclusions.	Historic materials
		IB	35-80	Fill Horizon; 10 YR 2/1, dark yellowish brown; clay, strong, medium, blocky structure; plastic; weak; terrigenous clear smooth lower boundary; few fine roots; historic mix. PVC and driscol pipe fragments; 3-5% subangular basalt cobble inclusions.	Historic materials; PVC and driscoal pipe fragments

Trench	Wall Profile	Stratum	Depth (cmbs)	Stratigraphic Descriptions	Cultural materials
		IC	80-230	Other Horizon; 10 YR 2/1, black; ash, single-grain non-plastic; weak; terrigenous not visible deposition accumulated in settling ponds. no observed roots; deposit likely resulted from cane ash/field burning activites	None
7	North	IA	0-75	Fill Horizon; 10 YR 4/3, brown; cobbly clay loam, strong, medium, blocky structure; firm moist consistency; plastic; weak; mixed clear smooth lower boundary; many fine roots; contains a sheet of black plastic seperates Ia and Ib. 1/2" pvc pipe , 24" metal pipe. Driscol pipe. General Observations; 15-20% water rounded basalt boulders, cobble, and pebble inclusions	Historic materials; sheet of blsck plastic, 1/2" PVC pipe and 24" metal pipe (SIHP - 6776C)
		IB	70-175	Fill Horizon; 7.5 YR 3/4, dark brown; mottled with 5 YR 3/4 dark reddish brown; clay, strong, medium, blocky structure; firm moist consistency; plastic; weak; terrigenous clear wavy lower boundary; no roots observed; 1/2" pvc pipe, 24" metal pipe, driscol pipe. 3.5 % subangular rounded boulders and cobbles	Historic materials; 1/2" pvc pipe, 24" metal pipe, driscol pipe
		II	50-135	B Horizon; Field Moisture; moist; Munsell Matrix 5 YR 4/4, dark reddish brown; clay, strong, medium, blocky structure; firm moist consistency; plastic; weak; terrigenous not visible no roots observed; no incluions in matrix	None
9	East	IA	0-100	Fill Horizon; 10 YR 5/2, grayish brown; very gravelly loamy sand, single-grain loose moist consistency; non-plastic; weak; mixed clear smooth lower boundary; no observed roots; mixed historic; 70-75% gravel inclusions.	Historic materials
		IB	100-130	Fill Horizon; 10 YR 3/2, very dark grayish brown; very gravelly loamy sand, strong, fine, granular structure; very friable moist consistency; non-plastic; weak; mixed clear smooth lower boundary; few fine roots; mixed historic; 30-40% gravel inclusions.	Historic materials
		IC	100-150	Fill Horizon; 10 YR 7/3, very pale brown; sand, single-grain loose moist consistency; non-plastic; weak; marine clear smooth lower boundary; no observed roots; mixed historic; General Observations; no inclusions noted in matrix	Late historic materials
		ID	100-210	Fill Horizon; 10 YR 3/2, very dark grayish brown; mottled with 10 YR 7/3 very pale brown; Size medium to coarse grain;very cobbly loamy sand, strong, fine, granular structure; friable moist consistency; non-plastic; mixed not visible few fine roots; mixed historic (metal and glass shropnel); terminated at bedrock; 35-45% boulder, cobble and pebble inclusions.	Historic metal fragments and glass shards.
10	South	IA	0-50	Fill Horizon; 10 YR 5/2, grayish brown;extremely gravelly sandy loam, single-grain loose moist consistency; non-plastic; weak; mixed clear smooth lower boundary; no roots observed; observed 70-75% gravel inclusions	None

Trench	Wall Profile	Stratum	Depth (cmbs)	Stratigraphic Descriptions	Cultural materials
		IB	50-110	Fill Horizon; Field Moisture; moist; Munsell Matrix 5 YR 3/4, dark reddish brown;gravelly silty clay, strong, fine, granular structure; very friable moist consistency; non-plastic; weak; terrigenous clear smooth lower boundary; no observed roots; contains metal, pvc pipe; 20-30% gravel inclusions	Historic metal and PVC pipe
		IC	135-170	Fill Horizon; Field Moisture; moist; Munsell Matrix 10 YR 7/3, very pale brown; sand, single-grain friable moist consistency; non-plastic; weak; marine clear smooth lower boundary; no roots observed; no inclusions	None
		ID	90-130	Fill Horizon; 7 YR 4/3, brown; very gravelly sandy clay, strong, very fine, granular structure; weak; mixed smooth lower boundary; no roots observed; observed 30-40% gravel inclusions	None
		IE	130-190	Fill Horizon; 10 YR 3/2, very dark grayish brown;very cobbly clay loam, strong, very fine, granular structure; very friable moist consistency; weak; mixed smooth lower boundary; no roots observed; concrete chunks 30-40% waterworn boulder, cobble, and pebble inclusions	None
12	South	I	0-60	Fill Horizon; 7.5 YR 4/4, brown;extremely gravelly silty clay; single-grain very hard dry consistency; very ferm moist consistency; slightly sticky and slightly plastic; weak; mixed clear smooth lower boundary; no roots observed; observed 65-75% gravel inclusions, contains some historic material remains include concrete fragment, metal fragments, crushed aluminum pipe, wire and black irregation hoses.	Historic materials
21	East	I	0-100	Fill Horizon; 10 YR 4/3, brown; silty clay, moderate, fine, prismatic structure; massive hard dry consistency; firm moist consistency; sticky wet consistency; plastic; weak; terrigenous abrupt smooth lower boundary; few fine roots; contains historic material; 15-20% of inclusions , waterworn cobbles, pebbles and boulders	Historic materials
		II	95-125	A Horizon; 7.5 YR 2.5/2, very dark brown; silty clay, moderate, fine/medium, prismatic structure; massive weakly coherent dry consistency; friable moist consistency; slightly sticky wet consistency; slightly plastic; terrigenous abrupt wavy lower boundary; no roots observed; this deposit is fine to medium and no inclusions. Probably interface between fill and original surface.	None
		III	120-290	A Horizon; 2.5 YR 4/3, olive brown; silty sand, weak, fine/medium, granular structure; single-grain weakly coherent dry consistency; very friable moist consistency; non-sticky wet consistency; non-plastic; weak; terrigenous not visible no roots observed; this deposit is fine to medium and no inclusions. Terminated due to bedrock at base of trench.	None

Appendix B-2 Area 2

The five remaining trenches of the seven excavated in Area 2 within portion of the project corridor between Dickenson and Shaw Streets are presented here in Appendix B-2.

Table 35. Summary of the five remaining backhoe trenches excavated in Area 2

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
16	South face wall	I	0-110	A Horizon; 5 YR 4/4, reddish brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; few fine roots; black irrigation tubing; plow zone	Historic black irrigation tubing.
		II	165-175	A Horizon; 5 YR 3/4, dark reddish brown; clay loam, moderate, medium, blocky structure; hard dry consistency; very firm moist consistency; sticky wet consistency; weak; terrigenous diffuse smooth lower boundary; few fine roots; clay loam with small pebbles of decomposing gravel.	None
		III	165-175	A Horizon; 5 YR 3/4, dark reddish brown; clay loam, moderate, medium, blocky structure; hard dry consistency; sticky wet consistency; plastic; weak; terrigenous not visible; no roots observed; clay loam with small pebbles of gray basalt decomposing gravel.	None
18	South face wall	I	0-90	A Horizon; 5 YR 4/4, reddish brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; few fine roots; contains black irrigation tubing; plow zone	Historic black irrigation tobing.
		II	90-140	A Horizon; 5 YR 3/3, dark reddish brown; clay loam, moderate, medium, blocky structure; hard dry consistency; very firm moist consistency; sticky wet consistency; plastic; weak; terrigenous diffuse smooth lower boundary; no roots observed; clay loam containing random bits of basalt gravel	None
		III	140-180	A Horizon; 5 YR 3/4, dark reddish brown; clay loam, moderate, medium, blocky structure; hard dry consistency; very firm moist consistency; sticky wet consistency; plastic; weak; errigenous not visible no roots observed; clay loam	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
				containing random bits of basalt gravel	
28	East face wall	I	0-35	A Horizon; 10 YR 5/3, brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; clear smooth lower boundary; few fine roots;	No cultural materials
		II	30-60	A Horizon; 10 YR 6/3, pale brown; sandy loam, medium, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; clear smooth lower boundary; few fine roots	No cultural materials
		III	50-110	A Horizon; 7.5 YR 4/2, brown;basalt sand/silt loam, medium, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear smooth lower boundary; basalt sand mixed with silt loam	No cultural materials
		IV	90-155	A Horizon; 7.5 YR 4/4, brown; clay loam, strong, fine, blocky structure; hard dry consistency; sticky wet consistency; plastic; strong; terrigenous clear smooth lower boundary; no roots observed; none band of clay loam bedded between silt loam strats	No cultural materials
		V	145-175	A Horizon; 7.5 YR 3/3, dark brown; silt loam, weak, medium, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; terrigenous clear smooth lower boundary; no roots observed;	No cultural materials.
		VI	170-185	A Horizon; 7.5 4/1, dark gray; silt loam, weak, medium, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; terrigenous not visible; no roots observed.	No cultural materials
29	East face wall	I	0-15	A Horizon; 10 YR 5/3, brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; common fine roots.	No cultural materials
		II	15-35	A Horizon; 10 YR 6/3, pale brown;sandy loam, medium, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; common fine roots.	No cultural materials
		III	30-90	A Horizon; 7.5 YR 4/2, brown;basalt sand/silt loam, medium, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
				plastic; weak; terrigenous abrupt smooth lower boundary; few fine roots;	
		IV	80-160	a Horizon; 7.5 YR 4/4, brown;clay loam, strong, fine, blocky structure; hard dry consistency; sticky wet consistency; plastic; strong; terrigenous abrupt smooth lower boundary; no roots observed.	No cultural materials
30	South face wall	I	0-45	A Horizon; 7.5 YR 3/3, dark brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; common fine roots; plow zone	No cultural materials
		II	40-85	A Horizon; 10 YR 5/6, Yellow brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; common fine roots.	No cultural materials
		III	75-145	A Horizon; 10 YR 4/4, darky yellow brown; mottled with 7.5 YR 4/4 brown; silt loam, moderate, fine, crumb structure; slightly hard dry consistency; non-sticky wet consistency; non-plastic; strong; terrigenous not visible no roots observed; powderly silt loam	No cultural materials
82	North face wall	Ia	0-30	Fill Horizon; 5 YR 4/4, reddish brown; compacted silt, moderate/strong, very fine to Fine, granular and crumb structure; firm moist consistency; slightly plastic; very abrupt and smooth lower boundary; roots; few, very fine to fine; This is fill layer above road bed;	No cultural materials
		Ib	30-55	Road bed; n/n, gravel, strong; n/a, n/a structure; extra hard dry consistency; non-plastic; very abrupt, smooth lower boundary; roots, none observed; gravel road bed c. 25cm thick.	No cultural materials
		II	55-250	2.5 YR 3/4, dark reddish brown; silt, moderate, very fine to fine, granular, crumb structure; friable moist consistency; slightly plastic; not visible; roots, none observed; uniform sterile silt; more than 5% inclusions.	No cultural materials
83	North face wall	Ia	0-50	A Horizon; 5 YR 3/3, dark reddish brown; loamy silt, weak to moderate, fine, crumb structure; very friable moist consistency; slightly plastic; clear smooth lower boundary; roots, common and fine.	No cultural materials
		Ib	50-230	B Horizon; 2.5 YR 3/4, dark reddish brown; silt, moderate, very fine to fine, granular and crumb structure; friable moist consistency; slightly plastic; not	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
				visible lower boundary; roots, few, very fine to fine,	
85	North face wall	Ia	0-20	Asphalt & Concrete; n/a, concrete and asphalt; strong, n/a, n/a structure; very abrupt lower boundary; roots, none observed.	No cultural materials
		Ib	20-50	Fill Horizon; compacted silt; moderate to strong, very fine to fine, granular, crumbs structure; firm moist consistency; slightly plastic; very abrupt lower boundary; roots; none observed.	No cultural materials
		Ic	50-55	Asphalt; n/a, asphalt, strong, n/a, n/a structure; very abrupt lower boundary; roots, none observed.	No cultural materials
		II	55-200	B Horizon; 5 YR 3/4, dark reddish brown; silt, moderate, very fine to fine, granular and crumb structure; friable moist consistency; slightly plastic; not visible lower boundary. Roots, none observed; sterile silt; more than5% inclusions.	No cultural materials

Appendix B-3 Area 3

The 30 remaining trenches of the 37 excavated in Area 3 within portion of the project corridor from Shaw St. near the Lahaina Recreation Center Park to the southern terminus of the corridor where it connects with Front St are presented here in Appendix B-3.

Table 36. Summary of the remaining 30 backhoe trenches excavated in Area 3

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
42	South face wall	I	0-60	A Horizon 7.5 YR 4/3, brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear wavy lower boundary; common fine roots; plow zone.	No cultural materials.
		II	40-90	A Horizon; 7.5 YR 5/2, brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous; lower boundary not visible; common fine roots; more than 75% basalt cobbles and boulders.	No cultural materials.
44	South face wall	I	0-80	A Horizon; 7.5 YR 3/3, dark brown; silt loam, weak, medium, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; common roots; black irrigation tubing; plow zone	Historic irrigation tubing
		II	60-90	A Horizon; 5 YR 5/1, gray; basalt sand, coarse, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; common roots; gray gravel/ basalt sand mixture	No cultural materials
		III	70-125	A Horizon; 5 YR 5/3, reddish brown; silt loam, moderate, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; few roots	No cultural materials.
		IV	105-155	A Horizon; 7.5 YR 4/3, brown; basalt sand/silt loam, coarse, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; no roots observed	No cultural materials.

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
		V	140-175	A Horizon; Field Moisture; dry; Munsell Matrix 10 YR 5/4, yellowish brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous not visible lower boundary; no roots observed; decomposing silt loam; 40% basalt cobbles and boulders.	No cultural materials
45	South face wall	I	0-110	A Horizon; 7.5 YR 3/3, dark brown; silt loam, moderate, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; common fine roots; black irrigation tubing; plow zone	Historic irrigation tubing
		II	90-140	A Horizon; 7.5 YR 5/3, brown; basalt sand/silt loam, strong, coarse, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous not visible few fine roots; basalt boulders and cobbles are 75% of strat II matrix	No cultural material
46		I	0-100	A Horizon; 7.5 YR 3/4, dark brown; silt loam, weak, fine, crumb structure; slightly hard dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt lower boundary; common fine roots; black irrigation tubing; plow zone.	Historic irrigation tubing
		II	80-145	A Horizon; 7.5 YR 5/2, brown; basalt sand-silt loam, weak, coarse, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous not visible lower boundary; few fine roots; basalt cobbles and boulders 75%	No cultural materials
47	North face wall	I	0-35	A Horizon; 7.5 YR 4/6, strong brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; common roots; Cultural Material; black irrigation tubing; plow zone	Black irrigation tubing
		II	30-140	A Horizon; 7.5 YR 5/2, brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear smooth lower boundary; few roots; silt loam cleared of field stone	No cultural materials
		III	105-115	A Horizon; 7.5 YR 4/1, dark gray; basalt sand -silt loam, coarse, granular	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
				structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear smooth lower boundary; no observed roots; no observed layer of basalt sand, basalt pebbles and silt loam	
		IV	100-150	A Horizon; 7.5 YR 6/4, light brown; weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous not visible lower boundary no roots observed; powdery silt loam with basalt cobbles and boulders 75% of ground mass.	No cultural materials
48	East face wall	I	0-45	A Horizon; 7.5 YR 6/6, reddish yellow; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; few fine roots; black irrigation tubing; reddish plow zone soil	No cultural materials
		II	40-70	A Horizon; 7.5 YR 5/6, strong brown; basalt sand, coarse, granular structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; few fine roots; basalt sand with 40% cobbles and pebbles.	No cultural materials
		Stratum III	70-110	A Horizon; 7.5 YR 4/4, brown; silt loam, medium, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; no roots observed; silt loam with 50% cobbles and pebbles	No cultural materials
		IV	100-120	A Horizon; 7.5 YR 4/1, dark gray; basalt sand, coarse, granular structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous not visible lower boundary; no observed roots; basalt sand with 70% basalt boulders and cobbles.	No cultural materials
50	West face wall	I	0-65	A Horizon; 7.5 YR 3/3, dark brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear smooth lower boundary; few very fine roots; plow zone with very few basalt pebbles	No cultural materials
		II	65-135	A Horizon; 5 YR 4/6, yellowish red; basalt sand, coarse, granular structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak;	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
				terrigenous clear wavy lower boundary; few very fine roots; basalt sand mixed with basalt cobbles and boulders make up 70% of matrix.	
		III	110-180	A Horizon; 10 YR 4/6, dark yellow brown; silt loam, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous not visible lower boundary; no observed roots; powdery silt loam and basalt boulders 70% of matrix.	No cultural materials
51	South face wall	I	0-75	A Horizon; 7.5 YR 3/4, silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear smooth lower boundary; common roots; black irrigation tubing; plow zone	Black irrigation tubing
		II	75-100	A Horizon; 5 YR 5/6, silt loam, weak, fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; few roots; silt loam	No cultural materials
		III	100-150	A Horizon; 7.5 YR 6/3, silt loam/ basalt sand, weak, fine, granular structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; no roots observed; silt loam mixed with basalt sand.	No cultural materials
		IV	135-180	A Horizon; 7.5 YR 6/2, coarse basalt sand, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; no roots observed; basalt sand	No cultural materials.
		V	180-190	A Horizon; 7.5 YR 6/6, silt loam, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous not visible lower boundary; no roots observed; powdery silt loam	No cultural materials
52	East face wall	I	0-100	A Horizon; 7.5 YR 4/3, brown; silt loam, weak, medium, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; terrigenous abrupt smooth lower boundary; no roots observed; plow zone	No cultural materials
		II	70-115	A Horizon; 7.5 YR 5/3, brown; silt loam/basalt sand, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; terrigenous abrupt smooth lower boundary; no roots observed; silt mixed	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
				with basalt sand	
		III	100-120	A Horizon; 7.5 YR 5/3, brown; basalt sand-pebbles, coarse, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; terrigenous not known; no roots observed; basalt sand containing pebbles	No cultural materials
		IV	120-160	A Horizon; 7.5 YR 6/3, light brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; common roots; silt loam	No cultural materials
		V	135-150	A Horizon; 7.5 YR 5/3, brown; coarse, granular structure; single-grain loose dry consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; few roots; basalt pebbles in basalt sand	No cultural materials
		VI	150-170	A Horizon; 7.5 YR 6/3, light brown; weak, fine, crumb structure; loose dry consistency; loose moist consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; few roots; silt loam mixed with basalt sand-pebbles and cobbles	No cultural materials
53		I	0-60	Other Horizon; 7.5 YR 4/4, brown; silt loam, weak, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear smooth lower boundary; common fine roots; black drip irrigation plantation tubing commercial sugar cultivation; plow zone	Black irrigation tubing
		II	60-160	Other Horizon; 7.5 YR 4/4, brown; silt loam, weak, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous unknown/not visible lower boundary; few fine roots; 70% basalt cobble and boulder inclusions	No cultural materials
54	South face wall	I	0-40	Other Horizon; 7.5 YR 5/4, Brown; silt loam, weak, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous very abrupt wavy lower boundary; few fine roots; commercial sugar cultivation layer	No cultural materials
		II	40-185	Other Horizon; 7.5 YR 5/4, brown; silt loam, weak, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic;	Black irrigation tubing

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
				weak; terrigenous very abrupt wavy lower boundary; few fine roots; black plantation irrigation tubing; possible stream wash erosion event	
55	South face wall	I	0-130	5 YR 4/2, dark reddish gray; silt loam, weak, fine, crumb structure; non-sticky wet consistency; weak; terrigenous clear smooth lower boundary; commercial sugar soil plow zone	No cultural materials
		II	130-170	5 YR 4/3, reddish brown; sand, coarse, granular structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; roots; basalt boulders mixed with basalt "sand" granuals not sorted -stream wash event.	No cultural materials
		III	170-185	2 Y 4/2, dark grayish brown; gravel, coarse, granular structure; loose dry consistency; non-sticky wet consistency; non-plastic; none; terrigenous unknown; rock gravel and cobbles- not sorted potential stream bed	No cultural materials
57	North face wall	I	0-60	A Horizon; 7.5 YR 3/2, dark brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; terrigenous abrupt smooth lower boundary; common fine roots; only irrigation drip flex-tubing	Irrigation drip tubing
		II	20-110	A Horizon; 10 YR 5/2, grayish brown; basalt sand, single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous unknown; few fine roots; 40% basalt cobble and boulder inclusions	
		III	100-140	A Horizon; 10 YR 6/4, light yellowish brown; sand, single-grain weakly coherent dry consistency; non-plastic; weak; terrigenous; no roots observed; 80% basalt cobble and boulder inclusions	No cultural materials
58	North face wall	I	0-90	7.5 YR 3/4, silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; terrigenous clear smooth lower boundary; roots; contains plastic irrigation tubing-flexible	Plastic irrigation tubing
		II	90-135	7.5 YR 3/4, sand, fine, single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; clear and wavy lower boundary; strean wash event basalt cobbles and pebbles.	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
		III	135-140	7.5 YR 5/3, sand, medium, granular structure; loose dry consistency; non-sticky wet consistency; non-plastic; clear and smooth lower boundary; bedding basalt sand and marine sand	No cultural materials
		IV	140-160	10 YR 6/4, sandy loam, moderate, medium, granular structure; slightly hard dry consistency; non-sticky wet consistency; non-plastic; weak; smooth lower boundary; no roots observed; bedding basalt sand/marine sand decomposing / lateritic sand	No cultural materials
59	North face wall	I	0-90	Other Horizon; 7.5 YR 3/3, dark brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear and wavy lower boundary; common fine roots; commercial sugar cultivation	No cultural materials
		II	55-155	Other Horizon; 7.5 YR 4/4, brown; basalt cobbles and basalt sand and marine sand, moderate, medium, granular structure; single-grain weakly coherent dry consistency; non-sticky wet consistency; non-plastic; weak; abrupt and irregular lower boundary; few fine roots; stream wash event	No cultural materials
		III	125-185	other Horizon; 10 YR 4/3, brown; basalt sand and marine sand, moderate, medium, granular structure; single-grain slightly hard dry consistency; non-sticky wet consistency; non-plastic; weak; mixed diffuse irregular lower boundary; no roots observed; sediment bedding	No cultural materials
60	North face wall	I	0-60	A Horizon; 7.5 YR 3/2, dark brown; silt loam, weak, fine, crumb structure; weakly coherent dry consistency; non-sticky wet consistency; non-plastic; terrigenous clear and wavy lower boundary; few very fine roots; black plastic drip irrigation line-flexible; plow zone	Black plastic irrigation tubing
		II	70-120	A Horizon; 7.5 YR 5/3, Brown; sandy loam, moderate, medium, granular structure; fine hard dry consistency; non-sticky wet consistency; non-plastic; terrigenous clear wavy lower boundary; few very fine roots; mixture of basalt sand and basalt pebbles and cobbles.	No cultural materials
		III	90-120	A Horizon; 7.5 YR 5/4, brown; basalt sand and silt loam fine, moderate, medium, granular structure; single-grain hard dry consistency; non-sticky	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
				wet consistency; non-plastic; terrigenous very abrupt smooth lower boundary; no roots observed; mixture of basalt sand and silt loam	
		IV	110-120	A Horizon; 10 YR 4/3, brown; basalt sand, moderate, granular structure; single-grain slightly hard dry consistency; non-sticky wet consistency; non-plastic; weak; no roots observed; basalt sand with basalt pebbles	No cultural materials
63	West face wall	I	0-70	A Horizon; 7.5 YR 3/2, dark brown; silt loam, weak, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear wavy lower boundary; common roots; plantation irrigation black plastic tubing; plow zone	Black plastic irrigation tubing
		II	70-110	A Horizon; 7.5 YR 4/4, brown; basalt sand, moderate, medium, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous very abrupt wavy lower boundary; few roots; basalt sand	No cultural materials
		III	110-160	A Horizon; 7.5 YR 3/2, dark brown; silty loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; no roots observed; silt loam mixed with large basalt boulders	No cultural materials
		IV	160-190	A Horizon; 10 YR 4/4, dark yellowish brown; silt loam, weak, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous; none observed lower boundary; decomposing field silt loam (laterite)	No cultural materials
64	South face wall	I	0-70	A Horizon; 7.5 YR 4/2, brown; silt loam, weak, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear smooth lower boundary; common fine roots; tubing for irrigation; plow zone	Black irrigation tubing
		II	70-85	A Horizon; 7.5 YR4/2, brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear smooth lower boundary; few fine roots; thin layer of silt loam containing 40% basalt pebbles and cobbles.	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
		III	85-120	A Horizon; 7.5 YR 4/2, brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear smooth lower boundary; no roots observed	No cultural materials
		IV	120-130	A Horizon; 7.5 YR 4/2, brown; basalt sand, weak, coarse, granular structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear smooth lower boundary; basalt sand, basalt pebbles, and cobbles in a thin layer.	No cultural materials
		V	130-190	A Horizon; 10 YR 5/4, yellowish brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear smooth lower boundary; no roots observed; compacted silt loam	No cultural materials
		VI	190-205	A Horizon; 10 YR 6/4, light yellowish brown; weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous not known; no roots observed; powdery solid oxidized silt loam	No cultural materials
65	East face wall	I	0-80	A Horizon; 7.5 YR 3/2, dark brown; silt loam, weak, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear wavy lower boundary; common fine roots; black plastic irrigation tubing; plow zone with 10% cobbles.	Black plastic irrigation tubing
		II	80-130	A Horizon; 7.5 YR 4/3, brown; basalt sand, moderate, coarse, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear wavy lower boundary; few fine roots; basalt sand-basalt cobbles 10% of matrix	No cultural materials
		III	130-170	A Horizon; 7.5 YR 5/4, brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous; no roots observed; basalt boulders and cobbles make up over 50% of matrix	No cultural materials
		IV	165-180	A Horizon; 10 YR 6/4, light yellowish brown; silt loam, weak, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous; no roots observed; oxidized silt loam slightly	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
				powdery	
66	East face wall	I	0-110	A Horizon; 7.5 YR 3/3, dark brown; silt loam, weak, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear wavy lower boundary; few very fine roots; black flexible irrigation tubing; plow zone -cobbles less than 5% of matrix	Black irrigation tubing
		II	110-140	A Horizon; 7.5 YR 5/3, brown; basalt sand, moderate, coarse, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear wavy lower boundary; no roots observed; basalt sand layer; cobbles are 10% of sediment	No cultural materials
		III	140-155	A Horizon; 7.5 YR 6/3, light brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous; no roots observed	No cultural materials
		IV	150-165	A Horizon; 10 YR 3/2, very dark grayish brown; weak, coarse, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous very abrupt smooth lower boundary; no roots observed; black basalt sand with 70% basalt pebbles and cobbles	No cultural materials
		V	155-170	A Horizon; 10 YR 4/4, dark yellowish brown; weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous; no roots observed; oxidized silt loam	No cultural materials
67	South face wall	I	0-60	A Horizon; 7.5 YR 4/3, brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; common fine roots; black irrigation tubing; plow zone	Black irrigation tubing
		II	40-75	A Horizon; 10 YR 6/6, brownish yellow; silt loam, moderate, fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous clear wavy lower boundary; few fine roots; disturbed "A" Horizon	No cultural materials
		III	60-80	A Horizon; 7.5 YR 4/3, brown; silt loam, moderate, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear smooth lower boundary; few fine roots; compacted silt	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
				loam layer	
		IV	75-100	A Horizon; 7.5 YR 5/2, brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous very abrupt smooth lower boundary; no roots observed; silt loam slightly powdery	No cultural materials
		V	100-155	A Horizon; 7.5 YR 5/1, gray; basalt sand, coarse, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous very abrupt smooth lower boundary; no roots observed; basalt sand and basalt cobbles -50 % stony material.	No cultural materials
		VI	145-170	A Horizon; 10 YR 4/4, dark yellowish brown; silt loam, weak, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; terrigenous; no observed roots; oxidized powdery silt loam -5% basalt cobbles	No cultural materials
68	South face wall	I	0-70	A Horizon; 7.5 YR 3/3, dark brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; terrigenous very abrupt smooth lower boundary; few fine roots; black flexible irrigation tubing; plow zone	Black plastic irrigation tubing
		II	65-75	A Horizon; 7.5 YR 3/1, very dark gray; basalt sand, weak, coarse, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; terrigenous very abrupt smooth lower boundary; few fine roots; basalt sand layer	No cultural materials
		III	70-95	A Horizon; 5 YR 5/2, reddish gray; silt loam, weak, fine, crumb structure; loose dry consistency; `moist consistency; non-sticky wet consistency; non-plastic; terrigenous very abrupt wavy lower boundary; few fine roots	No cultural materials
		IV	73-115	A Horizon; 7.5 YR 4/2, brown; basalt sand, weak, coarse, granular structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous very abrupt smooth lower boundary; few roots; basalt sand and basalt cobble layer	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
		V	110-140	A Horizon; 7.5 YR 6/3; silt loam, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous; no roots observed; silt loam decomposing (oxidizing) into laterite	No cultural materials
70	South face wall	I	0-50	A Horizon; 7.5 YR 3/2, dark brown; silt loam, weak, very fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear irregular lower boundary; common fine roots; Cultural Material; black irrigation tubing-flexible; plow zone contains 40% basalt pebbles/cobbles.	Black irrigation tubing
		II	50-130	A Horizon; 7.5 YR 4/4, brown; sand/silt loam, weak, medium, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous clear irregular lower boundary; few fine roots; silt loam containing 70% basalt cobbles and boulders	No cultural materials
		III	130-150	Other Horizon; 5 YR 5/3, reddish brown; sand/ silt loam, moderate, medium, granular structure; single-grain terrigenous unknown no observed roots; basalt sand mixed with silt loam	No cultural materials
71	East face wall	I	0-90	A Horizon; 7.5 YR 3/3, dark brown; moderate, fine, crumb structure; slightly hard dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; common roots; Cultural Material; black irrigation tubing; plow zone	Black irrigation tubing
		II	80-110	A Horizon; 7.5 YR 5/3, brown; basalt sand, coarse, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; few roots; basalt cobbles 50% of level -basalt sand 50%	No cultural materials
		III	110-120	A Horizon; 10 YR 6/4, light yellowish brown; silt loam, moderate, fine, crumb structure; hard dry consistency; non-sticky wet consistency; non-plastic; strong; terrigenous abrupt smooth lower boundary; no roots observed; hard, compacted weathered silt loam	No cultural materials
		IV	110-160	A Horizon 10 YR 5/2, grayish brown; weak, medium, granular structure; single-grain loose dry consistency; non-sticky wet consistency; non-plastic;	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
				weak; terrigenous abrupt wavy lower boundary; no roots observed; fine basalt sand clear of field stone	
		V	140-175	A Horizon; 10 YR 6/1, gray; basalt sand, strong, coarse, gra structure; single-grain hard dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous; no roots observed; basalt boulders and cobbles over 75%-basalt sand and silt loam 25%	No cultural materials
72	South face wall	I	0-55	A Horizon; 7.5 YR 3/3, dark brown; silt loam, weak, medium, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt wavy lower boundarycommon fine roots; black irrigation tubing; silt loam plow zone	Black irrigation tubing
		II	40-90	A Horizon; 7.5 YR 4/3, silt loam; weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt wavy lower boundary; few fine roots; 60% basalt cobble	No cultural materials
		III	80-150	A Horizon; Field Moisture; dry; Munsell Matrix 7.5 YR 4/3, brown; silt loam, weak, fine, crumb structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous unknown; not visible lower boundary; no roots observed; 40% basalt boulders and reddish silt loam	No cultural materials
73	South face wall	I	0-45	A Horizon; 7.5 YR 4/3, brown; silt loam, fine, crumb structure; loose moist consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; common fine roots; black irrigation tubing; plow zone stone material 30% of matrix.	Black irrigation tubing
		II	40-75	A Horizon; 5 YR 5/4, reddish brown; silt loam, fine, crumb structure; loose moist consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; common fine roots	No cultural materials
		III	70-95	A Horizon; 7.5 YR 5/3, brown; basalt sand, medium, granular structure; loose moist consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; few fine roots; basalt sand includes 30% basalt pebble material.	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
		IV	90-155	A Horizon; 7.5 YR 5/1, gray; silt loam and basalt sand, coarse, granular structure; loose dry consistency; non-sticky wet consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; no roots observed; silt includes basalt sand and gravel that constitutes 30% of the matrix.	No cultural materials
		V	150-190	A Horizon; 10 YR 6/6, brownish yellow; silt loam and boulders, very fine, crumb structure; loose dry consistency; non-plastic; weak; terrigenous abrupt smooth lower boundary; no roots observed; boulders are 80% of ground mass powdery laterite	No cultural materials
76	East face wall	I	0-30	A Horizon; 10 YR 4/2, dark grayish-brown; silty loam, single grain structure; slightly hard dry consistency; slightly plastic; abrupt and clear lower boundary; roots, few and fine; 3-5% subangular cobbles and boulders inclusions, plow zone.	Contains irrigation drip lines and no other cultural materials.
		II	30-70	B Horizon; 7.5 YR 4/3, brown; silty clay; slightly hard dry consistency; slightly plastic; abrupt and smooth lower boundary, roots, few and fine to medium; 4-5% subangular and rounded cobbles as inclusions.	No cultural materials
		III	70-160	B Horizon; 10 YR 6/1, grey; coarse boulderly cobbely, gravelly, silt; slightly hard dry consistency; slightly plastic; abrupt lower boundary roots; few and fine; 55-65% basalt boulders, cobbles, and gravels as inclusions.	No cultural materials
		IV	160-180	B Horizon; 2.5 YR 4/5, light olive brown; Silt; very fine, structure; slightly hard dry consistency; slightly plastic; not visible lower boundary; roots, none observed.	No cultural materials
77	South face wall	I	0-50	A Horizon; 10 YR 4/2, dark grayish-brown; silty loam, slightly hard dry consistency; slightly plastic; abrupt lower boundary; roots, few and fine; 1-2% subangular basalt cobbles inclusion; plow zone.	Contains black plastic irrigation drip lines and no other cultural materials.
		II	50-150	B Horizon; 7.5 YR 4/3, brown; slity clay, slightly hard dry consistency; slightly plastic; not visible lower boundary; roots, few and fine; 50-60% subangular and rounded basalt boulders, cobbles, and pebbles (river bed or storm deposit).	No cultural materials

Trench #	Wall Profile	Stratum	Depth in Centimeters Below Surface	Stratigraphic Descriptions	Cultural Materials
80	East face wall	I	0-45	A Horizon; 10 YR 4/2, dark grayish-brown; silty loam; slightly hard dry consistency; slightly plastic; abrupt lower boundary; roots, few, fine to medium; 3-5% subangular basalt boulders, cobbles, and pebbles as inclusions; plow zone.	Contains black plastic irrigation drip lines, no other cultural materials.
		II	45-160	B Horizon; 7.5 YR 4/4, brown; silty clay;slightly hard dry consistency; slightly plastic; abrupt lower boundary; roots, few and fine; 40-45% subangular and rounded basalt boulders, cobbles, pebbles, and gravels; river or storme deposit.	No cultural materials
		III	130-230	B Horizon; 2.5 YR 4/5, light olive brown; Silt; slightly hard dry consistency; slightly plastic; not visible lower boundary; roots, few and fine; 35-40% subangular and rounded basalt boulders, cobbles, and pebbles; river or storme deposit.	No cultural materials
81	South Face wall	I	0-140	A Horizon; 7.5 YR 3/3, dark brown; clay loam; slightly hard dry consistency; slightly plastic; abrupt lower boundary; roots, few and fine; 3-5% subangular basalt boulders and cobbles as inclusions; plow zone.	Contains black irrigation driplines, a clear glass bottle fragment and a charcoal stain. Stain is located between plow zone and a river or strom deposit.
		II	90-250	B Horizon; 10 YR 6/1, grey; boulderly, cobbley, and gravelly coarse silt; slightly hard dry consistency; slightly plastic; abrupt lower boundary roots, few and fine; 40-45% subangular and rounded basalt boulders, cobbles, pebbles, and gravels; probably river or storme deposit.	No cultural materials
		III	230-270	B Horizon; 7.5 YR 4/2, brown; silt; slightly hard dry consistency; slightly plastic; not visible lower boundary; roots, few and fine.	No cultural materials

Appendix C Artifact Catalog

Table 37 Cultural Materials Catalog

Accession Number	Catalogue Number	Catalogue Type	Site #	Feature	Excavation Unit	Stratum	Depth	Excavation Unit Length	Excavation Unit Width	# of Pieces	Length	Width	Thickness	Total Wt. (g)	Material Type	Formal Type	Comments
2011.01	1	H	Backhoe Trench #20B	Cultural Layer	T.U. 2	If	1-10 cmbd	1m	1m	7	1.53-5.66 cm	0.54-3.67cm	0.22-0.46 cm	17.2	Glass	Bottle Frags	Various size, shape, and color bottle fragments
2011.01	2	H	Backhoe Trench #20B	Cultural Layer	T.U. 2	If	1-10 cmbd	1m	1m	5	3.44-11.01 cm	0.4-1.83cm	0.4-1.54 cm	74.4	Metal	Nails/ Hardware	3 Nails & 2 unknown metal pieces, all rusted/ corroded
2011.01	3	H	Backhoe Trench #20B	Cultural Layer	T.U. 2	If	1-10 cmbd	1m	1m	1	2.22cm	1.28 cm	0.42 cm	1.6	Slate	Frag/ Unknown	Slate Fragment
2011.01	4	MS	Backhoe Trench #20B	Cultural Layer	T.U. 2	If	1-10 cmbd	1m	1m	1	0.74cm	0.46 cm	0.08 cm	0.1	Marine Shell	Frag	Nerita Picea fragment
2011.01	5	CH	Backhoe Trench #20B	Cultural Layer	T.U. 2	If	1-10 cmbd	1m	1m	N/A	N/A	N/A	N/A	24.5	C-14	Collection	Collection of C-14/ Slag
2011.01	6	BN	Backhoe Trench #20B	Cultural Layer	T.U. 2	II	10-20 cmbd	1m	1m	1	1.44cm	0.28 cm	0.18 cm	<0.1	Bone	Small Animal Bone	Likely Rodent Bone
2011.01	7	CH	Backhoe Trench #20B	Cultural Layer	T.U. 2	II	10-20 cmbd	1m	1m	N/A	N/A	N/A	N/A	31.1	C-14	Collection	Collection of C-14/ Slag
2011.01	8	H	Backhoe Trench #20B	Cultural Layer	T.U. 2	II	20-30 cmbd	1m	1m	1	3.83cm	0.74 cm	0.5 cm	2.1	Metal	Nail	Rusted/ Corroded metal nail
2011.01	9	H	Backhoe Trench #20B	Cultural Layer	T.U. 2	II	20-30 cmbd	1m	1m	1	1.71cm	1.33 cm	0.41 cm	0.8	Slate	Frag/ Unknown	Slate fragment
2011.01	10	I (?)	Backhoe Trench #20B	Cultural Layer	T.U. 2	II	20-30 cmbd	1m	1m	1	5.27cm	2.14 cm	0.66 cm	9.6	Basalt	Possible Flake	Possible flake/debitage
2011.01	11	I (?)	Backhoe Trench #20B	Cultural Layer	T.U. 2	II	20-30 cmbd	1m	1m	2	2.58-3.48cm	2.05-2.69 cm	0.92-1.03 cm	18.8	Basalt	Water-worn Pebbles	Possible 'ili 'ili stones (pos. natural)
2011.01	12	CH	Backhoe Trench #20B	Cultural Layer	T.U. 2	II	20-30 cmbd	1m	1m	N/A	N/A	N/A	N/A	0.4	C-14	Collection	Collection of C-14/ Slag
2011.01	13	S	TR-20	-	N/A	II	150-180 cmbs	N/A	N/A	N/A	N/A	N/A	N/A	> 500	Soil	Organic Sample	Organic/soil sample
2011.01	14	H	TR-20	-	N/A	II	150-180 cmbs	N/A	N/A	2	7.42	4	0.47	65.9	Glass	Bottle Frags	Aqua glass bottle neck/lip and body shards
2011.01	15	H	TR-20	-	N/A	Ic	100-150 cmbs	N/A	N/A	1	4.1	2.1	0.3	3.9	Glass	Glass Frag	Aqua glass shard with seam
2011.01	16	H	TR-20	-	N/A	Ic	100-150 cmbs	N/A	N/A	1	3.6	3.4	0.4	7.5	Ceramic	Body sherd	A body sherd with clear crazed glaze on white paste
2011.01	17	H	TR-20	-	N/A	Ic	100-150 cmbs	N/A	N/A	3	3.92	1.98	1.14	15.8	Metal	Frag	Rusted/corroded metal fragments
2011.01	18	I	TR-20	-	N/A	II	150-170 cmbs	N/A	N/A	1	0.82	0.34	0.17	< 0.1 g	Volcanic Glass	Flake	Very small volcanic glass chip or flake.
2011.01	19	CH	TR-20	-	N/A	II	150-170 cmbs	N/A	N/A	N/A	N/A	N/A	N/A	0.6	Charcoal	C-14 sample	C-14 screen sample
2011.01	20	CH	TR-20	-	N/A	II	153 cmbs	N/A	N/A	N/A	N/A	N/A	N/A	0.1	Charcoal	C-14 sample	C-14 sample from wall of trench, sent for AMS dating
2011.01	21	H	TR-61	-	N/A	I	0-75 cmbs	N/A	N/A	1	1.49	1.23	0.27	1.0	Glass	Bottle Frag	Very small clear glass bottle body shard.
2011.01	22	H	TR-61	-	N/A	I	0-75 cmbs	N/A	N/A	1	3.25	3	0.72	8.2	Glass	Glass Frag	Thick clear glass shard
2011.01	23	H	TR-61	-	N/A	I	0-75 cmbs	N/A	N/A	1	4.02	2.72	0.65	9.1	Glass	Bottle Frag	Amber glass bottle body shard.
2011.01	24	H	TR-61	-	N/A	I	0-75 cmbs	N/A	N/A	1	1.81	1.05	0.35	0.8	Ceramic	Body sherd	Blue on white ceramic sherd.

2011.01	25	H	TR-61	-	N/A	I	0-75 cmbs	N/A	N/A	1	4.35	3.41	0.52	12.8	Ceramic	Body sherd	Blue on white sherd
2011.01	26	CO	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	> 100	Varied	Varied	Varied	557.2	Coral	Coral	Bag of coral pieces collected from trench
2011.01	27	-	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	7	2.21 - 4.42	1.2 - 3.49	0.84 - 2.7	104.5	Conglomerate	Unknown	Cemented marine conglomerate (sandstone?)
2011.01	28	MS	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	1	6.27	2.81	1.57	28.4	Marine Shell	Shell fragment	Large, thick piece of unidentifid marine shell, possibly cowrie.
2011.01	29	MS	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	4	0.7	0.5	0.3	0.3	Marine Shell	Shell fragments	Four small pieces of unidentified marine shell.
2011.01	30	MS	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	1	0.89	0.83	0.39	0.3	Marine Shell	Operculum	Operculum from unidentified marine shell.
2011.01	31	BN	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	1	0.93	0.79	0.75	0.3	Fish bone	Vertebret	Fish vertebret
2011.01	32	H	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	4	2.5 - 4.4	2.0 - 3.2	0.4 - 0.6	26.6	Ceramic	Base, rim, and body sherds	Ceramic sherds, two with white on blue design. One base and one rim sherd, the other two are body.
2011.01	33	H	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	4	2.3 - 6.5	1.6 - 4.9	0.6 - 1.1	59.3	Ceramic	Body sherds and rim sherd	Beige earthenware sherds: one rim, three body.
2011.01	34	H	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	2	1.4 - 2.94	1.1 - 2.42	0.6	8.0	Ceramic	Electrical insulator frag	Approximately 1/3 of a small ceramic electrical insulator.
2011.01	35	H	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	10	1.06 - 3.03	0.7 - 2.5	0.4 - 1.52	37.1	Glass	Bottle frags	Dark olive green, almost black, thick bottle glass fragments. Likely from wine or liquor bottle.
2011.01	36	H	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	1	2.4	1.2	0.37	2.2	Glass	Bottle frag	Small rim shard of aqua tinted glass bottle.
2011.01	37	H	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	3	1.46 - 3.07	0.67 - 1.0	0.19 - 0.3	2.1	Glass	Bottle frags	Small body shards from aqua tinted glass bottle (thinner glass than cat #36, looks like a different bottle).
2011.01	38	H	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	14	1.65 - 4.2	0.44 - 3.35	0.22 - 0.44	37.9	Glass	Bottle frags	Various aqua-green colored bottle shards.
2011.01	39	H	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	4	1.1 - 2.63	0.9 - 1.57	0.2	4.1	Glass	Bottle frags	Various amber colored bottle shards.
2011.01	40	H	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	18	1.13 - 3.76	0.97 - 2.1	0.15 - 0.44	24.6	Glass	Bottle frags	Various olive green colored bottle shards.
2011.01	41	H	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	5	1.14 - 2.61	0.53 - 1.41	0.17 - 0.38	4.9	Glass	Bottle frags	Various clear glass shards.
2011.01	42	H	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	2	1.04 - 2.92	0.7 - 1.24	0.47 - 1.13	5.3	Cane slag	-	One piece of cane slag.
2011.01	43	H	TR-78	-	N/A	-	0-270 cmbs	N/A	N/A	1	1.6	1.1	0.01	0.2	Metal	Fragments	Rusted metal frags.

CATALOGUE TYPE:
Historic Artifact = **H**
Indigenous Artifact = **I**
Grave Good = **G**
Marine Shell = **MS**
Marine Invertebrate = **MI**
Bone (Non Human) = **BN**

Coral = **CO**
Charcoal = **CH**
Botanical = **BO**
Pollen = **P**
Soil = **S**

Table 38 Faunal Analysis - Mammal Bone

Acc #	Cat #	Site #	Feature	Excavation Unit	Stratum	Depth	Wt. (g)	# of pcs.	General Size	Family	Genus	Species	Element	% of Completion	Cut Marks (Y/N)	Burnt (Y/N)	Comments
2011	6	By Backhoe Trench #20B	Cultural Layer	T.U. 2	II	10-20 cmbd	<0.1 g	1	Small	Muridae	MUS or Rattus	Unknown	Rib	95%	N	N	Rat or mouse rib bone- appears complete or mostly complete

Table 39 Fish Bone

Acc #	Cat #	Spec.	Site #	Feature	Excavation Unit	Stratum	Depth	Wt. (g)	# of pcs.	Family	Genus	Species	Burnt (Y/N)	Comment
2011.01	31	-	TR-78	-	-	-	0-270 cmbd	0.3	1	Unidentified	Unidentified	Unidentified	N	Unidentified fish vertebret

Table 40 Marine Shell

Acc #	Cat #	Spec.	Site #	Feature	Excavation Unit	Stratum	Depth	Wt. (g)	# of pcs.	Family	Genus	Species	Burnt (Y/N)	Comment
2011.01	4	N/A	By Backhoe Trench #20B	Cultural Layer	T.U. 2	II	0-10 cmbd	0.1	1	Neritidae	Nerita	N.Picea	N	Fragment of a Pipipi shell
2011.01	28	N/A	TR-78	-	-	-	0-270 cmbs	28.4	1	Unidentied	N/A	N/A	N	Large thick fragment from an unidentied shell
2011.01	29	N/A	TR-78	-	-	-	0-270 cmbs	0.3	4	Unidentied	N/A	N/A	N	Four small pieces of unidentified marine shell, possibly 2 littorinidae

Table 41 Lithics

Acc #	Cat #	Spec.	Site #	Feature	Excavation Unit	Stratum	Depth	Item Type	# of pcs.	Weight (g)	Length (cm)	Width (cm)	Thickness (cm)	Cortex	# Dorsal Ridges	Modification	Comment
2011.01	10	N/A	By Backhoe Trench #20B	Cultural Layer	T.U. 2	II	20-30 cmbd	Pos. 42	1	9.6	5.27	2.14	0.66	~ 50%	Not Definitive	NONE	Possible flake/debitage. Crude but unlike other material screened, so it was collected as a flake
2011.01	18	A	-	-	Trench #20 A	II	150-170	42	1	< 0.1	0.8	0.3	0.2	Smooth	1	NONE	Date Analyzed: 1/14/2010. Very small piece of volcanic glass
2011.01	18	B	-	-	Trench #20 A	II	150-170	42	1	< 0.1	0.8	0.3	0.2	Smooth	1	NONE	Date Analyzed: 1/14/2010. Very small piece of volcanic glass. *Note, 18B is missing and cannot be relocated. Was photographed and analyzed by JM 3/15/11 but was not present during cataloguing 7/14/11.

Item Type:
Hammerstone = 40 Lithic Debitage = 42 Cortex: 40 60 Modification: Retouch = R Polish = P Usewear = U
Grinding Stone = 41 Adz Reject/Preform = 172
Worked Basalt = 256 Volcanic Glass Core = 171

Table 42 Historic Glass

Acc #	Cat #	Spec.	Site #	Fea.	Unit	Strat	Level	Depth (cmbs)	Func. Class	Category	Item Code	# of pcs.	Element	Wt (g)	Color	Manufac Technique	Body Seam #	Base Seam #	Bottle Finish	Bottle Closure	Base Marks	Trademark (Y/N/Part)	Trademark Type	Length (cm)	Width (cm)	Thickness (cm)	% Complete	Comments
2011.01	1	A	By Backhoe Trench #20B	Cultural Layer	T.U. 2	If	1	0-10 cmbd	CR	BL	26	1	Neck/part of shoulder	11.2	Olive Green	Unknown	0	N/A	N/A	N/A	N/A	N	N/A	5.62	3.86	0.33	< 5% (frag)	Dark olive green frag. From likely wine bottle. Streaks evident (vertical) on exterior and within glass
2011.01	1	B	By Backhoe Trench #20B	Cultural Layer	T.U. 2	If	1	0-10 cmbd	CR	BL	29	1	Body	0.8	Olive Green	Unknown	0	N/A	N/A	N/A	N/A	N	N/A	1.68	1.26	0.33	Frag	Very small olive green glass fragment, displays an angled corner on exterior, interior is relatively flat
2011.01	1	C	By Backhoe Trench #20B	Cultural Layer	T.U. 2	If	1	0-10 cmbd	CR	MC	25	1	Body	0.6	Amber	Unknown	0	N/A	N/A	N/A	N/A	N	N/A	1.47	1.01	0.28	Frag	Very small amber glass fragment, likely from beer bottle based on color/ clarity (looks new)
2011.01	1	D	By Backhoe Trench #20B	Cultural Layer	T.U. 2	If	1	0-10 cmbd	CR	MC	24	1	Frag	1.6	Clear	Unknown	0	N/A	N/A	N/A	N/A	N	N/A	2.83	1.82	0.23	Frag	Clear glass fragment from angled corner
2011.01	1	E	By Backhoe Trench #20B	Cultural Layer	T.U. 2	If	1	0-10 cmbd	CR	MC	24	1	Frag	1.1	Clear	Unknown	0	N/A	N/A	N/A	N/A	N	N/A	2	1.37	0.28	Frag	Clear glass fragment from angled corner
2011.01	1	F	By Backhoe Trench #20B	Cultural Layer	T.U. 2	If	1	0-10 cmbd	UO	MG	29	1	Frag	0.3	Clear	Unknown	0	N/A	N/A	N/A	N/A	N	N/A	1.56	0.53	0.35	Frag	Small sliver or flat clear glass
2011.01	1	G	By Backhoe Trench #20B	Cultural Layer	T.U. 2	If	1	0-10 cmbd	UO	MG	89	1	Frag	1.4	Clear	Unknown	0	N/A	N/A	N/A	N/A	N	N/A	2.02	1.37	0.48	Frag	Very chipped/ irregularly shaped piece of clear glass
2011.01	14	A	Trench 20	-	N/A	II	-	150-180 cmbs	CR	BL	23	1	Finish w/portion of neck	45.3	Aqua	Unknown	N/A	N/A	LPTL	CT	N/A	N	N/A	7.4	3	0.3	5-10%	Finish with portion of neck shad. It fits with catalogue # 14B.
2011.01	14	B	Trench 20	-	N/A	II	-	150-180 cmbs	CR	BL	23	1	Portion of neck & shoulder	20.5	Aqua	Unknown	1	N/A	N/A	N/A	N/A	N	N/A	7	4	0.3	5-10%	Portion of neck and shoulder shard. It fits with catalogue # 14A.
2011.01	15	-	Trench 20	-	N/A	Ic	-	100-150 cmbs	CR	BL	23	1	Portion of neck & shoulder	3.9	Aqua	Unknown	1	N/A	N/A	N/A	N/A	N	N/A	4.1	2.1	0.3	1-2%	Very small portion of neck & shoulder shard.
2011.01	21	-	Trench 61	-	N/A	I	-	0-75	CR	BL	29	1	Body shard	1.0	Clear	Unknown	N/A	N/A	N/A	N/A	N/A	N	N/A	1.49	1.23	0.27	0.005	Very small clear glass bottle body shard.
2011.01	22	-	Trench 61	-	N/A	I	-	0-75 cmbs	CR	BL	29	1	Shard	8.2	Clear	Unknown	N/A	N/A	N/A	N/A	N/A	Y	EMB	3.25	3	0.72	1-2%	Thick clear glass shard, flat, no seams or marks. Possibly thick plate glass or a bottle base.
2011.01	23	-	Trench 61	-	N/A	I	-	0-75 cmbs	CR	BL	29	1	Body shard	9.1	Amber	Unknown	N/A	N/A	N/A	N/A	N/A	N	N/A	4.02	2.72	0.65	< 5%	A body shard.
2011.01	35	-	TR-78	-	-	-	-	0-270 cmbd	CR	BL	26	10	Neck and lip, base, and body	37.1	Dark green	Unknown	0	N/A	LPTL	CK	N/A	N	N/A	1.06 - 3.03	0.7 - 2.5	0.4 - 1.52	< 10%	Dark olive green, almost black, thick bottle glass fragments. Likely from wine or liquor bottle.
2011.01	36	-	TR-78	-	-	-	-	0-270 cmbd	CR	BL	29	1	Lip	2.2	Aqua	Unknown	0	N/A	N/A	N/A	N/A	N	N/A	2.4	1.2	0.37	< 5%	Small rim shard of aqua tinted glass bottle.

2011.01	37	-	TR-78	-	-	-	-	0-270 cmbd	CR	BL	29	3	Body	2.1	Aqua	Unknown	0	N/A	N/A	N/A	N/A	N	N/A	1.46 - 3.07	0.67 - 1.0	0.19 - 0.3	< 5%	Small body shards from aqua tinted glass bottle (thinner glass than cat #36, looks like a different bottle).
2011.01	38	-	TR-78	-	-	-	-	0-270 cmbd	CR	BL	29	14	Body	37.9	Aqua-green	Unknown	1	N/A	N/A	N/A	N/A	N	N/A	1.65 - 4.2	0.44 - 3.35	0.22 - 0.44	< 10%	Various aqua-green colored bottle shards.
2011.01	39	-	TR-78	-	-	-	-	0-270 cmbd	CR	BL	25	4	Body	4.1	Amber	Unknown	0	N/A	N/A	N/A	N/A	N	N/A	1.1 - 2.63	0.9 - 1.57	0.2	< 5%	Various amber colored bottle shards.
2011.01	40	-	TR-78	-	-	-	-	0-270 cmbd	CR	BL	29	18	Body	24.6	Olive Green	Unknown	0	N/A	N/A	N/A	N/A	N	N/A	1.13 - 3.76	0.97 - 2.1	0.15 - 0.44	< 10%	Various olive green colored bottle shards.
2011.01	40	-	TR-78	-	-	-	-	0-270 cmbd	CR	BL	29	5	Body	4.9	Clear	Unknown	0	N/A	N/A	N/A	N/A	N	N/A	1.14 - 2.61	0.53 - 1.41	0.17 - 0.38	< 5%	Various clear glass shards.

Functional Class: Containers = CR Domestic Items = DI Unidentifiable Objects = UO Structural Material = ST
Category: Bottle = BL Misc. Container = MC Misc. Glass=MG

Item Code: Soda Bottle = 23 Medicine Bottle = 24 Beer Bottle = 25 Wine Bottle = 26 Unknown Contents = 29 Ketchup
Bottle Finish: Lipping Tool = LPTL
Bottle Closure: Cork/Stopper = CK Crown Top = CT

Table 43 Historic Ceramics

Acc #	Cat #	Spec.	Site #	Depth	Functional Class	Category	Item Code	# of pcs.	Wt (g)	Ware Type	Paste Color	Primary SFC Treatment	Primary Decoration**	Makers Mark (Y/N/ Part)*	Element	Length (cm)	Width (cm)	Thickness (cm)	Comments
2011.01	16	-	TR-20	150-180 cmbd	DI	HL	115	1	7.5	SNW	White	CLER	UND	N	Body	3.6	3.4	0.4	A body sherd with crackles on white paste color and clear glaze
2011.01	24	-	TR-61	0-75 cmbs	DI	HL	293	1	0.8	SNW	White	CLER	TFP	N	Body	1.81	1.05	0.35	Very small body sherd with blue on white pattern on exterior, clear glaze only on interior.
2011.01	25	-	TR-61	0-75 cmbs	DI	HL	59	1	12.8	SNW	White	CLER	TFP	N	Body	4.35	3.41	0.52	Larger sherd with blue on white tranfer print design on exterior and clear glaze only on interior. The pattern is abstact, incorporating circular and floral or cloud-like design elements.
2011.01	32	A	TR-78	0-270 cmbs	DI	HL	59	1	14.3	SNW	White	CLER	UND	N	Base	4.65	3.83	0.4 - 0.55	Base sherd from cup or small bowl. Footprint of base is 3.3 cm in diameter. Small pits in glaze can be seen around the interior of the base. This sherd is undecorated. The glaze is uncrazed.
2011.01	32	B	TR-78	0-270 cmbs	DI	HL	293	1	3.6	SNW	White	CLER	MNC	N	Rim	2.65	1.95	0.6	Rim sherd with a painted blue on white feather edge pattern 0.9 cm wide around the rim on the interior only. The clear glaze shows crazing.
2011.01	32	C	TR-78	0-270 cmbs	DI	HL	293	1	5.1	SNW	White	CLER	TTN	N	Body	2.6	2	0.7	Body sherd with darker blue geometrical and wave-like pattern under a cobalt blue glaze on the interior. The exterior glaze looks like it is slightly tinted with the same blue in areas and remains clear in other areas. There is a slight ridge on the interior suggested of a shell or molded pattern. Crazing is evendent on both surfaces.
2011.01	32	D	TR-78	0-270 cmbs	DI	HL	293	1	2.1	SNW	White	CLER	UND	N	Body	2.63	1.18	0.6	Small non-diagnostic clear glazed body sherd with crazed glaze.
2011.01	33	-	TR-78	0-270 cmbs	DI	HL	293	4	59.3	ETW	Beige	CLER	UND	N	Body and rim	2.3 - 6.5	1.6 - 4.9	0.6 - 1.1	Beige earthenware body sherds, one rim sherd and three body. Undecorated.
2011.01	34	-	TR-78	0-270 cmbs	HW	MH	118	2	8.0	SNW	Cream	None	UND	N	Body	1.4 - 2.94	1.1 - 2.42	0.6	One larger and one smaller piece of a smaller ceramic electrical insulator. No decorations and unglazed.

Waretype: Earthenware = ETW Stoneware = SNW
Surface Treatment: Clear = CLER
Decoration Type: Transferprint = TFP Two-Toned = TTN Undecorated = UND Monochrome = MNC
Makers Mark Style: Backstamped = BKST Impressed = IMPR Handpainted = HDPT

Table 44 Historic Nails

Acc #	Cat #	Spec.	Site #	Feature	Excavation Unit	Stratum	Depth	Functional Class	Category	# of pcs.	Weight (g)	Nail Type	Type of Head	Cross-Section	Galvanized (Y/N)	Length (cm)	Width (cm)	Thickness (cm)	Pennywt (d)	Comments
2011.01	2	A	By Backhoe Trench #20B	Cultural Layers	T. U. 2	If	0-10 cmbd	Unknown, likely HW/SM	Unknown, likely SH	1	9.9	Wire	R or F	IND	IND	6.68	1.23	0.64	IND	Rusted/Corroded whole/complete nail
2011.01	2	B	By Backhoe Trench #20B	Cultural Layers	T. U. 2	If	0-10 cmbd	Unknown, likely HW/SM	Unknown, likely SH	1	8.5	Wire	R or F	IND	IND	8.04	0.85	0.48	IND	Rusted/Corroded whole/complete nail
2011.01	2	C	By Backhoe Trench #20B	Cultural Layers	T. U. 2	If	0-10 cmbd	Unknown, likely HW/SM	Unknown, likely SH	1	24.7	Wire	R or F	IND	IND	11.02	1.43	0.76	IND	Rusted/Corroded whole/complete nail
2011.01	8	N/A	By Backhoe Trench #20B	Cultural Layers	T. U. 2	II	20-30 cmbd	Unknown, likely HW/SM	Unknown, likely SH	1	2.1	Wire	R or F	IND	IND	3.83	0.74	0.5	IND	Rusted/Corroded whole/complete nail

Functional Class: Hardware = HW Structural Material = SM
Category: Structural Hardware = SH
Type of Head: Roundhead = R Flathead = F
Cross Section: Indiscernable = IND

Appendix D Report of Radiocarbon Dating Analyses

BETA ANALYTIC INC.
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REPORT OF RADIOCARBON DATING ANALYSES

Dr. Hallett H. Hammatt — Report Date: 8/11/2010

Cultural Surveys Hawaii — Material Received: 7/27/2010

Sample Data	Measured Radiocarbon Age	13C/12C Ratio	Conventional Radiocarbon Age(*)
Beta - 282352	100.6 +/- 0.5 pMC	-10.8 o/oo	180 +/- 40 BP

SAMPLE : LAHAINA2-08
ANALYSIS : AMS-Standard delivery
MATERIAL/PRETREATMENT : (charred material): acid/alkali/acid
2 SIGMA CALIBRATION : Cal AD 1650 to 1710 (Cal BP 300 to 240) AND Cal AD 1710 to 1880 (Cal BP 240 to 60)
Cal AD 1910 to 1950 (Cal BP 40 to 0)

Dates are reported as RCYBP (radiocarbon years before present, "present" = AD 1950). By international convention, the modern reference standard was 95% the 14C activity of the National Institute of Standards and Technology (NIST) Oxalic Acid (SRM 4990C) and calculated using the Libby 14C half-life (5568 years). Quoted errors represent 1 relative standard deviation statistics (68% probability) counting errors based on the combined measurements of the sample, background, and modern reference standards. Measured 13C/12C ratios (delta 13C) were calculated relative to the PDB-1 standard.

The Conventional Radiocarbon Age represents the Measured Radiocarbon Age corrected for isotopic fractionation, calculated using the delta 13C. On rare occasion where the Conventional Radiocarbon Age was calculated using an assumed delta 13C, the ratio and the Conventional Radiocarbon Age will be followed by "*". The Conventional Radiocarbon Age is not calendar calibrated. When available, the Calendar Calibrated result is calculated from the Conventional Radiocarbon Age and is listed as the "Two Sigma Calibrated Result" for each sample.

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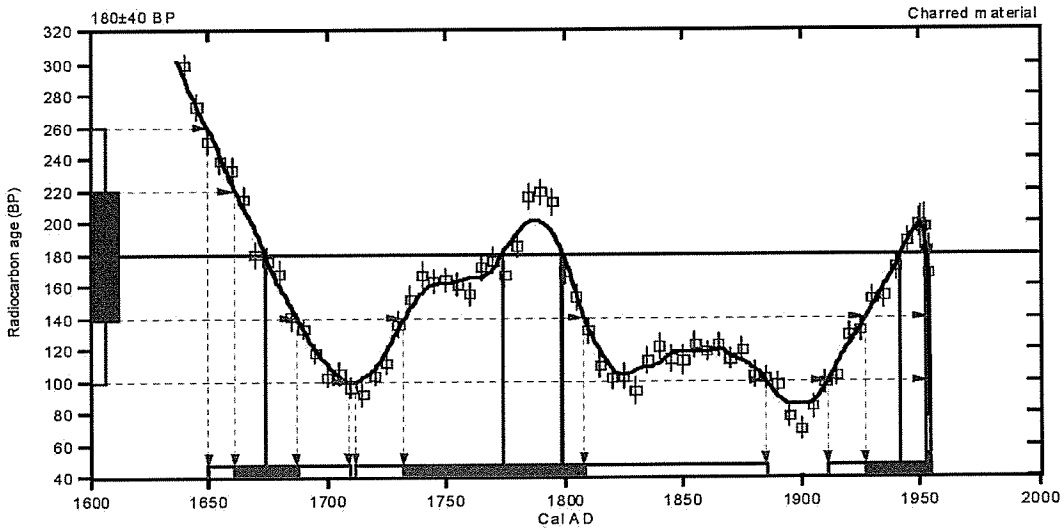
CALIBRATION OF RADIOCARBON AGE TO CALENDAR YEARS

(Variables: C13/C12=-10.8:lab. mult=1)

Laboratory number:	Beta-282352
Conventional radiocarbon age:	180±40 BP
2 Sigma calibrated results: (95% probability)	Cal AD 1650 to 1710 (Cal BP 300 to 240) and Cal AD 1710 to 1880 (Cal BP 240 to 60) and Cal AD 1910 to 1950 (Cal BP 40 to 0)

Intercept data

Intercepts of radiocarbon age with calibration curve:	Cal AD 1670 (Cal BP 280) and Cal AD 1770 (Cal BP 180) and Cal AD 1800 (Cal BP 150) and Cal AD 1940 (Cal BP 10) and Cal AD 1950 (Cal BP 0)
1 Sigma calibrated results: (68% probability)	Cal AD 1660 to 1690 (Cal BP 290 to 260) and Cal AD 1730 to 1810 (Cal BP 220 to 140) and Cal AD 1930 to 1950 (Cal BP 20 to 0)



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Talma, A. S., Vogel, J. C., 1993, Radiocarbon 35(2), p317-322

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APPENDIX E.

Cultural Impact Assessment

Cultural Impact Assessment
For the Kuhua Street Extension and Improvement Project
Spanning Multiple Ahupua'a from Moali'i to Makila, Lahaina District, Island of Maui
Multiple TMK (2) 4-5-007, 009, 010: Multiple Parcels and (2) 4-6-013, 014, 015, 016: Multiple Parcels

Prepared for

County of Maui-Department of Public Works

DRAFT

Prepared by

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Cultural Surveys Hawai'i, Inc.

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Acknowledgements

Many thanks go out to the various individuals who shared their personal life experiences and traditional knowledge for this study. Information shared by these people helps tremendously in reconstructing the way life was lived at different phases in history and also shows how lifestyles, particularly relating to Hawaiian traditions and cultural practices, have evolved.

The following individuals contributed to our understanding of traditional cultural practices related to the lands of Lāhainā surrounding the proposed Kuhua Street Extension and to them we extend a sincere gratitude; Mrs. Jackie Opunui, Mr. Nelson Waikiki, Mr. Ke'eamoku Kapu and Mrs. Ui'lani Kapu and Mrs. Mahealani Ventura. A profound *mahalo* goes to the *kupuna* who took the time to recall their memories of the study area; Mr. Kenneth Sharpe, whose vivid memories of historic Lāhainā take us back in time. Mrs. Momi Jaentsch, who continues to share her memories of Puunoa. Much *aloha* goes to Mrs. Mildred (Opunui) Ka'ahane who has lived on the lands of the study area for 83 consecutive years.

Management Summary

Date	March 2012 (DRAFT)
Project Number (s)	CSH Job Code: :Lāhainā 3
Project Location	A 2.6 mile roadway extension east of and parallel to the existing Honoapi'ilani Highway, east of Lāhainā Town. The proposed Kuhua Street extension will pass through multiple ahupua'a, Lāhainā District, Maui Island, TMK: (2) 4-5-07, 009, 10, 11;4-6, 013-016. This area is depicted on the 1992 Lāhainā USGS 7.5-minute topographic quadrangle.
Land Jurisdiction	Kā'anapali Land Management Corp.
Agencies	County of Maui: Department of Public Works State: Hawai'i Office of Environmental Quality Control
Project Description	On behalf of the County of Maui, Department of Public Works, Cultural Surveys Hawai'i Inc. has performed this Cultural Impact Assessment for the proposed Kuhua Street Extension and Improvement project. The subject project has been proposed to improve traffic circulation for surrounding communities and reduce increasing traffic congestion. The proposed Kuhua Street extension will also serve as an alternate route in the event of emergencies or when unplanned closures of Honoapi'ilani Highway occur. The proposed roadway will be 2.6 miles long with a 56 foot wide corridor.
Region of Influence (ROI)	The area of direct effect for the proposed undertaking is considered as the roadway footprint of the 56 ft. right-of-way (ROW), in addition to approximately 2.6 mile length of road. When assessing the presence or absence of direct, indirect, and cumulative effects of the project on the traditional cultural practices of this region, traditional use and access to resources from the mountains to ocean, or *mauka* to *makai* must be taken into consideration. As such, the ROI for this undertaking is defined as the geographic area encompassing the proposed roadway mainly Lāhainā Town proper and some discussion of the Kaua'ula and Kahoma Stream valleys which were traditionally utilized for agricultural crops and supplied water to this area.
Regulatory Context	As a County funded project, this undertaking is subject to State of Hawai'i Environmental Regulations. With regard to State of Hawai'i Environmental Regulations, this undertaking is subject to Hawai'i Administrative Rules (HAR) Title 11 Chapter 200-4(a) and Chapter 343 of the Hawai'i Revised Statutes (HRS).
Fieldwork Effort	Field work was conducted by Colleen P. Medeiros consisted of informal interviews with Hawaiian organizations, *kūpuna,* and individuals who have cultural knowledge of the study area including lineal descendants of Lāhainā .
Consultation Results	This cultural impact assessment found evidence of traditional agriculture,

	including *lo'i* agriculture, as having taken place within the study area and in the Kaua'ula and Kahoma Valleys. Traditional access trails were mentioned as having crossed the study area. The waters fronting Lahaina have traditionally provided rich marine resources to the area's population. There are both pre-contact and historically significant burial sites and cemeteries located throughout Lahaina Town within one-half mile of the proposed project area. Some of Hawaii's well-known *kumu hula* are also from Lāhainā including Mrs. Rebecca Kauhai Likua and Mrs. Emma Sharpe. Therefore, road design and construction activities need to take the above mentioned cultural practices into consideration, and steps should be taken to minimize negative impacts to these Hawaiian cultural and traditional practices and/or traditional cultural areas.
Recommendations	Traditional cultural practices were identified as having existed, or as ongoing practices within the current study area. These practices may be impacted by the construction of the proposed Kuhua Street Extension. The following are recommendations for mitigating potential negative impacts to traditional cultural practices of the study area: 1. To avoid adverse impacts to traditional subsistence fishing practices of Lāhainā resulting from damage caused by the siltation of the reef ecosystem of Lāhainā, it is recommended that all runoff generated from proposed roadway construction be contained in retention basins or as Best Management Practices mandate. The Polanui Hiu requests continued consultation with their group as the planning of such measures continues. 2. Individuals consulted, including members of the Kapu family, continue to access *mauka* lands by crossing the route of the proposed Kuhua Street Extension. They utilize the old Kaua'ula Road to reach their homes and traditional *lo'i.* Additionally, it was said that there is a regeneration of the traditional medicinal plants, *'uhaloa* (*Waltheria indica*) and *popolo* berry (*Solanum nelsonii*), now growing in the fallow cane fields. Because these plants were used in traditional *la'au lapa'au*, individuals may want to harvest these plants in the future. To maintain access routes which cross the proposed roadway corridor, it is recommended that access routes to *mauka* lands be developed with the involvement of Lāhainā families and community members (see Section 5.1.1 Kuleana Ku'ikahi LLC Lāhainā Community Meeting, May19, 2011). 3. Because the proposed road corridor passes through many historic Land Commission Award parcels, great

	caution should be taken during all phases of ground disturbing activities to minimize the potential for encountering previously unidentified human burials. It is recommended that a notation is drafted on construction plans further warning the use caution near the Aholo feeder road as this road is adjacent to the Opunui property. Although there is a clearly marked burial platform on the Opunui property, because of the history of this area (see Section 6.1 Mrs. Mildred (Opunui) Ka'ahane and Section 6.2 Mrs. Jackie Opunui), there is a high likelihood that unmarked graves may exist in the area surrounding this platform. If human burials are inadvertently discovered personnel on-site are required to contact the State Historic Preservation Division, Maui branch, Cultural Specialist, Mr. Hinano Rodrigues. 4. The Maui/Lanai Burial Council also recommended that a formal burial treatment plan be completed for the burial find discovered during the archaeological inventory survey (Lee-Greig 2012). Close consultation with the Lāhainā community is recommended for the development of this plan (see Section 5.1.5 Maui/Lana'i Island Burial Council (M/LIBC), October 27, 2011 and Appendix B Formal Response Letters).

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Section 1 Introduction

1.1 Project Background

On behalf of the County of Maui, Department of Public Works, Cultural Surveys Hawai'i Inc. has performed this Cultural Impact Assessment for the proposed Kuhua Street Extension and Improvement project. As a result of growing demand for roadway capacity in and around Lāhainā Town, the subject project has been proposed to improve traffic circulation for surrounding communities and reduce increasing traffic congestion. The proposed Kuhua Street extension will also serve as an alternate route in the event of emergencies or when unplanned closures of Honoapi'ilani Highway occur.

Beginning at its southeastern extent, the Kuhua Street extension originates south of Aholo Road at the intersection of Front Street and Honoapi'ilani Highway. From here it jogs east then northwest running parallel to Honoapi'ilani Highway and the Mill Street cane haul road. The proposed extension route will include connections to Aholo Road, Shaw Street, Dickenson Street, Lahainaluna Road and Papalaua Street, thus connecting the Kuhua extension road with Honoapi'ilani Highway. Because of severe grade differences at Honoapi'ilani Highway and Prison Street, Prison Street is currently not identified as an intersecting street. The proposed route will curve around the Lahaina Recreation Center park and traverse the area between the park and the West Maui Resource Center. The proposed Kuhua Street extension will terminate at its northern point at Keawe Street just *mauka* of the new Lahaina Gateway Shopping Center.

This cultural impact assessment is meant to address the cultural traditional practices that may be impacted by the proposed development. The area of direct effect, or areas that may be directly impacted by construction activity and hereafter referred to as the "project area" includes a proposed length of road 2.6 miles long and approximately 98 feet wide (Figure 1). Due to the unique *ahupua'a* system of Lāhainā which contains small *lele* like *ahupua'a*, the proposed roadway will pass through 31 of these *lele*. They include; Aki, Aupokopoko, Panaewa, Kopili, Paeohi, Kuhua, Paunau, Makila, Puehuehunui, Halakaa, Polanui, Kooka, Puaanui, Wainee (Waineenui), Puako, Waianae, Haleu, Kaulalo, Puehuehuiki, Puunauiki, Puunau, Polaiki, Kamani, Puaaiki (Puaa), Kulahuhu, Puuhoowale, Kapewakua, Opaeula, Uhao, Aupokopoko, Moalii, and Kuholilea (Figure 1and Figure 2).

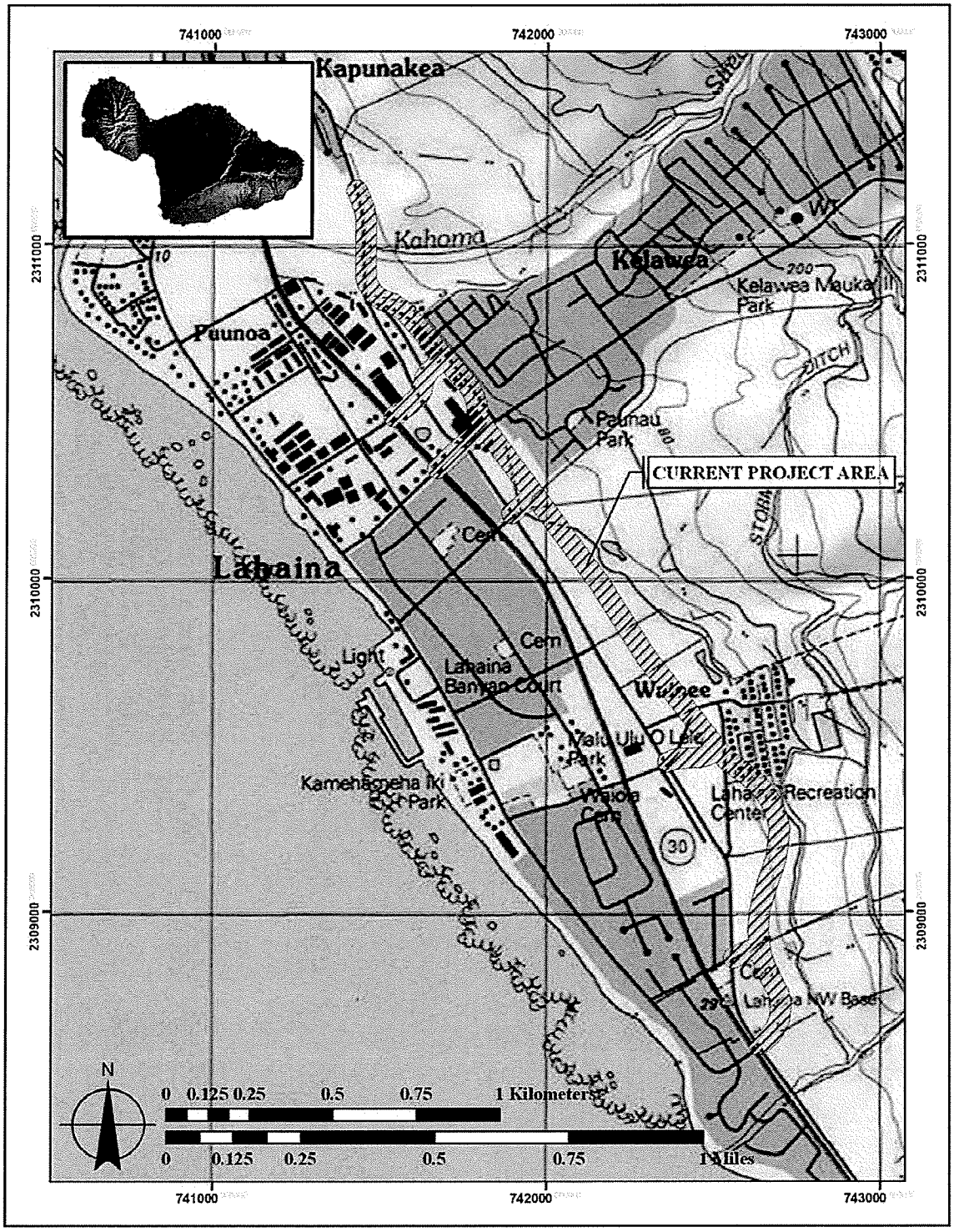

Figure 1. A portion of the USGS 7.5' topographic map, Lāhainā Quadrangle (1992) showing the Kuhua Street Improvement and Extension Project corridor in red cross-hatch.

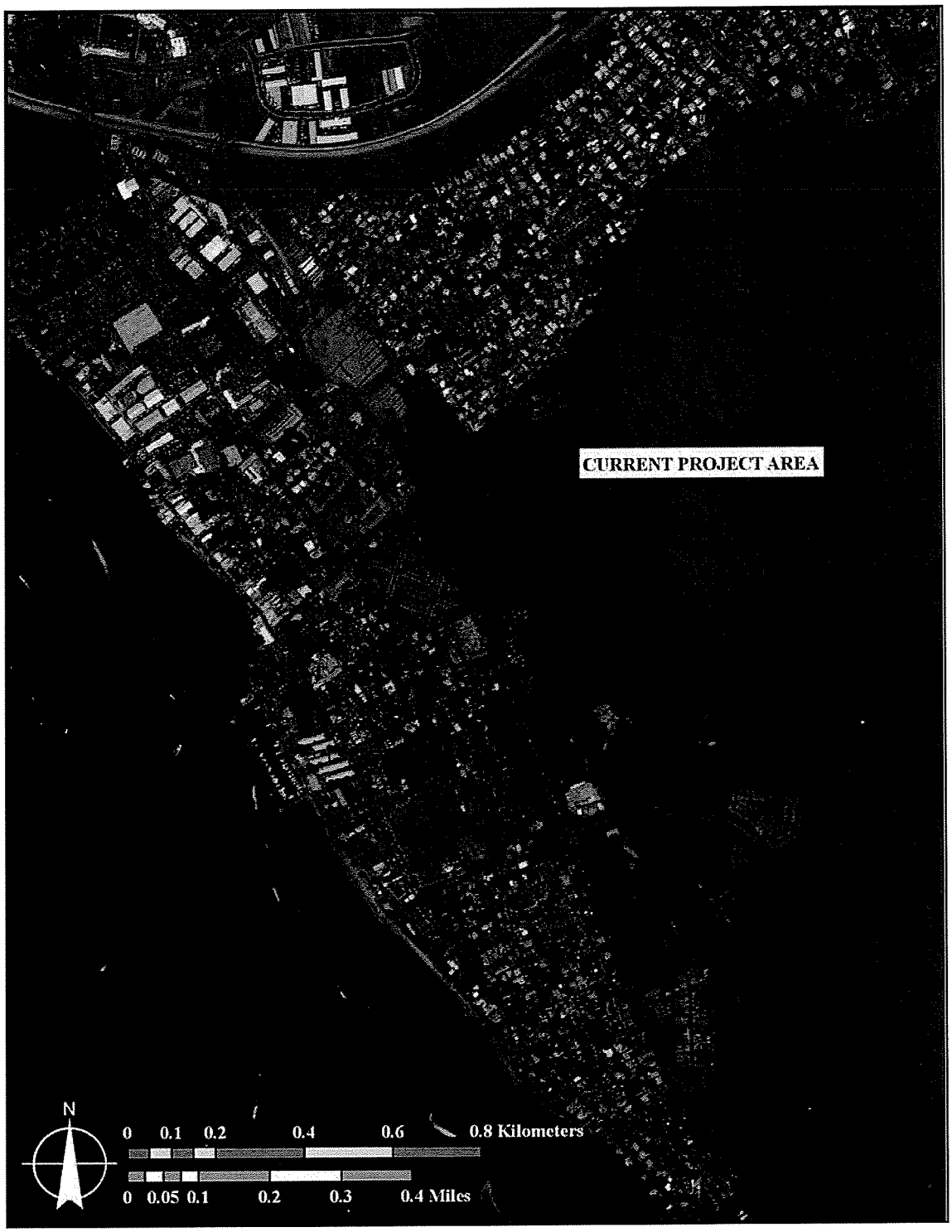

Figure 2. Aerial photo showing the environmental setting in the general area of the Kuhua Street Improvement and Extension Project corridor (red cross-hatch).

1.2 Scope of Work

The scope for the Cultural Impact Assessment is summarized as follows:

1. Examination of historical documents, Land Commission Awards, historic maps, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal and other resources or agricultural pursuits as may be indicated in the historic record.
2. A review of the existing archaeological information pertaining to archaeological sites within the study area to reconstruct traditional land use activities and to identify and describe the cultural resources, practices, and beliefs associated with the parcel and identify present uses, if appropriate.
3. Interviews with persons knowledgeable about the past and present cultural practices in the project area and its surrounding area.
4. Preparation of a report on items 1-3 summarizing the information gathered related to traditional practices and land use. The report will assess the impact of the proposed undertaking on the cultural practices and features identified.

1.3 Environmental Setting

1.3.1 Natural Environment

The current project corridor varies in elevation from approximately 80 ft (24 m) above mean sea level (amsl) in the northern portion to less than 20 feet (6 m) amsl in the southern portion. The distance of the project corridor from the coastline ranges between 0.7 (0.43 miles) and 0.2 km (0.12 miles).

The soils within the project corridor are generally described as being of the Pulehu-Ewa-Jaucas association. This soil association consists of deep, nearly level to moderately sloping, well-drained soils that have moderately fine textured subsoil on alluvial fans and in basins (Foote et al. 1972:8). More specifically, the soils within the project corridor are a combination of Ewa silty clay loam, 0 to 3% slopes (EaA); Pulehu silt loam, 0 to 3% slopes (PpA); Pulehu cobbly clay loam, 3 to 7% slopes (PtB); Wahikuli stony silty clay, 3 to 7% slopes (WdB); and Wainee Very Stony Silty Clay 3 to 7% slopes (WxB) (Foote et al. 1972: 30-145). For the most part, at the time of the soil survey conducted by Foote et al. (1972) Ewa, Pulehu, Wahikuli and Wainee series soils were utilized primarily for sugarcane with small acreages used as home sites (USDA Natural Resources Conservation Service 2001).

The average rainfall on the western slope of the West Maui Mountains at this elevation is 15 inches per year (Giambelluca and Schroeder 1998 in Lee-Greig, et al. 2008) with cooler temperatures and heavier rainfall occurring in the winter months and warmer temperatures and lighter rainfall occurring during the summer months. During the pre-contact era, these soils and level of rainfall would likely have supported a lowland dry and mesic forest, woodland, and shrubland. According to Pratt and Gon (1998: 127), this type of native environment would have provided medicinal plants for *la'au lapa'au* (traditional Hawaiian medicine) and hardwoods for

building, tool, and carving material, as well as *pili* grass for use in thatching. Pratt and Gon (1998: 127) go on to point out that some mesic areas were cleared and converted to dryland *kalo* (taro) and *'uala* (sweet potato) agriculture (Lee-Greig, et al. 2008). After years of historic and modern era sugarcane agriculture, the natural environment of the former cane lands within the current project area now consists entirely of various species of introduced grasses and plants with small stands of *'ilima* (*Sida fallax*) and *koa haole* (*Leucaena and leucocephala*) scattered throughout.

1.3.2 Built Environment

The current project corridor, approximately 3 km (2.6 miles) traverses urban industrial and residential areas as well as fallow sugar cane fields *mauka* of Lāhainā town (Figure 2). The corridor begins in the north at the intersection of Keawe St. and an unimproved road *makai* of Kupuohi St. The unimproved road currently serves as an alternate access to the base yard of the Hawaiian Dredging Construction Co. among other businesses. After crossing the Kahoma Stream the corridor veers towards the east across an open field and connects with Kuhua St, a residential area bordered on the west by various businesses in addition to the previous site of the Pioneer Mill Co. Factory (SIHP 50-50-03-4420/1598). After crossing Lahainaluna the remainder of the corridor is predominately in fallow sugarcane fields.

