DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
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SEP 23 2015

KIRK CALDWELL
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GEORGE I. ATTA, FAICP
DIRECTOR

ARTHUR D. CHALLACOMBE
DEPUTY DIRECTOR

2015/ELOG-1704 (mw)

September 8, 2015

RECEIVED
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OFC. OF ENVIRONMENTAL QUALITY CONTROL

Ms. Jessica Wooley
Director
Office of Environmental Quality Control
Department of Health, State of Hawaii
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

Dear Ms. Wooley:

SUBJECT: Draft Environmental Assessment Under Chapter 343, HRS for the Haleiwa Mixed Use Parcel, Waialua District, Oahu

Applicant:	Backyard Haleiwa, LLC
Agent:	SSFM International, Inc. (Jared K. Chang)
Location:	Bordered by the Joseph P. Leong Highway to the east, Cane Haul Road to the south, Haleiwa's main business district to the west, and Opaeula Road to the north
Tax Map Key:	(1) 6-2-5: 2
Zoning:	AG-1 Restricted Agricultural District and P-2 General Preservation District
Request:	A State Land Use District Boundary Amendment Under 15 acres, a zone change, and a Haleiwa Special District permit
Proposal:	A zone change to allow a 7.5-acre mixed-use residential and commercial/retail development

The Department of Planning and Permitting submits for publication in The Environmental Notice a draft environmental assessment (DEA) and an anticipated finding of no significant impact for the proposed Haleiwa Mixed Use Parcel project in Waialua District, Oahu (Tax Map Key: 6-2-5: 2). The project proposes to construct 156 two-bedroom apartment units with 328 parking stalls and 30,000 square feet of commercial space on 7.5 acres of land in central Haleiwa.

Enclosed are one hard copy and one electronic copy of the DEA, plus a hard copy of the Publication Form. The Publication Form, including project summary, was also sent via electronic mail to your office.

Should you have any questions, please contact Mike Watkins of our staff at 768-8044.

Very truly yours,

George I. Atta, FAICP
Director

GIA:js

Enclosures: OEQC Publication Form
DEA (CD and one copy)

cc: SSFM International, Inc. (Jared K. Chang)
Backyard Haleiwa, LLC

July 2015 Revision

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SEP 23 2015

APPLICANT ACTION SECTION 343-5(e), HRS PUBLICATION FORM

Project Name: Haleiwa Mixed Use Parcel

HRS §343-5 Trigger(s): Trigger #6: A county action to designate land to urban use under the authority of the county general plan

Island: Oahu

District: Waialua

TMK: (1) 6-2-5: 2

Permits: National Pollutant Discharge Elimination System (NPDES), Wastewater System review and approvals, Construction Noise Permit, Change in Zone, State Land Use District Boundary Amendment, Subdivision, Haleiwa Special District Permit (Major), Joint Development Agreement (JDA) and Conditional Use Permit (Minor), Building Permit, Grading, Grubbing and Stockpiling Permit, Demolition Permit, Water System approval, Street Usage Permit, and Trenching Permit

Approving Agency: Department of Planning and Permitting
City and County of Honolulu
650 South King Street, 7th floor
Honolulu, Hawaii 96813
Mike Watkins, (808) 768-8044

Applicant: Backyard Haleiwa, LLC
4391 Kahala Avenue
Honolulu, Hawaii 96816
Jonathan Grobe, (808) 366-5587

Consultant: SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817
Jared K. Chang, (808) 356-1242

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OFC. OF ENVIRONMENTAL QUALITY CONTROL

Status (check one only):

X DEA-AFNSI — Submit the approving 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 approving 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 approving 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 approving 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 applicant simultaneously transmits to both the OEQC and the approving agency, 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 oeqc@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.

__FEIS — The applicant simultaneously transmits to both the OEQC and the approving agency, 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 oeqc@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.

__ Section 11-200-23

Determination	The approving agency simultaneous transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the applicant. 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):

Backyard Haleiwa, LLC is proposing to develop a mixed-use project within the Haleiwa Special District on a 7.5-acre parcel between the Joseph P. Leong Highway and Kamehameha Highway. The vision for the proposed development is a mix of residential and commercial retail land uses. At full build-out, the development would include a total of 156 two-bedroom apartment units with 543 parking stalls, a 30,000 gross-square-feet commercial development to include studios, shops, galleries, a restaurant, and a 6,000 square- foot facility to house an indoor Farmer's Market. Land for up to 100 additional off-street public parking stalls is being set aside on this site for the City and County of Honolulu to replace displaced street parking resulting from the City's Haleiwa Improvement District Project which is currently in the planning and design stages.

The proposed action requires a change in zoning from general preservation (P-2) and restricted agricultural (AG-1) to neighborhood business (B-1) and low-density apartment mixed use (AMX-1), a State Land Use District Boundary Amendment from Agricultural to Urban, and a Special District Permit (Major).

DRAFT
ENVIRONMENTAL ASSESSMENT

HALE'IWA MIXED USE PARCEL
Hale'iwa, O'ahu, Hawai'i
TMK (1) 6-2-005: 002

August 2015

Applicant:
Backyard Haleiwa, LLC.

Approving Agency:
City and County of Honolulu
Department of Planning and Permitting

HALE‘IWA MIXED USE PARCEL

HALE‘IWA, O‘AHU, HAWAI‘I

TMK: (1) 6-2-005: 002

DRAFT ENVIRONMENTAL ASSESSMENT

Prepared Pursuant to:
Chapter 343, Hawai‘i Revised Statutes and
Title 11, Chapter 200, Hawai‘i Department of Health Administrative Rules

Submitted by:
Backyard Hale‘iwa, LLC.

Approving Agency:
City and County of Honolulu
Department of Planning and Permitting

Prepared by:
SSFM International, Inc.

August 2015

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PREFACE

The North Shore of O‘ahu’s two rural towns, Hale‘iwa and Waialua, still feature a country atmosphere with low-density residential structures and low-rise buildings, housing retail establishments, restaurants, and surf shops. With Honolulu and other areas of O‘ahu becoming increasingly urbanized, the *North Shore Sustainable Communities Plan* (NSSCP) recognizes the importance to maintain the North Shore as an essential haven and respite from the urbanization of O‘ahu by directing limited growth toward its two rural towns.

The NSSCP, adopted by the City Council via Ordinance 11-3 in May 2011, was prepared as a community-developed guidance document for orderly and coordinated public and private sector development and to maintain North Shore’s rural character through growth management. One of the key elements of the NSSCP’s Vision describes the importance of maintaining the plan’s Community Growth Boundary in order to protect the region’s large tracts of agricultural lands, open spaces and natural and cultural resources. The Community Growth Boundary was first established in 2000 and has remained fixed since then with no new development occurring outside of its boundary, thereby successfully preserving areas outside the boundary for agriculture, open space or other resources. Within the Community Growth Boundary, lies Hale‘iwa Country Town District which is designated for a compatible mix of commercial, service industrial and residential uses, which must also enhance and preserve the rural town context, while also allowing for a diverse range of civic, retail, office, and light industrial uses that meet the needs of residents and visitors (City, 2011).

Backyard Hale‘iwa, LLC is proposing to develop a 7.5 acre parcel within both the NSSCP’s Community Growth Boundary and Hale‘iwa’s Country Town District. The overall objective for this development is to achieve consistency with the community vision, policies, and guidelines as stated within the NSSCP. The current proposal provides two-bedroom apartment rentals; commercial and retail units; off-street public parking and a farmers market.

The proposed action requires a Change in Zoning and State Land Use Boundary Amendment to allow for the mixed-use development on the infill lands between the existing Hale‘iwa Town and Joseph P. Leong Highway. According to the City and County of Honolulu’s Land Use Ordinance (LUO), the proposed rezoning action is a “significant zone change” because the parcel is more than five (5) acres and involves a change to a commercial and mixed use zoning district. Therefore, this Draft Environmental Assessment was prepared in accordance with LUO requirements, Chapter 343 of the Hawai‘i Revised Statutes (HRS) and Title 11, Chapter 200 of the State Department of Health’s Hawai‘i Administrative Rules (HAR). In summary, the proposed action is shown consistent with the vision, policies and guidelines set forth by the NSSCP and is anticipated to result in a Finding of No Significant Impact (FONSI).

1.0 INTRODUCTION

Backyard Hale‘iwa, LLC. (Backyard Hale‘iwa) is proposing to develop a 7.5-acre parcel, identified as Tax Map Key (1) 6-2-05: 002 located in Hale‘iwa on the North Shore of O‘ahu. The proposed action requires a change in zoning from general preservation (P-2) and restricted agricultural (AG-1) to neighborhood business (B-1) and low-density apartment mixed use (AMX-1); and a State Land Use District Boundary Amendment from Agricultural to Urban.

1.1 PROJECT INFORMATION SUMMARY

Name:	Hale‘iwa Mixed Use Parcel
Project Location:	Hale‘iwa, O‘ahu, Hawai‘i (see Figure 1)
Tax Map Key:	(1) 6-2-05: 002 (See Figure 2)
Land Area:	7.525 acres
Landowner:	Basin Projects, Inc.
Applicant/Developer:	Backyard Hale‘iwa, LLC.
State Land Use Classification:	Agricultural (See Figure 3)
City and County Zoning:	AG-1 and P-2 (See Figure 4)
Sustainable Communities Plan:	North Shore
Sustainable Communities Plan Land Use Map:	Within Hale‘iwa Country Town and within Community Growth Boundary (See Figure 5)
Special District:	Within Hale‘iwa Special District
Special Management Area:	Not within SMA
Existing Use:	Undeveloped
Proposed Action:	1) Change in zoning from P-2 general preservation and AG-1 restricted agricultural to B-1 neighborhood business and AMX -1 low-density apartment mixed use (See Figure 6) 2) State Land Use District Boundary Amendment from Agricultural to Urban
Approving Agency:	City and County of Honolulu, Department of Planning and Permitting

Figure 1: PROJECT LOCATION MAP

Figure 2: TAX MAP KEY

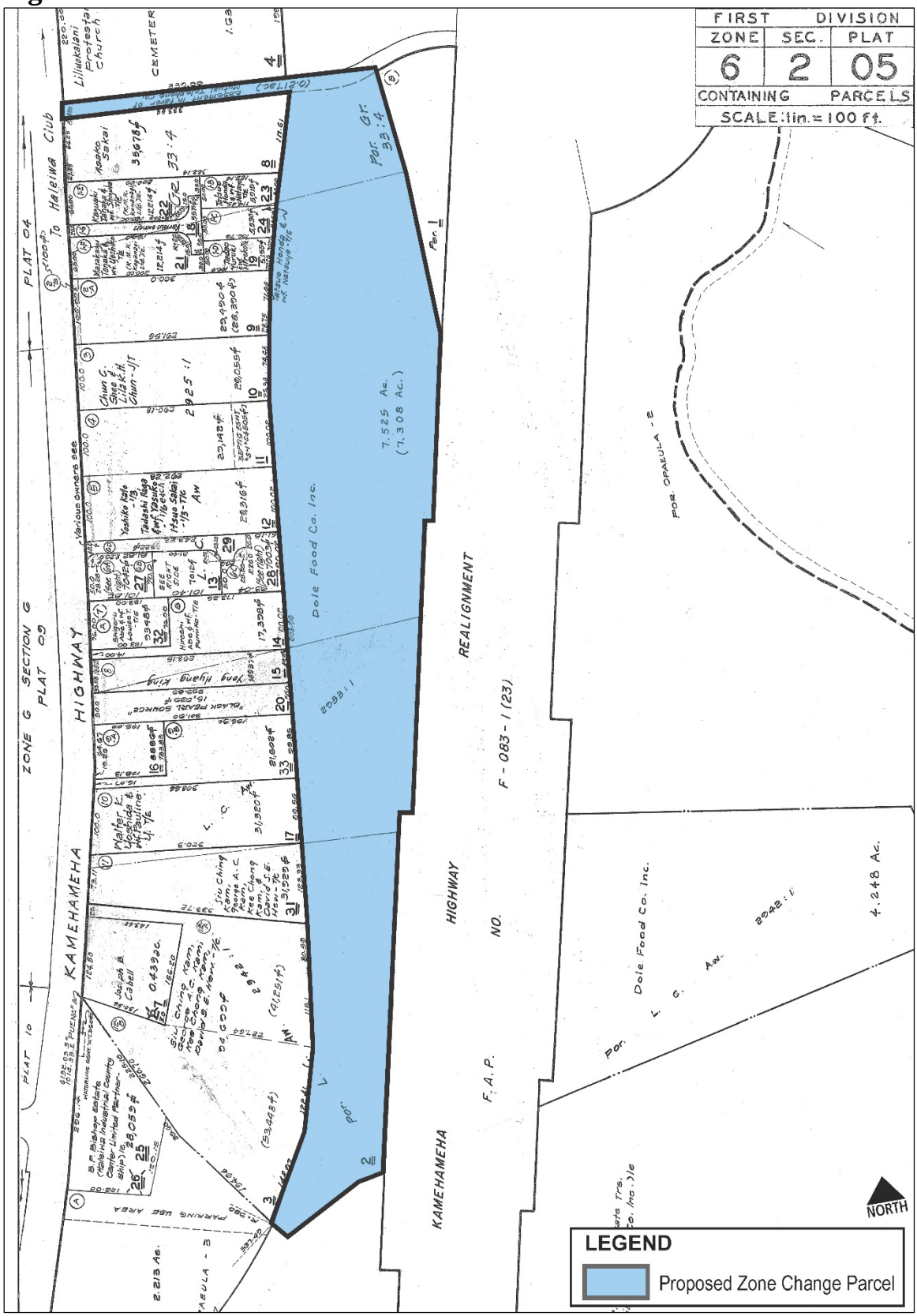


Figure 3: STATE LAND USE DISTRICT

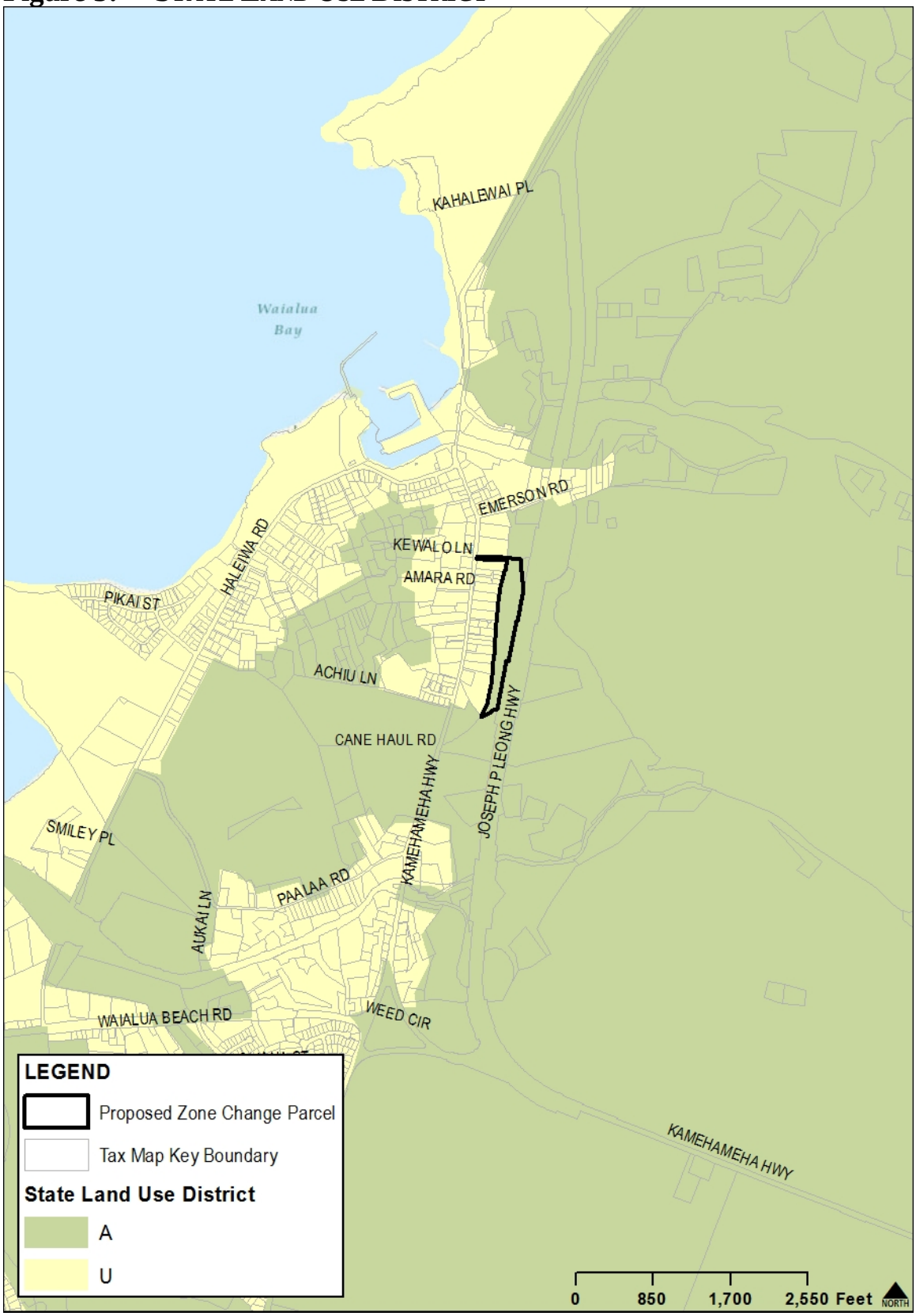


Figure 4: CITY AND COUNTY OF HONOLULU ZONING

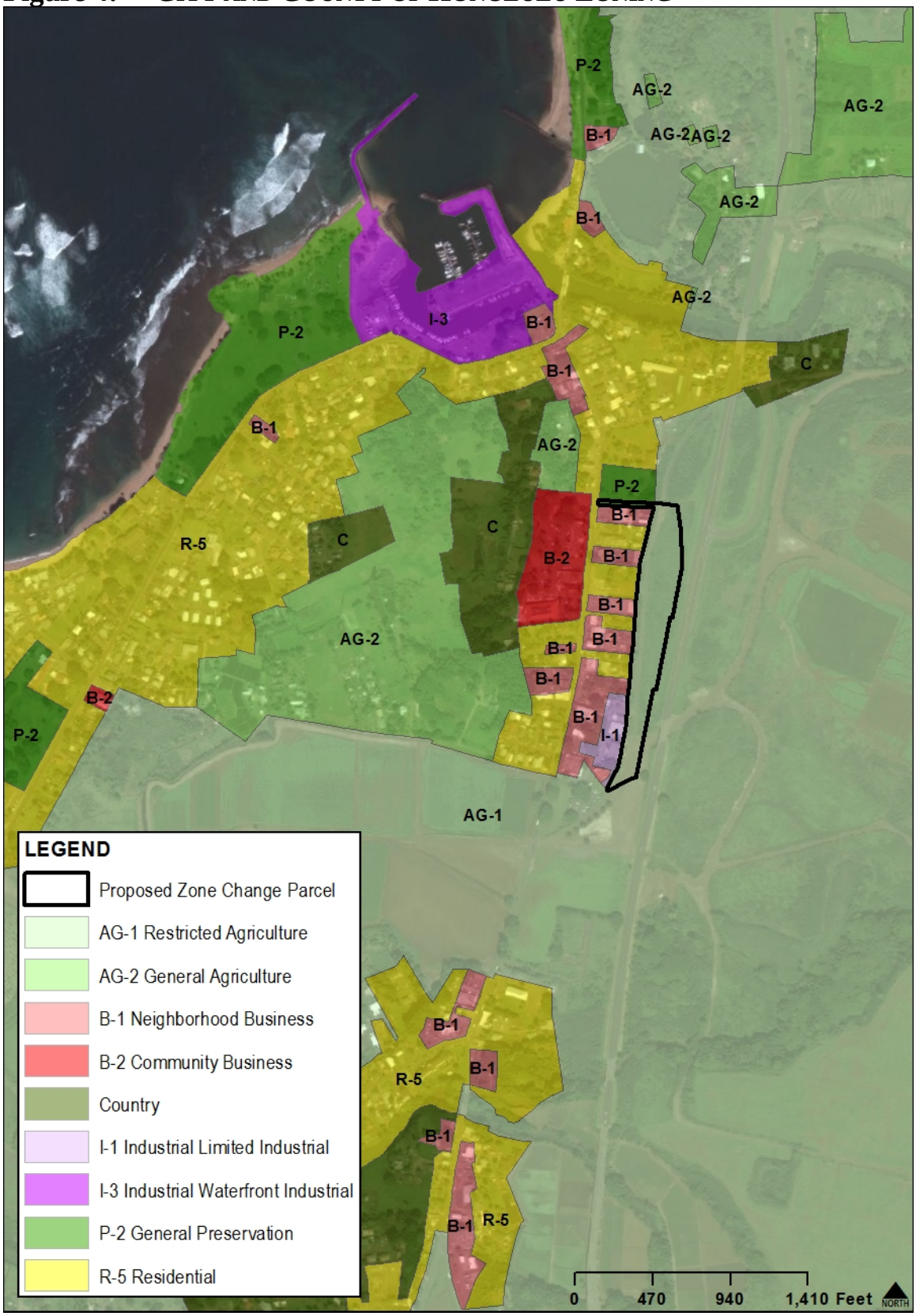
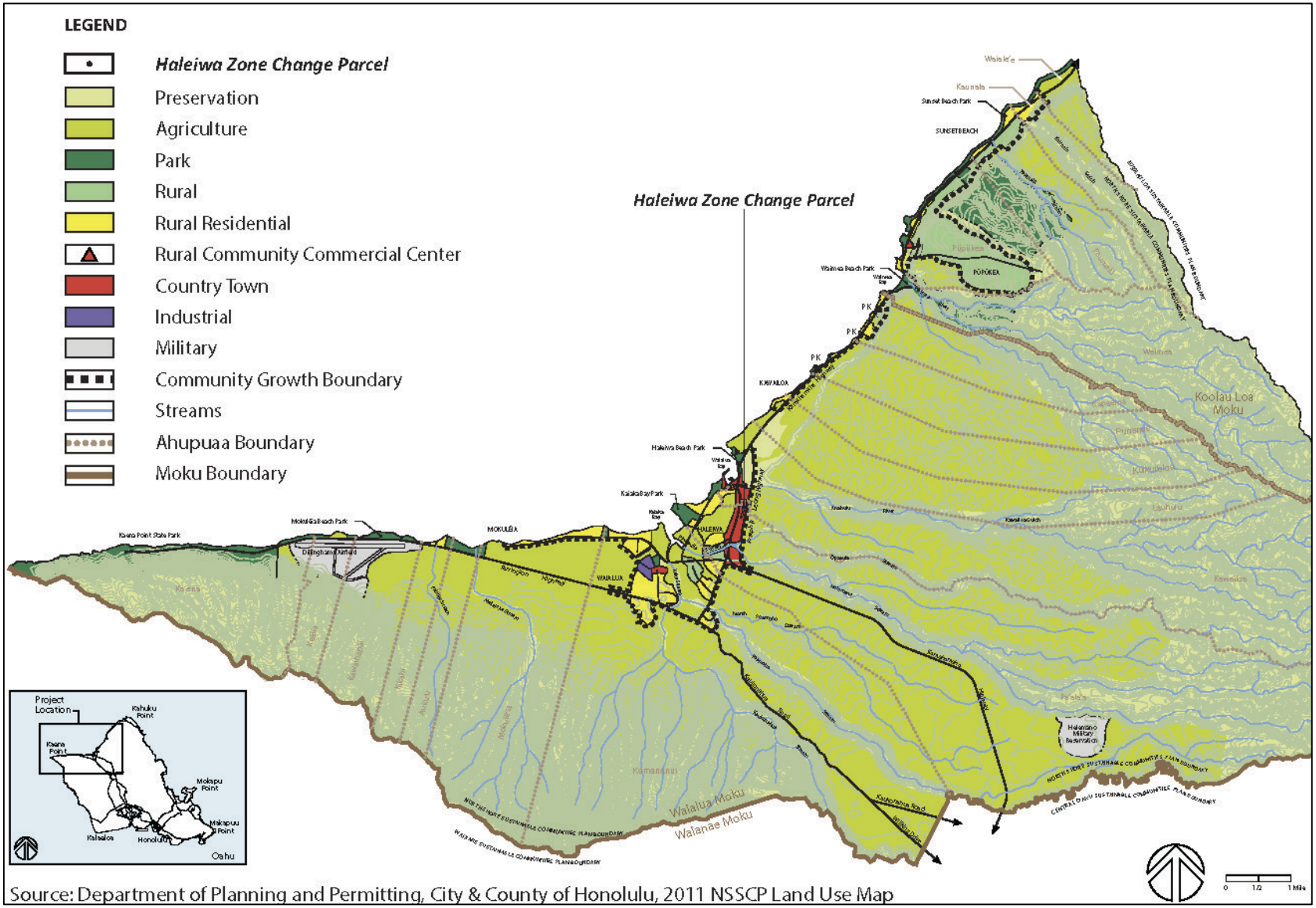
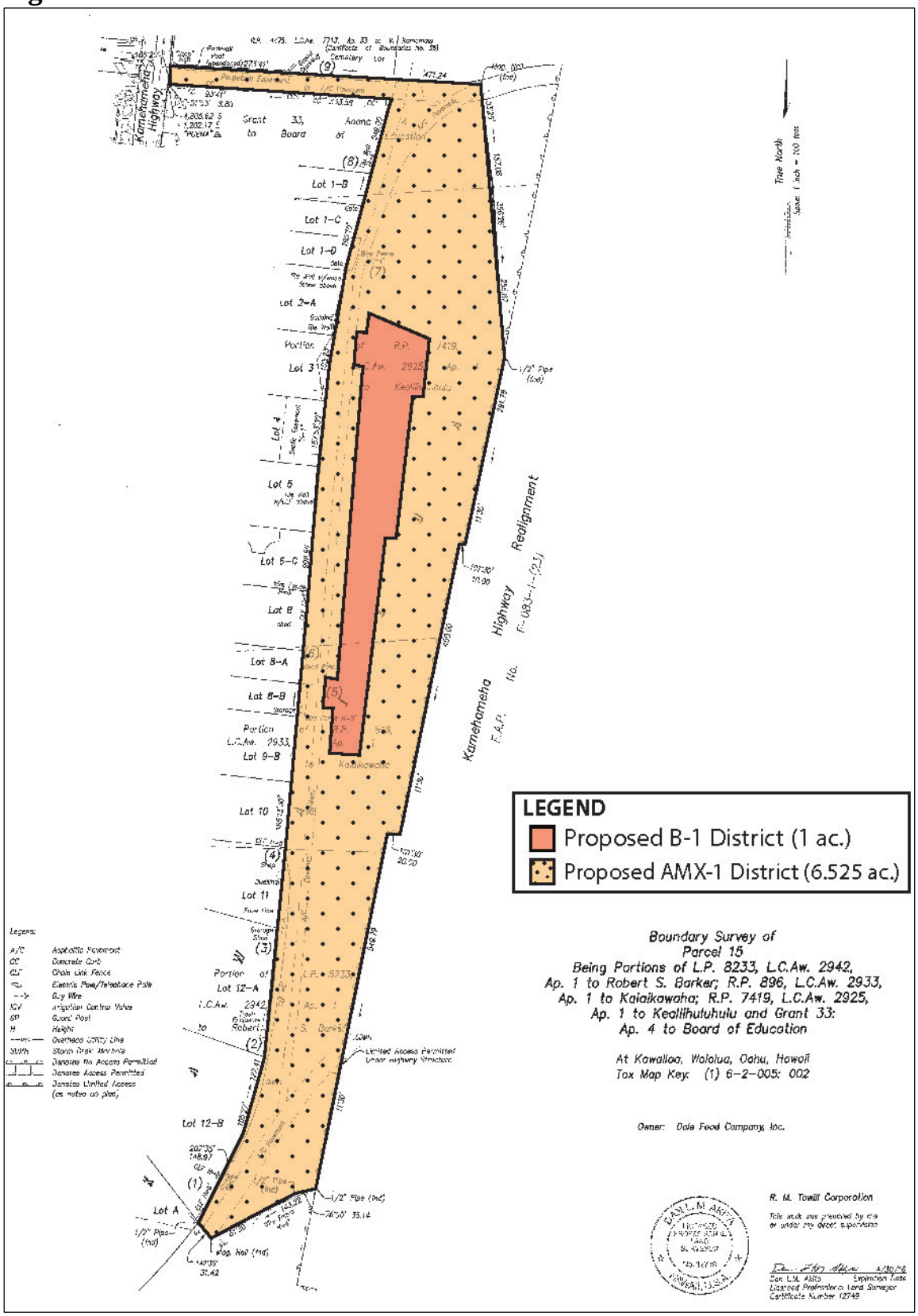


Figure 5: NSSCP LAND USE MAP



Source: Department of Planning and Permitting, City & County of Honolulu, 2011 NSSCP Land Use Map

Figure 6: BOUNDARY SURVEY AND PROPOSED CHANGE OF ZONE



2.0 PROJECT DESCRIPTION

This section provides an overview of the proposed action and development.

2.1 PROJECT LOCATION

The proposed development is located in Hale‘iwa, on the North Shore of O‘ahu. The 7.525 acre parcel is bordered by the Joseph P. Leong Highway to the east and Hale‘iwa’s main business district to the west. The property ranges from 130 feet to 265 feet wide and 1,725 feet long on a north-south axis, with a 35-foot wide strip of land extending for 325 feet from the parcel’s northwest corner to Kamehameha Highway along ‘Ōpae‘ula Road. See Figure 1, Project Location Map and Figure 2, Tax Map Key. A short section of ‘Ōpae‘ula Road defines the parcel’s north end, with Cane Haul Road at the south, and an unnamed, and blocked off, paved road along the west side. The gentle westerly sloping parcel has an elevation of from 10 to 50 feet above mean sea level.

2.2 EXISTING AND SURROUNDING USES

The subject property is comprised of a narrow strip of undeveloped vacant agricultural land. An old asphalt concrete paved, approximately 20-foot wide access road extends the entire length of the parcel’s west side and separates the undeveloped land from Hale‘iwa’s commercial and residential district.

Existing development in the adjacent makai parcel consists of the North Shore Marketplace, a shopping center that consists of specialty gift shops, dining establishments, and clothing stores. Mauka (landward) of the property is the Joseph P. Leong Highway (Route 83), a segment of Kamehameha Highway that acts as a bypass of Hale‘iwa town.