Section 2 Methods

This section details the methods used by CSH personnel during the fieldwork and preparation of this cultural impact assessment. Interviews and consultation was conducted by lead researcher, Colleen Medeiros, B.S. and contributing researchers Katie Sprouse B.A. and Tanya L. Lee-Greig, M.A. under the overall guidance of Hallett H. Hammatt, Ph.D. Field interviews and consultations were accomplished over a five month period from May 2011 to October 2011. Document research was conducted by the researchers named above with contributions from Robert H. Hill, B.A.

2.1 Document Review and Research

Numerous published and unpublished accounts, surveys, reports, maps and photographs found in public and private collections pertaining to Lāhainā and the study area were investigated by Cultural Surveys Hawai'i Inc. English language historical documents, maps, and archaeological studies were researched at the DLNR/SHPD library, the Survey Office of the Department of Accounting and General Services (DAGS), the Lahaina Restoration Foundation Archives at the Hale Pa'i, the Maui County Planning Department, and the Cultural Surveys Hawai'i (CSH) library; in addition to private collections held by others in the community. Land Commission Award Claims were studied using historic maps and cross referenced with the Waihona 'Aina online database (www.waihona.com).

2.2 Scoping and Community Outreach

2.2.1 Government Agencies, Advisory Councils, and Local Community Organizations

In order to identify individuals with knowledge of the traditional cultural practices of the area of potential effect for the proposed project as it relates to this study, CSH initiated contact with government agencies, advisory councils, and local community organizations (See Section 4 Community Consultations). As the common practice at CSH, three follow up attempts are made to all contacts on the initial mailing list in a good-faith effort to make contact. Letters and project area maps showing the location of the proposed Kuhua Street Extension was mailed out with the following accompanying text:

> April 14, 2011
>
> Subject: Cultural Impact Assessment for the proposed
>
> Kuhua Street Extension and Improvement Project, Moali'i to
>
> Makila Ahupua'a, Lahaina District, Maui Island, Multiple TMK
>
> Aloha,
>
> On behalf of the County of Maui, Department of Public Works, and in cooperation with the Kā'anapali Land Management Corp., Cultural Surveys Hawaii, Inc. (CSH) is conducting a cultural impact assessment for the proposed

Kuhua Street Extension and Improvement Project. As a result of growing demand for roadway capacity in and around Lahaina Town, the subject project has been proposed to improve traffic circulation for surrounding communities and reduce increasing traffic congestion. The proposed Kuhua Street extension will also serve as an alternate route in the event of emergencies or when unplanned closures of Honoapi'ilani Highway occur.

Beginning at its southeastern extent, the Kuhua Street extension originates south of Aholo Road at the intersection of Front Street and Honoapi'ilani Highway. From here it jogs east then northwest running parallel to Honoapi'ilani Highway and the Mill Street cane haul road. The proposed extension route will include connections to Aholo Road, Shaw Street, Dickenson Street, Lahainaluna Road and Papalaua Street, thus connecting the Kuhua extension road with Honoapi'ilani Highway. Because of severe grade differences at Honoapi'ilani Highway and Prison Street, Prison Street is currently not identified as an intersecting street. The proposed route will curve around the Lahaina Recreation Center Park and traverse the area between the park and the West Maui Resource Center. The proposed Kuhua Street extension will terminate at its northern point at Keawe Street just *mauka* of the new Lahaina Gateway Shopping Center.

The area of direct effect, or areas that may be directly impacted by construction activity and hereafter referred to as the "project area" includes a proposed length of road 2.6 miles long and approximately 200 feet wide. Due to the unique *ahupua'a* system of Lahaina which contains small *lele* like *ahupua'a*, the proposed roadway will pass through 31 of these *lele*. They include; Aki, Aupokopoko, Panaewa, Kopili, Paeohi, Kuhua, Paunau, Makila, Puehuehunui, Halakaa, Polanui, Kooka, Puaanui, Wainee (Waineenui), Puako, Waianae, Haleu, Kaulalo, Puehuehuiki, Puunauiki, Puunau, Polaiki, Kamani, Puaaiki (Puaa), Kulahuhu, Puuhoowale, Kapewakua, Opaeula, Uhao, Aupokopoko, Moalii, and Kuholilea.

To ensure that potential impacts to traditional cultural practices which may not occur within the boundaries of the "project area", but may nonetheless be affected by the proposed project (e.g. where a proposed action that may not physically alter gathering practices but may affect access to gathering areas) are assessed, the *ahupua'a* is typically the appropriate geographical unit to begin with. But unlike the typical *ahupua'a* which extends continuously from the mountains to the sea, the *ahupua'a* of Lahaina are small and discontinuous with partner *ahupua'a* located both *mauka* and *makai* and often in the *kula* lands as well. For this CIA study, research will be focused on the lands surrounding the project area and include the traditional connections to the *mauka lele* associated with their coastal counterparts.

We are seeking your *kōkua* or help and guidance regarding the following aspects of our study:

- **General history and present and past land use of the project area.**
- **Knowledge of cultural resources which may be impacted by the Kuhua Street Extension and Improvement Project - for example, traditional plant gathering sites, historic sites, archaeological sites, and burials.**
- **Knowledge of traditional gathering practices in the area – both past and ongoing.**
- **Cultural associations of the project area, such as legends and traditional uses.**
- **Referrals of *kūpuna* or elders who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua'a* lands.**
- **Any other cultural concerns the community might have related to Hawaiian cultural practices within these Lahaina Ahupua'a and/or in the vicinity of the proposed Kuhua Street Extension and Improvement project area.**

I invite you to contact me, Colleen Medeiros, at 1-808-242-9882. You may also contact me by e-mail at cdagan@culturalsurveys.com if you have any information you would like to share.

Mahalo,

Colleen Medeiros, Historic Researcher

Cultural Surveys Hawai'i, Inc.

2.2.2 Individuals with Lineal Ties to the Lands within the Current Study Area

As a result of the initial scoping, referrals were then made to cultural and lineal descendants of the area, as well as long-time residents and *kūpuna*. These individuals were then contacted and informal interviews were then conducted (see Section 6 .

Section 3 Background Research

This section contains a summary of the rich traditional historic background associated with the District of Lāhainā. In addition, this section details the previous archaeological investigations within and adjacent to the current project corridor. It concludes with a background summary and predictive model.

3.1 Traditional and Historical Background

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 twelve districts or *moku* during traditional times: Kula, Honua'ula, Kahikinui, Kaupō, Kīpahulu, Hāna, Ko'olau, Hāmākua Loa, Hāmākua Poko, Wailuku, Kā'anapali, and Lāhainā (Figure 3). The current project area, comprised of circa 58 acres (approximately 23.5 hectare), is located on the leeward flank of Mauna o E'eka, in the *moku* of Lāhainā, from Moali'i to Makila Ahupua'a.

Due to the unique *ahupua'a* system of Lāhainā which contains small *lele* like *ahupua'a*, the proposed roadway will pass through 31 of these *lele*. They include; Aki, Aupokopoko, Panaewa, Kopili, Paeohi, Kuhua, Paunau, Makila, Puehuehunui, Halakaa, Polanui, Kooka, Puaanui, Wainee (Waineenui), Puako, Waianae, Haleu, Kaulalo, Puehuehuiki, Puunauiki, Puunau, Polaiki, Kamani, Puaaiki (Puaa), Kulahuhu, Puuhoowale, Kapewakua, Opaeula, Uhao, Aupokopoko, Moalii, and Kuholilea.

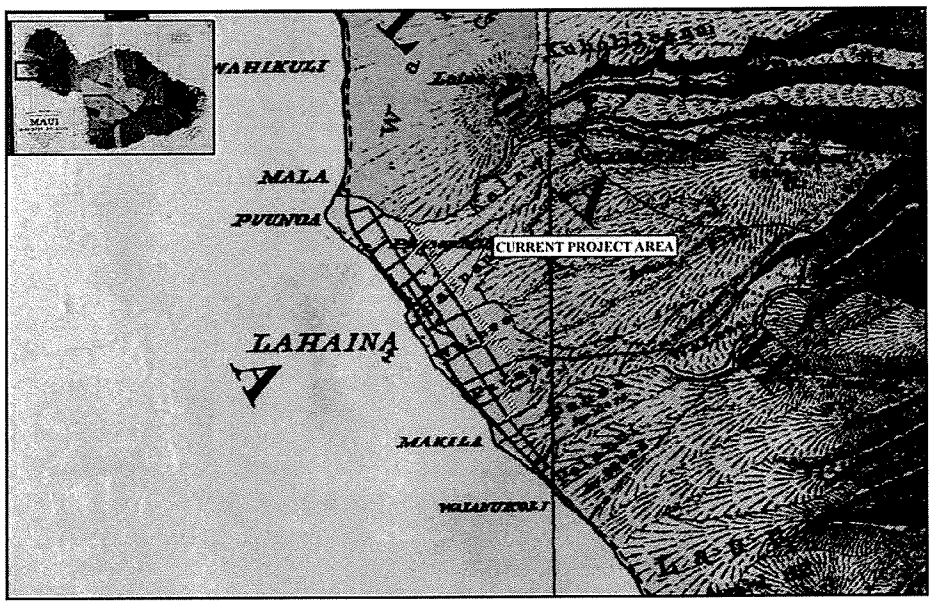

Figure 3. A portion of the F.S Dodge map (1885) showing the project area in relation to the traditional *moku* of Lāhainā (crown lands in yellow, government lands in green).

3.1.1 Mythological and Traditional Accounts

The name Lāhainā traditionally refers to the "cruel sun", possibly associated with the drought that has impacted the surrounding area from time to time (Pukui, et al. 1974:127). Rich in traditional accounts, Lāhainā is associated with the chief Kaka'alaeno, who lived in the present Lāhainā district. Kaka'alaneo was also the father of the mischievous Kaulula'au who cut down breadfruit trees throughout Lāhainā and was eventually exiled to Lāna'i. Kaulula'au subsequently out-witted the spirits of that island, making it habitable for humans. The area is also known for the goddess Hina, mother of the demigod Maui among others. In regard to Kaka'alaeno, Beckwith (1970) explains:

> Many legends mention the name of Kaka'alaneo ([alternate spellings] Kukaalaneo, Kaalaneo), who lived in the present Lahaina district on the hill Keka'a (Black Rock of Sheraton Maui). He also owned fishponds in the Hana district on the opposite end of the island and planted a famous breadfruit grove in Lahaina. His wife was the Molokai chiefess whom Eleio found for him and who brought him the first feather cape ever seen on Maui, and by whom he had the mischievous son Kaululaau who killed off the spirits on Lanai. In his day Lahaina was called Lele.
>
> According to tradition, a group of strangers (*haole*) who later played an active part in court life and whose names (according to Kamakau), kept in memory as late as Captain Cook's day, arrived on Maui in Kakaalaneo's time. Kukanaloa and Kaekae (also Kakae) were the leaders of this group. The "last allusion" in this legend is a pun about chief Lolae of Oahu who abducted the pretty chiefess of Maui, Kelea (sister of Pi'ilani's father), while she was out surfing and carried her away to Oahu in the uplands of Lihue (now Schofield Barracks). She later deserted him for his cousin Kalamakua of Ewa (and Waikiki), by whom she became mother of the high chiefess Laie-lohelohe (the drooping pandanus vine), who became the wife of her Maui cousin Pi'ilani. All these names appear in the chant linked with the coming of Ku-kanaloa, together with the names of a wife and son of Kakaalaneo (Beckwith 1970:384-385).

In W.D. Westervelt's account of "Hina the mother of Maui" (1910), he presents stories of Hina as the mother of Maui, residing in the West Maui Mountains:

> A version of the Maui stories is met with representing him as the son of Hina-lauae and Hina, residing above Lahainaluna, Maui, which relate his venturing forth on mischievous pranks before birth.
>
> Reference is made to his snaring the sun that Hina might have time to dry her kapas. It says, further, that while absent on his duty Hina bore another son, an owl, which he did not treat with contempt. Setting out one day pole-fishing, Maui was to be placed on the altar the following day as a sacrifice by the king. Hina saw in a vision what was being done so she and the owl followed along, Hina staying at a rock by the wayside. The owl flew on to where Maui was guarded and saw that he was tied with cords. The guards were awake, so the owl waited till near dawn, but they would not sleep.

> Maui then spoke: "O thou Aina, retard and prolong the night." The night being prolonged, the guards fell asleep, whereupon the owl entered and struck at Maui's bonds till they fell off. They then set off to where Hina was waiting, by which time it was daylight. Hiding Maui under the stone, Hina sat outside of him and spread out her sleeping garment and looked for fleas as the searching party came up. To their inquiry for the man which was to be sacrificed by the chief, she said that she had not seen him, having just now arisen, and by the warmth of the sun was looking for fleas. At their departure the owl led Maui forth, and Hina followed till they reached home. Thus was Maui saved (Westervelt 1910).

Mythological accounts relevant to this study are those associated with *mo'o*, or serpent/lizard like gods. Considered guardians or *'aumaku,* Kamehameha worshipped the most famous mo'o, Kihawahine, during his conquest of the Hawaiian islands. Kihawahine made her main home in Loko o Mokuhinia, the pond surrounding Moku'ula in Lāhainā. Kihawahine was born a human and deified upon her death. She was said to visit several ponds throughout Maui and Hawaii and was seen, at times, as a woman sitting on a rock alongside the pond Lauoho combing her hair. She is known at the ponds of Haneo'o, Hana and Maulili, Koloa, Kauai (Beckwith 1970:126).

At least two notable *'auwai* (irrigation channels), that span multiple *ahupua'a* between Kaua'ula and Kahoma, are described in native lore. Roughly datable by the chiefs associated with them, the earliest, in the Lahainaluna vicinity, known as 'Auwaiawao, is reportedly named for the Chiefess Wao, sister of Kaululā'au, who ruled a portion of Maui in ca. 1390. Portions of this *'auwai* were subsequently incorporated into the construction of the Lahainaluna Ditch. The second *'auwai*, known as 'Auwai o Pi'ilani, is associated with Pi'ilani, who ruled Maui and the neighboring islands in ca. 1450. The 'Auwai o Pi'ilani has its headwaters in the Kaua'ula Stream and irrigated lands along both sides, with waterways extending to lands below Lahainaluna. Maly and Maly (2007:4).

3.1.2 Menzies Account of the Agricultural Systems of Lāhainā

Archibald Menzies was the acting surgeon and naturalist onboard the H.M.S Discovery and traveled to the Hawaiian Islands between the years 1792-1794. Menzies was from Weem, Scotland and born in 1754. Captained by Geo. Vancouver, the Discovery, and Menzies, made three visits to Hawaii (Menzies 1920). Menzies kept a journal and notated in it were references to two previous trips to Hawaii in 1786 and 1787, although no further notes are known of from those earlier trips.

Likely motivated by his natural interest in botany he went on to attain formal training as a gardener and then a surgeon. Menzies journals provide highly detailed descriptions of Lāhainā and its deliberately designed agricultural arrangement. The following passages described some of what he saw on these trips. In his passage titled *Menzies Botanizes In Mountains Behind Lahaina*, he describes *lo'i* systems in what is thought by this author to be either Kahoma or Kanahā Valley. Traveling there for the purpose of studying plants, he gives the following description:

> Here our conductors importuned us to dine, and a pig being killed and got ready, together with yams and sweet potatoes, we partook of a hearty meal, after which

> we continued our journey, and soon entered the verge of the woods where we observed the rugged banks of a large rivulet that came out of the chasm cultivated and watered with great neatness and industry. Even the shelving cliffs of rocks were planted with esculent roots. Banked in and watered by aqueducts from the rivulet with as much art as if their level had been taken by the most ingenious engineer. We could not indeed but admire the laudable ingenuity of these people cultivating their soil with so much economy. The indefatigable labor in making these little fields in so rugged a situation, the care and industry with which they were transplanted, watered and kept in order, surpassed anything of the kind we had ever seen before. It showed in a conspicuous manner the ingenuity of the inhabitants in modifying their husbandry to different situations of soil and exposure, and it was with no small degree of pleasure we here beheld their labor rewarded with productive crops. (Menzies 1920:105)

Another detailed description of the cultivated fields of Lāhainā village is given by Menzies (1920) in his account during a trip aboard the Discovery, with Captain George Vancouver in 1793:

> March 17. On the forenoon of the 17th, I accompanied Captain Vancouver and a party of the officers, with the two Niihau women, to see the village of Lahaina, which we found scattered along shore on a low track of land that was neatly divided into little fields and laid out in the highest state of cultivation and improvement by being planted in the most regular manner with the different esculent roots and useful vegetables of the country, and watered at pleasure by aqueducts that ran here and there along the banks intersecting the fields, and in this manner branching through the greatest part of the plantation.
>
> These little fields were transplanted in a variety of forms, some it rows, in squares, in clumps and others at random; some according to their nature were kept covered with water, while others were with equal care kept dry by gathering the earth around them in little hills. In short, the whole plantation was cultivated with such studious care and artful industry as to occupy our minds attention with a constant gaze of admiration during a long walk through it, in which we were accompanied by a numerous group of natives that continued very orderly and peaceable the whole time. (Menzies 1920:112)

3.1.3 Early Historic Period

The *kalana* of Lāhainā was a favored place of residence for the high chiefs of Maui. The entire *moku,* or traditional district of Lāhainā, could boast of a mild climate all year round, plentiful marine and terrestrial resources, and close proximity to Lana'i and Moloka'i. Lāhainā was the primary seat of the *ali'i* of West Maui (Handy, et al. 1991:272). Subsequently, Lāhainā served as the center of government for the Kingdom of Hawaii as it was centrally located between O'ahu and Hawai'i. As to the wealth of resources at Lāhainā, Fornander writes the following:

> Kekaa was the capital of Maui when Kakaalaneo was reigning [sic] over West Maui ... Many houses were constructed and people cultivated a great deal of potatoes, bananas, sugar cane, and thins of a like nature. I have been told that the country from Kekaa to Hahakea and Wahikuli – that country now covered by cactus, in a northwesterly direction from Lahaina – was all cultivated. This chief also planted bread fruit and *kukui* trees down at Lahaina. Some of these trees southwest of the Lahaina fort, were called the bread fruit trees of Kauheana (Fornander 1919).

The importance of Lāhainā lands and resources is also reflected in the political and warfare history of the area. During battles fought between Ka-uhi of Maui and Alapa'i of Hawai'i, the Hawai'i Island warriors attacked the food resources of Lāhainā by drying up the streams of Kaua'ula, Kanahā, and Kahoma, and laying waste to the *lo'i* fields and brooks. This action by Alapa'i effectively severed food and freshwater resources from the Maui forces and country people (S. Kamakau 1992:74).

The "Olowalu Massacre", one of the more infamous early historic accounts specific to the Lāhainā region, reveals how conflicts between early western traders and native Hawaiians were easily provoked as western goods became the focus of Hawaiian needs. The Olowalu conflict began in late January of 1791 when the American Merchantman *Eleanora,* under the command of Simon Metcalfe, landed off the coast of Honua'ula to barter for food. During the night, natives killed the ship's watchmen and stole a boat tied to the stern of the *Eleanora*, after which it was burned on shore for the iron fittings. When the incident was discovered the next day, Metcalfe expelled all of the Hawaiian women from the ship, then fired on the village of Honua'ula with grapeshot, effectively setting the *hale* (homes) and *heiau* (temples) on fire. The *Eleanora* then set sail for Olowalu where a chief offered in trade the return of the stolen boat and the bones of the killed watchmen. To Metcalfe's dissatisfaction, only a piece of the boat's keel and leg bones of the watchmen were given by the chief. In revenge, the angered Metcalfe and shipmates tricked the Olowalu natives to bring their trade canoes to the ship's starboard and fired upon them all, killing and wounding at least 100 Hawaiians (Daws 1986:33-34).

The nineteenth century brought to Lāhainā and other portions of the present study area a multitude of commercial, social and religious changes that were encouraged by the burgeoning foreign influx. In 1819 the first whaling ships arrived in Hawaiian waters and Lāhainā became one of the primary harbors for provisioning ships in the islands. The whaling trade flourished until the 1860's and gave impetus to the development and growing population of Lāhainā. Between 1824 and 1861, 4747 whale ship arrivals were recorded for Lāhainā, representing 47 percent of the total arrivals in all ports of the Hawaiian Islands. Figures from an 1846 census of Lāhainā document the following changes brought to the area midway through the nineteenth century: 3,445 Hawaiians, 112 foreigners, 600 seamen, 155 adobe houses, 822 grass houses, 59 straw and wooden houses, and 529 dogs. With an increasing population of foreigners entering Lāhainā, there was a need to increase the traditional agricultural surplus, primarily under the control of the *ali'i* class, for economic trade.

The first Protestant missionaries and their families arrived in Lāhainā in 1823. The missionary William Ellis, who visited Lāhainā during the 1820's, described the landscape that had entranced both the Hawaiians themselves and the nineteenth century newcomers:

> The appearance of Lāhainā from the anchorage is singularly romantic and beautiful. A fine sandy beach stretches along the margin of the sea, lined for a considerable distance with houses and adorned with shady clumps of kou-trees, or waving groves of cocoa-nuts. ...The level land of the whole district, for about three miles, is one continued garden, laid out in beds of taro, potatoes, yams, sugar-cane, or cloth-plants. The lowly cottage of the farmer is seen peeping through the leaves of the luxuriant plantain and banana tree, and in every direction white columns of smoke ascend, curling up among the wide-spreading branches of the bread-fruit tree. The sloping hills immediately behind, and the lofty mountains in the interior, clothed with verdure to their very summits, intersected by deep and dark ravines, frequently enlivened by waterfalls, or divided by winding valleys, terminate the delightful prospect (Ellis 1969:76-77).

Missionary, C.S. Stewart, in his journal from his residence in Hawaii between 1823 and 1825, describes Lāhainā and its cultivation and irrigation systems. Thirty years after Menzies visits, Stewart describes Lāhainā as appearing to be in neglect although in his description there is ample evidence of traditional cultivation:

> The bread-fruit trees stand as thickly as those of an irregularly planted orchard, and beneath them are taro patches and fishponds, twenty or thirty yards square, filled with stagnant water, and interspersed with clumps of tapa tree, groves of the banana, rows of the sugar-cane, and bunches of the potatoe and melon. All these flourish exuberantly from the richness of the soil alone, with but little attention or labor from the hand of man.
>
> It scarce ever rains, not oftener than half a dozen times during the year; and the land is watered entirely by conducting the streams which rush from the mountains, by artificial courses on every plantation. Each farmer has a right, established by custom, to the water every fifth day. The pathways, which are very narrow, are usually along the sides of these water trenches.
>
> The number of inhabitants is about two thousand five hundred. Their houses are generally not more than...eight or ten feet long, six or eight broad, and from four to six high: having one small hole for a door, which cannot be entered but by creeping, and is the only opening for the admission of light and air. They make little use of these dwellings, except to protect their food and clothing, and to sleep, in during wet and cool weather; and most generally eat, sleep, and live in the open air, under the shade of a *kou*, or bread-fruit tree (Stewart 1839).

The Missionary Herald

> We are living in houses built by the heathen and presented to us. They are built in native style, and consist of posts driven into the ground, on which small poles are ties horizontally, and then long grass is fastened to the poles by strings which pass around each bundle. We have no floors, and no windows, except holes cut through the thatching, which are closed by shutters without glass. Our houses are

> comfortable at this season, and we hope will remain so during most of the year, as very little rain falls at this place. During the three months that we have resided here there at been none at all. Nearly all that grows, not only in Lahinah, but on all this part of Mowee, is watered artificially by streams from the mountains (Richards 1824).

Another missionary, E. Loomis, wrote this description of the cultivation in Lāhainā during the same time frame, 1823, in his journal:

> May 25 – Walked over a considerable part of Lahaina this afternoon in company with Mrs. L. and Mr. and Mrs. Richards. The whole place appears to us who dwell on the dusty plain of Honoruru exceedingly beautiful, being covered with cocoanut, bread-fruit, kou, (a beautiful shade tree), banana and tapa [*wauke*] trees. The tapa is a species of the mulberry [*Broussonetia papyrifera*]; sugar cane, maize, potatoes, taro as are cultivated to a considerable extent and add much to the pleasantness of the place.

As described by these individuals, Lāhainā was indeed organized in a high state of cultivation. After the consolidation of the ruler ship of the Hawaiian Islands by Kamehameha I early in the nineteenth century, Lāhainā became the "capital" of the kingdom until the 1840's when the government moved to Honolulu. The sugar cane Ellis observed in the environs of Lāhainā in the 1820's would become the basis for a commercial venture that would reshape the landscape within much of the *present* study area during the second half of the nineteenth century.

3.1.3.1 Moku'ula

The historical significance of Lāhainā as the capitol of the Kingdom of Hawaii from approximately 1820 to 1845 found Moku'ula at its center. Due in part to its relatively calm waters, Lāhainā was first utilized by Kamehameha as a place where he and his entourage stayed while waiting for his *peleleu,* or war fleet, to arrive around 1802. Although somewhat devastated by previous attacks, Lāhainā provided ample provisions of food and water. During this time the ruling *ali'i* of Lāhainā lived, and some died, at Moku'ula. The island of Moku'ula, now the location of Malu'ulu o Lele County Park, was a one acre island located within an inland fishpond known as Loko o Mokuhinia. During the years that Lāhainā was the capital of the Hawaiian Kingdom, Moku'ula was also the residence of Kamehameha III, Kauikeaouli (1837-1845) (Klieger, et al. 1995:2). Imbued with religious and sacred significance, Loko o Mokuhinia, was also the home of the *mo'o* or lizard goddess, Kihawahine. Moku'ula's significance to Lāhainā is based on the fact that it was from this island that the ruling Maui *ali'i* administered their laws and it was from Kihawahine that they attained their chiefly *mana* passed through their lineal connection to her (P. C. Klieger 1998:7).

The island of Moku'ula was also said to be a place *ali'i* went for solitude as well as a place of *kapu*. Hale Piula was the name of Kamehameha III's palace. Hale Piula was constructed of coral blocks and was located in front (to the west or *makai*) of Loko o Mokuhinia. A group of *hale pili* or traditional Hawaiian houses was located on the actual island of Moku'ula along with a family mausoleum. Klieger states that this mausoleum contained several members of Kamehameha III's family including his mother (Keopuolani), sister (Nahe'ena'ena) and children, was in existence

from 1837 to 1883 (Klieger, et al. 1995:2). Loko o Mokuhinia may have been connected to other fish ponds and *lo'i* in a greater area called Kalua'ehu (Klieger, et al. 1995:14).

Kihawahine Mokuhinia Kalama'ula Kalā'aiheana was born as a female child to Pi'ilani, the well known Maui chief, and Lā'ieloheloheikawai. Both Pi'ilani and Lā'ieloheloheikawai were descendants of Mo'oinanea, the matriarch of *mo'o* in Hawaiian genealogy (1998:8). Klieger (1998) explains that Mo'oinanea was likely the first *mo'o* in Hawaii, arriving from Tahiti with the Kū and Hina groups of gods and therefore she was the highest ranking *mo'o* goddess (1998:8). Kihawahine, formally referred to as Kalā'aiheana, was born as an *'e'epa*, meaning, with an extraordinary mental or physical difference and/or powers. It was not until her death that she was deified. It is said that she was the only *mo'o* with the ability to move from pond to pond and from island to island within the island chain (P. C. Klieger 1998:9), "Moku'ula was the traditional Kalua o Kiha, the grotto of the highest *mo'o* goddess (Klieger, et al. 1995:12). Her vertebrae are said to symbolizing the lineal connection, from head to tail, of all the royal ancestors (P. C. Klieger 1998:8).

In a 1947 letter to a Mrs. Taylor, Inez Ashdown (1947a) details the lands that surrounded Moku'ula. One of her informants, Mrs. William Kaae, formerly known as Kaehukai Shaw, tells of the moving of three coffins by Bernice Pauahi Bishop, from the royal tomb on Moku'ula to the Waiola (originally Waine'e) cemetery. She explained that the coffins were loaded on a horse drawn cart and, with a procession of individuals with torches and taken to Waine'e cemetery. But, Mrs. Kaae explained that the remains were not in the coffins. They instead were filled with sand. That the bones of these *ali'i* were taken and hidden somewhere in Lāhainā in the traditional Hawaiian manner (Ashdown 1947a). In her book, The Story of Lāhainā, Ashdown states that Kamehameha II and his wife Kamamalu were also buried there (1947b).

In the same letter, Ashdown give brief descriptions of Moku'ula and speaks of the *mo'o* goddess, and guardian of Moku'ula, Kihawahine. She refers to her as Wao:

> The Mokuhenia (sic) river ran near there, and surrounded the island of Moku-ula, where the king had a *kapu* house, and where later a stone house was built as a tomb. It was from the stone house that the 3 coffins were moved. At that time the Moo protected the kapu place and the name of the main goddess was "Wao" (she pronounced it "Va-o"). This Wao was used to sit and comb her hair and people would often see [her] there, so they avoided the place. If anyone dirtied the pond there, the Moo grabbed them by the ankles and drowned them, and later the kahuna would pray, and then the bodies would come to the surface and could be taken away (Ashdown 1947b).

Ashdown (1947b) mentioned a place called Luaehu and described it as adjoining to the site of the kings palace which was surrounded by *lo'i*, fish ponds, banana trees and coconut palms. She described a canal which allowed ships to travel up to a location where they filled their kegs with fresh water. From this same canal one could reach Apuakehau, once known to be the king's taro patch. Apuakehau was located in the open square fronting the Lāhainā Public Library. She goes on to explain that these *lo'i* were watered by the Pahumanana Stream, which flowed down what is now Dickensen Street (Ashdown 1947b).

In an account given by Menzies during a trip to Lāhainā in 1793, the following description of a chiefly residence describes what might have been the royal residence at Moku'ula:

> On our coming near the kings house, the greatest part of them [an accompaniment of Hawaiians] separated from us, particularly the women, on account of the ground round it being tabooed. The royal residence was sheltered with spreading trees and cocoa-nut palms situated near some beautiful fish ponds with which it was more than half surrounded, though they were not all at this time in repair of filled with water. They were so contrived as to be filled or emptied at pleasure or in succession. Here we found Kahekili with some of his chiefs seemingly in deep consultation, seated under the shady trees in front of his house (Menzies 1920:113).

3.1.4 Mid- to late-1800s

With the unification of the Hawaiian Islands in 1791 and the arrival of the first Missionaries in 1820, western commerce and the Christianization of the Native Hawaiian people swept across Lāhainā. The lands surrounding Lāhainā town were cultivated in commercial sugar (Gilmore 1936:198-203), while the whale trade and the establishment of the Lāhainā Mission Station and Lahainaluna High School, drew people to the waterfront areas as well as the town itself, ultimately resulting in a population rise (A. E. Haun and D. Henry 2001:12). This trend made Lāhainā one of the main religious and educational centers for the entire island chain (S. Kamakau 1992:304).

Government censuses during the second half of the 19th century document the diminishing population of West Maui and the Lāhainā District. In 1853, 4,833 persons were recorded as living in the Lahaina District. Twenty-five years later, in 1878, the total district population had dropped to 2,448; by 1896, it was 2,398 (Schmitt 1977:12-13).

The whaling industry in the Pacific Ocean reached its peak in 1859. Prices for whale oil collapsed five years later. Since the 1840's, the Hawaiian economy had been dependent primarily on supplying whale ships during their long layovers in the islands. With the dwindling number of ships arriving during the 1860's, the population of Lāhainā Town and neighboring West Maui *ahupua'a* dependent on the prosperity of Lāhainā migrated to other parts of Maui and to other islands.

As the Hawaiian population of West Maui declined during the 19th century, missionaries and entrepreneurs moved into the district, reshaping the landscape for western enterprises and pursuits. Reverend Dwight Baldwin (1798-1886) had arrived in the Hawaiian Islands in 1831 and was stationed at Lāhainā between 1835 and 1870. During the early 1850's, Baldwin had been granted 2,675 acres of land in northwest Maui. This land holding would be the basis for enterprises expanding over areas of West Maui undertaken by his son, Henry Perrine Baldwin, during subsequent decades of the 19th century.

3.1.4.1 Great Mahele

The most significant change in land-use patterns and land allocation came with The Great Māhele and the privatization of land in Hawai'i. The 1839 establishment by Kamehameha III

(Kauikeaouli) of a Bill of Rights for the people of Hawai'i, followed by a formal constitution in 1840, hastened the shift of the Hawaiian economy from that of a subsistence-based economy to that of a market-based economy. During the Māhele, all of the lands in the Kingdom of Hawai'i were divided between *mō'ī* (king), *ali'i* and *konohiki* (overseer of an *ahupua'a*), and *maka'āinana* (tenants of the land) and passed into the Western land tenure model of private ownership. On March 8, 1848, Kauikeaouli further divided his personal holdings into lands he would retain as private holdings and parcels he would give to the government. This act paved the way for government land sales to foreigners, and in 1850 the legislature granted resident aliens the right to acquire fee simple land rights (Moffat and Fitzpatrick 1995a:41-51).

The *maka'āinana* were offered fee-simple titles for their house lots and lands which they cultivated for themselves. *Kuleana* awards for individual parcels within the *ahupua'a* were subsequently granted through a land commission. These awards were first presented to Native Hawaiian tenants, and subsequently to naturalized foreigners: non-Hawaiians born in the islands; or long-term resident foreigners who could prove occupancy on the parcels before 1845.

Land Commission Awards (LCAs) were granted by ministers representing the Kingdom of Hawaii's Department of the Interior. Native testimony to establish title to real property was recorded by Native Register - wherein claimants would provide traditional proof of ownership - and in like manner foreign testimony by Foreign Register - wherein boundary survey evidence would support traditional claims.

Of the *kuleana* awarded in the Lāhainā District, most land claims were concentrated in the stream valleys along Ukumehame, Olowalu, Kahoma and Kaua'ula Streams and scattered throughout the alluvial plains and coastline associated with these streams. The primary uses of the land claims in the upper environs were for agricultural with some used as house lots while the land claims in the coastal regions consisted primarily of house sites with home gardens. Figure 4 reflects this general pattern of *kuleana* claims.

There are a total of 64 Land Commission Awards (LCAs) within and/or adjacent to the current project area corridor. Thirty-eight out of the 64 LCAs were awarded for agricultural lots and the remaining 26 were awarded for both house lots and small home gardening lots. In addition, a total of six Grant Awards are also within and/or adjacent to the project corridor. Summarized in Section 3.1.4.1 Great Mahele and Table 1, the complete testimonial as presented by Waihona 'Aina (2000) is available in Appendix C .

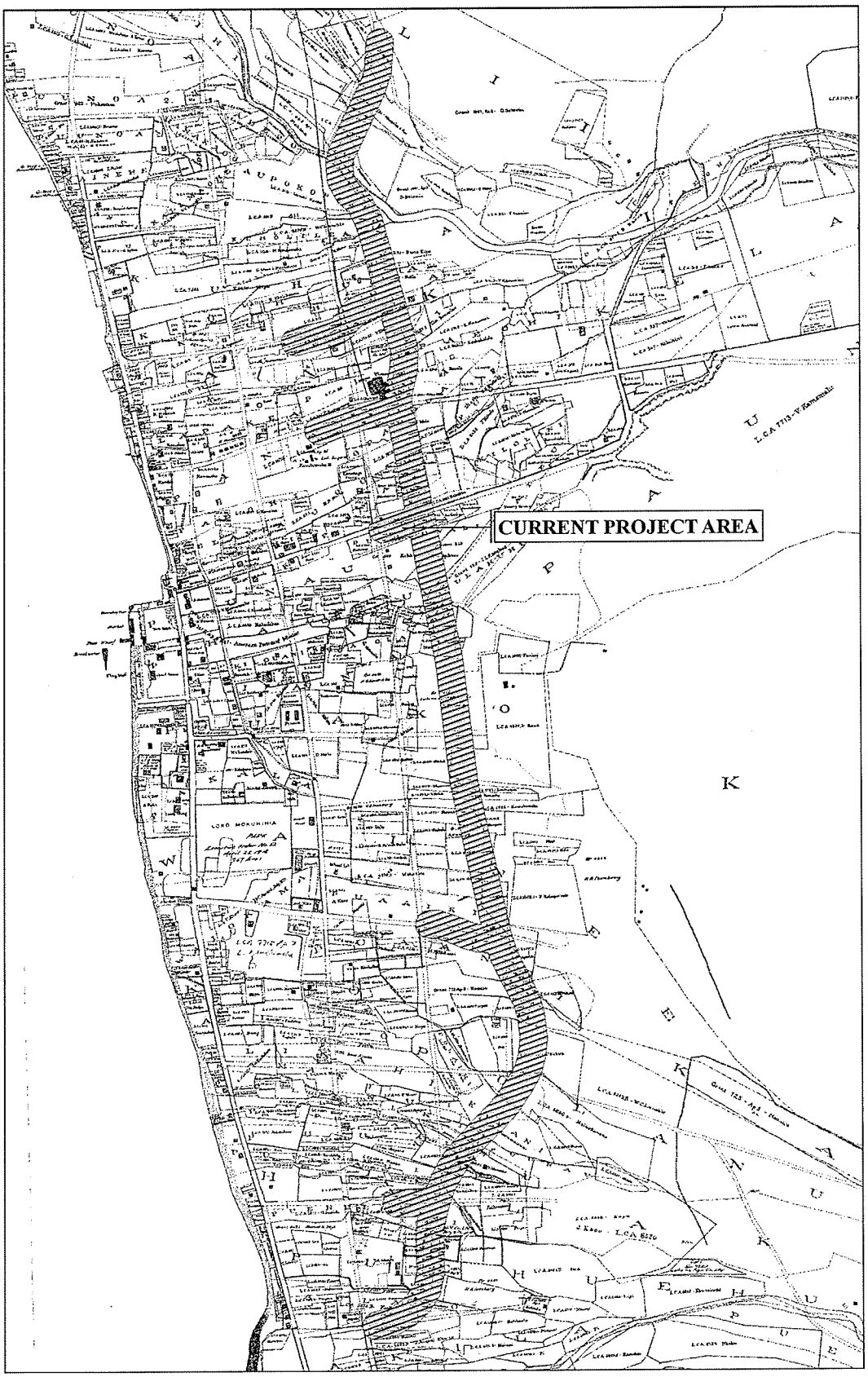

Figure 4. A portion of the 1884 S.E. Bishop map showing the location of Land Commission Awards (LCAs) in relation to the current project corridor (adapted from Bishop 1884)

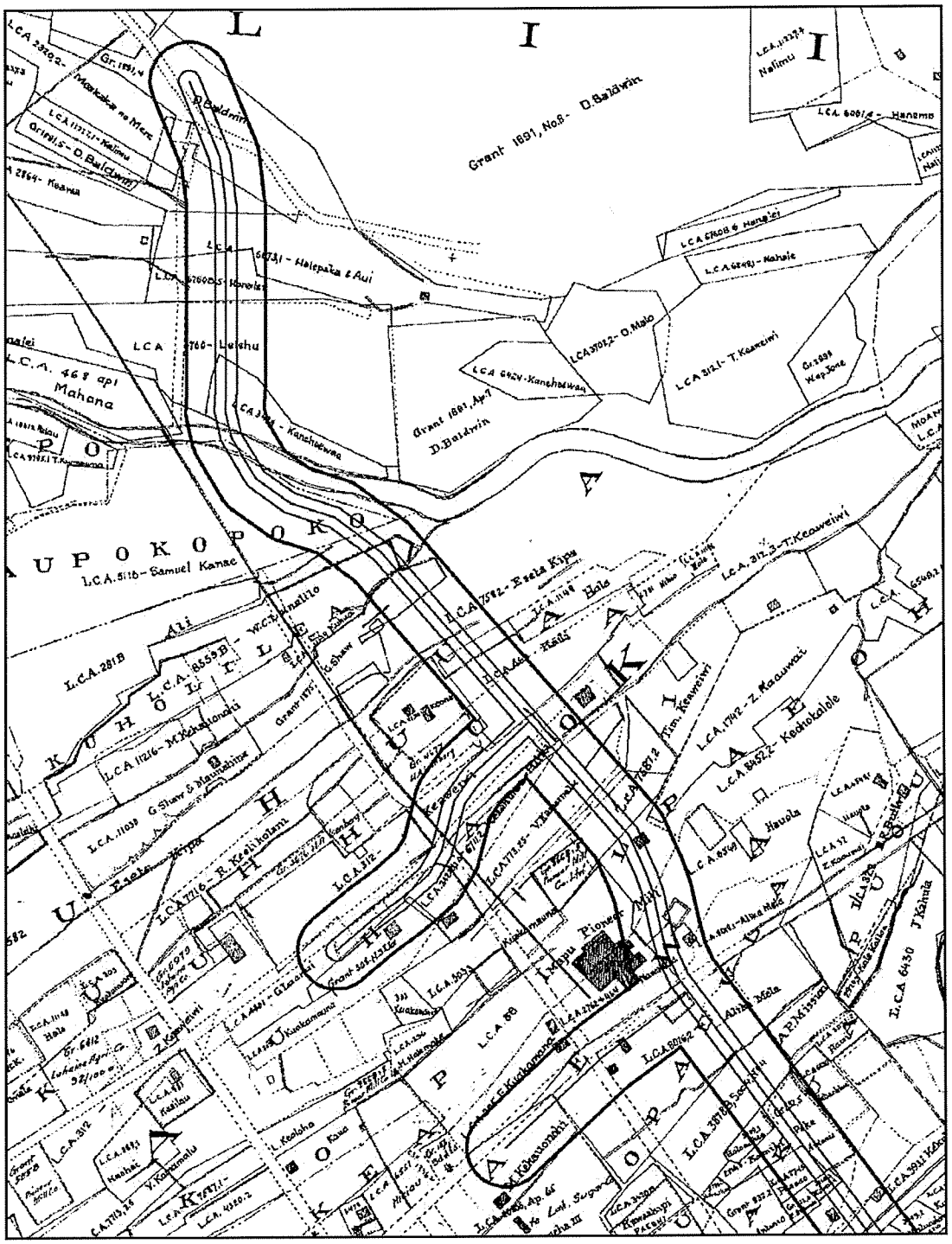

Figure 5. A close-up section of the 1884 S.E. Bishop map showing the concentration of Land Commission Awards (LCAs) adjacent to Kaua'ula Stream (adapted from Bishop 1884).

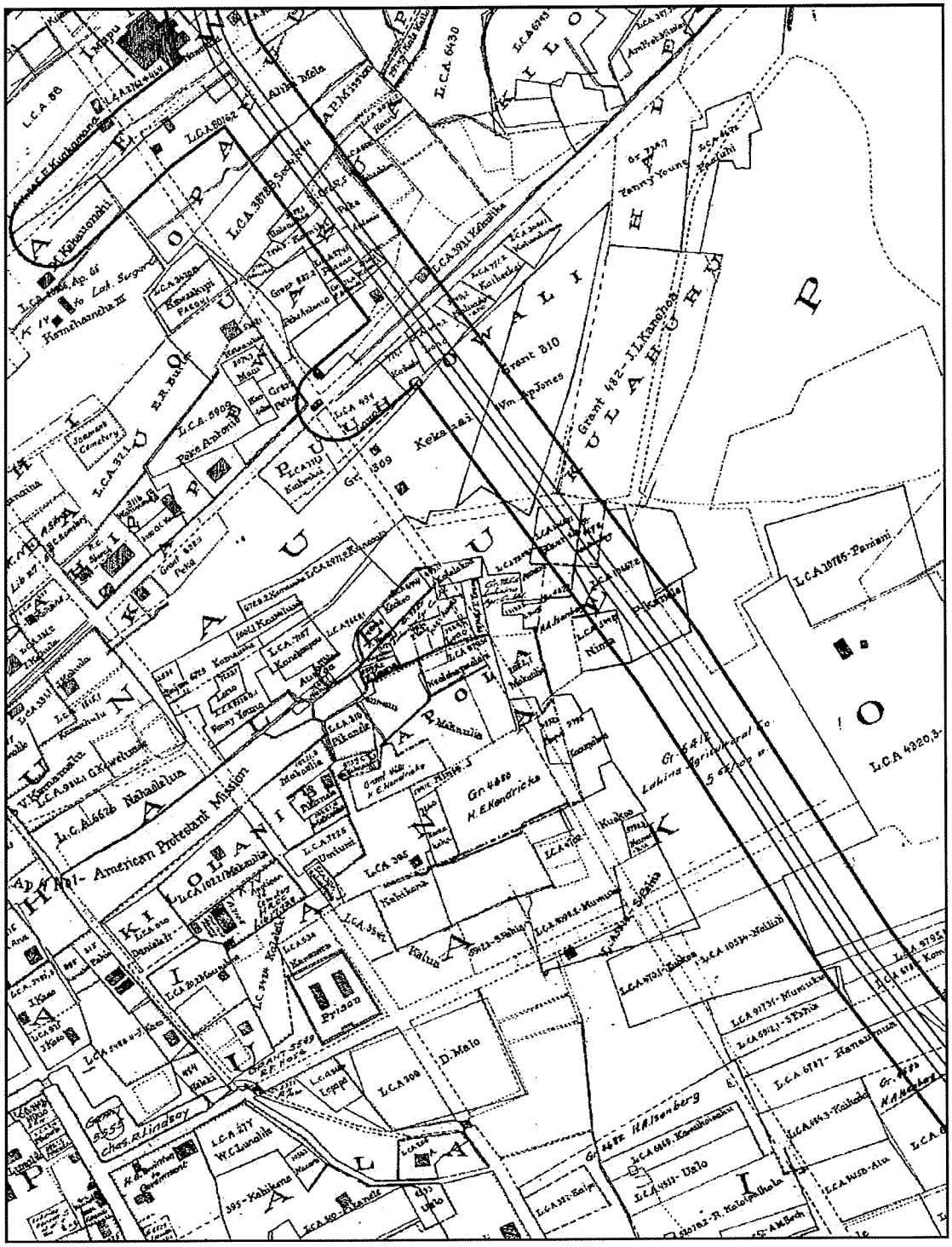

Figure 6. A close-up portion of the 1884 S.E. Bishop map showing Land Commission Awards (LCAs) and other parcel of lands adjacent to the central section of the project corridor (adapted from Bishop 1884).

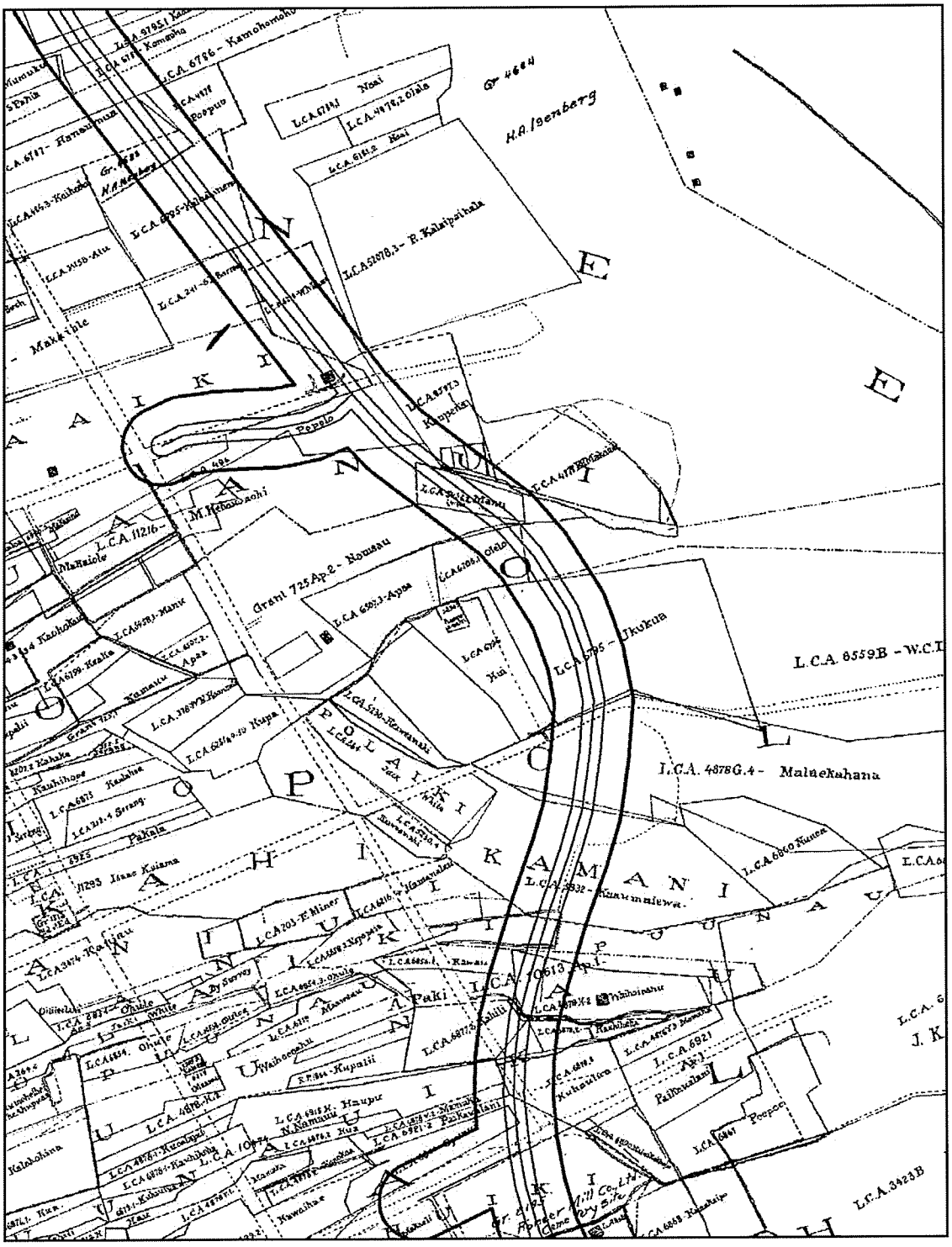

Figure 7. A close-up portion of the 1884 S.E. Bishop map showing Land Commission Awards (LCAs) in relation to the south central section of the project corridor (adapted from Bishop 1884).

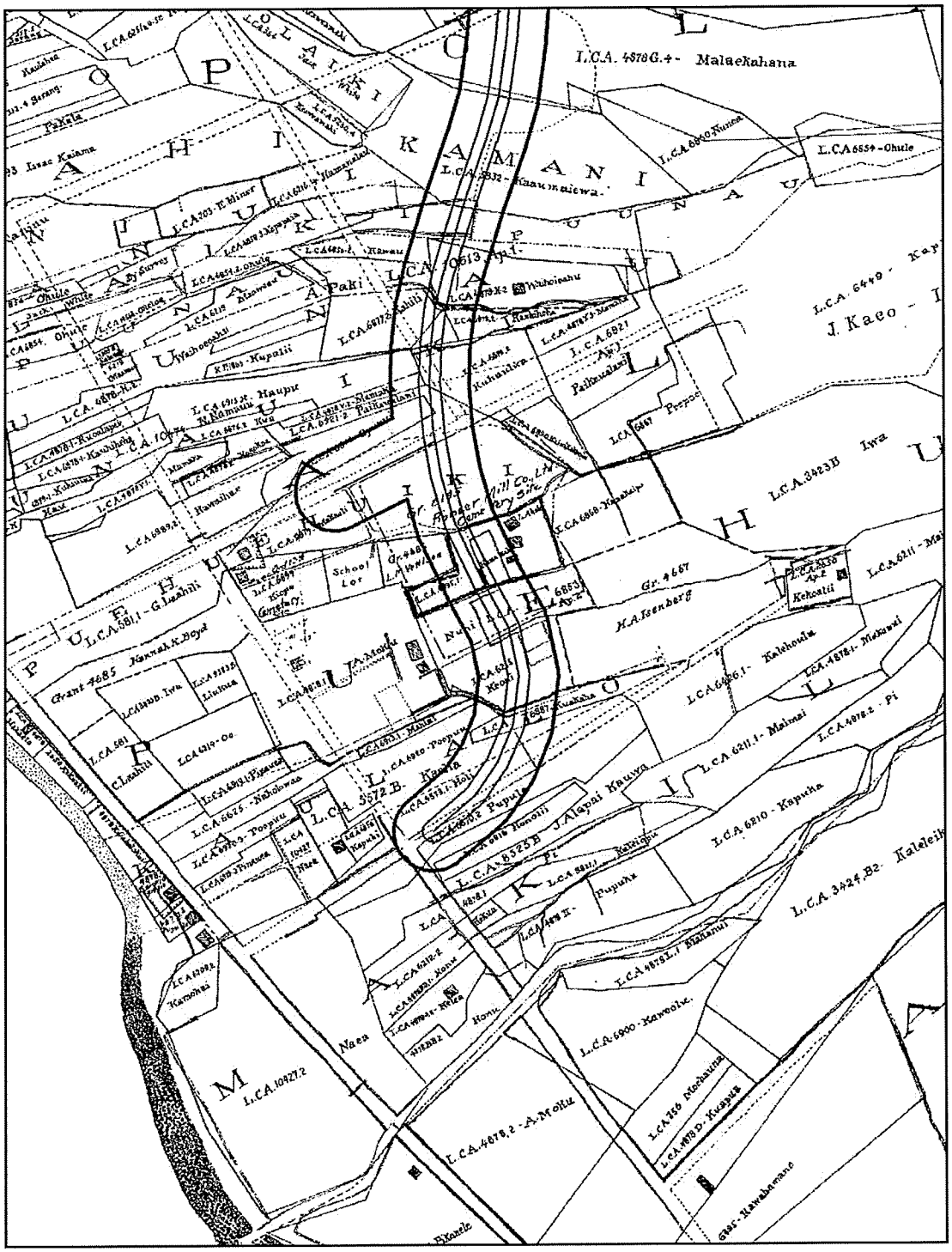

Figure 8. A close-up portion of the 1884 S.E. Bishop map showing Land Commission Awards (LCAs) in relation to the southernmost section of the project corridor (adapted from Bishop 1884).

Table 1. Summary of Land Commission Awards (LCAs) identified within or adjacent to the current project area.

Royal Patent Number	LCA Number	Claimant(s)	Ahupua'a	Lands of the Claimant(s)	Lands Awarded and Acreage
404, 405	00058	Mapu	Aki, Kopili, Kopili Hema	8 *'āpana*	8 *'āpana*; totaling 4.7675 Acres
410	00241	S.D. Burrows	Wainee	1 House lot	1 *'āpana*; 0.81 Acres
1831, 8219	00305	Kuakamauna, E.	Panaewa, Uhao	6 House lots Government road present	6 *'āpana*; 5.175 Acres
2650, 1180, 1179	00312	Timoteo Keaweiwi	Aki, Kuhua, Uhao, Moalii	1 House lot Fence present	7 *'āpana*; totaling 15.9725 Acres
1958, 1600	00387B	A.P. Mission	Paunau, Haleu	3 House lots 1 Canoe house lot 12 Taro patches 1 *kalo* section	3 *'āpana*; 7.1 Acres
1672	00393	Kekuelike	Puukoowali (Puuhoowali)	1 House lot 15 *lo'i* Property is fenced and bounded by a government road and Paunau ditch	2 *'āpana*; 1.21 Acres (awarded in combination in Puuhoowali & Kelawea)
1160	00464	Nawaakoa, wahine	Panaewa	1 House lot Fence present	1 *'āpana*; 1.11875 Acres
5613	00469	Kaili	Kuhua	1 House lot	1 *'āpana*; 1.8 Acres
3536	00494	Lono	Puuhoowali	1 House lot 1 *kula* parcel 2 *lo'i* Government road present	2 *'āpana*; 1.1125 Acres
2759/3340	00496	Popolo	Puaanui	1 House lot 1 Banana planting *kula* parcel 1 *lo'i* *Poalima* plot, *pali,* and a government road	2 *'āpana*; 1.5 Acres

Royal Patent Number	LCA Number	Claimant(s)	Ahupua'a	Lands of the Claimant(s)	Lands Awarded and Acreage
				present	
5563	00812	Asa Kaeo	Puaa (Puaaiki)	1 House lot	1 *'āpana*; 1.24375 Acres
2154	01742	Z. Kaauwai	Paeohi, Kamani	2 *pauku* of *kalo,* including one *poalima*	1 *'āpana*; 2.975 Acres
5579	02320	Moakaka, naamalia, wahine	Moalii	1 House lot 1 *lo'i* 1 section of land	3 *'āpana*; 3.9575 Acres
1691, 1716	02745	Paaoao	Kapewakua, Paunau	1 House lot with 3 houses A *kihapai* of cultivated land	4 *'āpana*; totaling 1.01 Acres
1703	02762	Z. Nawaakoa	Paunau (*'ili*: Pohakuou)	1 *kalo* section (yet no *lo'i* were claimed) 1 piece of land This claim is described as two *pauko*, or small sections. One *pauko* is at Paunau kai and the other is at Paunau uka, an example typical of lands in this part of Lahaina.	2 *'āpana*; 1.10625 Acres
5574	02866	S. Kamiki	Kapewakua	1 House lot 6 *lo'i*	3 *'āpana*; 0.41875 Acres
5578, 5595	03049	Kaluaokamano	Puuhoowali	1 House lot 1 *kula* 2 *lo'i*	2 *'āpana;* 0.45 Acres
1678	03422B	Kekahuna	Uhao	1 House lot with two homes 17 lo'i Stream present, plot bordered by a government road	2 *'āpana;* 1.25 Acres
5666	04760-2	A. Lelehu	Moalii	1 *kula* parcel 7 *lo'i* *Loko* present Bordered by Moalii Stream.	2 *'āpana*; 5.3875 Acres

Royal Patent Number	LCA Number	Claimant(s)	Ahupua'a	Lands of the Claimant(s)	Lands Awarded and Acreage
8394	04801	Laanui, G.	Uhao	Uhao Ahupua'a	2 *'āpana*; 1.93 Acs (Uhao Ahupua'a)
2737	04878 (See No. 4878EE)	Makaiole	Puaanui, Waineenui (Wainee)	1 House lot 3 *kula* 6 *lo'i*	6 *'āpana*; 6.80625 Acres
1199, 2711	04878E	Holi	Makila	1 *kula* parcel 14 *lo'i* *Pali* present	2 *'āpana*; totaling 1.28 Acres
2737	04878EE	Makailoe, wahine	Puaa (Puaaiki), Waianae, Wainee	1 House lot 5 *kula* parcels 6 *lo'i* Government road present	6 *'āpana*; totaling 9.51875 Acres
2738	04878FF	Poopuu, wahine	Puako, Wainee, Waianae 1 & 2	1 House lot 1 *kula* 2 *lo'i*	3 *'āpana*; 0.87 Acres
1959, 2742	04878G	Malaekahana	Polanui	1 House lot with two houses 2 *kula* parcels 1 *lo'i* *Poalima* plot(s)	4 *'āpana*; totaling 8.3875 Acres (2.3875 Acres in Awardee index)
1877	04878H	Waihoioanu	Puunauiki	1 House lot 1 *kula* 4 *lo'i*	6 *'āpana*; 3.621875 Acres
2718	04878Y	Mamaka and Muolo, widow & heir	Halakaa	2 *kula* parcels 1 *lo'i*	3 *'āpana*; 1.19 Acres
1833, 1871	05116	Samuela Kanae	Panaewa, Aupokopoko	Aupokopoko Ahupua'a 1 House lot	2 *'āpana*; totaling 6.65 Acres
1746	05389	Holoauhee	Kapewakua	1 House lot with two houses	3 *'āpana*; 0.62 Acres

Royal Patent Number	LCA Number	Claimant(s)	Ahupua'a	Lands of the Claimant(s)	Lands Awarded and Acreage
				3 *lo'i* 2 *mo'o* Two *kukui* trees, two coconut trees, and one breadfruit tree	
1751	05441	Ninia	Waianae (*'ili*: Kaluokiha)	1 House lot with 4 houses 5 *lo'i* 2 Bananas, 4 breadfruit, 1 orange, 1 sugar cane, 2 grape vines, 13 *kukui* trees, *ti* leaves, 2 other plants, 1 other tree Property is fenced and a government road is present Naiahelu got this land from Hoapiliwahine, her *aikāne*	3 *'āpana*; 0.63 Acres
1699	05458	Manu	Kooka	14 mo'o kula 27 lo'i *Poalima* plot(s) and stream present	4 *'āpana*; 1.625 Acres
4515	05672B	Kaaha (for H. Kahanawai)	Kaulalo	Kaulalo Ahupua'a	No documents located, but Kaaha gets Kaulalo in No. 1280*M
1157	05832	Kaaumaiewa	Kamani	1 *kula* 1 *lo'i*	1 *'āpana*; 4.35 Acres
1173	05912	Simeona Pahia	Puako (*'ili*: Luahoomu)	4 taro sections 1 pasture	4 *'āpana*; 2.27 Acres
1182	06073	Halepaka	Moali'i (*'ili*: Kapaahu)	1 *kula* with a house present	1 *'āpana*; 2.63125 Acres
2723	06205	Olelo	Kooka	1 House lot 3 *kula* parcel	2 *'āpana*; 1.4125 Acres

Royal Patent Number	LCA Number	Claimant(s)	Ahupua'a	Lands of the Claimant(s)	Lands Awarded and Acreage
				6 *lo'i* *Pali* present	
1854	06215	Keoni	Puehuehunui	1 *kula* parcel	1 *'āpana*; 0.88 Acres
1184	06218	Mauae, wahine	Waineenui (Wainee)	1 House lot 1 *kalo* section 4 *mo'o*	4 *'āpana*; 1.46 Acres
1840	06424	Kanehoewaa	Moalii	1 House lot 1 Farm lot	1 *'āpana*; 1.6 Acres
None	06549	Hauola	Panaewa, Paeohi	1 House lot 1 *kalo* and *kula* mixed parcel	4 *'āpana*; totaling 4.4925 Acres
1880	06626	Nahaolelua	Haleu, Kapewakua	1 House lot with some *kalo* land 1 *kalo* section	2 *'āpana*; 1.78 Acres
3453	06760B	Hanalei	Moalii	1 House lot 1 *kula* parcel 11 *lo'i* 8 Breadfruit trees, 6 groves Bound by government road	6 *'āpana*; 6.7 Acres (awarded in combination in Moalii & Kapunakea Ahupua'a)
8248	06785	Kaluahinui	Wainee	1 *kula* parcel 3 *lo'i*	1 *'āpana*; 2.075 Acres
1183	06786	Kamohomoho	Wainee	1 *kula* with a house present	1 *'āpana*; 2.52 Acres
1701	06787	Haunaumua	Waineenui (Wainee)	1 *kula* parcel	2 *'āpana*; 1.75 Acres
1171	06788	Kamauoha	Wainee	1 *kula* parcel	1 *'āpana*; 0.8 Acres
8401	06795	Ukukua	Polanui	1 *kula* 1 *lo'i* ·Bordered by Polanui Stream	2 *'āpana*; 4.58125 Acres
4562	06801	Opunui	Halakaa	1 *kula* 12 *lo'i*	2 *'āpana*; 1.09375 Acres

Royal Patent Number	LCA Number	Claimant(s)	Ahupua'a	Lands of the Claimant(s)	Lands Awarded and Acreage
				Poalima plot present Bordered by Paunaula Creek	
1851	06853	Nuhi	Puehuehunui	1 *kula* parcel 10 *lo'i*	1 *'āpana*; 1.4 Acres
2750	06856	Kawau	Paunau	1 *kula* 22 *lo'i*	2 *'āpana*; 0.78125 Acres
2714, 8266	06870	Pupule, wahine	Makila	1 House lot 1 *kula* parcel 1 *lo'i* section with 2 *poalima* plots Seashore, road, stream, and *pali* present	3 *'āpana*; totaling 2.695 Acres
5587	06877	Kahili	Paunauiki	3 *kula* 4 *lo'i* Government road, *poalima* land, stream, and *pali* present	6 *'āpana*; 1.1625 Acres (awarded in combination in Paunauiki & Kauaula Ahupua'a)
2749, 4557	06878	Kauhiheha	Puehuehu	2 *kula* 10 *lo'i* *Poalima* plot(s), *pali*, road, and burial features present	10 *'āpana*; totaling 2.235 Acres (awarded in combination in Paunauiki & Kauaula Ahupua'a)
4556	06879	Kuhaulua	Paunauiki	2 *kula* parcels Government road and a stream are present	2 *'āpana*; 1.45625 Acres
5703	06887	Kuakaha	Kaulalo	3 lo'i *Pali* present	1 *'āpana*; 0.5875 Acres
4507	06895	Kauakahi	Puehuehunui	3 *kula* parcels 3 *kalo* sections *Poalima* plot(s) and stream present	4 *'āpana*; totaling 14.49375 Acres
5559	06915	Haupu	Paunauiki	2 *kula* parcels *Poalima* plot(s) and Government road are present.	1 *'āpana*; 1.2625 Acres

Royal Patent Number	LCA Number	Claimant(s)	Ahupua'a	Lands of the Claimant(s)	Lands Awarded and Acreage
2376	06916	Honolii	Makila	1 *kula* parcel	1 *'āpana*; 0.51325 Acres
4554	06920	Poopuu, wahine	Kaulalo	1 *kula* 11 *lo'i* Stream and *pali* present	3 *'āpana*; 1.9 Acres
2717	06921	Paikaualani	Halakaa	1 *kula* parcel with a house present 1 *kalo* section with 2 *poalima lo'i*	3 *'āpana*; 1.7 Acres
2732	07269	Auwaa	Haleu	1 House lot 3 *kula* 12 scattered *lo'i* 2 Breadfruit trees, 2 *kukui* trees, grape vines, *neleau* trees, *hala* clumps, and some roses	5 *'āpana*; 1.1375 Acres
8393	07582	Eseta Kipa	Kuhua	Kuhuanui Ahupua'a.	1 *'āpana*; Kuhua Ahupua'a
None	07587* M	Kealoha, Luisa	Kopili	An *'ili* of Kopili Ahupua'a	Claim not awarded on Maui, see Oahu
3582	07711	John H. Kaiheekai	Puuhoowali	Puuhoowali Ahupua'a	3 *'āpana*; 0.85625 Acres (Puuhoowali Ahupua'a)
4475	07713	V. Kamamalu	Aki, Moalii, Paunau	Aki Ahupua'a Moalii Ahupua'a Paunau Ahupua'a	2 apana (Paunau Ahupua`a and Aki Ahupua`a)
4560	08018	Alika Mela	Opaeula1	Opaeula Ahupua'a with a house lot present	2 *'āpana*; 4.7625 Acres (Opaeula Ahupua'a)
4388, 7453	08452* M	Keohokalole, A. wahine	Paeohi, Kuhua, Kooka	Paeohi Ahupuaa 1 *mala* of *lauhala*, 10 coconut trees, some *kou* trees, and a *hala* clump	Paeohi is listed in the award but acreage details are missing
5637, 5639, 8395, 8397	08559* M	William C. Lunalilo and Kanaina,	Aki, Polanui, Paeohi, Waianae,	Kuholile Ahupuaa Polanui Ahupuaa 5 lots	8 *'āpana;* totaling 629.55625 Acres

Royal Patent Number	LCA Number	Claimant(s)	Ahupua'a	Lands of the Claimant(s)	Lands Awarded and Acreage
		Charles for King	Kuholilea		
5580	08587	Kaupena	Puaanui (Puaa)	1 House lot 1 *kula* 3 *kalo* sections *Poalima* plot(s) and stream present	3 *'āpana*; 1.5625 Acres
1172	09793	Mumuku	Puako	1 House lot 2 *kula* parcels 1 *pauku* of *kalo* and 4 *lo'i* Road present	4 *'āpana*; 1.7 Acres
1761	09795	Kaaumaiewa	Puako	1 House lot 1 *kula* 9 *lo'i*	4 *'āpana*; 1.06 Acres
8256	09817	Makaele	Puehuehuiki	1 House lot 1 *kula* 1 *kalo* section	2 *'āpana*; 2.33125 Acres
None	10534	Nailiili	Puako	1 House lot 1 *kula* parcel 6 *lo'i*	1 *'āpana*; 1.425 Acres
	10613	Paki, A	Paunau	See Appendix C for original documents	
1729, 2399	10667	K. Pikanele	Waianae	13 *lo'i*	4 *'āpana*; 2.767 Acres
2651	11150	Keone, wahine	Kuhua	2 House lots 1 *kula* 1 *kalo* patch	4 *'āpana*; 1.88125 Acres
8388, 8389	11216* M	Kekauonohi, Mikahela	Puaa, Aki 2, Kuholilea 2,	Puaa Ahupua'a Aki 2 Ahupua'a Kuholilea 2 and 3 Ahupua'a	5 *'āpana*; totaling 37.46 Acres (Aki 2 Ahupua'a, Puaa Ahupua'a, and Kuholilea 2 & 3 Ahupua'a)

Table 2. Summary of Grant Awards identified within and/or adjacent to the current project area.

Grant #	Grantee	Ahupua'a	Land Use
1875	George Shaw	Kuholea	NA
832	Peke Antonio	Kapewakua	NA
309	Kekauai	Pu'uho'owali	NA
310	Ap Jones, William	Puahaoowale	NA
482	Kanehoa, James Y.	Kalahuhu	NA
4683	Isenberg	Wainee	N/A

3.1.5 Early Sugar Cultivation

Ko (sugarcane) is believed to have been brought to the islands during their initial settlement by the Polynesians. Although there is no reference to its introduction to the islands in the rich oral tradition of Hawai'i, the diversity of the cultigens suggests that it has been here a long time (Handy, et al. 1991:183-189).

As foreign entrepreneurs looked to expand their exportable crops and increase their profits sugar became the answer. Farmers first started meeting the demand for sugar brought on by the California gold rush, and by the early 1850's Chinese and Japanese contract labors were brought to Maui to farm the fields. In 1854, Captain P. Edwards brought in two varieties of sugarcane, one from Tahiti and one from Cuba, which flourished. However, the Tahitian variety outperformed the Cuban variety and was named Lāhainā (Lee-Greig and Hammatt 2006:37).

In 1849 Judge A.W. Parsons was operating a mill in Lāhainā but the demand for sugar would wane as the gold rush ended (Lee-Greig and Hammatt 2006: 37).With the onset of the American Civil War, the demand for sugar once again skyrocketed as the northern states were now without their southern suppliers, creating a high demand for the commodity. In 1862 the first steam driven mill was constructed on Maui which increased production. Over the next 20 years the sugarcane industry exploded in Hawaii with over 22 plantation or mills operating on the island of Maui by 1884 (Wilcox 1996:2-5). The West Maui Sugar Company and Pioneer Mill Company were the leading operations in the Lāhainā District.

3.1.5.1 West Maui Sugar Company

King Kamehameha V ventured into the sugar industry, creating the West Maui Sugar Company in 1864 along with two established sugar entrepreneurs, F. W. Hutchison and James Makee. Hutchinson owned interest in the Lahaina Sugar Company and Makee owned the Rose Ranch sugar plantation. The King leased the crown lands in Olowalu and Ukumehame to the West Maui Sugar Company. However, without a mill the crop was sent to the Pioneer mill for processing. The mill was steam driven and could process 1200 tons of sugar yearly (Olowalu Town 2008:127).

Late in the 1860's the West Maui Sugar Company took Z.S. Spalding as a partner. As manager, Spalding acquired the Lahaina Sugar Company mill to relieve the reliance on the

Pioneer mill for processing. As sugar prices declined in the 1870's, King Kamehameha V held Spalding responsible, ultimately leading to his dismissal. In 1872 King Kamehameha V died, and with his death the land leases under his name were transferred to the West Maui Sugar Company. Within two years the West Maui Sugar Company was sold to the Pioneer Mill Company (Wilcox 1997:127).

3.1.5.2 Pioneer Mill Company

In 1860 James Campbell started a sugar plantation, growing and milling cane for small farmers with his mule powered mill. Two years later Campbell joined with Henry Turton and James Dunbar establishing the Campbell and Turton Company. In 1865, Dunbar pulled out and Campbell and Turton changed the name to the Pioneer Mill Company (University of Hawaii HSPA Plantation Archives 2004). The original lands acquired for the venture belonged to Thomas Phillip in Launiupoko Ahupua'a (Lee-Greig and Hammatt 2006:41). The company expanded quickly after acquiring the West Maui Sugar.

With increasing acreage under cultivation resulting in higher crop yields, the Pioneer Mill Company was one of the first to put in a rail system for hauling cane from the fields to the mill. As the company grew so did the town of Lāhainā; by 1910 the company employed over 1600 workers and cultivated over 8,000 acres of cane. In order to maintain production and the successful growing of sugar cane along the west coast of Maui, further development of water resources was required.

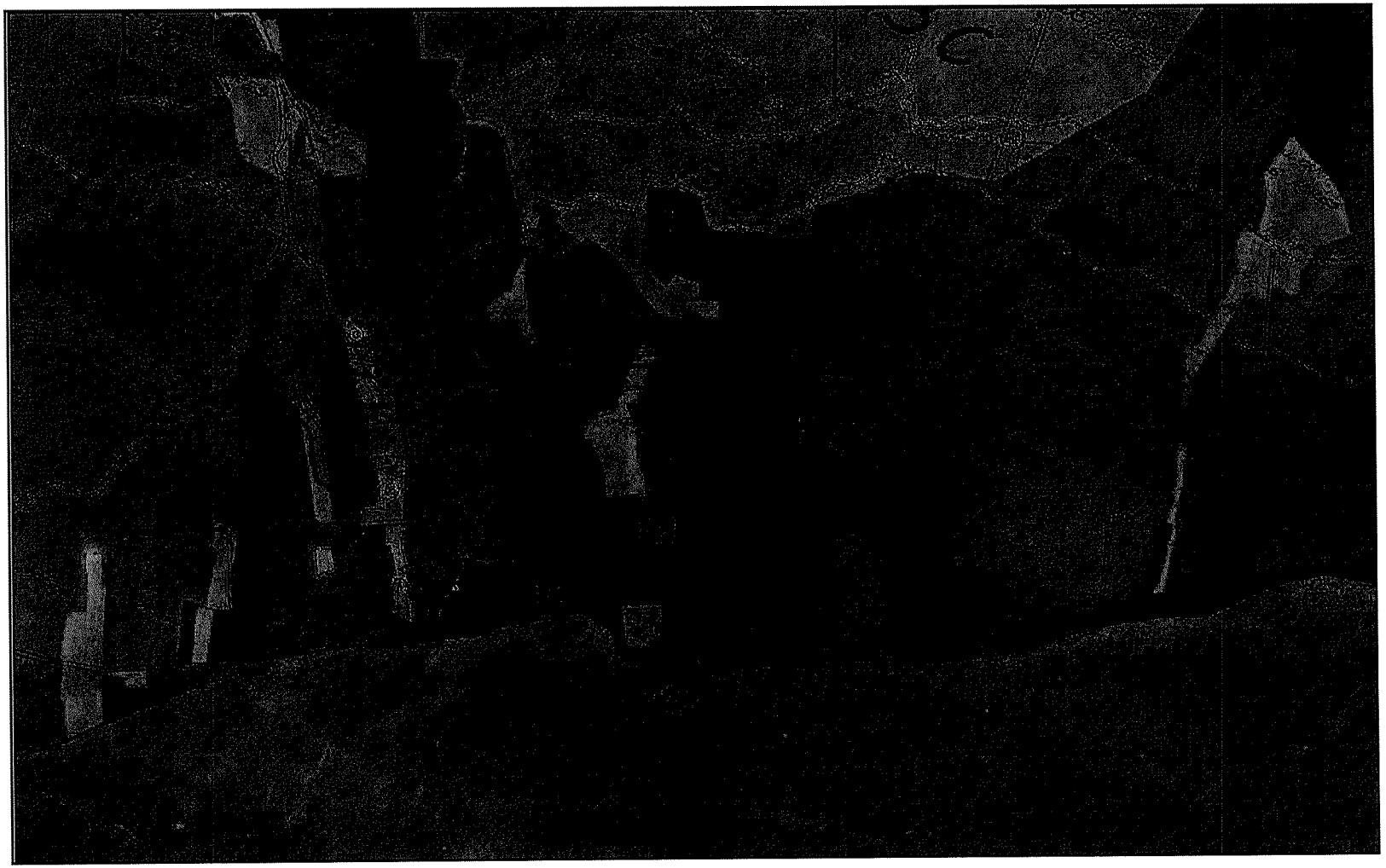

Figure 9. A portion of a 1918 map illustrating lands under cultivation by the Pioneer Mill Company in relation to the current project area (outlined in red), Pioneer Mill Co. lands in red, Government lands in green, Bishop Estate lands in yellow, leasehold and lands under other ownership in blue.

3.1.6 1900s to Modern Era

By the late 1920's, the Pioneer Mill Company developed a complex of irrigation systems including flumes used to transport cane to railroad "car loading stations". In May of 1931 the Pioneer Mill Company expanded its cane enterprise as far as Ukumehame to the east with the acquisition of the Olowalu Sugar Company (Conde and Best 1973:254-264).

A dramatic technological change to cane production of the Pioneer Mill occurred in 1946 when it became more economical to use trucks to transport the harvested cane instead of railroad carts. As reported in a Pioneer Mill Co. annual, the year of 1953 marked the final elimination of railroad use in the Pioneer Mill Company (in Condé and Best 1973:255). An exhaustive study by the combined staffs of Pioneer Mill Company, and American Factors, Ltd., Plantation Division, resulted in the elimination of the railroad system altogether by 1952. All sugarcane would be hauled by trucks, with the ability to haul 45-65 tons per load, on a shift basis.

After World War II heavy equipment and mechanized farming were introduced and from the years 1948 to 1951 Pioneer Mill Company started a rock removal program to increase production. The program used heavy equipment to clear the fields of rocks, which were stacked into large piles. These plantation rock piles exist on the landscape today.

The Pioneer Mill Company thrived throughout major dips in the American economy; however, all ventures are susceptible to market change and the Pioneer Mill Company was no exception. Faced with foreign competition, which had lower land and labor cost, the company closed down in 1999 (Kubota 1999). Today, fallow fields, the smoke stack, and a six-mile segment of the track are all that remain of the Pioneer Mill Company. In 1970, the Kaanapali & Pacific Railroad used the six-mile segment of track to create a tourist Sugar Cane Train ride *mauka* of Lāhainā Town. Although the sugarcane industry has disappeared from this area of Maui, the impact of the industry changed the landscape of West Maui and the rest of Hawai'i forever.

3.2 Previous Archaeological Research

This section provides a brief overview of the research and findings of previous archaeological investigations in the general area surrounding the current project. Investigations including the current project area are discussed next followed by a summary of those conducted nearby (Figure 10 and Table 3).

Formal archaeological research began on Maui early in the twentieth century when Thomas Thrum began recording the *heiau* of Maui the Hawaiian Annual from 1909 through 1918. At the conclusion Thrum had located 121 *heiau* on Maui (Thrum 1909-1918). The first attempt at a systematic island –wide survey was undertaken by Winslow Metcalf Walker from 1928 to 1929. The survey was commissioned by the Bishop Museum and focused on large sites and *heiau* around the island.

Walker identified four *heiau* in the vicinity of the current project area. These include Wailehua, Halekumukalani, Apahua, and Waiie *heiau*. Wailehua heiau, now destroyed, was located in the *ahupua'a* of Makili, at the shore. According to Thrum (1909) it was built by Kauhi-ai-moku-kama, son of Kekaulike, around 1738. The heiau measured 130 x 80 ft.

Subsequently its location served as the residence of the manager of the Pioneer Mill Co. (Walker 1931:64).

Halekumukalani was a small sacrificial *heiau*. Described by Walker (1931:64) as being located in the cane lands of Puehuehunui in the *ahupua'a* of Halekaa, it was likely located in the *ahupua'a* of Puehuehunui. Halekumukalani *heiau* had been destroyed prior to 1931. Apahua *heiau* was located above the cane fields of Wainee. Completely destroyed, its construction was credited o Hua-nui. Waiie heiau located in the Kapaulu district south of Lahainaluna Rd. was destroyed prior to Walkers survey (Walker 1931).

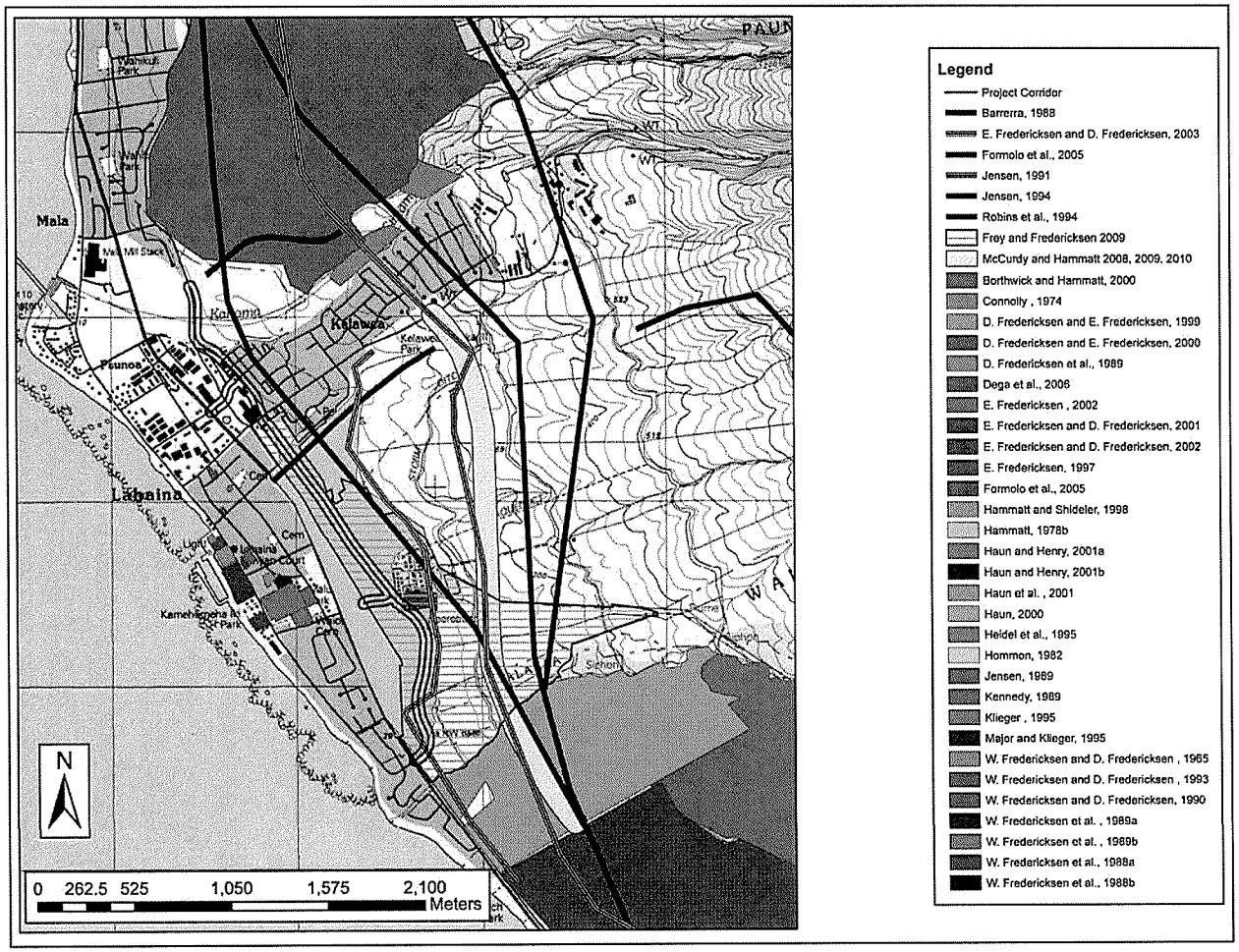

Figure 10. A portion of the USGS 7.5' topographic map, Lāhainā Quadrangle (1992) showing the Current Project Corridor in relation to previous archaeological studies.

Table 3. Previous Archaeological Studies

Reference	Year	Location	Summary of Work
(Walker 1931)	1931	Island Wide	Walker identifies four heiau in the vicinity of the current project area. These include Wailehua, Halekumukalani, Apahua, and Waiie heiau
(Fredericksen and Fredericksen 1965)	1965	Paunau	Data Recovery: Confirmed the location and construction techniques of the "Brick Palace" of Kamehameha I.
(Connolly 1974)	1974	Kahoma Stream	Inventory Survey of Kahoma Stream Flood-Control Project Area, which identifies the "Kahoma Stream Terrace System Complex" of 33 agricultural terraces and a second complex at a higher elevation: the "Haia Terrace System" that is located outside of the project area.
(Hammatt 1978)	1978	Māla Wharf	Archaeological Investigation and Monitoring: Monitored the exhumation of 90 human burials, three of which were determined to be pre-contact Hawaiian burials, at SIHP 50-50-03-226 (Pu'u Piha Cemetery). Identified a pre-contact cultural material layer likely associated with pre-contact habitation.
(Hommon 1982)	1982	Waine'e	Reconnaissance: No significant finds.
(Barrera 1988)	1988	Multiple Ahupua'a	Archaeological Reconnaissance: Identified historic properties associated with agricultural pursuits.
(Fredericksen, et al. 1988a)	1988a	Panaewa Ahupua'a	Inventory Survey: Excavations of a portion of the "Aus Site" 50-03-1797 were conducted. Based on the scarcity of cultural material remains, initial analysis of the area indicated that it was a low use area.
(Fredericksen, et al. 1988b)	1988b	Waine'e Ahupua'a	Inventory Survey: Phase I inventory survey at Hale Pi'ula. Did not identify features positively associated with Hale Pi'ula (unfinished stone palace of Kamehameha III); however, 2 oblong structures of an indeterminate function and a portion of the foundation from the old armory building was documented
(D. L. Fredericksen, et al. 1989)	1989	Panaewa	Data Recovery/ Monitoring: 10 early post-contact to modern-era refuse pits.
(Jensen 1989)	1989	Wahikuli	Inventory Survey: Documentation of 20 agricultural terraces, 13 burial and possible burial features, seven walled habitation enclosures, one temporary shelter, one historic road, one petroglyph panel, and one platform representing both pre-contact and historic-era use of the area.
(Kennedy 1989)	1989	Paunau	Limited Subsurface Testing: Artifacts with a time range of early post-contact to modern era.