2.3 PROPOSED ACTION

The proposed action involves a Change in Zoning from general preservation (P-2) and restricted agricultural (AG-1) to neighborhood business (B-1) and low-density apartment mixed use (AMX-1); and a State Land Use District Boundary Amendment from Agricultural to Urban.

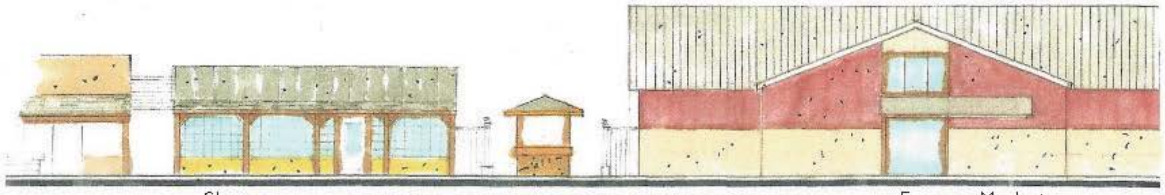
2.4 DESCRIPTION OF THE DEVELOPMENT

The vison of the proposed development is for a mix of residential and commercial retail land uses consistent with the North Shore Sustainable Communities Plan. The development would include rental two-bedroom apartments; commercial units; off-street public parking and a farmers market. At full build-out, the development would include a total of 156 two-bedroom apartment units with 328 parking stalls for residents and their guests. A 30,000 gross-square-feet commercial development is proposed which will include studios, shops, galleries, a restaurant, and a farmer’s market. See Figure 7, Conceptual Site Plan; Figure 8, Typical Elevations at Street Level; Figure 9, Typical Apartment Elevations; and Figure 10, Conceptual Rendering of Apartment Building.

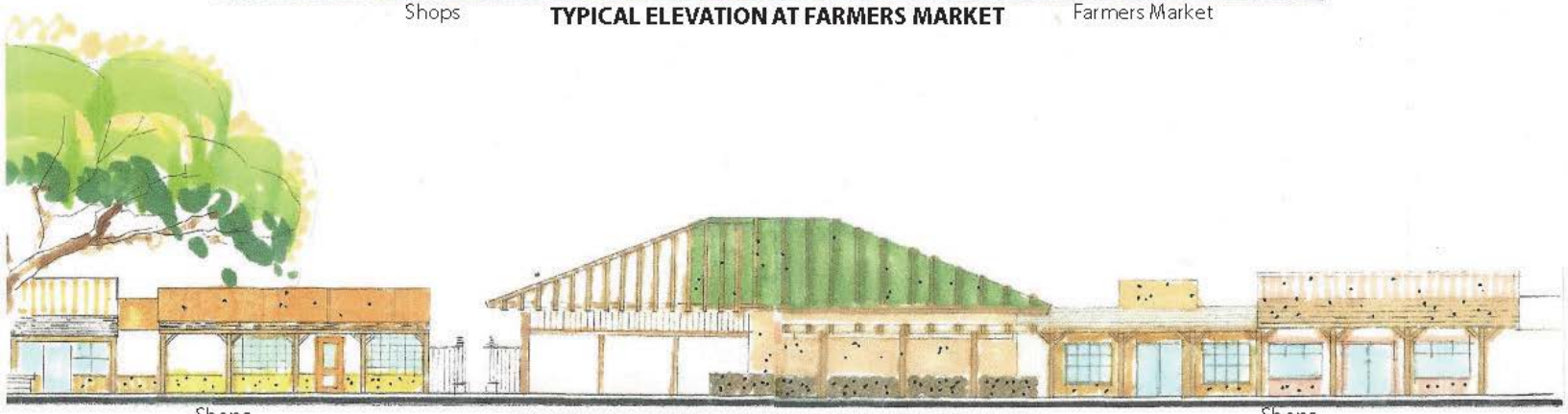
Figure 7: CONCEPTUAL SITE PLAN

Figure 8: TYPICAL ELEVATIONS AT STREET LEVEL

TYPICAL ELEVATION AT RENTAL APARTMENTS



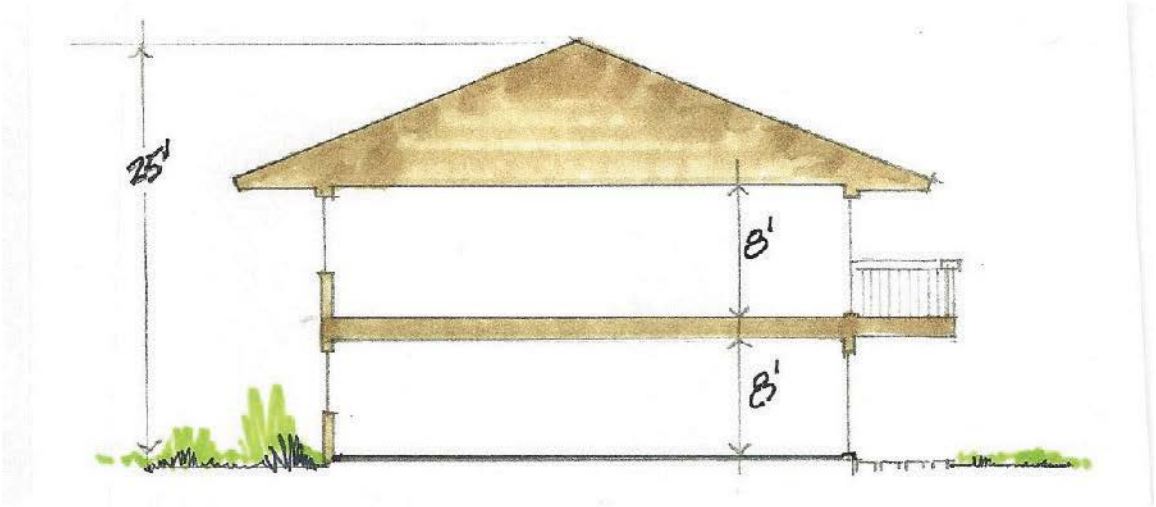
TYPICAL ELEVATION AT FARMERS MARKET



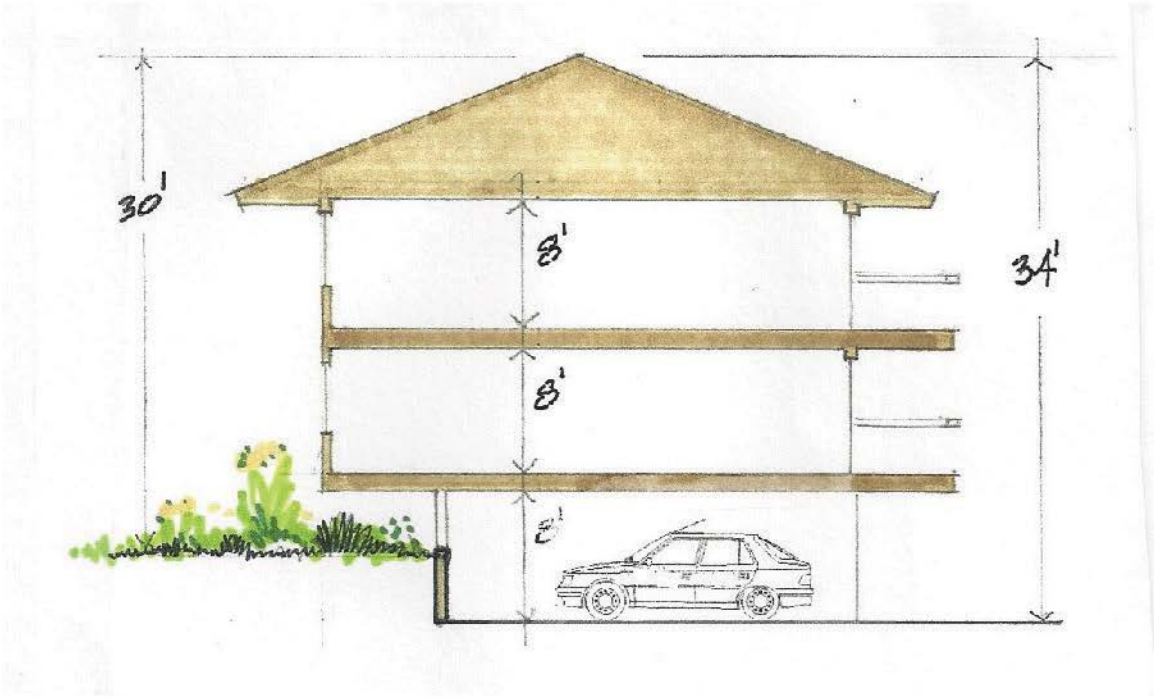
TYPICAL ELEVATION AT RESTAURANT AND SHOPS

*ALL ELEVATION STUDIES ARE PRELIMINARY AND CHANGES MAY BE REQUIRED

Figure 9: TYPICAL APARTMENT ELEVATIONS



TYPICAL BUILDING SECTION - RENTAL APARTMENT
*PRELIMINARY AND CHANGES MAY BE REQUIRED



TYPICAL BUILDING SECTION - RENTAL APARTMENT WITH COVERED PARKING
*PRELIMINARY AND CHANGES MAY BE REQUIRED

Rental Apartments

The rental apartments are envisioned as two-bedroom units designed to maintain the rural character of Hale‘iwa Town in consistency with the Hale‘iwa Special District design guidelines. There are two (2) types of apartment buildings proposed; two-story buildings over parking and two-story buildings with adjacent surface parking. As shown in Figure 9, the maximum building height above grade will vary between 25 feet and 34 feet, depending on the roof pitch design and whether covered parking is provided.

The intent of Backyard Hale‘iwa’s development is to have affordable rental apartment housing in close proximity (i.e., walking distance) to employment within Hale‘iwa Town Center. The primary purpose of providing rental apartments is to support the North Shore work force employed within Hale‘iwa’s main commercial areas. Being in such close proximity to Hale‘iwa’s Town Center, renters will be able to walk to and/or ride bicycles to places of employment or shopping. The site plan as shown is designed with interior pedestrian and bike paths for residents.

Photo 2: Example of Architectural Style

Public and Commercial Parking

The current conceptual site plan shows a total of 543 vehicle parking stalls which will accommodate residents, shoppers and Hale‘iwa visitors. A total of 328 parking stalls will be dedicated to the apartments and 115 parking stalls are being dedicated for use by customers and employees of the commercial development.