Reference	Year	Location	Summary of Work
(Walter M. Fredericksen, et al. 1989)	1989a	Panaewa	Inventory Survey: Sparse historic-era cultural materials in a disturbed context.
(Walter M Fredericksen, et al. 1989)	1989b	Paunau	Inventory Survey: Determined that the parcel was open space/lakeshore and that a portion was likely submerged under Loko o Mokuhinia
(Fredericksen and Fredericksen 1990)	1990	Panaewa	Monitoring/ Data Recovery: Out-of-context indigenous artifact. No significant finds.
(Jensen 1991)	1991	Panaewa	Inventory Survey: Four pre-contact historic properties containing 28 component features associated with agriculture, habitation, and burial interment and ceremony.
(Fredericksen and Fredericksen 1993)	1993	Lāhainā Town	Inventory Survey: Documentation of three historic era disposal pits.
(Jensen 1994)	1994	Hanakao'o and Paunau	Inventory Survey: No significant findings.
(Robins, et al. 1994)	1994	Ma'alaea to Paunau	Inventory Survey: Identification of 34 historic properties, including: permanent and non-permanent habitation sites, heiau, shines, travel markers, non-irrigated agricultural sites, historic ranching walls, irrigation canals, burials sites, possible railroad beds from the previous sugar plantation operation.
(Heidel, et al. 1995)	1995	Waine'e	Inventory Survey: No significant findings.
(Klieger 1995)	1995	Lower Wane'e Moku'ula	Data Recovery: Verified the location and condition of the inland island, and royal residence of Moku'ula, verified the nature of the surrounding fresh water pond of Loko o Mokuhinia, documented modifications to the inland island and nature of cultural material remains associated with the occupation of Moku'ula.
(Major and Klieger 1995)	1995	Pakala	Inventory Survey: Identified two historic properties SIHP 50-50-03-4118, a subsurface deposit potentially related to pre-contact to early historic habitation of the parcel by Lāhainā *konohiki* Pikanele, and 50-50-03-4119, a historic-era dwelling.
(Fredericksen 1997)	1997	Pioneer Inn	Monitoring Report: No significant finds.
(Hammatt and Shideler 1998)	1998	Lahaina Courthouse	Archaeological Monitoring: Identified historic era fill deposit and pig remains. The presence of pig remains is indicative of a possible pre-contact cultural deposit.

Reference	Year	Location	Summary of Work
(Fredericksen and Fredericksen 2000)	2000a	Waine'e	Inventory Survey: Identified SIHP 50-50-03-5042, two plantation era structural remnants and cultural material associated with the settlement of Waine'e Village.
(Haun 2000)	2000	Pūehuehu Iki, Pāhoa, and Pola Nui	Inventory Survey: A total of three historic properties associated with both traditional and commercial agricultural endeavors from the later pre-contact era to early historic era for the former (SIHP -4789 and -4795), and historic to late historic for the latter (SIHP -4787).
(Borthwick and Hammatt 2001)	2001	Lahaina Courthouse	Subsurface Archaeological Investigation: Documented a pre-contact subsurface cultural deposit (SIHP 50-50-03-4754) at approximately 1-1.2m below surface.
(Fredericksen and Fredericksen 2001)	2001	Puako	Archaeological Monitoring: Four pre-contact to early post-contact historic properties consisting of traditional Native Hawaiian burial interments and cultural deposits with subsurface features indicative of habitation.
(A. E. Haun and D. Henry 2001)	2001	Launiupoko	Inventory Survey that identified four sites consisting of six component features. One of the sites (SIHP-4787) was previously recorded by PHRI (2000). The other three were new discoveries. SHHP-5187 consisted of two linear rockpiles, SIHP-5188 is a series of low terraces associated with a concrete and mortared stone ditch and the final site consisted of a terrace interpreted as *lo'i* based on appearances and proximity to Kaua'ula Stream. No cultural material was observed during subsequent testing.
(A. E. Haun and J. D. Henry 2001)	2001		Inventory survey that identified six sites consisting of seven component features. Two of the sites were previously recorded by PHRI. SIHP-2665 by Graves et al. (1998) and SIHP-4787 in PHRI (2000). SHIP-5049 and 5050 are cattle walls, SIHP 5051 is a historic roadbed, and SIHP-5052 consisted of linear rock mounds or terraces.
(Fredericksen 2002)	2002	Paunau, King Kamehameha III Elementary	Archaeological Monitoring: No significant finds.
(Frederickson and Frederickson 2002)	2002	Puako	Inventory Survey: One historic property consisting of four post-contact trash pits and one "backyard" water worn pavement.
(Fredericksen and Fredericksen 2003)	2003	Multiple Ahupua'a	Inventory Survey: One pre-contact human burial identified below the plow zone (50-50-03-5238).
(Formolo, et al. 2005)	2005	Hanakao'o Ahupua'a	Archaeological Assessment: No significant historic properties identified.

Reference	Year	Location	Summary of Work
(Paraso and Dega 2006)	2006	Polanui and Launiupoko	Inventory Survey: Identified a total of 10 historic properties, five are associated with historic era commercial sugar cultivation (50-50-03-4787 [Lāhainā Pump Ditch No. 1]; -5950 [17 field clearing mounds]; -5951 [water control features]; -5952 and -5957 [terraces associated with manual sugar cultivation]), two are rock walls associated with historic era ranching activities (50-50-03-2665 and -5954); one is a historic slag scatter (50-50-03-5953); two are activity areas of an indeterminate age (50-50-03-5955 [modified outcrop and coral fragments] and -5956 [cultural material scatter of indigenous and historic era materials])
(McCurdy and Hammatt 2008)	2008	Multiple Ahupua'a	Literature Review and Field Inspection that identified two previously recorded historic properties (State Inventory of Historic Properties ([SIHP] 50-50-03-5950 and 50-50-03-4787) and three previously unrecorded historic properties ([SIHP] 50-50-03-6631, -6632, and -6633).
(McCurdy and Hammatt 2009)	2009	Multiple Ahupua'a	Inventory survey documentation of SIHP -6631, -6632, and 6633. SIHP-6631 is the remnants of a dry stacked basalt stone wall associated with Land Grant 725 (Namauu). SIHP-6132 is a pre-Contact agricultural complex that includes a minimum of 21 terraces and SIHP-6633 is a plantation era irrigation pipe no longer in use.
(Frey and Fredericksen 2009)	2009	Multiple Ahupua'a	Inventory Survey: Identified eight previously unrecorded sites (SIHP 50-50-03-6471-6478. These include one disturbed human burial (-6473), five subsurface pre/post contact agricultural sites (-6471, 6472, 6474, 6475, and 6476), one linear rock formation (-6477) and a historic railroad bed (-6478).
(McCurdy and Hammatt 2010)	2010	Multiple Ahupua'a	Mechanical testing of SIHP 50-50-04-5950 Features 20-23, 25 and 27. Identified a mid 19th century burn deposit beneath feature 25 likely associated with slash and burn deforestation land clearing activities prior to sugarcane cultivation in this area. No significant cultural material or features observed.

Section 4 Community Consultations

Cultural Surveys Hawai'i Inc. contacted the following individuals and Hawaiian organizations requesting their *kōkua* and guidance regarding knowledge of traditional cultural practices and cultural resources of the study area. The following table represents all community consultations conducted with *kama'āina*, Hawaiian cultural advisors and Hawaiian organizations. Individuals who expressed personal knowledge of the study area and gave their consent to share their *mana'o* for this study informally, are presented in Section 5. Formal letters of response to the scoping letter sent out by CSH have been appended to this study as Appendix A Appendix B .

Table 4. Community Contacts

Name	Affiliation	Contacted[1]	Personal Knowledge (Y/N/S)	Comments
Mr. Foster Ampong	Descendant of Keaweiwi and Kekahuna	Y	Y	CSH mailed letter of inquiry. Mr. Ampong would have liked to see the proposed Kuhua Street Extension utilized instead of constructing the Lahaina Bypass and had suggested this to the DOT during consultation for the Bypass. He does not believe that both these roads are necessary.
Ms. Kala Baybayan	Pali *'Ohana*	A		CSH mailed letter of inquiry.
Ms. Yolanda Dizan Mr. Albert Dall Dizan	Lāhainā *Kama'āina*	A		CSH mailed letter of inquiry. Ms. Dizan was present at *'ohana* meeting, August 1, 2008.
Ali'i Sir William Garcia	Royal Order of Kamehameha	A		CSH mailed letter of inquiry.
Ms. L. Haia	Current owner of Haia Cemetery property – Haia *'Ohana*	A		CSH mailed letter of inquiry.

[1] Key:

Y=Yes
N=No
A=Attempted (at least 3 attempts were made to contact individual, with no response)
S=Some knowledge of project area
DC=Declined to comment
DP=Declined to participate
U=Unable to contact, i.e., no phone or forwarding address, phone number unknown

Name	Affiliation	Contacted[1]	Personal Knowledge (Y/N/S)	Comments
Ms. Hōkūlani Holt-Padilla	Friends of Moku'ula	A		CSH sent letter of inquiry.
Ms. Lehua and Mr. Glenn I'i	Pali *'Ohana*	A		CSH mailed letter of inquiry.
Mr. Phillip Jaentsch	Kailihou *'Ohana*	Y	Y	CSH mailed letter of inquiry. (See Section 6.3)
Mrs. Momi Jaentsch	Daughter of Samuel Kaluapana Kailihou	Y	Y	CSH mailed letter of inquiry. (See Section 6.3)
Mr. Ke'eamoku Kapu	Maui/Lana'i Island Burial Council	Y	Y	CSH sent letter of inquiry. (See Section 5.1.5)
Mr. Ke'eamoku And Mrs. Uilani Kapu	Kuleana Kuikahi LLC and Kailihou *'Ohana*	Y	Y	CSH sent letter of inquiry. (See Section 6.4)
Mr. Kalani Kapu	Kailihou *'Ohana*	A		CSH mailed letter of inquiry. Mr. Kapu was present at *'ohana* meeting, August 1, 2008.
Mr. Kekai and Colleen Kapu	Unknown	A		CSH mailed letter of inquiry.
Ms. Qualani Kapu-White	Kailihou *'Ohana*	A		CSH mailed letter of inquiry.
Mr. Jonah Keahi	Haia *'Ohana*	A		CSH mailed letter of inquiry. Mr. Keahi is a great grandson of Pili Haia Kekai. See Section Formal Interviews
Mrs. Mildred (Opunui) Ka'ahane	Opunui *'Ohana*	Y	Y	(See Section 6.1)
Mr. Tommy Kekona	Kailihou *'Ohana*	A		CHS mailed letter of inquiry.
Mr. Charlie Lindsey	Kaho'olawe Island Reserve Commission	Y	S	CSH mailed letter of inquiry; Mr. Lindsey would like to see coastal land preserved and fishing rights continued.
Mr. Charlie Makekau	Makekau *'Ohana*	A		CSH mailed letter of inquiry.
Ms. Nicole McMullan	Bailey House Museum/Maui Historical Society	Y	S	CSH mailed letter of inquiry.
Mr. Kapon'ai Molitau	Kumu Hula, Cultural Practitioner	A		CSH mailed letter of inquiry.
Ms. Patty Nishiyama	Na Kupuna O Maui	A		CSH mailed letter of inquiry.
Mrs. Jackie Opunui	Opunui *'Ohana*	Y	Y	(See Section 6.2)
Mr. and Mrs. Aimoku Pali	Lāhainā *Kama'āina*	Y	N	Mrs. Lehua Pali grew up at Lāhainā Pump or Wainee Village.
Mr. Hinano Rodrigues	SHPD – Cultural Specialist	Y	S	CSH mailed letter of inquiry; Ms. Cayan stated that CSH

Name	Affiliation	Contacted[1]	Personal Knowledge (Y/N/S)	Comments
				has made an extensive community outreach and she did not have any additional referrals, see Appendix B
Mr. Kenneth Sharpe	Lāhainā *Kama'āina*	Y	Y	(See Section 6.5)
Mrs. Thelma Shimaoka	Office of Hawaiian Affairs,	Y	S	CSH mailed letter of inquiry. (See Section 5.1.2)
Lāhainā Hawaiian Civic Club	Lāhainā Hawaiian Civic Club	A		CSH mailed letter of inquiry. Letter returned.
Mrs. Mahealani Ventura	Lāhainā *Kama'āina*	Y	S	(See Section 6.7)
Mr. Nelson Waikiki	Opunui *'Ohana*	Y	Y	(See Section 6.6)

Section 5 Summaries of Kama'āina Interviews

The summaries presented in the section below consists of information that was shared during community consultations and informal interviews related to past and present land uses and traditional Hawaiian cultural resources and traditional practices and beliefs of the study area. Interviews and consultation was conducted by lead researcher, Colleen Medeiros, B.S. Field interviews and consultations were accomplished over a six month period from May 2011 to October 2011.

5.1 Hawaiian and Local Community Organizations

5.1.1 Kuleana Ku'ikahi LLC Lāhainā Community Meeting, May19, 2011

Kuleana Ku'ikahi LLC is a grassroots Hawaiian organization organized by Mrs. Uilani Kapu. Together, Mrs. Kapu and her husband, Mr. Ke'eamoku Kapu, run this company dedicated to the preservation of Native Hawaiian cultural values and practices as well as advocate for the protection of Native Hawaiian burial remains. Today this organization has created a repository for historic documents (manuscripts, maps, land claim award documents and land court documents) made available to the public for research purposes. In addition, Kuleana Ku'ikahi holds monthly community meetings at the Malu'ulu o lele Cultural Center to address community issues and how they may relate to or impact Hawaiians and Hawaiian traditional cultural practices throughout the community.

CSH presented the cultural impact assessment project for the proposed Kuhua Street Extension at Kuleana Ku'ikahi's May 19th meeting. At this time CSH also shared information on the burial discovered during backhoe trenching during the archaeological inventory survey for the same project. During this meeting the attendees had a chance to share their mana'o with CSH regarding traditional cultural practices of the Lāhainā area. Mr. Nelson Waikiki explained that the location of the burial discovery was very near to his family *kuleana* lands, LCA 6801 to Opunui. Mr. Waikiki explained that Opunui was associated with the Kamehameha line. He said that his cousin, Ms. Jackie Opunui, would be knowledgeable about the area as she lives on one of Opunui's *kuleana* parcels today. Mr. Waikiki said that as he understands it, the Pioneer Mill Company (PIMCO) leased Opunui lands for sugar cane cultivation in historic times, but explains that no one in his family ever received money for these leases, nor did they ever receive money from any sale to PIMCO, and having somehow lost title to these lands. Mr. Waikiki also said that he is involved with water rights issues relating to Kaua'ula Stream and simply would like to see the proposed project be developed in a "*pono*" way.

The Kaina family from Napili was also in attendance (Orpha and daughters Noreen, Deann and Silla). Ms. Silla Kaina explained that the area in which the proposed roadway is planned for was predominately cultivated in sugar cane in historic times. She noted that many of the endemic plant species are growing back in these fallow areas, plants such as *uhaloa* (*Waltheria indica*) and *popolo* berry (*Solanum nelsonii*). Ms. Kaina explains that when places are left alone or after brush fires, the natural resources of that area reappear. Another individual named Mr. Kaipo Kekona said that he has grown up in the area and has walked through the lands surrounding the proposed Kuhua Street Extension. He said that he has seen Nene and Francolins, as well as the

Kolohala, the Chinese ring-neck pheasant. Mrs. Orpha Kaina explained that her family gathered *limu* and *opelu* (*Decapterus macarellus*) at Mala.

5.1.2 Office of Hawaiian Affairs (OHA)

The Office of Hawaiian Affairs suggested expanding the discussion regarding the unique *ahupua'a* configuration in Lāhainā. In addition, OHA encouraged contacting those individuals and families consulted for the Lāhainā Bypass Modified Alignment (Dagan, et al. 2009) with the potential for discovering additional contacts from the study area. No additional referrals were made by OHA.

5.1.3 Polanui Ahupua'a Community Managed Marine Area (Polanui Hiu)

In a formal letter response dated October 6 2011 (see Appendix B), Dr. Scott Fisher, board member of the Maui Nui Marine Resources Council and Mr. Ekolu Lindsey, both participants of the Polanui Ahupua'a Community Managed Marine Area, explained this groups mission and expressed their concerns regarding the proposed projects impacts on near shore marine resources. In addition, recommendations and requests were also put forth which support best management practices regarding fishing resources in this area.

The Polanui Hiu (Hiu meaning, to work together as a group), in partnership with various stakeholders including West Maui *kupuna,* resource managers and West Maui fishermen, has spent the past year and a half assessing the overall condition of Polanui's reef ecosystem and ecological health as well as researching the historic marine conditions and resources. As a result of this work, the Polanui Hiu has identified a decline in the areas "keystone" species; *manini* (Convict Tang, *Acanthurus triostegus*), *kole* (Surgeonfish, *Ctenochaetus strigosus*), *moi* (Six-fingered threadfin, *Polydactylus sexfilis*), *weke* (Goatfish, *Mullidae sp.*), *uhu* (Parrot fish, *Scaridae sp.*) and *hinalea* (Psychedelic Wrasse, *Anampses chrysocephalus*). These species were determined to be the main contributors to sand and reef composition and a healthy reef ecosystem.

The Polanui Hiu also found that one of the most severe impacts on the reef and near shore fishing resources was caused by sediment run-off from development projects. As described in his letter, Dr. Fisher explains that a "failure to control the velocity of hydrological flow from the uplands into the coastal zone" results in sediment build-up on the reefs. This build-up in turn causes the death of reefs which then leads to major degradation of the reef ecosystem.

The Polanui Hiu made several recommendations that would help mitigate adverse impacts to the near shore waters which include the construction of retention basins or barriers placed to slow the flow of water to the ocean; minimize overall grading and grubbing activities; perform road work during the dry season, mid-May to mid-October; and partner with an environmental firm who will conduct marine ecosystem monitoring during the project. The Polanui Hiu also requested a meeting with Kuhua Street Extension project engineers so that they might work together on strategies to reduce any impacts to the coastal ecosystems.

5.1.4 Maui County Cultural Resources Commission (MCCRC), May 5, 2011

CSH personnel, Tanya Lee-Greig and Colleen Medeiros attended the May 5th meeting of the MCCRC. The following cultural practices information was shared during this meeting. Ms. Rhiannon Chandler explained she had heard of an "old Hawaiian" cemetery located near the old Goodfellows Bros., Inc. base yard. This base yard is located near the cane haul road and it was said that there are several homeless people living in the vicinity. Ms. Chandler made note of the overall sensitivity of the Lahaina Historic District area and advised drawing additional traditional and cultural practices information from the community as well as using caution during construction activities. Mr. Erik Fredericksen mentioned that he discovered a burial near the proposed road corridor and explained that the AIS he completed (Frey and Fredericksen 2009) has not yet been accepted by SHPD. Mr. Fredericksen also mentioned a coffin burial at Waine'e as well as a cultural deposit located there.

5.1.5 Maui/Lana'i Island Burial Council (M/LIBC), October 27, 2011

At its October 2011 meeting, CSH consulted the M/LIBC to attain their feedback regarding traditional cultural practices in the area. At this time the M/LIBC was also consulted regarding an inadvertent burial discovered during the archaeological inventory survey (also performed by CSH). The M/LIBC comments and concerns were largely focused on the burial discovery. Aware and satisfied with the temporary protection measures taken which included backfilling and covering the pit with a metal plate, the council strongly recommended permanent measures be taken through the process of developing a formal burial treatment plan. Their recommendations are stated in their formal letter (see Appendix B).

Section 6 Kama'āina Interviews

6.1 Mrs. Mildred (Opunui) Ka'ahane

Mrs. Mildred Ka'ahane, referred to as "Millie" by friends and family, is the daughter of John Luikua Opunui and was born in 1929. Today, Mrs. Ka'ahane works at the Baldwin House Museum in Lāhainā and lives near the project area on lands her family has owned for generations. Her property is located on the southeast corner of Aholo Road and Honoapi'ilani Highway. Aholo road was known as Kaua'ula Road and extended *mauka*.

There are three homes located on this parcel, Mrs. Ka'ahane lives in one, her niece, Mrs. Jackie Opunui lives in another and a third family lives in the remaining home. On the 1884 S.E. Bishop map of Lāhainā Town (Bishop 1884), there are LCA parcels naming Opunui; LCA 6801 to Opunui and the property they live at now correlates to LCA 9583 B to Liukua (error in spelling) was John Luikua Opunui, Mrs. Mildred Ka'ahane's father. Across Honoapi'ilani Highway there are two cemeteries; Puehuehuiki Cemetery and a Chinese Cemetery. Mrs. Ka'ahane explained that several of her family members are buried in the Puehuehuiki Cemetery including her son, uncles, aunts and brothers. She also explained that the Puehuehuiki Cemetery site was the area dump prior to becoming a county cemetery. Mrs. Ka'ahane also noted that members of her family are buried on her property, under mango trees and in a burial platform.

The famed Ms. Rebecca Kauhai Likua, was Mrs. Ka'ahane's grandmother. Ms. Likua was a *hula* dancer in the court of King Kalakaua. Mrs. Ka'ahane explained that Ms. Kauhai Likua taught the *hula* in secrecy to her granddaughter and a few other students in the cane fields *mauka* of their home in Lāhainā. They met under what was known as the "Umbrella Tree". Mrs. Emma Sharpe was one of Ms. Likua's students. Mrs. Ka'ahane recalls the Kaua'ula winds and her house was blown over 50 years ago by these winds.

6.2 Mrs. Jackie Opunui

Mrs. Jackie Opunui was referred by Mr. Nelson Waikiki, her cousin, as an individual whose family lives near the project area and whose family has owned lands near the project area for generations. Mrs. Opunui is the *hanai* daughter of Marjorie Kauhai Kaholo (her biological Aunt). Her biological mother was Alice Ululani Kaholo and both sisters mother was Alice Kahai-Opunui. Mrs. Opunui's father was David Kaea. Jackie understood Hawaiian language as a child but was forbidden to speak it. Today, Mrs. Opunui lives on the same property as her aunt, Mrs. Mildred Ka'ahane, on the southeast corner of Aholo Road and Honoapi'ilani Highway.

Mrs. Opunui's great-great grandmother was Ms. Rebecca Kauhai Likua, mentioned above. She also explained that Ms. Kauhai Likua met secretly with her students in the cane fields *mauka* of their home in Lāhainā. In addition to dancing hula, Mrs. Opunui explains, Ms. Rebecca Kauhai Likua was a Christian minister. Mrs. Opunui explained that in her capacity as a Christian minister, Ms. Rebecca Kauhai Likua was said to have taken responsibility for burying many individuals who were immigrants to Hawaii, those individuals who did not have family in the islands. She did not have a designated burial area and it was said that she buried individuals throughout the area.

Mrs. Opunui explained that Ms. Rebecca Kauhai Likua owned property *mauka*, in Kaua'ula Valley, near the reservoir. These were active *lo'i kalo* lands until the Pioneer Mill sugar plantation diverted water from this stream to irrigate their cane fields. After the water was diverted, and it was no longer possible or feasible to cultivate *kalo*, the Opunui family moved from the *mauka* lands and came further *makai*, to where they are now, at Aholo Road. This area was once known as "Waine'e Camp" and was surrounded by cane fields. Their home was located exactly where the Honoapi'ilani Highway runs today. When planning for construction of the Honoapi'ilani Highway, the State condemned a portion of the Opunui property located in the highway right-of-way and moved their home out of the right-of-way to its' current location. Before the highway was build, Mrs. Opunui said they grew dry land taro and sweet potato on this property.

Today, Mrs. Opunui explained, there are several burials on this property. She said that family members are buried under every mango tree on the property. In addition, there is a burial platform located in front of their houses. It is constructed of water rounded cobbles and is covered by a vine and fallen leaves which Jackie explained was to keep it concealed from viewing. Across Honoapi'ilani Highway, Jackie believes at one time the Puehuehuiki cemetery may have extended into the area of the current day highway. Their property originally abutted this cemetery. Mrs. Opunui explained that there was once a *hanawai*, or plantation ditch running through their property. These ditches were filled in when the highway was built. They have an *imu* pit (ground oven) in the yard and a *hale* where Mrs. Opunui's husband, a Tongan man, conducts *kawa* ceremonies. Mrs. Opunui recommended speaking with Martha Medeiros at the Baldwin house.

6.3 Mrs. Momi Jaentsch

Ms. Jaentsch was contacted in August 2011 and gave her permission to again share her connection and traditional cultural practices regarding the current study area. Her son, Mr. Phillip Jaentsch and daughter Ms. Donnalyn Johns also shared their knowledge of the area in a 2008 interview (Dagan, et al. 2009:117-120). Ms. Jaentsch is a *kupuna* who grew up living between her grandparents beach house at Pu'unoa, in Lāhainā and a mountain home located in Kahoma Valley. Samuel Kaluapana Kailihou (S. Kaluapana) was Ms. Jaentsch's father and Samuel "Nika" Kailihou (Nika) was her grandfather. Her great-grandfather was Ka'umi'umi, and Leleku (also known as: Kahili) was her great-great-grandfather. Ka'umi'umi was the father of Samuel "Nika" Kailihou (S. Nika). Leleku was Ka'umi'umi's father. S. Nika's sister was Mary Nakilu.

Ms. Jaentsch describes her family cemetery (referring to it as a *"heiau")* explaining that it was located along the Kahoma Stream (Kahoma Stream exists into the ocean at the northern end of the study area). Gravesites were marked by large rocks and rock piles and this cemetery was a landmark she used when walking into Kahoma valley. "We knew where the graves of our family were, that was our landmark" (Ms. Jaentsch, per telephone conversation September 4, 2008). They would pass this family *heiau* on their way up to their home in Kahoma

As a child Mrs. Jaentsch spent weeks at a time in Kahoma Valley with her family. Mrs. Jaentsch explained that her brothers came up only on the weekends because they had jobs in Lāhainā and generally like to be near the coast for fishing. Mrs. Jaentsch's eldest sister, Adaline

Kalani raised her and her sister Sarah after their mother and father passed away. As children they spoke Hawaiian with their parents.

Mrs. Jaentsch's family utilized plants grown in the area of Puunoa for traditional medicinal purposes. She explained that they used *uhaloa* (*Waltheria indica*) for colds, stomach, all ailments, and coughs. They peeled the skin from stalk and boiled the plant. They also utilized *popolo* (*Solanum nelsonii)* medicinally. They used the steam from steeping eucalypts leaves to clear the sinuses and to break a fever.

6.4 Mr. Ke'eamoku and Mrs. Uilani Kapu

Mrs. Uilani Kapu and her family live in Kaua'ula Valley, *mauka* of Waine'e. They currently access their home via Shaw Street which meets up with the cane haul road and then connects to the old Kaua'ula Road, located at the end of the baseball field (Lahaina Recreation Center). Mrs. Kapu explained that the proposed Kuhua Street Extension, as currently designed, may interfere with their access into Kaua'ula Valley. Mr. Ke'eamoku Kapu explained that the Hawaii State Department of Transportation, responsible for constructing the Lāhainā Bypass (located further *mauka* than the proposed Kuhua Street Extension) has constructed a tunnel under a section of the Bypass to accommodate their access needs. As described, this family will need to cross the proposed Kuhua Street Extension and therefore a crossing method will need to be developed. Mr. and Mrs. Kapu would like to be involved the planning of an access point off this proposed roadway.

6.5 Mr. Kenneth Sharpe

Mr. Kenneth Sharpe is from Lāhainā, he is the son of Mr. David Taylor Sharpe and Mrs. Emma (Farden) Sharpe. Mr. Sharpe was interviewed on September 7, 2011 at his home in Lāhainā. He explained that he grew up at the southern end of Front Street, across the street from Peter and Luana McKinney, a green house with white trim. He described the neighborhood as being surrounded by sugar cane. Mr. Sharpe explained that "Puamana" was the name of the *ahupua'a* of the area until a Hawaiian chief eliminated this name.

Mr. Sharpe said that the Opunui family lives near the project area and has been there for generations. He explained that Nelson Waikiki's mother was an Opunui (Mr. Waikiki claims he is a lineal descendant to the burial discovered during archaeological inventory survey work for this project, see Section 5.1.1). Their property is on the corner of Aholo and Honoapi'ilani Highway. Mr. Opunui grew taro and their property used to be larger, but as a result of the construction of the Honoapi'ilani Highway, half of their property was condemned by the State. Mr. Sharpe explained that their old house still stands today and Apikaila "Millie" still lives there along with her niece Jackie Opunui. The Honoapi'ilani highway took possibly half of the Opunui property, and the plantation also took some by way of a cane haul road. This family lost their water when the highway was constructed.

According to Mr. Sharpe, the Opunui property used to run across the current day Honoapi'ilani Highway and abut the Puehuehunui cemetery. Mr. Sharpe explains that the Pioneer Mill condemned a portion of the Opunui property for use as a cane haul road and estimates that the State condemned as much as another half of their property for the highway. In

addition, another portion of it was converted for sugar cane cultivation. Mr. Sharpe further describes historic Lāhainā Town stating that sugar cane was planted all the way down to the corner of Papalaua, where the Foodland parking lot is today. He said that sugar cane was planted on any lands the plantation considered "idle" land.

In his role as a traffic director for Wackenhut during the 1970-1971 installation of the waterline for 505 front street development, Mr. Sharpe described trenching activities uncovering several Hawaiian artifacts such as *ulu maika* and a basalt pestle near the Take Home Maui store. Trenching for this waterline ran the entire length of Dickenson Street then continued left on Front Street to the 505 block. He said that these artifacts were reburied in the trench near the Take Home Maui store. Mr. Sharpe said that a wall was also uncovered near the Take Home Maui store. Construction crews also uncovered a stone-lined canal which ran along Dickenson Street. Additionally, there was stone work uncovered near Maria Lanakila Church, near the mango trees, which he described as "fitted rock with flat sides" or possibly hand cut-stone masonry.

Mr. Sharpe also described an empty lot near Puamana, near the historic location of Mr. Moyer's vegetable garden. Today this location is merely a bend in Honoapi'ilani Highway. On this empty lot, he explains, there was a large piling of rocks which no one touched. The plantation did not alter it and people generally avoided it. As a 5 year old child Mr. Sharpe once ventured to this area and recalls it being reprimanded by his father for going there, as a matter of fact, this instance was one of the very few times his father ever shouted at him. He said that it would have been a great vantage point for viewing the ocean. At the time, he believes someone might have been living there, he recalls seeing a wooden platform covered by coconut palm fronds. This location is now homes developed and possibly owned by Goodfellow Bros. Construction Company.

6.6 Mr. Nelson Waikiki

Mr. Nelson Waikiki attended Kuleana Ku'ikahi's May 18 meeting in Lāhainā. He introduced himself after a description was given of the burial find during the archaeological inventory survey. Mr. Waikiki explained that he was a descendant of Opunui, who was part of the Kamehameha Ali'i class. The nearest LCA to the burial find was to Opunui (LCA 6801). Mr. Waikiki is involved in water rights issues and *kuleana* leases to the Pioneer Mill. His main concern was that the proposed project is planned in such a way that is right and beneficial for everybody.

6.7 Mrs. Mahealani Ventura

In an emailed response, Mrs. Mahealani Ventura describes (certain) lands of the study area as her family *kuleana* lands. Mrs. Ventura believes there may have been taro and *wauke* (Broussonetia papyrifera) cultivation in the area. She said the general lands of the proposed project are connected to a certain fishpond located *makai* and that there is a fishing *ko'a* in the near shore waters. In addition, Mrs. Ventura makes mention of a family cemetery also located in the vicinity. Mrs. Ventura advocates for protection of burial remains and concerns about road access to *mauka* lands.

Section 7 Traditional Cultural Practices

7.1 Traditional Habitation and Agriculture

In traditional times, Hawaiians utilized resources from various regions of the land within the framework of the *ahupua'a* system (Section 3.1 Traditional and Historical Background). Lāhainā was unique in that the *ahupua'a* of the region were not always continuous, from *mauka* to *makai* (mountain to ocean), as they were in other parts of Maui. Here, due to several factors likely stemming from the political standing of Lāhainā and the relatively large population (see Section 3 Background Research and Section 7.5 The Unique *Ahupua'a* Configuration of Lāhainā and *Mauka-Makai* Connections) *ahupua'a* were smaller and discontinuous, actually cut-off from partner sections by other interspersed *ahupua'a*. For example a particular *ahupua'a* might have a section on the coast, another section in the rising plain behind Lāhainā and a third section within Kahoma Valley. Lāhainā's *ahupua'a* system did serve the same purpose though and that was to afford those living in that *ahupua'a* equal access to the resources of different topographic/growing regions.

In both the pre-contact and historic timeframe, Lāhainā was a political center; the home of several of Maui's ruling *ali'i*, a place with deep sacred significance, and a place with great agricultural resources (Section 3 Background Research). Appropriate climate, soils and fresh water sources provided the people of Lāhainā with the necessary conditions for successful agricultural endeavors. It was stated by Handy and Handy (1991:492) that the areas main taro *lo'i* were located in the lower reaches of Kahoma and Kanahā Valleys. The proposed Kuhua Street Extension would cross the modified section of the Kahoma Stream and connect to Keawe Street, near the Lāhainā Gateway Shopping Center. The following description of Lāhainā speaks of these attributes:

> Lahaina District was a favorable place for the High chiefs of Maui and their entourage for a number of reasons: the abundance of food from both the land and sea; its equable climate and its attractiveness as a place of residence; it had probably the largest concentration of population, with its adjoining areas of habitation; easy communication with the other heavily populated area of eastern and northeastern West Maui, "The Four Streams," and with the people living on the western, southwestern and southern slope of Haleakala; and its propinquity to Lanai and Molokai (Handy, et al. 1991:492).

During a botanizing trip into the mountains behind Lāhainā, Menzies described the *lo'i* system in what is thought to be either Kahoma or Kanahā Valley:

> Here our conductors importuned us to dine, and a pig being killed and got ready, together with yams and sweet potatoes, we partook of a hearty meal, after which we continued our journey, and soon entered the verge of the woods where we observed the rugged banks of a large rivulet that came out of the chasm cultivated and watered with great neatness and industry. Even the shelving cliffs of rocks were planted with esculent roots. Banked in and watered by aqueducts from the

> rivulet with as much art as if their level had been taken by the most ingenious engineer. We could not indeed but admire the laudable ingenuity of these people cultivating their soil with so much economy. The indefatigable labor in making these little fields in so rugged a situation, the care and industry with which they were transplanted, watered and kept in order, surpassed anything of the kind we had ever seen before. It showed in a conspicuous manner the ingenuity of the inhabitants in modifying their husbandry to different situations of soil and exposure, and it was with no small degree of pleasure we here beheld their labor rewarded with productive crops. (Menzies 1920:105)

Another detailed description of the state of cultivation in Lāhainā was given by Menzies (1920) in his account during a trip aboard the Discovery, with Captain George Vancouver in 1793:

> March 17. On the forenoon of the 17th, I accompanied Captain Vancouver and a party of the officers, with the two Niihau women, to see the village of Lahaina, which we found scattered along shore on a low track of land that was neatly divided into little fields and laid out in the highest state of cultivation and improvement by being planted in the most regular manner with the different esculent roots and useful vegetables of the country, and watered at pleasure by aqueducts that ran here and there along the banks intersecting the fields, and in this manner branching through the greatest part of the plantation.
>
> These little fields were transplanted in a variety of forms, some it rows, in squares, in clumps and others at random; some according to their nature were kept covered with water, while others were with equal care kept dry by gathering the earth around them in little hills. In short, the whole plantation was cultivated with such studious care and artful industry as to occupy our minds attention with a constant gaze of admiration during a long walk through it, in which we were accompanied by a numerous group of natives that continued very orderly and peaceable the whole time. (Menzies 1920:112)

At the time of Menzies visit it is unknown if the two extensive *'auwai*, 'Auwaiawao and the other called 'Auwai o Pi'ilani, were still in use. As mentioned earlier (Section 3.1 Traditional and Historical Background) these *'auwai* were said to have spanned from Kaua'ula to Kahoma and are roughly datable due to their association with Kaululā'au and Pi'ilani. The 'Auwai o Pi'ilani has its headwaters in the Kaua'ula Stream and irrigated lands along both sides, with waterways extending to lands below Lahainaluna (Maly and Maly 2007:4).

Archaeological studies of Lāhainā provides additional evidence of the extent to which Lāhainā was settled and for how long. Archaeological sites located within the current study area include pre and post-contact sites ranging from agricultural sites, to habitation sites (several belonging to Maui's chiefly residents), ceremonial sites and burial/cemetery sites (see Section 3.2 Previous Archaeological Research). Mr. Kenneth Sharpe recalls uncovering several Hawaiian artifacts including an *ulu maika* stone and a basalt pestle as well as a historic wall and

stone-lined canal, while monitoring (as a traffic director) the installation of the water main for the 505 Front Street development.

The sheer number of Land Commission Awards (LCAs) located within the project area is also a testament to the population and agricultural crops planted in the study area around 1848, during the Great Māhele. There are a total of 64 LCAs within and/or adjacent to the current project area corridor. Thirty eight out of the 64 LCAs were awarded for agricultural lots and the remaining 26 were awarded for both house lots and small agriculture lots. In addition, a total of six Grant Awards are also within and/or adjacent to the project corridor. Descriptions of agricultural crops grown on these lands were given as a part of the native testimony and include *lo'i kalo*, *kalo* (dry land taro), banana, *kula* plots, breadfruit trees, orange tree, sugar cane, and *kukui* nut trees. It is noteworthy to mention that a great many of these claims included *pō'alima* plots, or plots cultivated for contribution to tax payments.

In addition to the evidence above which provides data regarding the study area's population and traditional and historic agricultural practices, individuals interviewed for this study; Mrs. Jackie Opunui, Mrs. Momi Jaentsch, Mr. Kenneth Sharpe, Mrs. Mahealani Ventura, Mr. and Mrs. Ke'eamoku Kapu, also described *lo'i* cultivation which took place and continues to take place, on *kalo* lands located east of the project area in the Kahoma and Kaua'ula Valleys as well as in Lāhainā Town. Mrs. Jackie Opunui explained that her family tended *lo'i kalo* in Kaua'ula Valley, she also said that her family grew *kalo* on their property in Lāhainā, on the corner of Aholo Road and Honoapi'ilani Highway. Many years ago this property extended across the highway and family members cultivated dry land *kalo* and sweet potato in small plots. During the sugar plantation era, the Opunui property was surrounded by sugarcane. The Kapu *'ohana* currently farms kalo on their families traditional lands in Kaua'ula Valley. Mrs. Momi Jaentsch recalls living on the beach at Puunoa, west and *makai* of the proposed project, and describes walking up to into Kahoma Valley, crossing lands of the proposed project, to tend their family *lo'i*. She said they had another home in Kahoma Valley where they stayed for weeks at a time while tending their *lo'i kalo*. Several individuals interviewed explained that medicinal herbs such as *uhaloa* (*Waltheria indica*) and popolo berry (*Solanum nelsonii)* could be found in the lands of the proposed project area.

7.2 Aquatic Resources

Freshwater and marine resources supplied the Hawaiian diet with a rich source of protein and fish was a mainstay of the Hawaiian diet. Virtually all edible resources of the ocean were consumed by Hawaiians. The traditional lifestyle of Hawaiians revolved around fishing and cultivation (Titcomb 1977). As the lands were divided into *ahupua'a*, the near shore waters were also divided; some attached to fronting land sections. Hawaiians knew the sea as well as they knew the land and both near shore and far shore waters contained delineations designated by reef sections, by depth and by distance from land. There were many "landmarks" so to speak, in the ocean which consisted of underwater *ko'a* or shrines, fishing holes, coral heads and reef. The oceans were, very literally, mapped-out by Hawaiians as they depended on marine resources for survival. As freshwater resources were necessary for growing agricultural crops, freshwater was also critical to marine resources. Freshwater entering the ocean created a brackish water habitat which provided nutrients to marine life.

The proposed project area parallels Lāhainā's shoreline at an approximate distance of one-half mile. In consultation with Dr. Scott Fisher and Mr. Ekolu Lindsey of the Polanui Hiu (see Section 5.1.3 Polanui Ahupua'a Community Managed Marine Area (Polanui Hiu)), the concerns of their group relate mainly to the potential construction runoff and the effects of such runoff on the near shore fisheries that the Polanui Hiu is managing and working to restore. The Polanui Hiu has spent the past year and a half researching historic marine conditions here and assessing the health of the current reef ecosystem. The group includes fisherman, *kūpuna* and other community members and has found that there has been a decline in the areas "keystone" species which include *manini* (Convict Tang, *Acanthurus triostegus*), *kole* (Surgeonfish, *Ctenochaetus strigosus*), *moi* (Six-fingered threadfin, *Polydactylus sexfilis*), *weke* (Goatfish, *Mullidae sp.*), *uhu* (Parrot fish, *Scaridae sp.*) and *hinalea* (Psychedelic Wrasse, *Anampses chrysocephalus*). These species were determined to be the main contributors to sand and reef composition and a healthy reef ecosystem. Mrs. Orpha Kaina explained that *opelu* (*Decapterus macarellus*) could be found around the Mala Warf area.

Dr. Fisher explains that one of the main factors for this decline involves sediment runoff. Sediment runoff kills the reef by settling on it and cutting off the sunlight supply to it. Sunlight coupled with oxygen generated by wave action allows the reef to grow and allows *limu* to grow on the reef. Both the reef itself and *limu* in turn provides a food source for fish. Therefore, with the decline in the health of the reef, the Polanui Hiu has begun to address the decline in the above mentioned fish species.

Previous investigations find that the areas coastal waters were once rich *limu* harvesting grounds. Mrs. Orpha Kaina (see Section 5.1.1) gathered *limu* from the Mala Warf area, while previous studies found the following *limu* varieties to be collected from the study area; *Wāwae'iole* (*Lycopodium cernuum*), *Lipoa* (*Dictyopteris plagiogramma* and *D. australis*), *limu kohu* (*Asparagopsis taxiformi*), *limu 'ele'ele* (*Enteromorpha prolifera*), and *līpe'epe'e* (*Laurencia parvipapaillata*, and *L. dotyi, L. succisa*) were commonly harvested from the ocean fronting the proposed roadway extension (Dagan, et al. 2009:125). Ms. Myra Kanoelehua Kali'ipio, interviewed in 2009 relayed her families sense of conservation stating that they never took more than their family could eat knowing that many other families harvested from the same area (Dagan, et al. 2009:125).

Additionally, information shared during previous studies confirmed that freshwater food resources once existed in the study area, and could be found in the Kahoma Stream. The Kahoma Stream being relevant to this CIA because it exits into the ocean near Mala Warf and transects the proposed Kuhua Street extension roadway near Keawe Street. *Kama'āina* testimony confirmed that individuals collected *'opae* (*Halocaridina rubra*) and *o'opu* (Gobiidae) from Kahoma Stream. (Dagan, et al. 2009:125)

7.3 Hula Traditions

Hula is the Hawaiian dance form traditionally practiced for religious ceremony and performed accompanied by chants intended for the gods (Abbott 1992:117). Further described by Emerson, "...the hula was an accomplishment requiring special education and arduous training in both song and dance, and more especially because it was a religious matter...(Emerson 1909:18)" As time passed from traditional times to the modern-era, the purpose of the *hula* grew to include

storytelling and entertainment. Today there are two forms of *hula*; *hula kahiko*, the ancient *hula* and *hula 'auana*, the modern *hula.* Dedicated to the goddess Laka, the *hālau hula* was the structure in which the *hula* was studied and practiced. Those who danced the *hula* in traditional times dedicated themselves wholly to the dance and maintained the discipline necessary to adhere to the many *kapu,* or laws, associated with the *hula* (Abbott 1992:117).

The Opunui property, located on the corner of Aholo Road and Honoapi'ilani Highway, is associated with a well-known *kumu hula*, or instructor of *hula,* Mrs. Rebecca Kauhai Likua. Often referred to as Kauhai Likua, she was said to be a *hula* dancer in the royal court of King Kalakaua. She was the daughter of John Kauhai Likua and Abigail Apikaila Ehu. She married Mr. William Kahai Opunui. With her depth of knowledge in the traditional art of the *hula,* she secretly taught students in the cane fields *mauka* of Lāhainā Town (see Section 6.2 Mrs. Jackie Opunui and Section 6.1 Mrs. Mildred (Opunui) Ka'ahane).

Her teachings were taught in secrecy because during that time the *hula* had been prohibited by the Christian establishment in Lāhainā. Mrs. Likua taught the *hula* to her granddaughter, Mrs. Mildred Ka'ahane (interviewed for this study) as well as the late Mrs. Emma (Farden) Sharpe. Mrs. Emma Sharpe would later become a well-known *kumu* hula as a result of her instruction by Mrs. Likua. In the book, *Sweet Voices of Lahaina*, a memoire about the Farden family, it is stated that it was Mrs. Emma Sharpe who, after much persistence, convinced Mrs. Likua to teach her the *hula* lest it become a lost tradition (Richards 1990:2).

It is not known how many individuals Mrs. Likua taught, but today, an enduring *hula* tradition continues to be perpetuated by her students. There are several *kumu hula* who owe their knowledge of the art to Mrs. Rebecca Kauhai Likua. These *kumu hula* continue to teach in her tradition, in the style she learned as a dancer in the court of King Kalakaua.

7.4 Traditional Access Routes to Mauka Lands

To understand the importance of traditional access, it is important to understand the Hawaiian land tenure system and the degree to which Hawaiians relied on their access to natural the resources. As stated by Moffat and Fitzpartick, "Without access to land-and to the waters considered an integral part of the land-there was no way to sustain life (1995b:13). The traditional pre-contact era Hawaiian required free access to the various fishing and growing regions of his *ahupua'a* for survival. To accomplish this and maintain social order, Hawaiians devised the *ahupua'a* system (see Section 3 Background Research and Section 7.1 Traditional Habitation and Agriculture).

In Lāhainā Town and including lands of the study area, the *ahupua'a* are not the typical pie-shape, they are small and discontinuous, interspersed by other small *lele* like *ahupua'a*. These *lele* instead consisted of two or three (sometimes more) counterpart *ahupua'a* strategically placed near coastal resources, mid-elevation resources and mountain/stream resources. The ability for people to access partner *ahupua'a* was critical. As illustrated by Dagan and others (2009) in the CIA for the Lāhainā Bypass Modified Alignment, individuals interviewed for that study describe a continual traversing from coastal Lāhainā *ahupua'a*, to *mauka ahupua'a* located in Kahoma and Kanahā Stream Valleys for the purpose of cultivating and harvesting their family *lo'i* plots. Several of the individuals interviewed for that study also describe having homes in

these valleys and temporarily living there while cleaning *lo'i* and harvesting *kalo* (Dagan, et al. 2009:134).

Mrs. Momi Jaentsch, interviewed again for this study (see Section 6.3 Mrs. Momi Jaentsch) said that her family walked from their home on the beach at Puunoa, up Puunoa road, across the old Honoapi'ilani Highway (government road), then over the train tracks, up a dirt road and towards Kahoma Stream. At Kahoma Stream they crossed to its northern bank and followed the stream *mauka* into Kahoma Valley. As mentioned above, their family cemetery was on this route and acted as a landmark on their way into Kahoma Valley. Mrs. Momi Jaentsch also explains that her father followed a trail on the right side of the stream into the valley. Her descriptions of their access route would have crossed the proposed project area near the now channelized portion of Kahoma Stream. Mrs. Jaentsch, Ms. Donnalyn Johns and Mr. Phillip Jaentsch all affirm that generations of their family have had continued access into Kahoma Valley. Although the landscape has changed dramatically over the last 50 years, this family and others continue to sporadically visit Kahoma and Kanahā Valleys. Today they mainly utilize different routes through Wahikuli Ahupua'a, via cane haul roads.

The Kapu family lives and farms taro, in Kaua'ula Valley, *mauka* of Waine'e and the current project area. They presently access their home via Shaw Street, which crosses the proposed project area and then connects to the old Kaua'ula Road, located at the end of the baseball field at Lahaina Recreation Center. Mrs. Uilani Kapu explained that the proposed Kuhua Street Extension, as currently designed, will interfere with their access into Kaua'ula Valley. Mr. Ke'eamoku Kapu explained that the Hawaii State Department of Transportation, responsible for constructing the Lahaina Bypass (located further *mauka* than the proposed Kuhua Street Extension) has constructed a tunnel under a section of the Bypass to accommodate their access needs. In the same manner, family will need to cross the proposed Kuhua Street Extension and therefore a crossing method will need to be developed.

7.5 The Unique *Ahupua'a* Configuration of Lāhainā and *Mauka-Makai* Connections

Traditional Hawaiian life ways revolved around subsistence farming practices and the *ahupua'a* system of land tenure and resource distribution; a system that was designed to utilize resources from the mountains to the ocean that ultimately supported the complex chiefly society from the top down. As described above (Section 7.1 Traditional Habitation and Agriculture) the geographic arrangement of the typical *ahupua'a* within the traditional Hawaiian land tenure system is commonly thought of as a "pie-shaped" unit of land that extends from the coastline to the mountains. In this sense, the land tenants of an *ahupua'a* may be permitted access to resources and carry out subsistence practices that would include marine resources and fishing rights in the coastal area, arable lands for crop cultivation, as well as, water and timber rights in the planting zones, and valuable bird catching privileges at the higher elevations (Handy, et al. 1991:48). As indicated by Maly and Maly (2007:82), however, the distribution and geographic boundaries of the *ahupua'a* of Lāhainā are exceptionally unique in Hawaiian Islands.

Within their cultural landscape study, Maly and Maly (2007:8) note that many of the *ahupua'a* of the Lāhainā area are small and often configured as detached parcels, or *lele*, that do

not run in the typical *mauka* to *makai* "pie-shaped" manner. One section of an *ahupua'a* may be situated near the coastline, another section bearing the same *ahupua'a* name may be within the upper reaches of the stream valleys, while still another section might be found within the mid-elevation areas – all of which are separated by intervening *ahupua'a* bearing different names. This configuration of *lele ahupua'a* as described by Maly and Maly (2007:82) is the *ahupua'a* configuration within the ROI for this study.

This *ahupua'a* configuration suggests a bimodal traditional settlement pattern and complex land tenure system that was likely a result of a growing environment that was limited to the stream valleys and lower coastal plains -- a uniquely patchy resource base that sustained a highly concentrated population and the rather large chiefly class of that area. For example, as a result of LCA research and review of the historic maps, we know that the coastal *ahupua'a* of Puunoa 1, 2, and 3 had a *mauka* counterpart within Kahoma Valley above the Kahoma/Kanahā confluence. Many times claimants who retained a *kuleana* within the *makai* section also retained a section *mauka*. In this manner, the tenants of the land were able to maintain a productive *lo'i* in the *mauka* reaches (Girvin and Mesick 1910), as well as, access the abundant coastal resources, two resource environments that were effectively bisected by the rocky alluvial plains of West Maui. The following table lists specific examples of this pattern of *kuleana* distribution located in the study area.

Table 5. Representative *Kuleana* Illustrating the Unique Ahupua'a Boundaries and Resource Distribution of Lāhainā

Claimant/ Awardee	LCA Number	Apana	Location	Ahupua'a
Keaweiwi	312	1	Kahoma Stream, North side	Aki
		2	Near coast	Aki
		3	Kahoma Stream, South side	Aki
		4	Near coast	Aki
		5	Unknown[2]	Aki
		6	Coastal parcel, extends into ocean (fishpond claim)	Aki
	7587	1	Near coast	Kopili
		2	Further from coast Nearer to Kahoma Stream	Uhao
		3	Kanahā Valley	Kopili
Kekahuna	3422B		Kanahā Valley	Uhao
Naleh u (Kalal uhi)	6621		Kahoma Valley	Kuholilea
	10465	1	Coastal	Waiokama

[2] Could not locate onn Map

Claimant/ Awardee	LCA Number	Apana	Location	Ahupua'a
		2	Mauka of government road (Front St.) near coast	Waiokama
J.W. and M. Recard	10579		Kahoma Valley	Kuholilea
Lēleku (M.J. Recard and Sam Kailihou)	9950	1	Kahoma valley "Nikas House" lot	Puako
		2	Kahoma Valley	Puunoa 2
	9780B		Kahoma Valley[3]	Aki
Kaahanui "Mrs. Recard's House"	333		On Coast	Puunoa 2
Phillip Pali	470	1	Unknown	Puako[4]
		2	Unknown	Puako
		3	Kahoma Valley	Puako
		4	Kahoma Valley	Puako
		5	Unknown	Puako
	277 W. Lunalilo Lots	Lot 6	Kahoma Valley	Kuholilea
Pohalapu (Poholopu)	7721	1	Kahoma Valley	Kuholilea
	7724	1	Unknown	Kuholilea
		2	Kahoma Stream	Wahikuli

The relative close proximity of the agricultural uplands and valleys to the ocean allowed a person to traverse the distance in less than a day.

It is clear that the lands within the overall study area, or ROI, were traditionally used for their resources, resulting in the continual movement of families from ocean properties to mountain properties. Evidence gathered from community consultations of past research by Dagan and others (2009) coupled with LCA documentation reveals the importance of continued *mauka-*

[3] believe that LCA numbers on map are transposed, they read 9870B, but there is no record in Waihona Aina for this number

[4] according to Waihona Aina, all apana are in Puako, but cannot locate all apana on map

makai access in this subsistence lifestyle. The majority of individuals interviewed for that study described their families as having properties along or near the coast for the purpose of gathering ocean resources, and properties in the Kahoma or Kanahā Valleys or along *makai* portions of Kahoma Stream, for agricultural purposes. Individuals interviewed gave nearly identical descriptions of walking into the valleys on a weekly basis to farm their family *lo'i*, while fishing, squidding or gathering *limu* when at their ocean home (Dagan, et al. 2009:134). Their paths would have crossed the proposed project corridor.

7.6 Traditional Burial Sites and Historic Cemeteries

While traditional Hawaiian funerary practices were varied prior to European contact, Hawaiians most commonly interred their dead in sand dune deposits and caves. Often buried in a flexed position, with knees drawn up to chest, arms wrapped with hands tucked under knees, and head rested on knees, individuals may have been wrapped in *kapa* (bark cloth) with an outer layer of *lau hala* or other woven material. In cave burials, said to have existed at one time in the walls along Kahoma Valley, the bodies might have been flexed or laid in an extended position, or selected long bones and skull might be bundled in *tapa* (Buck 1957:565-573). Buck also describes platform tombs as being a common practice (1957:572). Additionally, individuals may have been buried with *moepū* (items placed with the dead) or any number of personal effects such as personal adornments, weaponry, or other sentimental items (Buck 1957:565-573).

Several burials thought to be from the pre-contact era, including private family plots on *kuleana* parcels, were described during the consultation process as being within the area of study. Ms. Rhiannon Chandler spoke of a Hawaiian cemetery located near the old Goodfellows Brothers base yard, located near the proposed road corridor. Mrs. Mildred Ka'ahane and her niece Mrs. Jackie Opunui, live on their family *kuleana* parcel at the corner of Aholo Road and Honoapi'ilani Highway. They explained that several members of her family are buried on this property, in various locations. Across Honoapi'ilani Highway there are two historic cemeteries; Puehuehuiki Cemetery and the Man Fook Tong Chinese Cemetery. Mrs. Ka'ahane explained that her son, uncles, aunts and brothers are buried at the Puehuehuiki Cemetery.

Additionally, there is a dry-stacked basalt cobble burial platform on the Opunui property maintained by the family. Mrs. Ka'ahane's grandmother (Mrs. Opunui's great aunt), Ms. Rebecca Kauhai Likua, is said to be buried in this platform along with other family members. They further explained that Ms. Likua was a Christian minister and that in her capacity as a minister, she took on the responsibility for burying immigrants who died here with no family in the islands. It was explained that she did not have a designated burial area and was said to have buried individuals on lands throughout the area.

Three burials were also discovered during archaeological surveys within the current project area. In an archaeological survey of 480 acres, Xamanek Researches (Frey and Fredericksen 2009) discovered disturbed post-contact human remains, SIHP: 50-50-03-6473. Another burial discovery by Xamanek (Fredericksen and Fredericksen 2003), SIHP: 50-50-03-5239, was located during an inventory survey for the Lahaina Watershed Flood Control Project. This burial was discovered 50 feet outside of the right-of-way within the proposed project corridor. The individual was located at 90 centimeters below the surface and below the plow zone. The third burial find was discovered by McCurdy (2011) during archaeological testing and consisted of a

previously disturbed pre-contact burial, possibly displaced from its original context by a storm or flood/river wash. This burial was discovered near LCA 6801 to Opunui and both Mr. Nelson Waikiki and Ms. Mahealani Ventura have stepped forward to be recognized as lineal descendants of this individual.

With the arrival of foreigners to Lāhainā, specifically the Christian missionaries, Christian burial practices were established and coffin burials and designated cemetery parcels associated with the various denominations of churches, became part of the historic layout of Lāhainā. High chiefess Keopuolani, the highest ranking individual in Hawaii at the time and Kamehameha I's most sacred wife, supported the missionaries efforts and became the first Hawaiian converted to Christianity (S. M. Kamakau 1992:262-263). There are eight cemeteries are located in Lāhainā Town (Table 6). All of these cemeteries date to historic times and some are registered as State Historic Sites.

Table 6. List of Historic Cemeteries Within the Current CIA Study Area

Cemetery Name	Location	Description
Lahaina Episcopal (Holy Innocents Church Cemetery)	Waine'e Street	Historic cemetery maintained by Lahaina Restoration Foundation. Sixty-six tombstones and six unmarked graves.
Lahainaluna Mission	Behind main building at Lahainaluna School	Eight tombstones, over twelve unmarked graves.
Man Fook Tong Chinese Cemetery	Honoapi'ilani Highway, near Ahlo Street.	Irregularly maintained cemetery. Twenty-six tombstones and over seven unmarked graves.
Maria Lanakila Church	712 Waine'e Street	This church was founded in the 1840's and is regularly maintained. There are 291 tombstones and over 25 unmarked graves.
Puehuehuiki County	Honoapi'ilani Highway	The Kā'anapali Beach Hotel has maintained this cemetery since 1988. There are 42 tombstones and over 25 unmarked graves.
Pu'upiha County	Ala Moana Street, directly adjacent to Mala Warf	Three hundred tombstones and over one hundred unmarked graves. This cemetery is in a sand dune along the coast. The cemetery often deals with emotional issues as a result of wave action.
Seamen's	712 Waine'e Street, within the Maria Lanakila Church Cemetery	Established in the 1840's, this is the burial site of sailors who had died while at the port of Lahaina. There is only one tombstone that remains of the over 100 burials located here.

Cemetery Name	Location	Description
Waiola Congregational Church	535 Waine'e Street	Established in 1823 as Wainee Church, there are 134 tombstones and over 30 unmarked graves.

Although all of the cemeteries in Lāhainā hold cultural and historical significance, and many historically influential individuals are buried in these cemeteries, it is at Waiola Church cemetery, originally called Waine'e Cemetery, that many Hawaiian *ali'i*, and royal Kamehameha line are buried. Among them are Keopuolani. *Kapu* chiefess Keopuolani was the most sacred wife of Kamehameha I and outranked Kamehameha himself. As a result of her acceptance of Christianity and with the consent of all the chiefs, Keopuolani broke the eating *kapu*, an act that led to the fall of the traditional *kapu* system (S. M. Kamakau 1992:223-224). Queen Ka'ahumanu, Kamehameha I's favorite wife (S. M. Kamakau 1992:82), is also buried at Waiola Church cemetery. Queen Ka'ahumanu also ruled alongside Kamehameha II, Liholiho, as regent and chief counselor (S. M. Kamakau 1992:219).

There is some speculation about the true whereabouts of the remains of these individuals. Originally they were interred at the royal tomb at Moku'ula. In a letter dated May 9, 1947, Inez Ashdown explained that a Mrs. William Kaae, 80 years old at the time and described by Ashdown as the authority on history in Lāhainā, Mrs. Kaae explained that three coffins were taken to Waine'e cemetery but did not contain the remains of the *ali'i*. Instead they were filled with sand and thus placed in Waine'e cemetery:

> I asked her about the actual burial of the chiefs here, and she said that when she was about 17 that Mrs. Bernice Pauahi Bishop moved some coffins from the old stone tomb to where the present headstones are now in Waine'e cemetery. There were three coffins, but there were no bones in them. Only sand. But the coffins were placed on a wagon with a span of horses, and the people stood about with *kukui* torches to follow the wagon. But, the horses could only rear. They could not move the wagon. Then some of the older people "spoke to the spirits" and finally the horses could go on, and the coffins were taken to the present place. She [Mrs. Kaae] said that the old style was to "hide the bones of Ali'i", so she does not believe the actual "bodies" of the Ali'i are in the cemetery. However, they are someplace around Lahaina in a hidden spot, so it "seems as well to say they are under the present headstones." (Ashdown 1947a)

It is important to note that all of the above cemeteries presented in this section are located within the study area for this CIA and less than one mile from the proposed Kuhua Street Extension corridor and feeder roads. Also, the three individual burial finds mentioned above are located within the current project area/proposed road corridor, although it is understood that the road right-of-way has been modified so that it does not impact any of these burials.

7.7 Moku'ula: Sacred and Political Center of Maui

Paramount to Lāhainā's traditional and cultural history and its status as capitol of the Kingdom of Hawaii during part of the nineteenth century, was the sacred significance of

Moku'ula. Today the location of Moku'ula is covered by Malu'ulu o Lele County Park. This park is located less than one mile from current project area along Front Street. As described in Section 3.1.3.1, Moku'ula held tremendous cultural significance as a royal retreat and as a place of *kapu* for the Hawaiian Kingdoms ruing *ali'i*. King Kamehameha III maintained his personal residence here for a time and many *ali'i* stayed at this location. A royal mausoleum was constructed on Moku'ula and was said to have existed there for 46 years. During that time, the tomb held individuals of the royal Pi'ilani family line and the Kamehameha line. Keopuolani, as well as her daughter, Nahi'ena'ena, two of Hawaii's highest ranking and most sacred *ali'i* at the time, were said to have been buried in this tomb before their remains were moved to Waiola Cemetery (see Section 3.1.3.1 Moku'ula). What became of the other individuals in this tomb is unknown and it has been rumored that human remains may be present at this location under the fill of the ball park.

The sacredness of Moku'ula is directly related to the surrounding freshwater pond, Loko o Mokuhinia being the main home of the *mo'o* goddess Kihawahine. Kihawahine was an early ancestor of the chiefs, born a human and deified upon her death. Kihawahine Mokuhinia Kalama'ula Kalā'aiheana and her predecessors were the deities from which the Kamehameha line of *ali'i* attained their supernatural power and their rank of *ali'i*. The physical body of the serpent or *mo'o*, namely their many vertebrae, was said to represent the linking of the lineal connection of generations of *ali'i*:

> The royal *mo'o* of Maui represents the indigenous royal family. She is the backbone that connects the present with the divine ancestors of the past (P. C. Klieger 1998:7).

A picture is painted of the area by Ashdown (1947b), Klieger (1998; 1995), and Menzies (1920) that speaks of a lush grotto like area called Kalua'ehu and/or Luaehu described as being a larger fish pond surrounding Loko o Mokuhinia but connected and utilized for *lo'i* and other crops. Additionally, there were canals which provided waterways for traveling by canoe and larger ships. As described by Menzies, the area was partially irrigated by the Kahoma and Kaua'ula Streams, and partially spring fed.

This account given by Menzies during a trip to Lāhainā in 1793 provides a description of a chiefly residence in Lāhainā:

> On our coming near the kings house, the greatest part of them [an accompaniment of Hawaiians] separated from us, particularly the women, on account of the ground round it being tabooed. The royal residence was sheltered with spreading trees and cocoa-nut palms situated near some beautiful fish ponds with which it was more than half surrounded, though they were not all at this time in repair of filled with water. They were so contrived as to be filled or emptied at pleasure or in succession. Here we found Kahekili with some of his chiefs seemingly in deep consultation, seated under the shady trees in front of his house. (Menzies 1920:113)

Because of these element attached to Lāhainā's history, one can see how Lāhainā then holds tremendous traditional and cultural significance.

Section 8 Summary and Recommendations

The significance of Lāhainā in both Maui's and the Kingdom of Hawaii's cultural and political history stems from several elements that together made it a favorite place of Hawaii's *ali'i* prior to western contact, a sacred and political center for the Kingdom of Hawaii during the formative years. One major element was the rich natural resources of this area. With waters from Kahoma and Kaua'ula Streams feeding the *lo'i* and other crops of the valleys and Lāhainā Village, a great deal of food was cultivated here. A famous early ruler of Maui, Kaka'alaneo, lived in the Lāhainā Moku. Kaka'alaneo planted the famed "shady breadfruit grove of Lele", known as "Malu ulu o Lele". His mischievous son, Kaulula'au, then destroyed these *ulu* trees and was exiled to Lana'i where he is best known for out-witting the spirits there and making the island habitable for humans. Kaka'alaneo was also known for his attention to agricultural endeavors (see Section 3 Background Research) and it was said that the lands of the Lāhainā Moku were kept in the highest state of cultivation. The ocean resources, including fishing and *limu* collection, were equally abundant and has supported the population of the area in both pre-contact and historic times. Today, a great variety of fish and *limu* continue to be harvested from these same waters (7.2 Aquatic Resources).

As the Lāhainā resources supported a substantial population it stands to reason that Lāhainā would be a chiefly center, the capitol of which would be the sacred lands of Moku'ula. The great Chief Pi'ilani ruled from Lāhainā and is believed to have died there as well. It is from Pi'ilani that the sacred aspects related to the island of Moku'ula stem. It was at Moku'ula that Pi'ilani's daughter, Kihawahine Mokuhinia Kalama'ula Kalā'aiheana was deified upon her death and became the *mo'o* goddess referred to as Kihawahine. Her home became the pond surrounding Moku'ula and her namesake, Loko o Mokuhinia. Beginning with King Pi'ilani and continuing with Kamehameha the Great, who stayed here in around 1802, through the reign of Kamehameha III, Lāhainā Village and Moku'ula became and remained a place for *ali'i.* Their worship of Kihawahine allowed the continued flow of chiefly *mana* thus maintaining their connection to their ancestors. At odds with traditional Hawaiian worship and ideology was the influence of Christian missionaries who successfully converted the ruling class of *ali'i,* beginning with Keopuolani.

From Lāhainā, the impacts of the Great Māhele, which introduced the concept of private land ownership and allowed for the purchase and lease of lands to sugar industry owners and others shifted Maui's economy from a traditional subsistence based model, to a market based model. As a result, many Hawaiians abandoned their *kuleana* lands for paid work with the sugar and pineapple plantations. Others continued to work their *kuleana* lands while simultaneously holding jobs with the plantations. Sugar cane cultivation was so extensive, Lāhainā was said to have been planted in sugar cane virtually down to the coast and between houses. Since the sugar industry decline and the official closing of the Pioneer Mill Company, the tourist industry as well as the real-estate industry has majorly influenced the character of Lāhainā over the past 30 years.

As it was throughout history, Lāhainā continues to attract people to its center, whether it's as a major tourist destination or a full-time residential community. Many current residents of Lāhainā have lived there for generations and are able to trace their lineage back to the time of the Great Māhele when their ancestors were laying claim their *kuleana* and further back in antiquity

through their family *mo'olelo*. We were fortunate to interview some of these individuals for this study. What they recall regarding traditional and cultural practices were times when their grandparents and great-grandparents maintained their *lo'i kalo* by traveling on foot to cultivate *mauka* parcels, and stayed at their family homes located here for weeks at a time. Some individuals interviewed for this study continue to cultivate these ancient taro patches. The need to traverse the land to reach *mauka lo'i*, and maintaining access routes from *mauka* to *makai* is a concern for this community. Generally speaking, those interviewed describe their cultural practices as activities related to the gathering of food resources from their environment. Gathering of marine resources such as fish and *limu*, harvesting medicinal plants for *la'au lapa'au* and farming of taro were common practices of this area that continues today.

In addition to the Christian burial practices of the area and the many historically significant cemeteries all of which are located in relatively close proximity to the current project area, more informal burial practices also took place in the study area. It was learned that individuals were commonly buried on their family lands. Known burial sites such as this are located as close to the proposed project area as the Opunui property along Aholo Road. There was also a large population of immigrants living in Lāhainā while working in the sugar cane fields at the turn of the century. These individuals did not have family in the islands and it was said that Mrs. Kauhai Likua often took responsibility for these people after they passed, and buried them at her discretion. Hula traditions also appear to have been quite strong in Lāhainā with the teachings of Mrs. Rebecca Kauhai Likua and her student Mrs. Emma Sharpe which took place in the cane fields just *mauka* of Lāhainā Town. Their *hula* traditions are carry on today.

8.1 Recommendations

Traditional cultural practices were identified as having existed, or as ongoing practices within the current study area. These practices may be impacted by the construction of the proposed Kuhua Street Extension. The following are recommendations for mitigating potential negavite impacts to traditional cultural practices of the study area:

1. To avoid adverse impacts to traditional subsistence fishing practices of Lāhainā resulting from damage caused by the siltation of Lāhainā's reef ecosystem, it is recommended that all runoff generated from proposed roadway construction be contained in retention basins or as Best Management Practices mandate. The Polanui Hiu requests continued consultation with their group as the planning of such measures continues.
2. Individuals consulted, including members of the Kapu family, continue to access *mauka* lands by crossing the route of the proposed Kuhua Street Extension. They utilize the old Kaua'ula Road to reach their homes and traditional *lo'i*. Additionally, it was said that there is a regeneration of the traditional medicinal plants, *uhaloa* (*Waltheria indica*) and *popolo* berry (*Solanum nelsonii*), now growing in the fallow cane fields. Because these plants were used in traditional *la'au lapa'au*, individuals may want to harvest these plants in the future. To maintain access routes which cross the proposed roadway corridor, it is recommended that access routes to *mauka* lands be developed with the involvement of Lāhainā families and community members (see Section 5.1.1 Kuleana Ku'ikahi LLC Lāhainā Community Meeting, May19, 2011).

3. Because the proposed road corridor passes through many historic Land Commission Award parcels, great caution should be taken during all phases of ground disturbing activities to minimize the potential for encountering previously unidentified human burials. It is recommended that a notation is drafted on construction plans further warning the use caution near the Aholo feeder road as this road is adjacent to the Opunui property. Although there is a clearly marked burial platform on the Opunui property, because of the history of this area (see Section 6.1 Mrs. Mildred (Opunui) Ka'ahane and Section 6.2 Mrs. Jackie Opunui), there is a high likelihood that unmarked graves may exist in the area surrounding this platform. If human burials are inadvertently discovered personnel on-site are required to contact the State Historic Preservation Division, Maui branch, Cultural Specialist, Mr. Hinano Rodrigues.
4. The Maui/Lanai Burial Council also recommended that a formal burial treatment plan be completed for the burial find discovered during the archaeological inventory survey (Lee-Greig 2012). Close consultation with the Lāhainā community is recommended for the development of this plan (see Section 5.1.5 Maui/Lana'i Island Burial Council (M/LIBC), October 27, 2011 and Appendix B Formal Response Letters).

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Appendix A Scoping Community Contact Letter

CULTURAL SURVEYS HAWAI'I

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CSH Job Code: LAHAINA 3

April 14, 2011

Subject: Cultural Impact Assessment for the proposed Kuhua Street Extension and Improvement Project, Moali'i to Makila Ahupua'a, Lahaina District, Maui Island, Multiple TMK

Aloha,

On behalf of the County of Maui, Department of Public Works, and in cooperation with the Kā'anapali Land Management Corp., Cultural Surveys Hawaii, Inc. (CSH) is conducting a cultural impact assessment for the proposed Kuhua Street Extension and Improvement Project. As a result of growing demand for roadway capacity in and around Lahaina Town, the subject project has been proposed to improve traffic circulation for surrounding communities and reduce increasing traffic congestion. The proposed Kuhua Street extension will also serve as an alternate route in the event of emergencies or when unplanned closures of Honoapiilani Highway occur.

Beginning at its southeastern extent, the Kuhua Street extension originates south of Aholo Road at the intersection of Front Street and Honoapiilani Highway. From here it jogs east then northwest running parallel to Honoapiilani Highway and the Mill Street cane haul road. The proposed extension route will include connections to Aholo Road, Shaw Street, Dickenson Street, Lahainaluna Road and Papalaua Street, thus connecting the Kuhua extension road with Honoapiilani Highway. Because of severe grade differences at Honoapiilani Highway and Prison Street, Prison Street is currently not identified as an intersecting street. The proposed route will curve around the Lahaina Recreation Center Park and traverse the area between the park and the West Maui Resource Center. The proposed Kuhua Street extension will terminate at its northern point at Keawe Street just *mauka* of the new Lahaina Gateway Shopping Center.

The area of direct effect, or areas that may be directly impacted by construction activity and hereafter referred to as the "project area" includes a proposed length of road 2.6 miles long and approximately 200 feet wide (Figure 1). Due to the unique *ahupua'a* system of Lahaina which contains small *lele* like *ahupua'a*, the proposed roadway will pass through 31 of these *lele*. They include; Aki, Aupokopoko, Panaewa, Kopili, Paeohi, Kuhua, Paunau, Makila, Puehuehunui, Halakaa, Polanui, Kooka, Puaanui, Wainee (Waineenui), Puako, Waianae, Haleu, Kaulalo, Puehuehuiki, Puunauiki, Puunau, Polaiki,

April 14, 2011

Kamani, Puaaiki (Puaa), Kulahuhu, Puuhoowale, Kapewakua, Opaeula, Uhao, Aupokopoko, Moalii, and Kuholilea (Figure 2 and Figure 3).

To ensure that potential impacts to traditional cultural practices which may not occur within the boundaries of the "project area", but may nonetheless be affected by the proposed project (e.g. where a proposed action that may not physically alter gathering practices but may affect access to gathering areas) are assessed, the *ahupua'a* is typically the appropriate geographical unit to begin with. But unlike the typical *ahupua'a* which extends continuously from the mountains to the sea, the *ahupua'a* of Lahaina are small and discontinuous with partner *ahupua'a* located both *mauka* and *makai* and often in the *kula* lands as well. For this CIA study, research will be focused on the lands surrounding the project area and include the traditional connections to the *mauka lele* associated with their coastal counterparts.

We are seeking your *kōkua* or help and guidance regarding the following aspects of our study:

- **General history and present and past land use of the project area.**
- **Knowledge of cultural resources which may be impacted by the Kuhua Street Extension and Improvement Project - for example, traditional plant gathering sites, historic sites, archaeological sites, and burials.**
- **Knowledge of traditional gathering practices in the area – both past and ongoing.**
- **Cultural associations of the project area, such as legends and traditional uses.**
- **Referrals of *kūpuna* or elders who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua'a* lands.**
- **Any other cultural concerns the community might have related to Hawaiian cultural practices within these Lahaina Ahupua'a and/or in the vicinity of the proposed Kuhua Street Extension and Improvement project area.**
-

I invite you to contact me, Colleen Medeiros, at 1-808-242-9882. You may also contact me by e-mail at cdagan@culturalsurveys.com if you have any information you would like to share.

Mahalo,

Colleen Medeiros, Historic Researcher
Cultural Surveys Hawai'i, Inc.

www.culturalsurveys.com | info@culturalsurveys.com

April 14, 2011

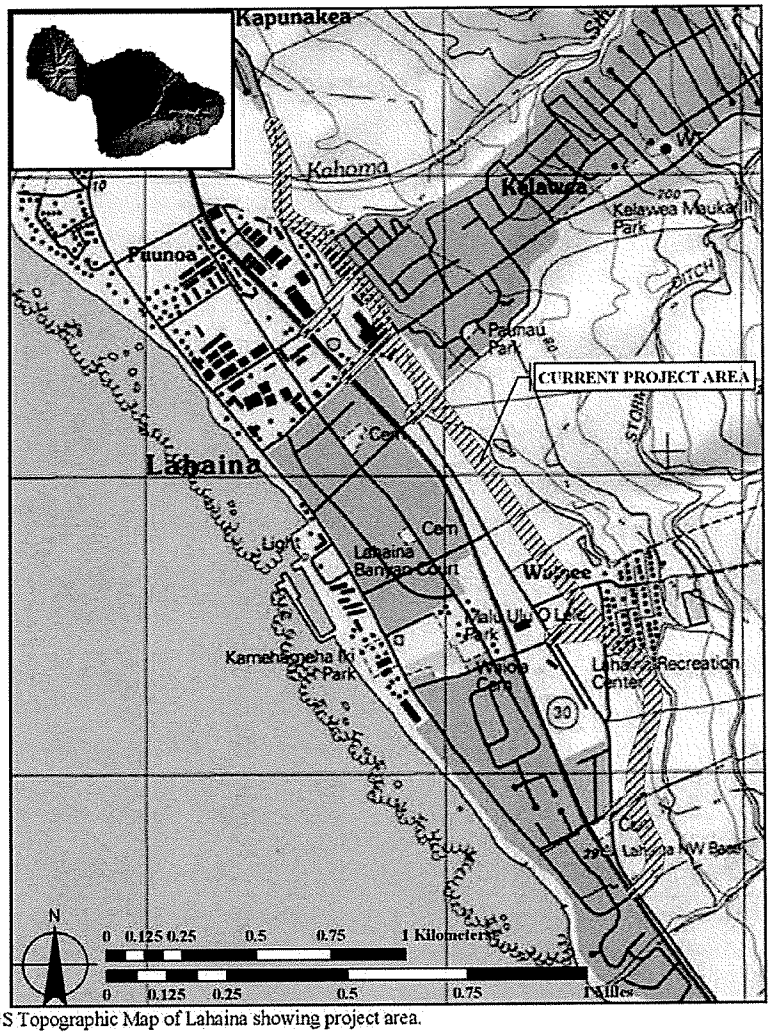


Figure 1. USGS Topographic Map of Lahaina showing project area.

April 14, 2011

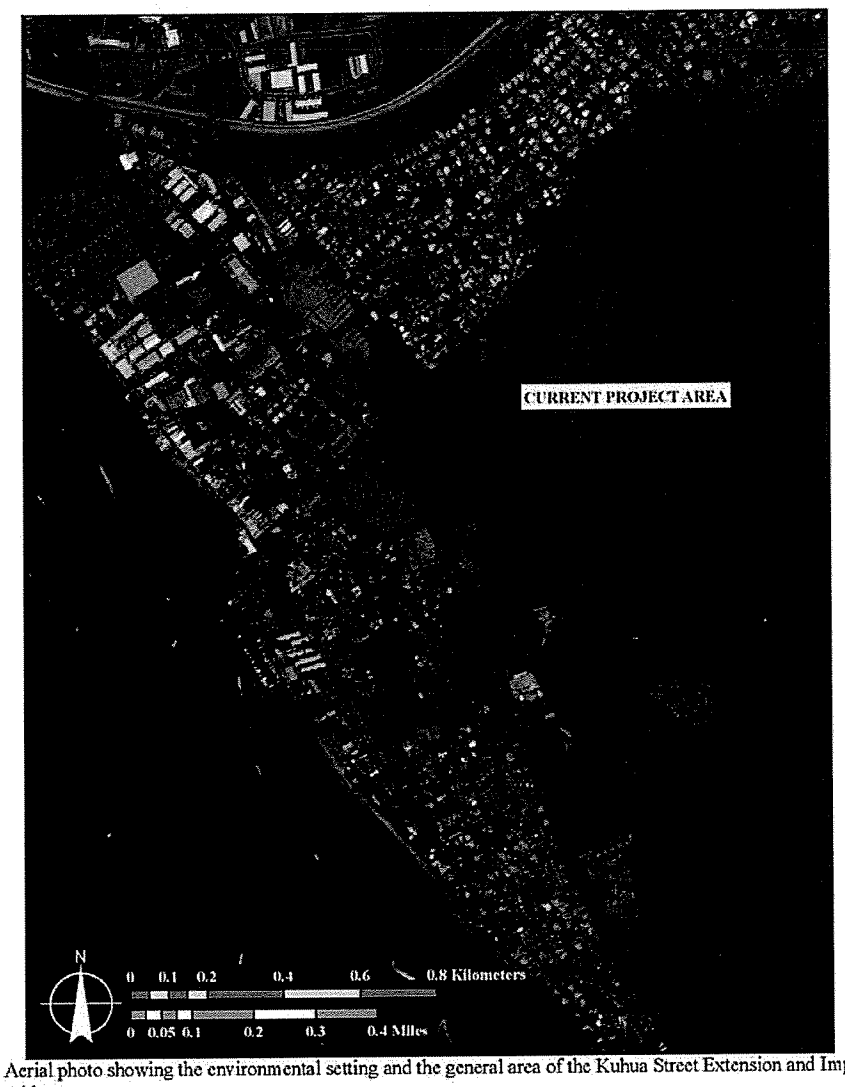


Figure 2. Aerial photo showing the environmental setting and the general area of the Kuhua Street Extension and Improvement Project corridor.

April 14, 2011

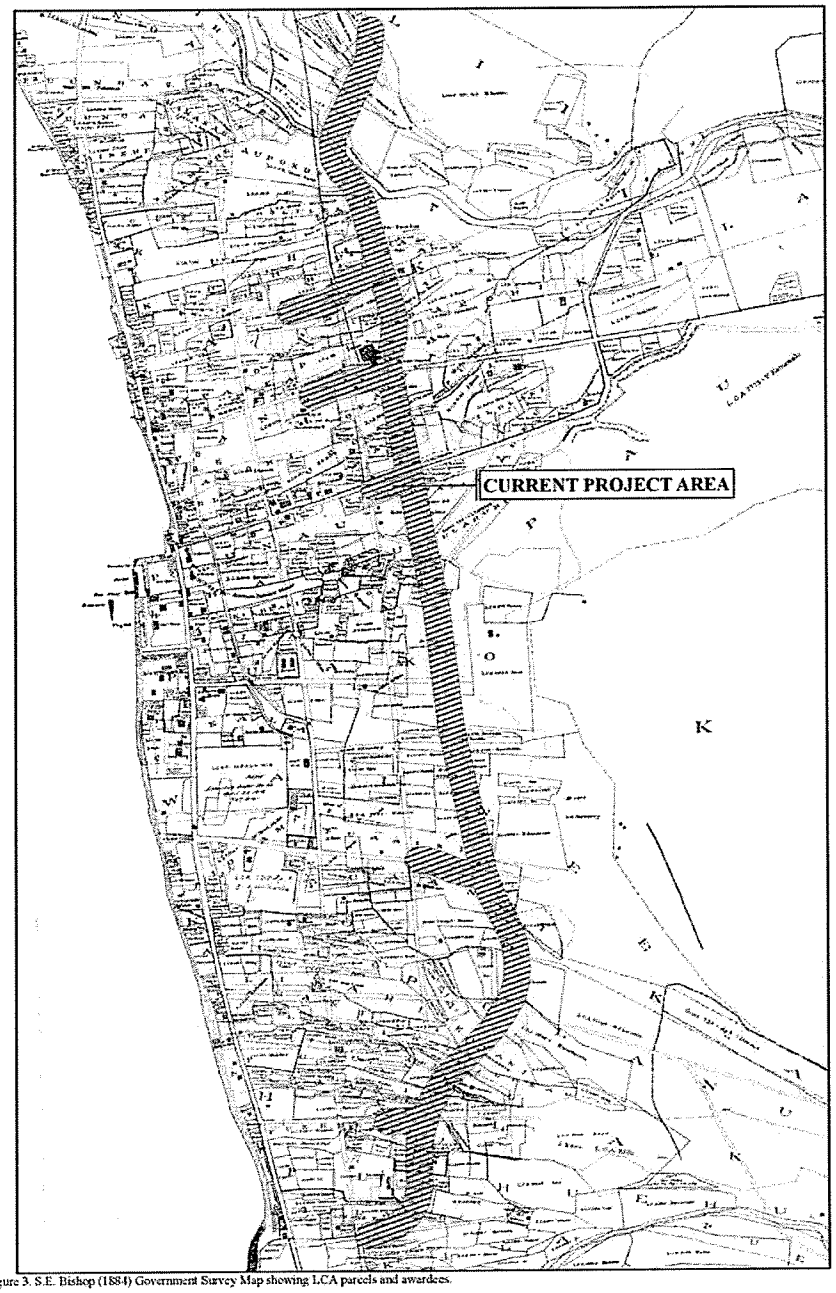


Figure 3. S.E. Bishop (1884) Government Survey Map showing LCA parcels and awardees.

Appendix B Formal Response Letters

MAUI/LANA'I ISLAND BURIAL COUNCIL 2
OFFICE OF HAWAIIAN AFFAIRS 3
POLANUI COMMUNITY MANAGED MARINE AREA 5
MRS. UILANI KAPU 7

Maui/Lana'i Island Burial Council

December 9, 2011

Scott Fisher
Maui/Lana'i Island Burial Council
c/o State Historic Preservation Division
Department of Land and Natural Resources
130 Mahalani St.
Wailuku, HI. 96793

Aloha Ms. Lee-Greg and Ms. Medeiros,

At its October, 2011 meeting the Maui/Lana'i Island Burial Council (MLIBC) was provided with an update to the Kahua Street extension project at Pu'ehu'ehu'iki Ahupua'a, Lahaina, Maui (TMK: (2) 4-6-013: 01). Of particular interest to the council was the inadvertent discovery of native Hawaiian remains at this site. While we recognize that interim measures have been taken to prevent further disturbance to these remains, including backfilling and placing a metal plate over the exposed pit, we strongly encourage the implementation of more permanent measures for the permanent protection of these *iwi kupuna.*

In particular, the MLIBC requests the expedited composition of a burial treatment plan which will provide substantive and permanent protection to these *iwi kupuna.* While we are aware that you will be working closely with the State Historic Preservation Division while drafting such a plan, we strongly recommend that any such plan follow these guidelines:

- These iwi kupuna should be kept in place, and should not undergo any further disturbance;
- Sufficient temporary buffers should be established to prevent any inadvertent damage to the site during the construction phase of this project;
- Upon completion of the construction phase of this project, we advise establishing permanent measures to protect this site. These measures should be assertive in demarcating this burial site as sacred to the Native Hawaiian people, as well as aesthetic, in keeping with the surrounding area. The MLIBC recommends the use of indigenous and endemic plantings around this site;
- These permanent protection measures should utilize signs notifying the public of the sacredness of this site and should utilize indigenous and endemic plants in its design.

Should you have any questions from the MLIBC, we request that you place this item on the agenda so that we might discuss this issue further.

Mahalo
Scott G. Fisher
Scott Fisher
Vice-Chair, Maui/Lana'i Burial Council

Office of Hawaiian Affairs

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD11/5691

May 10, 2011

Colleen Medeiros, Historic Researcher
Cultural Surveys Hawai'i, Inc.
1993 Main Street
Wailuku, Hawai'i 96793

Re: Pre-Cultural Impact Assessment Consultation
Kuhua Street Extension and Improvement Project
Lahaina District, Island of Maui

Aloha e Colleen Medeiros,

The Office of Hawaiian Affairs (OHA) is in receipt of your April 14, 2011 letter with enclosures seeking comments ahead of a cultural impact assessment (CIA) for the Kuhua Street Extension and Improvement Project (project) proposed by the County of Maui-Department of Public Works in cooperation with the Kā'anapali Land Management Corporation. The project intends to improve traffic circulation and reduce traffic congestion in Lahaina Town and surrounding communities. Upon completion, the proposed Kuhua Street Extension will serve as an alternative route in the event the Honoapi'ilani Highway is closed.