Land for an additional 100 parking stalls is being set aside on the subject parcel for the City and County of Honolulu to replace displaced street parking resulting from the City’s *Hale‘iwa Improvement District Project* which is currently in planning and design stages. Additional discussion of ongoing coordination with the City regarding the proposed development is provided in Section 3.10 of this document.

Farmers Market

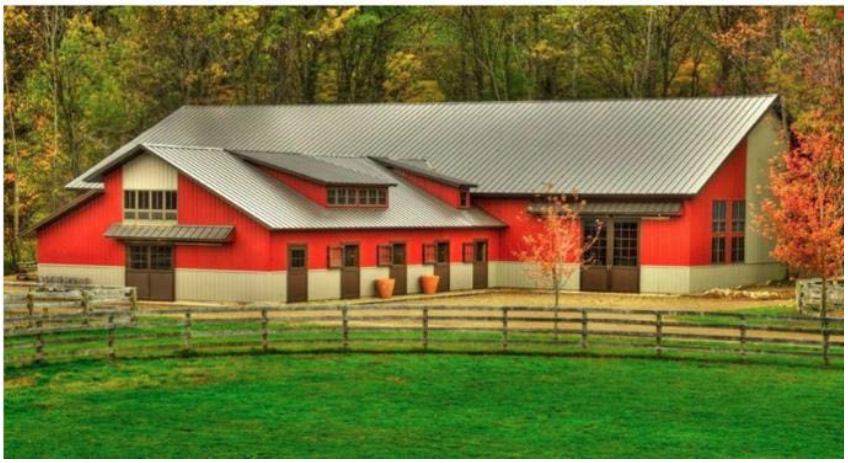


Photo 3 - Example of Farmers Market Building

The NSSCP supports farmers markets. In the plan’s guidelines for agriculture-based tourism, the NSSCP calls for identifying and developing a convenient, suitable location in or near Hale`iwa and/or Waialua Town to establish a farmers market where farmers can market products locally. The NSSCP also provides guidance to focus Hale‘iwa’s Country Town commercial core around a mix of compatible activities, including but not limited to, farmers’ markets and to provide pedestrian walkways linking commercial establishments within Hale‘iwa to farmers’ markets and agricultural product and retail outlets.

The development proposes to provide a permanent Farmers Market in Hale`iwa, with a focus on building a stronger local food system. The current concept envisions a 6,000 square foot facility to house an indoor Farmer's Market environment. Additional space can also be provided adjacent to the Farmers Market building to accommodate additional vendors should it be needed. The Farmers market would be open seven days a week and would include permanent vendors. The interior will be designed as a large open-market with limited, if any, interior walls. The building would be air conditioned to keep the produce cool, fresh and salable.

Photo 4 - Example of Farmers Market Interior

Retail Shops, Art Galleries and Restaurant

The proposed B-1 zoning area will allow for the addition of small retail shops, artisan galleries and a new restaurant. The restaurant will be approximately 5,600 square-feet and the studio, shops and galleries will cover a total area of approximately 19,200 square-feet.

The shops and galleries area is envisioned as a community friendly gathering place which provides opportunities for local Artisans to bring, display and sell their work on a weekly basis in a setting similar to the “Celebrate the Arts in Hale`iwa" weekend.

2.5 ALTERNATIVES CONSIDERED

No-Action Alternative

Under the no-action alternative, a Change in Zoning and State Land Use Boundary Amendment would not be sought. The proposed rezoning of the parcel and subsequent development of residences and commercial business would not occur and no site disturbance or construction impacts would occur. However, in this alternative, no portion of the planned development could be implemented which would be consistent with the vision of the North Shore Sustainable Communities Plan (NSSCP). The property would remain undeveloped since the current zoning (AG-1 and P-2) does not allow for land uses called for in the NSSCP.

The street parking stalls eliminated by the Hale‘iwa Improvement District project would not be replaced by off street parking on this parcel which is situated in a desirable location and proximity to the main street (Kamehameha Highway). There are no other desirable locations for providing off-street parking due to Hale‘iwa’s historic buildings, sensitive environmental resources, such as wetlands and agricultural lands to the east of the main street. The loss of street parking without its eventual replacement would create significant pedestrian, parking, and vehicular conflicts through Hale‘iwa’s main corridor.

Residents and locals would not benefit from the apartment rentals and close proximity to Hale‘iwa’s primary economic and employment source. There would be no expansion of businesses opportunities for small vendors or for farmers seeking a permanent farmers market to sell their goods.

Alternative Mixed-Use Zoning Designations

Alternate mixed-use zoning designations were considered and dismissed during the project’s conceptual design phase. Initially, the Community Business Mixed District (BMX-3) was identified for the proposed zoning designation because it would allow for all of the proposed uses to be developed within one zoning designation. Following a presentation to the North Shore Neighborhood Board at their February 2015 meeting, the board took action to oppose BMX-3 zoning as well as any other zoning that does not keep with the country character of Hale‘iwa Town. The Medium-density Apartment Mixed Use District (AMX-2) was also considered but dismissed because it would allow for higher densities of apartment districts than desired for in the NSSCP. The Planned

Development concept was dismissed as an option because the commercial retail allowed would be too limited not allowing for desired retail or the farmers market.

2.6 ESTIMATED PROJECT CONSTRUCTION COSTS

Estimated project construction costs will be developed at a later time.

2.7 REQUIRED PERMITS AND APPROVALS

The following is a list of permits and approvals that may be required for the project:

Federal

No Federal approvals are anticipated at this time.

State of Hawai‘i

- Department of Health (DOH), National Pollutant Discharge Elimination System (NPDES), Permits for construction activities and storm water discharge
- DOH, Wastewater System review and approvals
- DOH, Construction Noise Permit
- Coordination with the Hawai‘i Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP).

City and County of Honolulu

- Department of Planning and Permitting (DPP), Change in Zone and State Land Use District Boundary Amendment
- DPP Subdivision Application
- DPP Hale‘iwa Special Design District Permit (Major)
- DPP Joint Development Agreement (JDA) and Conditional Use Permit (Minor)
- Permits for Construction, such as Building Permit, Grading, Grubbing and Stockpiling Permit, Demolition Permit, Water System approval, Street Usage Permit, and Trenching Permit.
- Plan review by Honolulu Fire Department (HFD)

3.0 DESCRIPTION OF THE EXISTING ENVIRONMENT, PROJECT IMPACTS & MITIGATION MEASURES

This section describes the surrounding environment in the vicinity of the subject property, the probable environmental impacts associated its development for mixed residential and commercial uses, and provides any mitigating measures, if necessary.

3.1 CLIMATE

Hale‘iwa has a moderate coastal climate with daily temperatures between approximately 62° and 78° F in January, and 68° and 87° F in July. The coldest month of the year is February with an average minimum temperature of 59.3° F. The prevailing winds throughout the year are the northeasterly trade winds, with occasional southwesterly “Kona” winds. The annual average precipitation at Hale‘iwa is 29.77 inches. Most of the rainfall occurs in the winter months. The wettest month of the year is January with an average rainfall of 5.17 inches. The driest months of the year are June and July with approximately 1.2 to 1.6 inches of rainfall.

Project Impacts

The project is not anticipated to have any effect on the region’s climate.

3.2 FLORA AND FAUNA

A biological survey report and assessment was prepared for the project area in December 2014 and is provided as Appendix D in this document. The survey found that the habitat is highly degraded and consists primarily of a variety of non-native plant species. Within the project area only a single individual of an indigenous plant species was detected. The majority of the project area is overgrown by Guinea grass and koa haole scrub. Two (2) plant communities were found to occur in the project area: Koa Haole shrubland and roadside vegetation. The botanical survey identified 52 species of vascular plants in 22 families. No listed threatened or endangered plants were found to be present.

Flora

The majority of the project area can be classified as early stage succession Koa Haole Shrubland as shown in the photo on the next page. This coastal dry shrubland community occurs throughout the coastal area of the main Hawaiian Islands, especially on abandoned ranch lands (Gagne and Cuddihy, 1999). Currently Guinea grass is the most dominant species in area of coverage. Other species found include perennial soybean and a few small African Tulip and China-berry trees. The Koa Haole Shrubland plant community has very low species richness and includes no species that are native to the Hawaiian Islands.

Photo 5 - View of Project Site facing South.

Vegetation on the roadside areas of the property predominantly consists of naturalized non-native grass, herbs, vines, and scrubs. Only one indigenous plant (‘ilima pua kea) was found to be present among the 48 species observed. Commonly observed species on the roadside include koa haole which are less than five feet tall and less than one inch in diameter, indicating re-vegetation following recent disturbance.

Photo 6 - View facing north of roadside vegetation.

Fauna

The project area contained the usual mix of introduced birds that would be expected in a Koa Haole Shrubland. During the biological survey, six species of birds were detected. All these birds are introduced species commonly found near urban environments.

The project area does not provide suitable habitat for Hawai‘i’s ESA listed avian species, which are either forest birds limited to high elevation native forests or water birds that require open water or a wetland environment.

The ESA listed Hawaiian short-eared owl (Pueo) is listed as endangered on O‘ahu and protected under the Migratory Bird Treaty Act and could potentially use the project area for foraging or nesting. However, the owls are extremely rare on O‘ahu, with none detected from 1974 to 2009 (Pyle and Pyle, 2009). The tall and dense Guinea grass in the project area does not provide preferable nesting habitat for Pueo.

No mammals were observed during the biological survey. Although the federally listed ‘ōpe‘ape‘a (Hawaiian hoary bat, Lasiurus cinereus semotus) has been recorded in the region, the project area does not have ≥15 feet tall trees that provide a bat roosting habitat. The project is unlikely to adversely affect Hawaiian hoary bats.

Project Impacts and Mitigation

Use of the subject property for residential and commercial development is not anticipated to have a significant adverse impact on flora or faunal resources. Because of previous disturbance to the property, the flora and fauna communities on the property are comprised of non-native birds and plants. Migratory birds such as the Pacific golden plover and ruddy turnstone may temporarily use the project area for foraging or resting, however because these species do not nest in Hawai‘i, they are unlikely to be harmed by construction activities.

Although the project area does not provide any stream or wetland habitats, it is close to several wetland areas (within 0.5 miles). These wetlands support several species of endangered waterbirds. Construction activities have the potential to impact the water quality of the nearby Hale‘iwa Marsh and coastal waters. Best management practices (BMPs) will be implemented to minimize risk of siltation and pollution through stormwater runoff during construction. If necessary, additional BMPs will be included in design plans to minimize impacts to migratory bird species.

3.3 GEOGRAPHY, TOPOGRAPHY, AND SOILS

The land forms in the project area are the result of lava flows from the Ko‘olau volcano that formed the Schofield Plateau and the Waialua Plain. Over time the plateau was bounded by a broad coastal plain formed by detritus sediments derived from the deeply eroded stream valleys and coastal dune sands (Armstrong 1983:34). The parcel lies on the Schofield Plateau, close to the juncture with the coastal plain. The parcel’s existing terrain is sloped from east down to the west with elevations varying at around 10 to 50 feet above sea level, with the lower elevation near the connection to Kamehameha

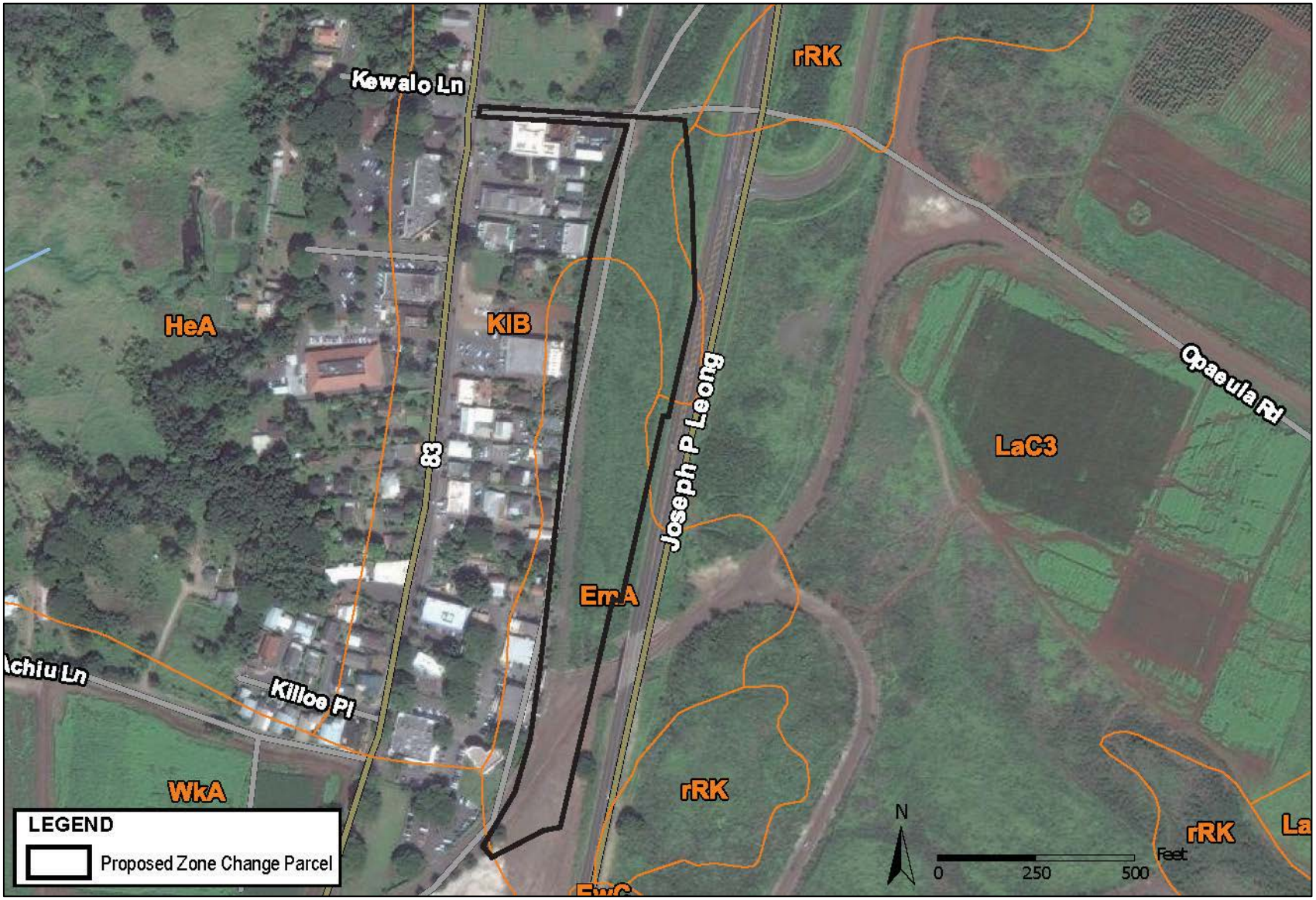
Highway and highest elevation at the northeast corner adjacent to Joseph P. Leong Highway. The parcel’s lowest point, at the road spur connection to Kamehameha Highway, is about 10 feet above sea level. The Joseph P. Leong Highway road surface is situated at a higher elevation along the length of the parcel and ranges from 30 to 55 feet above sea level. Along the section of the highway where elevations are the closest, an earth berm within the highway right-of-way lies between the road shoulder and parcel boundary.

The majority of the project area’s soils (58% by area) are classified as Ewa silty clay loam (EmA) with slopes of up to two percent (USDA 2015). Soils in the northern portion of the parcel are classified as Kawaihapai clay loam (KIB)(31.5% by area), with two to six percent slopes. These well-drained soils formed in alluvium derived from basic igneous rock that washed from the adjacent uplands. Soils in two northeastern portions (the remaining 10% of the property by area) are classified as Lahaina silty clay (LaC3) with slopes of 7 to 15 percent. See Figure 10, Natural Resources Conservation Service (NRCS) Soils Survey Map.

Project Impacts and Mitigation

No significant impact to topographic landforms or soils at the subject property is anticipated. Development of the subject property will require grading for lot preparation and is likely to reduce the overall elevation of the parcel and reduce the difference of elevation at the lower and higher sections of the parcel. All earthwork will comply with the City and County of Honolulu’s grading regulations. A construction grading permit will be required.

Figure 10: NATURAL RESOURCES CONSERVATION SERVICE (NRCS) SOILS SURVEY MAP



3.4 HYDROLOGY

According to the *Aquifer Identification and Classification for O‘ahu*, the subject property overlies the Waialua aquifer system of the North Oahu aquifer sector. Two aquifer types exist within this portion of the Waialua aquifer system. The first contains groundwater that is basal and unconfined and found in sedimentary-type geology. Water from this aquifer is ecologically important, has a low salinity of 200 to 1,000 milligrams per liter (mg/l) of chloride, is irreplaceable, and has a high vulnerability to contamination. The second aquifer type contains groundwater that is basal and confined and found in flank-type geology. It can be used for drinking, has a low salinity of 250 to 1,000 mg/l of chloride, is irreplaceable, and has a low vulnerability to contamination.

The parcel lies between two major streams, Anahulu and Ōpau‘ulu. Flowing from the Ko‘olau Mountains to the Waialua coast, the Anahulu Stream is about 1200’ to the north of the project area. At seven miles long, Anahulu Stream is O‘ahu’s longest watercourse. Beginning in the Wahiawa-Helemano area of the Central Plateau, a tributary of the Paukauila Stream, the Ōpau‘ulu Stream, flows approximately 1800’ to the south of the property. The confluence of the Ōpau‘ulu and the Helemano then forms the Paukauila Stream which begins approximately one-half mile south of the project area.

Project Impacts and Mitigation

No long-term impacts to groundwater aquifers or surface waters are expected to result from acquisition of the property and its use for residential and commercial development.

Although the project area does not contain any stream or wetland habitats, it is close to several wetland areas (within 0.5 miles). These wetlands support several species of endangered waterbirds. Construction activities have the potential to impact the water quality of the nearby Hale‘iwa Marsh and coastal waters. Best management practices will be implemented to minimize risk of siltation and pollution through construction related stormwater runoff.

3.5 FLOOD AND TSUNAMI HAZARD

According to the Flood Insurance Rate Map (FIRM) prepared by the Federal Emergency Management Agency, the subject property is located in Zone “X” which is an area that has been determined to be outside the 0.2% annual chance floodplain and outside of the 500 year floodplain (see Figure 11). According to the State Civil Defense Tsunami Evacuation Zone maps, the subject property is not within a tsunami evacuation zone (see Figure 12).

Project Impacts and Mitigation

Based upon the development plan, an increase of impervious surfaces (e.g. structural roofs, walkways, and roads) and a land use change from agriculture to mixed use development is expected. The anticipated increase in peak flow and runoff volume will be mitigated so that the proposed peak flow is attenuated to match predevelopment peak flow.

Although conceptual at this stage, the storm water management plan will include proven and effective measures to meet the requirements of the State of Hawai‘i, Department of Health, Clean Water Branch (CWB), amended Hawai‘i Administrative Rules Chapters 11-54 (Water Quality Standards), and 11-55 (Water Pollution Control). These measures are likely to incorporate on-site storm water retention basins with controlled release rates and detention/infiltration facilities where soil conditions are conducive, to help mimic the existing runoff conditions.

In addition, a suite of water quality enhancement measures will be explored and implemented as applicable to reduce sediment and pollutant loadings that are typically associated with urban runoff. The water quality enhancement measures may include elements such as grass-lined filter strips, bioswales, infiltration chambers, rain gardens, cisterns and permeable pavers. The City and County of Honolulu provides storm water quantity best management practices guidelines that will be used in the design process to assess the suitability, size and selection of the most appropriate measures.