While the project "footprint" is currently defined as being approximately 200 feet wide and extends 2.6 miles, OHA recognizes and applauds that the scope of the CIA has been developed to consider a broader region of influence to evaluate the potential impacts of the project on traditional cultural practices. This broad study area is encouraged by the text of Act 50, which amended Chapter 343, Hawaii Revised Statutes and required the disclosure of the effects of a proposed action on cultural practices. OHA is especially interested in the discussion in your letter relative to the unique traditional land divisions on Maui. Unlike typical ahupua'a, which extend from the mountain to the sea, ahupua'a in Lahaina are smaller and discontinuous with "partner" ahupua'a both mauka (sometimes in kula lands) and makai. OHA looks forward to seeing the CIA expanding on this discussion.

It is our understanding that your firm conducted the CIA which was incorporated into the final environmental assessment for the "Lahaina Bypass Modified Alignment Project" (Wilson Okamoto Corporation, March 2009). This CIA included an excellent overview of concerns regarding the changing cultural landscape of Lahaina and impacts to traditional practices expressed by knowledgeable individuals with familial connections to these lands. OHA respectfully suggests that the individuals who participated in this previous CIA be contacted and consulted within the scope of this current CIA. Additional individuals and organizations may be recommended or identified as you move forward with your consultation process.

Colleen Medeiros, Historic Researcher
Cultural Surveys Hawai'i, Inc.
May 10, 2011
Page 2 of 2

Thank you for initiating consultation at this early stage and providing the opportunity to comment. We look forward to reviewing the CIA and providing additional comments at that time. Should you have any questions or concerns, please contact Keola Lindsey at 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Chief Executive Officer

C: OHA- Maui COC

Polanui Community Managed Marine Area

October 6, 2011

Aloha Ms. Medeiros,

My name is Dr. Scott Fisher and I am writing to you as the Hawaiian Island Land Trust's Director of Conservation as well as a board member of the Maui Nui Marine Resources Council, specifically in the capacity as a participant in the Polanui Ahupua'a Community Managed Marine Area. Our goal at Polanui is to utilize traditional Hawaiian terrestrial and marine management strategies to improve the quality of these ecosystems, increase the abundance of keystone species and to improve the quality of life for the local community who depends on these marine resources.

Over the past year and a half we have held numerous meetings with local kupuna, resource managers and other stakeholders to understand the current condition of the nearshore marine environment; evaluate what was known historically about the relative abundance of this area; and to devise strategies to restore the ecological integrity and health of Polanui's marine ecosystem. Our evaluation of the relative abundance of the marine ecosystem has indicated a dramatic reduction in the identified keystone species, particularly manini, kole, moi, weke, uhu and hinalea. We selected these particular fish species based on their contribution to the sand and reef composition, structure and function as well as the overall health of the nearshore ecosystem.

Through this participatory process we have concluded that, while there are many stresses on this fragile ecosystem, traditional Hawaiian management practices can serve to mitigate the disturbance patterns brought about by development (including infrastructure improvements), over harvesting and the array of stresses to the reef and nearshore marine ecosystem. Some of the most severe disturbance patterns derive from the excessive accumulation of sediments which result from the failure to control the velocity of hydrological flow from the uplands into the coastal zone. Sediment accumulation causes a broad spectrum of problems, but is most evident when it results in the death of the coral reef ecosystem which can have catastrophic and cascading impacts on the entire nearshore environment. Excessive sedimentation derives from a combination of poor management practices, including failing to construct barriers which slow the velocity of storm runoff and implementing inadequate measures to prevent erosion at construction sites. Considering the size and scope of the proposed Kuhua Street project we are particularly concerned with the potential for further degradation of the marine environment and the direct impact this will have on the quality of life for the people who depend on this area for their livelihood.

We are asking that the following strategies be implemented prior to the commencement of this project:

- Adequate measures should be taken to reduce the velocity of rain water flowing through the project area during major storm events. These might include such things as the construction of small retention basins to collect storm water flow, or the placement of barriers which slow hydrologic velocity;
- Any grading or grubbing in this area should be sufficiently small that, if the above measures are taken, a storm event will not overwhelm these sediment accumulation prevention measures;
- Grading or grubbing work should only be done during the dry season (kauwela) between the middle of May and the middle of October, to avoid the possibility of large storms;
- Contract an environmental firm to conduct thorough and comprehensive nearshore marine ecosystem monitoring to evaluate the impact of this project;
- Finally, we would like to set up a meeting with the Polanui Community Marine Management Area group and a project engineer so that we might have the opportunity to review the specific strategies this firm will use to address these concerns.

The Polanui Community Marine Managed Area group is concerned about the potential for significant ecological degradation of the local marine resources deriving from this project, and consequently our ability to manage this area according to traditional Hawaiian principles and practices. However, we also recognize that through a process of collaborative dialogue and the implementation of adequate preventative measures, many of these issues can be adequately addressed.

Me ka ha'aha'a

Scott Fisher, Ph.D.
Director of Conservation

Mrs. Uilani Kapu

April 29, 2011

Aloha Colleen,

I have reviewed your project area map. At this time the only question I have regarding this is.

It will inconvenience our Kuleana road mauka-

Which can't be shut down at any time to all Kuleana owners living mauka.

This is our only traditional alanui home.

We are sharing your information with others and will get back with you later.

I just want to get this addressed.

Mahalo

Uilani Kapu

Pre-Kuleana Ku'ikahi & resident

Appendix C Land Claim Awards

00058 to Mapu

Claim Number:	00058	**Awarded:**	1
Claimant:	Mapu	**FR:**	71v1
Other Claimant:	Kauhiahiwa, Kealawaa daugh. & heirs	**NR:**	62v1
Other Name:	Emma Jones	**FT:**	220v3, 29v15
Island:	Maui	**NT:**	29v15
District:	Lahaina	**RP:**	404/405
Ahupuaa:	Aki, Kopili, Kopili Hema	**Number of Royal Patents:**	2
Apana:	8	**Claimant Died:**	Yes

No. 58, Mapu, claimant, Maui
F.R. 71v1

1 document entered in Native Register, Page 62

T.R. 62-64v1
No. 58, Mapu

Greetings to the Land Commissioners: I have heard in my old age that the King as appointed the Land Commissioners. I hope you will be so good as to consider my paper concerning my claim. May your distinguished eyes peruse the following:

Three Rights
(1) The owner of the land had it from his ancestors.

(2) The owner of the land gave it to the konohiki which gave him rights on the land.

(3) I am the tenant (hoaaina), having been on the land since my ancestor's time and I do the work of the konohiki and all the instructions of the owner. Two of us lived on the land – the Konohiki and myself. We divided up our kula land and the taro patches, separating his and mine.

I am the one who has the rights over my place and it is valuable to me, and/now/ I am deprived, for this reason.

A person lived with me as is the custom of this land – some live under some others, and after some time they get up and leave without my knowing of their departure. Some time after his departure, I heard it was given to someone else and then my wife rote [stet] him asking bout this departure and the return to said place and we did not receive a reply.

Shortly thereafter the tax official took action in court and I was deprived, and whit it was tried again, I was still deprived, and this is not good, in my mind.

I had my kokua /advocate/ please before the Governor's court, but have not heard of this being rectified in this high court, until now. My advocate is Ladana /London?/; - he was the one who appeared before the Governor's court and he is the one who knows the action of this court and the one who will again appeal to you.

I will continue to esteem you in my old age. Let the names of the designated persons be praised forever. I am your servant, with praise.
MAPU (his mark)

P.S. The friend who was to do this was Kekulelike, however he died, and his successor is Kuakamauna.
Kopili, Lahaina, Maui

F.T. 220-221v3
Cl. 58, Mapu, translated from Vol. II, p. 65 N. [next page:] 1849

Hikiau, sworn, Mapu consented to Kauwaa living there and he consents to Kekaulike living there, and he did live there undisturbed.

Kamakini, sworn, That Mapu received that land from Kauwaa. This man gave it to Kekaulike. It is not clear to me what year. The gift was made on Kalaimoku's death. The land was given to Kukualiki and he had lived there to this time. The title to the land, however, was Mapu's, who gave away a certain part of it to Kamakini. As to the destitution of Kekaulike, I do not know.

Kaauwai, sworn, taken 3 November 1849 Hale Hoona Honolulu, I know that Kualiki went to live with Mapu about 1825 and that Mapu at the same time was Konohiki and gave Kekualiki two thirds of the lot which he himself occupied and owned. And that Kekualike fenced and cultivated it and lived on it in a house of his own building. Having built 3 houses and the adobe fence, he then put up a still standing at least in the same place – for he replaced the first twice with new adobes. I know that he went backward and forward to Molokai up to 1846 when he died, and that he never abandoned this place to the time of his death, either living there himself or represented by the presence of some of his family or servants. In 1843 he was acting Konohiki in Molokai under Kekauonohi. The last time he was at Lahaina was in 1845. When his daughter attended him on account of his sickness and returned to Molokai. When he requested, on leaving, Kuakamauna to take charge of his lot on behalf of Kalama his son, Kuakamauna then occupied it by agents of his own and some of Kekualike's people also remained. Mapu had nothing to say in the affair. He had no idea of any right in this portion olong separated by a fence still standing and which he had long ago given away to Kekualiki. Kalama is his only child.

Mapu & Ladana still occupy the third originally held. Instead of Kedualiki being a destitute wanderer he was a konohiki at the time at Molokai and had a house and food there. His object in going to Lahaina was to be near the Chief's, being a Punahele of theirs or favorite, and another object brought him there was religious teaching to be near Mr. Richards.
See Kekuamauna's Claim 303. P.P. 71 ½ Testimony page 73, v2. Hikiau's testimony.
Resumed page 282

F.T. 282-284v3
No. 58, Mapu, 7303, Kuakamauna, Counter, Evidence taken in May by President Lee from page 320, 3 Testimony & 73 v2, N.T. 14 May

Both parties present. Claim for the moo in the ahupuaa of Kopili, Lahaina, Maui.

Umiumi, Sworn, I am Kamaaina of Kopil. I know the land in dispute between Mapu & Kuakamauna. It is Mapu's land. He had it from Kauwa which I knew first in Hoapili's time. I lived on this land when a little boy long before Hoapili died. I went as one of the company of Kekualike whom Mapu gave a right to live on it under himself. He lived there till after the death of Nahieaena, when Kekualike & his party went to Kauai, but I and Hanaloa remained & lived there under Mapu. Soon after, about 1840 when Kuha was hung at Paunoa, Hanaloa left and went to Molokai. I lived with Mapu a time & then went to Kaanapali at Liliha's funeral about 1840. I was the last of Kekualike's company except Kaoaholope who still lived under Mapu. Kekualike & company lived under Mapu's shade, which I heard Kekualike say.

Kahalemake, sworn, I am an old son of Lahaina and well know this land in dispute. Mapu had it from his sister in Hoapili's time while Nahienaena was alive, and the sister being Hewa, the land was taken from her & given to Kauwe & Mapu lived on it under Kauwa as his hoaaina. Kauwa then divided this land called Kopili with Mapu,

each taking a part as his separate property. I lived there under Mapu. Kekualike, being in trouble for a plan, came & asked Mapu to live under him & he agreed so they lived there a while & then left with all his people except Umiumi & her sister, who remained under Mapu. Kekualike left in 1835. I heard him ask for the plan. Mapu gave him a spot on the express conditions that when he left, it should revert to him (Mapu). Kekuamauna took the part occupied by Kekualike about 1842 and has since occupied it (not in peace for Mapu has constantly disputed his claim).

Kekuamauna admitted that he held this land under Mapu. He had the same right in it that Kekualike had, he said, he held it for Kalama, Kekualike's son.

Kaua, sworn, for Kekuamauna, I am an old resident of Lahaina and know the disputed land. In 1825 Mapu & lived on this land and in 1826 Kekualike came and we consented he should live there, which he did till 1835 about. When Mapu and I divided the land 250 fathoms was given to Mapu in length and 17 in width, and mine was 207 by 8 fathoms 1 yard. His part was mauka and mine makai. Kekuamauna's house lot was then in Kekualike's hands, and was in the past belonging to Mapu. Kekualike lived under Mapu. I consider Kekuamauna is now in possession of all the rights of Kekualike: viz. he has a right to live on the land by paying a tax. He lived there from 1843 but disputed, though not constantly, by Mapu.

Mataio Kenui, sworn, Soon after the Kauai War in 1825 I came here to Lahaina with Kekualike following in the company of the chiefs.

When we landed we looked for a residence. Kekualike found a place under Mapu's shade where they lived together till the land was divided under Mapu. It is clear to me that Mapu is the superior & Kekualike and all claiming under him are the inferior dwellers on this disputed lot.

Kaunakakai, sworn, Kekualike, when he came here made friends with Mapu & went to live in his place. Kekualike was a man of property and went to Molokai bringing food &c to live upon & gave to Mapu. He lived there in peace, but was under Mapu.
See 39v15 [Sic: 29v15}

F.T. 29v15
No. 58, Mapu, (Deceased), from page 282v3

Kane, sworn, says he is the brother of Lakana, deceased. The only claim of Lakana is that for his House Lot on the Beach at Lahaina. The two pieces of land in Lakana's claim, which he held under Mapu, his father-in-law, were not Lakana's house. They belong to the two daughters of Mapu (his heirs), to whom he left his property in equal parts (The Konohiki consents to Mapu's Claim)

N.T. 65V2
No. 58, Mapu

Hikiau, sworn by the Bible, Yes, the right to live there is by this person. He received it (land) from Kauwa, and from this person to Kualike. Kualike lives there by this one, and no one has objected.

Kamakini, sworn, That property is for the one from Kauwa. This person here gave it to Kekualike, the year in which it was given is not clear. Just after the death of Kalaimoku it was given to Kekualike and it has been that way to the present time but the largest claimant is Mapu, the person who gave a section of property to Kamakini. How Kekualike had become destitute is not known. See page 163v3 [7]

N.T. 163v7
No. 58, Mapu, Lahaina, May 14 1850 (from page 65, Vol. 2)
No. 306 Kuakamauna, (from page 195, Vol. 2)

Dispute between Mapu and Kuakamauna over the moo land in Kopili of Lahaina.

Umiumi sworn "Yes, I have seen that moo land, for I am a native, of Lahaina, having lived there in Kopili as a child. Mapu's land was from Kaua, I had seen Mapu living there at the time Hoapili was living. I had lived there-also with Kekualike, Kekuelike's kuleana was from Mapu.

Mapu was over Kekuelike and he (Kekuelike) lived there. After Nahienaena's death, Kekuelike together with some of his servants went to Kauai while Hanaloa and I were asked to lived there under Mapu.

Hanaloa went to Molokai to live with Mapu at Kopili at the time Kuloa was Chief of Puunaa for ten years probably and I went to Kaanapali to live at the time of LIliha's funeral. Kaiakolohe lived there are Kekuelike's servant.

Kahalemake, sworn, "I am a native of Lahaina and have seen this land in Kopili over which there is a dispute It was at the time of Hoapili and Nahienaena was still alive the land had been for Mapu's sister and when she had been released from the land, it was then passed on to Kaua. Mapu lived there, how ever as a caretaker for Kaua.

Later Kaua divided this land and gave a one half portion to Mapu. When Kukuelike had no place to live, Mapu gave his this place upon request with the agreement that should Kekuelike decide to leave, he would then return the land to Mapu.

I personally had heard Kekualeke ask Mapu and Mapu in turn had requested the Kekuelike return the land should he leave. Kekuelike had lived there for probably ten years when they went to Oahu and upon leaving for Kauai permanently, he returned the land to Mapu. Umiumi and Kanaloa had been living there. Kuakamauna had taken Kekuelike's interest in 1842 perhaps he was under Kalam, the son of Kekuelike.

Kaua, sworn, "That land came into my possession in 1822, in 1826 Kekuelike asked for a place to live, therefore, Mapu and I gave his a piece of land. Kekuelike's place is in the half portion of Mapu's place which was divided at the time of Nahienaeana. The size of Mapu's land: Two hundred and fifty and seventten is the width – and my place is 207, the width is 8 fathoms. My place is makai and Mapu's is located mauka.

In the year 1843, I asked Kekuelike what about your interest in our place?
Kekuelike answered, "Mapu (wife) will live on my place and will care for it" then in 1845, Kekauluohi asked me to live on that land. I was not angered that Kekuelike had built his house there, he had lived there under Mapu. Umikana is presently living there. Kekuelike has 4 moos; my place is smaller with 3 moos only.

Kuakamauna has never objected previously, only now he has intervened. He had possession of the land in 1843, Kekuelike had it first in 1826."

Mataio Kenui, sworn, "After the war of Kahalai had ended and the men all returned to live on Lahaina here, that was the time I had seen Kekuelike living on that place. During that time I heard Mapu's wife suggest the division of the land between Mapu and Kekuelike and since then Kekuelike lived there until he went to Molokai. I have not known his independence because he had lived under Mapu.

The land had been divided before this time, the mauka half portion for Mapu and Kekuelike, while the half makai for Kaua".

Kaunakakai, sworn, "I am not a native, I had come as a stranger and lived in Lahaina. Kekuelike had a house as soon as we had come, from his friend Mapu. Later Kekuelike asked Mapu for a place and he received it for Kekuelike was a wealthy man at the time, he had lands on Molokai. For this reason he was able to build his house and was successful in living here. My house was completed later. I had not heard that Kekuelike had possession of that place, he had lived under Mapu."

[Award 58; R.P. 404 & 405; Kopili Lahaina; 3 ap.; 2. Acs 2 roods 38 rods; Aki Lahaina; 4 ap.; 2 roods 32 rods; Kopili Hema Lahaina; R.P. 4041; 1 ap.; 1.33 Acs for Emma Jones (Mapu Piianaia); R.P.; 404; Kopili Hema (Apana 1) 1 ap.; 1-1/3 Acs; Kauhiahiwa & Kealawaa also awared land under 58 in Kopili Lahaina; 1 ap.; 1 1/6 Ac.]

00241 to Burrows

Claim Number:	00241	**Awarded:**	1
Claimant:	Burrows, S.D.	**FR:**	136v1
Island:	Maui	**FT:**	139v1
District:	Lahaina	**NT:**	66v2
Ahupuaa:	Wainee	**RP:**	410
Apana:	1	**Number of Royal Patents:**	1
House Lot:	1	**Miscellaneous:**	Survey included

No. 241, Solomon D. Burrows, Claimant, Honolulu, October 24 1841.
F.R. 157-158v1

Gentlemen:
I take this opportunity of soliciting your attention relative to the quieting of my title to my land.
I would inform you that I acquired my land called Wainee from Governor Hoapili in December 1839 in part payment for my building his house in the Fort.
The Honorable Board of - Your attention will much oblige Sir Land Commissioners, &c &c &c, Signed, S. D. Burrows

Note: Survey of the above recorded in Page 163

F.R. 163-164v1
No. 241, Survey of Claim 241, Recorded on Page 157

Notes of a survey of a building spot in Waihee (Wainee) Lahaina Maui for Soloman Burrows.

Commencing at stake north corner of this land, on boundary line between this, and a land owned by Kuakiniopio and on south side of Alanui, and running
South 60° West, 3 chains 40 ½ feet along south side of Alanui to stake. Thence
South 33° East 2 chains 8 inches along boundary line between this and Kuakiniopio's land on makai side of this. Thence
north 65° 30' East 3 chains 57 feet along North side of mud wall, the boundary line between this and a land said to be owned by Kaaio to stake. Thence
North 35° West 2 chains 22 ½ feet along line between this land and Kuakiniopio & on mauka to place of commencement - including an area of 988 square fathoms
Lahaina Oct 27, 1846.

Note - 1210 square fathoms make one acre 66 feet make 1 chain.

[DIAGRAM]

F.T. 136v1
Claim No. 241, S.D. Burrows, Maui

I. Nowlien, sworn deposed, I know that S.D. Burrows is in possession of a land in Lahaina up back of the Church and just below Kekauonohi's former house. Burrows is my son-in-law. I went with him to Hoapili about 1839 and I heard Hoapili give orders to one of his men to go and measure off the piece which Burrows now has - perhaps an

acre - and he did so. He has held possession of it down to the present time. I supposed that it was given to him for having built a house for Hoapili.

N.T. 66-67v2
No. 241, Solomon D. Borrows, Lahaina, December 25, 1846, See B

Kimo, sworn: I have [know] Solomon's property in Lahaina here, mauka of the church. Solomon is a son-in-law for me. My son-in-law and I went together to Hoapili in the year 1836 and I heard Hoapili tell a certain man to go with us and survey a land for Solomon. I have heard that Hoapili gave (land) to Solomon for building a house.

[Award 241; R.P. 410; Wainee Lahaina; 1 ap.; .81 Ac.]

00305 to Kuakamauna

Claim Number:	00305	**Awarded:**	1
Claimant:	Kuakamauna, E.	**NR:**	71v2
Island:	Maui	**NT:**	73v2
District:	Lahaina	**RP:**	1831/8219
Ahupuaa:	Panaewa, Uaho	**Number of Royal Patents:**	2
Apana:	1		

No. 305, Kuakamauna, E.

[Award 305 [303-305]; R.P. 1831; Panaewa Lahaina; See Award 303 (below) for documents for 303-307]

Claim Number:	00303	**Awarded:**	1
Claimant:	Kuakamauna, E.	**NR:**	71v2
Island:	Maui	**FT:**	282v3
District:	Lahaina	**NT:**	73v2
Ahupuaa:	Panaewa	**RP:**	1831/8219
Apana:	6	**Number of Royal Patents:**	2
House Lot:	6	**Koele/Poalima:**	Yes
		Miscellaneous:	Claims 5 lots with different numbers, is awarded 6, government road

No. 303-307, Kuakamauna, E.
N.R. 71-72v2

Greetings to the Land Commissioners:

I hereby tell you of my houselots at Lahaina. Three are my very own and two are inherited. I will describe the five lots:

303
Lot 1 is makai of Panaewa on the north of the government Road, running to Kaloa. On the east is Kamakini's lot and on the south are the po`alima taro patches of Kekauonohi, on the northwest is the lot of Kanae; it has not been surveyed, it is for the surveyor to do.

304
Lot 2 is at Lapakea and Panaewa, on the northwest of the Government Road running to Lahainaluna. On the south

are the pa`ahao taro patches and the lot of one who has gone to Kahiki, and on the north is the lot of Hikiau, on the east is the lot of Wahie. The dimensions are for the surveyor to determine.

305
Lot 3 is insignificant to talk of, however it will be stated. My own /right/ is ended, but it however should be put with my inherited lots, because it is mine to be awarded, when the time comes.

306
Lot 4 is at Lahaina. It adjoins the insignificant lot which I spoke of. You have received a petition from Mapu for this place. It is not his, it is mine by inheritance. I will work on it. You all work with Mapu. I am one of the heirs.

307
Lot 5 is at Puaa on the north of the road mauka of the church, on the northeast of this church is the fifth /lot/ by inheritance and I will award and fulfill according to the law in Chapter 7, par. 12, pages 86-87. This is my message to you, the Honorable Commissioners of the independent government of the King of the Hawaiian Islands.
I am, your friend,
E. KUAKAMAUNA

To verify what I have said, I have some witnesses: Hikiau, J. Kamakini, Mokulawaia, Nauku, Kanaana.

N.T. 73v2
Nos. 303-307, Kuakamauna, Lahaina, December 28, 1846

John Young, sworn, I have heard, yet probably have forgotten (what I've heard). According to what I have heard, it is for Kuakamauna, Mapu and for Kuelike. Ladana has filed a complaint for Mapu, but I had heard previously it is for Mapu and Kekuelike. I have not heard that Mapu had been rejected.

Namakeha, sworn, Both John Young and I had worked (on this case) but it was not quite clear because Kekuelike was away so it was deferred until Kekuelike could come (here).
See page 83

N.T. 83-84v2
Nos 303 and 307, Kuakamauna, from page 73

Hikiau, sworn, That property is for Kuakamauna. It was his property long after his people were gone. He had lived there long ago from the time of Wahinepio who had received it (land) from Kalaimoku and no one objecting in 23 or 24 years perhaps.

Lot 2 - That property at Papakea was from me and I had given (it) for him. I received it from Kamehameha II (sic) in the year 1834 (sic) and from that time till this day, no one has objected. Lots 4, 5, 6 - I have not known who had given this person (these lands).

Wahie, sworn, Kenalo came from the other end of the island and said to us, "My father had gone away and has returned to this property. I have given it away (to him)." That is what I have heard and no one has objected.
See page 107

N.T. 107-108v2
No. 303-307, Kuakamauna, from page 73

Keohokana, sworn, I have known that Manono has a house lot here in Lahaina and it is toward the mountain end of the church. Kaaimalalo gave it to him and he had built a fence in the year 1838.

That property is for Kaaimalalo. It had been for Manono and he had left it to his son, Keaupuni. Keaupuni is to live under Kaaimalalo and when Kaaimalalo dies, then Keaupuni shall live under Kaaimalalo's son, Kaeo. Before he died on April 23, 1843, Kalua, the caretaker, had said to me to stir if the property was to be taken away. Kaaimalalo came for the property and we had a talk with him. He stated:

Kaaimalalo: I am taking the property because Manono is gone. The property comes back to me.

Keohokana: You may not have the property. Kalua had left orders with me to wait till Manono had returned.

Kaaimalalo: Then my work with you is done, the two of you will do it.

Keohokana: Here are the papers for you and Manono.

Kaaimalalo: The papers are not mine. They are probably for Kalua.

I read Kaaimalalo's documents and his wives said to him, "Those are your documents, are they not? Do not deny and they are from your eldest brother!" This ends this.

After this the servants lived on that property until the death of Kaaimalalo in the year 1845 at which time Kaeo took possession of that property. Then we had a court session with Kaenaena for that property, but the tax assessor did not work with us. This will be delayed till Manono returns and he will take care of it (the tax).
See page 195

N.T. 195-196v2
Nos 303-305, Kuakamauna, See page 73 (from 108)

Kulu, sworn by the Bible, I have heard about the property Kuakamauna is claiming. They have worked here but were not successful. A letter was sent to me on Molokai telling me to have a proper hearing for Kekuelike and Mapu so I went to hear directly from them and when I returned to Maui here, I reported the statements of Kekuelike and Map to Keoni Ana and he said to me this way, "I feel that my decision is that the property is for Kekuelike." That was his decision.
See page 163, vol. 7 [See Awards 58 & 306]

[Award 303-305; R.P. 1831 & 8219; Panaewa Lahaina; 1 ap.; 3 Acs 1 rood 26 rods; Award 304; R.P. 1831 & Land Patent 8219; Panaewa & Aki Lahaina; 1 ap.; 28 rods; Land Patent 1831; Kuhua Lahaina; 1 ap.; 1 rood 8 rods; Award 305; Land Patent 8219 Uhao Lahaina; 1 ap.; 1 rood 29 rods; Land Patent 8219; Kapunakea Lahaina; 2 ap.; 3 roods 17 rods; See also No. 307 and No. 58 for contested case documents]

00312 to Keaweiwi

Claim Number:	00312	**Awarded:**	1
Claimant:	Keaweiwi, Timoteo	**NR:**	76v2
Island:	Maui	**NT:**	195v2
District:	Lahaina	**RP:**	2650, 1180, 1179
Ahupuaa:	Aki, Kuhua, Waiokama, Uhao, Moalii, Akiaiole	**Number of Royal Patents:**	3
Apana:	8	**Wall/Fence:**	Yes
House Lot:	1		

No. 312, T. Keaweiwi
N.R. 76-77v2

To the Land Commissioners, Greetings: I hereby tell you of my right, at Lahaina. Aki and Kuhua are the lands where my lot is, and this is my residence.

A portion has been occupied from ancient times and a portion is new. It has not been surveyed - it is for you to survey it.
Farewell, and thank you
TIM. KEAWEIWI
Witnesses: Imiwale, Kaleoku

N.T. 12v15
No. 312, Timoteo Keaweiwi, Lahaina 15. November 1852

Ahuli, sworn, says he knows the House Lot of Claimant in Waiokama, Lahaina. Witness has lived there under Claimant for the last ten years. Claimant received this Lot from Kekahiko about 1836, and there is no dispute to his title.

The Lot is bounded:
Mauka by Nalehu
Olowalu by Malokuakea
Makai by Nalehu
Kaanapali by Napahi's house Lot.

N.T. 87v2
No. [312], Keaweili, Lahaina, January 1847

Postponed - work to be resumed when (he) returns.

N.T. 195v2
No. 312, Timoteo Keaweiwi, See T.

Hoohei, sworn by the Word of God, This place which Timoteo is claiming is at Aki and are small sections of land. It was acquired during the time of Kalehu and the right was received from Kalehu, who was the konohiki of Aki, who had received his interest from Kalaimoku and Kalaimoku had received his interest from Kamehameha. Imiwale and Kaiahua both have a small piece of that place. He (Timoteo) has two lots there which have been enclosed with a

fence. There is a mud house standing in there, also another enclosure and he is living there now. No one has objected to him.

It (claim) is postponed and will resume when a witness is found.

[Award 312; R.P. 2650; Waiokama Lahaina; 1 ap.; 16 rods; Kuhua Lahaina; 1 ap.; .43 Ac. & Uhao (See 11146) Lahaina; 3 ap.; 1.36 Acs; R.P. 1180; Moalii Lahaina; 2 ap.; 7.62 Acs; Aki Lahaina; 1 ap.; 6 Acs 2 roods 10 rods; R.P. 1179; Akiaiole Lahaina; 1 ap.; 3.47 Acs; See also Award 11146]

00387*M to ABCFM (Mission)

Claim Number:	00387*M	**Bananas:**	1
Claimant:	ABCFM (Mission)	**Coconut:**	5
Other Name:	American Board of Missions	**Sugar Cane:**	1
Island:	Maui	**Awarded:**	1
District:	Hana, Lahaina, Wailuku	**FR:**	9v2/26v2/14
Ahupuaa:	Wailuku, Wananalua, Kauaula, Kelawea, Opaeula, Paunau, Haleu, Pohakukauhi, Halaula	**FT:**	26v3
Ili:	Kukalopako, Pohaku o Kaulii	**NT:**	215v2
Apana:	10	**RP:**	1958 & 1600
Loi:	10	**Number of Royal Patents:**	2
Plus:	+	**Other Edifice:**	Yes
House Lot:	10	**Road/Path:**	Yes
		Wall/Fence:	Yes

Cl. 387*M, Messrs Clark & Baily Mission Claim, February 6, Maui Part 5 Section 1 F.R. 142-144v1

Kaauwai, sworn, deposed that he knew the rights originally given to Mr. Green in Wailuku first down where the prison is, then, where Mr. Baily now lives by Hoapili through Auwae; and the boundaries were just those which are marked by the fences of Mr. Baily at the present time. This was done in 1833, and no one to my knowledge, has interfered with the peaceable possession of said Premises, down to the present time. The place now occupied by Mr. Clark, was formerly mine, with the consent of Auwae and I gave it to Mr. Green in 1835. Kukalopako is the name of the place and its boundaries those marked by Mr. Clark's present fence, and no one has to my knowledge interfered with his occupation of the same. According to ancient usage, these Yards are entitled to the use of water for cultivation.

The Female seminary was commenced in 1836, and Kawailepolepo gave a small place for its site. Subsequently the King, on his visit to the place in 1838 added the land called Pohaku o Kaulii. The boundaries were those now marked by the fences enclosing the same Yard. There has been no interference with the quiet possession of the same. Perhaps some writings were given for these lands. I do not know certainly, but I do know that the Chiefs and Missionaries united & appointed agents to superintend the school & lands, according to my recollection Mr. Richards & David Malo of Lahaina were two of them. Mr. Armstrong & myself here at Wailuku, Mr. Bingham & Kaio at Oahu, and at Wailua, Emera & Laanui was the Native, at Kauai Mr. Whitney & Papohaku was the Native, at Hawaii Mr. Thurston & Kanalia was the Native, and two others, whom I have forgotten, these were to superintend the school & land.

Mr. Armstrong & I went to Hoapili Wahine to beg pasture grounds for cattle, which she gave. The boundaries were there specified in the application. Subsequently to the death of Hoapili Wahine, the place not being enclosed, there arose some doubt, when I went to Kekauluohi, and the original grant was confirmed, and the fence built. The

original conversation with Hoapili Wahine was in 1838, and was fully promised by her in June of that Year. The Taro patches in the valley mentioned in the Claim were given by Kaoo, in consequence of a request made by myself, and other officers of the Church, that we might be able to assist Mr. Armstrong, by cultivating the land for his benefit. I know of no other claimants to that land.

Napelo, sworn, deposed that he and Mr. Armstrong went together to Lahaina in 1838, and conversed together on the way, in relation to the Pasture land mentioned in the claim, and that he heard at that time from him, that Hoapili Wahine had given it. The boundaries which I heard mentioned were the seminary premises, the valley, and the mountain, but the boundaries on the south I did not hear.

Kaoo, sworn, deposed that she knew the testimony of Kaauwai just given to be correct, and that Auwae did give the place as above stated, and I know also that Auwae asked & received the approbation of the King as to what he did in the case, and in addition, to what Kaauwai has stated in Relation to the pasture ground, I can add, that I heard Hoapili Wahine say that she had given it to Mr. Armstrong. I do not know that any person has ever disputed either of the Claims put in by Mr. Clark & Baily.

F.R. 144-145v1
Claim No. 387, Lahainaluna, Mission Claim, Maui Part 5, Section 2

Extracts from the minutes of the General Meeting of the American Mission at the Sandwich Islands, held at Honolulu, June & July 1835.

Page 16 under the head "Security of the land at Lahainaluna and vicinity for the use of the school" it is recorded as follows

"The instructors recommend that the land between the two ravines between which Lahainaluna lies, beginning at about halfway up from the sea shore to the school house at Lahainaluna & from the same distance below the house of the Principal, including the large knob just above Lahainaluna, be secured by purchase, grant, lease, or otherwise, provided it can be done for a reasonable sum, to be entirely at the control of the Mission, & for the use and benefit of the high school."

2. "It is recommended that the land in the Valley, now generally wrought into kalo patches, be divided out to the scholars, making allowance for Wife and children, but for no others."
(Again, on page 25 it is further recorded under the heading "Grant from the High School") "The Government, after deliberating from a time on the proposition made to them by a committee of the Mission appointed for the purpose of securing the land described in the Report on the High School (page 16) declined an offer of 400% bonus and 100$ annually hereafter, but granted, for the use of the High School at Lahainaluna, the land between the two ravines between which Lahainaluna lies, extending form the house of Kaluwailehua below the School house to include the Knob above & the left ravine or narrow Valley from the house of Mr. Andrews upward & the narrow ridge on the left of it, from the junction of the two Rivulets, requiring an annual poll tax on the occupants of the land to be paid to the Government, taking the poll tax of the current Year as the Standard, viz. one dollar for each man - fifty cents for each woman - and twenty-five cents for each Boy over twelve Years of age, and twelve & half cents for each Girl over twelve: e.g. for 100 men, 75 Women, 50 Boys, and 16 Girls, enjoying the privileges of the land, the annual tax required to be paid to the Government would be $152.

F.R. 6-7v2
Claim No. 387, American Mission East Maui, Hana, September 25 1846

Dear Brother Castle,
I improve the present opportunity to inform you respecting our Premises and the Land claimed by the Mission in Hana. You and Brother Hall were appointed a Committee. I believe to present this subject to the proper officers of Government, whose business it is to decide as to the validity of any claims to land in these Islands held either by foreigners or natives.

The land on East Maui to which the Mission are entitled consists a part of Wananalua. It comprises all the land which is now contained between the makai & mauka roads, commencing near the line which formerly separated Hoapili's Kuakini's lands; and extending northward as far as a small piece of land formerly owned by Kaauwai, and which is in the vicinityof Waikakihi. The part now occupied by the Mission families is all enclosed in a stone wall, & comprises perhaps 15 or 20 acres. The remainder is also enclosed in a stone wall, and is occupied by two individuals, Kawainui & Ulunahele. The former took possession with my consent, promising to deliver it up to me whenever it might be needed; by the Mission. The latter took forcible possession of the lot which he now occupies, notwithstanding my repeated remonstrances. He has since confessed that he did wrong; but does not return the land.

The part occupied by those two men was selected by Mr. Van Duyer, and he actually commenced building upon it. On his leaving for the U. States, the two individuals above named took possession; or rather 2 or 3 Years after - one with and the other without my consent. All the land which we claim has always been considered by the natives generally in this region as belonging to us, by virtue of an order from Hoapili, the former Governor of Maui. Kaauwai, who was then the Governor's Secretary & Kawainui have repeatedly told me that they were acquainted with the fact of Hoapili giving said land to us as Missionaries. They are therefore our Witnesses. If Government decide in favor of Kawainui & Ulumahele, we must insist on their giving us a tract somewhere else, which shall be as serviceable to the Mission families here, as this disputed tract could be made. A piece of land somewhere else would be as acceptable as that for our herd. Hence we are willing to make an exchange if the Government wish to do so.

The lot on which our new Stone Meeting house stands joins our premises on the south. The lot formerly belonged to Kuakini of Hawaii; and was taken by the chh [church?] & Society with the Governor's knowledge. & I believe, consent. Means have already been taken to enclose with a stone wall.
Signed D.T. Conde

[F.T. 7-9v2]
Land at Wailuku Maui, given for the use of the Mission
1. Two house lots, upon which dwelling houses have been created, given by Hoapili or Auwai: they are enclosed by adobe walls and bounded on East by the Meeting house yard, on the south by Kauuwai's Yard, and the premises of the female seminary, on the North by the pasture lot described below (Note Witnesses Kaauwai & Keoo.)

2. Land given for the use of the Female Seminary. Witnesses: Kaauwai, David Malo, Messrs Green, Armstrong & others. This land is bounded on the East by Kaauwai's premises, and the road running to Waikapu, on the South & West by the Pasture lot above mentioned. North by Kaauwai's premises, the house lots & pasture. It has been fenced, buildings erected & Kalo patches made at the expense of the Seminary. The land is used for the benefit of the Seminary, number of acres not known. It is thought some writings were drawn but they are not to be found at the station.

3. Pasture land given by Hoapili wahine & confirmed by Kakauluohi - Witnesses Kaauwai, David Malo, Messrs Armstrong, Napela and others. It is bounded on the east by the Seminary premises, & house lots above described, on the North by the Wailuku Valley, on the West by the Mountains, on the south by a stone wall running from the Mountains until it meets the Seminary Premises near the Waikapu Road. Nearly $200 have been expended for fences to this lot.

4. A small lot Kalo ground in the Valley on the South side of the Wailuku river, forming part of a piece of ground called Halaula; bounded on the North by the Wailuku River; the East by a footpath leading to the River; on the South & West by other Kalo patches. It contains 12 or 14 small kalo patches, & about half an acre of Land, more or less. It was given by Kuoo to Mr Armstrong; and is now used by Mr. Clark. It is not known that there are any other claimants to this and other lands above mentioned.

5. About 4 Acres of ground east of the Meeting house adjoining Upa's premises on the West & Kaili's on the South. This land was given to Mr. Armstrong by the King; and planted with cane, nothing has been growing on it since it came under the care of Mr. Clark. Kaauwai asked Mr. Clark the privilege of using the land, to which Mr. C. consented, supposing there was but one acre. With Kaauwai's consent, it is desired that the land bay be set apart for the use of the Wailuku Church, according to the provision in the new laws for Parsonages. If Kaauwai has made any fence on it, he should be remunerated. It is with the Commissioners to do what they think about it. No other title to the above Lands is asked than the right to occupy them so long as they shall be needed for the promotion of the objects of the Mission
E.H. Clark - E. Bailey.

[F.R. 9-11v2]
The following are the Land Claims of the Mission of the American Board of Lahaina Island of Maui:

1. Three house lots as follows - a house lot partly in Paunau, partly in Hulea; given by Kaahumanu to Mr. Richards shortly after his arrival at Lahaina, fronting on the main Street of Lahaina to the West. The buildings were erected & occupied many years by Reverend Mr. Richards and are now occupied by Reverend. Mr. Forbes. The extent of the lot is about 8 or 10 Rods from NW to SE and about 15 Rods more or less from SW to NE.

2. The second house lot joins the preceding on the North: is of the same depth from SW to NE both occupying the space between the main Street of Lahaina and the back Street which runs from the Seaman's Chapel towards the Lahaina Native Church. Like the preceding it fronts SW on the main Pl [place?] of Lahaina; and the front is 10 rods in extent - more or less. The length from SW to NE is about 14 Rods more or less. The width on the east Street is about 12 Rods. The Seamans' Chapel and the building formerly occupied as a Seaman's reading room, are on this lot. This lot is in Paunau, and was given to the Mission, or to Reverend Mr. Andrews, who first occupied it between the years 1820 & 1830. Reverend Mr. Spaulding erected the first permanent buildings. It is now occupied by Reverend Mr. Baldwin.

3. The third Building lot of the Mission, corners on the preceding at the NE it fronts South on the road which runs to Lahainaluna. is 11 or 12 Rods in extent along that Road; & varies from 7 to 8 Rods in depth from said road back. The South part lies in Paunau and was purchased for the Mission by Dr. Alonzo Chapin, together with a stone house on the same. The north part is in Ilikahi, and was given to Dr. Chapin about the year 1833 for the sake of enlarging the Yard. Dr. Chapin erected the remaining Buildings & occupied the place several years. It has since been occupied by Mr. Baldwin & others. These three building lots have been long occupied by the Mission, are too well known to

need more particular description.

4. The Mission also claim a spot intended as a site for a canoe house, near the above premises. It is on the land called Paunau, is on the Sea Shore, and partly in the Sea. It is on the west side of the road opposite to the place called Kapahumaumana; formerly the Public Market of Lahaina. The Spot claimed by the Mission extends about 105 feet along the Road, and as far into the Sea as the Mission choose to build up with Stone work. It was granted to the Mission about the Year 1836 or thereabouts by Kekauluohi, and other Chiefs perhaps then residing at Lahaina, united with her, in virtue of the Missions making the Road adjoining the place which road is completed as far as can be done before the Government[?] make their part of it. The place was given for a Site of a Canoe house, and such other purposes as the Mission might need it for; it is now built up with Stone & prepared for a canoe house.

5. The Mission also claim situated towards the East part of central Lahaina, called Paiula[?]. It is the Southern of two lands called by that name, the other being in possession of heirs of John Miller. The Paiula claimed by the Mission, is bounded North by the Paiula of Mr. Miller, East by Paiohi and Puo, South by Paunau & Kapawakua & West by Paiolu[?]. It is about 46 or 48 Rods in length & varies from 2 Â½ to 8 or 9 in Width. It has on it about a dozen taro patches, large & small. The land originally belonged to Kekuanaoa; now Governor of Oahu, and was with his consent given by Keopualani to Mr. Stewart, then Missionary of the American Board at Lahaina. On his leaving for the United States, it reverted to the Mission; & is now in possession of Mr. Baldwin.

6. The remaining land at Lahaina claimed by the Mission is one adjoining the house lot now occupied by Reverend Mr. Forbes & called Haleu. It is the southern of two lands, called by the same name. it was given to Mr. Richards in the early part of his missionary residence at Lahaina, and occupied by him while he resided there. It was given by Kaahumanu; it is mostly covered with Kalo patches; and extends in length from the Sea inland about 100 Rods more or less; & is about 11 rods in width. It is bounded N by Haleu of Mr. Young, now in hands of his Children. East by the same Haleu P. Bolabola, South by Bolabola and Kilolani & Waianae, and West by the ocean. The north part of the Fort is on this land, and east of the main Street of Lahaina a house lot is fenced out of it; which was granted to Governor John Young in lieu of a piece of Mr. Young's Haleu included in the house lot of the Mission formerly occupied by Mr. Richards; the portion of the Mission Land remaining against the house lot of John Young is about 3 Rods wide. West of the Main Street the portion left by the Fort and Road N. of the Fort is about 3 Rods wide & 11 Rods in length extending nearly to the East and the store of Mr. Peck now Mr. Punchard & Co.. This Piece was leased by Mr. Richards to Mr. Peck; and is now covered by the Store houses of Punchard & Co.

The above are all the Claims of the Mission at Lahaina
Lahaina, December 10, 1846
D. Baldwin
continued Page 173.

[Note: The 2 previous sets of Mission claims came to hand too late for their order in the list as numbered being No. 275 sec. [?] 15 December 1846.]

[F.R. 12-14v2]
[No. 387, Mission at] Lahainaluna

In the Year 1835 the King & Chiefs of the Hawaiian islands made a grant of land to the Mission Seminary at Lahainaluna, and although the land was not then surveyed, Yet the boundaries were distinctly pointed out, and soon after were defined by a Stone fence erected at the expenses of the Mission. The above grant has been held in

undisputed possession by the Institution every since, and has been employed for the purposes for which it was granted. In order that the above boundaries might be clearly described, the whole Premises of the Seminary have been carefully surveyed; of which Survey, the following are the field notes.

Field Notes of a Survey of the Lahainaluna Premises of seminary taken 22 & 23rd of Dec[embe]r 1846 with the Surveyors compass belonging to institution. The variation of the needle being found by Azimuth to be 6Â° 45 East.

Commencing at the South Corner of the main building (north wing) of the Seminary a line bearing by Compass S 48Â° 30' W stri[kes?] the Boundary line at the distance of 24 Chains & 50 links. There the line runs
S 37Â° 00 E distance 13 chains, 66 links
N 45Â° 10 E distance 8 chains, 88 links to a large Stone in wall
N 59Â° 30 E distance 21 chains, 25 links
N 60Â° 00 E distance 4 chains, 00 links
S 69Â° 00 E distance 27 chains, 38 links at 16.75 offset to sight = 50 links
S 79Â° 00 E distance 12 chains, 72 links
S 87Â° 20 E distance 32 chains, 20 links
N 78Â° 40 E distance 26 chains, 00 links
S 83Â° 40 E distance 27 chains, 50 links to brink of the Ravine of Kauaula which ravine constitutes the continuation of the Lahaina boundary back into the Mountains.

Again commencing at a point 24 Ch. 50 links S 49Â° 30' W of said South corner of the Main Seminary Building, the boundary line runs
North 37Â° 00' West distance 21 chains, 89 links
North 40Â° 30' East distance 4 chains, 91 links
North 13Â° 00' West distance 0 chains, 34 links S. corner Seminary, bears South 78Â° 30' East
North 74Â° 45' East distance 0 chains, 44 links
North 78Â° 30' East distance 2 chains, 20 links
North 70Â° 45' East distance 7 chains, 33 links S. corner Seminary, bears South 75 Â° 00' East
North 16Â° 45' West distance 1 chains, 00 links
North 33Â° 00' West distance 2 chains, 63 links to red conglomerate rock over stream = 50 links
North 82Â° 00' West distance 4 chains, 30 links
South 74Â° 00' West distance 6 chains, 44 links S. corner Seminary, bears South 61Â° 15' East
South 45Â° 45' West distance 4 chains, 55 links S. corner Seminary, bears South 68Â° 30' East
North 20Â° 30' West distance 2 chains, 94 links S. corner Seminary, bears South 75Â° 45' East
North 71Â° 15' East distance 4 chains, 36 links
North 57Â° 00' East distance 5 chains, 00 links
North 35Â° 30' East distance 5 chains, 00 links to South corner Seminary, bears South 61Â° 30' East
North 60Â° 00' West distance 2 chains, 68 links To Bank of the Kahoma Valley, which Valley continues to be the Northern boundary back up into the mountains.

A line bearing North 28Â° 30' E distant 23 Chains 41 l. from the Cu [text destroyed; corner?] of the Seminary, reaches the Southern bank of the Koaaha Valley at the foot of which bank, at the head of the aqueduct called [text destroyed] which conducts the water along in front of the Seminary [text destryed] running North 6Â° 8' distance 4 ch. to the opposite of the Valley forming the upper boundary of the Kalo land belonging to the Seminary. The boundary at the head of the aqueduct is a large rock [text destroyed, possibly "placed"] into the water course from the South side. From the top of the bank directly over this spot, the centre of a cave on the opposite side of the Valley bears North 27Â° 8'.

The above Notes together with the accompanying plot defines the grant made to the Mission for the Seminary of Lahainaluna which comprises all the Kalo Land in the Valley of Kauoha, between the boundaries specified in the above field notes, together with the high land & mountain ridges between the Stone Wall & the South and the Kauoha Valley, on which the Seminary buildings stand; and also the high lands & ridges between the Valleys of Kauoha & Kahoma, which comprises the ridges of Kuliole & Mooahia, together with the Ravine of Halena.

To prove the truth of the grant above described, we refer to His Excellency, Wm. Richards, Minister of Public Instruction - to the Honorable Lorrin Andrews, Reverend E.W. Clark & Mr. David Malo.

All of which is respectfully submitted to the Honorable Board of Commissioners appointed by his Majesty, the King, to investigate Land Claims, &c &c.

In behalf of the American Mission to the Hawaiian islands
See page 26 Vol 3 F. Register
W.P. Alexander
T.D. Hunt
Mission Claims continued at page 26.

F.R. 26-27v2
No. 387, Mission Claims, continued from page 20, General Claim

To the Board of Commissioners for quieting Land titles.
Gentlemen:

The undersigned as Agents of the Mission of the American Board of Commissioners for Foreign Missions at the Sandwich Island beg leave to present for your examination, the accompanying documents, being statements of grants made to various individuals of the Mission at Sundry times & places, for the purpose of affording facilities for the prosecution of the Missionary work in these Islands by the Mission of the said A.B.C.F.M. to the end, that if upon examination, they shall be found valid, the said grants may be confirmed in such manner as the laws of the Sandwich Island may require. The following is a list of claims to be considered, Viz.

Kauai - Premises & lands at Waiole, Koloa & Waimea
Oahu - Premises & lands at Honolulu, Ewa, Waialua, Kaneohe, Hauula & Punahou.
Molokai - Premises & lands at Kaaluaha & out stations - if any.
Maui - Premises & lands at Lahaina - Lahainaluna - Kanipali, Wailuku & Hana.
Hawaii - Premises & lands at Kailua, Kealakekua, Kau, Hilo, Kohala & Waimea

The lands & Premises of the above named Stations are in care of the resident Missionaries of the A.B.C.F.M. at said stations - We have thought it best to enumerate all the Stations though some of the Claims have not been received; & some have been already presented to the Board.
Honolulu, March 12th
Signed Samuel N. Castle, Edwin O Hall, agents

The Claims herewith sent are for Waialua, Honolulu, Punahou, Kaneohe, Waiole, Koloa, Waimea, Kauai, Hilo, Kealakekua, Kailua, Waimea Hawaii Kohala.

I believe Kau, Lahainaluna, Lahaina, Wailuku, Hana, & Molokai are already sent in. Samuel N. Castle.

F.R. 173v2
Mission Claims 387 continued from page 11

Honorable Wm. L. Lee, Lahaina, January 13, 1848
Dear Sir:

As the time for sending in titles to land is nearly expired, we have one title not yet presented to the Board: it is a place high up on the Mountains above Lahaina about N.E. of the Village, on the ridge called Kahakea. This spot is now well known by the name of Mount Retreat, or as the Natives call it - Mauna Hoomaha.

The claim is a lease given by Kekauonohi to Mr. Richards which he gave over to me when he left for Europe, we being equally interested in the place. We selected the spot for health as a cool retreat: it was of much service to Mr. Richards & his family. We have been at considerable expense in building a good native house on it and may find it useful in future. I wish therefore this claim entered on the records - Before the time comes for adjudicating it I may think best to withdraw it.

The lease allows us to take as small or large an amount of land as we choose - not exceeding 20 acres. The utmost we wish to take would be one square acre, in the center of which will stand the Grass house.
Dwight Baldwin.

F.R. 26-27v3
Claim 387, Mission Claim, T.D. Hunt, Lahainaluna, 11 February 1848

See page 14 Foreign Register, same claims volume II.

Board of Land Commissioners, Sir,
I forward this claim for the land on which stands the church and Preacher's house at Kahana in the district of Kaanapali, Maui. On assuming the pastoral charge I found the premises enclosed as they now stand. All I know of the tenure of the property is that the site was granted by the proper authorities and has been appropriated to the uses for which it was given.

The church was constituted 5 September 1840. The lands consist of two lots adjoining each other: this drawing will exhibit their relative postion & dimensions.

[DIAGRAM f]

The situation is well known.
Signed, &c, T.D. Hunt

F.T. 26v3
Mission Claim 387, T.D. Hunt, See page 11 F. Register - same as Claims VII,

Board of Land Commissioners:
Lahainaluna 11 February 7, 1848

I forward the claim for the Land on which stands the Church and Preacher's house at Kahana in the district of Kaanapali Maui. On assuming the Pastoral Charge I found the Premises enclosed as they now stand. All I know of the tenure of the property is that the site was granted by the proper authorities and has been appropriated to the uses for which it was given.

The Church was constituted 5 September 1840. The land consists of two lots adjoining each other; this drawing will exhibit their relative position & dimensions.

[DIAGRAM]

The situation is well known.
Signed Yours, T.D. Hunt.

F.T. 145-146v3
Cl. 387, Sandwich Island Mission, Maui, Part 5, Hana, Section 3, May 8, from page 213 VII, N.T.

D.T. Conde, sworn, I am acquainted with the Mission lands in the district of Hana, Island of Maui. I went to reside there in January 1837 about, and was there to September 1848. These lands are mostly fenced round. I was present when the survey of Mr. Metcalf before me was made, and the bounds set forth in it are correct.

The Mission had this land from Hoapili Kane, Governor of Maui through Z. Kaauwai in 1838 or 9. Since then they have been in undisturbed possession of the land, excepting a portion, occupied by Ulumahele. But he has confessed that this land belonged to the Mission, although he has sent in a claim to the Board (See 615). Ulumahele is now dead. Beyond this, I never heard the Mission title disputed to any portion of this land. I would remark, however, that Kawainui has sent in a claim for a portion of this land on which he resides; but whatever right he had in the land, he had from me. I gave him permission to live on it until the Mission wanted it. I told him he might enclose a piece, and that he should be compensated for such improvements. He then enclosed a piece and has occupied it on the terms I have stated. He has told me he knew this land belonged to the Mission and that it was given them by Hoapili Kane.
Continued page 337

F.T. 337-338v3
Cl. 387, Part 5, Sec 3, Sandwich Island Mission, 7 June, Hana, from Page 145, See also N.T.

Z. Kaauwai, sworn. I went by order of Hoapili Kane, I went with Mr. Armstrong & others in 1837 to select a piece of land for the Missionaries at Hana, such as should be Kupono. Before we went I sent word to Wahie who had charge of Hana at that time to build & thatch 2 houses for the Missionaries, which were ready on our arrival. They stood on the land now claimed by Kawainui. I saw him there at the time, living Makai of the Government Road.Their houses were destroyed by fire in 1837 or 8. The Missionaries were in difficulty on this acct. being obliged to live in houses of the people. They went to Hoapili at Lahaina & asked for a land held by Wahie, which he refused, because it belonged to Governor Adams. Hoapili then told me to give them a piece of his own. I found Mr. Conde & others before me, on my arrival at Hana in 1838. I went with Conde & Ives to select a place for them. They

wanted some of Kuakini's land which I refused. I then pointed out the place they now occupy. Kawainui's place was on the other side of the stream. He came to Mr. Conde while I was there and said "If you get the land, then, who will I live under & Mr. Conde replied "You will live under the Chiefs." It was settled accordingly. I believe that Kawainui & Ulumahele's claims are both good. Mr. Rice built the fence which marks the boundary of the Mission land, along the stream between that & Kawainui's.

N.T. 145-149v2
No. 387, E.W. Clark and E. Bailey, Wailuku, Sec. 1, Lahaina (Mission)

Z. Kaauwai, sworn by the Word of God, I have seen the place that was given to Green in Wailuku here which is the place Bailey has (now). Green had first lived makai, later he moved mauka here. Hoapili and Auwae had given him that place. The divisions were clear just as he has them at this time. This place was obtained in the year 1833 until this time. The place that is held by E.W. Clark was my place and I had given it to Mr. Green. Auwae had approved about these places and the divisions were the same as they are established at the present time. Kukalepa is the name of that place. No one has objected to that property of Clark. Water is allowed to come to their properties, like the privileges of previous times.

The School Property
In the year 1836 Green started a school of higher learning. That was the time a portion of the land was given for that school. When the chiefs came here additional land Pohakuokauhi was given in the year 1838. The divisions were the same as they have been enclosed at this time and no one has objected to this property. I have known that they had chosen guardians for that school. W. Richards and D. Malo were selected for Lahaina, and I have heard that the chiefs had met with the haole council and had appointed the following guardians and their localities:

Aramslona (Armstrong) and Z. Kaauwai, a native - Wailuku
Pinamu (Bingham) and Kaio - Oahu
Emesona (Emerson) and Laanui, a native - Waialua
Wini (Winne) and Papohaku, a native - Kauai
Katina (sic) Kanuku and Polepe, Hawaiians - Hawaii

Those were the guardians who would direct the affairs of the schools and no one had objected.

Property for Raising Cattle
I went with Limaikaika to Hoapili to ask for a cattle-raising field and Hoapili wahine consented and the boundaries were similar to those indicated in the claim document. After the death of Hoapili, there was a small problem, so I went to Kekauluohi and she agreed and it (land) was enclosed with the first order in the year 1838. It was verified when Hoapili-wahine died.

There were some patches at Kahawai. The religious leaders had asked for these patches and they were given to Limaikaika. Clark has it now and no one has ever objected about these patches.

Napela, sworn, In the year 1836, I had heard Limaikaika saying, "Hoapili has given (me) that land because we (he and I) went together with Z. Kaauwai to Lahaina. The boundaries are similar to the claim statements.

Mikahala Kaoo, sworn, I have heard the statements just made by Kaauwai and they are true as the way we had given (land), also I have heard the chief's approval to all of these things which have been given to the missionaries. I have

heard too Hoapili's consent for a pasture land. I have not seen nor have I heard from anyone offering objections to them for all of these places.See pg. 220.

N.T. 213-215v2
No. 387, Konede (Conde), Conde (Mission) Hana, Lahaina, February 19, 1847

Z. Kaauwai, sworn by the Word of God, Hoapili had written to me for a meeting with him and this was probably in the year 1837, so from Oahu I had gone to Waihee and when I was asked to come, I had come to Lahaina here. When I arrived here Hoapili told me to take the haole teacher with me and find him a place in Hana. The men in Hana had been asked beforehand to build a house for us there. The houses, two of them, were built for us there. We went to Kalepolepo and from there I went to Waihee while the men escorted them (two teachers) to Lahaina here. In the year 1839 we discussed about a place for them to live. The reason for this was because the konohiki were not treating them well. They were telling them that they could not live there and that it was through Kuakini's orders. Hoapili then sent Maele and we had a discussion there. The haoles did not hear out statements but Hoapili indicated to them that he (Kaauwai) will show them their place. Hoapili asked Maele, "Do we have a vacant place at Wananalua?" to which Maele answered affirmatively. Hoapili again said, "The haoles want to live at Kuakaha," and Maele added, "That will do, and that is your place." So Hoapili said for me to point out specifically the place in Hana for the haoles, and I did as I had been instructed to do. He directed that sections one and two of Wananalua were the places to be given to them. The boundaries on the south where the first house was burned year 1839 and that was the end of this place. This is how this place which was further south was burned and taken away. Vanekuti had built his house mauka of the road where the natives also built their houses within the lot and they had refused to give up their place. This was the problem Panehuku had written about to Hoapili after which Hoapili dispatched a message to me thro' my servant. I sent him instead of going myself. I had asked him to tell the konohiki that Kuakaha had been acquired to the boundary of Palemo for the haole missionaries. After the Hawaiians heard about this, they, with Vanetuki, sold all of the houses to the foreigners. All of the houses were acquired by them. In 1842 I had gone again to Hana and heard Kawainui saying that he was about to build a lot for himself. I said to him, "All of this place has been given to the foreigners." He said, Donede (Conde) has allowed me to live here. Then we talked together about a place where I would pay for the tax of the land, which is a tax for them and that is what he had said to me. The boundary that is close to Wananalua and the house of Aiwe is the mauka boundary and running toward the sea. Since that time to this day I have not heard that (this) has ever been objected. (See pg. 219)

[Compiler's note: Vanetuki and Vanekuti are probably the same name; = Reverend E. Whittlesey?]

N.T. 215-217v2
No. 387, Folebe (Forbes), (Lahaina Mission), Part 5 - Sect. 4

D. Malo, sworn by the Word of God, I had heard the chiefs in our discussion about a place for W. Richards to live. Kahumanu said, "(He) will live at my place in the houses that are completed." I have heard that the Kou (tree) that is standing at Boluina (Baldwin) place is the boundary on the north side. I do not know the boundary on the south end. The road is on the east, also on the west side.

Lot 3
This lot is toward the mountain of Boluina's (Baldwin) property and I have heard that Hoapili had given this lot to Keoni Amara who had built a solid house in there. I do not know how big it was; however, I had seen the house being built there. later I heard he had sold his place to the missionaries. I have seen Kauka Oopa built a house for

himself. He had received (land) probably in the year 1834. Later I saw that the lot was bigger as compared with the first time I had seen it and to the present time, I believe it is the same as it was (at that time.).

Property Right
I have heard from Kalanikauikaalaneo that he had given Opaeula to Mikuaka when Keopuolani had first come here. The missionaries have eaten from that land to this day without any objections.

Property #2
I had been to Oahu to the assembly of chiefs and there they had said to give land to all of the missionaries, so Kaahumanu had given Haliu so that their problem would end, but the chief must hear (of this). This land was acquired in the year 1825.

W. Richards, sworn, by the Bible:

Lot 1
In the year 1825 Hoapili, the governor of Maui, had shown me a house site for myself and saying that Kaahumanu had given the place to me for a house site and that is the place that Folebe (Forbes) is living on now. It was small at that time but it was mentioned that it would be given away. After this in about one or one and a half years perhaps, all of the good sections were given to me. There is [a] patch on the southeast side, a row of coconuts and Kuheleloa's ditch. The coconuts were not taken away and the mauka boundary is the road and on the west is this standing fence. No one has ever objected to this time.

Lot 2
This property was adjoined with that lot before and Kaahumanu had given it to Anelu in the year 1828. The section of the lot is a patch makai. Our (lot) is on the southeast and northwest ends and slightly on the inside of the enclosure which is standing. There has been a very small increase in the year 1838 in the size of this lot.

Lot 3
It was sold in the year 1834 maybe or 1833 perhaps, with the consent of Hoapili, a governor and it was I who had biven money to Keoni Amara. I think it was $175.00 probably, $275.00 maybe, I do not remember. Later that property was extended and I did not see who had done it, but I know it was like it is now since 1838.

Canoe-hanger's area
In the year 1838 I had asked the chiefs and Auhea for a canoe house site at Kapahumanamana for the American missiosnaries. They gave a good section of the distant path, the length of it as the missionaries had desired, but they must build a good road for that place that they want. I do not know about the surveying which was done recently.

Opaeula, a property
Keopuolani had given that property to Mikuata (sic) on the 3rd day of June 1823, and the missionaries have lived there without any objections since that time.

Property of Helou {Haleu]
Kaahumanu had given me that land in the year 1825, but all of the section makai of the road was held by Wahinepio. After his death Poti (sic?) had come to Lahaina here and gave (me) all (of the land.) Haleu's division on the southeast side ran between Kaeo and Keoni Ana's property and it was the same going toward the sea althou' Keoni Ana's lot is from within Kuheloa. The place on the southern end of the road going up from Keawaiki is in Ukumehame and the chief had acquired that a long time ago.

See page 214

N.T. 219-220v2
No. 387, Conede (Conde) (Conede Hana Mission), from pg. 215

Nalehu, sworn by the Word of God, I have heard that Hoapili had given that place for the missionaries from this Wananalua to Palema and those are the boundaries on the north and the south between the land sections used by the animals mauka and makai of the pathway. I have heard that Kuakaha has been given away. That is the road on the side toward the sea and leading to Palema. Those are the boundaries on the east and the west sides.

N.T. 220-224v2
No. 387, The land and properties of the Lahainaluna High School, from pg. 147

D. Malo, sworn by the Word of God, I have heard Hoapili-wahine tell Hoapili-kane that Lahainaluna would be given to the missionaries as land for a high school and I had asked who was going to do this. Hoapili had said that he would (do it). The boundaries that I had questioned were:

Makai is Keouhuihu
Mauka is the fountain head of water of Auwaiawao
On the north the stream of Kahoma
On the south between Paupau to Wailele

and those are the boundaries. I had asked "When does the work begin?" "When the konohikis hear," he replied. "They (konohiki) would be refusing to part with the land by the time they would have heard of it," I said. After this we went to point out (the place) and the people chided us saying, "Do not give the lands, but find a better place to give. Do not give our lands for if this is done it would be given permanently," but Hoapili had agreed to the granting (of this land).

When Hoapili-wahine had taken ill, Kinau came to see her and on this came S. Dibble and E.W. Clark to talk again about Lahainaluna. They held a discussion with the chiefs, Kekauluohi, Kinau, Hoapili-wahine. Dibble said, "We (two) have come to understand about the divisions of Lahainaluna." Kekauluohi said, "That rests with Hoapili, the governor." "I have no statement," said Hoapili-kane, "if it is approved by you, the chiefs." Then Kauluohi said, "Perhaps Kinau has the answer." Kinau did not make an utterance, so Dibble went away with naught. After the evening meal had been completed, I asked, "What do the two of you think about the land of Lahainaluna, shall it be given?" to which Kinau asked," "Do they not have sufficient from the first land (grant)?" Twice more I repeated what I had said in the beginning, still the chiefs did not consent, so I again said, "The Israelites went to the land of Moab and they asked for a road for traversing. They were refused; therefore God gave that land for the Israelites, perhaps we could be the same." Then Kekauluohi said, "You give your land first, then we will give our land." Later I said to them, "That land is mine, yet is is not for me to say to give, it is for you to say to give, then I will give." When I had said to give, Kauluohi said, "Our share is gone now, you are predicting this fortune, aren't you?" Then I said, "Why do you (two) not give any land, for you have children? The Hoapilis do not have children, yet they help the school." Kauluohi said, "Our child would not be able to enter this school, he is too boisterous and the chiefs would be weary." Kauluohi said to Hoapili, "I am going to return to Oahu and when a foreigner's school is founded, I will come for Lot to enter that school."

The next morning Dibble was summoned, and I had heard from him that the boundaries for (Lahainaluna) were agreed upon as formerly and the word was approved before the passing of Kinau.

W. Richards, was sworn by the Bible, In the year 1831 a house was built for Andrews at Lahainaluna with the approval of Hoapili, the governor. The school house was built also and later the big house too was built. In the year 1832, Kaahumanu had come to inspect and saw their problem, so had given just further makai a place for the students to live, also a place for planting altho' I do not know accurately the divisions.

In the year 1835 in the month of June, Kamalena, Wini (Whitney) and W. Richards went to the chiefs with $500.00 and asked for land for the advantage of the students of Lahainaluna and saying to them about a yearly payment of $100.00. The chiefs gave this a long thought, then returned the money saying that they will not sell the land permanently but will offer it as a help to the school. Here are the boundaries as I had heard them (See Foreign Testimony).

There is land between two streams, the small stream is on the southeastern side; the big stream is Paupau, and the section makai below the house of Kuhuailehua runs into Paupau. The ridge which adjoins that stream on the north is in the lot to which Hoapili had given. When we went to Lahainaluna, many natives had gone along too and they became angry because taro land had been given away; therefore Hoapili did not give all of the stream as I had heard in the initial discussion. The large rock mauka was the boundary and when I returned from Maleka in the year 1838, I had heard that the entire land was granted just as it had been stated in the beginning and since then, I have known that the people of Lahainaluna have lived on that land and I have not heard that there have ever been any objections to them. In the year 1839 in the month of June the missionaries again requested for land in Wailuku. It was agreed at that time by the chiefs that certain people be chosen to look into the lands in Lahainaluna and Wailuku. D. Malo, Z. Kaauwai from Maui, Laahui and Kaio from Oahu. D. Papohaku from Kauai and someone from Hawaii were chosen. They were to observe (activities) and if anything was done either in Lahainaluna or in Wailuku which was contrary to the initial statements, then they were to take the lands away.

Andrews of Oahu is summoned for a witness.

N.T. 224-225v2
No. 387, Bodlowin (Baldwin), (Lahaina Mission), from page 218

Kamanawa, sworn by the Word of God, I have seen Kaahumanu grant her property at Paunau to Richards which has a patch as the makai boundary, Kuheleloa's ditch is on the east and the coconut (trees) are retained and the mauka boundary is the road.

The Property of Baldwin.
The boundary mauka is similar to the first lot. Makai is the road which is the boundary on the north and the ditch is in the front.

Mahoe, sworn by the Word of God, I have known that Keoni Amara's property is sold to the missionaries. Southeast of Paunau is the boundary makai, the pathway going toward the mountains is on the north and Ilikahi is mauka of Paunau. It was acquired by "Kauka Oopa" before the year 1835. No one has objected to them.

N.T. 468-469v3

No. 387, Section V, Missionaries' Dwelling Place, Hana, Maui, May 8, 1849

Daniel L. Conde, sworn, and stated, "I have seen the missionaries' land in Hana. I had lived there in 1828 and most of those lands have been enclosed from the corners of one side to the other and which are correct. I have seen the surveying and that is correct. Mr. Hoapili had given him these places. Z. Kaauwai had shown thoroughly (the boundaries) in the year 1828 or probably 1829 and life has been peaceful from that time to the present. Ulunahele was living there but he understood that the place is for the missionaries, for this reason he moved away. Kawainui offered Ulunahele to live on another land belonging to the missionaries and with their approval, he is still residing there.

N.T. 20-24v15
No. 387, Part 5, Sec 4., Sandwich Island Mission, Lahaina, 16th November, 1852

Counter G. Kaea & Fanny Young

Kuaimanu, sworn, says he knows the place in dispute, in Haleu, Lahaina, adjoining Mr. Richards' premises. It is bounded makai by the street, Olowalu by the fence of the watering place, Kaanapali by another part of Mr. Richards' premises, Mauka by the back street. It is a part of "Haleu". When I went to live with Mr. Richards in 1835, he held the place in question. Richards, myself and others under him planted Bananas, vines, figs &c in this Lot. The fence which separates this from the watering place was in existence when I went to live there. The house in which I lived belonged to Richards and stood on the land in dispute. The figs which are now growing on it were planted by Mr. Richards. Recently, I have seen Mr. Baldwin's horses pasturing on this Lot. I have also seen the horses of other people on the mauka part of it. I never heard of any one else setting up a claim to this place during Mr. Richards' life time. This land ran down, originally to near the sea shore at the place formerly leased to Mr. Peck (It is a part of the "Haleu" which belongs to the Young family). I have heard Mr. Richards say that he owned the watering yard and a portion of the place where the Fort now stands, clear down to the sea, and that he gave up those for the place which is now disputed.

Kaolulo, sworn, says he knows the yard in dispute. Mr. Richards lived at first near where Hale Piula now stands. After that Kaahumanu gave him the present Mission premises to live on. The place in dispute came into the possession of Mr. Richards in exchange for the present Watering yard, which is really a lihi on the land given to him by Kaahumanu. This exchange was made in the time of Kaahumanu, and Mr. Richards then fenced in the land in question. Mr. Richards held this place without dispute till his death. I never heard of any counter claim to it until a few days ago. I was one of his men and lived near this place. I once asked Mr. Richards to give me this place but he said he would not do so on account of its being in possession of Mr. Baldwin for the Mission.

Kale, sworn, says he knows the place in dispute. The figs, bananas &c were planted by Mr. Richards. I lived with him, on the place in question from 1833. The fence between the watering yard and this lot was built at Mr. Richards' expense. He gave books to the people for their labor upon it. I never heard his title to this place disputed during his life time, nor the title of Dr. Baldwin since.

Hopuola, sworn, says I came from Hawaii just after the death of Kaahumanu and went to live on the land of the Missionaries in Lahaina. The place in dispute always belonged to Mr. Richards in my time. He planted the trees and bananas in the lot and enclosed it. After Mr. Richards left, it came to Dr. Baldwin the present Missionary.

Umiumi, sworn, says he knows the place in dispute well. A part of the premises given to Mr. Richards by

Kaahumanu stood in "Paunau" and a part in "Haleu" of the Young family. The part now in dispute was fenced in by Mr. Richards and the path to his house went through it, but there are two Cocoa Nut trees still standing on this land which were always in dispute, and I believe they belong to Kekela (Fanny Young). I do not know who planted the figs and other fruit trees. My house stood on this land before Mr. Richards' time. The ground in question belonged, I believe, to Richards but Nahienaena had a house on it at one time. Mr. Richards held it without dispute, but the Cocoa Nut trees belong to Kekela.

Kekuelike, sworn, says he knows the place in dispute. The Makai part of it belongs to Kekela and the mauka part to Mr. Richards. I lived on the makai part of this place at the time of the Battle of Nuuanu, under old John Young. At the time Mr. Richards first arrived in Lahaina, I was living there, and so I was when he went to live on the present Mission premises. The place where the large wall for watering ships now is, belonged to the King. My house was on the mauka part of the strip in dispute and Kekela built a house for Nahienaena makai, near the present street. That house did not stand on Richards' land. I lived on the land in question till about the time Kaahumanu died. The house of Nahienaena had fallen down before I left the land. Mr. Richards built the fence between the watering place and the strip in dispute during the lifetime of Nahienaena. The fig trees &c were planted by Kekela and her people. I am certain for I saw them planted. Some one else might have also planted figs there. After Mr. Richards built the fence spoken of above, the path to his house went thro' this place under a large grape Vine planted by him. The place where the Cocoa Nuts are belong to Kekela. Mr. Richards planted bananas in the part of the lot claimed by Kekela but the land did not belong to him. The house occupied by his servants stood about the dividing line between his part of the land and Kekela's part.

Kawaa, sworn, says Mr. Richards got the Mission premises from Kaahumanu in 1824 or '25 and I believe it included the strip in dispute. I never heard Mr. Richards' title disputed.

P. Nahaolelua, sworn, says when he came to Lahaina, at the time the Seminary began, Kekela was living on the place in dispute. She owned the Cocoa Nuts growing on it, and I have always been in the habit of taking nuts from thence. Kekela had left this place some years before the death of Kinau. The King's sister also lived on this Lot, farther mauka at the same time as Kekela. At the time I [?] built the fence between this place and the Watering yard, John Young wished me to include the strip now in dispute, but Kekela would not allow it, because she said that strip belonged to her and not to John, and she wished to have their lands kept separate.

Reverend Mr. Baldwin, sworn, says that when he first arrived at Lahaina, Nahienaena was living in Mr. Richards' house, and her servants occupied a house which stood on the strip in dispute. In 1835, I came to live in Lahaina, and Mr. Richards servants were then living in the above house. The only entrance to Mr. Richards' premises was through the place in dispute and his children used to cultivate it as a garden for themselves. When Mr. Richards was absent, I had charge of his whole premises including the strip in question. There never was any counter claim made to this piece during the time I held it, or during Mr. Forbes' residence there. When Mr. Richards heard Land Claims in Lahaina, in 1847, no counter claim was presented for this place. It was publicly measured and included in the Mission premises, and no one made any objection to it. I understood from Mr. Richards about 1834 that the strip in dispute was given to him in exchange for the place where the large wall now is. We have always had this place in cultivation and occupancy, and I never knew that the Mission Claim to this place was disputed, until a few days ago. The only difference we ever had was about the Cocoa Nuts.

[Award 387; (Maui) R.P. 1958; Wananalua Hana; 1 ap.; 27.64 Acs; Kauaula Lahaina; 2 ap.; 1 Ac. 38 rods; R.P. 1943; Kelawea Lahaina; 32 rods; Opaeula Lahaina; 1 ap.; 1 Ac. 3 roods 5 rods; R.P. 1943; Paunau & Haleu (1 Ac.) Lahaina; 2 ap.; 5 Acs 1 rood 11 (25) rods; Pahumanamana Lahaina; 1 ap.; 32 rods; R.P.; 1925; Pohakauhi Wailuku (Bailey); 1 ap.; 112 Acs; R.P. Halaula Wailuku (Castle & Cooke); 2 ap.; 3.29 Acs; R.P. 1928 Pohakauhi Wailuku

(Maria Ogden) 1 ap.; 38.64 Acs; (Molokai) R.P. 1958; Kaluaaha]

00393 to Kekuelike

Claim Number:	00393	**NR:**	127v2
Claimant:	Kekuelike	**FT:**	156v7
Island:	Maui	**NT:**	38v5
District:	Lahaina	**RP:**	1672
Ahupuaa:	Puukoowali, Kelawea	**Number of Royal Patents:**	1
Apana:	3	**Auwai/Ditch:**	Yes
Loi:	15	**Road/Path:**	Yes
House Lot:	1	**Wall/Fence:**	Yes
Awarded:	1	**Pali:**	Yes
		Miscellaneous:	Awarded 2 apana, 1 in Puuhoowali & one in Kelawea, Creek of Moalii bounds one side of 1 piece, govenrment road

No. 393, Kekuelike
N.R. 127v2

I, Kekuelike, hereby tell you of my right to my lot at Lahaina. It is at Puukoowali on the northwest of the Government Road, which I enter before the Land Commissioners.
Farewell to the Honorable Ones of the Government.
January 11, 1847, Lahaina.
KEKUELIKE

F.T. 156v7
Cl. 393, Kekuelike

Kaluokamano, sworn, I know the lands of the claimant. They consist of a house lot with some lois in Puuhoowali, Lahaina, and a kula land in two pieces in Kelawea, Lahaina.

The claimant received it from Kapiiwi[?] in the days of King Liholiho in 1821, and has held it without dispute ever since.

It is bounded:
Mauka by the Government road leading to Lahaina
Olowalu by the same
Makai by the same
Kaanapali by the Creek of Paunau.
It is fenced and it is the correct boundary.

Claimant received this land of lois, 15 in number, from Pikanele and his grandfather in 1838 and enjoyed them in peace until 1847, when Pikanele took away 3 of them, because the man having them in charge was too old to go to the poalima work.

The piece of 14 lois is bounded:
Mauka by Kalaikini

Olowalu by Kaheekai's land
Makai and Kaanapali by the creek of Moalii.

The piece of 1 lois is bounded:
Mauka by Pikanele's loi
Olowalu by the pali
Makai by Liu's land
Kaanapali by the creek of Moalii.

There is still one new piece, a lot in Kelawea; a very small lot. The claimant received it from Pikanele in 1833 and he has held it without dispute to the present day.

It is bounded:
Mauka by Liu's lot
Olowalu by the pali
Makai by the street
Kaanapali by the creek of Kanaha.

See page 38v5 N.T.

N.T. 38v5
No. 393, Kekuelike, SEE page 157 vol. 7

Kaluokamano, sworn, He has seen 4 sections belonging to Kekuelike consisting of a house lot at Puuhoowali and 3 sections at Kelawea, here are the boundaries:

Section 1 - House lot.
Mauka, Olowalu, and Makai by Government road
Kaanapali by Adjoining Paunau ditch.

Section 2 - 14 patches.
Mauka and Olowalu Kalaikini's land
Makai by big stream
Kaanapali by stream.

Section 3 - 1 patch.
Mauka by Pikanele's land
Olowalu by pali
Makai by Liu
Kaanapali by big stream.

Section 4 - Farming lot.
Mauka by Liu
Olowalu by oali
Makai by Alanini or Alanui
Kaanapali by Kanaha big stream

1st section had been from Kaiheekai (he is new) at the time of Kamehameha II in 1821, no one has objected to him.

Pikanele has taken 2 patches out of 14, at the same time he had taken Kaluaokamano's first section in 1847.

The 4th section also had been from Pikanele at the time of Hoapili in 1839, no one has objected to the 3rd section.

[Award 393; R.P. 1672; Puuhoowali & Kelawea Lahaina; 2 ap.; 1.21 Acs]

00464 to Nawaakoa

Claim Number:	00464	**NR:**	184v2
Claimant:	Nawaakoa, wahine	**FT:**	160v7
Island:	Maui	**NT:**	43v5
District:	Lahaina	**RP:**	1160
Ahupuaa:	Panaewa, Moanui	**Number of Royal Patents:**	1
Apana:	2	**Sea/Shore/Dunes:**	Yes
House Lot:	3	**Other Edifice:**	Yes
Awarded:	1	**Road/Path:**	Yes
		Wall/Fence:	Yes

No. 464, Nawaakoa
N.R. 184-185v2

To the Land Commissioners: here is my thought to you. Act quickly and enter in the Book and quickly survey in order to properly record this right. These to lots are, one at Pana'ewa, and one at the wharf on one side of the Fort at the blacksmith's house.

Here are the accurate witnesses: The lot at Pana'ewa, Kamakini, the lot at the wharf, Nahau, Polea. They are the proper witnesses for these houselots.
I am, NAWAAKOA
The one who was settled here at Lahaina by Ulunahele, just under Ulunahele, is the true and correct witness.
Lahaina, January 22, 1847.

F.T. 160-161v7
Cl. 464, Nawaakaa, Wahine

A. Moku, sworn, I know the lands of the claimant. They are in Lapakea, Lahaina. They consist of 3 pieces & formerly it was all in one piece, but the road has made two of it. The claimant received it from Hikiau about 1837 through her brother. Her title has never been disputed.

The makai piece is bounded:
Mauka by the Alanui Aupuni
Olowalu by Ladana's lot
Makai by the sea shore
Kaanapali by the Government House.

The other piece is bounded:
Mauka by Hikiau's lot
Olowalu by the same
Makai by Alea's land
Kaanapali by Wahie's lot.

Z. Kaauwai, sworn, I know the house lot of the claimant in "Panaewa," Lahaina. The claimant received it through her brother Ulunahele from Kamakini in 1838 and there is no dispute about her title. It is fenced and the fence is the correct boundary.

It is bounded:
Mauka by Keaka's lot
Olowalu by the road leading to Lahainaluna
Makai by Kuakamauna's lot
Kaanapali by Ladana's lot.

N.T. 43v5
No. 464, Z. Nawaakaa, See 394 page 69 /can't figure this one out/ [See page 69]

[Left blank], sworn, He has seen 2 house lots at Lapakea, there is a separation here made by the government road. Hikiau had given this to Ulunahele in 1827, no one had objected.

The boundaries are:

Section 1 - the makai lot.
Mauka by Government road
Olowalu by Ladana
Makai by beach
Kaanapali by Government building.

Section 2 - Mauka lot.
Mauka and Olowalu by Hikiau's lot
Makai by Ahia's lot
Kaanapali by Wahia's lot.

Z. Kaauwai, sworn, He has seen the land at Panaewa, it has been enclosed and was given by Kamakini to Ulunahele in 1838, no one had objected.

Section 1:
Mauka by Jack's (black foreigner) land
Olowalu by Government road
Makai by Kuakamauna's land
Kaanapali by Ladana.

[Award 464; R.P. 1160; Panaewa Lahaina; 1 ap.; 1 Ac. 19 rods; Moanui Lahaina; 1 ap.; 1 rood 19 rods]

00469 to Kaili

Claim Number:	00469	**House Lot:**	1
Claimant:	Kaili	**Awarded:**	1
Island:	Maui	**NR:**	186v2
District:	Lahaina	**NT:**	61v5
Ahupuaa:	Kuhua	**RP:**	5613
Apana:	1	**Number of Royal Patents:**	1

No. 469, Kaili, Januaary 2, 1846
N.R. 186v2

Greetings to the Land Commissioners: The survey of the lot at Kuhua has been completed.
KAILI

N.T. 61v5
No. 469, Kaili

Kekahuna, sworn, he has seen this land section at Kuhua which was idle land, no one has objected. Kaili is now residing there.

[It is bounded]:
Mauka by Haole's land
Olowalu by Aki ahupuaa
Makai by Keone
Kaanapali by Kuhuanui.

[Award 469; R.P. 5613; Kuhua Lahaina;1 ap.; 1.8 Acs]

00494 to Lono

Claim Number:	00494	**House Lot:**	1
Claimant:	Lono	**Awarded:**	1
Island:	Maui	**FT:**	10v16
District:	Lahaina	**NT:**	10v16
Ahupuaa:	Puuhoowali	**RP:**	3536
Apana:	2	**Number of Royal Patents:**	1
Loi:	2	**Road/Path:**	Yes
Kula:	1	**Miscellaneous:**	government road

Helu 494, Lono, Lahaina, December 26, 1853
F.T. 10v16, N.T. 10v16

Kekela, sworn, Knows the land claimed by Lono. Z. Kaauwai wrote out the claim for him and gave it to Mr. Richards when he was hearing Land claims at Lahaina in the year 1847.

Kaiheekai, sworn, says he knows the piece of land claimed by Lono at "Puuhoowali," Lahaina.

Apana 1 House Lot.
Apana 2 2 Kalo patches & Kula.

The first piece is bounded:
Mauka by the Konohiki's land
Olowalu by Kekauai's land
Makai by the Konohiki
Kaanapali by the Government Road.

The second piece is bounded:
Mauka by Kaluaokamano's land
Olowalu by Kekauai's land
Makai by the konohiki
Kaanapali by public road.

Claimant received these pieces of land from me in the year 1834 and has held them in peace ever since. I am the Deputy Konohiki of the Land.

Keoni Luite, sworn, confirms in full the statement of the former witness.

[Award 494; R.P. 3536; Puuhoowali Lahaina; 2 ap.; 4 roods 18 rods]

00496 to Popolo

Claim Number:	00496	**Bananas:**	1
Claimant:	Popolo	**Awarded:**	1
Other Claimant:	Kaiuli, son, heir	**FT:**	10-11v16
Island:	Maui	**NT:**	10-11v16
District:	Lahaina	**RP:**	2759/3340
Ahupuaa:	Puaanui	**Number of Royal Patents:**	[illegible]
Apana:	2	**Koele/Poalima:**	Yes
Loi:	1	**Pali:**	Yes
Kula:	1	**Claimant Died:**	Yes
House Lot:	1	**Miscellaneous:**	Aina kalo, government road

Helu 496, Popolo
F.T. 10-11v16

Upai, hoohikiia, Nau no i kakau i kona palapala kuleana, a hoouna i ua Luna Honua ka M.H. 1847.

Ualo, hoohikiia, Ua ike au i kona mau Apana aina ma Puaanui, Lahaina, 2 Apana.

Ap. 1 Kahuahale & Kula kanu maia.

Mauka, aina o Kaupena
Kaanapali aina o Pauloa & Alanui Aupuni
Makai aina o Kaha
Olowlalu aina o Kawelohea & Kalua & Kahaka.

Ap. 2 - Aina Kalo.
Mauka he poalima me ka aina o Kalua
Kaanapali aina o Makaiole
Olowalu he pali me ka poalima
Makai aina o Makaiole.

Ua loaa ia ia keia mau Apana aina no Kapeleaumoku mai mamua aku o ka haunaele o Kaomi i ka M.H. 1829, a ua noho oluolu oia ma keia wahi, a hiki i kona make ana i ka M.H. 1948, hooili i keia mau Apana aina no Kaiuli kana keiki, a ke noho nei no a keia wa, aole mea keakea.

Kalua (Hope Konohiki) hoohikeia, a olelo mai la, ua pololei kona kuleana, aole ma keakea

F.T. 10-11v16
No. 496, Popolo

Upai, sworn, It was I who wrote his claim and sent it to the Land Commissioners in 1847.