Figure 11: FLOOD INSURANCE RATE MAP (FIRM)

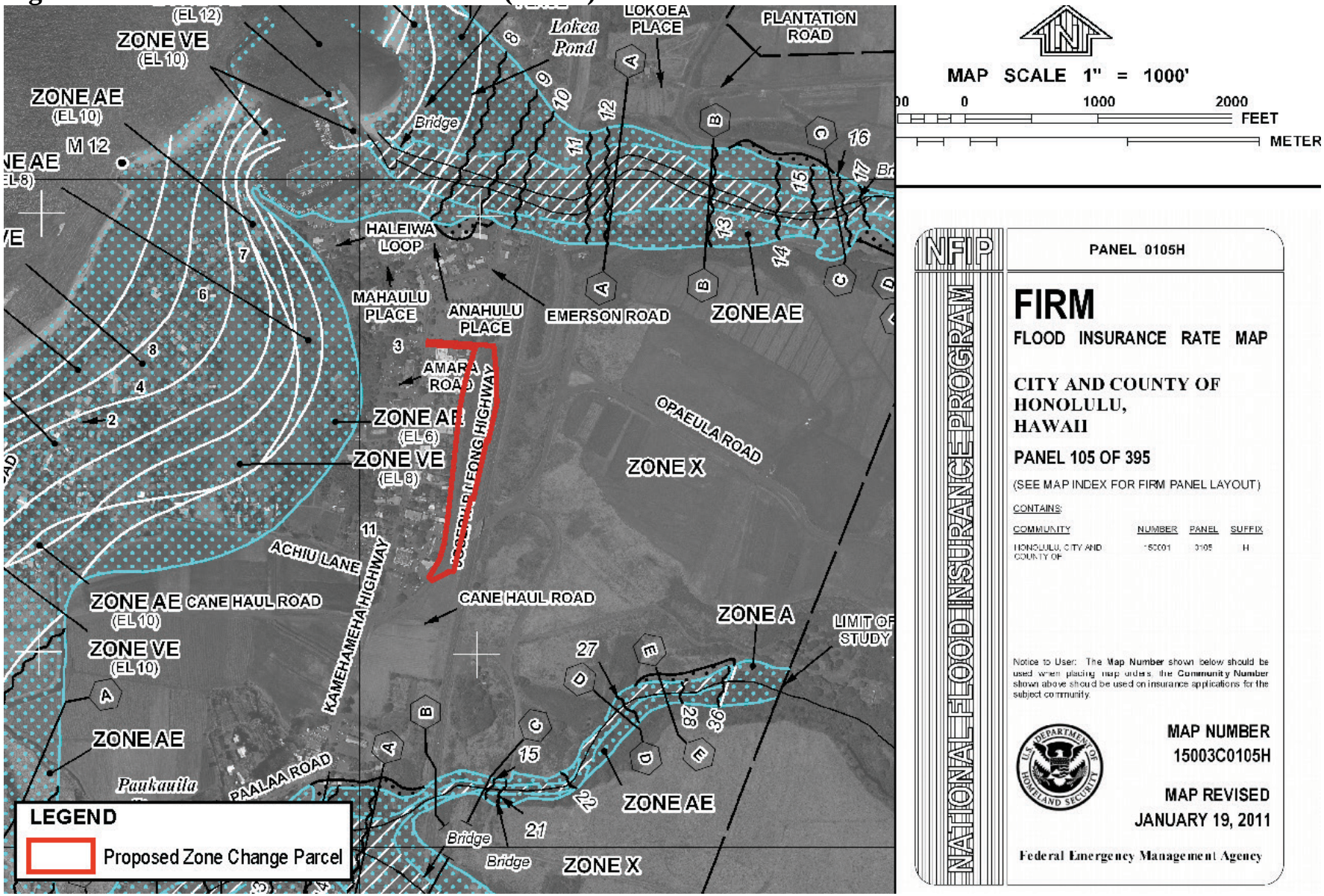


Figure 12: WAIALUA AND HALEIWA TSUNAMI EVACUATION ZONE

3.6 NOISE

Noise is defined as excessive or unwanted sound. Various local and federal agencies have established guidelines and standards for assessing environmental noise impacts and set noise limits as a function of land use.

State of Hawai‘i, Community Noise Control

The maximum permissible noise levels are enforced by the State Department of Health (DOH) for any location at or beyond the property line and shall not be exceeded for more than 10% of the time during any 20-minute period. The specified noise limits which apply are a function of the zoning and time of day as shown in Table 8. In determining the maximum permissible sound level, the background noise level is taken into account by the DOH.

Table 1: COMMUNITY NOISE CONTROL REGULATED NOISE LEVELS

Zoning District		Day Hours (7 AM – 10 PM)	Night Hours (10 PM – 7 AM)
Class A	Residential, Conservation, Preservation, Public Space, Open Space	55 dBA (exterior)	45 dBA (exterior)
Class B	Multi-Family Dwellings, Apartments, Business, Commercial, Hotel, Resort	60 dBA (exterior)	50 dBA (exterior)
Class C	Agriculture, Country, Industrial	70 dBA (exterior)	70 dBA (exterior)

City and County of Honolulu

The City and County of Honolulu noise ordinances do not regulate traffic or construction noise. They focus on noise from animals, hospitals, “boom boxes” and the Waikiki Shell.

Project Impacts and Mitigation

According to the DOH Community Noise Control rules, in cases where construction noise exceeds, or is expected to exceed the State’s "maximum permissible" property line noise levels, a permit must be obtained from the State DOH to allow the operation of vehicles, cranes, construction equipment, power tools, etc., which emit noise levels in excess of the "maximum permissible" levels.

In order for the State DOH to issue a construction noise permit, the Contractor must submit a noise permit application to the DOH, which describes the construction activities for the project. Prior to issuing the noise permit, the State DOH may require action by the Contractor to incorporate noise mitigation into the construction plan. The DOH may also require the Contractor to conduct noise monitoring or community meetings inviting the neighboring residents and business owners to discuss construction noise. The Contractor should use reasonable and standard practices to mitigate noise, such as using

mufflers on diesel and gasoline engines, using properly tuned and balanced machines, etc. However, the State DOH may require additional noise mitigation, such as temporary noise barriers, or time of day usage limits for certain kinds of construction activities.

Specific permit restrictions for construction activities in the DOH Community Noise Control rules are:

- "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels ... before 7:00 a.m. and after 6:00 p.m. of the same day, Monday through Friday."
- “No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels... before 9:00 a.m. and after 6:00 p.m. on Saturday."
- “No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels on Sundays and on holidays."

3.7 AIR QUALITY

The U. S. Environmental Protection Agency (EPA) sets national ambient air quality standards (NAAQS) for six criteria pollutants: carbon monoxide, nitrogen dioxide, sulfur dioxide, lead, ozone, and particulate matter (PM_{10} and $PM_{2.5}$). Hawai‘i has also established a state ambient air standard for hydrogen sulfide. The State of Hawai‘i, Department of Health, operates several air monitoring stations throughout the state including four stations on Oahu.

Both Federal and State air quality standards in Hale‘iwa are generally met because of prevalent trade winds and lack of any major stationary pollutant emission sources. According to the State of Hawai‘i Annual Summary Air Quality Data, measured levels of PM_{10}, SO_2, and NO_2 (nitrogen dioxide) are well within State and Federal ambient air quality standards for the Island of Oahu (State of Hawaii, DOH 2014).

Project Impacts and Mitigation

Short-term impacts to air quality from fugitive dust may occur during development of the property. These impacts could result from construction vehicle activities and fugitive dust from excavation and grading. There are two potential types of air pollution emissions associated with these construction activities. First, fugitive dust caused by vehicle movements and excavation/fill activities. Second, vehicles exhaust emissions from on-site construction equipment. These impacts will be minimized through the implementation of best management practices to control construction dust and emissions in compliance with provisions of HAR Section 11.60.1-33. All work will be in conformance with the air pollution standards and regulations of the State DOH.

Long term impacts to air quality from the proposed project are expected to be minimal. Vehicle emissions will increase slightly over current levels resulting from the transport of residents and visitors to the residences and businesses of the proposed development on the property. The slight increase in vehicle emission resulting for the proposed project is not expected to cause a significant impact to air quality in the project vicinity.

3.8 ARCHAEOLOGICAL AND CULTURAL RESOURCES

The project area is on the border of Pa‘ala‘a and Kawailoa Ahupua‘a in eastern Waialua District, O‘ahu. The two large ahupua‘a extended from Waialua Bay to the summit of the Ko‘olau Range. Most of the parcel is in Pa‘ala‘a Kai, the seaward section of the ahupua‘a, about a kilometer inland from the coast of Waialua Bay. The parcel’s southern width is roughly equivalent to the paved two-lane Cane Haul Road (SIHP 50-80-04-7604) that is in use by vehicular traffic. A gravel one-lane access road extends the entire length of the parcel’s west side and separates the undeveloped land from Hale‘iwa’s commercial and residential district.

Archaeological test excavations were conducted on the project parcel (TMK (1) 6-2-005:002) on November 10 and 11, 2014. Because the property has been disturbed by construction of the adjacent Joseph P. Leong Highway in the 1990s, there are no structures or artifacts on the surface of the property. A single re-deposited historic artifact, an OR&L Railroad iron spike, and a paved portion of the previously recorded Cane Haul Road (SIHP 50-80-04-7604), were the only historic resources encountered in the parcel. All six of the test excavations found mixed topsoil and alluvium capping construction fill resulting from the construction of the adjacent Joseph P. Leong Highway in the 1990s.

A trash dump, containing artifacts dated to the 1960s to at least the early 1980s and a re-deposited railroad spike, was encountered in Trench 3. Other than the railroad spike in the Trench 3 trash dump, no signs of the OR&L Railroad (SIHP 50-80-04-5791) that once crossed diagonally through the project parcel remain. A 250’ segment of the previously recorded Cane Haul Road (SIHP 50-80-04-7604) defines the width of the southern extent of the parcel. This segment is currently a two-lane paved road used for vehicular traffic. Within the project area, the site has been paved and is currently in use by vehicular traffic.

Project Impacts and Mitigation

The State Historic Preservation Division (SHPD) reviewed the Archaeological Inventory Survey (AIS) prepared for the property in December 2014 in accordance with HRS Chapter 6E-42. The AIS report (Sims et al. 2015) was reviewed and accepted by SHPD on February 19, 2015. Based on the information contained within the AIS, SHPD concurred with a determination that no historic properties will be affected by the proposed project.

No impact to archaeological resources is anticipated as according to the SHPD, no historic sites are known to be present on the property based on previous archaeological surveys. No impacts to cultural resources or practices are expected as the site is not associated with ongoing cultural practices and does not possess any unique resources to support such activities.

The location of Cane Haul Road (SIHP 50-80-04-7604) has been documented on topographic maps since at least 1956. There is no further reasonable and adequate information that can be collected about the 250’ length of the road that defines the

southern base of the project area. The proposed undertaking will have no effect on Cane Haul Road as it is planned to be kept intact and to continue to be used as a thoroughfare. No further work is recommended for the site.