Ualo, sworn, I know his parcels of land at Puaanui, Lahaina. There are 2 apana.

Apana 1: House site and kula planted in bananas.
Mauka by land of Kaupena
Kaanapali by land of Pauloa & Government Road
Makai by land of Kaha
Olowalu by land of Kawelohea and Kalua and Kahaka.

Apana 2: Taro land.
Mauka by a po`alima and the land of Kaha
Kaanapali by land of Makaiole
Olowalu by a pali and the po`alima
Makai by land of Makaiole.

He received these parcels from Kapeleaumoku before the commotion over Kaomi in 1829, and had quiet possession until his death in 1848. These parcels were bequeathed to Kaiuli, his keiki, who has had undisputed possession until this time.

Kalua (Deputy Konohiki, sworn, confirms claim and says there are no objections.

N.T. 10-11v16
No. 496, Popolo

Upai, sworn, he wrote Popolo's claim and forwarded to the Land Commissioners in 1847.

Ualo, sworn, he knows Popolo's land in Puaanui of Lahaina in 2 sections.

Section 1 - House lot and banana planting kula.
Mauka by Kaupena's land
Kaanapali by Pauloa's land Government road
Makai by Kaha's land
Olowalu by Kawelohea's land/Kalua's land/Kahaka's land.

Section 2 - Taro land.
Mauka by A poalima and Kaha's land
Kaanapali by Makaiole's land
Olowalu by A poalima and a pali
Makai by Makaiole's land.

Land from Kapeleaumoku before Kaomi's upheaval in 1829. Popolo lived undisturbed until his death in 1849, he bequested this land to his son Kaiuli. He has lived undisputed to the present.

Kalua, sworn, (assistant konohiki) Popolo's claim is correct, no objections.

Land from Kapeleaumoku before Kaomi's upheaval in 1829. Popolo lived undisturbed until his death in 1849, he bequested this land to his son Kaiuli. He has lived undisputed to the present.

Kalua, sworn, (assistant konohiki) Popolo's claim is correct, no objections.

[Award 496; R.P. 2759; Puaanui Lahaina; 2 ap.; 1 Ac. 2 roods; R.P. 3340]

00812 to Kaeo

Claim Number:	00812	**Awarded:**	1
Claimant:	Keaeo	**NR:**	452v2
Island:	Maui	**FT:**	104v16
District:	Lahaina	**NT:**	104v16
Ahupuaa:	Puaa, Lahainalalo	**RP:**	5563
Apana:	3	**Number of Royal Patents:**	1
		Miscellaneous:	Government road

No. 812*M, Kaeo, Honolulu, 25 October 1847
N.R. 447-449v2

The President of the Land Commissioners and the Commissioners appointed by the Mo`i, greetings: I hereby tell you of my house lots and my claims for them.

1. House lot in Honolulu on Oahu. On the north is the lot of Kahikona, on the west is the lot of Wm. Beckley, on the south is the lot of B. Namakeha and the road. This is my lot and I occupy it, together with B. Namakeha.

2. House lot at Lahaina, Maui. The place of A. Paki is on the south and the sea is on the west. The Halekamani is on the north and the pond is on the east. This is my place, where my makuahine lived, and on her death I inherited it.

3. House lot at Lahaina, Maui, at Puaa, mauka of the church. These house lots are submitted by me at this time.

4. House lot at Punahoa, Hilo, purchased by me from Wm. Beckley. These house lots 4 & 5 were mentioned by me in my letter to the Land Commissioners last year, in 1846.

6. House lot at Lahaina, Maui, which is situated as follows: The road is on the east, the house of Pikanele on the south, and the smithy and the lot of Baea on the west, and the stream on the north. This place belonged to my makuas and I inherited it.

I am prepared to bring the witnesses for these places mentioned herein when the proper time comes.

The 6 mentioned in this letter was given by me to I.W.H. Kaunahi and all my rights and benefits were conveyed to him.
I am, with thanks,
ASA KAEO, Eleele

F.T. 201v3 [See 976 to William Beckley]

F.T. 233-234v3
Cl. 812, A. Kaeo, 1849

Z. Kaauwai, sworn, Part I. I know this house lot. It is in Apana 2 of Honolulu nui. It belonged to nobody in olden times. it being waste land, but it was taken up in 1825 by the Claimant. Naeo and [he] fenced it. He has possessed it in peace ever since and I never heard his claim disputed.

It is bounded:
Mauka by Wm Beckley's lot

On the Waikiki sides by the lot of Kahilona and the lot of Bent & Co.
Makai by Broadway Street
Ewa by Corso street. [Cross Street?]

No one lived on this lot except those who live under Kaeo.

A. Paki, sworn, I have heard the testimony of Kaauwai, and it is strictly correct.

Part II. This is a House lot at Lahaina, Maui.
Z. Kaauwai, sworn, I know this lot. The Claimant received it from his mother, and she had it from Kahikili before the year 1820. Her title nor his has ever been disputed. Some of Kaeo's people live there but they have no claim for this land. It has always had a fence around it.

It is bounded:
Mauka by a small land dividing it from the land of Kekuanaoa and the Government
Olowalu by A. Paki's lot
Makai by the sea shore
Kaanapali by Kekuanaoa's lot.

A. Paki, sworn, I know this lot and have heard the testimony of Z. Kaauwai respecting it. This testimony is correct.

Part III. House lot in Lahaina.
Z. Kaauwai, sworn, I know this lot. it is in Lahaina, mauka of the church Lot of the Protestant Mission. I first knew this lot in 1836, when it was possessed by Manono under Kaaimalolo the mother of the claimant, who made claimant her heir. Manono's title was never disputed until 1846, until that time he had it in peaceable possession. Manono entered his claim for it very early, and it was heard by Mr. Richards at Lahaina. Keaupuni is Manono's heir, he being dead at this time. He died soon after entering his claim in 1846, I think. Keaupuni is a Counter Claimant to Kaeo, Kuakamauna took possession of the lot for Keaupuni on the death of Manono and the claim stands registered in his name (See Claim 3030 to 307 and testimony taken concerning this lot).

This lot is in Puaa, Lahaina. Kaaimalelo gave this land to Manono, and that Keaupuni is Manono's heir. But I know nothing of the merits of the controversy between Kaeo and Keaupuni. I always understood that Kaaimalulo gave this lot to Manono to take care of for Keaupuni at the time of her death.

A. Paki, sworn, I know but little about this title. I cannot say with any certainty who is entitled to it.

Auwaa, sworn, I reside in Honolulu, but resided in Lahaina until 1845. I know the lot in dispute between Kaeo and Keaupuni. This witness stated nothing new or positive.

N.T. 569-572v3
No. 812, A. Kaeo, Dec. 26, 1849

Z. Kaauwai, sworn, I have seen his house lot in Honolulu here.
1. This had been an idle land; it was he who had worked on it in 1825. he enclosed it completely around the lot and has lived there to the present; no one has objected.

The boundaries are:
Mauka by Wm. Bekele's land
Waikiki by Kahikona's house lot
Makai by government road
Ewa by road leading to Mr. Palani's (French) place.

There are people living there; however, they live under Kaeo.

A. Paki, sworn, We have known similarly; no one has objected.

Section II house lot on the beach in Lahaina. Laaimalolo, his /Kaeo/ brother had given him his land in 1844. She had received it from Kahekili before the year 1820 and it has been this way; no one has objected. The people who are living there are no claim, they live under Kaeo. It has been enclosed. The boundaries are:

Mauka by Kekuanaoa, also the government's pond
Olowalu by Paki's house lot
Makai by the beach
Kaanapali by Kekauonohi's house lot.

A. Paki, sworn, We have known in the same way; no one has objected.

Section III house lot: mauka of the church at Puaa in Lahaina. This lot has been opposed by the son of Manono, Keaupuni. I had first seen Manono living there in 1832 and he had received it from Kaaimalolo. He built a fence and he lived there to 1842. No one had objected to him to 1845 at which time he died and the land was bequested to his son, Keaupuni. Both Keaupuni and Kaeo's servants are on this land where they are quarreling one with another. Keaupuni has filed his claim as No. 307 in the name of Kuakamauna. This was done at the time Mr. Richard was alive on Maui.

I have not know the reason Kaaimalolo had given Manono land and whether it had been without cost or as a sale, perhaps. I had managed Kaaimalolo's bequest for he had told me the house lot was his and Manono was living under him and his (Kaaimalolo) son was living under Kaeo.

A. Paki, stated, "I had distinctly heard Manono, as he was preparing to leave for Kauai, say to Laaimalolo, `You may have the lot and my son shall be under you.' That is what I had heard."

Auwaa, sworn, I have seen this place over which there is a dispute. I had seen Kaaimalolo enclose this lot and Manono was living makai. When the chiefs acquired the lot, Manono asked Kaaimalolo to allow him to live there and his request was granted, but when he went to kauai, he let Kalua live there. Kaaimalolo complained to the tax assessor, but before the case could be heard, Manono died on Kauai. It was never taken before the tax assessor again. I have never known Keaupuni has an interest there; however, Kaaimalolo had specified Manono's interest there. The words are: "Puaa has that lot, the lot Manono has is the third (lot). This is all of your rights of living just as I am living."

Section V - This has been completed.

Section VI - Z. Kaauwai, sworn, I have seen this house lot in Lahaina, Maui. Kaeo had received this interest from Kaaimalolo, who had obtained it as an idle land in the year 1835, where Puaa had lived through Kaaimalolo. In the year 1834 or 1835 perhaps, Puaa died and his wife, Kamailohi, inherited his interest. In 1846 Kamailohi died and she had bequested to her brother, Hihio, and he is living there at the present time. Hihio has filed his interest as done for him by Mr. L. Lee.

Auwaa, sworn, Kaaimalolo owns all of that place, according to what I have heard and seen. Kamailohi lived under Kaaimalolo. I had seen the court hearing before Kekauluohi and Kaaimalolo had placed Hihio on this place under him because he was Hihio's guardian.

Later Kamailohi remarried to Ulunahele, then Kaaimalolo died in Hana. Hihio did not know about this. The bequest also was not known.

[Award 812; (Maui) R.P. 5563; Puaa Lahaina; 1 ap.; 1 Ac. 39 rods; (Oahu) R.P. 308; King St. Honolulu; 1 ap.; .49 Ac.]

01742 to Kaauwai

Claim Number:	01742	**Wauke:**	1
Claimant:	Kaauwai, Z.	**Awarded:**	1
Island:	Maui	**NR:**	235v3
District:	Wailuku, Lahaina	**FT:**	215v3
Ahupuaa:	Wailuku, Olowalu	**NT:**	235-236v3,651v9
Ili:	Paeohi, Papohaku, Kaioaiki, Wailoanui, Kamani, Kaluaahoo, Owa	**RP:**	2154, 5531, 8453
Apana:	8	**Number of Royal Patents:**	3
Loi:	27	**Koele/Poalima:**	Yes
Plus:	+	**Sea/Shore/Dunes:**	Yes
Kula:	3	**Pali:**	Yes

No. 1742*M, Z. Kaauwai
N.R. 235-236v3

Concerning my remaining claims which I state before the court of the Land Commissioners. Greetings: I hereby state my remaining claims, which are in the Ahupua`a of Wailuku on the Island of Maui, within the `ili of Papohaku. I got this land in the year 1843. Also, in Olowalu are two `ilis for my wahine, which she got before the death of Kamehameha I.

Also there are some mo`os of mine in the `ili of Paeohi in Lahaina which I got in the year 1842. Also in Honolulu, at Pauoa, one half of Kamooakua which I got from my Kaikaina, Kaapuiki. There is where my punalua, Nohoua, is living. I got this land in the year 1844. Those are my remaining claims.
I am, with thanks,
Z. KAAUWAI
Waikiki, Oahu, Dec. 14, 1847

F.T. 215-216v3
No. 1742, Z. Kaauwai

Nohohua, sworn, This land is in Pauoa Honolulu aina, kalo 16 patches and some kula, 1 house.

Mauka by Kaapuiki's kula
Waititi by Government fence and I.I.
Makai by Nohomua & Koane
Ewa by Koana & Kaapuiki.

Claimant had this from Kaapuiki in 1846 and has held it undisputed. It wa a gift of friendship.

See page 180 volume 7.

F.T. 180-181v7
Cl. 1742, Z. Kaauwai, See page 215 volume 3 and 187 volume 7

This is a claim for Kaauwai and his wife separately.

Keawelauole, sworn, I know the lands of the claimant, Kaauwai in part. He has two pieces of lands in "Paeohi," Lahaina. The 1st piece, this is a pauku of kalo land called Waiea and the other a pauku of kalo land. There is one poalima loi in the first piece.

The 1st piece is bounded:
Mauka by the land of Kaimunui
Olowalu by Kekuelike's land
Makai by Kaaua's land
Kaanapali by "Wahikuli."

The 2nd piece is bounded:
Mauka by Hauola land and Kimokeo's
Olowalu by Neuneu's land
Makai by Pakea's land
Kaanapali by Kimokeo's land

For his wife's lands, Kaauwai said her witness was at Olowalu and requested that it be postponed until the Commission visits Olowalu.

F.T. 187-188v7
Cl. 1742, Z. Kaauwai, from page 180

This claim was partly heard this forenoon. The part remaining to be heard is that which belongs to Kaauwai's wife, Sale.

Maui, sworn, I know the lands of Sale. They consist of 2 ilis of land in Olowalu. They are called "Kailoaiki," and "Wailoanui."

The claimant received them from her first husband, Kauhane in the year 1814. and she has ever held them without dispute.

They are 4 pieces. I should say that Haole and myself have titles within these ilis.

No. 1 is a kalo land and kula land with one poalima loi within.
No. 2 is a kula land.
No. 3 is a kula land up mauka.
No. 4 is a kula land up mauka.

No. 1 is bounded:
Mauka by Kamani, an ili
Hana by the same
Makai by the sea shore
Lahaina by Kaluaokahui, an ili.

No. 2 is bounded:
Mauka by Maomao, an ili
Hana by the high pali
Makai by Kaumukukahi, an ili
Lahaina by the creek of Olowalu.

No. 3 is bounded:
Mauka by the mountains
Hana by "Kaumukukahi"

Makai and Lahaina sides by the creek of Olowalu.

No. 4 is bounded:
Mauka by the mountain
Hana by Kamani
Makai by the creek of Olowalu
Kaanapali by the same.

Resumed page 561.

F.T. 561v7
Cl. 1742, Z. Kaauwai, from page 188

Holana, sworn, the claimant's lands in Wailuku, so far as I know, consists of 7 pieces with ili of Papohaku.

No. 1 is 6 lois.
No. 2 is 4 moos of lois and a kula wauke.
No. 3 is 5 lois and 3 moos of kalo.
No. 4 is 1 loi.
No. 5 is 2 moos of kalo land
No. 6 is 6 moos of kalo land.
No. 7 is 3 pauku or section of lois.

The claimant received these lands from Governor Namakeha in the year 1843 and with the exception of No. 7 which he received in 1837, Namakeha received them from Kauohua in 1839. His title was never disputed.

No. 1 is bounded:
Mauka by Kuole's land
Waihee by Naea's land
Makai by Anakalanui's land
Maalaea by Kaulahea's land.

No. 2 is bounded:
Mauka by Kaaina's land
Waihee by the creek of Wailuku
Makai by Kamahiai's land
Maalaea by Naea's land.

No. 3 is bounded:
Mauka by Moo's land
Waihee by Kepui's land
Makai by Naea's land
Maalaea by Koloku's land.

No. 4 is bounded:
Mauka by Lihi's land
Waihee by Naea's land
Makai by Moo's land
Maalaea by Kawahie's land.

No. 5 is bounded:
Mauka by Pepe's land
Waihee by Naea's land

Makai by Lihi's land
Maalaea by the King's Eka.

No. 6 is bounded:
Mauka by Piohia's land
Waihee by Piohia's land and the creek
makai by Kaili's land
Maalaea by the King's Eka.

No. 7 is bounded:
Mauka by "Owa" and the paahao lois
Waihee by Piohia's land
Maalaea by the King's Eka
Waihee [makai?] side by the creek of Wailuku.

Resumed page 85 volume 15

F.T. 85v15
No. 1742, Z. Kaauwai, Olowalu, Maui, Apana 2, September 2, 1853, Disputed by the King, from 215v3

Kaiwi, sworn, Knows the place in dispute, situated in the ili of "Kaluaahoo," Olowalu. Some time before Kinau's death, Claimant enclosed the place in dispute by a mud fence. He has had possession of it ever since without interruption. The place was given to claimant by Maui and Mailehewa. Some time in the year 1852 when the place was measured by Ua (the Surveyor) Naea (the King's Agent) objected to its being surveyed. Witness does not know of any Poalima being inside of this lot. Kahalepuhi owned one half of the disputed lot, and he gave it to Maui in the year 1848, who enclosed with the other piece and gave it to Claimant. The place belonged to Kahalepuhi from the time of Kamehameha II.

It is bounded:
Mauka by the Konohiki land
Ukumehame side by the same
Makai by the sea beach & Nahua's lot
Lahaina side by Kalupaihala's lot.

It is still in possession of Claimant's family.

Cross examined
The place belongs to Z. Kaauwai.

Kama and Peekauai, being sworn, confirmed in full the statement made by the former witness.

N.T. 544v3
No. 1742, Z. Kaauwai

Nohona, sworn, I have seen his place at Kamooakua in Pauoa.

16 taro patchs and a pasture, 1 house
Mauka by Kaapuiki
Waikiki by a lot and Ii
Makai by Nohomua and Kawana
Ewa by Kawana and Kaapuiki.

Kaapuiki had given him his land in 1846 and he has lived unmolested to this time. He had received this by his relationship as a cousin.

See page 63 volume 5 and page 651 volume 9.

N.T. 63v5
No. 1742, Z. Kaauwai, /Pg. 544, vol. 3/ (See pg. 69)

Keawelauole, sworn, he has seen 2 sections in the Paeohi ahupuaa, here are the boundaries:

Section 1 - Taro section.
Mauka by Kaimunui, Kelawea
Olowalu by Kekuelike
Makai by Kaaua
Kaanapali by Ahikuli land.

Section 2 - Taro.
Mauka by Hauola and Timoteo's land
Olowalu by Neuneu
Makai by Kapaakea
Kaanapali by Poki and Timoteo's land

These two sections are at Waie, no objections. This interest from Keohokalole in 1842.

N.T. 69v5
No. 1742, Z. Kaauwai, From page 63

E. Maui, sworn, He has seen these 4 sections of ? lale and folks. It was from her first husband Kauhane in 1814, no one has objected to Maui and Haole and their interests.

The boundaries are:

Section 1 - path and pasture.
Mauka and Hana by Kamani
Makai by Beach
Kaanapali by Kaluaokahui.

Section 2 - Taro.
Mauka by Maomao
Hana by Pali
Makai by Kaumukukahi
Kaanapali by Olowalu stream.

Section 3 - Mauka pasture.
Mauka by Mountain
Hana by Kaumukukahi
Makai and Kaanapali by Olowalu stream.

Section 4 - Pasture.
Mauka by Mountain
Hana by Kamani
Makai and Kaanapali by Olowalu stream.

N.T. 651-652v9
No. 1752!, Z. Kaauwai, Wailuku, July 23, 1849
[Should be 1742]

Holoua, sworn, I know his land in the `Ili of Papaohaku, in Wailuku, with seven parcels.
Parcel 1 - 6 Lo`i.
Parcel 2 - 4 Mo`o and kula wauke (this is 1 acre).
Parcel 3 - 5 Lo`i and 2 taro mo`o.
Parcel 4 - 1 Lo`i.
Parcel 5 - 2 Taro mo`o.
Parcel 6 - 6 Taro mo`o.
Parcel 7 - 3 Taro pauku.

Parcels 1, 2, 3, 4, 5 and 6 were from Namakeha in 1843, and parcel 7 was from Kaunuohua in 1837. Namakeha got his parcels in 1837 from Kaunuohua. No opposition.

No. 1. is bounded:
Mauka by the land of Ihuole
Waihee by the land of Naea
Makai by the land of Auimakalani
Maalaea by the land of Laulahea.

No. 2. is bounded:
Mauka by the land of Kaaena
Waihee by the Wailuku stream
Makai by the land of Kawahie
Maalaea by the land of Naea.

No. 3. is bounded:
Mauka by the land of Moo
Waihee by the land of Kepio
Makai by the land of Naea
Maalaea by the land of Holoku and Moo.

No. 4. is bounded:
Mauka by the land of Alihi
Waihee by the land of Naea
Mauka by the land of Moo
Maalaea by the land of Kawahie.

No. 5. is bounded:
Mauka by Peepee
Waihee by the land of Naea
Makai by the land of Alihi
Maalaea by the land of the Mo`i.

No. 6. is bounded:
Mauka by the land of Piohia
Waihee by the land of Kawahie and Kahawai
Makai by the land of Kaili
Maalaea by the land of the Mo`i.

No. 7. is bounded:
Mauka by the `Ili of Ala and Pa`ahao
Waihee by Wailuku Stream
Makai by the land of Piohia
Maalaea by an Acre of the Mo`i.

[Award 1742; R.P. 2154; Kaluaahoo Olowalu Lahaina; 1 ap.; 3 Acs 1 rood 22 rods; Kamani Olowalu Lahaina; 1 ap.; 2 Acs 3 roods 36 rods; R.P. 5531; Koloa Wailuku; 1 ap.; 15 1/25 Acs; Papohaku Wailuku; 4 ap.; 18.28 Acs; no R.P. Owa, Paiki Wailuku; 1 ap.; 5.26 Acs; & 8453 in Wailuku; See also Award 407]

02320 to Mapu

Claim Number:	02320	**House Lot:**	1
Claimant:	Mapu	**Awarded:**	1
Island:	Maui	**NR:**	448v3
District:	Lahaina	**NT:**	74v5
Ahupuaa:	Moalii	**RP:**	5579
Ili:	Kauakahikaula	**Number of Royal Patents:**	1
Apana:	3	**Miscellaneous:**	Taro section
Loi:	1		

No. 2320, Naamalia Moakaka, December 11, 1847
N.R. 448v3

Greetings to the Land Commissioners: I, Moakaka, a native born woman of Moalii, Lahaina, Maui, hereby petition you for my land, which is called Kauakahikaula, a land area in Moalii. I am living on it at this time. It was gotten by my makuakane, and is now mine. Therefore, I present my houselot to be entered in the records of the commissioners to quiet land titles. Here are the dimensions of this house lot:

/Diagram shows 26 fathoms long by 12 wide/[no diagram in this text]

Farewell to you all, with thanks
NAAMALIA MOAKAKA

*Probably Na Amalia: By Amalia Moakaka

N.T. 74-75.5
No. 2320, Maakaka, sup. Incl., June 14, 1849

I have sent my claim to Oahu, Dec. 11, 1847, no return as yet, however here is a copy. Kealohapaalani sworn 3 sections are at Moalii since the time of Kamehameha I, Pauahi had objected to the taro section and the house lot in 1836, the taro land has been returned by Maikai in 1848, 2 patches have been turned over to Kekualele.

Section 1:
Mauka by Pasture
Olowalu and Makai Keawa
Kaanapali by Malule.

Section 2 – Taro section.
Mauka by Kaei
Olowalu by Kekualele and Kahanoi's land
Makai by Kanaha stream
Kaanapali by Waianaenui.

Section 4 – House lot.
Mauka by Kaei
Olowalu by Keawa
Makai by Kaei

Kaanapali by Kalama.

[Award 2320; R.P. 5579; Moalii Lahaina; 3 ap.; 3 Acs 3 roods 33 rods; Name in index Moakaka no Mere; See also 9795H not awarded]

02745 to Paaoao

Claim Number:	02745	**Awarded:**	1
Claimant:	Paaoao	**NR:**	15v6
Island:	Maui	**FT:**	148v6
District:	Lahaina	**NT:**	31v5
Ahupuaa:	Kapewakua, Paunau	**RP:**	1691 & 1716
Apana:	2	**Number of Royal Patents:**	2

No. 2745, Paaoao
N.R. 15-16v6

I, Paaoao, hereby petition you, the Land Commissioners /for my/ house lot at Ilikaha and my kihapai in the Ahupua`a of Kapewakua in Lahaina, Island of Maui.

The dimensions of this houselot for which I petition are: on the north 81 feet, on the east 66 feet, on the south 91 feet, on the west 42 feet. The dimensions of the kihapai are: on the south 138 feet, on the west 90 feet, on the north 120 feet, on the east 84 feet. That is the size of my claims for which I petition you.

My occupancy of this place for which I petition you has been for a long time, from the time of Mahiole Haole until this day.

It was I who built the house and the fence and who planted everything. That is my petition, to be entered in the Award Book.
Farewell to you all,
PAAOAO X
Lahaina, Maui, January 8, 1848

F.T. 148v6
Cl. 2745, Paaoao

Kamana, sworn, the claimant has one house lot in "Ilikahi," Lahaina and one piece of cultivated land in Paanau, Lahaina. The claimant received the house lot from his ancestors in the days of Kamehameha I, and the same may be said of his land in Paunau. His title has never been disputed. The house lot has 3 houses on it and is fenced.

It is bounded:
Mauka by the yard of Kaino
Olowalu by the yard of Kahula
Makai by Kekuanaoa's land
Kaanapali by Keaweluaole.

The other piece is bounded:
Mauka and Olowalu sides by the pali of Paunau
On the other two sides by the creek of Paunau.

N.T. 31v5
No. 2745, Paaoao, June 12, 1849

Kamana, sworn, He has seen Paaoao's interest of a house lot at Ilikahi and a land section at Paunau, this was bequested land from Paaoao's parents during the time of Kamehameha I, no one has objected.

Section 1 - House lot.
Mauka by Kaino
Olowalu by Kahula
Makai by Kekuanaoa's patch
Kaanapali by Keaweluaole's land.

Section 2 - Taro land.
Mauka and Olowalu by Paunau pali
Makai and Kaanapali by Paunau stream.

No houselot at Kapewakua.

[Award 2745; R.P. 1691; Kapewakua Lahaina; 3 ap.; .74 Ac.; R.P. 1716; Paunau Lahaina; 1 ap.; .27 Ac.]

02762 to Nawaakoa

Claim Number:	02762	**Awarded:**	1
Claimant:	Nawaakoa	**NR:**	16v6
Island:	Maui	**FT:**	161v7
District:	Lahaina	**NT:**	44v5
Ahupuaa:	Paunau	**RP:**	1703
Ili:	Pohakuou	**Number of Royal Patents:**	1
Apana:	2		

No. 2762, Z. Nawaakoa
N.R. 16v6

To the Land Commissioners, respectfully: I, Nawaakoa, hereby explain my claim, an `Ili named Pohakuou in the Ahupua'a of Paunau in Lahaina, Island of Maui. However, there are two pauku /small sections/ in this land. One side is at Paunau kai and one is at Paunau uka. The 'Ili tax No. 3 is $1.50. My claim for which I petition you is that I have given my annual poll tax and have gone to the po`alima work.

For your information I received my right of occupancy as follows: From Pualinui to Ulunahele, and from Ulunahele to me. Therefore I have a long standing right in this `Ili. I am with aloha to you all.
Z. NAWAAKOA
Lahaina, January 7, 1848

F.T. 161v7
Cl. 2762, Nawaakoa [wahine], Part 2

Kamanoha sworn, The land here claimed is in Paunau, Lahaina. It is an Ili of land known by the name of "Pohakunui." It is in two pieces; one up mauka, and the other makai. The claimant received these land from Poalinui, the luna that time in 1837, and her title has never been disputed.

The piece up mauka is kalo land and is bounded:
Mauka by Kekahuna's land
Olowalu by the creek of Kahoma
Makai by Kaiki
Kaanapali by the pali.

The piece makai is bounded:
Mauka by Kapena's lot
Olowalu by Kaohie's lot
Makai by Olekaua's
Kaanapali by the poalima of Kekuanaoa.

Kaumauma, sworn, I know the claimant's loi in Moanui, Lahaina. the claimant received it from Ulunahele in 1833 and held it to 1841 in peace when Kuakini [?] knows the konohiki took it away because he was konohiki, and has held it to the present time.

It is bounded:
Mauka by "Aki"
Olowalu by Palau's land
Makai by J. Armas' land
Kaanapali by "Aki."

N.T. 44v5
No. 2762, Nawaakoa

Kamanoha, sworn, he has seen 2 sections of land in Pohakuou at Paunau from Pualinui to Ulunahele in 1837, no one had objected.

Section 1 - Taro land.
Mauka by Kekahuna
Olowalu by Kahoma stream
Makai by Kaiki
Kaanapali by Pali.

Section 2 - makai land.
Mauka by Kapena
Olowalu by Kaohie
Makai by Hoolekaua
Kaanapali by Kekuanaoa's Friday land.

Kaumauma, sworn, He has seen 1 patch at the Moanui ahupuaa which had been received from Ulunahele in 1823, and was taken by Huakini [Kuakini] in 1841, here are the boundaries:

Mauka by Aki ahupuaa
Olowalu by Palau
Makai by Huakini's land
Kaanapali by Aki ahupuaa.

[Award 2762; R.P. 1703; Paunau Lahaina; 2 ap.; 1 Ac. 17 rods; See also Award 464]

02866 to Kamiki

Claim Number:	02866	**Apana:**	4
Claimant:	Kamiki	**Awarded:**	0
Island:	Maui	**NR:**	18v6
District:	Lahaina	**RP:**	5574
Ahupuaa:	Kapewakua	**Number of Royal Patents:**	1

No. 2866, S. Kamiki
N.R. 18v6

With respect, to the Land Commissioners who quiet titles to land and house lots of the Hawaiian Islands: I, Samuela Kamiki, have six lo`i and a house lot. On the northeast it is 75 feet wide. On the southwest the length is 97 feet. The northwest side is 97 feet. Those are my claims for your information, which I wish to have entered in your book. Farewell to you all.
I am, respectfully,
S. KAMIKI
Kapewakua, Lahaina, January 7, 1848

F.T. 168-167v7
Cl. 2866, S. Kamiki

Kanahoa, sworn, I know the lands of the claimant. They are in Kapawakua, Lahaina. They consist of two pieces.

No. 1 consists of kalo land in 3 pieces and
No. 2 consists of house lot.

The claimant received it from Peke in the year 1834. His title has never been disputed.

The first piece of 3 lois is bounded:
Mauka by Peke's land
Makai by Kaina's lot
Olowalu by Mr. Butler's lot
Kaanapali by Mr. Baldwin's lot.

The 2nd piece of house lot is bounded:
Mauka by Peke's lot
Olowalu by Pukoa, the ahupuaa
Makai by Mr. Butler's lot
Kaanapali by the same.

The 3d piece of 2 lois is bounded:
Mauka by Naia's land
Olowalu by Puuhoowahi, the ahupuaa
Makai by Kani
Kaanapali by Kaehukulani.

The last piece of 1 loi is bounded:
Mauka by Kaehukulani
Olowalu by Kaina

Makai by Kaehukulani
Kaanapali by Kaina.

N.T. 51-52v5
No. 2866, Kamiki

Kahahoa, sworn, He has seen 4 sections at Kapawakua. It was from Peke in 1834. No one had objected.

Section 1 - House lot.
Mauka by Peke's land
Olowalu by Puou ahupuaa
Makai and Kaanapali (?) by Mr. Patava (?).

Section 2 - 3 patches
Mauka by Peke's land
Olowlau by Kaiawa
Makai by Mr. Parava's land
Kaanapali by Rev. P. Baldwin's land.

Section 3 - 2 patches
Mauka by Naia
Olowalu by Puuhoowahi
Makai by Kani
Kaanapali by Kaehukulani.

Section 4 - 1 patch
Mauka by Kaehukulani
Olowalu by Kaiawa
Makai by Kaehukulani
Kaanapali by Kaiawa.

[Award 2866; R.P. 5574; Kapewakua Lahaina; 3 ap.; 1 rood 27 rods]

03049 to Kaluaokamano

Claim Number:	03049	**Awarded:**	1
Claimant:	Kaluaokamano	**NR:**	32v6
Island:	Maui	**FT:**	136v7
District:	Lahaina	**NT:**	9v5
Ahupuaa:	Puahoowali, Kelawea	**RP:**	5578, 5595
Apana:	3	**Number of Royal Patents:**	2
Loi:	2	**Miscellaneous:**	Government road
House Lot:	1		

No. 3049*M, Kaluaokomano, January 11, 1849
N.R. 32-33v6

Greetings to the Land Commissioners: I, Kaluaokamano, hereby petition for my kihapai claims. Two flourishing lo`i are at Puahoowali; some mo`os also, 90 in length, 17 in width. Also, there is a mountain area; my land is on Molokai. I hereby state that it is four miles the outside area /circumference?/. That is my claim which I petition to have entered in the Book of the Land Commissioners.
KALUAOKAMANO
Lahaina, Maui

F.T. 136v7
Cl. 3049, Kaluaokamano, June 9, 1849

Kuelike, sworn, I know the lands of the claimant in Puuhoowali, Lahaina. it consists of one kula land and 3 lois, one house lot and kalo land, and one loi in Kelawea, Lahaina.

The claimant received this land from me, his father, in the days of Hoapili. He has held the land without dispute except the one in Kelawea, which Pikanele took away form him in 1847, without any other cause than this that I was an old man, and exempted by law from going to poalima work.

The lot of 2 lois is bounded:
Mauka by Kaihukai's land
Olowalu by "Puuhoowali 2"
Makai by Lono's lot
Kaanapali by the Government Road.

The house lot and kula is bounded:
Mauka by "Puako"
Olowalu by "Puuhoowali"
Makai by Kaihukai's land
Kaanapali by the Government Road.

The loi in Kelawea is bounded: On all sides by Pikanele's lois.

Liu, sworn, I know the loi in dispute between Kaluaokamanu and Pikanele. This loi was given to the claimant's father by Pikanele, and taken away recently because the claimant's father, who had it in charge was old and did not go to the poalima work.

N.T. 19v5
No. 3049, Kaluaokamano

Kuelike, sworn, He has seen Kaluaokamano's interest of 2 patches, 1 pasture, a house lot at Puuhoowali and 1 patch at Kelawaa. These were received at the time of Hoapili, from Kuelike. No one has objected to the sections at Puuhoowali. Pikanele has objected to the patch at Kelawaa because of the failure of the old man Kuelike to attend the Friday detail.
The sections of these parcels of land:

Section 1 - 2 patches.
Mauka by Kaihukai's land
Olowalu by Puuhoowali 2 land
Makai by Lono's land
Kaanapali by Road.

Section 2 - House lot.
Mauka by Puako land
Olowalu by Puuhoowali 2 land
Makai by Kaihukai's land
Kaanapali by Road.

Section 3 - 1 patch at Kelawaa.
Mauka by Pihenui
Olowalu, Makai & Kaanapali by Pikanele's land.

[Award 3049; R.P. 5578; R.P. 5595; Puuhoowali Lahaina; 2 ap.; 1 rood 32 rods; Land on Molokai awarded?]

03422B to Kekahuna

Claim Number:	03422B	**House Lot:**	1
Claimant:	Kekahuna	**Awarded:**	1
Island:	Maui	**NR:**	50v9
District:	Lahaina	**FT:**	133v13/19v15
Ahupuaa:	Uhao	**RP:**	1678
Apana:	1	**Number of Royal Patents:**	1
Loi:	17	**Stream/Muliwai/River:**	1
		Miscellaneous:	2 houses

Cl. 3422B, Kekahuna, Lahaina Maui
F.T. 376v3

Kenaoe of Lahaina, Maui being sworn before W. Ap. Jones, P. Magistrate, made oath that Kekahuna put into deponant's hands a land claim for a kuleana on "Uhai" (Ahlupuaa) in Lahaina, and that he took the claim to Honolulu and gave it to Namauu, Commissioners, which claim was written by a schoolmaster "Nahia."

The above signed in presence of H.W. Daniels, 31 August

Nahia, sworn, made oath that he wrote a claim as above described & saw it put into Kenaoe's hands to take to the Land Commission and he also swears that he wrote another claim at the same time for Opunui which was given to Kanaoe has since been found to have been delivered. Signed before W. Ap. Jones 3 September 1852.
<>
No. 3422B, Kekahuna

Napohaku, sworn, says he knows the land of Claimant in Uhao, Lahaina. It consists of two pieces.

The first piece is a House Lot bounded:
Mauka and Olowalu by "Aki"
Makai and Kaanapali by the Konohiki.

The second piece is bounded:
Mauka and Olowalu by "Aki"
Makai by the Konohiki
Kaanapali by a stream.

Claimant derived the land through his wife about 1842 (or through her sister) and has occupied it in peace up to a short time since when Puuki has disputed his claim.

Timoteo Keaweiwi, sworn, says he knows the land claimed by Kekahuna. He has occupied and cultivated it the same as all other Hoaainas, since he got it in the time of Kinau, and held the land in peace till lately, when Puuki raised a counter claim. There are no poalima patches in it.

N.T. 112v10
Kekahuna, 4 February 1852
[No number given]

Kainawe, sworn, I have seen his land sections in the ahupuaa of Uhao, Lahaina, Maui.

Section 1 - 17 taro patches.
Section 2 - 1 house lot with two houses.

Section 1:
Mauka and Olowalu by Namauu's land
Makai by Puuki's land, government land
Kaanapali by Kaleipaihala's land.

Land from Luukia in 1841, when Kaenaena had been tax assessor, no objections.

Napohaku, sworn, every statement above is true, I have known in the same way.

[Award 3422B; R.P. 1678; Uhao Lahaina; 2 ap.; 1.25 Acs]

04760-2 to Lelehu

Claim Number:	04760-2	**Kula:**	1
Claimant:	Lelehu, A	**Awarded:**	1
Island:	Maui	**NR:**	116v9
District:	Lahaina	**FT:**	144v12
Ahupuaa:	Moalii	**RP:**	5666
Apana:	2	**Number of Royal Patents:**	1
Loi:	7	**Loko:**	Yes
		Stream/Muliwai/River:	Yes

No. 4760-2, A. Lelehu
F.T. 129v7

Hanalei, sworn, I know the land of Lelehu in "Moalii," Lahaina. They are 7 lois, and one kula in one piece. The claimant received it from Hoapili wahine before 1839 and has held them without dispute ever since.

It is bounded:
Mauka by the creek of Moalii
Olowlau by the same
Makai by my land
Kaanapali by Heano's land.

[Award 4760-2; R.P. 5666; Moalii Lahaina; 2 ap.; 5 Acs 1 rood 22 rods; There is another 4760 award on Kauai to another person]

04801 to Laanui

Claim Number:	04801	**Awarded:**	1
Claimant:	Laanui, Gideon	**NR:**	201v6
Island:	Maui	**FT:**	13v7
District:	Lahaina	**NT:**	338v10
Ahupuaa:	Uhao	**RP:**	8394
Apana:	2	**Number of Royal Patents:**	1

No. 4801, G. Laanui, January 18, 1848
N.R. 201-202v6

To the Most Honorable Land Commissioners: I, G. Laanui, am a claimant of land at Lahaina, Maui. The name of this little `Ili is Uhao. Kamehameha I gave it to Nuhi. Nuhi died and I, his keiki, inherited it. When Kamehameha I died, our land was broken up, and transferred to someone else, with the exception of three which were left to me.

On the death of Kamehameha II I had possession of the three lands, until the reign of Kamehameha III. Then Kamehameha III divided the lands, two for himself - Waiomuku in Ka`u and Puohua in Hilo. These two `Ilis on Hawaii became the Mo`i's.

Uhao, in Lahaina, Maui, remains mine, and I have a lot in it. Therefore, I request you, the Land Commissioners, to rule that this land is for me, with a document for my benefit.
G. LAANUI

F.T. 14v7
Cl. 4801, G. Laanui

For an ili in Lahaina in Ahupuaa of Uhao.

Claimant states he gave up 2 lands on Hawaii to the King at the late division and this was left to him. The lands given up were Waiolimu in Kau and Puohue.

Kaleipaihala, sworn, I know Uhao in Lahaina of Claimant. It is a portion of land given to the claimant by the King to be his forever, in exchange for lands in Kau and Hilo, Hawaii.

Claimant had this land originally from his ancestors and has occupied it undisputed from 1835 to my knowledge.

Bounded:
mauka and Olewalu by "Uhao II"
Makai and Kaanapali by "Aki 1."

N.T. 160v10
No. 4801, G. Laanui

COPY
Gideon Laanui's land in the Mahele Book.
Uhao ahupuaa, Lahaina, Maui
True copy
Ministry Office
A.G. Thruston, Secretary K.K.
13 October 1842
See page 338

N.T. 338v10
No. 4801, Gideon Laanui, (from page 160), 2 Feb. 1854

Gideon Laanui's land distribution.
Uhao ahupuaa, Lahaina, Maui
TRUE COPY
A.G. Thruston, Clerk
Interior Dept.
2 Feb. 1854

[Award 4801; R.P. 8394; Uhao ahupuaa Lahaina; 2 ap.; 1.93 Acs]

04878 to Makaiole

Claim Number:	04878	**District:**	Lahaina
Claimant:	Makaiole	**FT:**	167v7
Island:	Maui	**Miscellaneous:**	See 4878EE

No. 4878!, Makaiole, Part 28
F.T. 167-168v7
[See Award 4878EE]

04878E to Holi

Claim Number:	04878E	**Awarded:**	1
Claimant:	Holi	**NR:**	215v6
Island:	Maui	**FT:**	28v7
District:	Lahaina	**RP:**	1199, 2711
Ahupuaa:	Makila	**Number of Royal Patents:**	2
Apana:	2	**Pali:**	Yes
Loi:	14		

Cl. 4878E, Holi, Part 4
F.T. 28v7

Pi, sworn, the lands of Holi are in Makila Lahaina and consist of four moos or ridges of land in one piece and 14 lois - uka. Claimant received these lands from the konohiki, Kamaihina in the days of Hoapili before 1839. From that time to this he has possessed these lands without dispute.

The kula piece is bounded:
Mauka by the yard of Kalohoula
Olowalu by the land of Pupae
Makai by the land of Naea
Kaanapali by "Kaulalo."

The lois 14 in number are all in one piece, which is bounded:
Mauka by the land of Pupule
Olowalu by the creek
Makai by the land lois of Hookoekoe
Kaanapali by a pali.

[Award 4878E; R.P. 1199; Makila Lahaina; 1 ap.; .70 Ac.; R.P. 2711; Makaila Lahaina; 1 ap.; .58 Ac.; See 4878 for Native Register document]

04878EE to Makaiole

Claim Number:	04878EE	**House Lot:**	1
Claimant:	Makaiole, wahine	**Awarded:**	1
Island:	Maui	**NR:**	215v6
District:	Lahaina	**FT:**	40v7
Ahupuaa:	Puaa, Waianae, Wainee	**NT:**	50v5
Apana:	6	**RP:**	2737
Loi:	6	**Number of Royal Patents:**	1
Kula:	5	**Miscellaneous:**	government road

Cl. 4878EE, Makaiole, Part 27, See page 167
F.T. 40v7

No person appeared upon the calling of this claim.

F.T. 167-168v7
[Cl. 4878EE], Makaiole, part 28, See page 26, 115 volume 10

Manae Wahine, sworn, I know the lands of the claimant in Puaanui, Lahaina. They consist of 6 pieces: one Pahale, two pieces of kula, 5 moos of kula, separate[d in] two pieces, one piece of 1 moo, and the other 4 moos, and the other two in Waineenui, one piece of 5 lois, and the other piece of one loi and kula.

The claimant received the first six pieces from Kakelihi in 1851 and the two pieces in Waineenui in 1831 and her title has never been disputed up to the present time, except for the 5th piece, which was disputed, and taken away by Kahue in 1848, at the first she had 5 moos in this piece, but in 1838 she gave it to the King, and in 1848 Kalua, the konohiki, took away the 4 remaining.

The first piece in Puaanui of Pahale is bounded:
Mauka by Kooka
Olowalu by Kaakamauna
Makai by Pahine
Kaanapali by Kaeo's land.

The 2nd piece of kula is bounded:
Mauka by Kalaoa's land
Olowalu and Makai by the same
Kaanapali by Kaha's land.

The 3d piece of one moo of kula is bounded:
Mauka by Niiki's lot
Olowalu by Kalaoa's lot
Makai by the same
Kaanapali by Kaha's lot.

The 4th piece of kula is bounded;

Mauka and Olowalu sides by Kaha's lot
Makai by another person not known
Kaanapali by Kaeo land.

The 5th piece of 4 moos of kula is bounded:
Mauka by Kaha's lot
Olowalu by Kuahamauna
Makai by the Government road
Kaanapali by Kaeo's land.

The 6th piece of kalo and kula land is bounded:
Mauka by Haualolua[?]
Olowalu by Kalaoa
Makai and Kaanapali by "Puehuehunui."

The first piece in Wainee, of kalo of 5 lois, is bounded:
Mauka by Laahili's land
Olowalu by "Kooka"
Makai by Kalaipahala
Kaanapali by Namaka's land.

The last piece of one loi and kula is bounded:
Mauka by Naai
Olowalu by Polanui
Makai and Kaanapali by Naai.

N.T. 50-51v5
No. 4878EE, Makaiole (Female)

Manae, sworn, He has seen 6 sections at Puaanui and 2 sections at Wainee. These 6 sections at Puaanui was from Kahehekili in 1823 and 18234, the 2 sections at Wainee were given in 1831. Oppositions have been for sections 4 and 5 by Kalua without cause in 1848, all of section 5 have been taken. Here are the boundaries of these sections:

Section 1 - House lot.
Mauka by Kooka land
Olowalu by Kuakamauna
Makai by Friday land
Kaanapali by Kaeo eleele's land.

Section 2 - Dry land.
Mauka, Olowalu, Makai by Kalaoa
Kaanapali by Kaha.

Section 3 - Pasture.
Mauka by Nihiiki
Olowalu by Kalaoa
Makai by Nihiiki
Kaanapali by Kaha.

Section 4 - Pasture.
Mauka and Olowalu by Kaha
Makai by Malihini

Kaanapali by Kaeo and Kaaimalalo's land.

Section 5 - 4 Moo pasture.
Mauka by Kaha
Olowalu by E. Kuahamauna's land
Makai by Government land
Kaanapali by Kaeo's land.

Section 6 - Moo land and pasture.
Mauka by (? can't make out)
Olowalu by Kalaoa
Makai by Puehuehunui pali
Kaanapali by Puehuehunui pali.

Section 7 - Patches at Wainee.
Mauka by Kahili
Olowalu by Kooka land
Makai by Namaka
Kaanapali by Kalaipaaihala.

Section 8 - pasture and 1 patch.
Mauka by Kalaipaihala and Naai
Olowalu by Polanui
Makai and Kaanapali by Naai.

[Award 4878EE; R.P. 2737; Puaa Lahaina; 3 ap.; 5 Acs 1 rood 9 rods; Pukalale Puaa Lahaina; 1 ap.; 1 Ac. 2 roods; Waianae Lahaina; 1 ap.; 25 rods; Wainee Lahaina; 1 ap.; 2 Acs 2 roods 9 rods; See 4878 for Native Register document]

04878FF to Poopuu

Claim Number:	04878FF	**Kula:**	1
Claimant:	Poopuu	**House Lot:**	1
Island:	Maui	**Awarded:**	1
District:	Lahaina	**NR:**	215v6
Ahupuaa:	Puako, Wainee, Waianae 1 & 2	**FT:**	40v7
Apana:	4	**RP:**	2738
Loi:	2	**Number of Royal Patents:**	1

Cl. 4878FF, Poopuu [wahine], Part 28
F.T. 40-41v7

Umiumi, sworn, I know the lands of claimant. They are [sic] consist of one large loi in Waianae 1. One large loi on Waianae 2, a House lot and kula on Waineenui, all in Lahaina.

The first large loi was obtained by claimant from Kaaimalalo in 1824 and he has held in peace until about three weeks since, when the head man, John Hoolulu, the King's agent disputed it.

The next large loi the claimant received from the same source at the same time, and her title to it has never been disputed.

THe first loi is bounded:
Mauka by the land of Pikanele
Olowalu by the lois of Ninia
Makai by the loi of Paupau
Kaanapali by the land of Pikanele.

The last piece is bounded:
Mauka by "Puako"
Olowalu by the lois of Kunalo
Makai by the loi of Kauiloihi [?]
Kaanapali by the land of Napuakale [?]

Olala, sworn, I know the house lot and kula of the claimant. It is in "Waineenui." The claimant obtained this land from me in the days of Pricess Nahienaena before 1836, and she has had the quiet possession of it ever since.

It is bounded:
Mauka by my land
Olowalu by the land of Kaai
Makai by Hanaunau's [?] and my own land
Kaanapali by the land of Kamehameha.

[Award 4878FF; R.P. 2738; Wainee Lahaina; 3 ap.; .87 Ac.; See 4878 for Native Register document; See also Award 6920]

04878G to Malaekahana

Claim Number:	04878G	**House Lot:**	1
Claimant:	Malaekahana	**Awarded:**	1
Island:	Maui	**NR:**	215v6
District:	Lahaina	**FT:**	29v7
Ahupuaa:	Polanui	**RP:**	1959, 2742
Apana:	4	**Number of Royal Patents:**	2
Loi:	1	**Koele/Poalima:**	Yes
Kula:	2		

Cl. 4878G, Malaekahana, part 6
F.T. 29v7

Mahaulea, sworn, I know the land of claimant. They are in Polanui, Lahaina, and consist of three distinct pieces. One kalo land and two patches of kula. There is a house lot beside this.

Claimant has these lands from a woman, Kamane's wife. This was in 1835, I think, and he has never been disputed in his title to the present time. I am the head man of Polanui under Kanaina.

One piece of kula containing two moos is makai and is bounded:
Mauka by Kanaina poalima lois
Olowalu by the land of Makuwahine
makai by the yard of Kaoo
On the other side by the same.

The mauka piece of kula is fenced, and the fence is the correct boundary
Mauka of it is the kula of mine
Olowalu is Puunoa
Makai is Polaiki's land
on the other side is the land of Koalakai.

The house lot has two houses on it and is bounded:
Mauka by the land of Makuwahine's land
Olowalu by John White's land
Makai the road to Olewalu
On the other side by the land of Kapuwanui.

The kalo land contains 10 lois and it is bounded:
Mauka by Alio
Olowalu by the same
Makai by the poalima lois of Kanaina
Kaanapali by Kaiwi.

[Award 4878G; R.P. 1959; Polanui Lahaina; 3 ap.; 8 Acs 49 rods; R.P. 2742; Polanui Lahaina; 1 ap.; 13 rods; See 4878 for Native Register document; (Awardee index lists R.P. 1959 as 2 Acs 49 rods?)]

04878H to Waihoioahu

Claim Number:	04878H	**House Lot:**	1
Claimant:	Waihoioanu	**Awarded:**	1
Island:	Maui	**NR:**	215v6
District:	Lahaina	**FT:**	29v7
Ahupuaa:	Puunauiki, Kauaula	**RP:**	1877
Apana:	6	**Number of Royal Patents:**	1
Loi:	24	**Koele/Poalima:**	Yes
Plus:	+	**Stream/Muliwai/River:**	Yes
		Pali:	Yes

Cl. 4878H, Waihoioahu, Part 7
F.T. 29-30v7

Hule, sworn, I know all the lands of claimant. They are in Paunaunui, Lahaina. They consist of one house lot, and 3 lois in one piece. And 4 moos of kula in another piece. 15 lois in another piece. 2 lois in another piece, and 1 loi by itself making in all six distinct pieces.

Claimant received these lands from Kamaikini in 1832, and he has held them in undisturbed possession ever since. There is however a poalima land [in the] midst of his kula.

The house lot piece is bounded:
Mauka by Kapu's land
Olowalu by "Halakaa"
Makai by the poalima land of Paki
kaanapali by "Panau akahi."

The piece of 4 moos is bounded:
Mauka by the poalima land of Paki
Olowalu by the land of Kupalii
Makai by the yard of Kamaihina
kaanapali by "Paunau akahi."

The 15 loi piece is uka loa, and is bounded:
Mauka by the lois of Alapai
Olowalu by the lois of Kawau
Makai by the lois poalima of Paki
Kaanapali by a pali and Kaulunu's place.

One of the 2 lois piece is bounded:
Mauka by the lois poalima of Paki
Olowalu by the pali
Makai by loi poalima
Kaanapali by "Kooka."

Another 2 loi piece makai of the 15 lois piece is bounded:
Mauka by poalima lois
Olowalu by the creek
Makai by creek and poalima lois
On the other side by the pali and "Paunau."

The other lois is bounded: On all sides by my land.

[Award 4878H; R.P. 1877; Puunauiki Lahaina; 2 ap.; 2 Acs 20 rods; Kauaula Lahaina; 4 ap.; 1 Ac. 1 rood 39½ rods; See 4878 for Native Register document]

04878Y to Mamaka

Claim Number:	04878	**Awarded:**	1
Claimant:	Mamaka	**NR:**	215v6
Island:	Maui	**FT:**	38v7
District:	Lahaina	**RP:**	2718
Ahupuaa:	Halakaa	**Number of Royal Patents:**	1
		Claimant Died:	Yes

No. 4878Y, Mamaka, Part 22, June 1, 1849
F.T. 38v7

Waihoioaku, sworn, I know the lands of the claimant. They consist of 2 pieces of kula and one piece of both kula and kalo land. They are all in "Halakaa."

Claimant received these lands from Unele in 1845 and he has been [in] undisturbed possession ever since. The Lord of this land is Kaeo.

The makai kula is bounded:
Mauka by the yard of Kapu
Olowalu by the land of Paikaualani
Makai by the land of Hulu
Kaanapali by Paunau ekolu.

The next piece is bounded:
Mauka by the land of Kaiwikaola
Olowalu by the land of Kupalii
Makai by the lois of Paikaualani
Kaanapali by the creek.

See page 77 V. 15

F.T. 77v15
No. 4878Y, Mamaka, Lahaina, 24th August 1853, from page 38v7

Unele, sworn, says he knows the three first pieces set forth in the survey of this claim made by W.P. Alexander. The claimant received these pieces of land from the witness who is Luna of "Halakaa," under Kaeo, in the year 1844 and no one disputes the claim.

Witness as Luna objects to apana 4 situated in "Kauaula."

(Muolo, the widow and heir of claimant withdraws all claim to Apana 4)

[Award 4878Y; R.P. 2718; Halakaa Lahaina; 3 ap.; 1.19 Acs; Mamaka for Muolu; See 4878 for Native Register document]

05116*M to Kanae

Claim Number:	05116*M	**NR:**	239v6
Claimant:	Kanae, Samuela	**FT:**	33v16
Island:	Maui	**NT:**	35v5
District:	Lahaina	**RP:**	1833, 1871
Ahupuaa:	Panaewa, Aupokopoko	**Number of Royal Patents:**	2
Awarded:	1	**Claimant Died:**	Yes

No. 5116*M, S. Kanae
N.R. 239v6

Greetings to you, Z. Kaauwai: I hereby tell you of a claim for a lot, which you may have written in the Government's Depository of Claims. If you have not entered it, then enter this claim.

If you wish to know the boundaries you may ask B. Manakaeha.

Furthermore, Aupopoko should be entered with it. It is a little land in Lahaina.
Farewell to you and everyone in your house.
I am, respectfully,
S. KANAE
Lahaina, Maui, 19 January 1848

F.T. 152v7
Cl. 5116, S. Kanae (is dead)

Z. Kaauwai, sworn, The claimant's land they consist of one ili of land called Kiokapu in Waikiki, Oahu and an Ahupuaa in Lahaina called Aupokopoko and one house lot in Lahaina also.

Kiokapu and Aupokopoko he received from the king at the recent division. There are 7 lands. Claimant's living on Kiokapu and on Aupokopoko.

The claimant had the house lot from Hoapili Kane in 1835 and his title has never [been] disputed. He died in 1848. He left a widow named Keleuila and one daughter.

He has a house lot also in Honolulu, Oahu. He received this from his wives in olden time in 1837 and he has held it but not without dispute. William Smith disputed his title to this lot and so does Noihonua.

The house lot at Lahaina is bounded:
Mauka by Kapaakea's lot
Olowalu by the same
Makai by the Alanui Aupuni
Kaanapali by Kuakamauna's lot.

I don't know the bounds of the house lot in Honolulu, but it is the one near Mr. Woods, claimed by William Smith.

See page 32v15

F.T. 32v15
No. 5116, S. Kanae, (Deceased) from page 152v7

The widow of Claimant presented the following Certificate of Division.

"No Samuela Kanae"
Aupokopoko, Ahupuaa, Lahaina, Maui
Kiokapu, Ili no Waikiki, Kona, Oahu
E hookomo i ka Hoona Kuleana
(Signature) S.P. Kalama
Hale Alii
Feberuari, 7, 1848, See P. 53 [sic: See 33]

F.T. 33v15
No. 5116, Samuela Kanae, (Deceased) from page 152v7

Hauola, sworn, says, he knows the House Lot in dispute between Kanae and Kaolulo. This place was occupied by Kanae from the time of Nahienaena up to the time of his death, about 1840. Kanae built the house which now stands on the Lot, in the time of Hoapili, and rented it out to some foreigners. Kanae's first wife got the place from her brother Kaolulo, deceased, and when she died, it came to Kanae and now belongs to his heirs. (Decided in favor of S. Kanae.)

N.T. 35-36v5
No. 5116, S. Kanae

Z. Kaauwai, sworn, He has seen Kanae's land on Oahu, Kiokapu in Waikiki and the house lot in Honolulu; Aupokopoko in Lahaina and the house lot, 4 sections. These are farming sections in Aupokopoko was from Hoapili in 1835, no one had objections for that land until his (Kanae) death in 1848. 2 servants are at Aupokopoko with their claim.

Moehonua and a half Caucasian have objected to the lot in Honolulu. The district officers of Maui have enforced these lots for Kekaula, wife and heir of Kanae. The house lots on Oahu have been from Kanae's wives, Pulehu and I, in 1837. The boundaries to the Lahaina lot are:

[It is bounded]:
Mauka and Olowalu by Kapaakea's land
Makai by Government road
Kaanapali by E. Kuakamauna's land.

No. 2. Kaauwai has not known the boundaries of the house lot in Honolulu, Oahu.

N.T. 414v10
No. 5116, L. [S] Kanae, 7 October 1854

COPY
L. Kanae's land distribution
Aupokopoko ahupuaa, Lahaina, Maui.
TRUE COPY
A.G. Thruston, Chief Clerk, Interior department, 7 October 1854

[Award 5116; R.P. 1833; Panaewa ; Panaewa Lahaina; 1 ap.; .07 Ac.; R.P. 1871; Aupokopoko Lahaina; 1 ap.; 6.58 Acs]

05389 to Holoauhee

Claim Number:	05389	**Awarded:**	1
Claimant:	Holoauhee	**NR:**	218v6
Island:	Maui	**FT:**	4v7
District:	Lahaina	**NT:**	33v5
Ahupuaa:	Kapewakua	**RP:**	1746
		Number of Royal Patents:	1

No. 5389, Holoauhee, Lahaina, Maui
N.R. 281v6

Kapaoakua is the name of the land, Apeke is the claim, with two houses, two kukui trees, two coconut trees, one breadfruit tree, three lo`i, two mo`o. Those are my claims which are stated to you, the Land Commissioners, which I occupy in Lahaina.
HOLOAUHEE

F.T. 4-5v7
No. 5389, Holoauhee, present without witness, See 150B.

F.T. 150v7
Cl. 5389, Holoauhee, from page 4

Kaiawa, sworn, I know the claimant's land. It is in "Kapewakua," Lahaina, and conisists of a house lot and a cultivated land. The claimant received them from Hoapili before 1839 and his title to them has never been disputed.

The house lot is bounded:
Mauka by Beke's land
Olowalu by Hani's land
Makai by Mr. Butler's
Kaanapali by the same.

The other piece is bounded:
Mauka by the poalima of Beke
Oloalu by Kamiki's land
Makai by the same
Kaanapali by Dr. Baldwin's land.

N.T. 33v5
No. 5389, Holoauhee

G. Kaiawa, sworn, He has seen Holoauhee's 2 sections at Kapewakua, a house lot and a parcel of land, Hoapili had given in 1839/ below of this land is Peke's land.

Here are their boundaries:

Section 1 - House lot.
Mauka by Peke's land

Olowalu by Hani's land
Makai and Kaanapali by Mr. Pa ? (can't make it out).

Section 2 - Land section.
Mauka by Peke's land
Olowalu and Makai by Kamiki's land
Kaanapali by Mr. Baldwin's.

[Award 5389; R.P. 1746; Kapewakua Lahaina; 3 ap.; .62 Ac.]

05441 to Ninia

Claim Number:	05441	**Breadfruit:**	4
Claimant:	Ninia	**Oranges:**	1
Other Claimant:	Naiahelu, wife	**Sugar Cane:**	1
Island:	Maui	**Other Plants:**	2
District:	Lahaina	**Awarded:**	1
Ahupuaa:	Waianae	**NR:**	293v6
Ili:	Kaluokiha	**FT:**	4v7
Apana:	3	**NT:**	27v5
Loi:	5	**RP:**	1751
Plus:	+	**Number of Royal Patents:**	1
House Lot:	1	**Wall/Fence:**	Yes
Bananas:	2	**Other Trees:**	1
		Miscellaneous:	Naiahelu got this land from Hoapiliwahine, her aikane, government road, ti leaves, 2 grape vines, 4 houses, 13 kukui trees

No. 5441, Ninia, Lahaina, Maui
N.R. 293-294v6

Waianae: Kanele is the one from whom I received my right in 1842. I have five lo,i, five kukui trees, two taro patch banks planted with sugar cane, and one taro patch planted with ti leaf plants. One /dried out/ lo`i is planted in bananas. The witness is Kaeo. The head is Kanele.

Puaa: There are 12 mo`o, planted with sugar cane, bananas, four breadfruit trees, two grape vines, eight kukui trees. There are four houses in this parcel. The witness is Kaeo, he is the head. /There is/ an orange tree.

Hoapili was the one from whom I received my right, in 1842. He has died, and at this time Kanaina is at the head. The house lot claim is from him. Those are the claims of occupancy in Lahaina, for your information, O Land Commissioners.
NINIA

F.T. 4-5v7
No. 5441, Ninia, See page 115 volume 10, & 105 volume 15.

Keaweluaole, sworn, I know the house lot of Claimant in Lahaina. It is now occupied by Victor Chancerot as an eating house &c. It is fenced. The fence is the correct boundary.

Claimant got this land from Hoapili Kane and built the house on it & fence. I never heard the title disputed. Claimant has had peaceable possession and now rents the premises. I do not know of his other lands.

Kalaikini, sworn, confirmed the preceding testimony and new of no counter claimant.

F.T. & N.T. 105-106v15
No. 5441, Ninia, Disputed by Kanaina, Lahaina, 15th September 1853, from page 4, vol. 7

Pikanele, sworn, says he knows the house lot now in dispute. Ninia built his first house on the lot in 1842 and has occupied it up to the present time. I do not know who gave him the lot or who allowed him to build on it. He rented his house lot different times. This lot is in the Ahupuaa of Puako which belonged to Kalaimoku and afterwards to Kahalaia. Kekauluohi made the lane which runs from the main road to the sea side, and which cut through Ninia's lot. Ninia built the enclosure around the lot. After Kahalaia's death Puako came to Kekauonohi to whose heirs it now belongs.

Hihio, sworn, says Hoapili gave this lot to Ninia in the year 1842. Ninia and his wife Naiahelu lived on the place a year or two previous to the gift by Hoapili. I was present when Hoapili gave the lot to them. I think the Ahupuaa of Puako belonged to Kekauonohi at that time. There was a grass house there before which was occupied by a man belonging to Hoapili, named Luhiluhi, who died about the time Ninia got the lot. Luhiluhi had a wooden fence round the lot and when that fell down Ninia replaced it with an adobe wall.

Naiahelu was an aikane of Hoapiliwahine, which probably was the reason of the gift. Hoapiliwahine told Naiahelu, in my hearing, to pull down the old grass house then standing on the lot and erect a good house on it for her and her husband Ninia. Ninia then went to work and built his house on that lot. I was one of Kaaimalaia's retainers. She gave Naiahelu a small piece of land mauka at the same time.

Kaleikini, sworn, I was Luna for Hoapiliwahine in 1842 and was present when she gave this lot to Naiahelu (her aikane) the wife of Ninia. Naiahelu was the bosom friend of Hoapiliwahine. When Ninia got the lot he pulled down the old grass house then standing there and erected a house of stone and mud. There were several chiefs present when Hoapiliwahine gave the lot to Naiahelu. The reason of the gift was that Hoapili wished to have her friend Naiahelu close to her own residence. I understood the gift to be absolute and lila loa.

N.T. 115-117v10
No. 5441, Ninia, 5 February 1852, vs. C. Kanaina 277 (from page 4, volume 7)

Makaulia, sworn, I have seen this house lot at Kaluokiha, adjoining with Luaehu. There is a dispute over this land in Lahaina, Maui between Ninia and C. Kanaina.

Mauka by Government road
Olowalu leading into Luaehu, a small patch
Makai by Luaehu's lot
Kaanapali by Pikanele's house lot.

Land to Puhipuhi, Makaulia's wife from Hoapili as a house dweller in 1841, but no house was built and after the death of Mrs. Hoapili, it seemed as if Naaihelu had previously asked for the place.

When it was time to present a property report to M. Kekauluohi who is the heir of Mrs. Hoapili, I showed them the place Hoapili had given me, and Naaihelu said that Hoapili (Mrs.) had given him that house permanently, then I gave it to him saying, "the estate is mine, together with the lumber and the loss for supplying the needs of the house is mine only." He lived there to 1846, then Mr. Richards came to work on claims and at this time C. Kanaina offered objections for the heir of M. Kekauluohi.

C. Kanaina had this place in question because he had been a tenant there and a house dweller. He claimed that the land was for the chiefs, therefore, they should have the same privileges living under hoapili's heirs as they had under Hoapili, however, I believe that Ninia has a claim on the house and C. Kanaina has the right to the land, together, they should reap the value of the land and should Ninia buy C. Kanaina's half interest, then all of it should be for Ninia.

Pelupelu, sworn, I have seen that place over which there is a dispute between C. Kanaina and Ninia. Mrs. Hoapili gave this place to Puhipuhi, the wife of Makaulia before she (Mrs. Hoapili) died. 'It was a place for them to live

under her and they did live there peacefully. I had not heard in the least that it was given to Naahelu, the wife of Ninia because I had always lived with Mrs. Hoapili until she died. Ninia and relatives lived close to the Hoapilis to enable them to have their meals with them and this was protection only for them, he did not get the ground (land). When M. Kekauluohi died, C. Kanaina opposed as an heir of M. Kekauluohi. Ninia did not get the ground, this is for the heirs of Mrs. Hoapili.

Ninia (Question): Did you always live with Hoapili?
Pelupelu (Answer): Yes, I have always lived with him and was with him at the time of his death, but I had not heard that he had given to you both permanently, but it was protection that you would have. M. Kekauluohi had placed you there and she let you build a house, but the land was reserved for her heirs.

[Award 5441; R.P. 1751; Waianae Lahaina; 3 ap.; .63 Ac.; See Award 392 for other Foreign and Native Testimony documents]

05458 to Manu

Claim Number:	05458	**Kula:**	14
Claimant:	Manu	**Awarded:**	1
Island:	Maui	**NR:**	296v6
District:	Lahaina	**FT:**	13v7
Ahupuaa:	Kooka	**RP:**	1699
Apana:	4	**Number of Royal Patents:**	1
Loi:	27	**Koele/Poalima:**	Yes
		Stream/Muliwai/River:	Yes

No. 5458, Manu
N.R. 296-297v6

Greetings to the Land Commissioners: I have some lo`is and some mo`o kulas which were given by Namauu, my konohiki, at the time when Kaenaena was the Tax Official for Lahaina.

There are a total of 27 lo`i, they are not large ones but are small.

Furthermore, there are a total of 14 mo`o kula. These mo`os are not long, they are short.

The boundaries of these lo`is and the mo`o kulas are understood by us.

Also, the explanation of the giving of this land to me by Namauu, if this is not clear to you, you can see in the letter claiming land by Namauu.
MANU
Lahaina, Maui, 28 January 1848

F.T. 13v7
Cl. 5458, Manu

Namauu Witness absent, postponed. Resumed page 45.

F.T. 45-46v7
Cl. 5458, Manu, from page 13

Kuaana, sworn, I know the land of the claimant consists of a piece of kula and 5 lois lying together and 17 lois comprising a section of kalo land mauka. They are all in "Kooka" Lahaina. The claimant received these lands in the days of Hoapili in the early days (of that great man) and he has been in undisputed possession ever since.

The kula piece is bounded:
Mauka by the land of Kamamoku
Oloalu by the land of Kalena
Makai by the land of Opunui
Kaanapali by Puaa.

The kalo section is bounded:
Mauka by the poalima of Namauu Ehu
Olowalu by the creek

Makai by my lois
Kaanapali by the land of Oleloa.

[Award 5458; R.P. 1699; Kooka Lahaina; 4 ap.; 1.5 Acs 20 rods]

05672B to Kaaha

Claim Number:	05672B	**Awarded:**	1
Claimant:	Kaaha (for H. Kahanawai)	**RP:**	4515
Island:	Maui	**Number of Royal Patents:**	1
District:	Lahaina	**Miscellaneous:**	See 1280
Ahupuaa:	Kaulalo		
Apana:	1		

No. 5672B, Kaaha for Hiram Kahanawai

[Award 5672B; R.P. 4515; Kaulalo Lahaina; no 5672B documents yet located, but Kaaha gets Kaulalo Lahaina in 1280*M]

05832 to Kaaumaiewa

Claim Number:	05832	**Awarded:**	1
Claimant:	Kaaumaiewa	**NR:**	334v6
Island:	Maui	**FT:**	5v7
District:	Lahaina	**RP:**	1157
Ahupuaa:	Kamani	**Number of Royal Patents:**	1
Apana:	1		
Loi:	1		
Plus:	+		
Kula:	1		

No. 5832, Kaaumaiewa, 22 January 1848
N.R. 334v6

To the Land Commissioners, Greetings: I, Kaaumaiewa am a petitioner for my land claim. It is a pauku of land, one mo'o, and a kula. It is finished, except for a portion in another place. That is my land claim which is stated to you. The name /of the land/ is Kamani. It is in Lahaina waena, adjoining Polanui.
KAAUMAIEWA

F.T. 5v7
Cl. 5832, Kaaumaiewa

Claimant said his only proper witness was Kaniau now in Hamakua from whom he has the land.

Moku, sworn, I am luna ahau of Lahaina. I know claimant's land. It is in one piece and a section in the ahupuaa of Kamani.

Bounded:
Mauka by Kanaina's Polanui
Olowalu by Punau
Makai by Kanaian's
Kaanapali by Polanui.

[Award 5832; R.P. 1157; Kamani Lahaina; 1 ap.; 4.35 Acs]

05912 to Pahia

Claim Number:	05912	**Awarded:**	1
Claimant:	Pahia, Simeona	**NR:**	336v6
Island:	Maui	**FT:**	117v7
District:	Lahaina	**NT:**	9v5
Ahupuaa:	Puako	**RP:**	1173
Ili:	Luahoomu	**Number of Royal Patents:**	1

No. 5912, S. Pahia, Lahaina, 26 January 1848
N.R. 336-337v6

To the Land Commissioners: I hereby state my claim for land to you, in the ahupua'a of Puako, 'ili of Luahoomu. It is bounded on the north by the land of Kuokoa, on the east, south and west by the land of Kalua.

Here is another claim, bounded on the north by the land of Kupele and Mumuku, on the east and west by the land of Kalua, on the south by the land of Kuokoa.

Here is another claim, bounded on the north by kula, on the east by the land of Kaleipaihala, on the south by the land of Davida, on the west by the land of Mumuku.

Here is another claim, bounded on the north by the pali, on the east by the land of Kalua, on the south and west by the land of Kuokoa. It is finished.
Respectfully,
S. PAHIA

F.T. 117v7
Cl. 5212, Simeona Pahia

Mumuku, sworn, The land of the claimant is in "Puuako," Lahaina. They consist of 5 pieces. They were received from Kuakea in the year 1840 and he has held them without dispute ever since.

The first piece is bounded:
Mauka by my lois
Olowalu by the road from the sea mauka
Makai and Kaanapali by the land of Kahea.

The second piece is bounded:
Mauka by Kalua's land
Olowalu by the same road spoken of above
Makai by my land
Kaanapali by Kanuku's land.

The third piece is bounded:
Mauka by Kalua's land
Olowalu by Judge Parsons' land
Makai by Kamuku's land
Kaanapali by a road or street.

The fourth piece is bounded:
Mauka by Kamehai's land
Olowalu by Waineenui
Makai by D. Malo's land
Kaanapali by my own land.

The 5th piece is bounded:
Mauka by Kalua's land
Olowalu by Kamuku's land
Makai by Kalua's land
Kaanapali by the pali. This last piece is way up mauka.

N.T. 9v5
No. 5912, Simeona Pahia

Mumuku, sworn, He has seen Pahia's interest in the Puako ahupuaa of 5 sections, the boundaries are:

Section 1 - Taro section.
Mauka by Mumuku's land
Olowalu by Road
Makai and Kaanapali by Konohiki.

Section 2 - Taro.
Mauka by Kalua's land
Olowalu by road
Makai by Mumuku's land
Kaanapali by Kanuku's land

Section 3 - Taro.
Mauka by Kalua's land
Olowalu by Haole's land
Makai by Kanuku's land
Kaanapali by road.

Section 4 - Taro.
Mauka by Kamauoha's land
Olowalu by Waineenui's land
Makai by D. Malo's land
Kaanapali by Mumuku's land.

Section 5 - Pasture.
Mauka, Olowalu and Makai by konohiki
Kaanapali by Lauhoomoe moo.

Land received in 1840. No objections.

[Award 5912; R.P. 1173; Puako Lahaina; 4 ap.; 2.27 Acs; See also 10767]

06073 to Halepaka

Claim Number:	06073	**Awarded:**	1
Claimant:	Halepaka	**NR:**	346v6
Island:	Maui	**FT:**	120v7
District:	Lahaina	**NT:**	11v5
Ahupuaa:	Moalii	**RP:**	1182
Ili:	Kapaahu	**Number of Royal Patents:**	1
Apana:	1		

No. 6073, Halepaka, Lahaina, Maui
N.R. 346v6

Greetings to the Land Commissioners: I have a claim at Moalii, in Lahaina, Maui, a house lot in the kula. My right /was from/ Kaliiliiai, who died, and Kaaaa /is in charge/ at this time. It was given and conveyed absolutely. There is no opposition.
Farewell to you all, in peace.
HALEPAKA
January 27, 1848

F.T. 120-121v7
Cl. 6073, Halepaka

The claimant has gone to California, but his wife Aue appeared and answered for him.

Kaaa, sworn, the land of the claimant they are one house lot in Puunoa, the claim for which was heard by Mr. Richards and a piece of kula with a house thereon, in Moalii, Lahaina.

The claimant received part of this named land, i.e., 3 moos from me between 1836 and 1839 and at the same time received the remaining part, Liiliiai. There was no dispute about his possession until about a week ago, when a man disputed with him, but it was a matter of no consequence. A little thing not affecting the claimant's rights.

It is bounded:
Mauka by the land of Kaulaohukai
Olowalu by the land of Paakai
Makai by the land of Moakaka
Kaanapali by Keawe's land.

N.T. 11-12v5
No. 6073, Halepaka and Aui's wife [Aue is wife]

Kaaa, sworn, He has seen Halepaka's interest in the `ili of Kapaaku of the Moalii ahupuaa which Kaaa had given. There are farming moos and a house lot, some of which had belonged to Kaliihiai who had lived there before 1839, no one had objected. At the time there has been a slight objection but the claim is secure.

The boundaries are:
Mauka by Kaulokukui's land
Olowalu by Paakai's land

Makai by Mioakaka's land
Kaanapali by Keawe's land.

[Award 6073; R.P. 1182; Kapaahu Moalii Lahaina; 1 ap.; 2 Acs 2 roods 21 rods]

06205 to Olelo

Claim Number:	06205	**House Lot:**	1
Claimant:	Olelo	**Awarded:**	1
Island:	Maui	**NR:**	355v6
District:	Lahaina	**FT:**	102v7
Ahupuaa:	Kooka	**NT:**	27v5
Apana:	2	**RP:**	2723
Loi:	6	**Number of Royal Patents:**	1
Kula:	3	**Pali:**	Yes

Cl. 6205, Olelo
F.T. 102v7

Lazaro Namauu, sworn, I know the lands of the claimant. They are in "Kooka," Lahaina. They consist of 3 kula and 6 lois in one piece and one house lot.

The claimant received them from me in the year 1842 and his title has never been disputed. The lois on my half of "Kooka" mentioned in the claim above [10533].

This land is bounded:
Mauka by "Puehuehuiki"
Olowalu by Pahoa
Makai by the pali
Kaanapali by "Waineenui."

The house lot is bounded:
Mauka by my land
Olowalu by "Polanui"
Makai by my land
Kaanapali by "Puaanui"

[Award 6205; R.P. 2723; Kooka Lahaina; 2 ap.; 1.25 Acs 26 rods; See 6203, N.R. 555v5 for Native Register document]

06215 to Keoni

Claim Number:	06215	**Awarded:**	1
Claimant:	Keoni	**NR:**	355v6
Island:	Maui	**FT:**	105v7
District:	Lahaina	**RP:**	1854
Ahupuaa:	Puehuehunui, Lahaina	**Number of Royal Patents:**	1

No. 6215, Keani
F.T. 105v7

A. Moku, sworn, I know the land of the claimant is in Puehuehunui, Lahaina and is in one piece of kula land.

The claimant had this land from Mimai, the blind man in 1847. Maimai had it from Maimai in 1845 and these titles have never been disputed.

It is bounded:
Mauka by the land of Kaleimikio[?]
Olowalu by Kaalalo
Makai by my land
kaanapali by the poalima land.

The claimant has gone to California.

[Award 6215; R.P. 1854; Puehuehunui lahaina; 1 ap.; .88 Ac.; See 6203, N.R. 555v6 for Native Register document]

06218 to Mauae

Claim Number:	06218	**Awarded:**	1
Claimant:	Mauae, wahine	**NR:**	355v6
Island:	Maui	**FT:**	187v7
District:	Lahaina	**RP:**	1184
Ahupuaa:	Waineenui	**Number of Royal Patents:**	1

No. 6218, Mauae
F.T. 187v7

Waihele, sworn, I know the lands of the claimant is in "Waineenui," in 2 pieces.

No. 1 is a house lot and 4 moos.
No. 2 is a piece of kalo land.

The claimant received this land from me in 1841 and I had it from Kuakini in 1838. His title nor mine was ever disputed.

No. 1 is bounded:
Mauka by Maio's land
Olowalu by Puaa and Kaeo
Makai by J. Nowlein's lot
Kaanapali by Waineeiki.

No. 2 is bounded:
Mauka by Helelualani's land
Olowalu by Puaa
Makai by Aa's land
Kaanapali by Waineeiki.

N.T. 68v5
No. 6218, Mauae

Waihele sworn He has seen 2 sections at Waineenui Land from Kuakini through Waihele in 1838, no opposition.

Section 1 - House.
Mauka by Maii's land
Olowalu by Kaeo's eleele land
Makai by Kimo Iaolene's land
Kaanapali by Waineeiki land.

Section 2 - Taro.
Mauka by Helelualani's land
Olowalu by Puaa of Kuakamauna land
Makai by AA
Kaanapali by Wainee of Kalipaihala land.

[Award 6218; R.P. 1184; Waineenui Lahaina; 4 ap.; 1.46 Acs; See 6203, N.R. 555v6 for Native Register document]

06424 to Kanehoewaa

Claim Number:	06424	**Awarded:**	1
Claimant:	Kanehoewaa	**NR:**	370v5
Island:	Maui	**FT:**	18v7
District:	Lahaina	**RP:**	1840
Ahupuaa:	Moalii	**Number of Royal Patents:**	1

No. 6424, Kanehoewaa, Lahaina, February 4, 1848
N.R. 371v6

Greetings to the Commissioners of the Mo`i: I have a little claim for a lot, at Moalii, adjoining the flowing stream; it is 68 fathoms long by 68 fathoms wide.

[DIAGRAM a]

Furthermore, there is a kihapai for planting sweet potatoes, 11 fathoms in length and 24 fathoms in width /sic/.

This is its diagram

[DIAGRAM b]

This is its diagram, adjoining the stream of Moalii in Lahaina on the Island of Maui.
KANEHOEWAA

F.T. 18v7
Cl. 6424, Kanehoewaa

for house lot and farm

Lelehu, sworn, I know these lands. Claimant had them from Hoaai who had them from me about 10 years since. I had them from Kaahumanu. I never head claimant's title disputed.

The house lot is in Lahaina, the part called Moalii.
Mauka is David Malo's land
Olowalu is Kaulakukui's
Makai is my land
Kaanapali is my yard.
The fence is the true boundary.

The farm lot is bounded:
Mauka by my land
Olowalu by Moalii Creek
Makai by my land and Kaanapali.

[Award 6424; R,P. 1840; Moalii Lahaina; 1 ap.;. 1.6 Acs]

06549 To Hauola

Claim Number:	06549	**Awarded:**	1
Claimant:	Hauola	**NR:**	400v6
Island:	Maui	**FT:**	22v7
District:	Lahaina	**NT:**	25v15
Ahupuaa:	Panaewa, Paeohi	**RP:**	1731, 3584
		Number of Royal Patents:	2

No. 6549, Hauola, Lahaina, Maui, February 4, 1848
N.R. 400-401v6

To the Honorable land Commissioners of Hawaii, Greetings: I, Hauola, hereby state my claim for a lot in the ahupua`a of Paeohi in Lahaina, Maui. That is my claim for a lot and its basis is that I received it from Waiki, and he is the witness.
HAUOLA X, His Mark

F.T. 22v7
Cl. 6549, Hauola

Claim for 1 piece "Paeohi" Lahaina
Kahea, sworn, I know claimant's land in "Paeohi," Lahaina, consisting of a house lot, kalo land & kula in one piece and the fence is the true boundary. Claimant had it from Waiki in time of Kamehameha I and has held undisputed claim till very lately when Z. Kaauwai set up a claim as head man of this land. He has since been superseded by Kapuonui who has not disputed it.

N.T. 25v15
No. 6549, Hauola, from Page 22v7

Kaaka, sworn, says she knows the land of Hauola in "Panaewa" Lahaina. It consists of a House Lot and a piece of land for cultivation. He derived it from his parents who held it from the time of Kamehameha I. His title was never disputed until the time his land was measured when the Konohiki disputed his claim to the cultivated land. The House Lot is undisputed. Claimant has always cultivated the piece in dispute and held possession of it. When the present Konohiki came into office, she put some new man on this place as lopas, but they have no right there. The land has been Hauola's land his ancestors' from ancient times.

Waiki, sworn, says he knows the piece of land in dispute, and corroborates the testimony of the last witness in full. The lopas spoken of are new people and have no right whatever to the land.

Kaaikaula, sworn, says he is a stranger in Panaewa & not a Kamaaina.
(Decided in favor of Hauola).

[Award 6549; R.P. 1731; Panaewa Lahaina; 2 ap.; 2.13 Acs (Ap.2); R.P. 3584; Paeohi Lahaina; 2 ap.; 1 Ac. 5 roods 18 rods]

06626 to Nahaolelua

Claim Number:	06626	**Awarded:**	1
Claimant:	Nahaolelua	**NR:**	401v6
Island:	Maui	**FT:**	14v15
District:	Lahaina	**RP:**	1880
Ahupuaa:	Haleu, Kapewakua	**Number of Royal Patents:**	1

No. 6626, Nahaolelua, February 3, 1848
N.R. 401-403v6

Here is something which is stated to you - a petition for a house claim, mauka of the place of Kaluaopele ma, at the tall hala clumps. It is not at all proper for a certain person to enter /a claim/ for this place, because that is for Pane, the konohiki of Haleu.

Here is another place of mine, some mo`os of Haleu, mauka, adjoining Puuhoowali.
NAHAOLELUA

[DIAGRAM]

[Lot of Keaweluaole, Land of Kaluaopele, Land of Richards]

The diagram of the lot of Nahaolelua in Haleu, Lahaina, Maui.

The survey begins on the mauka side of the Mauka Government Road, also adjoining the lot of Keaweluaole, the first side running
South 46Â° 30' East 2 chains 2 8/12 feet to the land of Richards, thence turning and running exactly in the middle of the water course.
North 53Â° 30' East 3 chains 61 feet, turning
North 44Â° 45' East 3 chains, turning
North 41Â° 30' East 55 8/12 feet, turning
North 44Â° West 1 chain 6 8/12 feet, turning
South 51Â° West 52 4/12 feet, turning
North 70Â°15' West 26 8/12 /feet/ to the lot of Keaweluaole, thence running down the middle of the adobe wall
South 16Â° West 15 4/12 feet to the offset place of the wall, turning and running down the middle of the adobe wall
South 54Â° 30' west 6 chains 47 8/12 feet, to the place of beginning
This land contains an area of 1 acre, 150 fathoms 8 feet square
Surveyed 31 January 1848
John Richardson

N.T. 14v15
No. 6626, P. Nahaolelua

Claimant being sworn, deposed that he put in his claims before the Land Commission in the time of Mr. Richards, and they were heard by him at Lahaina, in 1846. The pieces of land were subsequently surveyed by John

Richardson.

Kahookano, sworn, says he knows the lands of Claimant. in Lahaina.

Apana 1 is a House lot with some kalo land adjoining in Haleu.
Apana 2 is a piece of kalo land in Kapewakua.

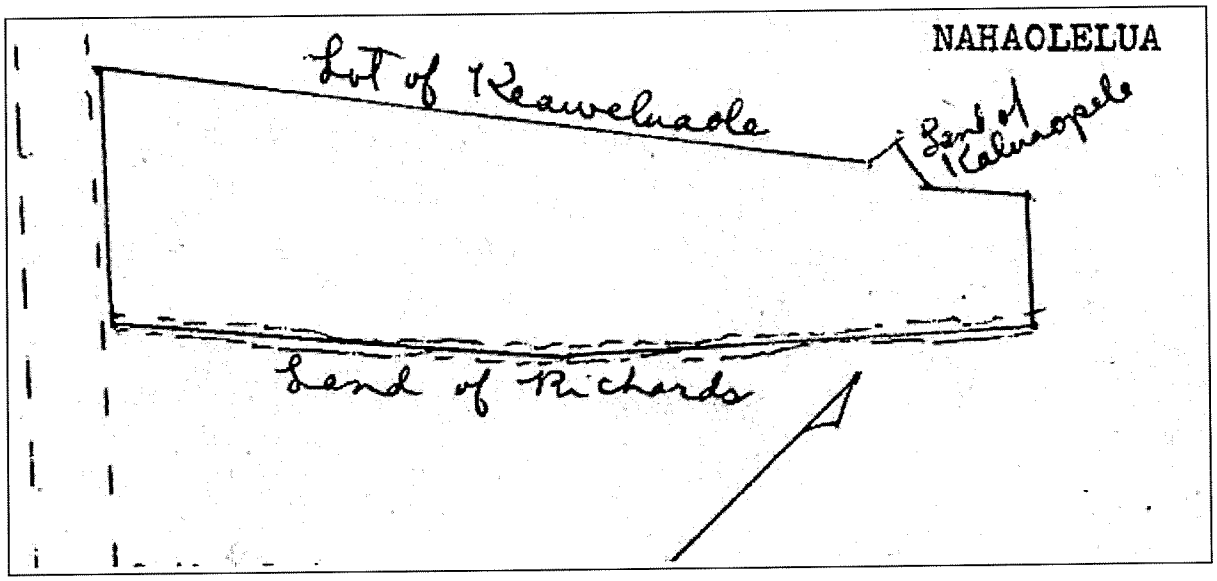
Lot 1 is bounded:
Mauka by Kekela's
Olowalu by Mr. Baldwin's
Makai by the road
Kaanapali by Keaueluaole's.

Lot 2 is bounded:
Mauka by Victoria's land
Olowalu by the same, "Paunau"
Makai by Akoni's land
Kaanapali by Mr. Baldwin's.

Claimant received this land from Kekela in ancient times, and has held it without dispute up to the present time.

[Ilae/Hae?] sworn, says he has heard the testimony given by the last witness and confirms the same in full.

[Award 6626; R.P. 1880; Kapewakua & Haleu Lahaina; 2 ap.; 1.78 Acs]



06760B to Hanalei

Claim Number:	06760B	**Breadfruit:**	8
Claimant:	Hanalei	**Awarded:**	1
Island:	Maui	**NR:**	418v6
District:	Lahaina	**NT:**	129v7
Ahupuaa:	Moalii, Kapunakea	**RP:**	3453
Apana:	5	**Number of Royal Patents:**	1
Loi:	41	**Loko:**	Yes
Plus:	+	**Sea/Shore/Dunes:**	Yes
Kula:	1	**Road/Path:**	Yes
House Lot:	1		

No. 6760B, Hanalei, Lahaina, February 5, 1848
N.R. 418v6

Hear ye, ye Land Commissioners: Here are my 11 lo`i, 30 mo`o, 6 groves*, 1 house lot, 8 breadfruit trees. Here is my name below.
HANALEI

/*Claimant does not say what groves are/

F.T. 129v7
Cl. 6760B, Hanalei, June 8, 1849

Lehulehu, sworn, I know the lands of Hanalei in "Moalii," Lahaina. They are in three pieces, one a house lot, one a kalo land of 8 lois, and one a kula land.

The claimant received these lands from a son of the land, Puhi by name, in 1831. His parents had the land [from a] time out of mind. His title has never been disputed.

The house lot is bounded:
Mauka by the Government road
Olowalu by the pond of Victoria
Makai by the sea
Kaanapali by the konohiki's land.

The kalo land is bounded:
Mauka by the konohiki's land
Olowalu by "Makalii"[?]
Makai by my land
Kaanapali by "Kapahuiki" name of ili

The kalo piece is bounded:
Mauka by my land

olowalu by "Moalii"
Makai by Polea
Kaanapali by the konohiki's land.

[Award 6760B; R.P. 3453; Moalii & Kapunakea Lahaina; 6 ap.; 6 Acs 2 roods 32 rods]

06785 to Kaluahinui

Claim Number:	06785	**Kula:**	1
Claimant:	Kaluahinui	**Awarded:**	1
Island:	Maui	**NR:**	424v6
District:	Lahaina	**FT:**	56v7
Ahupuaa:	Wainee	**RP:**	8248
Apana:	3	**Number of Royal Patents:**	1
Loi:	3		

Cl. 6785, Kaluahinui, June 2, 1849
F.T. 56v7

Kamohomoho, sworn, I know the lands of the claimant. They are in Waineenui, Lahaina. They consist of one piece of kalo and two pieces of kalo land and one of one loi, and the other of two. The claimant received these lands from Kahekaihala, the lord of this land some time in the days of Hoapili in ancient times. And he has possessed them without dispute ever since.

The kula piece is bounded:
Mauka by the land of Namaka
Olowalu by the land of Kuakini
Makai by the land of Kahuna
Kaanapali by the kula of Naleipaihai.

The makai loi is bounded:
Mauka by the lois of Mamaka
Olowalu by the lois of Nau
Makai by the lois of Kaniho
Kaanapali by the land of Ualo.

The other piece is bounded: On all sides by the land of Kalapaihala.

[Award 6785; Land Patent 8248; Waineenui Lahaina; 1 ap.; 2 Acs 12 rods; See 6781 for Native Register document]

06786 to Kamohomoho

Claim Number:	06786	**House Lot:**	1
Claimant:	Kamohomoho	**Awarded:**	1
Island:	Maui	**NR:**	424v6
District:	Lahaina	**FT:**	56v7
Ahupuaa:	Wainee	**RP:**	1183
Apana:	1	**Number of Royal Patents:**	1
Kula:	1		

Cl. 6786, Kamohomoho
F.T. 56v7

Kaluahinenui, sworn, I know the lands of the claimant. They are in Waineenui. They consist of one piece of kula land, with a house thereon

The claimant received this land from Pikanele in the days of Hoapili and his title has never been disputed.

It is bounded:
Mauka by the kula land of Kaleipaihala
Olowalu by the same
Makai by the land of David Malo
Kaanapali by "Puako."

[Award 6786; R.P. 1183; Waineenui Lahaina; 1 ap.; 2.52 Acs; See 6781 for Native Register document]

06787 to Haunaumua

Claim Number:	06787	**Awarded:**	1
Claimant:	Haunaumua	**NR:**	424v6
Island:	Maui	**FT:**	56v7
District:	Lahaina	**RP:**	1701
Ahupuaa:	Waineenui, Moanui	**Number of Royal Patents:**	1

Cl. 6787, Haunaumua
F.T. 57-57v7

Kamanoha, sworn, I know the lands of the claimant. They are two in number. One is a kula land in "Waineenui," and the other a kalo land in Moanui. The land in Moanui is the same which the claimant has claimed in No. 6805.

The land in Waineenui he received from Kaipaihala in the days of Hoapili and in the same olden days he received his kalo land in Moanui from Wahinepu, and his title to them has never been disputed.

The kula land consists of 4 moos and is bounded:
Mauka by the auwai dividing it from Kaleipaihala's land
Olowalu by the land of John K [illegible]
Makai and Kaanapali by the land of Kaleipaihala.

The kalo land is bounded:
Mauka by the land of Kuakini
Olowalu by the creek called Kapaula
Makai by the pali
Kaanapali by the same creek.

[Award 6787; R.P. 1701; Waineenui Lahaina; 2 ap.; 1.75 Acs; See 6781 for Native Register document]

06788 to Kamauoha

Claim Number:	06788	**Awarded:**	1
Claimant:	Kamauoha	**NR:**	424v6
Island:	Maui	**FT:**	57v7
District:	Lahaina	**RP:**	1171
Ahupuaa:	Wainee	**Number of Royal Patents:**	1

Cl. 6788, Kamauoha, June 2, 1849
F.T. 57v7

Hanaumue, sworn, I know the land of the claimant. It is a piece of kula land in "Puako," Lahaina.

The claimant received this land from Pahia at the time they put taxes on the dogs two years ago. Pahia received it from Kalua in the days of Hoapili. He holds his land without dispute.

It is bounded:
Mauka by the kula of "Puako"
Olowalu by "Waineenui"
Makai by the kula of Puako
Kaanapali by the same.

[Award 6788; R.P. 1171; Puako Lahaina; 1 ap.; .8 Ac.; See 6781 for Native Register document]

06795 to Ukukua

Claim Number:	06795	**Kula:**	1
Claimant:	Ukukua	**Awarded:**	1
Island:	Maui	**NR:**	424v6
District:	Lahaina	**NT:**	59v7
Ahupuaa:	Polanui	**RP:**	8401
Apana:	2	**Number of Royal Patents:**	1
Loi:	1	**Stream/Muliwai/River:**	Yes
Plus:	+		

Cl. 6795, Ukukua
F.T. 59v7

Makaulia. sworn, I know the lands of the claimant. it is in "Polanui," Lahaina. It consists of two pieces, one a kula land and the other a kalo land.

The claimant received these lands from me about the year 1840 and he has enjoyed them in peace ever since.

The kula land is bounded:
Mauka by the land of a Koolakai
Olowalu by the Malaekahana
Makai by the land of Malaekahana and Kua
Kaanapali by "Kooka."

The kalo land is bounded:
Mauka by my lois
Olowalu by the same
Makai by the land of Kekaawi
Kaanapali by the stream of "Polanui."

[Award 6795; Land Patent 8401; 2 ap.; 4 Acs 2 roods 13 rods; See No. 6781 for Native Register with multiple claims and 6654 for claim with wrong number in Keokea]

06801 to Opunui

Claim Number:	06801	**Awarded:**	1
Claimant:	Opunui	**NR:**	424v6
Island:	Maui	**NT:**	52v7
District:	Lahaina	**RP:**	4562
Ahupuaa:	Halakaa	**Number of Royal Patents:**	1
Apana:	2	**Koele/Poalima:**	Yes
Loi:	12	**Stream/Muliwai/River:**	Yes
Kula:	1		

Cl. 6801, Opunui, June 2, 1849
F.T. 52v7

Kaeo,, sworn, I know the lands of the claimant. They are in "Halakaa." They consist of 3 moos of kula in one piece and 12 lois of kalo land in one piece. The luna or konohiki Kahua Kaeo has a poalima loi, however, in the middle of this kalo land.

The claimant received these lands from Kauku [[?] the luna of Halakaa in the days of Hoapili, and he has held them in peace ever since.

The kula land is bounded:
Mauka by the land of Kaoeno
Olowalu by Puehuehu iki
Makai by the land of Paikaualani
Kaanapali by the land of Puneauna.

The kalo land is bounded:
"Haleu" by Mauka side
Olowalu by the creek of Paunaula
Makai by "Paunau"
Kaanapali by the same.

[Award 6801; R.P. 4562; Halakaa Lahaina; 2 ap.; 1 Ac. 15 rods; See 6781 for Native Register document]

06853 to Nuhi

Claim Number:	06853	**Awarded:**	1
Claimant:	Nuhi	**NR:**	427v6
Island:	Maui	**NT:**	63v7
District:	Lahaina	**RP:**	1851
Ahupuaa:	Puehuehunui	**Number of Royal Patents:**	1

Cl. 6853, Nuhi
F.T. 63v7

Moku, sworn, I know the lands of the claimant. They are in "Puehuehunui," Lahaina and consist of one kula land and one kalo land of 10 lois. The claimant received these lands from Kalahuna, the luna of Puehuehunui in 1841 and he has held them without dispute to the present day.

The kula land is bounded:
Mauka by the lot of Ana[?]
Olowalu by the poalima land
Makai by my land
Kaanapali by the land of Kanahele.

the kalo land is bounded:
Mauka by the high pali
Olowalu by the land of Umiumi
Makai by the land of Luikaa
Kaanapali by the land of Kainakaoo.

[Award 6853; R.P. 1851; Puehuehunui Lahaina; 1 ap.; 1.40 Acs.; See No. 6851 Kahula ma for Native Register document]

06856 to Kawau

Claim Number:	06856	**Awarded:**	1
Claimant:	Kawau	**NR:**	427v6
Island:	Maui	**FT:**	64v7
District:	Lahaina	**RP:**	2750
Ahupuaa:	Puunau	**Number of Royal Patents:**	1

Cl. 6856, Kawau
F.T. 64v7

Kaihoiaku[?], sworn, I know the lands of the claimant. they are in "Paunau nui," Lahaina. they consist of two pieces, one a kula land, and 22 lois in one kalo land. The kula consists of 3 moos. the claimant received these lands from me, I being the luna of the land, Paunaunui in 1829, and he has held them in peace ever since. Paki is the Lord of the land.

The kula land is bounded:
Mauka by my land
Olowalu by the poalima
Makai by the Meeting House lot
Kaanapali by "Paunauiki."

The kalo land is bounded:
Mauka by the land of "Kupalii"[?]
Olowalu by the creek of Kanaula
Makai by the land of Auli[?]
Kaanapali by my land.

[Award 6856; R.P. 2750; Paunaunui Lahaina; 1 ap. 1 rood 19 rods; no R.P. Paunau Lahaina; 1 ap. 1 rood 26 rods; See No. 6851 Kahula ma for Native Register document]

06870 to Pupule

Claim Number:	06870	**Awarded:**	1
Claimant:	Pupule	**NR:**	427v6
Island:	Maui	**FT:**	71v6/8v16
District:	Lahaina	**RP:**	2714, 8266
Ahupuaa:	Makila	**Number of Royal Patents:**	2
Apana:	3	**Koele/Poalima:**	Yes
Loi:	1	**Sea/Shore/Dunes:**	Yes
Plus:	+	**Road/Path:**	Yes
Kula:	1	**Stream/Muliwai/River:**	Yes
House Lot:	1	**Pali:**	Yes

Cl. 6870, Pupule [wahine]
F.T. 71-72v6

Kainokane, sworn, I know the lands of the claimant. It is in two pieces; one a kula of 2 moos, and the other a section of kalo land. The claimant received these lands from Kaulunae in 1838 and she has had [them] in peaceably [peaceable] possession ever since.

It is bounded:
Mauka by the land of Kelehoula
Olowalu by the poalima land
Makai by the alanui Aupuni
Kaanapali by the land of Holi.

The kalo land is bounded:
Mauka by the land of Kahulanui
Olowalu by the creek of Kanaula
Makai by the land of Holi
Kaanapali by the high pali.

There are two poalima lois in this kalo section.

There is a house lot which is bounded:
Mauka by the Alanui Aupuni
Olowallu by the lot of Kane
Makai by the sea beach
Kaanapali by the land of Kaiwiopiopio.

F.T. 8v16
No. 6870, Apana 2, Pupule

Pupuka, hoohikiia, Ua ike au i kona Apana aina ma "Makila" iuka o Kauaula, Lahaina, Maui.

1 Apana kalo.
Mauka aina o Kukui me Kahulanui
Kaanapali he pali
Makai aina o Holi
Olowalu he Kahawai me aina o Konohiki.

Ua loaa ia ia keia aina no Kalalea kana kane mai i ka makahiki 1834 a 1835 paha, a ua noho oluolu a keia wa, aole mea keakea.

Kawelo, hoohikeia, Ua like pu kou ike me kona, aole keakea.

[Award 6870; R.P. 2714; Makila Lahaina; 2 ap. 2.07 Acs; R.P. 8266; Makila Lahaina; 1 ap.; 2 roods 20 rods; See No. 6851 Kahula ma for Native Register document; See also Award 3491B]

06877 to Kahili

Claim Number:	06877	**Awarded:**	1
Claimant:	Kahili	**NR:**	427v6
Island:	Maui	**FT:**	75v7
District:	Lahaina	**RP:**	5587
Ahupuaa:	Paunauiki	**Number of Royal Patents:**	1
Apana:	7	**Koele/Poalima:**	Yes
Loi:	4	**Road/Path:**	Yes
Plus:	+	**Stream/Muliwai/River:**	Yes
Kula:	3	**Pali:**	Yes
		Miscellaneous:	Government road

No. 6877, Kapili [Kahili]
F.T. 75-76v7

Kua, sworn, I know the lands of the claimant. They are in Paunauiki," Lahaina. They consist of 3 pieces of kula and 4 of kalo. The claimant received these lands from the King in the days of Hoapili in ancient times. His title has never been disputed.

The piece of kula of 6 moos is bounded:
Mauka by the land of Kuhaopao
Olowalu by the poalima land
Makai by Haupu and my land
North by Paunaunui."

The kula of one moo is bounded:
Mauka by the land of Kahaulua
Olowalu by "Halakaa"
Makai by the creek of Paunauiki
North by the poalima kula and the same creek.

The other piece of kula is bounded:
Mauka by the road leading to Olowalu
Olowalu by the land of Haupu
makai by the great Government road
North by the poalima land.

The first piece of kalo land of 2 lois is bounded:
Mauka by the land of Powai[?]
Olowalu by the high pali
Makai by the land of Hekona
Kaanapali y the poalima land.

The 2d kalo patch is bounded:
Mauka by the poalima loi
Olowalu by the pali

Makai by the land of Hai
North by the land of Hekona.

The 3d piece of kalo is bounded:
Mauka by my land
Olowalu by the high pali
Makai by the poalima land
kaanapali by my land.

The last piece of kalo is bounded:
Mauka by the poalima land
Olowalu by the pali
Makai by Hae's land
Kaanapali by Poonui's land.

[Award 6877; R.P. 5587; Paunauiki & Kauaula; 6 ap.; 1 Ac. 26 rods; See No. 6851 Kahula ma for Native Register document]

06878 to Kauhiheha

Claim Number:	06878	**Awarded:**	1
Claimant:	Kauhiheha	**NR:**	427v6
Island:	Maui	**FT:**	76v7
District:	Lahaina	**RP:**	2749, 4557
Ahupuaa:	Puehuehu	**Number of Royal Patents:**	2
Apana:	4	**Koele/Poalima:**	Yes
Loi:	10	**Road/Path:**	Yes
Plus:	+	**Burial/Graveyard:**	Yes
Kula:	2	**Pali:**	Yes
		Miscellaneous:	Road leading to meeting house

No. 6878, Kauhiheha [Kauhihape]
F.T. 76v7

Kua, sworn, I know the lands of the claimant. They are in "Paunauiki," Lahaina. They consist of 4 pieces, 2 of kula land and 2 of kalo land one containing 4 lois, the other 6 lois.

The claimant received these lands from me in the days of King Kamehameha II and he has held the without dispute up to the present day.

The first piece of kula is 2 moos is bounded:
Mauka by Haupu's land
Olowalu by the land of Kuhaulua
Makai by the road leading mauka of the meeting house to Olowalu
Kaanapali by "Paunaunui."

The second piece of kula likewise contains 2 moos and is bounded:
Mauka by the pali
Olowalu by Kuhaulua's land
Makai by the grave yard
Kaanapali by "Paunaunui."

The kalo land of 6 lois is bounded:
Mauka by the poalima lois
Olowalu by the poalima and Moos and my land
Makai by Poonui's land
Kaanapali by the same.

The kalo land of 4 lois is bounded:
Mauka by Poonui's land
Olowalu by Kapili's land
Makai by the poalima lois
Kaanapali by Poonui's land.

[Award 6878; R.P. 4557 Paunauiki Lahaina; 2 ap.; 3 roods 25 rods; Kauaula Lahaina; 3 ap.; 19 rods; & R.P. 2749; Paunauiki & Kauaula Lahaina; 5 ap.; 1.21 Acs; See No. 6851 Kahula ma for Native Register document]

06879 to Kuhaulua

Claim Number:	06879	**Awarded:**	1
Claimant:	Kuhaulua	**NR:**	427v6
Island:	Maui	**FT:**	78v7
District:	Lahaina	**RP:**	4556
Ahupuaa:	Paunauiki	**Number of Royal Patents:**	1
Apana:	2	**Road/Path:**	Yes
Loi:	7	**Stream/Muliwai/River:**	Yes
Plus:	+	**Miscellaneous:**	Governement road
Kula:	2		

No. 6879, Kuhaulua [Kauhielua]
F.T. 78v7

Kua, sworn, I know the lands of the claimant. They are in "Paunauiki," Lahaina. They consist of 2 pieces of kula land, one containing 7 moo, the oher 2 moo. The claimant received these lands in the days of King Kamehameha [II] in 1844 from me as luna and he possessed them in peace ever since.

The first piece contains of 7 moos is bounded:
Mauka by "Halakaa"
Olowalu by the same
Makai by the same and Haliili's land
Kaanapali by Hekona's land.

The other piece is bounded:
Mauka by the creek of Paunau
Olowalu by Haupu's land
Makai by the Government road leading to Olowalu
Kaanapali by Kauhiheha's land.

[Award 6879; R.P. 4556; Paunauiki Lahaina; 2 ap.; 1 Ac. 1 rood 33 rods; See No. 6851 Kahula ma for Native Register document]

06887 to Kuakaha

Claim Number:	06887	**Awarded:**	1
Claimant:	Kuakaha	**NR:**	427v6
Island:	Maui	**FT:**	82v7
District:	Lahaina	**RP:**	5703
Ahupuaa:	Kaulalo	**Number of Royal Patents:**	1
Apana:	1	**Pali:**	Yes
Loi:	3		

No. 6887, Kuakaha, June 4, 1849
F.T. 82v7

Kamohai, sworn, I know the land of the claimant; [It] is in "Kaulalo," Lahaina and consists of 3 lois in one piece. The claimant received it from Pinauea in the days of Namakeha, and his title has never been disputed.

It is bounded:
Mauka by Pinauea's land
Olowalu by Poopuu's land
Makai by Makakuia's land
Kaanapali by the high pali.

[Award 6887; R.P. 5703; Kauaula Lahaina; 1 ap.; 2 roods 14 rods; See No. 6851 Kahula ma for Native Register document]

06895 to Kauakahi

Claim Number:	06895	**Kula:**	3
Claimant:	Kauakahi	**Awarded:**	1
Island:	Maui	**NR:**	427v6
District:	Lahaina	**FT:**	96v7
Ahupuaa:	Puehuehunui	**RP:**	4507
Apana:	4	**Number of Royal Patents:**	1
Loi:	3	**Koele/Poalima:**	Yes
Plus:	+	**Stream/Muliwai/River:**	Yes

No. 6895, Kauakahi
F.T. 96v7

Moku, sworn, I know the lands of the claimant. They are in "Puehuehunui," Lahaina and it consists of 3 pieces of kula and 3 of kalo.

The claimant received these lands from Nalima in the year 1832 and has possessed them i peace ever since.

The first piece of kula has no lois and is bounded:
Mauka by Hanakaipo's land
Olowalu by Kuhi's land
Makai by my land
Kaanapali by Puehuehuiki.

The second piece of kula has 2 lois connected with it and is bounded:
Mauka by Keliuhua's land
Olowalu by the creek of Puehuehu
Makai by Hanakaoo's land
Kaanapali by "Halakaa."

The 3d piece of 2 lois is bounded:
Mauka by Umi's land
Olowalu by the creek of Puehuehu
Makai by Keliuhua's land
Kaanapali by Kokino's land

The 4th piece is bounded:
Mauka by "Waineenui"
Olowalu by Kanakoa's land
Makai by the poalima land
Kaanapali by Waineenui.
There are seen lois in this piece.

[Award 6895; R.P. 4507; Puehuehunui Lahaina; 3 ap.; 1.25 Ac. 39 rods; Puehuehunui Lahaina; 1 ap.; 13 Acs; See No. 6851 Kahula ma for Native Register document]

06915 to Haupu

Claim Number:	06915	**Awarded:**	1
Claimant:	Haupu	**NR:**	427v6
Island:	Maui	**FT:**	77v7
District:	Lahaina	**RP:**	5559
Ahupuaa:	Paunauiki	**Number of Royal Patents:**	1
Apana:	2	**Koele/Poalima:**	Yes
Kula:	2	**Road/Path:**	Yes
		Miscellaneous:	Government road

No. 6915, Haupu, H
F.T. 77-78v7

Kua, sworn, I know the lands of the claimant. They are in "Paunauiki," Lahaina. and consist of two pieces of kula land.

The claimant received this land from me in my capacity of luna of Paunauiki in 1843 or 4 and from that time to the present, he has been undisturbed. The King is the great Lord of Paunauiki.

The first piece of kula contains 2 moos is bounded:
Mauka y the poalima land
Olowalu by my land
Makai by Kauhihehe's land
Kaanapali y the land of Kaulanae.

The other piece is bounded:
Mauka by Halakaa
Olowalu by the same
Makai by the Alanui Aupuni
Kaanapali by Kahili's land.

[Award 6915; R.P. 5559; Paunauiki Lahaina; 1 ap.; 1 Ac. 1 rood 2 rods; See No. 6851 Kahula ma for Native Register document]

06916 to Honolii

Claim Number:	06916	**Awarded:**	1
Claimant:	Honolii	**NR:**	427v6
Island:	Maui	**FT:**	80v7
District:	Lahaina	**RP:**	2376
Ahupuaa:	Makila	**Number of Royal Patents:**	1

No. 6916, Honolii
F.T. 80v7

Keawe, sworn, I know the land of the claimant. They are in "Makila," Lahaina. It is one piece of kula which he received from Kaulanae in the days of Hoapili before 1839 and his title has never been disputed.

It is bounded:
Mauka and Kaanapali by the poalima land
Olowalu and Makai by Kalehoula's land.

[Award 6916; R.P. 2376; Makila Lahaina; 1 ap.; 2 roods 5 rods; See No. 6851 Kahula ma for Native Register document]

06920 to Poopuu

Claim Number:	06920	**Kula:**	1
Claimant:	Poopuu, wahine	**Awarded:**	1
Island:	Maui	**NR:**	427v6
District:	Lahaina	**FT:**	83v7
Ahupuaa:	Kaulalo	**RP:**	4554
Apana:	4	**Number of Royal Patents:**	1
Loi:	3	**Stream/Muliwai/River:**	Yes
Plus:	+	**Pali:**	Yes

No. 6920, Poopuu, Wahine, June 4, 1849
F.T. 83v7

Kamohai, sworn, I know the lands of the claimant. They are in "Kaulalo," Lahaina, and consist of 4 pieces; 3 pieces of kalo, and one of kula land. One of the kalo lands has 8 lois, and one kula. Another 1 loi. Another 2 lois. The claimant received them from Kanehiwa in the days of Namakeha and she has never been disturbed in her possessions.

[No.] 1. The first piece of kalo is bounded:
Mauka by Umi's land
Olowalu by Ilikahi
Makai by Makaiwa's land
Kaanapali by the same.

[No.] 2. The next piece is bounded:
Mauka by Kanaula's Creek
Olowalu by Pahoa
Makai by Umi's land
Kaanapali by the pali.

[No.] 3. The last piece is bounded:
Mauka by Pinauea's land
Olowalu by Makila
Makai by Pinauea's land
Kaanapali by Makahiwa's land.

[No.] 4. The kula land is bounded:
Mauka by Puehuehu nui
Olowalu by Makiai's
Kaanapali by Moku's land.

[Award 6920; R.P. 4554; Kaulalo Lahaina; 3 ap.; 1.75 Ac. 24 rods; See No. 6851 Kahula ma for Native Register document]

06921 to Paikaualani

Claim Number:	06921	**Awarded:**	1
Claimant:	Paikaualani	**NR:**	427v6
Island:	Maui	**FT:**	86v7
District:	Lahaina	**NT:**	14v15
Ahupuaa:	Halakaa	**RP:**	2717
		Number of Royal Patents:	1

No. 6921, Paikaualani
F.T. 86v7

Kaiwikuheole, sworn, I know the land of the claimant. They are in "Halakaa," Lahaina. They consist of 2 pieces, one piece of kalo land with two poalima lois inside and one piece of kula makai consisting of 2 moos. There is a house on this last piece.

The claimant received it from Naea, in 1844 and has held quiet possession ever since.

The kalo land is bounded:
Mauka by Kamaka's land
Olowalu bh the high pali
Makai by Punaiwaa's land
Kaanapali by "Haleu.

The other piece is bounded:
Mauka by Kapeke's land
Olowalu by the pali
Makai by Punaiwaa's land
Kaanapali by "Halei."

See page 14 v15

N.T. 14v15
No. 6921, Paikaualani, from Page 86v7

Kaanaana, sworn, says he knows the House Lot of claimant in Lahaina. He is without dispute.

The Lot is bounded:
Mauka by Kukahiko's land
Olowalu by the land called "Alio"
Makai by the public land
Kaanapali by Kaanaana's land.

Kapule, sworn, confirmed the testimony of Kaanaana.

[Award 6921; R.P. 2717; Halakaa Lahaina; 3 ap.; 1.7 Acs; See No. 6851 Kahula ma for Native Register document]

07269 to Auwaa

Claim Number:	07269	**Awarded:**	1
Claimant:	Auwaa	**NR:**	431v6
Island:	Maui	**FT:**	25v7
District:	Lahaina	**RP:**	2732
Ahupuaa:	Haleu	**Number of Royal Patents:**	1

No. 7269, Auwaa, Lahaina, February 10, 1848
N.R. 431v6

Greetings to the Land Commissioners: I, Auwaa, whose name is on this letter, hereby state to you my claims for house lot land and house, kula, and the planted trees, at Haleu, Lahaina, Maui.

The claims are for 12 lo`i, 2 house sites and 2 houses, 3 kula, 2 breadfruits, 2 kukui trees, some grape vines, some neleau trees, and some hala clumps, and some roses.

The rights to these claims which are stated to you in accordance with the law, were given me by Nahaolelua.
AUWAA

F.T. 25v7
Cl. 7269, Auwaa

Nalulu, sworn, I know these lands in "Healu, Lahaina; a small house lot & 12 lois, 3 of which are dry.

Claimant had them from Nahaoleelua in Namakeeha's Governorship. 1842. And has held the lois undisputed, but Nahaoleelua disputed the house lot.

The lois are scattered. I could point them out, but can not define the bounds.

The house lot is bounded:
Mauka by Mua's yard
Olowalu by Lono's place
Makai by Wahaoleelua's yard
Kaanapali by "Paunau."

Lono, sworn, I know Auwaa's house lot in "Healu." He had it from Nahaoleelua about 1842 and has held it to this time, but disputed by Nahaoleelua who made Auwaa head man of "Healu" and gave him this place to live in. I think it should be Nahaoleelua's now that auwaa is no longer had man.

Nalulu recalled I am of the same opinion as to the right of Nahaoleelua.

[Award 7269; R.P. 2732; Haleu Lahaina; 5 ap.; 1 Ac. 22 rods]

07582 to Kipa

Claim Number:	07582	**Awarded:**	1
Claimant:	Kipa, Eseta	**NR:**	358v5
Island:	Maui	**FT:**	458v10
District:	Lahaina	**RP:**	8393
Ahupuaa:	Kuhua	**Number of Royal Patents:**	1
Apana:	1		

No. 7582, Esela Kipa, Honolulu, February 9, 1848
N.R. 358v5

To the Land Commissioners, greetings to you all: I hereby enter my claim for land, from the Mo`i, at Lahaina, Maui, of the entire Ahupua`a from the upland to the sa, and all the unused places of the land. That is my claim. The name of this land of mine is Kuhuanui.
It is finished,
Aloha, I am, respectfully,
ESELA KIPA X

N.T. 458v10
No. 7582, E. Kipa

Kuhua ahupuaa, Lahaina, Maui
This distribution is correct and the land written above is for Kipa, he shall present it before the land officers who settle claims.
(sign) Kamehameha
28 January 1848

[Award 7582; R.P. 8393, Kuhua Lahaina (ahupua`a); 1 ap.]

07587*M to Kealoha

Claim Number:	07587*M	**Ahupuaa:**	Kipili
Claimant:	Kealoha, Luisa	**Apana:**	1
Other Name:	Kealoha, Luika	**Awarded:**	0
Island:	Maui	**NR:**	358v5
District:	Lahaina	**NT:**	219, 316v10

No. 7587*M, Luika Kealoha
N.R. 358v5

Luita Kealoha's share from the Mo'i: Puahuula, an 'Ili of Kaneohe, Oahu/and/Kapili Ahupua'a in Lahaina. By direction to have the title quieted, it is for you to work on.
Respectfully,
LUITA KEALOHA
9 February 1848

N.T. 219v10
No. 7587, Luisi Kealoha

Puahuula ili for Kaneohe, Koolaupoko, Oahu.
Kipili ahupuaa, Lahaina, Maui.
TRUE COPY
A.G. Thruston, Clerk, Interior Department
14 April 1853

See page 316

N.T. 316v10
No. 7587, Luisi Kealoha (from page 219), 29 September 1853

Luisi Kealoha's lands in the Registry of the Mahle Book.
Puahuula ili for Kaneohe, Koolaupoko, Oahu.
Kopili ahupuaa, Lahaina, Maui.
True Copy
A.G. Thruston, Clerk, Interior Department

[No. 7587 not awarded on Maui; See Oahu]

07711 to Kaiheekai

Claim Number:	07711	**Awarded:**	1
Claimant:	Kaiheekai, John H.	**NR:**	440v6
Island:	Maui	**FT:**	126v7
District:	Lahaina	**RP:**	3582
Ahupuaa:	Puuhoowali	**Number of Royal Patents:**	1
Apana:	2		

No. 7711, Kaiheekai, I.H.
N.R. 440v6

To the Land Commissioners: Here is my claim for land in Lahaina: Puahoowali Ahupua`a. That is my claim.
Respectfully,
I.H. KAIHEEKAI
Honolulu, Feb 8, 1848

F.T. 126v7
Cl. 7711, John H. Kaiheekai, 8 June 1849

The claimant offered in evidence a paper showing that at the recent division of lands with the King, he was permanently confirmed in his possession and ownership of the Ahupuaa of "Puahoowali" in Lahaina. There are only three men living on this land. Their names are: Kauailipi and Lono and ....

The name of the land given to the King by the claimant is "Polapola," in Kipahulu.

[Award 7711; R.P. 3582; Puuhoowali Lahaina; 3 ap.; 3 roods 17 rods; See also Awards 484 & 11086]

07713*M to Kamamalu

Claim Number:	07713*M	**Apana:**	55
Claimant:	Kamamalu, Victoria	**Awarded:**	1
Island:	Maui	**NR:**	440v5, 569v5
District:	Lahaina, Wailuku, Hamakualo	**FT:**	408v3
Ahupuaa:	Waihee, Paunau, Aki, Kelawea, Moalii, Kalua, Haiku, Makapuu, Kawela, Onouli, Kaumanu, Kahalehili, Kaeleku, Honokolani, Kawaipapa, Niumalu, Palemo, Pakakia, Kahuakamalii, Ihuula, Oloewa, Papalauhau, Mokae, Puekahi, Puuiki, Kapohoe, Pukuilua, Kaou, Hal	**NT:**	650v1
		RP:	4475
		Number of Royal Patents:	1

No. 7713*M, Victoria Kamamalu, Land Division, See Page 569
N.R. 440-444v5

Opukaula, `Ili, Waimano, Ewa, Oahu
Kilauluna, `Ili, Waimano, Ewa, Oahu
Hananau, `Ili, Waimano, Ewa, Oahu
Kanenelu, `Ili, Waimano, Ewa, Oahu
Pohe, `Ili, Waimano, Ewa, Oahu
Kaulu, `Ili, Waimano, Ewa, Oahu
Kapuna, `Ili, Waimano, Ewa, Oahu
Poupouwela, `Ili, Manaiki, Ewa, Oahu
Kapaloa, `Ili, Waiawa, Ewa, Oahu
Panio, `Ili, Waiawa, Ewa, Oahu
Kuhialoko, `Ili, Waiawa, Ewa, Oahu
Kahoaiai, `Ili, Waiawa, Ewa, Oahu
Papaa, `Ili, Waiawa, Ewa, Oahu
Kaohai, `Ili, Waiawa, Ewa, Oahu
Kalona, `Ili, Waiawa, Ewa, Oahu
Kuhiawaho, `Ili, Waiawa, Ewa, Oahu
Kapuaihalulu, `Ili, Waiawa, Ewa, Oahu

2.
Haleaka, `Ili, Waiawa, Ewa, Oahu
Piloaumoa, `Ili, Waiawa, Ewa, Oahu
Kionaole, `Ili, Waiawa, Ewa, Oahu
Hanakehau, `Ili, Waiawa, Ewa, Oahu
Kapopou, `Ili, Waiawa, Ewa, Oahu
Kalimukele, `Ili, Waiawa, Ewa, Oahu
Kumuulu, `Ili, Waiau, Ewa, Oahu
Hapuna, `Ili, Kalihi, Kona, Oahu
Waiaula, `Ili, Kalihi, Kona, Oahu
Kalaepohaku, `Ili, Kapalama, Oahu
Kauluwela, `Ili, Honolululu land, Oahu
Kanewai, `Ili, Waikiki, Oahu
Kapaakea, `Ili, Waikiki, Oahu
Komoawaa, `Ili, Waikiki, Oahu

Waialae, `Ili, Waikiki, Oahu

3.
Halawa, Ahupua`a, Koolau, Molokai

Kaa, Ahupua`a, Lanai

Kelawea, Ahupua`a, Lahaina, Maui
Moalii, Ahupua`a, Lahaina, Maui
Aki, Ahupua`a, Lahaina, Maui
Paunau, Ahupua`a, Lahaina, Maui
Waihee, Ahupua`a, West Puali, Maui
Kalua, `Ili, Wailuku, Maui
Haiku, Ahupua`a, Hamakualoa, Maui
Makapuu, Ahupua`a, Hana, Maui
Kawela, Ahupua`a, Hana, Maui
Onouli, Ahupua`a, Hana, Maui
Kaumanu, Ahupua`a, Hana, Maui
2 Kahalehili, Ahupua`a, Hana, Maui
3 Kaeleku, Ahupua`a, Hana, Maui
Honokalani, Ahupua`a, Hana, Maui
Kawaipapa, Ahupua`a, Hana, Maui
5 Niumalu, Ahupua`a, Hana, Maui
2 Palemo, Ahupua`a, Hana, Maui
3 Pakakia, Ahupua`a, Hana, Maui
2 Kahuakamalii, Ahupua`a, Hana, Maui
Ihuula, Ahupua`a, Hana, Maui
Oloewa, Ahupua`a, Hana, Maui
4 Papalauhau, Ahupua`a, Hana, Maui
4 Mokae, Ahupua`a, Hana, Maui
Puekahi, Ahupua`a, Hana, Maui
Puuiki, Ahupua`a, Hana, Maui
3 Kapohoe, Ahupua`a, Hana, Maui
Pukuilua, Ahupua`a, Hana, Maui
2 Kaou, Ahupua`a, Hana, Maui
Halehana, Ahupua`a, Hana, Maui
Kaukuhalahala, Ahupua`a, Hana, Maui
2 Piapia, Ahupua`a, Hana, Maui
Koakapuna, Ahupua`a, Hana, Maui
Kawaalua, Ahupua`a, Hana, Maui
Pueokahi, Ahupua`a, Hana, Maui
Pueokauiki, Ahupua`a, Hana, Maui
Pohakanele, Ahupua`a, Hana, Maui
Ahuakaio, Ahupua`a, Hana, Maui
Kihapuhala, Ahupua`a, Hana, Maui
Papahawahawa, Ahupua`a, Hana, Maui
Muolea, Ahupua`a, Hana, Maui
Puuhaoa, Ahupua`a, Hana, Maui
Kahalawe, Ahupua`a, Hana, Maui
Ohia, Ahupua`a, Hana, Maui
Kolokole, Ahupua`a, Hana, Maui
Kapuuomahuka, Ahupua`a, Hana, Maui
Mahulua, Ahupua`a, Hana, Maui

Poopoo, Ahupua`a, Hana, Maui
Lapalapaiki, Ahupua`a, Hana, Maui
Waieli, Ahupua`a, Hana, Maui
Paihala, Ahupua`a, Hana, Maui
Kalihi, Ahupua`a, Hana, Maui
Kakiweka, Ahupua`a, Hana, Maui
Kailihiakoko, Ahupua`a, Hana, Maui
Puukohola, Ahupua`a, Hana, Maui
Kahalawe, Ahupua`a, Hana, Maui
Puaaluu, Ahupua`a, Hana, Maui

Kahua, Ahupua`a, Kohala, Hawaii
Honokane, Ahupua`a, Kohala, Hawaii
Holualoa 1,2, Ahupua`a, Kona, Hawaii
Kahaluu, Ahupua`a, Kona, Hawaii
Keopunui, Ahupua`a, Kona, Hawaii
Keauhou, Ahupua`a, Kona, Hawaii
Honuaino, Ahupua`a, Kona, Hawaii
2 Honokua, Ahupua`a, Kona, Hawaii
Haukalua 1, 2, Ahupua`a, Kona, Hawaii
Pakini, Ahupua`a, Kau, Hawaii
Keauhou, `Ili, KapapalaKau, Hawaii
Kahuai, Ahupua`a, Puna, Hawaii
Kauhaleau, Ahupua`a, Puna, Hawaii
Kauaea, Ahupua`a, Puna, Hawaii
Piopio, Ili in Waiakea, Puna, Hawaii
Kalalau, Ahupua`a, Puna, Hawaii
Honohononui, `Ili in Waiakea, Puna, Hawaii
Pahoehoe, Ahupua`a, Puna, Hawaii
Onomea, Ahupua`a, Puna, Hawaii
Alae, Ahupua`a, Puna, Hawaii
Kekelani, `Ili in Waimanu, Hamakua, Hawaii
Kuilei, Ahupua`a, Puna, Hawaii

N.R. 569v5
0No. 7713, Victoria Kamamalu, from page 440

Victoria Kamamalu's lands in the Mahele by the Mo`i, in the month of January 1848, continued:

Huleia, a district of Kauai, however, the Government cattle shall graze there.
Makaweli, Ahupua`a, Kona, Kauai
Places unsuitable for the soldiers and the fort
Maunalua, `Ili, Waimanalo, Koolaupoko, Oahu
Pahoa, `Ili, Waianae, Waianae, Oahu
Kaluanui, Ahupua`a, Koolauloa, Oahu
Kawailoa, Ahupua`a, Waialua, Oahu
Paalaa, Ahupua`a, Waialua, Oahu
Kaelepulu, `Ili, Kailua, Koolaupoko, Oahu
Kikiwelawela, `Ili, Kaneohe, Koolaupoko, Oahu

F.T. 408-411v3
No. 7713, V. Kamamalu
No. 10474, N. Namauu

No. 7716, R. Keelikolani
No. 7714B, M. Kekuaiwa
No. 7712, M. Kekuanaoa [7712B]
A True Copy
(Sig). A. G. Thurston
Clerk Interior Department.
Copy of the Division of Lands agreed upon in Privy Council August 27, 1850

Kekuanaoa and his children to receive Fee simple titles for those lands here set off to them- they resigning to the Gov. all title to the other lands granted them in the Buke Mahele.

No. 7713, Ko Victoria Kamamalu mau aina ma ke ano Alodio

Honokane, Ahupuaa, Kohala, Hawaii
Kahua, Ahupuaa, Kohala, Hawaii
Keopu, Ahupuaa, Kona, Hawaii
2 Holualoa, Ahupuaa, Kona, Hawaii
Kahaluu, Ahupuaa, Kona, Hawaii
Keauhou, Ahupuaa, Kona, Hawaii
Honuaino, Ahupuaa, Kona, Hawaii
Honokua, Ahupuaa, Kona, Hawaii
Pakini, Ahupuaa, Kau, Hawaii
Keauhou, Ili is Kapapala, Kau, Hawaii
Kahuwai, Ahupuaa, Puna, Hawaii
Kauwalehau, Ahupuaa, Puna, Hawaii
Kauaea, Ahupuaa, Puna, Hawaii
Honohononui, ili o Waiakea, Hilo, Puna, Hawaii
Piopio, ili o Waiakea, Hilo, Puna, Hawaii
Kalalau, Ahupuaa, Puna, Hawaii
Pahoehoe, Ahupuaa, Hilo, Hawaii
Alae, Ahupuaa, Puna, Hawaii
Onomea, Ahupuaa, Puna, Hawaii
Kuilei, Ahupuaa, Hamakua, Hawaii
Kekelani, ili no Waimanu, Hamakua, Hawaii

Kalua, Ahupuaa, Wailuku, Maui
Waihee, Ahupuaa, Puali, Kom. [Komohana]

Aki, Ahupuaa, Lahaina, Maui
Paunau, Ahupuaa, Lahaina, Maui
Kelawea, Ahupuaa, Lahaina, Maui

Halawa, Ahupuaa, Koolau, Molokai

Kaa, Ahupua, Kona, Lanai

Maunalua, ili no Waimanalo, Koolaupoko, Oahu
Kaelepulu, ili no Kailua, Koolaupoko, Oahu
Kikiwelawela, Ahupuaa, Heeia, Koolaupoko, Oahu
Kaluanui, Ahupuaa, Koolauola, Oahu
Kawailoa, Ahupuaa, Wailalua, Oahu
Paalaa, Ahupuaa, Waialua, Oahu
Waiawa, Ahupuaa, Ewa, Oahu

Pahoa, ili no Waianae, Waianae, Oahu
He mau ili ma Waimano, Ewa, Oahu
Poupouwela, ili in Mananaiki, Ewa, Oahu
Kumuulu, no Waiau, Ewa, Oahu
Kapuna no Kalihi, Kona, Oahu
Waiaula no Kalihi, Kona, Oahu
Kalaepohaku no Honolulu, Kona, Oahu
Kauluwela no Honolulu, Kona, Oahu
Kapaakia no Waikiki, Kona, Oahu
Komowaa no Waikiki, Kona, Oahu
Kanewai no Waikiki, Kona, Oahu
Waialae no Waikiki, Kona, Oahu

Makaweli, Ahupuaa, Kauai
Huleia, Puna, Kauai
Kikiaola, Waimea, Kauai

Ko ke Aupuni hapakolu loko o ko V. Kamamalu mau aina. Makapuu, Kawela, Oniuli, Kaumanu, 2 Kahalehili, Kaeleku, Honokalani, Kawaipapa, 5 Niumalu, 2 Palemo, 2 Pakakea, Nahuakamaii, Ihuuloi, Hoewaa, 2 Papauhau, Hamoa, 3 Mokae, Puekahi, Puuiki, 3 Pohue, Pukuilua, Haou, Halehana, Kaukuhalahala, Peapea, Koakupuna, Kawalua, Pueokauiki, Pohakanele, Ahuakaio, Kihapuhala, Papahawahawa, Muolea (The above ahupuaa in Hana, Maui) Moalii Ahupuaa Lahaina Maui.

F.T. 538-539v3
No. 7713, M. Kekuanaoa (for Victoria), 1 April 1854, Counter the government

A. Paki, sworn, for the Government, Knows that the fish pond called "Kawa", in Honolulu, was broken up in the year 1847 & the materials of the wall taken to help to construct the wall or breakwater erected by the Government on the west side of the harbor. The Government got permission from M. Kekuanaoa to take the materials of the wall of "Kawa" to make the Breakwater. He did not give the Government any portion of the soil of "Kawa," or of "Kaakaukukui." The land on which now stands the Government slaughter House, occupied by John Meek, is a portion of the ili of "Kalui."[?] I do not know what title the Government has to that place, but I have heard that Kekualoa had given it to the Government - this I state as hearsay only.

G.P. Judd, sworn, for Government, says, I was the Hawaiian Minister of Finance in the year 1847, and remember when the wall was built from the present lime kiln House running over to the land of sea & Sumner, Known as Kohololoa." It was built to prevent the filling up of the Harbor of Honolulu. It was thought advisable to remove a part of the wall of a fish pond in "Kawa," which I supposed belonged to the Government. Finding, however, that it was claimed by M. Kekuanaoa, for Victoria, Mr. Young and I applied to him for the privilege of removing it, which he granted to us, and accordingly it was removed under the direction of Piikoi and the stones put into the new wall first named, and my impression is that we built a new partition wall for the Governor's fishpond. I will not be certain however. Piikoi will know. Piikoi ran a plow through the fish pond to give direction to the stream and divert it from the harbor. I never knew of any definite cession of the fish pond or other land to the Government, but I think Kekuanaoa consented that the Government should divide the fish pond, in Privy Council. I didn't know that he claimed the land where the wall runs from the Lime Kiln, but I don't recollect that he said anything particular about it.

See P. 548. [about Pearl Harbor]

F.T. 548v3
No. 7713, M. Kekuanaoa (V. Kamamalu), Aprila 19, 1854, counter the Government, from page 538

Keone Ana, sworn says, I have nothing to testify to in reference at the claim of M. Kekuanaoa in Kaakuukukui, pertaining to the wall built to protect the harbor from filling in, which wall runs from the Lime Kiln to Sea & Sumner's land.

I am sure he gave it to Government in 1847, but I will not swear anything about it until I have laid the matter before the Privy Council, as to "Kaliu," he said he had nothing to say.

To page 555

F.T. 555-557v3
No. 7713, M. Kekuanaoa (for V. Kamamalu) from page 538, counter the Government

Keoni Ani, sworn, presents a plan which he says was made by Order of the King in Council, in the year 1848, perhaps, and placed in my charge, as minister of the Interior. The plan shows two rows of lots laid out from the Beach seaward. The Government built the wall or breakwater in the year 1847, I think. The Government claimed no more land as I understood the matter than what is shown on the plan. When the wall was built by the Government no opposition was made to its erection by any private party. The wall was erected by the Government to prevent the harbor from being filled up with the mud washed down by the Nuuanu River. When this wall was built the wall of the loko called "Kawa" was taken down and the size of the loko reduced. After the wall was built, this plan was made by the Government and laid before the Privy Council, who resolved to sell the lots as laid out for the benefit of the Treasury. Two of the lots were accordingly disposed of with the approval of the Privy Council, to Louis Gravier. After that, a proposition was made in Privy Council to sell some of the lots to a steam boat company, but at the suggestion of M. Kekuanaoa, the proposition was dropped. Kekuanaoa advising the Council that they were disposing of the Government property too fast. After the report of a committee appointed by the Privy Council on the subject of the filling up of the harbor, the Council resolved to remove the wall of the loko called "Kawa" and M. Kekuanaoa assented.

I do not know to whom the land really belonged. I have always seen this, that when the government wanted a piece of land for their purposes, the konohikis have always given their consent. A. Paki, who had charge of Kaliu, and M. Kekuanaoa, who had charge of Kaakaukukui were both in Privy Council at the time referred to. I consider that the place where this wall is built belonged to the Government previous to that time, because by law, the papakoa and the harbor belongs [sic] to the Government. All the chiefs were in Council at the time these things were transacted. The place where the wall is built is papa koa, perhaps, mud perhaps.

Iona Kapena, sworn, says the names of the land lying between the wall of the Government and the loko called "Kawa" are Kaakaukukui and Kaliu. I pointed out the boundary line between Kaakaukukui and Kaliu a few days ago to Messers Lee and Robertson. The boundary has been well known to me ever since I was a boy. The breakwater or wall is built on the land of Kaakaukukui.

M. Kekuanaoa states that he never understood before that the Government meant to take this place now in dispute. I have heard the testimony of Young, who says the Government took it. I gave my consent to the Government to remove the wall of Kawa and for the materials, but I did not intend that the Government should take away any part of Kaakaukukui.

N.T. 598-599v3
No. 7713, V. Kamamalu - protest

M. Kekuanaoa and Mahuka were the persons who settled the land of V. Kamamalu with objections to C. Kanaina's rights to that property over which there was a dispute. Below are the statements of witnesses clarifying their /two/ rights.

Kumuhonua, sworn, I have seen the place over which there is a dispute between C. Kanaina and V. Kamamalu, Kaanaenui is the name. I have seen that it is the center for Waialae. The boundaries as I have seen from Kaiahaki to

Kauhaki, from there to Pohakuaumiumi, then to Kaananiau and run directly to Puukuaka; from there to Kalohupale; Kapahulu is on this side and from there run directly to Kupikipikio point.

Mt. Leahi is for Kapahulu.

The boundaries of the land Kekio: on the mauka direction of Makahuna road is the taro land, detached and following to the sea of Kapua and the coconut grove.

Poo wahine: I am a native of Waiale and since I was very young and at the time of Kahekili, I have known that place over which there is a dispute. Keanaenui is the name and it is the center of Waialae. I have known the boundaries as they are at Kuialauahi to Aumeume Rock, to Kaananiau, to Mount Kuaka and from there to Kalahu to the lae of Kupikipikio. Those are the boundaries which separate Waialae from Kapahulu. Mt Leahi is for Kapahulu.

The land Kekio runs from mauka of Makahuna Street, then separated to the extreme makai to the sea and the coconut grove.

Kuapuu, sworn, I am a land child of Waialae and I have seen the boundaries of Waialae as they were pointed out to me by my parents, from Kuahaki to Kauhaki, therefrom to Aueume Rock and so on just as Poo has related here.

The boundaries of Kekio run from mauka of Makahuna road, then it separates until the extreme makai of Kapua sea and a road called Kukii. The report given of this survey is imperfect because he had taken Waialae's pasture.

Kaula, sworn, I have not been a native very long, but I have heard the same thing from my older brother whose name is Hanakinau, as the reports given by those people above. I had heard these things after the death of Kaahumanu I.

Hehea, sworn, I am a land child of Waialae and have seen the boundaries of Waialae exactly as those witnesses have related above.

The boundaries of the land, Kekio by name, of Keekapu, are exactly as the statements given

N.T. 373-375v10
No. 7713, Victoria Kamamalu, Waianae, 17 August 1854

Testimony on the boundary between the ahupuaa of Waianae and the ili of "Pahoa."

Nahinu, sworn, says the ili of Pahoa is but small. The loko, makai, belongs to this ili. The boundary of the piece is dispute runs along to the eastward of an enclosure belonging to Kaapuiki, and up through the coconut grove and along a stone wall to some hau trees, and then up mauka and across to the east corner of the land, and from thence running makai to the loko.

This ili consists of three pieces, first, the fish pond; second, the piece which I have tried to describe; third, the mauka piece undisputed.

I learned these boundaries from my ancestors who lived here from ancient times.

Cross examined. I accompanied Kekuanaoa and M. Hopkins when they suspected [inspected?] the boundary line in question. I saw the marks made at that time on the coconut trees by order of Kekuanaoa, in presence of M. Hopkins. The line marked out by them on the northwest side, runs farther mauka than that described by me in my testimony.

Ohule, sworn, says he knows the middle Mana of Pohao about which the present dispute exists. It is only of late that I have heard that the boundary was disputed. This middle piece is bounded: Mauka by a stone wall. The western boundary runs up through the coconut grove and then runs to the southward, and then at the corner of what used to

be a wauke patch, turns seaward and runs down to the hau trees and the stone wall. I was born on this land. The land on which stand the church and parsonage belongs to the ahupuaa of Waianae.

Kaapuiki, sworn, says when I came here to live, the boundaries of the middle piece of Pahoa were nearly the same as have been described by the preceding witnesses. Afterwards, when the law was made to restore the ancient boundaries of all the lands, Kulepe, the then tax officer, gave to "Pahoa" the land now claimed by Victoria, on the southeast side of the coconut grove, and disputed by the King. I was luna of Waianae when that arrangement was made by Kulepe. I was under Kekuanaoa. The people who live on the disputed land formerly went to the labor days on Waianae," but of late they labor on "Pahoa."

Kulepe, sworn, says, "Pahoa" consists of two pieces; the fish pond forming the part of the mauka piece. I have lived here about 15 years. I was appointed tax officer of Waianae in 1841. In 1850, the boundaries of the makai piece of "Pahoa" were pointed out to me by three kamaainas, who are all now dead. In the same year, Hopkins and Kekuanaoa came down here but I did not accompany them when they went round this land. I do not know anything myself of the true boundary, except what I heard from these kamaainas in 1850. About 1841, I restored a lihi of "Pahoa," which lies between the fish pond and the stone wall, and was claimed for "Pahoa," on account of some coconut trees. This was the only lihi of "Pohoa" restored by me. The people who formerly lived on the land now in dispute used to do konohiki labor for the ahupuaa of "Waianae."

Molea, sworn, confirms in full, the testimony of Nahinu and Ohule.

[Award 7713; (Maui) R.P. 4475; Kalua Waihee Wailuku, 1 ap. (Ap. 23); Iliaina; Puali Waihee Wailuku; R.P. 4475; Paunau Lahaina; 1 ap.; ahupua`a (Ap. 26); Aki Lahaina; 1 ap.; ahupua`a (Ap. 25); Kelawea Lahaina; 1 ap.; ahupua`a (Ap. 27); (Island of Hawaii) R.P. 4475; Keopu, Honuaino, Holualoa, Keauhou Kona and Keauhou Kau, Kuilei Hamakua, Honokane & Kahua Kohala, Honohononui, Piopio, Kalalau; Kekelani, R.P. 4475 & 6856, Kahaluu; R.P. 6857, Honokua; R.P. 6865, Haukalua; R.P. 4475, 6883 & 8220, Kauaea R.P. 6884, Kahuwai Puna; R.P. 4475 & 6887 Pakini nui Kau; R.P. 4475 & 8117 Onomea; R.P. 4475 & 8199 Kaueleau; R.P. 4475 & 6860 Pahohoe Hilo; R.P. 4475 & 6864 Alae Hilo; (Molokai) R.P. 4475 Halawa, Molokai 1 ap. Ahupuaa; (Oahu) R.P. 227 Kamoaaa, Waikiki; no R.P. for Kanewai Manoa; R.P. 4475, Waialaenu, Maunalua, Waiawa, Poupouwela, Mananaiki, Hapuna & Waialua Kalihi; Waimano, Waiau; R.P. 4475 & 7834, Kalaepohaku Kapalama; R.P. 4475 & 7805 Kaluanui; R.P. 4775 & 7793, Kauluwela; R.P. 4475 & 7789, Kapaakea; R.P. 4475, Kikiwelawela Heeia, Kawailoa Waialua, Paalaa Waialua, Kaelepulu Koolaupoko; (Lanai) R.P. 4475, Kaa; (Kauai) Kikiaola Waimea, R.P. 4476 Makaweli; R.P. 4477, Haiku, Nawiliwili, Niumalu; R.P. 4480, Kalapaki, R.P. 4481, Hanamaulu; R.P. 4482 Kipu & Mahaulepu; See 7713 for Oahu, Kauai, Lanai, Hawaii and Molokai]

08018 to Mela

Claim Number:	08018	**Awarded:**	1
Claimant:	Mela, Alika	**NR:**	476v5
Island:	Maui	**NT:**	188v10
District:	Lahaina	**RP:**	4560
Ahupuaa:	Opaeula 1	**Number of Royal Patents:**	1
Apana:	1	**Miscellaneous:**	ahupuaa

No. 8018, Alika Mela, Honolulu, 8 February 1848
N.R. 476-477v5

Greetings to the Land Commissioners: I hereby quit title to my land claim, named Opaeula, an Ahupua`a at Lahaina, Maui. This land was for my makua, from the `li`i, and also this land was gotten from the `li`i, Kamehameha III. I have occupied it with no opposition from any one until this time and I request that you award it to me. My witness is the Mahele Book of the Mo`i, and the people who know of my occupancy. I also have a house lot at Opaeula.
With a respectful farewell,
ALIKA MELA

N.T. 188v10
No. 8018, Alika Mela

Copy
Alika Mela's land in Mahele Registry.
Opaeula ahupuaa in Lahaina, Maui.
True Copy
A.G. Thruston, Secretary, K.K.
Department of Interior, 25 December 1852

[Award 8018; R.P. 4560; Opaeula Lahaina; 2 ap.; 4.75 Acs 2 rods]

08452*M to Keohokalole

Claim Number:	08452	**Sweet Potatoes:**	3
Claimant:	Keohokalole	**Coconut:**	5
Island:	Maui	**Awarded:**	1
District:	Kula, Lahaina, Hana	**NR:**	567v5
Ahupuaa:	Aapueo, Alae 3, Kamehame, Kealahou 3 & 4, Koheo 2, Kukuiaeo, Paeohi, Hana, Kuhua, Kooka	**FT:**	573v3
		NT:	326v10
Apana:	10	**RP:**	4388, 7453
Mala Taro:	1	**Number of Royal Patents:**	2
Hala:	1	**Sea/Shore/Dunes:**	Yes

No. 8452*M, Keohokalole, Waikiki, Oahu, February 5, 1848
N.R. 567-568v5

I, the one whose name is below, hereby state my claims in my lands to enter in the lands of the Mo'i. These are things done by my own hands, with my people.

At Waiomao, one orange tree and my cultivated valley, an `Ili in Waikiki, with seven lo'i.
At Kapiwai are two mala of coffee and one mala of lauhala, one lo'i, and also a cultivated lot. This in an 'Ili in the Ahupua'a of Honolulu, Island of Oahu.
At Makua, on the Island of Oahu, one orange tree.

At Aamakao, an Ahupua'a on the Island of Hawaii, is one lo'i, and a house lot and an orange tree.
In the District of Kau, Ahupua'a of Wailau, is a house lot in the land.
In the Ahupua'a of Kaalaiki is a lot like that /in Wailau/. These are on the Island of Hawaii.

At Lahaina, in Kuhua Ahupua'a, is a mala of lauhala.

At Honouliwai, an Ahupua'a on the Island of Molokai are two orange trees.

At Kula, Island of Maui, Keokea Ahupua'a, there are three small mala of sweet potatoes and one mala of taro, made by our own hands, not by /those of/ the /people of the/ land.
At Kooka, an Ahupua'a in Lahaina, are four coconut trees and a single coconut tree at the shore in the lot of Kualaula, in Kiika, a /total of/ five coconut trees, and some kou trees at Pahoa, which have not been counted, also a hala clump is there, at the seashore.
I am with aloha, respectfully,
KEOHOKALOLE, who affirms this is my name, signed by Z. Kaauwai

F.T. 573v3
No. 8452, Keohokalole

Awahua, sworn, says he knows the House lots claimed by Keahokalole at Kaawaloa, Hawaii. The first one is fenced all round with a stone wall.

It is bounded:
Makai by the sea shore
On Kailua side by the Government land
Mauka by the land of Kahaku and Awahua
and on the other side by the road.

Claimant derived this lot from her ancestors, who held it from very ancient times. There is a stone house and several grass houses in it, belonging to claimant, besides a Tomb.

The second Lot is called "Aeoili" and is fenced all round.
It is bounded:
Makai by Government land
On Kailua side by the same
Mauka the same
On the side next the Pali by the Road.

Claimant derived this lot from her ancestor, who held it from olden times.

Witness knows the three House Lots in Kealakeakua claimed by Keohokalole. The first Lot is called "Kulou" and is fenced in.

It is bounded:
Makai by the Sea beach
Kaawaloa side by Government land
Mauka by the Road
South Kona side by a lot belonging to T. Cummings.

The second Lot is called "Kaahaloa" it is enclosed all round, and [is] bounded on:
Kona Hema by a lot belonging to T. Cummings
Mauka by the lot of Nakoko
North Kona by an old Heiau
Makai by the Road.

The third Lot is called "Hailokoalii" and is bounded on:
The south Kona side by an old Heiau
Mauka by a Government Lot & the lot of Ialua
Makai by the Sea Beach
On the other side by a pali.

Claimant inherited these Lots from her ancestors by the mother's side, who possessed them from ancient times.

Kekaalua, sworn, says he knows there lots perfectly & confirms in full the testimony of Awahua.

N.T. 326-327v10
No. 8452, A. Keohokalole; K. Kapaakea

To His Highness, John Young, Minister of Interior
Greetings:
This is to inform you and the Privy Council of my desire to convey some of my lands for the Governments one third in the land which remain as mine. Grant me this, of course, with the approval of the Privy Council

Below is a list of the lands I wish to convey to the government.

Aapueo ahupuaa, Kula, Maui
5 Omaopio ahupuaa, Kula, Maui.
Makehu ahupuaa, Kula, Maui
Kuikuiaeo ahupuaa, Kula, Maui
2 Kailua ahupuaa, Kula, Maui
2 Pukalani ahupuaa, Kula, Maui.
Kukuiula ahupuaa, Kipahulu, Maui.
Alaakua ahupuaa, Kaupo, Maui.

Kanakau ahupuaa, Kona, Hawaii.
Kaipuhao ahupuaa, Kohala, Hawaii.
Halaula ahupuaa, Kohala, Hawaii,
Keahakea ahupuaa, Hamakua, Hawaii.
Kaioula ahupuaa, Kau, Hawaii.
2 Makahakupa ahupuaa, Kau, Hawaii.
Kouhuhuula ahupuaa, Kau, Hawaii.
Pohina ahupuaa, Kau, Hawaii.
Puhalanui ahupuaa, Kau, Hawaii.
Wiliwilinui ahupuaa, Kau, Hawaii.
2 Papohaku ahupuaa, Kau, Hawaii.

The boundaries of all of these lands above have been established.
With appreciation,
(sign) A. Keohokalole

Honolulu, Jan. 3, 1850
To Your Highness, John Young, Minister of Interior
Greetings:

Here is a list of the names of my lands which has been left for me pending for an approval of its distribution.

Kahana ahupuaa, Koolauloa, Oahu.
Hamohamo ili, Waikiki, Oahu.
Malaekahana ahupuaa, Koolauloa, Oahu.

Paeohi ahupuaa, Lahaina, Maui.
2 Koheo ahupuaa, Kula, Maui.
3 Alae ahupuaa, Kula, Maui.
2 Kealahou 3,4, ahupuaaa, Kula, Maui.
Aapueo ahupuaa, Kula, Maui.
Kamehame ahupuaa, Kula, Maui.
Kuikuiaeo ahupuaa, Kula, Maui.
Muolea, Hana, Maui.

Kealakekua, Kona, Hawaii.
Kaawaloa ahupuaa, Kona, Hawaii.
Onouli ahupuaa, Kona, Hawaii.
Keahuolu ahupuaa, Kona, Hawaii.
Pau ahupuaa, Kohala, Hawaii.
Paauhau ahupuaa, Hamakua, Hawaii.
Puna ahupuaa, Puna, Hawaii.
Keaiwa ahupuaa, Kau, Hawaii.
Kawela ahupuaa, Kau, Hawaii.

With appreciation,
A. Keohokalole,
Honolulu, Jan. 3, 1850

Resolved, that the Minister of the Interior be and is hereby authorized to transfer to the list of lands belonging to Keohokalole, Kaapuna, Kona, Hawaii, and Aapueo 2, Kula, Maui, and transfer to the Government and list one of the Alae's in Kula, Maui, in lieu of Aapueo 2, sold by Kapaakea through mistake.

By order of Privy Council
December 22, 1850
Resolved, that the Government shall accept the division of lands of the chiefs as made by them, and those laid off for the Government shall be the government third of their lands.
By order of the King and Council
August 27th, 1850

I hereby certify the foregoing to be true copies of the original documents now on file in this Department.
(sign) A.G. Thruston, Chief Clerk, Interior Department
November 9th, 1853

[Award 8452 (Maui); R.P. 4388; 1 ap. Aapueo Kula Ahupuaa; Alae 3 Kula 1 ap. (ahupuaa), Kamehame Kula, R.P. 4388 & 7453 Kealahou 3-4 Kula (Apana 6); R.P. 7453; Kamehamenui Kula (Apana 21) together 5067 Acres; Koheo 2 Kula Ahupuaa Ap. 19; R.P. 4388; Kukuiaeo Kula; Muolea Hana; 1 ap.; ahupuaa; Paeohi Lahaina; Kukuiokaea Kula Ahupuaa Ap. 7; (Hawaii): Kealakekua S. Kona R.P. 7533 & 3607; Honohina Hilo R.P. 4386 & 7693; Kaawaloa S Kona R.P. 7532 & 4386, & 4385; Onouli S Kona R.P. 4386 & 7146; Keahuolo N. Kona R.P. 6886; Paauhau Hamakua R.P. 87123; Pau N. Kohala R.P. 8083; Puua Puna R.P. 7788; Kawela Kau R.P. 6886; Keaiwa Kau; (Oahu) R.P. 4386 & 7876; Malaekahana Koolauloa R.P. 5616; Kapiwai Pauoa R.P. 4389; Hamohamo Waikiki R.P. 5588 & 8330; Kahana Koolauloa R.P. 4387; See Award MA 3 for Hamoa Hana award]

08559B*M to Lunalilo

Claim Number:	08559B*M	**House Lot:**	1
Claimant:	Lunalilo, William C.	**Awarded:**	1
Island:	Maui	**FT:**	82v16
District:	Lahaina, Kaanapali, Wailuku	**RP:**	5637, 5639, 5699-2, 7664
Ahupuaa:	Polanui, Kalimaohe, Kuholilea, Aki, Paeohi, Waianae, Honolua, Pepee, Waiehu 2, Kaapahu	**Number of Royal Patents:**	13
		Road/Path:	Yes
Ili:	Luaehu, Ahikuli	**Miscellaneous:**	Government road
Apana:	13		

No. 8559B*M, (W.C. Lunalilo) C. Kanaina
F.T. 551-552v3

W.H. Uana, sworn, says he knows the house lot of Lunalilo, in Kaluaaha, Molokai. It is bounded:

Mauka by the public road
On the Halawa side by a fish pond of the government called "Neaupala"
Makai by the sea beach
On Kaluaakoi side by a government fish pond called "Kaluaaha."

This lot formerly was ordered to be enclosed by Hoapili wahine and Kekauluohe when Eseta Kipa was Governess of Molokai. The people of Kekauluohi's lands erected a stone house on this lot in the year 1835. It is now in possession of Lunalilo as heir of Kekauluohi.

E. Kipa, sworn says, she knows the lot. I was Governess of Molokai under Hoapili wahine & Kekauluohi in former times, and by their orders enclosed this lot and built a stone house on it with the labor of the people of their own lands. When the government sold the land of "Kaluaaha" to the Missionaries, I heard Kalolou come and ask permission from Kanaina to live in the stone house, which permission she got.

(A. Paki sets up a claim for this lot as heir of Kalaolou.)

L. Haalelea, sworn says, he knows the house lot claimed by Lunalilo in Kailua, Hawaii. It is bounded:

On Kiholo side by the church lots
Makai by the public road
On Keauhou side by a road leading mauka
Mauka by some house lots.

It is enclosed by a wall. This lot I have heard belonged formerly to Keaho, the father of Mahuka. I have heard that when Keaho died he left this lot to Kekauluohi, and I have recently seen a letter from Mahuka to W.C. Lunalilo requesting him to allow Mahuka to retain charge of this lot under Lunalilo. In 1843 I was at Kailua & Kekauluohi was there. I then saw the later Governor Adams give her some money which he said was rent received for this same lot. Part of this lot is claimed by the heir of W.P. Leleiohoku. There is a fence remaining though and dividing the lot into two parts.

F.T. 82-84v16 and N.T. 82-84v16
No. 8559B, William C. Lunalilo

Polea, sworn says, he knows the lots claimed by William C. Lunalilo, at Lahaina, Maui.

The first called Luaehu, is bounded as follows:
Mauka by Kaiheekai and Hiram's land
Olowalu by King's land
Makai by Sea beach
Kaanapali by Polea and M.J. Nouliau [Nowlien].

The second in Pakala is bounded as follows:
Mauka by Public street
Olowalu by Kaiheekai's land
Makai by H.S. Swinton's and others' land
Kaanapali by Public road.

The third lot called Hawaikaekea is also bounded as follows:
Mauka by Kalaleikio's land
Olowalu by Public road
Makai by Alaloa Kahiko street
Kaanapali by Daniela Ii's land.

This lot is disputed by Maunahina the wife of George Shaw, whose claim in right of her father. She has already got an award for a part of this lot.

The fourth lot in Paunau is bounded as follows:
Mauka by Keaweiheuhu's and Ka
Olowalu by Keaweluaole's land
Makai by Old road
Kaanapali by Street leading to Lahainaluna.

hula's land
The fifth lot called Loinui is bounded as follows:
Mauka by Keaweluaole; Kauhi and Kalolou's land
Olowalu by Mr. Baldwins
Makai by Old road
Kaanapali by Kamakinui's land.

The sixth lot in Aki is bounded as follows:
Mauka by Kaweka's land
Olowalu by Wahie's land
Makai by Main road
Kaanapali by M.I. Nowlein's land.

The seventh lot in Puunoa is bounded as follows:
Mauka by Main road
Olowalu by Iosua Kaeo
Makai by Iosua Kaeo
Kaanapali by King's land.

The eighth lot in Kelawea is bounded as follows:
Mauka by Lahainaluna

Olowalu by Road from the beach
Makai by Keleikini and Kahookano's lands
Kaanapali by A stream.

All these lots have descended to William C. Lunalilo from his mother, Kekauluohi, and are now in the hands of his lunas. The lot in "Pakala" is disputed by Paki and others.

N.T. 185-187v10
No. 8559B, William Charles Kanaina, [for Lunalilo], Honolulu, 24 April 1850

COPY
Greetings to you Highness, John Young, the Minister of Interior.
My desire is to have the government claim separated from my lands; therefore I hereby give some of my land for the government to have forever and the same shall apply to mine. Here are the names of my lands:

Kawela ahupuaa, Hamakua, Hawaii.
Waikaekoe ahupuaa, Hamakua, Hawaii.
Makapala ahupuaa, Kohala, Hawaii.
Kehena ahupuaa, Kohala, Hawaii.
Puhau ili of Iole, Kohala, Hawaii.
Puakoa ili of Waimea, Kohala, Hawaii.
Honuainonui ahupuaa, Kona, Hawaii.
Puapuanui ahupuaa, Kona, Hawaii.
Lehuulanui ahupuaa, Kona, Hawaii.
Kawainui ahupuaa, Kona, Hawaii.
Lanihaunui ahupuaa, Kona, Hawaii.
Pakiniili ahupuaa, Kau, Hawaii.
Hanuapo ahupuaa, Kau, Hawaii.
Kahanalea ahupuaa, Puna, Hawaii.
Keahialaka ahupuaa, Puna, Hawaii.
Keaau ahupuaa, Puna, Hawaii.
Makahanaloa ahupuaa, Hilo, Hawaii.
Pepekeo ahupuaa, Hilo, Hawaii.

Kaapuhu ahupuaa, Kipahulu, Maui.
2 Waiehu, Puali, West Maui.
Ahipuli [Ahikuli] ili for Waiehu, West Maui.
Pepee ili for Wailuku, West Maui.
Honolua ahupuaa, Kaanapali, Maui.
Kalimaohe ahupuaa, Lahaina, Maui.
Polanui ahupuaa, Lahaina, Maui.
Kuholilea ahupuaa, Lahaina, Maui.

Waialua ahupuaa, Kona, Molokai.
Kawela ahupuaa, Kona, Molokai.

Pau ili for Waikiki in Manoa, Kona, Oahu.
Kamoku ili for Waikiki in Manoa, Kona, Oahu.
Kaluaokau ili for Waikiki in Manoa, Kona, Oahu.
Kapahulu ili for Waikiki in Manoa, Kona, Oahu.
Kaalaea ahupuaa, Koolaupoko, Oahu.
Kapaka ahupuaa, Koolauloa, Oahu.
Laiewai ahupuaa, Koolauloa, Oahu.

Laiemaloo ahupuaa, koolauloa. Oahu.
Pahipahialua, Koolauloa, Oahu.

Kahili, Koolauloa [sic], Koolau, Kauai.
Kalihiwai, Koolauloa [sic], Koolau, Kauai.
Pilauwai, Koolauloa [sic], Koolau, Kauai.
Manuahi ili, Kona, Kauai.
Waipouli ahupuaa, Puna, Kauai.

These lands listed above shall be for me fee simple forever, it would not be right for the government to claim my land.

The following lands, I shall give to the government fee simple forever.
Kapulena ahupuaa, Hamakua, Hawaii.
Kukuihaele ahupuaa, Hamakua, Hawaii.
Auau ahupuaa, Kohala, Hawaii.
Keopuhuikahi ahupuaa, Kona, Hawaii.
Papaakoko ili of Honokohau, Kona, Hawaii.
Ninole ahupuaa, Kau Hawaii.
Laepaoo ahupuaa, Puna, Hawaii.
Koae 1 ahupuaa, Puna, Hawaii.
Koae 2 ahupuaa, Puna, Hawaii.
Laeapuki ahupuaa, Puna, Hawaii.
Kaiuiiki ahupuaa, Hilo, Hawaii.
Kahuku ahupuaa, Hilo, Hawaii.

Waiakoa ahupuaa, Kula, Maui.
Kou ili of Waiehu Puali, Komohana Maui.
Kapoino ili of Waiehu Puali, Komohana, Maui.
Halelena ili of Waiehu Puali, Komohana, Maui.
Keokamu ili of Waiehu Puali, Komohana, Maui.
Wainee ahupuaa, Lahaina, Maui.

Mahana ahupuaa, Lanai.

Kamalomalo ahupuaa, Puna, Kauai.
Kumukumu ahupuaa, Koolau, Kauai.

I've given the lands listed above to the government forever, all of them are for the government.
Please consider my request with compassion for me.
With appreciation, I am,
William Charles Lunalilo, Charles Kanaina (child guardian)
Department of Interior, 6 April 1852.

This is a try copy of Lunalilo's division with the government,
A.G. Thruston, Secretary

N.T. 450v10
No. 8559B, William C. Lunalilo, Protested by Kaai

Mahuna, sworn, it is true my own place was written in the bill of sale to C. Kanaina, the place is just mauka of the land in Kailua of Kona, Hawaii, over which there is a dispute by Kaai. That is the lot I have transmitted to him, Kanaina, but I have not seen the property Kaai has at this present time; however, I had seen my parents living on this

land at the time [of] Kaahumanu I. I had gone on a tour. Houses had been built, but I have not lived there since that time to the present, nor have I seen this lot over which there is a dispute with Kaai.

C. Kanaina, relates - the witnesses for this land on which Kaai and I are working are dead; although, I had thought they (two) would be my witnesses, but today they have denied by claim to this place. It is true this place had been for their father, Keoho, where he lived until he had died and they (two) are his own children, but I am demanding according to the old bequest of Keaho to M. Kekauluohi as well as by many other statements.

Naea, sworn, I have seen Kaai's place in Keopu of Kona, Hawaii, which is a house lot.

Mauka by Mahuka's lot
South Kona by a road
Makai by Government road
Kohala by vacant lot.

Land from Keoho (his father) upon his (Keoho) death in 1833. Keoho had obtained it long ago as idle land.

Kaai has always lived there peacefully to the present time.

Now C. Kanaina has offered a protest, I do not know the reason for it.

Kioloa, sworn, all of the statements above are true. I have known in the same way. I have not known the place was for C. Kanaina. It had been for Keoho, Kaai's father and now Kaai is the true claimant of this place.

[Award 8559B; (Maui) Land Patent 8395; Polanui Lahaina; 1 ap.; 440 Acs (apana 25); Land Patent 8129; Honolua Kaanapali; 1 ap.; 3860 Acs (ahupua`a, apana 23); R.P. 7664; Pepee Wailuku (apana 22); 4 ap.; 255.70 Acres; Land Patent 8396; 1 ap.; 255.7 Acs; Kalimaohe Lahaina; 2 ap.; 4.93 Acs; (apana 24); Land Patent 8397; Kuholilea Lahaina; 2 ap.; 184. 5 Acs; (apana 26); R.P. 5637; Paunau Lahaina; 1 ap.; 2 roods 24 perkas (apana 4); R.P. 5639; Aki Lahaina; 1 ap.; 16 perkas (apana 6); no R.P.; Paeohi Lahaina; 1 ap.; 1 Ac. 52 rods; R.P. 5699; Loiniu (Luaehu Waianae) Lahaina; 2 ap.; 2.75 Acs 37 rods; Land Patent S-8597; Kaapahu Kipahulu; 1 ap.; (ahupuaa, apana 19);1480 Acres; no R.P. Ahikuli Waiehu (apana 21); Land Patents 8537; Waiehu Wailuku; Por. apana 20; .205 Ac; Land Patent 8546; Waiehu Wailuku, Portion Apana 20, .41 Ac.; Land Patent S-8654; 2 Waiehu Wailuku, Por. apana 20; 27,797 square feet;(Hawaii) R.P. 478; Pakiniiki Kau; 1 ap.; 2357 Acs; Makanaloa Hilo; 2 ap.; 7600 Acs; R.P. 7049; Honuapo Kau; 1 ap.; ahupuaa 2200 Acs; Honuaino nui; 1 ap.; 262 Acs; R.P. 7454; Kawainui iki Kona; 1 ap.; 380 Acs; R.P. 7455; Lehuula nui; 1 ap.; 290 Acs; Lehuula nui; 1 ap.; 2840 Acs; Puapuaanui Kona; 1 ap.; 370 Acs; R.P. 7680; Kahena 2 N. Kohala; 1 ap.; (ap.4); ahupuaa; Puako S. Kohala; 1 ap.; Iliaina (Ap.6); Kahaualea Puna; 1 ap.; 26,000; Keahialaka Puna; 1 ap.; 5562 Acs; Pepeekeo Hilo; Keaau Puna; 1 ap.; 64.275 Acs; Kawela Hamakua; R.P. 7434 Honuainonui N. Kona; R.P. 7456; Lanihau Nui Kona; Land Patent 8452; Waikoekoe Hamakua; no R.P.; Makapala Kohala; R.P. 7192 Makanaloa Hilo; 2 ap.; 7600 Acs; (Molokai) R.P. 7655; Waialua; R.P. 7656 Kawela; (Oahu); R.P.; 7635; Kamoku Waikiki; Land Patents 8193, 8311 & 8416; Pau Waikiki; Land Patent 8124 & 8165 (see Kapahulu award); Land Patent 8124; Kapahulu Kona; 1 ap.; 31.50 Acs; Land Patent 8165; Kapahulu Kona; 2 ap.; 2,184.44 Acs; R.P. 7652; Kalauakou Waikiki; R.P. 7531; Kaalaea Koolaupoko; R.P. 7494; Laie-wai Koolauloa; Laie-maloo Koolauloa; R.P. 5688; Pahipahialua Koolauloa; no R.P.; Kapaka Koolauloa; (Kauai) Land Patent 8173; Kalihiwai Halelea; no R.P. Manuahi Hanapepe; Land Patent 8323; Kahili Koolau; R.P. 7060; Pilaa Koolau; R.P. 7373; Waipouli Puna; See 8559 to C. Kanaina who is awarded a property at Ukumehame under 8559B; see also Award 277]

08587 to Kaupena

Claim Number:	08587	**Awarded:**	1
Claimant:	Kaupena	**NR:**	470v6
Island:	Maui	**FT:**	491v7
District:	Lahaina	**NT:**	678v9
Ahupuaa:	Puaanui	**RP:**	5580
Apana:	4	**Number of Royal Patents:**	1
Loi:	3	**Koele/Poalima:**	Yes
Plus:	+	**Stream/Muliwai/River:**	Yes
Kula:	1	**Pali:**	Yes
House Lot:	1		

No. 8587, Kaupena, Lahaina, Mar. 5, 1848
N.R. 470v6

Hear ye, Land Commissioners of the Government: I hereby state my claim to you, which was given by the konohiki. There are one taro mo`o and a house lot. They are at Puaa. Kuakamauna gave his consent. That is my claim.
Respectfully,
KAUPENA

F.T. 174-175v7
Cl. 8587, Kaupena

Waikele wahine, sworn, I know the lands of the claimant. They are in Puaanui, Lahaina. Four pieces.

No. 1 House lot and kula
No. 2 A section of kalo land
No. 3 of one loi
No. 4 of one lo.

The claimant received these lands from Kauheauanui, the konohiki of Puaanui in 1845, and he has possessed them in peace ever since.

No. 1 is bounded:
Mauka by Waineenui
Olowalu by "Kooka"
Makai by Popolo's land
Kaanapali by Waineenui.

No. 2 is bounded:
Mauka by Kaheananui's land
Olowalu by the creek of Kanaula
Makai and Kaanapali sides by the pali of Puaanui.

No. 3 is bounded:
Mauka by Maluae's land

Olowalu by the creek of Kanaula
Makai and Kaanapali by Kupa's land.

No. 4 is bounded:
Mauka by Kalua's poalima
Olowalu by Keokehana's land
makai by Lupahoilani's land
Kaanapali by Kuakamauna's land.

N.T. 57v5
No. 8587, Kaupena

Waihole, sworn, He has seen 4 sections at Puaanui, this interest was from Kaheauanui in 1845, no one has objected to Kaupena and the boundaries are:

Section 1 - House lot and pasture.
Mauka by Waineenui
Olowalu by Kooka land
Makai by Popoolo
Kaanapali by Waineenui.

Section 2 - Taro.
Mauka by Kaheananui's land
Olowalu by Kanaula land
Makai and Kaanapali by Puaanui pali.

Section 3 - 1 patch.
Mauka by Mahiae
Olowalu by Keohokana
Makai by Lupaoholani
Kaanapali by Kuakamauna's land.

[Award 8587; R.P. 5580; Puaanui Lahaina; 3 ap.; 1.5 Acs 10 rods]

9793 to Mumuku

Claim Number:	09793	**House Lot:**	1
Claimant:	Mumuku	**Awarded:**	1
Island:	Maui	**NR:**	507v6
District:	Lahaina	**FT:**	189v7
Ahupuaa:	Puako	**NT:**	70v5
Apana:	4	**RP:**	1172
Loi:	4	**Number of Royal Patents:**	1
Kula:	2	**Road/Path:**	Yes

No. 9793, Mumuku
N.R. 506-507v6

Hear ye, ye land Commissioners: There are three of us in this letter who state their claims. Here is the first:

I, Mumuku have a claim for a house lot and two lo'i and one mo'o. Here is a claim which is mauka, for one mo'o and one lo'i.
That is my claim.
MUMUKU

F.T. 189v7
Cl. 9793, Mumuku

Kamaiewa, sworn, I know the lands of the claimant is [are] in Puako, Lahaina. They consist of 4 pieces.

No. 1 is a house lot an 2 lois and kula.
No. 2 is one loi.
No. 3 one moo of kula.
No. 4 one pauku of kalo.

The claimant received these lands from Kuakoa, the konohiki, before 1837, and there has been no dispute of his title since.

No. 1 is bounded:
Mauka by Pahia's land
Olowalu by the Government road
Makai by Pahia's land
Kaanapali by the Konohiki of Puako.

No. 2 is bounded:
Mauka by Ku's land
Olowalu by Pahia's land
Makai y Kunuku's land
Kaanapali by the same.

No. 3 is bounded:

Mauka by waste kula of the Konohiki
Olowalu by Pahia's land
Makai by Judge Parson's land
Kaanapali by my land.

No. 4 is bounded:
Mauka by Kanuku's land
Olowalu by Puunoa of Namauu
Makai by Kanuku's land
Kaanapali by "Kuholilea".

N.T. 70v5
No. 9793, Mumuku

Kamaiewa, sworn, he has seen 4 sections at Puako and interest which was given by Kuokoa in 1837, no one had objected. The boundaries are:

Section 1 - 2 patches and pasture.
Mauka by Pahia's land
Olowalu by Government road
Makai by J. Pahia's land
Kaanapali by konohiki.

Section 2 - 1 patch.
Mauka by Ku's land
Olowalu by J. Pahia's land
Makai and Kaanapali by Kanuku's land.

Section 3 - 1 Moo.
Mauka by konohiki
Olowalu by Pahia's land
Makai by A.W. Pasana's land
Kaanapali by Kamaiewa's land.

Section 4 - Land section.
Mauka by Kanuku Kamaiewa's land
Olowalu by Puunoa land
Makai by Kanuku's land
Kaanapali by Kuholilea.

[Award 9793; R.P. 1172; Puako Lahaina; 4 ap.; 1.7 Acs]

09795 to Kaaumaiewa

Claim Number:	09795	**Awarded:**	1
Claimant:	Kaaumaiewa	**NR:**	507v6
Island:	Maui	**FT:**	190v7
District:	Lahaina	**NT:**	70v5
Ahupuaa:	Puako	**RP:**	1763
		Number of Royal Patents:	1

No. 9795, Kaaumaiewa, Lahaina
N.R. 507v6

I, Kaaumaiewa, hereby state to you that I have one mo`o and one mo`o planted in gourd. Three lo`i are mauka. These are our claims for land which are petitioned for to you.
KAAUMAIEWA

F.T. 190v7
Cl. 9795, Kumaiewa

Mumuku, sworn, I know the lands of the claimant. They are in Puako, Lahaina. There are 4 pieces.

No. 1 a house lot and 6 lois.
No. 2 is one moo of kula
No. 3 is 2 lois.
No. 4 of 1 loi.

The claimant received these lands from Kuekoa, the konohiki of Puako in 1833 and has held the same without dispute.

No. 1 is bounded:
Mauka by Waianae
Olowalu by the konohiki's land
Makai by Waianae
Kaanapali by the konohiki's land.

No. 2 is bounded:
Mauka by Paunau
Olowalu by my land
Makai by Judge Parson's land
Kaanapali by Kuokoa's land.

No. 3 is bounded:
Mauka by the konohiki land
Olowalu by Kuokoa's land
Makai by my land
Kaanapali by "Kuholilea."

No. 4 is bounded:
Mauka by Kuokoa's land
Olowalu by the creek of Kahoma
Makai by my land
Kaanapali by Kuokoa's land.

N.T. 70-72v5
No. 9795, Kumaiewa

Mumuku, sworn, He has seen Kumaiewa's 4 sections at Puako which was from Kuokoa in 1833, no one has objected. The boundaries are:

Section 1 - 6 Patches and a house.
Mauka by Waianaenui
Olowalu by konohiki
Makai by Waianae
Kaanapali by konohiki.

Section 2 - Moo.
Mauka by Paunau pasture
Olowalu by Mumuku's land
Makai by A.W. Pasana's land
Kaanapali by Kuokoa's land.

Section 3 - 2 patches.
Mauka by konohiki
Olowalu by land - Kuokoa's
Makai by Kuhohilea land
Kaanapali by Mumuku land.

Section 4 - 1 patch.
Mauka by Kuokoa's land
Olowalu by Stream
Makai by Mumuku's land
Kaanapali by Kuokoa's land.

[Award 9795; R.P. 1763; Puako Lahaina; 4 ap.; 1.06 Acs]

09817 to Makaele

Claim Number:	09817	**Kula:**	1
Claimant:	Makaele	**Awarded:**	1
Island:	Maui	**NR:**	508v6
District:	Lahaina	**FT:**	98v7
Ahupuaa:	Puehuehuiki	**RP:**	8256
Apana:	2	**Number of Royal Patents:**	1
Loi:	1	**Koele/Poalima:**	Yes
Plus:	+	**Pali:**	Yes

No. 9817, Makaele
F.T. 98v7

This claim is identical with claim No. 4878, part 30. [31]

Cl. 4878HH, Makaele [wahine], Part 30 [31], See page 98
F.T. 42v7

Kapalii, sworn, I know the lands of the claimant. They [are] partly in "Puehuehu nui" and partly in "Puehuehu iki." They consist of a kula and kalo land in separate pieces in Puehuehuiki and a house lot in Puehuehunui.

The kalo and kula lands are from Poopuu in 1829 and have been held by the claimant ever since in peace.

The house lot was taken up by the claimant as waste land in 1829 and has been occupied by the claimant ever since. No one has disputed her title.

The house lot is bounded:
Mauka by the main road of Lahaina
Olowalu by a cooper's lime kiln
Makai by the sea beach
Kaanapali by the yard of Kaumaea.

The kula with some lois [grasseled?] is bounded:
Mauka by the creek
Olowalu by the high pali
Makai and Kaanapali by the creek.

The [other] which consists of 3 moos is bounded:

Mauka and Olowalu and Makai by the poalima land of Laahili
Kaanapaliby "Halakaa."

No. 4878, Upai ma, Lahaina, Jan. 19, 1848
N.R. 215-216v6

No. 4878KK [HH], 31. Makaele, He [She] is at Puehuehu, [Margin note: Index 9817]

[Award 9817; Land Patent 8256; Puehuehu iki Lahaina; 2 ap.; 2.25 Acs 13 rods; See 9811 for Native Register document; See also 4878HH]

10534 to Nailiili

Claim Number:	10534	**Loi:**	6
Claimant:	Nailiili	**Plus:**	+
Island:	Maui	**Kula:**	1
District:	Lahaina	**House Lot:**	1
Ahupuaa:	Puako	**Awarded:**	1
Apana:	1	**FT:**	129v7

No. 10534, Nailiili, Lahaina, 3 February 1848
N.R. 523v6

Greetings to the Land Commissioners: I hereby petition for my claims for house lot and lo`i at Puako. There are five lo`i and six mo`o at Puako. Also at Kapili, are four lo`i for which /I pay/ $350 per year. Those are my claims, under Kaua.
NAILIILI

/Translator's note: Claimant may have meant $3.50 per year but I did not see a decimal point./

F.T. 129v7
No. 10534, Nailiili

Kunano[?], sworn, I know the land of the claimant in "Puako," Lahaina. They consist of a house lot and 6 lois and a piece of kula land, all in one piece.

The claimant received them from Kawaa, the luna in the days of Hoapili before 1839, and has held them without dispute, but Kawaa, who is his foster father, owns two of the lois and 3 of the moos.

It is bounded:
Mauka by the kula of Paunau
Olowalu by Kuokoa's land
Makai by the same
Kaanapali by Pelupelu's land.

See page 65 volume 15.

F.T. 65v15
No. 10534, Nailiili, from page 129v7

J.W. Austin presents the award of the Land Commission to Kaua No. 4320 Apana 3, dated 18th February 1851, awarding to him 9 Acres 1 Rood and 24 Rods in one piece of land in "Puako," Lahaina. He presents at the same time a warranty Deed from Kaua to J.B. Hubble dated August 2nd, 1851, conveying to the said Hubble the same piece of land mentioned in the above award showing the same area and same boundaries, and he further presents a warranty deed from the said Hubble and his wife, Halo to A.H. Parsons, conveying to him the same piece of land, dated 15th December 1851; and he further presents a quit claim Deed from J.W. Austin as administrator of the Estate of A.W. Parsons, conveying to T.B Cummings all the right title and interest of the said Parsons to the part of the land remaining in his possession at the time of his death, he having previously sold a portion of it to B.F. Bolles quit

claim deed dated 29th day of October 1852. And he further presents a quit claim Deed from T.B. Cummings to F.W. Hutchinson dated 29th October 1852. It appears that Nailiili lived on a portion of the land awarded to Kaua (which he subsequently conveyed to Hubble as above). Nailiili has accepted from F.W. Hutchinson a life estate for the part he now occupies, the land having been originally sold by Kaua on condition that the (Nailiili) should not be disturbed during his life.

(Nailiili and Kaua both state that the land in question belonged wholly to Kaua, and Nailiili lived under him, having no claim to the soil. And Nailiili says he is satisfied to hold the place he occupies during his life and then leave it to the purchaser).

[Award 10534; Puako Lahaina; 1 ap.; 1.25 Acs 28 rods]

10613 to Paki

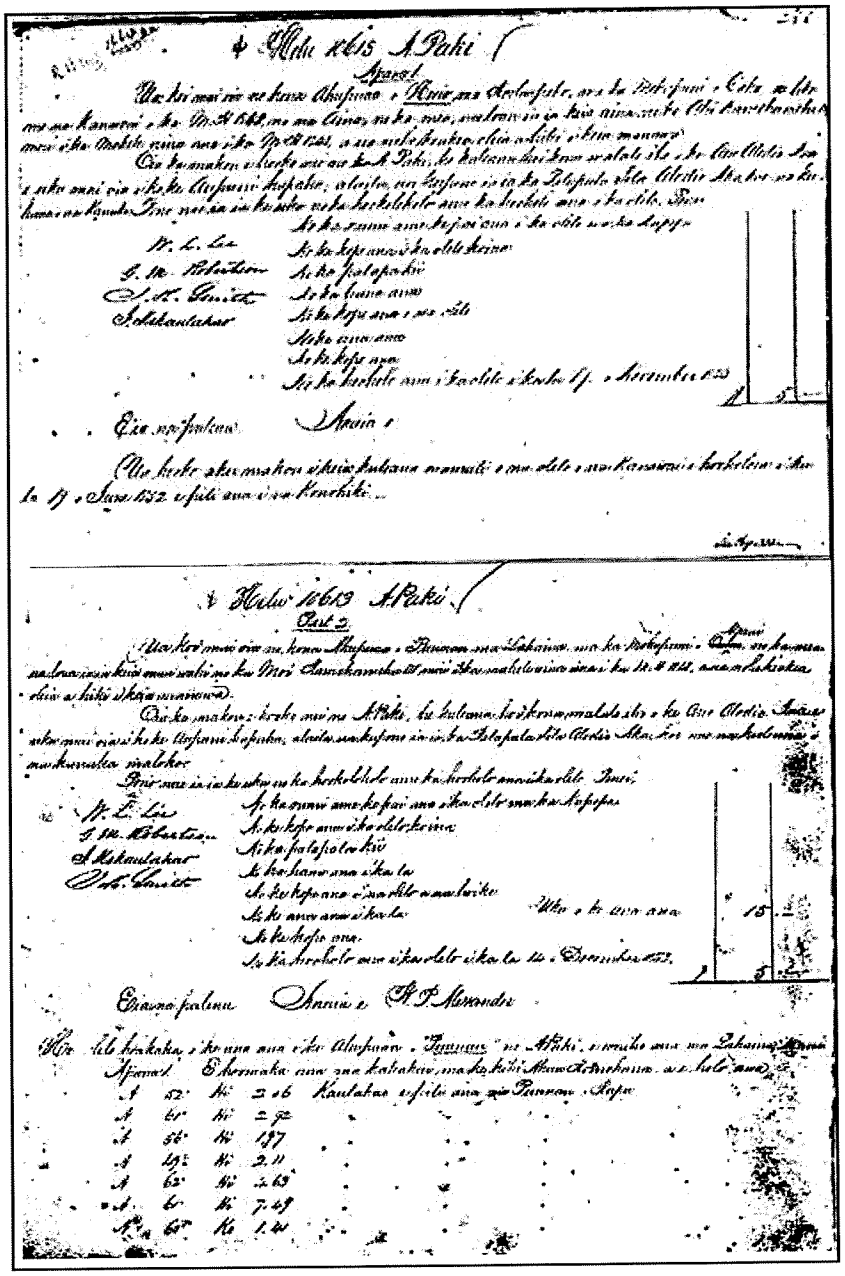
Claim Number: 10613

Claimant: Paki, A.

Island: Maui

District: Lahaina

Ahupuaa: Puunau



10667 to Pikanele, K.

Claim Number:	10667	**Kula:**	1
Claimant:	Pikanele, K.	**House Lot:**	1
Other Claimant:	Konohiki, counter	**Awarded:**	1
Island:	Maui	**NR:**	531v6
District:	Lahaina, Wailuku	**FT:**	132v7/97v15
Ahupuaa:	Kelawea, Waianae, Polapola, Wanaloa, Waihee	**NT:**	17v5
		RP:	2399, 2400
Ili:	Luaehu, Kapoho	**Number of Royal Patents:**	2
Apana:	9	**Loko:**	Yes
Loi:	39	**Miscellaneous:**	Government road, Section 9 bounded by uhi patch, houses on house lot

No. 10667, K. Pikanele, Lahaina, 8 February 1848
N.R. 531-532v6

Hear ye, ye Land Commissioners: I, Pikanele, hereby petition for my parcels of land in various `ilis in Lahaina.

Their names are Kelawea, Waianae, Polapola and Pahoa. My kihapai lo`i are in these `ilis. When you send a surveyor I will point out the boundaries of all my places within these `ilis.

Also, at Waihee there is a land named Kapoho which lies as follows: from the sea to the mountain, bounded on the north by a Pu`uone /pond/, on one side is Hakaaka, the two sides adjoin in one place. It will not be obscure to you when the time comes and you have it property surveyed.
I am, with aloha.
K. PIKANELE

F.T. 132v7
Cl. 10667, Pikanele, Part 1 (See Cl. 7777) page 170

Kauhiwahine, sworn, I know this land. It is an ili of land in "Waihee" near Wailuku, the name of the ili is "Kapoho."

The claimant had this land from Hoapili kane and now hold it under Kekuanaoa, paying him therefore the sum of 5 dollars per year, and if he does not pay him, the five dollars yearly then his title will be pau. But he has to fish ponds in this, that belong to Pikanele alone.

The two fish ponds lie together and are bounded:
Mauka by the poalima fish ponds
Olowalu by Kimikeo's land, the head man of Kekuanaoa
Makai by the government lois
North by Mileka's land.

See page 97 volume 15.

F.T. 132-134v7
Cl. 10667, Part 2, Pikanele

Kauhiwahine, sworn, I know the lands of the claimant is [are] in Kelawea, lahaina. 6 lois in one piece up mauka, 8 lois in another piece makai. He received these lands from Kekuanaoa in 1840 and he has held them without dispute ever since. He likewise has 2 pieces of poalima lois, each of 3 lois, which he holds under Kekuanaoa paying therefore the sum of 15 dollars per years [year].

The piece of 6 lois up mauka that belongs to Pikanele truly is bounded:
Mauka by the pali
Olowalu by the same and the kula of Kanaina
Makai by Keawehuali's land
Kaanapali by the creek of Kelawea.

The piece of 8 lois, makai, is bounded:

Mauka by Kalaikini's land
Olowalu by the land occupied by Keaweluaoli
Makai by the lot of Kualike
Kaanapali by the creek of Kelawea.

The land of the claimant in Waianae, Lahaina, consists of 3 pieces. The first piece up mauka loa has 6 lois. The second piece up mauka contains 5 lois. The third piece down makai, contains 2 lois.

The claimant had this land from Kaemalolo, Kaeo's mother in 1834, and he has held them in peace ever since.

The piece of 6 lois up mauka loa is bounded:
Mauka by Kauwa's land
Olowalu by Palani's land
Makai by the same
Kaanapali by the pali of Waianae.

The second piece of 5 lois, is bounded:
Mauka by Kaulu's lot
Olowalu by Waianaeiki
Makai by the King's land
Kaanapali by "Kulahuhu."

The 3d piece is bounded:
Mauka by Kaihukai's land
Olowalu by Puako and Kaihukai's land
Makai by "Puako"
Kaanapali by Kaihukai's land.

The lands of the claimant in Boabola were heard in the time of Mr. Richards.

His lands in "Pahoa," Lahaina, consist of 2 pieces of kalo land, one piece of kula land.

One piece of kalo land contains 7 lois, the other piece has 5 lois. The claimant received these lands from Kaele, the luna, in 1849. His title to the kalo lands has never been disputed. But Nalehu has disputed the title to the kula. When Kaele died in Febuary 1845, her brother, Nalehu took this kula from him and gave it to Kua. Kua and three otheres living on the land have put in their claims for the kula, which have been heard. The land was tkaen from him for some cause, known [unknown?] to me, perhaps becasue Kaele died.

The piece of kallo land of 7 lois is bounded:
Mauka by Upai's land
Olowalu by Nalehu's land
Makai by the same
Kaanapali by the high pali.

The piece of 5 lois is bounded:
Mauka by the high pali
Olowalu by Nalehu's land
Makai by Nalehu's kula
Kaanapali by the creek and the pali.

The kula piece is bounded:
Mauka by Kapua's little village
Olowalu by Keohokalole's lois
Makai by the Government road
Kaanapali by the land of the heirs of Namauu.

Nalehu, sworn, I am the brother of Kaele, now dead. The kula land in dispute between Pikanele and Moku and others was the property of Moku and others before Kaele gave it to Pikanele. Consequently, it was their land, and Kaele had no right to give it away. She might give away poalima land, but not the land of the tenants. It was very wrong for her to dispose of this land, and consequently it was restored to them.

F.T. 97v15
No. 10667, Pikanele, Waihee, September 10, 1853, Kue Konohiki, from page 132v7

He mau loko keia ma ka Ili o Kapoho, Waihee, Maui.

Kealoha, hoohikiia, ua ike au i na loko o Kaiwiau a me Kealiika ma ka Ili o Kapoho, Waihee. Ua maopopo iau he mau loko no ke konohiki ua hana mau ia o ma ua la o konohiki mai ka wa mamua mai a hiki i keia manawa.

Kaihumua, hoohikiia, Ua oiaio no he mau loko keia no konohki a Pikanele e hookohu nei i kuleana nona, ua hanaaia ma na la hana o ke konohiki a hiki i keia manawa.

(Hooholoia, ua nele o Pikanele, ua pono o konohiki)

F.T. 97v15
No. 10667, Pikanele, Waihee, September 10, 1853, See page 132 volume 7, counter konohiki

These are ponds in the `Ili of Kapoho, Waihee, Maui.

Kealoha, sworn, I know of the ponds of Kaiwiau and Kealuka in the `Ili` of Kapoho, Waihee. I understood these ponds were for the konohiki; they were always worked on the /labor/ days of the konohiki from formerly until the present.

Kaihumua, sworn, It is true that these ponds which Pikanele is assuming as a claim for himself are for the konohiki. They have been worked on on the labor days of the konohiki until the present.

(It was decided that Pikanele's claim was deificient and the konohiki was right.)

N.T. 17-19v5
No. 10667, K. Pikanele, (No. 819667)

Kauhiwahine, sworn, He has seen Pikanele's interest in Kapoho at Waihee and two parcels at Kelawaa in Lahaina here. Land had been from Mrs. Hoapili previously, however it is now under Kekuanaoa. 2 ponds are there. Land at Kelawea from Kekuanaoa in 1840. There will be separations from the land should there [be?] no $5.00 for Kapoho at Waihee and $15.00
for Kelawaa in Lahaina, the boundaries are:

Section 1 - Kapoho.
Mauka by Friday pond
Kahukuloa by Timoteo's land
Makai by Kiao patch
Wailuku by Makaaka's land.

Section 2 - 6 patches in uplands of Kelawea.
Mauka by Stream
Olowalu by C. Kanaina's land
Makai by Keaweluaole's land
Kaanapali by Stream.

Section 3 - 8 patches.
Makai by Kelawea land
Mauka by J. Kalaihini's land
Olowalu by Keaweluaole's lot
Makai by Kekulike's lot.
Kaanapali by Kelawea stream.

3 land sections at Waianae, Lahaina

Section 4 - 6 patches in uplands.
Mauka by Kana
Olowalu by Palau
Makai and Kaanapali by Waianae pali.

Section 5 - 5 patches.
Mauka by Kanaulu's lot
Olowalu by Waianaeiki
Makai by Kaihukai
Kaanapali by Kulahuhu's land.

Section 6 - 2 patches.
Mauka and Olowalu by Kaihukai of Puako
Makai by Puako land
Kaanapali by Kaihukai.

Land from Kaaimalolo in 1834, no objections to all of these parcels.

Section 7 - 7 patches by the stream.
Mauka by Upai
Olowalu and Makai by Nalehu
Kaanapali by Pali.

Section 8 - 5 patches by the stream.
Mauka by pali

Olowalu and Makai by Nalehu
Kaanapali by stream and pali.

Section 9 - Pasture.
Mauka by Kapua's house
Olowalu by Keohokalole's uhi (shell fish) patch
Makai by Government road
Kaanapali by Maele's sugar cane moo.

These sections in Pahoa from Maele in 1840-41?, no one has objected to the 2 taro sections. Nalehu had objected to the pasture. Nawaa and some other people had filed this pasture as a claim. Nalehu, A. Moku, Muwaa and others as witnesses. Maele did not give that pasture because people were already living there. It would have been well to give it, if the pasture had been a Friday area.

Lui, sworn, He has seen that single patch which belongs to Kaluaokamano at Kelawaa, it is for Pikanele now. He had taken it because of non-attendance on Friday.

N.T. 113v10
No. 10667, K. Pikanele

Kana, sworn, I have seen his house lot in Lahaina, Maui, also his land sections.

Section 1 - House lot at "Kaluaokiha".
Mauka by Government road
Olowalu by Ninia's house lot
Makai by C. Kanaina's lot
Kaanapali by Hihio's lot.

Section 2:
Mauka by Mahoe's lot
Olowalu by "Mokuhinia," pond
Makai by Kaiheekai's house lot
Kaanapali by Namauu's land.

Section 3:
Mauka by Kanaulu's land
Olowalu by Waianaeiki ahupuaa
Makai by Kaiheekai's land
Kaanapali by "Kulahuhu" pasture.

Section 4:
Mauka by Kaiheekai's land
Olowalu by Ninia's land
Makai by "Haleu," Rikeke's land
Kaanapali by Government land.

Section 1 was a vacant and idle land in 1823, Pikanele built houses since and had lived there to the present time without disputes. Section 2 from Kalaiwohi in 1823, no disputes. Section 3 and 4 from Kaaimalolo in 1835, no objections.

Kaiheekai, sworn, every statement above is true. Kaiheekai's land sections in Waiauaenui are his own property. I have known this for I am the assistant konohiki of this land, therefore I will not oppose to his claim there.

POSTPONED: Until T. Keaweiui returns for his claim at Kelawea.

[Award 10667; R.P. 1729; Waianaenui Lahaina; 2 ap. 1.63 Acs; Luaehu Waianae Lahaina; 1 ap.; 1.087 Acs; (See also Award 310); R.P. 2399; Waianae Lahaina; 1 ap.; 8 rods; Kelawea Lahaina; 1 ap. 2 roods 25 rods; Kelawea Lahaina; 1 ap. 1 Ac.; R.P. 1729; Polapola Lahaina; 2 ap.; .505 Ac.; R.P. 2400, Wanaloa Lahaina; (amount unknown)]

11150 to Keone

Claim Number:	11150	**Apana:**	4
Claimant:	Keone, wahine	**Awarded:**	1
Island:	Maui	**FT:**	68v15
District:	Lahaina	**RP:**	2651
Ahupuaa:	Kuhua	**Number of Royal Patents:**	1

No. 11150, Keone
F.T. 68v15

Claimant, being sworn, deposed that she gave in her claim to Mr. Richards, at lahaina, in the year 1847, and had it surveyed at the same time by J. Richardson (produced a copy of the survey).

T. Keaweiwi, sworn, says he knows the House lot of Keone, in Kuhua, Lahaina.

It is bounded on:
Olowalu side by Alaala's land
Makai by Hale's lot
Kaanapali side by "Kuhuanui"
Mauka by Imiewale's land.

Claimant has also a piece of Kula land, in "Kuhuanui," it is surrounded by the land of Konohiki, I think.

She has also another House lot, in "kuhuanui,"

Bounded on:
Olowalu side by a stream
Makai by Moaliis [?]
Kaanapali side by Timoteo
Mauka by Kekahuna's land.

It is enclosed and belonged to Claimant's husband and is still occupied by some of her relatives.

Claimant has also a kalo patch, adjoining the first mentioned House lot, in "kuhua." It is

Bounded on:
Olowalu side by a watercourse
Makai by Wahine's land
On the other side by the same.

Claimant derived her lands from her husband who got them from Kipa in ancient times, and has always held undisturbed possession of them.

Kuheleloa, sworn, says he is Luna of "Kuhua" under Haalelea and he knows the pieces of land claimed by Keone. She and her famly have held them ever since witness came to live on "Kuhua," seven years ago.

[Award 11150; R.P. 2651; Kuhua Lahaina; 4 ap.; 1 Ac. 3 roods 21 rods]

11216*M to Kekauonohi

Claim Number:	11216*M	**Awarded:**	1
Claimant:	Kekauonohi, Mikahela	**NR:**	360v4
Island:	Maui	**NT:**	334v10/447v10
District:	Hamakuapoko	**RP:**	4388, 7512, 8306, 8388,8389, 8390, 8391, 8531, 8534
Ahupuaa:	Kapunakea, Puaa, Aki 2, Kuholilea 2, Kukuiokaeo, Palauea, Papaka, Keoneoio, Kaupo 19, Wailamoa, Alaeanui, Hailimaile	**Number of Royal Patents:**	9
Apana:	14		

No. 11216*M, M. Kekauonohi and A.. [Aarona Kekauonohi]
N.R. 360-363v4

To the Land Commissioners, Greetings: We hereby state our claims for land from Hawaii to Kauai, as follows:

Those of Mikahela Kauonohi [also Kekauonohi]:
Name the Land, Ahupua'a, District, Island

Waikalua 2 on west, Ahupua'a, Koolau, Kauai
Kaakaaniu, Ahupua'a, Koolau, Kauai
Namahana, Ahupua'a, Koolau, Kauai
Waikoko, Ahupua'a, Halelea, Kauai
Wainihi Ahupua'a, Halelea, Kauai
Kealia, Ahupua'a, Puna, Kauai

Makao, Ahupua'a, Koolau poko, Oahu
Honouliuli, Ahupua'a, Ewa, Oahu
Waimalu, west side, Ahupua'a, Ewa, Oahu

Moakea, Molokai
Makanalua, Ahupua'a, Molokai
Kapualei, Ahupua'a, Molokai
Naiwa, Ahupua'a, Molokai
Kumueli, Ahupua'a, Molokai
Awawaie, Ahupua'a, Molokai

Panaeua [Panaewa], Ahupua'a, Lahaina, Maui

Palawai, Ahupua'a, Lanai

Kapunakea, Ahupua'a, Lahaina, Maui
Puaa, Ahupua'a, Lahaina, Maui
1 Aki 2, Ahupua'a, Lahaina, Maui
2 Kuholilea 2.3. middle & west, Ahupua'a, Lahaina, Maui
Kukuiokaeo, Relinquished Claim, Ahupua'a, Kula, Maui
Palauea, Ahupua'a, Honuaula, Maui
Papaka, Ahupua'a, Honuaula, Maui
Keoneoio, Ahupua'a, Honuaula, Maui

Kaupo 19, Ahupua'a Maui, The counting of Kaupo begins at Kipahulu
Wailamoa, Hana side, Kipahulu, Maui
Alaeanui, Ahupua'a, Maui
Haliimaile, Ahupua'a, Hamakua Poko, Maui
Honokawai, one 'ili there, Kaanapali, Maui

Kukuipahu, Ahupua'a, Kohala, Hawaii
Puuokumau, Ahupua'a, Kohala, Hawaii
Pahoa, Ahupua'a, Kohala, Hawaii
Kealahewa, Ahupua'a, Kohala, Hawaii
Puuepa, Ahupua'a Kohala, Hawaii
Kanahonua, Ahupua'a, Hamakua, Hawaii
The Lauhulus, Ahupua'a, Hamakua, Hawaii
Hakalau, Ahupua'a, Hilo, Hawaii
Kalaoa, Ahupua'a, Hilo Hawaii
Maumau, Ahupua'a, Hilo, Hawaii
Maulua, Ahupua'a, Hilo, Hawaii
Punahelu, Ahupua'a, Hilo, Hawaii
Kahuahooholo, Ahupua'a, Hilo, Hawaii
The Paanas 1.2, Ahupua'a, Hilo, Hawaii
Awawaloa, Ahupua'a, Hlo, Hawaii
The Kilaus, Ahupua'a, Hilo, Hawaii
Maonalulu, Ahupua'a, Hilo, Hawaii
Weloka, Ahupua'a, Hilo, Hawaii
Waiakahiula, Ahupua'a, Puna, Hawaii
Panau, Ahupua'a, Puna, Hawaii
Iliohae, Ahupua'a, Kau, Hawaii
Honaunau, Ahupua'a, Kona, Hawaii
Pahoehoe, Ahupua'a, Kona, Hawaii
Honokohau, Ahupua'a, Kona, Hawaii
Auhaukeae, Ahupua'a, Kona, Hawaii
Kalihi, Ahupua'a, Kona, Hawaii
Keopu, Ahupua'a, Kona, Hawaii

N.T. 334-336v10
No. 11216, Mikahela Kekauonohi, 20 December 1853

Waiakalua ahupuaa, Koolau, Kauai
Kaakaaniu ahupuaa, Koolau, Kauai
Namahana ahupuaa, Koolau, Kauai
Waikoko ahupuaa, Halelea, Kauai
Wainiha ahupuaa, Halelea, Kauai
Kealia ahupuaa, Puna, Kauai

Makao ahupuaa, Koolauloa, Oahu
Honouliuli ahupuaa, Ewa, Oahu
Waimalu west side ahupuaa, Ewa Oahu

Moakea ahupuaa, Kona, Molokai
Makanalua ahupuaa, Kona, Molokai
Kapualei ahupuaa, Kona, Molokai
Naiwai ahupuaa, Kona, Molokai
Kumueli ahupuaa, Kona, Molokai

Awaewaie ahupuaa, Kona, Molokai

Palawai ahupuaa, Kona, Lanai

Panaewa ahupuaa, Lahaina, Maui
Kapunakea ahupuaa, Lahaina, Maui
Puaa ahupuaa, Lahaina, Maui
1 Aki 2 ahupuaa, Lahaina, Maui
2 Kuholilea 2, 3 center and west ahupuaa, Lahaina renounce
Kukuiokaeo ahupuaa, Kula, Maui
Palanea ahupuaa, Honuaulu, Maui
Papaka ahupuaa, Honuaula, Maui
Keoneoio ahupuaa, Honuaulu, Maui
Wailamoa on Hana side ahupuaa, Kipahulu, Maui, 5 Sections
Kaupo 19 ahupuaa counting from Kipahulu, Kaupo, Maui
Alae nui ahupuaa, Kipahulu, Maui
Haliimaile ahupuaa, Hamakua Poko, Maui
Honokowai single ili there, Kaanapali, Maui

Kukuipahu ahupuaa, Kohala, Hawaii
Puuokumau ahupuaa, Kohala, Hawaii,

Renounced, Pahoa ahupuaa, Kohala, Hawaii
Kealahewa ahupuaa, Kohala, Hawaii
Puuepa ahupuaa, Kohala, Hawaii
Honokohau ahupuaa, Kona, Hawaii
Honaunau ahupuaa, Kona, Hawaii
Auhaukeae ahupuaa, Kona, Hawaii
Pahaoehoe ahupuaa, Kona, Hawaii

Renounced, Kalihi ahupuaa, Kona, Hawaii
Keohu ahupuaa, Puna, Hawaii
Waiakahiula ahupuaa, Puna, Hawaii
Panau ahupuaa, Hilo, Hawaii
Makalau ahupuaa, Hilo, Hawaii
Kalaoa ahupuaa, Hilo, Hawaii
Maumau ahupuaa, Hilo, Hawaii
Maulua ahupuaa, Hilo, Hawaii
Punahelu ahupuaa, Hilo, Hawaii
Kakuakookolo ahupuaa, Hilo, Hawaii
Na Paana 1, 2 ahupuaa, Hilo, Hawaii
Awawaloa ahupuaa, Hilo, Hawaii
Na Kilau ahupuaa, Hilo, Hawaii
Maonalulu ahupuaa, Hilo, Hawaii
Weloka ahupuaa, Hilo, Hawaii
Kanahonua, Hamakua, Hawai
Na Lauhulu, Hamakua, Hawaii
Iliohae ahupuaa, Kau, Hawaii

I hereby approve this distribution it is good, the lands listed above on pages 26-28 of this book are for Mikahela Kekauonohi and presentation can be made with this office of the land commissioners.
(Sign) Kamehameha
Royal Palace, 28 January 1848

COPIED, Interior Office 19 December 1853
I certify the above to be a true copy of that part of page 26 and 28 of "Book Mahele" or file in this office.
H.W.M. Coughtry, Clerk
See page 447

N.T. 447v10
No. 11216, M. Kekauonohi, (from page 335), 23 December 1854

K. Kalaikini, sworn, I have knonw M. Kekauonohi's land very well, which is lying in Honohowai ahupuaa of Kaanapali, Maui, by the name of "Moomuku."

[Award 11216; (Maui) no R.P.; papaka honuaula; Keoneoio Honuaula; Maalo Kaupo; Puulani Kaupo; Popooioi 1 Kaupo; Popooioi 2 Kaupo; Kahuai Kaupo; R.P. 4388; Kukuiokaeo Kula (Government Deed No. 329, Dec. 13, 1848); Wailamoa Kipahulu; 1 ap.; (ahupua'a; Ap. 24); Alaenui Kipahulu; 1 ap.; (ahupua'a; Ap. 26); Land Patent 8389, Puaa Lahaina; 2 ap.; 17.78 Acs (ahupuaa); Land Patent 8391, Kuholilea 2, 3, Lahaina; 2 ap.; 8.68 Acs (ahupuaa); Land Patent 8390, Panaewa Lahaina; 3 ap.; 8.15 Acs; Land Patent 7512; Haliimaile Hamakuapoko; 1 ap.; 44,260 Acs (Ap. 27); Land Patent 8531, Moomuku Honokawai Kaanapali; 1 ap.; (Iliaina Ap. 28); 322.69 Acres; Land Patent 8534, Palauea Honuaula; Land Patent 8388, Aki 2 Lahaina; 1 ap.; 11 Acs (ahupuaa); Land Patent 8306, Kapunakea Lahaina; 1 ap.; 35 Acs; (Hawaii) Land Patent 7874; Honaunau N. Kona; 1 ap.; 7120 acs; Land Patent 7587, Honokohau 1, N. Kona; 1 ap.; 2653 Acs; Land Patent 7580; Auhaukeae 1 N. Kona; 1 ap.; 3.34 Acs; No R.P.; Kalihi Kona; 1 ap.; (Ap. 38); no R.P.; Pahoehoe 2 N. Kona; 1 ap.; 1190 acs; Land Patent 7874; Keopu N. Kona; 1 ap.; 7120 Acs; Land Patent S8556, Keopu N. Knoa; Kauhonua Hamakua; 1 ap.; (ahupuaa); Land Patent 7541; Hakalaunui; 1 ap. 12580 Acs; R.P. 7139; Kalaoa Hilo; 2 ap.; 64 acs; R.P. 7140; Kalaoa Hilo; 1 ap; 37.75 Acs; R.P. 7141; Kalaoa Hilo; 1 ap.; 71.15 Acs; R.P. 7160; Kalaoa Hilo; 1 ap.; 36.5 Acs; R.P. 7161; Kalaoa Hilo, 1 ap.; 35.25 Acs; R.P. 7162; Kalaoa Hilo; 2 ap.; 98 Acs; Land Patent 8116; Kalaoa Hilo; 1 ap.; 842 Acs (Ap. 43); Land Patent 8018; Mauluanui Hilo; 1 ap.; 9288 Acs; no R.P.; Kukuipahu N. Kohala; 1 ap.; (Ap. 29) Ahupuaa; no R.P.; Puuepa N. Kohala; 1 ap.; ahupuaa; no R.P.; Puuokamau N. Kohala; 1 ap.; ahupuaa; no R.P. Kealahewa N. Kohala; 1 ap.; (ahupuaa); Land Patent 8095; Panau Puna; ahupuaa (Ap. 4); and Waiakahiula Puna; (ahupuaa) 2 ap.; 2972 Acs; Pahoa Kohala; Maumau Hilo; Punahelu Hilo, Kahuahookolo Hilo; Awawaloa Hilo; Weloka Hilo; (Oahu) Waimalu Ewa; R.P. 6971, Honouliuli Ewa; R.P. 5700, Makao Koolauloa; Land Patent 7960, Mokuueume Ewa; (Kauai) Waiakalua 2 Koolau; Namahana Koolau; Kaakaanui Koolau; R.P. 5680, Kealia Puna; R.P. 7165, Akoko Halelea; R.P. 7194, Wainiha Halelea; Waikoko 1 ap.; 476 Acs; (Molokai) Makanalua Kona; Land Patent 8184, Kapualei Kona; Land Patent 8132, Naiwa Kona; Land Patent 8162, Moakea; land Patent 8154, Kaiamiki Kona; Land Patent 8184, Kumueli Kona; Land Patent 8184, Awawaie Kona; (Lanai) R.P. 7093, Palawai]

Land Grants

00308 to Ua

Grant Number(LG)	00308	**Island**	Maui
Grantee:	Ua, L.S.	**Source Book:**	1
Ahupua`a:	Uhao	**Acreage::**	0.87 Ac.
District:	Lahaina		

No. 308, Ua, L.S. Uhao Ahupuaa, District of Lahaina, Island of Maui, Vol. 2, pps. 244-245 [LG Reel 1, 00801-00802.tif]

No. 308
ROYAL PATENT.

Kamehameha III, By the Grace of God, King of the Hawaiian Islands, by this Royal Patent, makes known, unto all men, that he has for himself and his successors in office, this day granted and given, absolutely, in Fee Simple unto [left blank], his faithful and loyally disposed subject for the consideration of [left blank], paid into the Royal Exchequer, all that certain piece of Land situated at [left blank] in the Island of [left blank] and described as follows:

Received of L.S. Ua the sum of Eight 70/100 Dollars for land described in Patent No. 308

Containing [left blank] Acres, more or less, excepting and reserving to the Hawaiian Government, all mineral or metallic mines of every description.

To have and to hold the above granted Land in Fee Simple, unto the said [left blank], Heirs and Assigns forever, subject to the taxes to be from time to time imposed by the Legislative Council equally, upon all landed Property held in Fee Simple.

In Witness whereof, I have hereunto set my Hand, and caused the Great Seal of the Hawaiian Islands to be affixed, at Honolulu, this [left blank] day of [left blank], 18[left blank]

[page 245]

Helu 308
Palapala Sila Nui

Ma keia palapala sila nui ke hoike aku nei o Kamehameha III, ke Alii nui a ke Akua i kona lokomaikai i hoonoho ai maluna o ko Hawaii Pae Aina, i na kanaka a pau, i keia la, nona iho; a no kona mau hope alii, ua haawi lilo loa aku oia ma ko ano alodio ia L.S. Ua i kona wahi kanaka i manao pono ia ia i kela apana aina a pau e waiho la ma Uhao Lahaina ma ka Mokupuni o Maui, a penei hoi ka waiho ana o na Mokuna.

E hoomaka ma ka pahu ma ka palena iwaena o Uhao a me Aki ma ke kihi Hikina Hema o kekahi Loi no Kekuanaoa

a e holo
Akau 38 1/2Â° Komohana 0.90 Kaulahao
Hema 50Â° Komohana 1.00 Kaulahao
Akau 34Â° Komohana 0.58 Kaulahao
Akau 40Â° Hikina 2.00 Kaulahao
Akau 37Â° Hikina 3.25 Kaulahao
Hema 60Â° Hikina 1.40 Kaulahao
Hema 24 1/2Â° Komohana 2.35 Kaulahao
Hema 44 1/2Â° Komohana 2.60 Kaulahao a hiki i kahi i hoomakaâ€™i.

A maloko o ia mau Apana 1051 Anana 6 Kapuai eka a oi iki aku, emi iki mai paha.
Eia ke kumu o ka lilo ana; ua haawi mai oia iloko o ka waihona waiwai o ke Aupuni i na Dala he Ewalu m na keneta Kanahiku. Aka, ua koe i ke Aupuni na mine minerala a me na mine metala a pau.

No L.S. Ua, ua aina la i haawiia, no na mau loa aku no, ma ke ano alodio, a me ko na mau hooilina, a me ko na waihona, ua pili nae ka auhau a ka Poe Ahaolelo e kau like ai ma na aina alodio a pau i kela manawa i keia manawa.

A i mea e ikeaâ€™i ua kau wau i koâ€™u inoa, a me ka sila nui o ko Hawaii Pae Aina ma Honolulu i keia la 12 o June, 1850

(Inoa) Kamehameha
(Inoa) Keoni Ana

[Land Patent Grant No. 308, Ua, L.S. Uhao Ahupuaa, District of Lahaina, Island of Maui, 1051 Fathoms 6 Feet (.870 Acre), 1850]

00309 to Kekauai

Grant Number(LG)	00309	**Island**	Maui
Grantee:	Kekauai	**Source Book:**	1
Ahupua`a	Puahoowale	**Acreage::**	3 Acs
District:	Lahaina	**TMK**	2-4-6-11, 16

No. 309, Kekauai, Puahoowale Ahupuaa, District of Lahaina, Island of Maui, Vol. 2, pps. 246-247 [LG Reel 1, 00803-00804.tif]

No. 309
Royal Patent

Kamehameha III, By the Grace of God, King of the Hawaiian Islands, by this Royal Patent, makes known, unto all men, that he has for himself and his successors in office, this day granted and given, absolutely, in Fee Simple unto [left blank] his faithful and loyally disposed subject for the consideration of [left blank] Dollars, paid into the Royal Exchequer, all that certain piece of Land situated at [left blank] in the Island of [left blank] and described as follows:

Received of Kekauai the sum of Five Dollars for land as per Patent No. 309
Treasury Office, September 17th, 1850
For The Minister of Finance, William Jarrett

Containing [left blank] Acres, more or less, excepting and reserving to the Hawaiian Government, all mineral or metallic mines of every description.

To have and to hold the above granted Land in Fee Simple, unto the said [left blank], Heirs and Assigns forever, subject to the taxes to be from time to time imposed by the Legislative Council equally, upon all landed Property held in Fee Simple.

In Witness whereof, I have hereunto set my Hand, and caused the Great Seal of the Hawaiian Islands to be affixed, at Honolulu, this [left blank] day of [left blank], 18[left blank]

[page 247]

Helu 309
Palapala Sila Nui

Ma keia palapala sila nui ke hoike aku nei o Kamehameha III, ke Alii nui a ke Akua i kona lokomaikai i hoonoho ai maluna o ko Hawaii Pae Aina, i na kanaka a pau, i keia la, nona iho; a no kona mau hope alii, ua haawi lilo loa aku oia ma ko ano alodio ia Kekauai i kona wahi kanaka i manao pono ia ia i kela apana aina a pau e waiho la ma Puahoowale, Lahaina ma ka Mokupuni o Maui, a penei hoi ka waiho ana o na Mokuna.

E hoomaka ana ma ke kihi Akau Komohana o ua aina nei, a penei aku la
Akau 34 3/4° Hikina 1.30 Kaulahao
Hema 45 1/2° Hikina 0.26 Kaulahao
Akau 50° Hikina 0.26 Kaulahao
Akau 45 1/2° Komohana 0.30 Kaulahao

Akau 34° Hikina 4.75 Kaulahao
Akau 39° Hikina 5.13 Kaulahao i ka pahu hoailonaia [?] ma ke kii
Hema 8° Komohana 9.20 Kaulahao ma ka mokuna e mahele ana ua aina nei a hiki i ka pahu hoailonaia B. ma ke kii
Hema 82° Komohana 0.83 Kaulahao
Hema 7° Komohana 0.47 Kaulahao
Akau 80° Komohana 0.90 Kaulahao
Hema 34 3/4° Komohana 0.86 Kaulahao
Akau 60 1/2° Komohana 0.68 Kaulahao
Hema 40° Komohana 1.14 Kaulahao
Akau 51 3/4° Komohana 2.56 Kaulahao i kahi i hoomaka'i.

Ua koe ke kuleana o na kanaka

A maloko o ia mau Apana 3 eka a oi iki aku, emi iki mai paha.
Eia ke kumu o ka lilo ana; ua haawi mai oia iloko o ka waihona waiwai o ke Aupuni i na Dala he $5.00. Aka, ua koe i ke Aupuni na mine minerala a me na mine metala a pau.

No Kekauai, ua aina la i haawiia, no na mau loa aku no, ma ke ano alodio, a no ko na mau hooilina, a me ko na waihona, ua pili nae ka auhau a ka Poe Ahaolelo e kau like ai ma na aina alodio a pau i kela manawa i keia manawa.

A i mea e ikea'i ua kau wau i ko'u inoa, a me ka sila nui o ko Hawaii Pae Aina ma Honolulu i keia la 12 o June, 1850

(Inoa) Kamehameha
(Inoa) Keoni Ana

[Land Patent Grant No. 309, Kekauai, Puahoowale Ahupuaa, District of Lahaina, Island of Maui, 3 Acres, 1850]

00310 to Ap Jones

Grant Number(LG)	00310	**Island**	Maui
Grantee:	Ap Jones, William	**Source Book:**	1
Ahupua`a	Puahoowale	**Acreage::**	3 Acs
District:	Lahaina	**TMK**	2-4-6-16

No. 310, Ap Jones, William, Puahoowale Ahupuaa, District of Lahaina, Island of Maui, Vol. 2, pps. 248-249
[LG Reel 1, 00805-00806.tif]

No. 310
Royal Patent

Kamehameha III, By the Grace of God, King of the Hawaiian Islands, by this Royal Patent, makes known, unto all men, that he has for himself and his successors in office, this day granted and given, absolutely, in Fee Simple unto William Ap Jones, his faithful and loyally disposed subject for the consideration of Puahoowale Fifteen Dollars, paid into the Royal Exchequer, all that certain piece of Land situated at Puahoowale Lahaina in the Island of Maui and described as follows:

Beginning a the post marked A on the plot near a spreading cactus and running
North 33 1/2° East 4.68 chains
South 6.65 chains
South 5 1/4° West 5.77 chains
North 86° West 2.22 chains
South 53 1/2° West 1.30 chains
North 8° East 9.20 chains along line of Kekauai to beginning.

The rights of Native Tenants are reserved.

Containing Three Acres, more or less, excepting and reserving to the Hawaiian Government, all mineral or metallic mines of every description.

To have and to hold the above granted Land in Fee Simple, unto the said William Ap Jones, his Hawaiian Heirs and Assigns forever, subject to the taxes to be from time to time imposed by the Legislative Council equally, upon all landed Property held in Fee Simple.

In Witness whereof, I have hereunto set my Hand, and caused the Great Seal of the Hawaiian Islands to be affixed, at Honolulu, this 12 day of September, 1850.

Received of William Ap Jones the sum of Fifteen Dollars for the above land.

Treasury Office, September 17, 1850
For The Minister of Finance, William Jarrett

[page 249]

Helu 310
Palapala Sila Nui

Ma keia palapala sila nui ke hoike aku nei o Kamehameha III, ke Alii nui a ke Akua i kona lokomaikai i hoonoho ai maluna o ko Hawaii Pae Aina, i na kanaka a pau, i keia la, nona iho; a no kona mau hope alii, ua haawi lilo loa aku oia ma ko ano alodio ia William Ap Jones i kona wahi kanaka i manao pono ia ia i kela apana aina a pau e waiho la ma Puahoowale, Lahaina ma ka Mokupuni o Maui, a penei hoi ka waiho ana o na Mokuna.

E hoomaka ma ka pahu i hoailonaia A, kokoke i kahi pa pipi kolo, a e holo
Akau 33 1/2° Hikina 4.68 Kaulahao
Hema 6.65 Kaulahao
Hema 5 1/4° Komohana 5.77 Kaulahao
Akau 86° Komohana 2.22 Kaulahao
Hema 53 1/2° Komohana 1.30 Kaulahao
Akau 8° Hikina 9.20 Kaulahao ma kahi o Kekauai a hiki i kahi i hoomaka'i.

Ua koe ke kuleana o na kanaka

A maloko o ia mau Apana 3 eka a oi iki aku, emi iki mai paha.
Eia ke kumu o ka lilo ana; ua haawi mai oia iloko o ka waihona waiwai o ke Aupuni i na Dala he $15.00. Aka, ua koe i ke Aupuni na mine minerala a me na mine metala a pau.

No William Ap Jones, ua aina la i haawiia, no na mau loa aku no, ma ke ano alodio, a no ko na mau hooilina, a me ko na waihona, ua pili nae ka auhau a ka Poe Ahaolelo e kau like ai ma na aina alodio a pau i kela manawa i keia manawa.

A i mea e ikea'i ua kau wau i ko'u inoa, a me ka sila nui o ko Hawaii Pae Aina ma Honolulu i keia la 12 o June, 1850

(Inoa) Kamehameha
(Inoa) Keoni Ana

[Land Patent Grant No. 310, Ap Jones, William, Puahoowale Ahupuaa, District of Lahaina, Island of Maui, 3 Acres, 1850]

00482 to Kanehoa

Grant Number(LG)	**00482**	Island	**Maui**
Grantee:	**Kanehoa, James Y.**	Source Book:	**3**
Ahupua`a	**Kulahuhu**	Acreage::	**4.47** Acs
District:	**Lahaina**	TMK	**2-4-6-16**

No. 482, Kanehoa, James Young, Kulahuhu, Ahupuaa, District of Lahaina, Island of Maui, Vol. 3, p. 173 [LG Reel 1, 01309-01310.tif]

Helu 482
Palapala Sila Nui

Ma keia palapala Sila Nui ke hoike aku nei o Kamehameha III, ke Alii nui a ke Akua i kona lokomaikai i hoonoho ai maluna o ko Hawaii Pae Aina, i na kanaka a pau, i keia la, nona iho, a no kona mau hope Alii, ua haawi lilo loa aku oia ma ko ano alodio ia James Young Kanehoa i kona wahi kanaka i manao pono ia ia, i kela apana aina a pau e waiho la ma Kulahuhu, Lahaina ma ka Mokupuni o Maui, a penei hoi ka waiho ana o na Mokuna.

E hoomaka ma ke kihi Komohana Hema o ua aina nei, mailaila aku ka moe ana o kahi oi o ka Hale pule o Baluina i Lahaina, Hema 1° Hikina a me kahi oi o ka hale Kula o Lahainaluna Akau 35° Hikina, a e holo ana penei
Hema 86 3/4° Hikina 3.59 Kaulahao e pili ana me Puako,
Akau 11 1/4° Hikina 3.56 Kaulahao e pili ana me Paumau,
Akau 12 1/2° Hikina 3.19 Kaulahao e pili ana me Paumau,
Akau 3 1/2° Komohana 3.68 Kaulahao e pili ana me Paumau,
Hema 88 3/4° Komohana 4.36 Kaulahao e pili ana me Paumau,
Hema 3 1/4° Komohana 3.82 Kaulahao e pili ana me Puahoawale,
Hema 1 3/4° Komohana 6.19 Kaulahao e pili ana me Puahoawale a hiki i kahi i hoomaka'i.

Ua koe ke Kuleana o na Kanaka

a maloko o ia Apana Eha 468/1210 eka a oi iki aku, emi iki mai paha.
Eia ke kumu o ka lilo ana; ua haawi mai oia iloko o ka waihona waiwai o ke Aupuni i na Dala he Iwakaluakumamalua. Aka, ua koe i ke Aupuni na mine minerala a me na mine metala a pau.

No James Y. Kanehoa, ua aina la i haawiia, no na mau loa aku no, ma ke ano alodio, a no ko na mau hooilina, a me ko na waihona, ua pili nae ka auhau a ka Poe Ahaolelo e kau like ai ma na aina alodio a pau i kela manawa i keia manawa.

A i mea e ikea'i ua kau wau i ko'u inoa, a me ka Sila Nui o ko Hawaii Pae Aina ma Honolulu i keia la 29 o Novemaba, 1850.

(Inoa) Kamehameha
(Inoa) Keoni Ana

[Insert]

Treasury Office, 17 of Dec 1850

Received of J. Y. Kanehoa the sum of Twenty two Dollars for land as per Patent No. 482 and four dollars, the fees of patenting.
For Minister of Finance, William Jarrett

[End of Insert]

[Land Patent Grant No. 482, Kanehoa, James Young, Kulahuhu, Ahupuaa, District of Lahaina, Island of Maui, 4.47 Acres, 1850]

00832 to Antonio

Grant Number(LG)	00832	**Island**	Maui
Grantee:	Antonio, Peke	**Source Book:**	4
Ahupua`a	Kapewakua	**Acreage::**	2.3 Acs
District:	Lahaina	**TMK**	2-4-6-11, -16

No. 832, Antonio, Peke, Kapewakua Ahupuaa, District of Lahaina, Island of Maui, Vol. 5, pps. 69-70 [LG Reel 2, 00634-00635.tif]

Helu 832
Palapala Sila Nui

Ma keia palapala sila nui ke hoike aku nei o Kamehameha III, ke Alii nui a ke Akua i kona lokomaikai i hoonoho ai maluna o ko Hawaii Pae Aina, i na kanaka a pau, i keia la, nona iho; a no kona mau hope alii, ua haawi lilo loa aku oia ma ko ano alodio ia Peke Antonio i kona wahi kanaka i manao pono ia ia i kela apana aina a pau e waiho la ma Kapewakua, Lahaina ma ka Mokupuni o Maui, a penei hoi ka waiho ana o na Mokuna.

Apana 1.
E hoomaka ana ma ke kihi Komohana Hema, a e holo ana
Akau 53 1/2° Hikina 0.37 Kaulahao e pili ana me ko Kekuanaoa
Akau 37° Hikina 1.90 Kaulahao e pili ana me ko Kekuanaoa
Akau 54° Komohana 0.35 Kaulahao e pili ana me ko Keoni Alulu
Hema 28 1/2° Komohana 2.27 Kaulahao e pili ana ala i Lahainaluna
Hema 57 1/4° Hikina 0.33 Kaulahao e pili ana me ko Kaio a hiki i kahi i hoomaka'i.
15 Roda

Apana 2
E hoomaka ana ma ke kihi Hikina Hema o ka pahale o ua Antonio Sylva nei, a e holo ana
Akau 38 3/4° Hikina 5.71 Kaulahao e pili ana me ke alanui i Lahainaluna
Akau 56 1/4° Komohana 0.45 Kaulahao e pili ana me ko Kaaiawahia
Hema 36 1/2° Komohana 1.43 Kaulahao e pili ana me ko Haui
Akau 49 1/4° Komohana 1.09 Kaulahao e pili ana me ko Haui
Akau 38 1/2° Komohana 0.77 Kaulahao e pili ana me ko Kapena
Akau 45° Hikina 2.33 Kaulahao e pili ana me ko Kapena
Akau 43 3/4° Komohana 2.60 Kaulahao e pili ana me ko Kapena
Hema 42 1/2° Komohana 2.20 Kaulahao e pili ana me ko Kamiki
Hema 36 1/4° Hikina 2.59 Kaulahao e pili ana me ko Holoauhu
Hema 53° Komohana 0.90 Kaulahao e pili ana me ko Holoauhu
Hema 32° Hikina 0.63 Kaulahao e pili ana me ko Haui
Hema 53° Komohana 0.77 Kaulahao e pili ana me ko Haui
Hema 40 3/4° Hikina 1.55 Kaulahao e pili ana me ko Haui
Hema 54 1/2° Komohana 1.96 Kaulahao e pili ana me ko Haui & Mi Sylva
Hema 37 1/2° Hikina 1.07 Kaulahao a hiki i kahi i hoomaka'i.
1 Eka 38 Roda

[page 70]

Apana 3
E hoomaka ana ma ke kihi Hema, a e holo ana
Akau 48° Komohana 0.66 Kaulahao e pili ana me ko Kamiki
Akau 39° Hikina 0.44 Kaulahao e pili ana me ko Kapena
Hema 56 3/4° Hikina 0.48 Kaulahao e pili ana me ko Kapena
Hema 17 1/2° Komohana 0.51 Kaulahao e pili ana me ko Kapena a hiki i kahi i hoomaka'i.
4 Roda

Apana 4
E hoomaka ana ma ke kihi Komohana Akau, a e holo ana
Hema 47° Hikina 0.84 Kaulahao e pili ana me ka apana 2 maluna ae nei
Akau 47 1/2° Hikina 1.15 Kaulahao e pili ana me ko Kapena
Akau 41 1/2° Komohana 0.84 Kaulahao e pili ana me ko Kamiki
Hema 47° Komohana 1.23 Kaulahao a i kahi i hoomaka'i.
20 Roda

Apana 5
E hoomaka ana ma ke kihi Hikina Hema, a e holo ana
Akau 15 3/4° Hikina 1.15 Kaulahao e pili ana me ko Kekuanaoa
Akau 20° Hikina 1.69 Kaulahao e pili ana me ko Kekuanaoa
Akau 48 1/2° Komohana 0.54 Kaulahao e pili ana me ko Kekuanaoa
Hema 41 1/2° Komohana 1.41 Kaulahao e pili ana me ko Fanny
Akau 46 1/2° Komohana 2.98 Kaulahao e pili ana me ko Fanny
Hema 25° Komohana 1.95 Kaulahao e pili ana me ko Baluina
Hema 47 1/2° Hikina 1.90 Kaulahao e pili ana me ko Kamiki
Akau 62 1/4° Hikina 0.27 Kaulahao e pili ana me ko Kapena
Hema 53 1/2° Hikina 2.14 Kaulahao e pili ana me ko Kapena i kahi i hoomaka'i.
3 Ruda 11 Roda

Koe ke kuleana o na kanaka

A maloko o ia Apana 2 34/100 eka a oi iki aku, emi iki mai paha.
Eia ke kumu o ka lilo ana; ua haawi mai oia iloko o ka waihona waiwai o ke Aupuni i $1.00. Aka, ua koe i ke Aupuni na mine minerala a me na mine metala a pau.

No Peke P. Antonio, ua aina la i haawiia, no na mau loa aku no, ma ke ano alodio, a no ko na mau hooilina, a me ko na waihona, ua pili nae ka auhau a ka Poe Ahaolelo e kau like ai ma na aina alodio a pau i kela manawa i keia manawa.

A i mea e ikea'i ua kau wau i ko'u inoa, a me ka sila nui o ko Hawaii Pae Aina ma Honolulu i keia la 19 o Julai, 1852

(Inoa) Kamehameha
(Inoa) Keoni Ana

[Land Patent Grant No. 832, Antonio, Peke, Kapewakua Ahupuaa, District of Lahaina, Island of Maui, 5 Apana, 2.34 Acres, 1852]

00725 to Namauu

Grant Number(LG)	00725	**Island**	Maui
Grantee:	Namauu	**Source Book:**	3
Ahupua`a	Kooka	**Acreage::**	22.08 Acs
District:	Lahaina	**TMK**	2-4-6-12, -15

No. 725, Namauu, Kooka Ahupuaa & Kauaula Ahupuaa, Lahaina District, Island of Maui, Volume 3, pps. 265-266 [LG Reel 2, 00340-00342.tif]

Helu 725
PALAPALA SILA NUI,

Ma keia palapala Sila Nui ke hoike aku nei o Kamehameha III., ke Alii nei a ke Akua i kona lokomaikai i hoonohi ai maluna o ko Hawaii Pae Aina, i na kanaka a pau, i keia la, nona iho, a no kona mau hope Alii, ua haawi lilo loa aku oia ma kea no alodio ia Namauu i kona kanaka i manao pono ia ia, i kela Apana aina a pau o waiho la ma Kooka Lahaina ma ka Mokupuni o Maui a penei hoi ka waiho ana o na Mokuna:

Apana 1.
E hoomaka ma ke Kihi Komohana Hema mauka ae o ke Alanui Kahiko, e pili ana i ka aina o Kupalii, a e holo
Akau 72 1/2° Hikina 2.98 Kaulahao
Akau 64 3/4° Hikina 2.03 Kaulahao
Akau 53 1/2° Hikina 2.34 Kaulahao
Akau 43 1/2° Komohana 96 pauku e pili ana ia mau aoao i ko Kupalii, Alaila
Akau 44 1/2° Hikina 2.08 Kaulahao ma ko Keaka, Alaila
Hema 70 1/4° Hikina 1.13 Kaulahao ma ko Manu, Alaila
Hema 78 3/4° Hikina 2 Kaulahao ma ko Apaa, Alaila
Hema 52 3/4° Komohana 3.40 Kaulahao a
Hema 62° Hikina 36 pauku ma ko Hoonaulu, Alaila
Hema 44° Komohana 1 Kaulahao ma ko Alio, Alaila
Akau 62 3/4° Komohana 39 pauku
Hema 62 3/4° Komohana 2.85 Kaulahao
Hema 04° Komohana 1.77 Kaulahao
Hema 71 1/2° Komohana 2.42 Kaulahao ma ko Kahaka, i ke Alanui, Alaila
Akau 34 1/2° Komohana 74 pauku ma ke Alanui a i Kahi i hoomaka'i
1 Eka 1 Ruda 11 Roda

Apana 2.
E hoomaka ma ke Kihi Komohana Akau o keia e pili ana me Puaa, a me ko Manu, a e holo
Hema 37 1/2° Hikina 2.14 Kaulahao ma ko Manu, Alaila
Hema 36 1/2° Hikina 2.47 Kaulahao ma ko Apaa,
Hema 15° Hikina 44 pauku ma ko Hoonaulu,
Akau 84° Hikina 2.98 Kaulahao ma ko Kuhalake,

Akau 48° Hikina 2.52 Kaulahao ma ko Polanui.
Akau 48 3/4° Komohana 3.61 Kaulahao ;
Akau 59° Hikina 5.61 Kaulahao ma ko Apaa
Akau 69 3/4° Hikina 3.55 Kaulahao ma ko Olelo
Akau 85 3/4° Komohana 4.20 Kaulahao ma ko Manu
Hema 65 1/4° Komohana 4.23 Kaulahao
Akau 59 3/4° Komohana 1.74 Kaulahao ma ko Kahaka, Alaila
Hema 44 3/4° Komohana 4.31 Kaulahao ma Puaa i Kahi i hoomaka'i.
4 Eka 1 Ruda.

Apana 3.
E hoomaka ma Pohakuloa, ma ka palena o Kooka a me Polanui, a e holo
Hema 73 1/2° Komohana 5.59 Kaulahao ma Polanui
Akau 19 1/4° Komohana 2 Kaulahao ma ko Olelo
Akau 7 1/2° Komohana 1.64 Kaulahao ma ko Manu
Hema 82 3/4° Hikina 6 Kaulahao ma Puaa
Akau 72 1/4° Hikina 14 Kaulahao
Akau 84 1/2° Hikina 23.30 Kaulahao,
Akau 87 1/2° Hikina 6.45 Kaulahao ma Wainee
Hema 21 1/4° Hikina 2.57 Kaulahao ma ko Kupalii
Hema 84° Komohana 43 Kaulahao ma Polanui a hiki i Kahi i hoomaka'i.
11 Eka 3 Ruda 19 Roda

Apana 4.
E hoomaka ma ke Kihi Komohana Hema Kahi e pili ana keia me ka aina o Kupalii, ma ka palena o Polanui, a e holo
Akua 14 1/3° Komohana 2.16 Kaulahao ma ko Kupalii, Alaila
Hema 78° Hikina 3.61 Kaulahao ma Wainee
Hema 7 3/4° Hikina 86 pauku ma Halakaa
Hema 80 1/2° Komohana 3.17 Kaulahao ma Polanui i kahi i hoomaka'i.
2 Ruda

[Blank page Insert]
Treasury Office
28th of February 1852
Received of Namauu
The sum of Twenty-eight dollars
for land as per Patent No. 725
and four dollars
the fee of patenting
S. Hardy
For Minister of Finance
[end of insert]

[Page 266]
[?] no kela mau Apana 4 iloko o ke Ahupuaa o Kooka.

Apana 5. He lele no Kookaa iloko o ka Ahupuaa o Kanaula [Kauaula]
E hoomaka ma Kekahi pohaku nui, ma ka palena o Wainee, e pili ana i ka aina o Olelo, a e holo
Hema 79 3/4° Hikina 1.99 Kaulahao, a
Hema 8 1/2° Hikina 45 pauku a
Hema 28° Komohana 3.53 Kaulahao ma ko Olelo,
Hema 80 1/2° Hikina 1.64 Kaulahao ma ko Keaka,
Akau 14° Hikina 1.86 Kaulahao ma ko Kuaana, Alaila
Akau 13° Komohana 1.38 Kaulahao a
Akau 87 1/4° Hikina 2.29 Kaulahao ma ko Manu,
Akau 9° Komohana 2.53 Kaulahao ma ko Kahaka,
Akau 21 1/2° Komohana 1.88 Kaulahao ma ko Kupalii, Alaila
Hema 35° Komohana 3.04 Kaulahao a
Hema 49 1/2° Komohana 2.65 Kaulahao ma Wainee i Kahi hoomaka'i.
1 Eka 2 Ruda 11 Roda.

Apana 6. He lele no Kooka ma Kanaula [Kauaula], elua Apana
Apana 1
E hoomaka ma ke Kihi Komohana ma ka auwai o Piilani, e pili ana i ko Kaia a me Puehuehu, a e holo
Hema 24 1/2° hikina 6.73 Kaulahao ma ko Puehuehu,
Akau 72° Hikina 1.46 Kaulahao ma ko Panau
Akau 22 1/2° Komohana 6.62 Kaulahao ma ko Puali,
Hema 74° Komohana 1.66 Kaulahao ma ko Kaia a hiki i Kahi i hoomaka'i.
1 Eka 6 Roda

Apana 2.
E hoomaka ma ke Kihi Komohana ma ka Auwai o Piilani e pili ana i Kaia, a me ko Puali, a e holo
Hema 24 3/4 ° Hikina 6.12 Kaulahao ma ko Puali,
Akau 43° Hikina 3.50 [3.30?] Kaulahao ma Punau,
Akau 33° Komohana 4.94 Kaulahao ma ko Kaia,
Hema 63 1/2° Komohana 2.28 Kaulahao ma Kuia [Kaia] i Kahi i hoomaka'i.
1 Eka 2 Ruda 5 Roda.

A maloko o ia Apana 22 Eka 12 Roda ~~eka~~ a oi iki aku, a emi iki mai paha.

Eia ko kumu o ka lilo ana; ua haawi mai oia iloko o ka waihona waiwai o ke Aupuni i Lwakaluakumamawalu Dala/$284.-/ Aka, ua koe i ke Aupuni na mine mineral a me na mine metala a pau.

No Namauu, ua aina la i haawiia, nona mau loa aku no, ma ko ano alodio, a no kona mau hooilina, a me kona waihona; ua pili nae ka auhau a ka Poe Ahaolelo e kau like ai ma na aina alodio a pau i kela Manawa i keia Manawa.

Ai mea e ikea'I, ua kau wau i ko'u inoa, a me ka Sila Nui o ko Hawaii Pae Aina, ma Honolulu, i keia la 15 o lanuari, 1852.

(Inoa) Kamehameha
(Inoa) Keoni Ana

[Land Patent No. 725, Namauu, Kooka Ahupuaa & Kauaula Ahupuaa, Lahaina District, Island of Maui, 7 apana, 22.08 Acres, 1852]

01875 to Shaw

Grant Number(LG)	01875	**Island**	Maui
Grantee:	Shaw, George	**Source Book:**	10
Ahupua`a	Kuholilea, Miana	**Acreage:**	1.28 Acs
District:	Lahaina	**TMK**	4-5-07

No. 1875, Shaw, George, Kuholilea, Miana Ahupuaa, District of Lahaina, Island of Maui, Vol. 10, pps. 151-152 [LG Reel 3, 01289-01290.tif]

Helu 1875
Palapala Sila Nui

Ma keia palapala sila nui ke hoike aku nei o Kamehameha IV, ke Alii nui a ke Akua i kona lokomaikai i hoonoho ai maluna o ko Hawaii Pae Aina, i na kanaka a pau, i keia la, nona iho; a no kona mau hope alii, ua haawi lilo loa aku oia ma ko ano alodio ia George Shaw i kona wahi kanaka i manao pono ia ia i kela apana aina a pau e waiho la ma Kuholilea, Miana, Lahaina ma ka Mokupuni o Maui, a penei hoi ka waiho ana o na Mokuna,

E hoomaka ana ma ke kumu ulu i ke kihi Hema, Hema o keia aina, alaila ma ko Goerge Shaw ma Maunahina
Akau 44 1/2° Hikina 2.09 Kaulahao alaila ma Kuholilea nui
Akau 24° Hikina 1.89 Kaulahao
Akau 29 1/2° Komohana 0.24 Kaulahao
Akau 43 1/2° Hikina 2.22 Kaulahao
Akau 17 1/2° Hikina 0.87 Kaulahao alaila ma Kuholilea o Mark Robinson
Akau 38° Hikina 1.68 Kaulahao alaila ma Kuhua
Akau 52 1/2° Hikina 1.12 Kaulahao
Hema 32° Hikina .86 Kaulahao
Hema 411/2° Komohana 2.41 Kaulahao
Hema 51 1/2° Komohana 1.56 Kaulahao
Hema 33 1/2° Hikina .22 Kaulahao
Akau 50° Hikina 1 Kaulahao
Hema 27° Hikina 1.72 Kaulahao
Hema 70° Komohana .84 Kaulahao
Hema 48° Komohana 1.76 Kaulahao
Hema 40° Komohana 1 Kaulahao
Hema 19° Komohana 1.46 Kaulahao hiki i ke kihi mua.

[Page 154]

A maloko o ia Apana 1.28 eka a oi iki aku, emi iki mai paha.
Eia ke kumu o ka lilo ana; ua haawi mai oia iloko o ka waihona waiwai o ke Aupuni i na dala he $32.00. Aka, ua koe i ke Aupuni na mine minerale a me na mine metala a pau.

No George Shaw, ua aina la i haawiia, no na mau loa aku no, ma ke ano alodio, a no kona mau hooilino, a me kona waihona, ua pili nae ka auhau a ka Poe Ahaolelo e kau like ai ma na aina alodio a pau i kela manawa i keia manawa.

A i mea e ikea'i ua kau wau i ko'u inoa, a me ka Sila Nui o ko Hawaii Pae Aina ma Honolulu i keia la 22 o Okatoba, 1855.

Kamehameha

[Land Patent Grant No. 1875, Shaw, George, Kuholilea, Miana Ahupuaa, District of Lahaina, Island of Maui, 1.28 Acres, 1855]

01891 to Baldwin

Grant Number(LG)	01891	**Island**	Maui
Grantee:	Baldwin, Dwight	**Source Book:**	10
Ahupua'a	Moalii	**Acreage::**	46.5 Acs
District:	Lahaina	**TMK**	4-5-10, 4-5-1[cut off]

No. 1891, Baldwin, Dwight, Moalii, Ahupuaa, District of Lahaina, Island of Maui, Vol. 183-185 [LG Reel 3, 01321-01323.tif]

No. 1891
Royal Patent

Kamehameha IV, By the Grace of God, King of the Hawaiian Islands, by this His Royal Pat–*[cut off]*
Makes known, unto all men, that he has for himself and his successors in office, this day g–*[cut off]*
Given, absolutely, in Fee Simple unto Dwight Baldwin his faithful and lyally disposed subject–*[cut off]*
Consideration of Two Hundred and Thirty two Dollars, paid into the Royal Exchequer, all tha–*[cut off]*
Piece of Land situated at Moalii, Lahaina in the Island of Maui and described as follows:

No. 1.
Beginning at South West corner on shore the boundary runs
South 52 1/?° East 1.00 Chains along Alamihi
North 18°East 155 Chains along Manakaumi"s house lot
South 72° East 67 Chains along said
South 16° 14" West 1.42 along Do
South 60° East 181 Chains along Alamihi"s boundary to Unahiole pond
North 31 1/2° East 0.94 Chains along house
North 62° West 0.90 along Kauakanui"s house lot
North 31° East 215 Chains along lots to a cocoanut tree
North 70° West 7.12 Chains along Hauki"s pond
North 14 1/2° East 2.90 Chains along Keawe"s
South 72 1/?° East 1.66 Chains along Keawe"s to road
North 4° West 2.89 Chains to road West 1.20 Chains along Kaiaakekoa
North 1° East 6.70 Chains along said lot to road
North 11 3/4° West 741 Chains along road of Punakea
North 42° West 4.52 Chains along Kealiipio
South 26° East 6.52 along sea shore
South 1° East 11.56 Chains along sea shore
South 11° West 8.47 Chains along sea shore to commencement.
Area 3 Acres, 1 Road, 9 Rods.

No. 2
Begin at South West corner on the main road, run
South 70 3/4° East 6.90 Chains along Palea
South 14 1/2° West 2.80 Chains along Palea to creek
South 84 1/3° East 1.64 Chains along creek
North 9 1/2° East 1.62 Chains along Kuaikawai"s House lot
South 78 1/2° East 2.50 Chains along D
South 89° East 2.13 Chains along D
North 85° East 2.24 Chains along D

North 25° West 1.00 Chains along Nalimanui"s
North 4° East 2.64 Chains along D & Kaulakukui"s
South 82 1/2° East 2.15 Chains along Nalimu
South 81 1/2° East 2.47 Chains
North 86° East 1.68 Chains along D, North 0.27 Chains along Moakaka
South 82° West 1.30 Chains
North 83° West 2.81 Chains
North 79° West 2.08 Chains all along Keawe"s
North 11 1/2° East 2.90 Chains along Nalimu, Keawe, & Moakaka
North 80° West 6.08 Chains along Moakaka
South 11° West 1.22 Chains along Moakaka & Nalimu
North 78 1/2° West 2.54 Chains
North 67 1/2° West 3.96 Chains both along nalimu
North 4° West 1.36 Chains along Malimu & Moakaka
North 81 1/4° West 3.00 along Government Swamp
South 4° East 1.70 Chains along main road
South 78 1/2° East 3.00 Chains along Kaiki & Keawe
South 67 1/2 ° East 3.96 Chains along Keawe
South 78 1/2° East 2.52 Chains along D
South 11° West 2.41 Chains along Keawe & Kaulakukui & Kaiki to North east corner of Ko–*[cut off]*
taro patch
North 81 3/4° West 1.25 Chains along Kaiki on bank of Koopahea
South 13° 3/4 West 0.71 Chains along Kauakanui
North 71° West 6.92 Chains along D to road
South 6 1/4° East 0.70 Chains along main road to place of beginning.
Area 7 Acres, 1 Road, 21 Rods.

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No. 3.
Begin at South West corner on Main Road, run
South 81° 1/4 East 2.94 Chains along middle of Government Swamp
South 71° 1/2 East 1.00 Chains
South 74° East 3.63 Chains
South 86° [?] 2.05 Chains
South 79° East 3.00 Chains
South 80 1/2 ° East 3.06 Chains these boundaries run along Moakaka, South 0.67 Chains a–*[cut off]*
Moo"s of Moakaka
South 78° 1/2 East 5.09 Chains
South 34° East 0.30 Chains
South 73° 1/2 East 2.23 Chains
South 6° West 0.46 Chains
South 84° East 1.58 Chains all along Moakaka
North 6 1/2° East 0.54 Chains
North 67° 1/4 West 4.66 Chains, North 0.93 Chains along Naolalo
North 70° West 2.48 Chains
North 75° West 2.47 Chains along Kaiwi, South 0.76 Chains along Naolalo
North 85° 1/4 West 2.12 Chains
North 83° 1/2 [?] 3.82 Chains
North 4° 1/2 West 0.48
North 88° West 1.64 Chains
North 78° West 3.50 Chains
North 2 1/2° East 0.66 Chains

North 81 1/2° West 0.72 Chains all along Naolalo
North 83° West 3.70 Chains to road
South 4° East 1.52 Chains along Main Road to place of beginning.
Area 3 Acres, 1 Road, 28 Rods.

No. 4.
Begin at South West corner run
South 77° 1/4 West 3.06 Chains
South 66° 1/2 East 2.60 Chains, South 0.90 Chains
South 87 1/2° East 1.12 Chains
South 11° 1/4 West 0.55 Chains
South 71° 1/4 East 4.70 Chains, all these boundaries running along Moakaka, North 0.51–*[cut off]*
along Hale Parker
South 84° 1/2 East 2.30 Chains along D
North 41° West along lava land to a great Gorge
North 65° West 7.32 Chains along Government lava land
South 15° West 1.83 Chains
North 82° 1/2 West 3.46 Chains both along Naolalo, South 0.52 Chains along Moakaka to–*[cut off]*
beginning.
Area 3 Acres

No. 5. A moo in Ili o Kapaahu
Begin at South West corner run
South 77° 1/2 East 5.08 Chains
North 25° East 0.61 Chains both along Keawe
North 72° 1/2 West 5.08 Chains along Nalimu
South 17° West 0.90 Chains along Nalimu & Nalimunui to place of beginning.
Area 1 Road, 21 Rods

No. 6, A short Moo North of No. 3.
Begin at South West corner run
South 85° [?] 2.68 Chains, North 0.36 Chains
North 82° 3/4 West 2.80 Chains, South 0.47 Chains all these boundaries running along Na–*[cut off]*
place of beginning.
Area 18 Square Rods

containing [left blank] Acres, more or less, excepting and reserving to the Hawaiian Govern–*[cut off]*
mineral or metallic mines of every description.

To have and to hold the above granted Land in Fee Simple, unto the said [left blank] Heirs–*[cut off]*
Assigns forever, subject to the taxes to be from time to time imposed by the Legislative Co–*[cut off]*
equally, upon all landed Property held in Fee Simple.

In Witness whereof, I have hereunto set my Hand, and caused the Great Seal of the Hawa–*[cut off]*
Islands to be affixed, at Honolulu, this [left blank] day of [left blank] 18[left blank].

[page 185]

Helu
Palapala Sila Nui

Ma keia palapala sila nui ke hoike aku nei o Kamehameha IV, ke Alii nui a ke Akua i kona –*[cut off]*
i hoonoho ai maluna o ko Hawaii Pae Aina, i na kanaka a pau, i keia la, nona iho; a no kon–*[cut off]*

hope alii, ua haawi lilo loa aku oia ma kea no alodio ia [left blank] I kona [left blank] kanaka –*[cut off]*
pono ia ia i kela Apana aina a pau e waiho la ma [left blank] ma ka Mokupuni o [left blank],–*[cut off]*
hoi ka waiho ana o na Mokuna.

No. 7, In Ili of Pueo
Begin at South West corner on the creek, run
South 80 1/2° East 1.80 Chains
North 47 1/2° East 3.77 Chains
North 64 3/4° East 1.79 Chains along Moalii Creek
North 43° East 1.20 Chains
North 45 1/2° West 0.40 Chains both along Keoni"s yard
South 77 1/2° West 2.90 Chains
North 71 3/4° West 2.11 Chains
North 43 1/2° 1.85 Chains along Kanehoewaa
North 86° East 2.05 Chains along D: (a stone wall)
North 41° West 1.20 Chains along Kaula Kukui
South 77 1/2° West 5.50 Chains along Hale Parker
South 12° East 5.90 Chains along Lelehu of Kanehoewaa to Moalii Creek to place of beginning.
Area 2 Acres, 3 Roads, 22 Rods.

No. 8, East part of Moalii lava land
Begin at South West part at great stone, run
South 41°

04677-04679 to Isenberg

04683 to Isenberg

Grant Number(LG)	4683	**Island**	Maui
Grantee:	Isenberg, H.A.	**Source Book:**	23
Ahupua`a	Wainee	**Acreage::**	0.5 Ac.
District:	Lahaina	**TMK**	Reel 9,

No. 4683, Isenberg, H.A., Wainee Ili, Ahupuaa, District of Lahaina, Island of Maui, Volume 22, pps. 205-207
[Reel 9, 01242-01244.tif]

Land Patent No. 4683
(Grant)

On Cash Purchase

By this Patent the Governor of the Territory of Hawaii, in conformity with the laws of the United States of America and of the Territory of Hawaii, makes known to all men that he has this day granted and confirmed unto H. A. Isenberg, for the consideration of Thirty Two 00/100 Dollars, $32 00/100 paid into the Treasury. And in conformity with section 17 of Part IV of the Land Act of 1895. all of the land situate at Wainee in the District of Lahaina, Island of Maui bounded and described as follows:

Sold at Public Auction September 13th 1902. Lot 8
Beginning at a point which is the West corner of this piece, and the North corner of L.C.A. 484, 3. Kaiheekai as shown on Government Survey Registered Map No. 1262, and running by true bearings
1. North 70° 20' East 266.5 feet along L.C.A. 6787 Hanaumua
2. South 42° 40' East 55.0 feet L.C.A. 4818, Poopuu;
3. South 59° 00' West 285.0 feet along L.C.A. 6785 Kaluahinenui;
4. North 24° 00' West 107.5 feet along L.C.A. 484, 3. Kaiheekai to initiated point. Area 50/100 Acre.

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[Diagram]

6787 Hanaumua, 4818 Poopuu, 6785 Kaluahinenui, 484-3 Kaiheekai, Lot 8 .50 Acres

Scale 200 feet = 1 Inch

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Containing 50/100 Acres, more or less.

To Have and to Hold the above granted Land unto the said H. A. Isenberg and his heirs and assigns forever.

In Witness whereof, The Governor of the Territory of Hawaii has hereto set his hand and caused the Great Seal of the Territory to be hereunto affixed, this 25th day of Feberuary, A.D. 1903.

(Great Seal)

By the Governor, (Signed) Sanford B. Dole
Commissioner of Public Lands, (Signed) Edward S. Boyd

[Land Patent Grant No. 4683, Isenberg, H.A., Wainee,Ahupuaa, District of Lahaina, Island of Maui, .50 Acre, 1903]

04686 to Vettlesen

06412 to Lahaina Agricultural Co.

08195 to Pioneer Mill Co.

APPENDIX F.

Acoustic Study

ACOUSTIC STUDY FOR THE KUHUA STREET EXTENSION LAHAINA, MAUI, HAWAII

Prepared for:

MAUI DEPT. OF PUBLIC WORKS

Prepared by:

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

JULY 2012

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CHAPTER I. SUMMARY

The existing and future traffic noise levels in the environs of the proposed Kuhua Street Extension (KSE) Project in Lahaina on the island of Maui were studied to evaluate potential noise impacts associated with the Build Alternative 1. Noise measurements were obtained, traffic noise predictions developed, and noise abatement alternatives evaluated.

Existing traffic noise levels in the project area currently do not exceed the U.S. Federal Highway Administration (FHWA) and Hawaii State Department of Transportation, Highways Division (HDOT) noise abatement criteria along the KSE corridor. Future (CY 2020) traffic noise levels are not expected to exceed the "71 Leq" HDOT noise abatement criteria for industrial or commercial uses along the KSE corridor under the Build or No-Build Alternatives. The "66 Leq" noise abatement criteria may be exceeded at noise sensitive dwelling units, and at two ball fields of the Lahaina Recreation Center. Traffic noise mitigation measures in the form of lower posted speed limits along the KSE are recommended under the Build Alternative 1. The use of sound attenuating walls along the KSE Right-of-Way which abuts existing residences will not be effective due to the open driveways which are required at these residences.

The following general conclusions can be made in respect to the number of impacted structures and lands which can be expected by CY 2020 under the Build Alternative. These conclusions are valid as long as the future vehicle mixes and average speeds do not differ from the assumed values.

- The HDOT's "15 dB increase" criteria for substantial change in traffic noise levels may be exceeded at five residences along the existing Kuhua Street. Maximum increases in traffic noise levels in this area could equal or exceed 15 dBA due to the proximity of the KSE to these residences and the relatively low traffic volumes along the existing Kuhua Street.

- Future traffic noise levels at three residences along the existing section of Kuhua Street may exceed the HDOT "66 Leq" noise abatement criteria with the project. The primary reason for this is the relatively short setback distances of these residences from the centerline of the KSE.

- The future 66 Leq traffic noise contour may extend into the two ball fields of the Lahaina Recreation Center. The use of a 20 miles per hour posted speed limit may be used to minimize the expansion of the 66 Leq traffic noise contour beyond the KSE Right-of-Way.

- No public structures (such as churches or schools) are located within the limits of project construction; therefore, none should be affected by the proposed project or require noise mitigation measures under Build Alternative 1.

- Future traffic noise levels at the existing commercial and industrial structures along Kuhua Street should not exceed the "71 Leq" noise abatement criteria with or without the project.

Potential short term construction noise impacts are possible during the project construction period primarily in the developed areas of Kuhua Street. However, minimizing these types of noise impacts is possible using standard curfew periods, properly muffled equipment, administrative controls, and construction barriers as required.

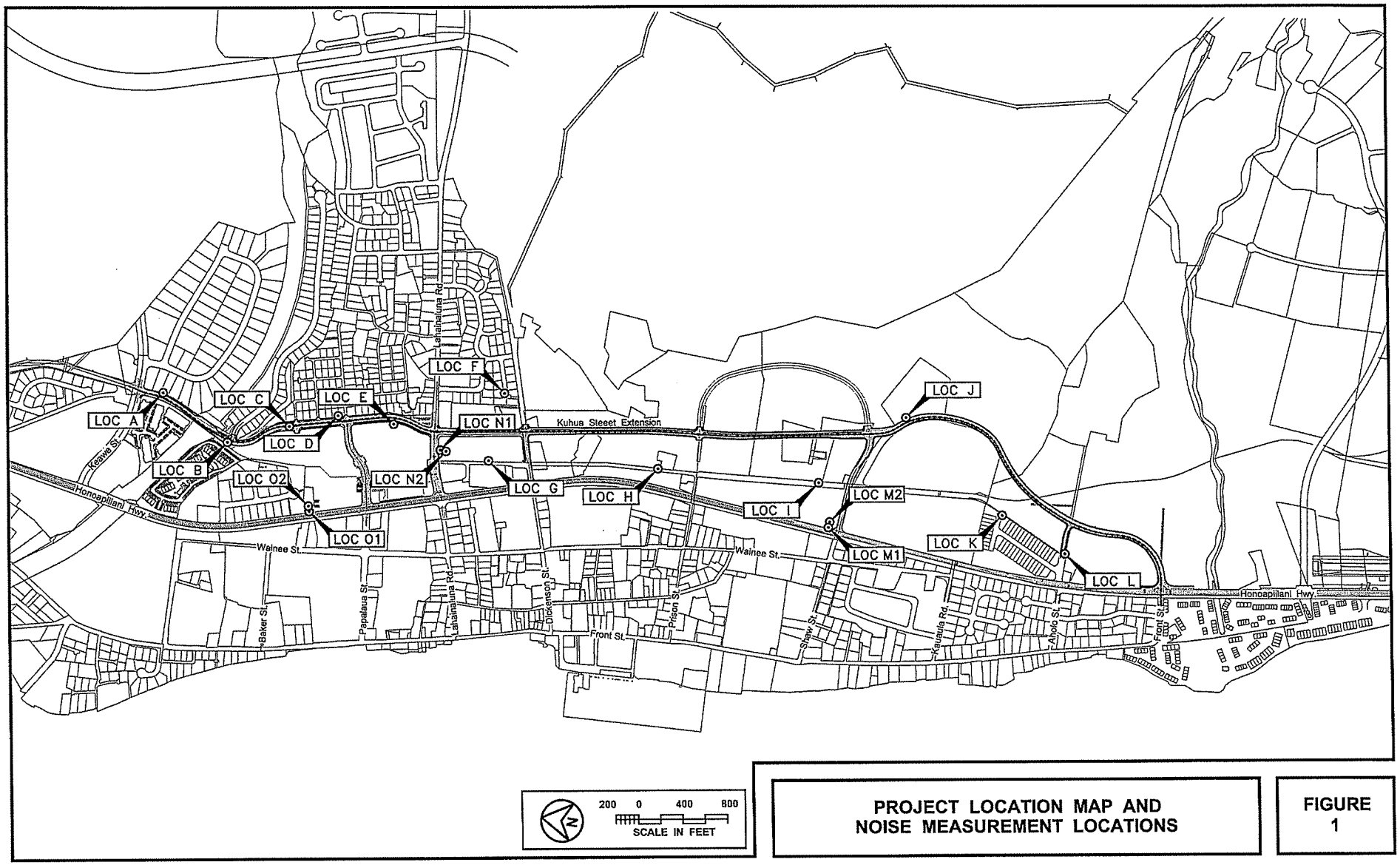
CHAPTER II. GENERAL STUDY METHODOLOGY

Noise Measurements. Existing traffic and background ambient noise levels at 18 locations in the project area were measured in June 2012. The traffic noise measurements were used to validate the traffic noise model which was used to calculate the Base Year (CY 2011) and future (CY 2020) traffic noise levels under the No Build and Build Alternatives. The background ambient noise measurements were used to define existing noise levels at receptors which may be affected by the project. Also, the measurements were used in conjunction with forecast traffic noise levels to determine if future traffic noise levels are predicted to "substantially exceed" existing background ambient noise levels at these receptors, and therefore exceed FHWA and HDOT's "15 dB increase" noise abatement criteria.

The noise measurement locations (A through O2) are shown in Figure 1. The results of the background noise measurements are summarized in Table 1, and the results of the traffic noise measurements are summarized in Table 2. In the tables, Leq represents the average (or equivalent), A-Weighted, Sound Level, which is the noise descriptor (or metric) which is typically used in highway noise evaluations. A list and description of the acoustical terminology used are contained in Appendix B.

Traffic Noise Predictions. The Federal Highway Administration (FHWA) Traffic Noise Model, Version 2.5 (or TNM, see Reference 1) was used as the primary method of calculating Base Year and future traffic noise levels, with model parameters adjusted to reflect terrain, ground cover, and local shielding conditions. At all traffic noise measurement locations, the measured noise levels were compared with TNM model predictions to insure that measured and calculated noise levels for the existing conditions were consistent and in general agreement. As indicated in Table 2, spot counts of traffic volumes were also obtained during the measurement periods and were used to generate the Equivalent Sound Level (Leq) predictions shown in the table. The average vehicle speeds entered into the TNM were typically higher than posted speeds so as to achieve better agreement between measured noise levels and those calculated by the TNM. With these input speed adjustments, the agreement between measured and predicted traffic noise levels was considered to be good and sufficiently accurate to formulate the Base Year and future year traffic noise levels.

Base Year traffic noise levels were then calculated in the project environs using Base Year (2011) traffic volume data for the AM and PM peak hours from Reference 2. These traffic volumes are summarized in Appendix C. Traffic mix by vehicle types and average vehicle speeds for the various sections of the existing and future roadways were derived from observations during the noise monitoring periods. Determinations of the periods of highest hourly traffic volumes along the project corridor were made after reviewing the AM and PM peak hour traffic volumes from Reference 2. Total two-way traffic volumes were generally highest during the PM peak hour, but highest during the AM peak hour along the west section of Lahainaluna Road and along Kuhua Street. However, measured traffic noise levels were slightly higher during the AM peak hour.



PROJECT LOCATION MAP AND NOISE MEASUREMENT LOCATIONS

FIGURE 1

TABLE 1
BACKGROUND NOISE MEASUREMENT RESULTS

LOCATION KSE Project; Lahaina, Maui
DATE: June 11, 2012 All records are 30 minutes in duration.

Start Time	Location	Lmax	L10	Leq	L50	Lmin	Event Description
0837	A	62.7	52.4	50.3	44.2	37.8	
0914	B	59.0	50.6	48.2	43.4	40.1	
0957	C	61.0	51.0	50.0	48.3	39.5	
1034	D	66.7	56.1	55.3	51.9	49.0	
1134	E	66.1	56.9	52.9	51.2	47.1	
1216	F	63.2	56.1	51.2	51.2	46.6	
1253	G	72.2	63.5	58.6	56.0	49.7	
1332	H	61.7	57.8	54.7	53.5	42.1	
1414	I	62.0	54.5	52.1	49.7	44.3	
1455	J	64.8	53.8	53.2	49.2	45.1	
1533	K	56.7	51.3	46.5	45.0	40.3	
1607	L	66.7	59.8	57.0	56.7	48.5	

Notes:

a. Leq = Average A-Weighted Sound Level (in dBA)
b. Lmax = Maximum A-Weighted Sound Level (in dBA)
c. Lmin = Minimum A-Weighted Sound Level (in dBA)
d. L10 = A-Weighted Sound Level (in dBA) which was exceeded 10 percent of the time.
e. L50 = A-Weighted Sound Level (in dBA) which was exceeded 50 percent of the time.

TABLE 2

TRAFFIC NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
M1. 56 FT from the center-line of Honoapiilani Highway (6/12/12)	0649 TO 0749	45	1,609	41	28	72.5	71.4
M2. 106 FT from the center-line of Honoapiilani Highway (6/12/12)	0634 TO 0734	45	1,609	41	28	65.2	65.7
N1. 50 FT from the center-line of Lahainaluna Road (6/12/12)	0808 TO 0908	30	793	10	4	63.1	62.9
N2. 100 FT from the center-line of Lahainaluna Road (6/12/12)	0808 TO 0908	30	793	10	4	57.2	57.7
N1. 50 FT from the center-line of Lahainaluna Road (6/12/12)	1426 TO 1526	30	802	16	2	62.9	62.8
N2. 100 FT from the center-line of Lahainaluna Road (6/12/12)	1426 TO 1526	30	802	16	2	57.6	57.4

TABLE 2 (CONTINUED)

TRAFFIC NOISE MEASUREMENT RESULTS

LOCATION	Time of Day (HRS)	Ave. Speed (MPH)	Hourly Traffic Volume AUTO	M.TRUCK	H.TRUCK	Measured Leq (dB)	Predicted Leq (dB)
M1. 56 FT from the center-line of Honoapiilani Highway (6/12/12)	1543 TO 1643	40	1,983	24	21	71.4	70.6
M2. 106 FT from the center-line of Honoapiilani Highway (6/12/12)	1543 TO 1643	40	1,983	24	21	64.6	64.8
O1. 50 FT from the center-line of Honoapiilani Highway (6/13/12)	0641 TO 0741	47	1,829	32	19	73.0	72.9
02. 100 FT from the center-line of Honoapiilani Highway (6/13/12)	0641 TO 0741	47	1,829	32	19	66.8	67.7

For the purposes of this study, the PM peak hour along the Kuhua Street Extension (as indicated by the data in Reference 2) was used to model the period with the highest traffic noise levels along the improved and new sections of the Kuhua Street Extension.

The Equivalent (or Average) Hourly Sound Level [Leq(h)] noise descriptor was used to calculate the Base Year and CY 2020 traffic noise levels as required by Reference 3. Aerial photo maps, tax maps, and project schematic plans (where available) of the area were used to determine terrain, ground cover, and local shielding effects and distances from building structures, which were entered into the noise prediction model. Roadway plans and profiles and topographic maps were available, and were used to model the Kuhua Street Extension (KSE) traffic lanes and the existing noise sensitive receptor locations along the proposed KSE alignment.

Future year (2020) traffic noise levels were then developed for the No Build and Build (roadway improvement) Alternatives using the future traffic assignments of Reference 2. Under the Build Alternative 1, it was assumed that the proposed Kuhua Street Extension would be constructed as shown in Figure 1, with traffic volumes in the project environs as shown in Appendix C. Forecast mixes of vehicle types were assumed to be identical for both existing and future traffic, and vehicle speeds for Year 2020 along existing roadways were assumed to be identical to their Base Year values. Future traffic conditions under the No Build Alternative may worsen, with average vehicle speeds declining as a result of increased congestion. Nevertheless, under the No Build Alternative, average vehicle speeds were assumed to remain the same as current values. Along the sections of the Kuhua Street Extension, a posted speed limit of 20 miles per hour was used to model future traffic noise levels between Keawe Street and Lahainaluna Road and between Shaw Street and Honoapiilani Highway, and a posted speed limit of 30 miles per hour was assumed between Lahainaluna Road and Shaw Street under Build Alternative 1.

Impact Assessments and Mitigation. Following the calculation of the future traffic noise levels, evaluations of the future traffic noise levels and impacts at existing receptor locations along the Kuhua Street Extension within the limits of construction were made. Comparisons of predicted future traffic noise levels with FHWA and HDOT noise abatement criteria (see Table 3) were made to determine specific locations where the noise abatement criteria are expected to be exceeded.

The HDOT 66 Leq(h) noise abatement threshold criteria and the HDOT "15 dB increase" criteria were applied to all noise sensitive buildings in the project environs. By Reference 4, the HDOT has replaced the FHWA 67 Leq(h) criteria with their 66 Leq(h) criteria for noise sensitive receptors in Activity Categories B and C. The HDOT 71 Leq(h) noise abatement threshold criteria and the HDOT "15 dB increase" criteria were applied to all commercial buildings in the project environs and within the limits of project construction. Along the project roadway corridor, the locations of the 66 and 71 Leq(h) traffic noise contours, without the benefit of shielding from natural terrain or man-made sound barriers, were also used to identify noise sensitive and commercial receptor

TABLE 3

FHWA & HDOT NOISE ABATEMENT CRITERIA
[Hourly A–Weighted Sound Level––Decibels (dBA)]

ACTIVITY CATEGORY	LEQ (h)*	DESCRIPTION OF ACTIVITY CATEGORY
A	57 (Exterior)	Lands on which serenity and quiet are of extra–ordinary significance and serve an important public need and where the preservation of those qualities is essential if the areas are to continue to serve their intended purpose.
B	67 (Exterior)	Residential.
C	67 (Exterior)	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 (Interior)	Auditoriums, day care centers, hospitals, libra–ries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, and television studios.
E	72 (Exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A–D or F. Includes undeve–loped lands permitted for this activity category.
F	None	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water re–sources, water treatment, electrical), and warehousing.
G	None	Undeveloped lands that are not permitted.

* The Hawaii State Department of Transportation, Highways Division, utilizes Noise Abatement Criteria levels which are 1 Leq unit less than the FHWA values shown.

locations, respectively, where the HDOT's noise abatement criteria would not be exceeded, and which would not require more detailed evaluations. In addition, the HDOT's criteria of "equal to or greater than 15 dB increase above existing background noise levels" was also used as a noise abatement criteria for this project (from Reference 4).

CHAPTER III. EXISTING ACOUSTICAL ENVIRONMENT

For the purposes of this study, 2011 was used as the Base Year for calculating changes in traffic noise levels associated with the future No Build and Build Alternatives. The Base Year noise environment along the project corridor was described by calculating the Hourly Equivalent Sound Level [Leq(h)] along the existing roadways during the AM or PM peak traffic hour (whichever had the highest traffic volume) for the 2011 time period. The hourly sound level, expressed in decibels, represents the average level of traffic noise along the project roadway during the peak traffic hour of the study's Base Year.

Table 4 presents the traffic volume, speed, and mix assumptions used to calculate the Base Year noise levels during the AM or PM peak hour along the existing sections of Honoapiilani Highway and Kuhua Street in the project environs. Shown in Table 4 are the calculated peak hour Leq(h)'s at reference distances of 50, 100, and 200 FT from the geometrical centers of the roadways. The calculated distances to the 66 and 71 Leq noise contour lines under unobstructed, line-of-sight conditions to the roadways are shown in Table 5 for the applicable AM or PM peak hour. The actual distances to the contour lines will generally be less than indicated in Table 5 when intervening structures or terrain obstructions exist between the roadway and a receptor. This reduction (or shrinkage) of the traffic noise contour distances from the roadway's centerline is the result of noise shielding (or attenuation) effects caused by the intervening structures (such as sound attenuating walls) or terrain features.

Existing background noise levels were measured at Locations A through L near existing and future noise sensitive residences along the proposed Kuhua Street Extension. These measurement results are summarized in Table 1. Existing background noise levels at locations removed from Honoapiilani Highway or Lahainaluna Road are controlled by local traffic, distant traffic, aircraft noise, birds, and foliage moving with the wind, and typically range between 45 and 55 Leq. The locations of existing and future noise sensitive receptors (#1 through #31) along the Kuhua Street Extension are shown in Figure 2, and estimates of their existing background noise levels are shown in Table 6.

Existing background noise levels along the proposed Kuhua Street Extension do not exceed the HDOT 66 Leq noise abatement criteria at noise sensitive receptor locations, or the HDOT 71 Leq noise abatement criteria at commercial/industrial receptor locations. Existing noise levels along Honoapiilani Highway are relatively high, and are controlled entirely by traffic along the highway. Tables 4 and 5 describe the existing traffic noise levels along Honoapiilani Highway, and indicate that existing traffic noise levels exceed the HDOT 66 Leq noise abatement criteria at 110 feet from the centerline of the highway.

TABLE 4

EXISTING (CY 2011) TRAFFIC VOLUMES AND NOISE LEVELS ALONG ROADWAYS IN PROJECT AREA (AM OR PM PEAK HOUR)

LOCATION	SPEED (MPH)	TOTAL VPH	****** VOLUMES (VPH) ******** AUTOS	M TRUCKS	H TRUCKS	50' Leq	100' Leq	200' Leq
Honoapiilani Hwy., N. of Keawe St. (PM)	47	3,094	3,001	56	37	75.3	69.2	63.2
Honoapiilani Hwy., Between Keawe & Hinau (PM)	47	3,099	3,006	56	37	75.3	69.2	63.2
Honoapiilani Hwy., Between Hinau & Papalaua (PM)	47	2,961	2,872	53	36	74.6	68.5	62.5
Honoapiilani Hwy., Between Papalaua & Lahainaluna (PM)	45	2,637	2,558	47	32	74.1	67.9	62.0
Honoapiilani Hwy., Between Lahainaluna & Dickenson (PM)	45	2,160	2,095	39	26	73.2	67.1	61.1
Honoapiilani Hwy., S. of Dickenson St. (PM)	45	2,022	1,962	36	24	72.9	66.8	60.8
Honoapiilani Hwy., N. of Shaw St. (PM)	45	2,081	2,019	37	25	73.1	66.9	61.0
Honoapiilani Hwy., Between Shaw & Aholo (PM)	45	2,178	2,113	39	26	73.3	67.1	61.2
Honoapiilani Hwy., Between Aholo & Front (PM)	45	2,127	2,063	38	26	73.2	67.0	61.1
Honoapiilani Hwy., S. of Front St. (PM)	45	2,193	2,128	39	26	73.3	67.1	61.2
KSE Between Keawe & Kahoma Entrance (PM)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KSE Between Kahoma Entrance & Keone (PM)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KSE Between Keone & Aki (AM)	20	52	51	1	0	46.8	41.1	36.5
KSE Between Aki & Lahainaluna (AM)	20	144	141	2	1	52.2	46.9	42.5
KSE Between Lahainaluna & Dickenson (PM)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KSE Between Dickenson & Shaw (PM)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KSE Between Shaw & Aholo (PM)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KSE Between Aholo & Front (PM)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
KSE S. of Front (PM)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

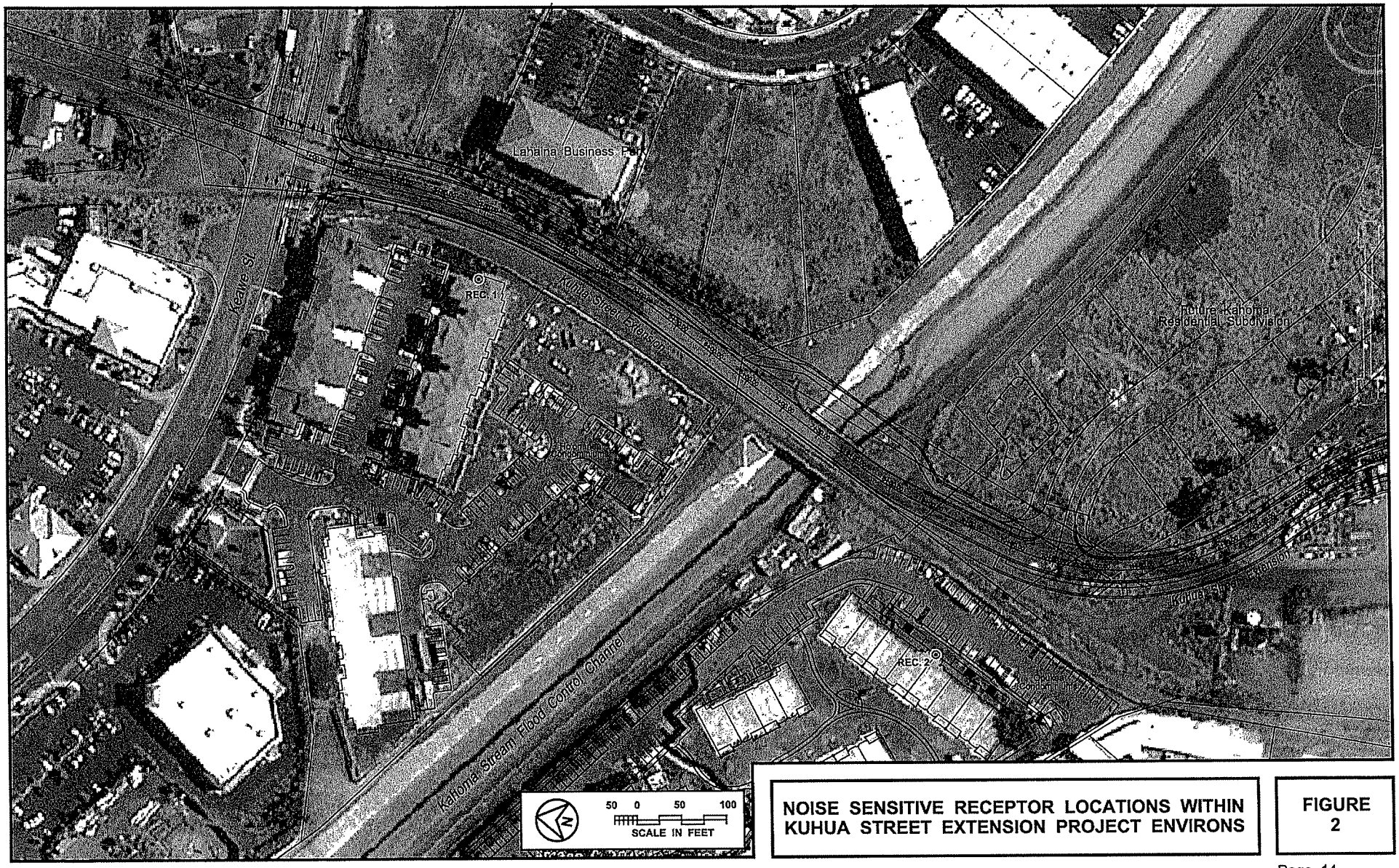
TABLE 5

EXISTING AND CY 2020 DISTANCES TO 66 AND 71 LEQ CONTOURS

STREET SECTION	66 LEQ SETBACK (FT)		71 LEQ SETBACK (FT)	
	EXISTING	CY 2020	EXISTING	CY 2020
Honoapiilani Hwy., N. of Keawe St. (PM)	145	187	82	105
Honoapiilani Hwy., Between Keawe & Hinau (PM)	145	161	82	90
Honoapiilani Hwy., Between Hinau & Papalaua (PM)	133	157	75	88
Honoapiilani Hwy., Between Papalaua & Lahainaluna (PM)	125	131	71	74
Honoapiilani Hwy., Between Lahainaluna & Dickenson (PM)	114	119	64	68
Honoapiilani Hwy., S. of Dickenson St. (PM)	110	111	62	63
Honoapiilani Hwy., N. of Shaw St. (PM)	111	116	63	66
Honoapiilani Hwy., Between Shaw & Aholo (PM)	114	114	65	65
Honoapiilani Hwy., Between Aholo & Front (PM)	112	114	64	65
Honoapiilani Hwy., S. of Front St. (PM)	114	137	65	77
KSE Between Keawe & Kahoma Entrance (PM)	N/A	42	N/A	22
KSE Between Kahoma Entrance & Keone (PM)	N/A	41	N/A	21
KSE Between Keone & Aki (AM & PM)	< 12	43	< 12	24
KSE Between Aki & Lahainaluna (AM & PM)	< 12	45	< 12	26
KSE Between Lahainaluna & Dickenson (PM)	N/A	67	N/A	38
KSE Between Dickenson & Shaw (PM)	N/A	63	N/A	34
KSE Between Shaw & Aholo (PM)	N/A	36	N/A	19
KSE Between Aholo & Front (PM)	N/A	39	N/A	22
KSE S. of Front (PM)	N/A	25	N/A	13

Notes:

(1) All setback distances are from the roadways' centerlines.
(2) See Tables 4 and 7 for traffic volume, speed, and mix assumptions.
(3) Setback distances are for ground level receptors.



NOISE SENSITIVE RECEPTOR LOCATIONS WITHIN KUHUA STREET EXTENSION PROJECT ENVIRONS

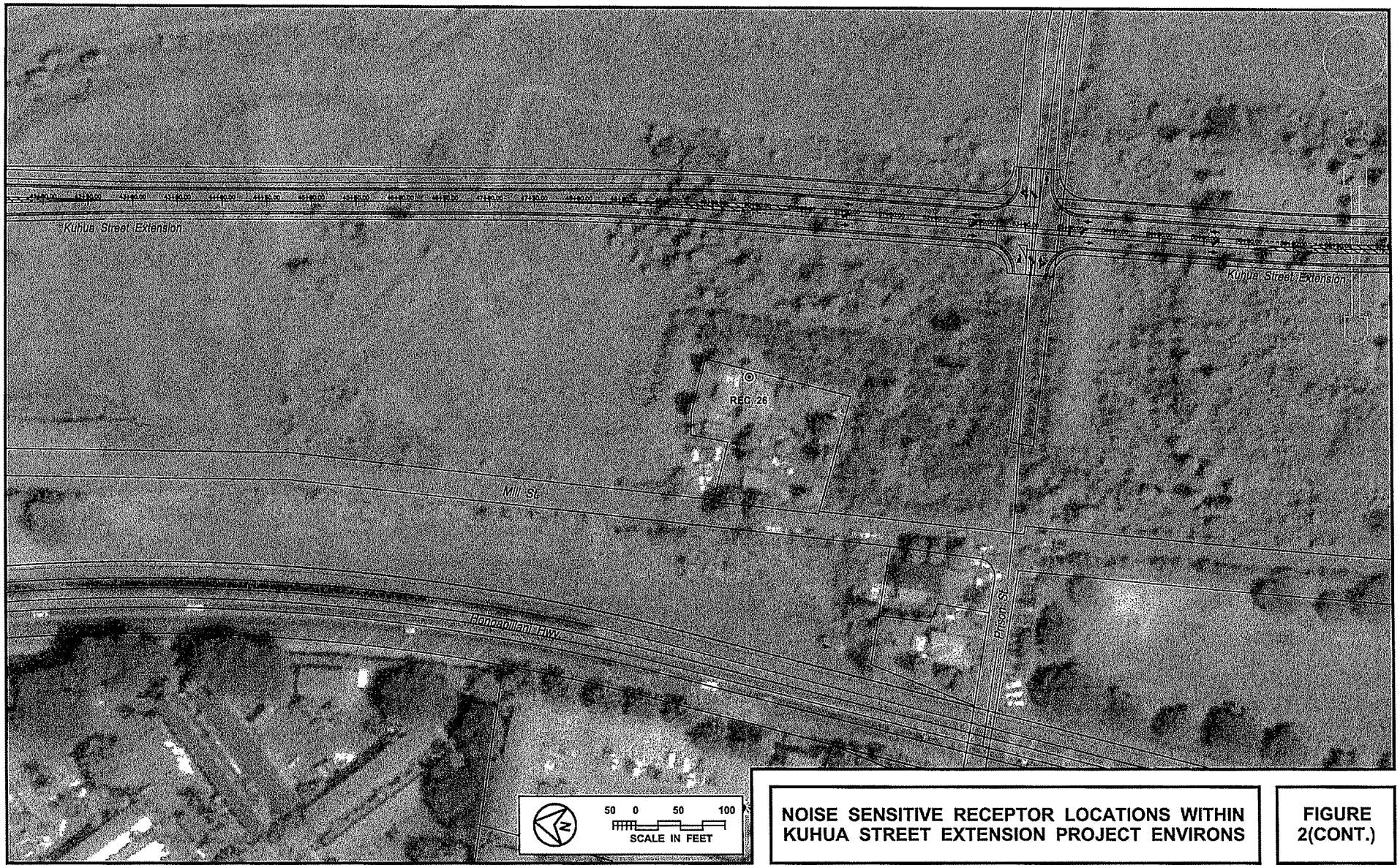
FIGURE 2

NOISE SENSITIVE RECEPTOR LOCATIONS WITHIN KUHUA STREET EXTENSION PROJECT ENVIRONS

FIGURE 2(CONT.)

NOISE SENSITIVE RECEPTOR LOCATIONS WITHIN KUHUA STREET EXTENSION PROJECT ENVIRONS

FIGURE 2(CONT.)



NOISE SENSITIVE RECEPTOR LOCATIONS WITHIN KUHUA STREET EXTENSION PROJECT ENVIRONS

FIGURE 2(CONT.)

NOISE SENSITIVE RECEPTOR LOCATIONS WITHIN KUHUA STREET EXTENSION PROJECT ENVIRONS

FIGURE 2(CONT.)

NOISE SENSITIVE RECEPTOR LOCATIONS WITHIN KUHUA STREET EXTENSION PROJECT ENVIRONS

FIGURE 2(CONT.)

TABLE 6

EXISTING BACKGROUND AND PREDICTED TRAFFIC NOISE LEVELS (AT 4.92 FT HIGH RECEPTORS, PM PEAK HOUR)

RECEPTOR LOCATION	SETBACK DIST. FROM KSE C/L	EXISTING Leq	-- FUTURE (CY 2020) Leq -- W/O SPEED RED. / (CHANGE)		WITH SPEED RED. / (CHANGE)
KEAWE STREET					
Receiver #1 (Ho'onanea Condominiums)	74 FT	50.3	63.3 / 13.0		61.6 / 11.3
Receiver #2 (Opukea Condominiums)	147 FT	48.2	57.5 / 9.3		55.9 / 7.7
KAHOMA ENTRANCE					
Receiver #3 (TMK: 4-5-24:068)	59 FT	49.0	65.1 / 16.1	**	63.4 / 14.4
Receiver #4 (TMK: 4-5-24:066)	58 FT	50.0	65.5 / 15.5	**	63.7 / 13.7
KEONE STREET					
Receiver #5 (TMK: 4-5-24:065)	56 FT	50.0	65.8 / 15.8	**	64.0 / 14.0
Receiver #6 (TMK: 4-5-24:064)	62 FT	50.0	65.3 / 15.3	**	63.6 / 13.6
Receiver #7 (TMK: 4-5-24:063)	55 FT	51.0	66.0 / 15.0	***	64.2 / 13.2
KAMAMALU STREET					
Receiver #8 (TMK: 4-5-24:019)	56 FT	52.0	65.8 / 13.8		64.0 / 12.0
Receiver #9 (TMK: 4-5-24:018)	59 FT	53.0	65.6 / 12.6		63.9 / 10.9
Receiver #10 (TMK: 4-5-24:017)	58 FT	55.0	65.7 / 10.7		64.0 / 9.0
Receiver #11 (TMK: 4-5-24:016)	54 FT	55.0	66.1 / 11.1	*	64.3 / 9.3
AKI STREET					
Receiver #12 (TMK: 4-5-24:015)	62 FT	54.0	65.3 / 11.3		63.5 / 9.5
Receiver #13 (TMK: 4-5-24:014)	55 FT	54.0	66.3 / 12.3	*	64.5 / 10.5
Receiver #14 (TMK: 4-5-25:014)	76 FT	54.0	63.8 / 9.8		62.1 / 8.1
Receiver #15 (TMK: 4-5-25:013)	58 FT	53.0	65.9 / 12.9		64.1 / 11.1
Receiver #16 (TMK: 4-5-25:012)	61 FT	53.0	65.6 / 12.6		63.8 / 10.8
Receiver #17 (TMK: 4-5-25:011)	59 FT	52.9	65.9 / 13.0		64.1 / 11.2
Receiver #18 (TMK: 4-5-25:010)	70 FT	52.0	64.6 / 12.6		62.8 / 10.8
Receiver #19 (TMK: 4-5-25:009)	61 FT	53.0	65.4 / 12.4		63.7 / 10.7
Receiver #20 (TMK: 4-5-25:028)	99 FT	52.0	61.9 / 9.9		60.5 / 8.5
Receiver #21 (TMK: 4-5-25:007)	107 FT	54.0	61.8 / 7.8		60.4 / 6.4
Receiver #22 (TMK: 4-5-25:006)	138 FT	55.0	61.0 / 6.0		59.9 / 4.9
Receiver #23 (TMK: 4-5-25:005)	167 FT	60.0	63.6 / 3.6		60.3 / 0.3
LAHAINALUNA ROAD					
Receiver #24 (TMK: 4-5-27:019)	281 FT	51.0	56.8 / 5.8		55.9 / 4.9
Receiver #25 (TMK: 4-6-10:028)	316 FT	56.0	58.3 / 2.3		57.8 / 1.8

Notes:

1. * Denotes exceedance of HDOT 66 Leq Noise Abatement Criteria for Activity Categories B and C (see Table 3).
2. ** Denotes exceedance of HDOT "15 dB Increase" Noise Abatement Criteria.
3. *** Denotes exceedance of both HDOT Noise Abatement Criteria.

TABLE 6 (CONTINUED)

EXISTING BACKGROUND AND PREDICTED TRAFFIC NOISE LEVELS (AT 4.92 FT HIGH RECEPTORS, PM PEAK HOUR)

RECEPTOR LOCATION	SETBACK DIST. FROM KSE C/L	EXISTING Leq	-- FUTURE (CY 2020) Leq -- W/O SPEED RED. / (CHANGE)	WITH SPEED RED. / (CHANGE)
DICKENSON STREET				
Receiver #26 (TMK: 4-6-16:001)	188 FT	54.7	60.3 / 5.6	59.3 / 4.6
PRISON STREET				
Receiver #27 (L.C. AW. 4878-EE:2)	476 FT	52.1	54.1 / 2.0	53.7 / 1.6
Receiver #28 (L.C. AW. 9813:3)	354 FT	45.0	53.1 / 8.1	52.1 / 7.1
SHAW STREET				
Receiver #29 (TMK: 4-6-15:003)	125 FT	53.2	59.7 / 6.5	58.4 / 5.2
Receiver #30 (TMK: 4-6-34:016)	292 FT	46.5	51.7 / 5.2	50.8 / 4.3
Receiver #31 (TMK: 4-6-34:002)	314 FT	57.0	58.8 / 1.8	57.6 / 0.6

Notes:

1. * Denotes exceedance of HDOT 66 Leq Noise Abatement Criteria for Activity Categories B and C (see Table 3).
2. ** Denotes exceedance of HDOT "15 dB Increase" Noise Abatement Criteria.
3. *** Denotes exceedance of both HDOT Noise Abatement Criteria.

CHAPTER IV. DESCRIPTION OF FUTURE TRAFFIC NOISE LEVELS

The future traffic noise levels in the immediate vicinity of the project during CY 2020 were evaluated for the No Build and Build Alternative 1. The same methodology that was used to calculate the Base Year noise levels was also used to calculate the Year 2020 noise levels. Under both the No Build and Build Alternatives, vehicle mixes and average speeds along Honoapiilani Highway were assumed to be identical to the Base Year values.

Along the Kuhua Street Extension (KSE), future traffic noise levels for posted speed limits of 20 miles per hour to 35 miles per hour were evaluated along various sections of the KSE due to the proximity of existing noise sensitive residences and park grounds to the proposed roadway alignment. Future traffic noise levels under the Build Alternative 1 were calculated at the noise sensitive receptor locations shown in Figure 2 for two scenarios as shown in Table 6. The two scenarios were as follows:

- Without Speed Reduction: Posted speed limit along the KSE of 25 miles per hour from Keawe Street to Lahainaluna Road; and posted speed limit along the KSE of 35 miles per hour from Lahainaluna Road to Shaw Street; and posted speed limit along the KSE of 25 miles per hour from Shaw Street to Honoapiilani Highway. Actual speeds along the KSE that were used in the future noise modeling were 10 miles per hour greater than posted speed limits.

- With Speed Reduction: Posted speed limit along the KSE of 20 miles per hour from Keawe Street to Lahainaluna Road; and posted speed limit along the KSE of 30 miles per hour from Lahainaluna Road to Shaw Street; and posted speed limit along the KSE of 20 miles per hour from Shaw Street to Honoapiilani Highway. Actual speeds along the KSE that were used in the future noise modeling were 10 miles per hour greater than posted speed limits.

Table 6 presents the predicted traffic noise levels at the noise sensitive receptor locations shown in Figure 2. Where predicted future traffic noise levels were not 10 dBA greater than the existing background noise levels, the future traffic noise plus existing background noise levels were combined and are shown in the two "Future (CY 2020) Leq" columns for the without and with speed reduction scenarios. Additional discussion of the possible and recommended posted speed scenarios is provided in Chapter V.

Tables 5 and 7 summarize the traffic conditions, noise levels, and setback distances for the Build Alternative during the PM peak hour in CY 2020. The traffic noise levels and setback distances in Tables 5 and 7 were based on the "With Speed Reduction" Scenario described above. Table 8 presents the increases in future traffic noise levels along Honoapiilani Highway and along the KSE resulting from project and non-project traffic. As indicated in Table 8, future traffic noise levels along Honoapiilani Highway are predicted to decrease by approximately 0.0 to 1.4 dB between CY 2011

TABLE 7

FUTURE (CY 2020) TRAFFIC VOLUMES AND NOISE LEVELS ALONG ROADWAYS IN PROJECT AREA (AM OR PM PEAK HOUR, BUILD)

LOCATION	SPEED (MPH)	TOTAL VPH	****** VOLUMES (VPH) ******** AUTOS	M TRUCKS	H TRUCKS	50' Leq	100' Leq	200' Leq
Honoapiilani Hwy., N. of Keawe St. (PM)	47	5,200	5,044	94	62	77.6	71.4	65.4
Honoapiilani Hwy., Between Keawe & Hinau (PM)	47	3,840	3,725	69	46	76.3	70.1	64.1
Honoapiilani Hwy., Between Hinau & Papalaua (PM)	47	3,645	3,535	66	44	76.0	69.9	63.9
Honoapiilani Hwy., Between Papalaua & Lahainaluna (PM)	45	2,895	2,808	52	35	74.5	68.3	62.4
Honoapiilani Hwy., Between Lahainaluna & Dickenson (PM)	45	2,393	2,321	43	29	73.7	67.5	61.6
Honoapiilani Hwy., S. of Dickenson St. (PM)	45	2,065	2,003	37	25	73.0	66.9	60.9
Honoapiilani Hwy., N. of Shaw St. (PM)	45	2,250	2,182	41	27	73.4	67.3	61.3
Honoapiilani Hwy., Between Shaw & Aholo (PM)	45	2,188	2,123	39	26	73.3	67.1	61.2
Honoapiilani Hwy., Between Aholo & Front (PM)	45	2,190	2,125	39	26	73.3	67.1	61.2
Honoapiilani Hwy., S. of Front St. (PM)	45	3,120	3,027	56	37	74.8	68.7	62.7
KSE Between Keawe & Kahoma Entrance (PM)	30	1,158	1,134	19	5	64.7	59.3	53.5
KSE Between Kahoma Entrance & Keone (PM)	30	1,125	1,102	18	5	64.5	59.2	53.3
KSE Between Keone & Aki (PM)	30	1,140	1,117	18	5	64.7	58.7	53.6
KSE Between Aki & Lahainaluna (PM)	30	1,250	1,225	20	5	65.1	59.0	54.0
KSE Between Lahainaluna & Dickenson (PM)	40	1,288	1,262	21	5	68.6	62.3	57.1
KSE Between Dickenson & Shaw (PM)	40	1,118	1,096	18	4	67.9	62.3	56.1
KSE Between Shaw & Aholo (PM)	30	888	870	14	4	63.5	58.1	52.3
KSE Between Aholo & Front (PM)	30	903	885	14	4	63.7	57.6	52.6
KSE S. of Front (PM)	30	455	446	7	2	60.6	55.2	49.4

TABLE 8

CALCULATIONS OF PROJECT AND NON-PROJECT TRAFFIC NOISE CONTRIBUTIONS (CY 2020) (LEQ)

STREET SECTION	NOISE LEVEL INCREASE DUE TO: NON-PROJECT TRAFFIC	PROJECT TRAFFIC
Honoapiilani Hwy., N. of Keawe St. (PM)	2.5	-0.3
Honoapiilani Hwy., Between Keawe & Hinau (PM)	1.8	-0.9
Honoapiilani Hwy., Between Hinau & Papalaua (PM)	2.3	-0.9
Honoapiilani Hwy., Between Papalaua & Lahainaluna (PM)	1.6	-1.2
Honoapiilani Hwy., Between Lahainaluna & Dickenson (PM)	1.8	-1.4
Honoapiilani Hwy., S. of Dickenson St. (PM)	1.5	-1.4
Honoapiilani Hwy., N. of Shaw St. (PM)	1.6	-1.2
Honoapiilani Hwy., Between Shaw & Aholo (PM)	1.2	-1.2
Honoapiilani Hwy., Between Aholo & Front (PM)	1.2	-1.1
Honoapiilani Hwy., S. of Front St. (PM)	1.2	0.4
KSE Between Keawe & Kahoma Entrance (PM)	N/A	9.3
KSE Between Kahoma Entrance & Keone (PM)	N/A	14.1
KSE Between Keone & Aki (AM & PM)	10.6	7.0
KSE Between Aki & Lahainaluna (AM & PM)	4.3	7.8
KSE Between Lahainaluna & Dickenson (PM)	N/A	11.3
KSE Between Dickenson & Shaw (PM)	N/A	16.3
KSE Between Shaw & Aholo (PM)	N/A	12.1
KSE Between Aholo & Front (PM)	N/A	7.6
KSE S. of Front (PM)	N/A	0.0

and CY 2020 as a result of the KSE project under the Build Alternative 1. Without the KSE project, future traffic noise levels along Honoapiilani Highway are predicted to increase by 1.2 to 2.5 dB between CY 2011 and CY 2020. With the KSE project, future traffic noise levels along Honoapiilani Highway are expected to increase by 0.0 to 2.2 dB.

CHAPTER V. FUTURE TRAFFIC NOISE IMPACTS AND POSSIBLE NOISE MITIGATION MEASURES

Future traffic noise levels are not expected to exceed the HDOT 66 or 71 Leq(h) noise abatement criteria by CY 2020 under Build Alternative 1 at existing noise sensitive or commercial structures within the limits of project construction for the Kuhua Street Extension if the "With Speed Reduction" Scenario of posted speed limits are used along the KSE. From Table 6, it was concluded that a posted speed limit of 20 miles per hour (as included in the "With Speed Reduction" Scenario) should be used between Keawe Street and Lahainaluna Road to avoid exceedance of the HDOT's "66 Leq" or "15 dBA increase" noise abatement criteria. Between Lahainaluna Road and Shaw Street, a posted speed limit of either 30 or 35 miles per hour may be used since there are no exceedances of the HDOT's "66 Leq" or "15 dBA increase" noise abatement criteria under both the "With Speed Reduction" or "Without Speed Reduction" Scenarios in Table 6. In addition, at a posted speed limit of 30 miles per hour between Lahainaluna Road and Shaw Street, at least 6 dB of margin is available for a further increase in the posted speed limit from 30 to 35 miles per hour.

Between Shaw Street and Aholo Street, the KSE is adjacent to the north side of the ball fields of the Lahaina Recreation Center, where the HDOT 66 Leq criteria of Activity Category C applies (see Table 3). Under the "With Speed Reduction" Scenario, with posted speed limit of 20 miles per hour, the 66 Leq contour is predicted to be 36 feet from the centerline of the KSE (see Table 5), so the 66 Leq contour is expected to be approximately 16 feet outside the KSE Right-of-Way. If a 25 or 30 mile per hour posted speed limit is used, the 66 Leq contour would then be approximately 25 feet or 35 feet, respectively, outside the KSE Right-of-Way. If a memorandum of understanding can be executed with the Lahaina Recreation Center regarding the acceptability of the expansion of the 66 Leq traffic noise level contour to 25 feet or 35 feet beyond the KSE Right-of-Way at the two ball fields, use of the higher posted speed limits of 25 or 30 miles per hour should be possible between Shaw Street and Aholo Street.

Between Aholo Street and Honoapiilani Highway, use of the higher 30 miles per hour speed limit should also be possible if it is desired to maintain the same speed limit between Shaw Street and Honoapiilani Highway. In Table 6, the indicated future noise levels at Receivers #29, #30, and #31 shown for the "Without Speed Reduction" Scenario would increase by approximately 1.5 Leq above the values shown in the table if the posed speed limit was raised from 25 to 30 miles per hour. This amount of increase in the traffic noise levels should not cause the future noise levels at these three receiver locations to exceed either the HDOT's "66 Leq" or "15 dBA increase" noise abatement criteria.

The use of lowered posted speed limits at locations where existing noise sensitive receptors are relatively close to the KSE Right-of-Way may be more effective in meeting the HDOT's noise abatement criteria than would sound attenuating walls. This is particularly true along the existing section of Kuhua Street between the Kahoma

entrance and Lahainaluna Road, where the need to provide open driveways will negate the sound attenuation effectiveness of walls constructed along the KSE Right-of-Way. For this reason, the use of lowered posted speed limits is the recommended noise mitigation measure for this project.

It is anticipated that potential noise impacts at any new noise sensitive or commercial establishments located along the KSE may be mitigated through the inclusion of air conditioning or other noise mitigation measures within the individual lot development plans. In addition, any new commercial establishments, public use facilities, or housing units which may be planned alongside the new or improved roadways represent areas of potential adverse noise impacts if adequate noise mitigation measures are not incorporated into the planning of these future projects. It is anticipated that the project's roadway improvements will be completed prior to any redevelopment of the presently open areas or commercial lots adjacent to the roadway, and that noise abatement measures such as adequate setbacks, sound attenuating walls or berms, or closure and air conditioning will be incorporated into these new developments along the roadway as required.

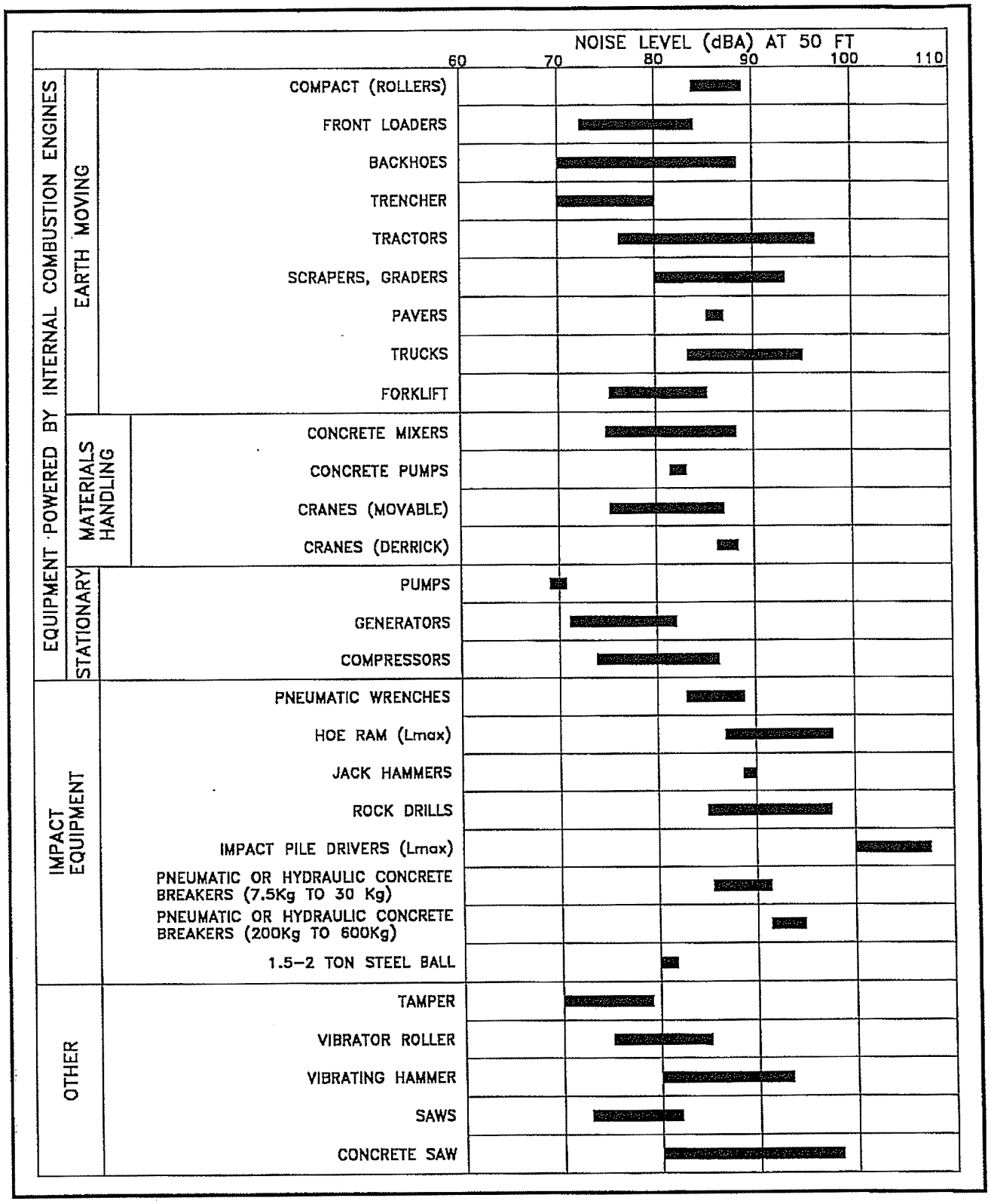
CHAPTER VI. CONSTRUCTION NOISE IMPACTS

Short-term noise impacts associated with construction activities along the KSE corridor may occur. These impacts can occur as a result of the short distances (less than 30 FT) between existing residential and commercial structures to the anticipated construction corridor. The total duration of the construction period for the proposed project is not known, but noise exposure from construction activities at any one receptor location is not expected to be continuous during the total construction period.

The ranges of construction equipment noise levels at 50 FT separation distance are shown in Figure 3. Noise levels of diesel powered construction equipment may range from 70 to 95 dB at 50 FT distance. Typical levels of noise from construction activity (excluding pile driving activity) are shown in Figure 4. The maximum impulsive noise levels of rock breaking equipment (such as hoe rams) can be 5 to 8 dB greater than those shown in Figure 4. Adverse impacts from construction noise are not expected to be in the "public health and welfare" category due to the temporary nature of the work and due to the administrative controls available for its regulation. Instead, these impacts will probably be limited to the temporary degradation of the quality of the acoustic environment in the immediate vicinity of the project work areas.

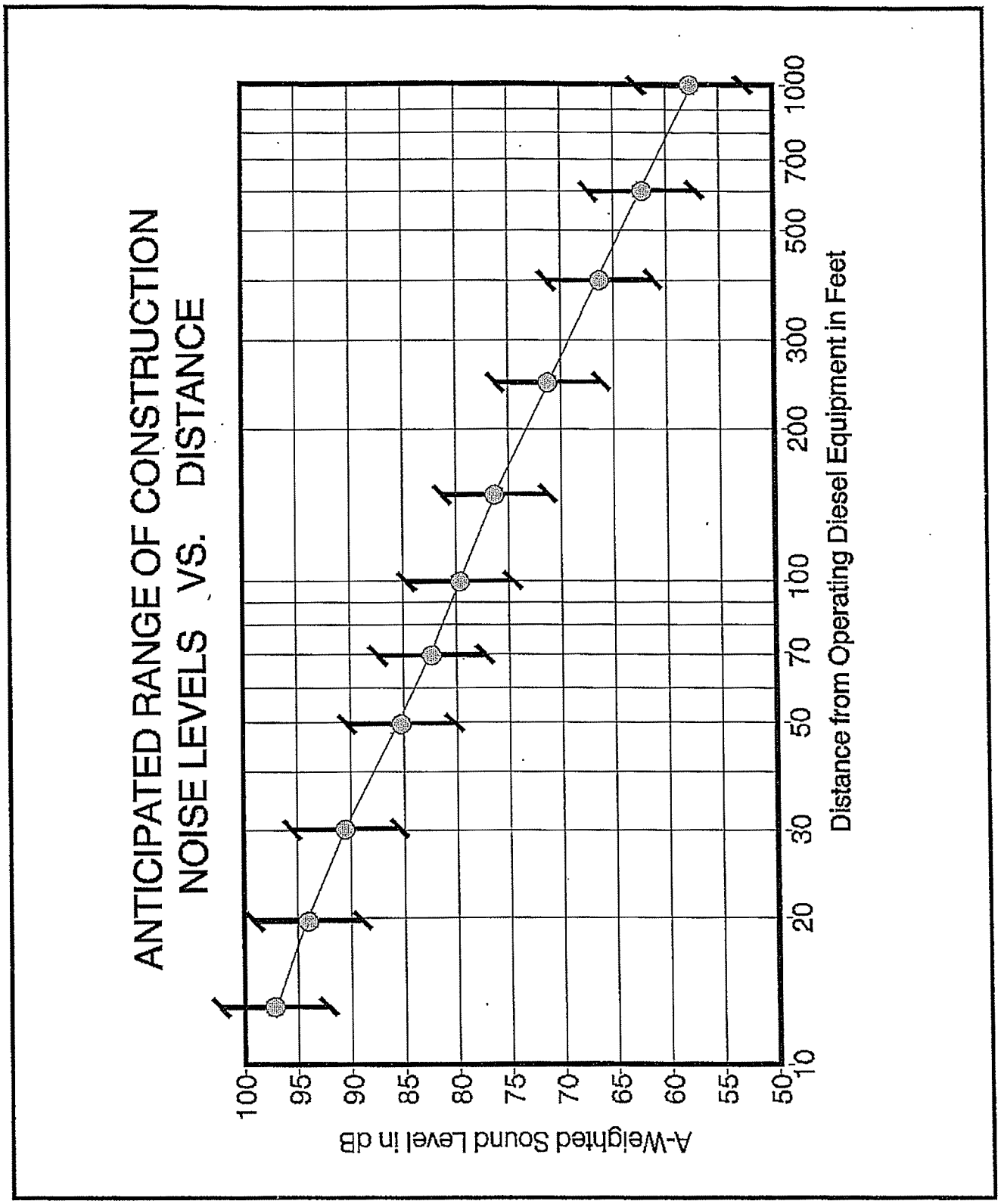
Construction noise levels at existing structures can intermittently exceed 90 dB when work is being performed at close distances in front of these structures. Along the existing section of Kuhua Street, distances between the construction sites and receptors are expected to be between 15 and 300 FT, and construction noise levels may intermittently exceed 90 dB. The State Department of Health currently regulates noise from construction activities under a permit system (Reference 5). Under current permit procedures (see Figure 5), noisy construction activities are restricted to hours between 7:00 AM and 6:00 PM, from Monday through Friday, and exclude certain holidays. Noisy construction activities are normally restricted to the hours of 9:00 AM to 6:00 PM on Saturdays, with construction not permitted on Sundays or holidays. These restrictions minimize construction noise impacts on noise sensitive receptors (such as residences) along the roadway project corridor, and have generally been successfully applied. In this way, construction noise impacts on noise sensitive receptors can be minimized.

In addition, the use of quieted portable engine generators and diesel equipment should be specified for use within 500 FT of noise sensitive properties. Heavy truck and equipment staging areas should also be located at areas which are at least 500 FT from noise sensitive properties whenever possible. Truck routes which avoid residential communities should be identified wherever possible.



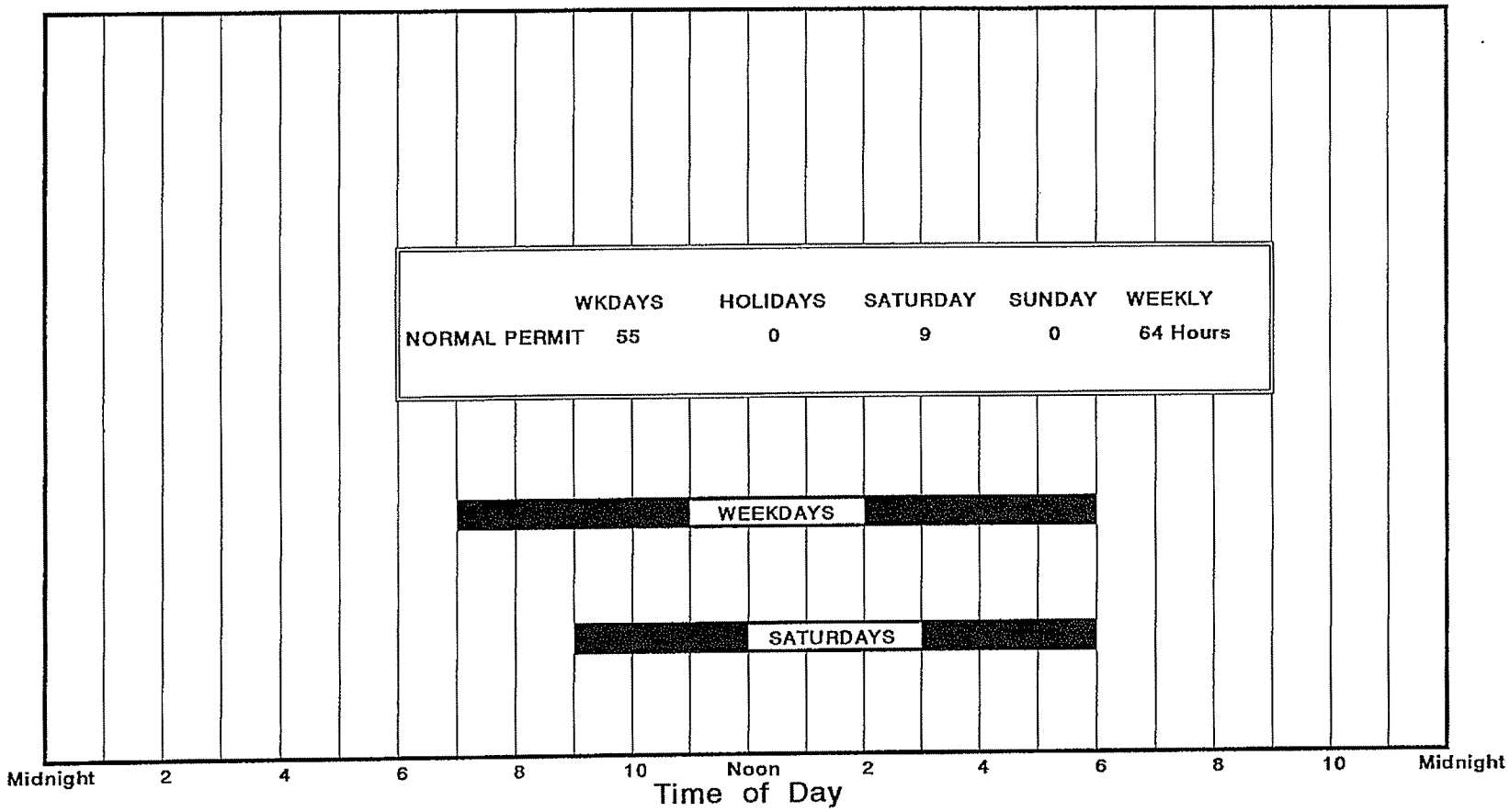
RANGES OF CONSTRUCTION EQUIPMENT NOISE LEVELS

FIGURE 3



CONSTRUCTION NOISE LEVELS VS. DISTANCE

FIGURE 4



AVAILABLE WORK HOURS UNDER DOH PERMIT PROCEDURES FOR CONSTRUCTION NOISE

FIGURE 5

APPENDIX A. REFERENCES

(1) "FHWA Highway Traffic Noise Model User's Guide;" FHWA-PD-96-009, Federal Highway Administration; Washington, D.C.; January 1998 and Version 2.5 Upgrade (April 14, 2004).

(2) Draft Traffic Impact Analysis Report, Kuhua Street Extension; Austin, Tsutsumi & Associates, Inc.; April 27, 2012.

(3) Federal Highway Administration; "Procedures for Abatement of Highway Traffic Noise and Construction Noise;" 23 CFR Chapter I, Subchapter H, Part 772;" April 1, 1995.

(4) "Highway Noise Policy and Abatement Guidelines;" State of Hawaii, Department of Transportation, Highways Division and U.S. Department of Transportation, Federal Highway Administration; April 25, 2011 and List of Corrections dated November 29, 2011.

(5) "Title 11, Administrative Rules, Chapter 46, Community Noise Control;" Hawaii State Department of Health; September 23, 1996.

APPENDIX B

EXCERPTS FROM EPA'S ACOUSTIC TERMINOLOGY GUIDE

Descriptor Symbol Usage

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

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

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

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

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

Descriptor Nomenclature

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

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

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

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

Noise Impact

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

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

APPENDIX B (CONTINUED)

TABLE I

A-WEIGHTED RECOMMENDED DESCRIPTOR LIST

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

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

SOURCE: EPA ACOUSTIC TERMINOLOGY GUIDE, BNA 8-14-78,

APPENDIX B (CONTINUED)

TABLE II

RECOMMENDED DESCRIPTOR LIST

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

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

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

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

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

APPENDIX C

SUMMARY OF EXISTING AND YEAR 2020 TRAFFIC VOLUMES (ALTERNATIVE 1)

ROADWAY LANES	**** EXISTING *****		CY 2020 (MIT.)		CY 2020 (BUILD)	
	AM VPH	PM VPH	AM VPH	PM VPH	AM VPH	PM VPH
Honoapiilani Hwy., N. of Keawe (NB)	1,366	1,499	2,235	2,725	2,185	2,465
Honoapiilani Hwy., N. of Keawe (SB)	1,147	1,595	1,965	2,785	1,850	2,735
Two-Way	2,513	3,094	4,200	5,510	4,035	5,200
Honoapiilani Hwy., Between Keawe & Hinau (NB)	1,471	1,481	1,883	2,223	1,523	1,700
Honoapiilani Hwy., Between Keawe & Hinau (SB)	1,131	1,618	1,538	2,460	1,343	2,140
Two-Way	2,602	3,099	3,420	4,683	2,865	3,840
Honoapiilani Hwy., Between Hinau & Papalaua (NB)	1,604	1,422	1,928	2,133	1,560	1,593
Honoapiilani Hwy., Between Hinau & Papalaua (SB)	1,038	1,540	1,438	2,420	1,245	2,053
Two-Way	2,642	2,961	3,365	4,553	2,805	3,645
Honoapiilani Hwy., Between Papalaua & Lahainaluna (NB)	1,450	1,178	1,763	1,723	1,290	1,203
Honoapiilani Hwy., Between Papalaua & Lahainaluna (SB)	982	1,459	1,213	2,060	1,028	1,693
Two-Way	2,432	2,637	2,975	3,783	2,318	2,895
Honoapiilani Hwy., Between Lahainaluna & Dickenson (NB)	1,022	921	1,525	1,348	1,180	943
Honoapiilani Hwy., Between Lahainaluna & Dickenson (SB)	774	1,239	1,130	1,930	940	1,450
Two-Way	1,795	2,160	2,655	3,278	2,120	2,393
Honoapiilani Hwy., S. of Dickenson (NB)	977	911	1,450	1,180	1,125	870
Honoapiilani Hwy., S. of Dickenson (SB)	708	1,111	1,045	1,655	835	1,195
Two-Way	1,685	2,022	2,495	2,835	1,960	2,065
Honoapiilani Hwy., N. of Shaw (NB)	948	973	1,320	1,290	1,025	1,010
Honoapiilani Hwy., N. of Shaw (SB)	647	1,108	995	1,690	815	1,240
Two-Way	1,595	2,081	2,315	2,980	1,840	2,250
Honoapiilani Hwy., Between Shaw & Aholo (NB)	967	998	1,168	1,230	908	945
Honoapiilani Hwy., Between Shaw & Aholo (SB)	618	1,180	985	1,663	735	1,243
Two-Way	1,585	2,178	2,153	2,893	1,643	2,188
Honoapiilani Hwy., Between Aholo & Front (NB)	932	982	1,018	1,190	818	930
Honoapiilani Hwy., Between Aholo & Front (SB)	554	1,145	905	1,583	665	1,260
Two-Way	1,486	2,127	1,923	2,773	1,483	2,190
Honoapiilani Hwy., S. of Front (NB)	981	1,019	1,080	1,250	1,165	1,475
Honoapiilani Hwy., S. of Front (SB)	570	1,174	900	1,630	1,080	1,645
Two-Way	1,551	2,193	1,980	2,880	2,245	3,120

APPENDIX C (CONTINUED)

SUMMARY OF EXISTING AND YEAR 2020 TRAFFIC VOLUMES (ALTERNATIVE 1)

ROADWAY LANES	**** EXISTING *****		CY 2020 (MIT.)		CY 2020 (BUILD)	
	AM VPH	PM VPH	AM VPH	PM VPH	AM VPH	PM VPH
KSE Between Keawe & Kahoma Entrance (NB)	N/A	N/A	N/A	N/A	438	638
KSE Between Keawe & Kahoma Entrance (SB)	N/A	N/A	N/A	N/A	383	520
Two-Way	N/A	N/A	N/A	N/A	820	1,158
KSE Between Kahoma Entrance & Keone (NB)	N/A	N/A	25	70	408	635
KSE Between Kahoma Entrance & Keone (SB)	N/A	N/A	65	40	393	490
Two-Way	N/A	N/A	90	110	800	1,125
KSE Between Keone & Aki (NB)	12	31	65	200	408	615
KSE Between Keone & Aki (SB)	40	15	150	248	430	525
Two-Way	52	46	215	448	838	1,140
KSE Between Aki & Lahainaluna (NB)	30	61	80	218	425	643
KSE Between Aki & Lahainaluna (SB)	114	43	168	173	408	608
Two-Way	144	104	248	390	833	1,250
KSE Between Lahainaluna & Dickenson (NB)	N/A	N/A	N/A	N/A	520	680
KSE Between Lahainaluna & Dickenson (SB)	N/A	N/A	N/A	N/A	430	608
Two-Way	N/A	N/A	N/A	N/A	950	1,288
KSE Between Dickenson & Shaw (NB)	N/A	N/A	N/A	N/A	428	570
KSE Between Dickenson & Shaw (SB)	N/A	N/A	N/A	N/A	445	548
Two-Way	N/A	N/A	N/A	N/A	873	1,118
KSE Between Shaw & Aholo (NB)	N/A	N/A	N/A	N/A	330	493
KSE Between Shaw & Aholo (SB)	N/A	N/A	N/A	N/A	443	395
Two-Way	N/A	N/A	N/A	N/A	773	888
KSE Between Aholo & Front (NB)	N/A	N/A	N/A	N/A	325	518
KSE Between Aholo & Front (SB)	N/A	N/A	N/A	N/A	463	385
Two-Way	N/A	N/A	N/A	N/A	788	903
KSE S. of Front (NB)	N/A	N/A	N/A	N/A	290	455
KSE S. of Front (SB)	N/A	N/A	N/A	N/A	0	0
Two-Way	N/A	N/A	N/A	N/A	290	455
Keawe E. of KSE (EB)	169	99	710	600	560	485
Keawe E. of KSE (WB)	73	145	595	820	595	695
Two-Way	242	244	1,305	1,420	1,155	1,180
Keawe W. of KSE (EB)	169	133	650	605	615	770
Keawe W. of KSE (WB)	73	183	625	760	870	1,000
Two-Way	242	316	1,275	1,365	1,485	1,770

APPENDIX C (CONTINUED)

SUMMARY OF EXISTING AND YEAR 2020 TRAFFIC VOLUMES (ALTERNATIVE 1)

ROADWAY LANES	**** EXISTING *****		CY 2020 (MIT.)		CY 2020 (BUILD)	
	AM VPH	PM VPH	AM VPH	PM VPH	AM VPH	PM VPH
Keone E. of KSE (EB)	N/A	N/A	20	45	20	45
Keone E. of KSE (WB)	N/A	N/A	60	25	60	25
Two-Way	N/A	N/A	80	70	80	70
Keone W. of KSE (EB)	N/A	N/A	50	205	45	195
Keone W. of KSE (WB)	N/A	N/A	40	100	45	120
Two-Way	N/A	N/A	90	305	90	315
Aki E. of KSE (EB)	16	19	30	30	30	30
Aki E. of KSE (WB)	67	24	85	35	90	40
Two-Way	83	43	115	65	120	70
Aki W. of KSE (EB)	N/A	N/A	35	105	60	190
Aki W. of KSE (WB)	N/A	N/A	85	190	155	145
Two-Way	N/A	N/A	120	295	215	335
Lahainaluna E. of KSE (EB)	623	558	470	500	505	605
Lahainaluna E. of KSE (WB)	737	449	605	415	610	405
Two-Way	1,360	1,007	1,075	915	1,115	1,010
Lahainaluna W. of KSE (EB)	292	360	505	625	390	550
Lahainaluna W. of KSE (WB)	225	269	730	490	565	385
Two-Way	517	629	1,235	1,115	955	935
Dickenson E. of KSE (EB)	N/A	N/A	N/A	N/A	55	100
Dickenson E. of KSE (WB)	N/A	N/A	N/A	N/A	30	30
Two-Way	N/A	N/A	N/A	N/A	85	130
Dickenson W. of KSE (EB)	N/A	N/A	N/A	N/A	160	235
Dickenson W. of KSE (WB)	N/A	N/A	N/A	N/A	65	80
Two-Way	N/A	N/A	N/A	N/A	225	315
Shaw E. of KSE (EB)	N/A	N/A	N/A	N/A	85	180
Shaw E. of KSE (WB)	N/A	N/A	N/A	N/A	190	170
Two-Way	N/A	N/A	N/A	N/A	275	350
Shaw W. of KSE (EB)	N/A	N/A	N/A	N/A	85	135
Shaw W. of KSE (WB)	N/A	N/A	N/A	N/A	180	150
Two-Way	N/A	N/A	N/A	N/A	265	285
Aholo W. of KSE (EB)	N/A	N/A	N/A	N/A	8	15
Aholo W. of KSE (WB)	N/A	N/A	N/A	N/A	50	30
Two-Way	N/A	N/A	N/A	N/A	58	45

APPENDIX G.

Community Meeting Minutes

LBN PMT Meeting Minutes

October 9, 2009
Kaanapali Land Management Conference Room
11:30 am to 1:00 pm

Present: Milton Arakawa, Reed Ariyoshi, Norma Barton, May Fujiwara, Chad Fukunaga, Kalani Ho, Harold Hyman, June Kaaihue, Clifford Mukai, Anthony Plitt, Bob Pure, Lori Sablas, Colleen Suyama

Team Updates

Bob Pure - Lahaina Bypass:

Fred Cajigal, with the DOT, is going to be onsite working with Hawaiian Dredging twice a week. Phases 1a and 1b1 are moving along well. LBN will have a presentation at our monthly meeting on December 11th, regarding Phase 1b1.

Bob Pure - Traffic Management:

The funds have been transferred to the State to handle implementation of a left hand turn lane coming out of Gateway Center at the Keawe Street Intersection. We have a realistic completion date of February, 2010.

The synchronization of the lights along the Honoapi'ilani Highway will be affected while the widening project is taking place. At this time we do not know exactly to what extent.

Mr. Arakawa added that there is an intergovernmental agreement between the State and the County regarding the Keawe St. intersection. $1.5 million is earmarked for the project and the specifics are being worked out. In addition, he informed us that the driveway from the Cannery Mall opening onto the Keawe St. intersection is privately owned. So, in order to install left hand turns and/or any other signage, the owners of the Mall need to be contacted.

Lori Sablas - Public Transit:

The Evening Commuter Bus Shuttle Survey is currently being worked on and we are assessing the needs of residents and tourists for this shuttle. Ridership is up for the current commuter service. We need to access actual numbers from the County in order to properly evaluate just how much ridership is up.

May Fujiwara – Community Communications:

May, Stacie Thorlakson and Norma recently met with Council Chair Mateo, and Council Members Molina, Nishiki, Victorino and Sol, in order to introduce Norma, discuss current LBN projects and also to learn about any needs the Council members had that LBN could help with. Although, we only met some of these members in passing, it was a good opportunity to introduce Norma to them. We will be meeting with the remaining council members in the near future.

Harold Hyman – Walkways:

Leilani Pumano has been spearheading the Wahikuli Trail project. There will be a 6' walking trail, paid for jointly by the Parks and Recreation Department and the Wastewater Division. The Draft EA has been published and is available for comment. LBN will be forwarding their comments to Unemori prior to the October 23rd deadline. Detailed survey maps are on the way, and the estimated construction start date is 2-3 years out. The following still needs to be done:

1. Connectors:

a. There is a 1/10th of a mile right before the beginning of Lahaina Town that has no pathway. Currently, pedestrians have to walk onto the highway to get to Lahaina Town from the south most point of the pathway.

b. At the Canoe storage area, at the Hyatt, a connector needs to be established.

c. Where the Sheraton Street side ends, the walkway then picks up at the south side of the Sheraton.

2. Maps of the walking paths need to be completed. Preliminary drawings have been done and the estimated completion date is approximately 6 months out.

Mill Street Extension
Presentation by Unemori Engineering and Milton Arakawa

LBN was presented with preliminary ideas for the construction of the Mill Street extension, and was given the first opportunity of any organization to comment on these ideas. The design of the Mill St. Extension is a condition of Intrawest's permit to build their resort. Intrawest is paying for this design. Still to be done are the plans and assessment of the project. After these are complete, the project will be turned over to the County for construction.

Munekiyo and Hiraga are drafting the EA, and this is the main permit hurdle. At this time, there are no construction funds. The idea is that the County will find the funds when it is time.

An outline of the project was presented, with the two alignment options currently under consideration explained. Initially Public Works favored the more direct route, which would avoid right of way constraints but would also create a division of the recreational parks and playing fields that are now there. Prior to the Lahaina Bypass breaking ground, this option was favored by PW. Because the Lahaina Bypass will largely take care of the congestion issue, PW is now open to the less direct alternative. This alternative route will go around the parks and playing fields, rather than going through them. The Department of Recreation favors this second alternative, as they feel it serves the community much better. Some discussion ensued, and it was concurred by many at LBN, that serving the community was a priority, and that this second option did this much better than the first. In addition, at the Design Workshop sponsored by LBN in 2006, it was discovered that the community strongly favors keeping the recreational area together and not having a min-bypass of sorts go through it.

The estimated completion of this project is dependent on funding for construction; and, on KLM's ability to develop the adjacent land. Further, Mr. Arakawa doesn't believe it will be funded until the Lahaina Bypass is complete. In addition, the money quite possibly will come from private developers. Several other details of the project were discussed, with the next steps being the EA, the traffic analysis, and the public review during the 1st quarter of 2010. LBN will receive a draft of the EA.

LBN appreciates the opportunity to be the first to comment on the ideas presented regarding the Mill St. extension, and hopes that this meeting and our input was a valuable use of our guest's time and energy.

Next Meeting: Friday, November 13, 2009
11:30 am – 1:00 pm
Kaanapali Land Management Conference Room

MUNEKIYO HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

November 18, 2009

MEETING MEMORANDUM

Date of Meeting: November 16, 2009

From: Colleen Suyama, Project Manager

Participants: See Attached Attendance Sheet

Purpose of Meeting: To Inform Kuhua Street Residents of Proposed Kuhua Street Extension and Improvement Project (formerly Mill Street Extension) and to Solicit Comments

1. Director Milton Arakawa of the Department of Public Works presented an overview of the project. The project was initiated based on a Special Management Area Permit condition placed on Intrawest for the Honua Kai Resort project at Kaanapali North Beach. The developer was required to pay for the planning and design work for the proposed Mill Street Extension to alleviate traffic on Honoapiilani Highway.

2. Clifford Mukai of Warren S. Unemori Engineering, Inc. (WSUE) described the regional context of the proposed roadway and proposed project plans with the two (2) alignment options near the Lahaina Recreation Center.

3. Concerns were raised by former Mill employees regarding the former Mill site and possible contaminants on the property that may affect the surrounding residents during construction. It was explained that prior to any construction on the Mill site an Environmental Protection Agency (EPA) Phase 1 Environmental Assessment (EA) will be required. If contaminants are discovered, then an EPA Phase 2 EA will be required outlining the removal of the contaminants.

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4. Residents questioned why the former cane haul road could not be used for the roadway alignment. It was explained that for the roadway to work as a parallel roadway to Honoapiilani Highway, it would need to be as far mauka as possible which aligned with Kuhua Street. K. Niiya of Austin, Tsutsumi & Associates (ATA) further explained that the current alignment of the Mill Street cane haul road would create queuing problems at the intersections with Honoapiilani Highway, especially at the Lahainaluna Road intersection.

5. Residents questioned, if the roadway needed to be further mauka, why couldn't it be located further up Lahainaluna Road near the beginning of the Kelawea Mauka Subdivision. K. Niiya explained that the roadway would conflict with the proposed Lahaina Watershed Flood Control project to the south of Lahainaluna Road and at Kahoma Stream a new bridge crossing would be required as well as the lands north have already been developed with commercial-industrial projects.

6. Residents asked when this roadway would be constructed. It was explained that the funds from Intrawest is limited to the preparation of an EA and design of project plans. There are no funds for land acquisition or construction and monies would need to be budgeted. It would take at least 3 to 4 years before any construction would be possible, provided the funding for the project is obtained.

7. Although opportunities are included in the plans to allow the driveways to extend into the right-of-way which could be used for parking, residents had concerns that this was not enough parking since many residents had multiple cars. Residents voiced concerns that parking would not be allowed on Kuhua Street. It was explained that at this time there are no plans to prohibit parking on Kuhua Street. The residents were informed that the consultants would take their comments under advisement and investigate other alternatives to providing additional parking.

8. Some residents preferred the multi-use trail (pedestrian/bikeway) located on the residential side of the roadway to provide a larger buffer between the residences and the roadway. It was pointed out that the County of Maui had concerns that the accessway on the residential side would conflict with residents exiting their driveways. Some residents explained they currently look out for people using the roadway and that should not be a problem. The design team will consider this option.

9. Concerns were raised that Kuhua Street was a residential street and there are many children in the area who play on the streets. A resident expressed his opinion that the speed limit on the roadway should be residential, between 10-20 miles per hour (mph). The County of Maui will consider this request once the project is further along in the process.

10. A resident also expressed concern that the school bus servicing Kuhua Street residents will no longer be available since the Department of Education (DOE) will require school bus service to be a minimum distance of 1.5 miles from the school.

11. Concerns were raised that the additional traffic on the roadway will impact the residents such as speeding on the roadway. Some residents requested traffic calming measures, such as speed humps/bumps, be considered for the roadway.

12. Concern was raised regarding the Papalaua Street intersection with Kuhua Street. Either a traffic signal or four-way stop should be considered for this intersection.

13. Trucks larger than 10,000 gross vehicle weight (GVW) should be prohibited from the roadway.

There being no other comments, the meeting was concluded ay 7:00 p.m.

Colleen Suyama
Project Manager

CS:lfm
Enclosure
cc: Milton Arakawa, Director, Department of Public Works (w/enclosure)
Clifford Mukai, Warren S. Unemori Engineering, Inc. (w/enclosure)
Gwen Ohashi Hiraga, Munekiyo & Hiraga, Inc. (w/enclosure)
Keith Niiya, Austin Tsutsumi & Associates (w/enclosure)
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MUNEKIYO HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

November 23, 2009

MEETING MEMORANDUM

Date of Meeting: November 17, 2009

From: Colleen Suyama, Project Manager

Subject: Community Meeting for Proposed Kuhua Street Extension and Improvement Project

Participants: See Attached Attendance Sheet

Meeting Purpose: To inform the Kuhua Street Surrounding Neighbors of the proposed Kuhua Street Extension and Improvement Project (formerly Mill Street Extension) and to solicit comments

The meeting commenced at 6:30 p.m.

1. Director Milton Arakawa of the Department of Public Works presented an overview of the project. The project was initiated based on a Special Management Area Permit condition placed on Intrawest for the Honua Kai Resort project at Kaanapali North Beach. The developer was required to pay for the planning and design work for the proposed Mill Street Extension to alleviate traffic on Honoapiilani Highway.

2. Clifford Mukai of Warren S. Unemori Engineering Inc. (WSUE) described the regional context of the proposed roadway and proposed project plans with the two (2) alignment options near the Lahaina Recreation Center.

3. According to the residents, there are a lot of pedestrian and bicycle traffic in the area, especially young children. It was explained that a proposed 10 ft. wide multi-use trail is planned that will be separated from the roadway. The residents were in favor of the multi-use trail but wanted assurances that the multi-use trail would remain in the future and not be turned into more vehicular travel lanes.

4. The residents voiced concerns that there are a number of vehicles parked on the existing Kuhua Street, as well as abandoned vehicles that are not being towed away. It was explained that the extended driveways on Kuhua Street in the County right-of-way will allow for at least two (2) parking spaces for each residence. The design team will investigate ways to provide more parking in the area. The residents suggested considering street parking while one (1) resident suggested a parking lot in the area.

5. Although not intended, there were concerns that the roadway will generate high traffic in the future that will affect their neighborhood as development in the area occurs. Of particular concern was what will happen to the former Mill site. K. Niiya, traffic engineer for Austin Tsutsumi & Associates (ATA), explained that they have initiated a traffic study of the area and as part of the study it will include the traffic of other known projects in the area, such as Wainee Village.

   The residents wanted Kuhua and Aki Streets to remain residential streets.

6. The residents also asked if there were to be any traffic signals. At the Kuhua Street/Lahainaluna Road intersection, there will most likely be a traffic signal and a crossing signal for the railroad crossing at the Kuha Street/Keawe Street intersection. The traffic study will determine if other intersections will require signalization. The residents requested that the traffic signals be synchronized.

7. The residents indicated that the area already has problems with people speeding. The design team will investigate ways to slow traffic, such as consideration of speed humps/bumps, round-a-bouts, traffic signals or 4-way stops at intersections.

8. The residents wanted to know whether Kuhua Street will need to be closed during construction. K. Niiya explained that the existing 20 ft. wide Kuhua Street pavement is where the landscaped buffer is proposed. Once the new Kuhua Street roadway is constructed, it will provide access to the existing residences, then construction can be completed for the landscape buffer and driveways.

9. It was pointed out that Kamamalu Street would be closed off at Kuhua Street to limit the number of intersection on Kuhua Street to allow for the flow of traffic. One (1) resident voiced her objections to the closure of the road since it will increase traffic on Kopili Street as drivers try to exit further north near her residence at Keone Street.

   Concern was also expressed that due to the narrowness of the existing roads in the surrounding neighborhood, the Fire Department will need as many access points in order to get to a fire in the area. The project consultants will evaluate the road closure and fire exits.

10. The residents requested that the bus stops be designed outside of the travel lanes. On Lahainaluna Road, the buses stop in the travel lanes and hold up traffic. The residents requested that a better designed bus stop at that location be planned as part of this project.

11. The residents asked what will happen to utilities in the area. It was explained that as the project progresses in the design phase, coordination with the utility providers will be completed. Some residents asked that some of the utility poles that are currently traffic hazards be relocated or be located underground.

12. Residents indicated that the narrowness of Lahainaluna Road toward Honoapiilani Highway is a problem. It was explained that the plans will include future widening of Lahainaluna Road between Kuhua Street and Honoapiilani Highway to improve the flow of traffic through the intersection.

13. A resident asked whether the Opukea project will be allowed to have an access on Kuhua Street. It was explained that although an access point is not planned at this time, it does not restrict the project from requesting an access from the County of Maui.

There being no other comments, the meeting was concluded at 7:30 p.m.

Colleen Suyama
Project Manager

CS:tn
Attachment
cc: Milton Arakawa, Director, Department of Public Works
Clifford Mukai, Warren S. Unemori Engineering, Inc.
Gwen Ohashi Hiraga, Munekiyo & Hiraga, Inc.
Keith Niiya, Austin Tsutsumi & Associates
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MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

MUNEKIYO HIRAGA, INC.

November 30, 2009

MEETING MEMORANDUM

Date of Meeting: November 24, 2009

From: Colleen Suyama, Project Manager

Participants: See Attached Attendance Sheet

Purpose of Meeting: To Inform the Aholo Street Surrounding Neighbors of the Proposed Kuhua Street Extension and Improvement Project (formerly Mill Street Extension) and to Solicit Comments

1. Deputy Director Michael Miyamoto of the Department of Public Works presented an overview of the project. The project was initiated based on a Special Management Area Permit condition placed on Intrawest for the Honua Kai Resort project at Kaanapali North Beach. The developer was required to pay for the planning and design work for the proposed Mill Street Extension to alleviate traffic on Honoapiilani Highway.

2. Reed Ariyoshi of Warren S. Unemori Engineering Inc. (WSUE) described the regional context of the proposed roadway and proposed project plans with the two (2) alignment options near the Lahaina Recreation Center.

3. Concerns were raised that Option B going between the two (2) parks will create safety concerns for park users. In general, the residents preferred Option A around the park site.

4. A resident voiced concerns that Leoleo Street was narrow with cars parked on both sides of the street and there will be an increase in traffic with the connection to the proposed roadway. He asked that the County reconsider the Leoleo Street outlet since he felt it was not needed. He also voiced concerns over the existing problem of abandoned vehicles in the area.

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5. The Aholo Street residents voiced concerns that parking will be eliminated from the subdivision roadway. Presently, many of the residents park along the street which narrows the street down to a one-lane roadway. It was explained that at present, there are no plans to restrict parking in the subdivision.

6. The Aholo Street residents voiced concerns regarding noise from the new roadway. It was explained that a noise consultant will be analyzing the noise impacts which will be part of the Environmental Assessment (EA) being prepared for the project. The consultant will evaluate mitigation measures, such as noise walls and landscaping. Residents voiced a preference for adequate setbacks from residential units and landscaping. It was explained that Option A is located significantly away from the existing residences and the conceptual plans include an approximate 15 ft. landscape buffer with a multi-use trail.

7. A resident voiced concern about what will happen to the vacant area between Option A and the existing residential lots. It was explained that the area is presently zoned agriculture and any development of the area would require land entitlements. As part of the land entitlement process, the surrounding neighbors will need to be notified.

8. Concerns were voiced regarding the present intersection problems at Keawe and Aholo Road for left turns. It was explained that at present, the Honoapiilani Highway road widening ends just before the Aholo Road intersection and there are no plans to signalize this intersection. The Keawe Street intersection will need to be modified in order to resolve the present queuing experienced by motorists.

9. The residents asked to be kept informed of the project.

There being no other comments, the meeting was concluded at 7:30 p.m.

Colleen Suyama
Project Manager

CS:tn
Enclosure
cc: Milton Arakawa, Director, Department of Public Works (w/enclosure)
Clifford Mukai, Warren S. Unemori Engineering, Inc. (w/enclosure)
Gwen Ohashi Hiraga, Munekiyo & Hiraga, Inc. (w/enclosure)
Keith Niiya, Austin Tsutsumi & Associates (w/enclosure)
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MUNEKIYO HIRAGA, INC.

MICHAEL T. MUNEKIYO
GWEN OHASHI HIRAGA
MITSURU "MICH" HIRANO
KARLYNN FUKUDA

MARK ALEXANDER ROY

December 8, 2009

MEETING MEMORANDUM

Date of Meeting: December 1, 2009

From: Colleen Suyama, Project Manager

Participants: See Attached Attendance Sheet

Purpose of Meeting: To Inform West Maui Community of the Proposed Kuhua Street Extension and Improvement Project (formerly Mill Street Extension) and to Solicit Comments

The meeting began at approximately 6:30 p.m.

1. Director Milton Arakawa of the Department of Public Works presented an overview of the project. The project was initiated based on a Special Management Area Permit condition placed on Intrawest for the Honua Kai Resort project at Kaanapali North Beach. The developer was required to pay for the planning and design work for the proposed Mill Street Extension to alleviate traffic on Honoapiilani Highway.

2. Colleen Suyama of Munkeiyo & Hiraga, Inc. (MHI), described the regional context of the proposed roadway and proposed project plans with the two (2) alignment options near the Lahaina Recreation Center.

3. A Kuhua Street resident again asked why the Mill Street alignment cannot be used for the new roadway. It was explained that the current alignment of Mill Street is too close to Honoapiilani Highway and would restrict the flow of traffic through the intersections on Honoapiilani Highway, as well as create problems at the intersection of Mill Street on Lahainaluna Road.

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4. Residents voiced concerns that the new roadway will impact existing residential areas, as well as park users of the Lahaina Recreation Center and that safety is a concern. It was explained that Option A of the proposed alignment is planned around the park site to limit impacts on the parks.

5. With the current improvements to Honoapiilani Highway and the construction of the By-Pass Highway, residents questioned the need for the new roadway. They voiced concerns that the new roadway was due to new developments planned for the area, in particular, the Kahoma development and Wainee Village.

   A resident indicated that the plans for Wainee Village should be determined, as well as the Maui Island Plan before planning the new roadway since changes in the alignment may be necessary. Several residents voiced opposition to the proposed roadway improvements since it would create traffic sprawl in order to accommodate new development.

   It was explained that the Lahaina By-pass is intended to be your higher speed roadway that vehicles will take to get to areas such as Kaanapali Resort with a limited number taking Honoapiilani Highway to get through Lahaina Town. The new roadway is planned as a local roadway providing another option for residents to travel between the commercial areas on Keawe Street and the Lahaina Recreation Center without having to travel onto Honoapiilani Highway.

6. A resident indicated concerns relative to archaeological sites along the roadway alignment. It was his understanding that the area along Mill Street is rich in archaeological sites, of particular concern were burial sites since two (2) burial sites were found in the area. It was explained that Cultural Surveys Hawaii will conduct an archaeological inventory survey for the project once the preferred alignment is determined.

7. Several residents felt that the existing roadways should be improved, such as intersection improvements on Honoapiilani Highway before any new roads are planned and constructed.

8. A resident voiced concern regarding the signalization of the Aholo Road intersection and submitted a petition with eighteen (18) signatures from residents on Puapihi Street opposed to any signalization of the intersection. The concern raised is that the residential traffic from Puamana will use Puapihi Street to access the Aholo Road intersection and increase traffic on their residential street. A copy of the petition is attached.

There being no other comments, the meeting was concluded at 7:40 p.m.

Colleen Suyama
Project Manager

CS:tn
Enclosure
cc: Milton Arakawa, Director, Department of Public Works (w/enclosure)
Clifford Mukai, Warren S. Unemori Engineering, Inc. (w/enclosure)
Gwen Ohashi Hiraga, Munekiyo & Hiraga, Inc. (w/enclosure)
Keith Niiya, Austin Tsutsumi & Associates (w/enclosure)
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