Archaeological test excavations indicate that the entire project area has been extensively covered with construction fill and alluvium during and after construction of the Joseph P. Leong Highway in the 1990s. The sugarcane field deposits that local informants report once capped the parcel were removed by grading or leveling prior to the deposition of the construction. Therefore development of this parcel is very unlikely to affect historic properties. As the project area has a low probability for containing archaeological deposits, no impact to archaeological resources is anticipated.

3.9 VISUAL RESOURCES

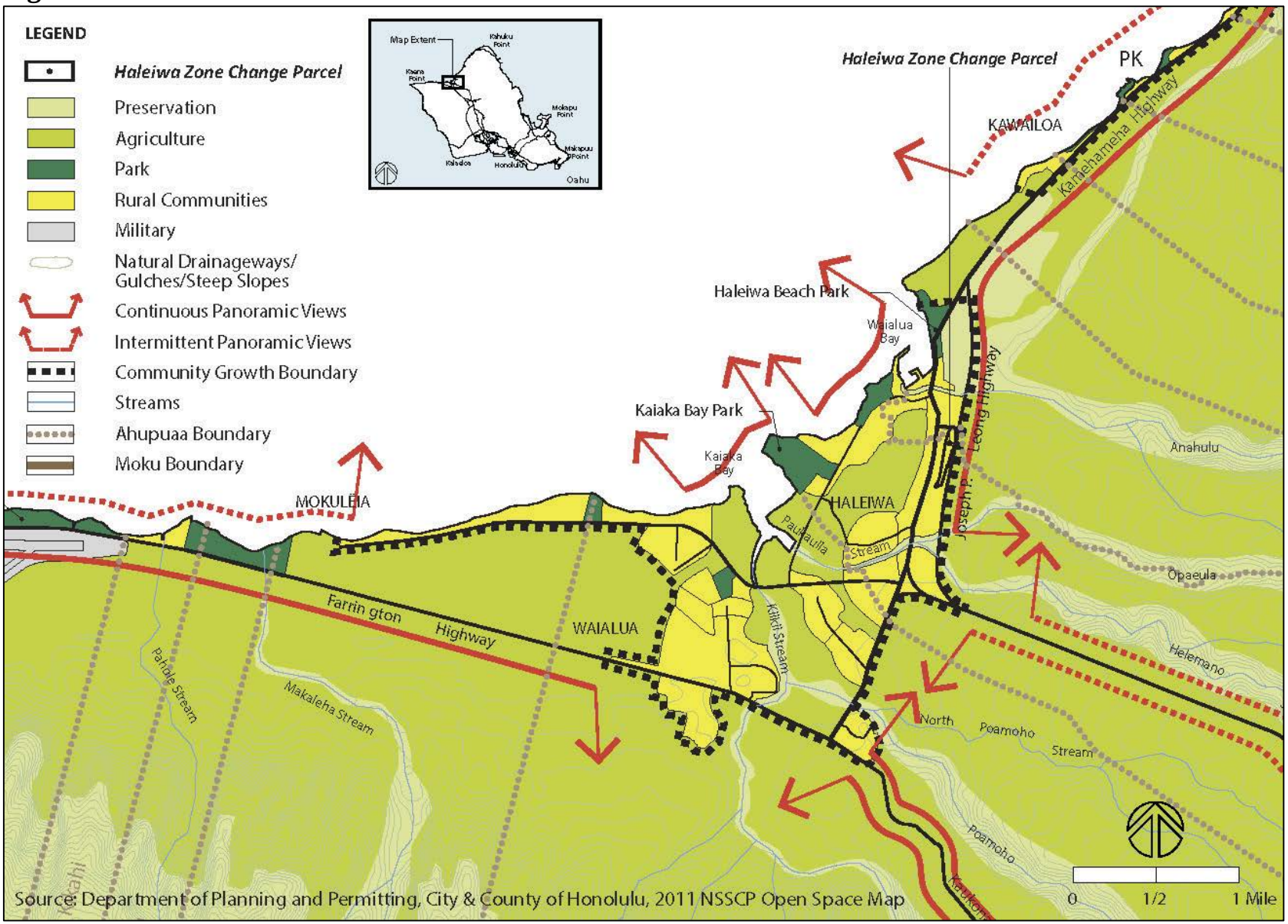
The project site is clearly visible when traveling in either direction along Joseph P. Leong Highway adjacent to Hale‘iwa town. The majority of the project area is covered in vegetation and overgrown by Guinea grass and koa haole shrub. The site’s western border is lined with koa haole shrubs measuring about five feet tall, which provides a buffer between the project parcel and adjacent parcels.

The NSSCP identifies the North Shore’s significant scenic resources as open spaces, scenic shorelines, backdrops of the Wai‘anae and Ko‘olau Mountain Ranges and the coastal pali. Panoramic views and scenic resources that should be protected throughout the region are identified on the NSSCP’s Open Space Map, see Figure 13. In the vicinity of the project site, these resources include the views from Kamehameha Highway of the Wai‘anae and Ko‘olau Mountains, the ocean and shoreline, and Waialua and Hale‘iwa Towns.

Project Impacts and Mitigations

The project is not anticipated to have a significant negative impact on scenic viewplanes or scenic resources in the vicinity of Hale‘iwa Town. The development’s apartment structures, with roof pitches up to 34 feet above grade, will be visible when traveling in either direction along Joseph P. Leong Highway and through gaps in structures when traveling along Kamehameha Highway through Hale‘iwa town. Structures in the north section of the project will have a higher visibility from both major adjacent roadways, however all structures will be designed in accordance with design guidelines for the Hale‘iwa Special District. The design guidelines will control the architectural building form and landscaping screening that would make the development compatible with the rural character of Hale‘iwa.

Figure 13: NSSCP OPEN SPACE MAP



Source: Department of Planning and Permitting, City & County of Honolulu, 2011 NSSCP Open Space Map

3.10 ROADWAYS AND TRAFFIC

A traffic study was conducted for the proposed project in May 2015. The traffic study analyzed existing conditions and impacts in the surrounding area as a result of the full build-out of the proposed development. Vehicular access to the development is being proposed through Cane Haul Road on the south side of the property and through ‘Ōpae‘ula Road on the north side with additional dedicated pedestrian access next to Malama Market. Full build-out of the development is anticipated to occur by the year 2025.

Vehicular Access

Vehicular access to the project property will be provided by Cane Haul Road from the south and ‘Ōpae‘ula Road from the north. Both these roads connect to Kamehameha Highway which is a City and County of Honolulu owned road with the functional classification of urban minor arterial. This two-lane, two-way, undivided roadway provides access to the various commercial and residential properties within Hale‘iwa Town.

Kamehameha Highway is oriented in the north-south direction and runs parallel to Joseph P. Leong Highway, a State-owned bypass of Kamehameha Highway, which in this area is a low-speed road lined with commercial businesses. The posted speed limit along Kamehameha Highway in this section is 25 mph.

Cane Haul Road is currently an agriculture road located approximately 650-feet south of the main driveway for North Shore Marketplace. Cane Haul Road intersects Kamehameha Highway at a four-leg signalized intersection.

‘Ōpae‘ula Road is currently a private two-lane, two-way roadway on the east side of Kamehameha Highway, located between Lili‘uokalani Protestant Church Cemetery and ACE Hardware. ‘Ōpae‘ula Road is controlled by a stop sign at the intersection with Kamehameha Highway.

Transit Access

The City and County of Honolulu transit system (TheBus) has five bus routes traveling along Kamehameha Highway through Hale‘iwa. Hale‘iwa is connected by bus to Honolulu via Mililani by Routes 52 and 88A. Bus service to windward Oahu communities and Honolulu is provided by Route 55. Route 76 provides service between Waialua and Hale‘iwa, and Route 83 provides service between Hale‘iwa and Wahiawā. These routes can be accessed from bus stops within 350’ to 0.1 mile from the property.

Existing Roadway Volumes

In 2013, average daily traffic (ADT) along Kamehameha Highway in the project area was 8,600-11,300 vehicles. This data is based on weekday counts taken by the Hawai‘i Department of Transportation (HDOT) and included in Historical Traffic Station Maps.

There were no distinct AM or PM peak hours at either the north or south approaches to Hale‘iwa along Kamehameha Highway as would normally expected along a road primarily used for commercial and retail access. The hourly volumes along Kamehameha Highway at the south end of Hale‘iwa between Pa‘ala‘a Road and Achiu Lane stayed near or above 900 vehicles from 11:30 AM to 4:00 PM. The peak hour volume along this section occurred at 3:15-4:15 PM with a total of 950 vehicles. Of the 950 vehicles, approximately 450 vehicles were traveling in the northbound direction and 500 vehicles in the southbound direction. The hourly volume along Kamehameha Highway at the north end of Hale‘iwa between Kahalewai Place and Joseph P. Leong Highway stayed above 700 vehicles from 11:00 AM to 4:30 PM. The peak hour volume along this section of Kamehameha Highway occurred at 2:00-3:00 PM. Of the approximately 800 vehicles traveling along this section of Kamehameha Highway during the peak hour, the northbound and southbound splits were equal with 400 vehicles traveling in each direction.

Intersection Peak Hour Volumes

Intersection turning movement traffic counts were performed on Wednesday, March 11, 2015 during the weekday AM and PM peak periods (7:30-9:30 AM and 2:15-4:15 PM, respectively) and on Saturday, March 14, 2015 during the midday peak period (12:30-2:30 PM) at the intersections of Kamehameha Highway at Cane Haul Road and Kamehameha Highway at the primary driveway for the North Shore Marketplace. The AM peak period (7:30-9:30 AM) counts for the intersection of Kamehameha Highway and Opaeula Road/Kewalo Lane were taken on Thursday, March 12, 2015. The turning movement traffic counts included the classification of passenger vehicles, heavy vehicles (buses, trucks, vehicles with trailers), bicycles, and pedestrians (see Table 1).

Table 2: HEAVY VEHICLES, BICYCLES, AND PEDESTRIAN VOLUMES DURING PEAK PERIOD

Intersection	Time Period	Heavy Vehicle		Bicycle Volume	Pedestrian Volume
		Volume	%		
Kamehameha Highway at Opaeula Road	AM	39	3.9	3	29
	PM	*	*	*	*
	Saturday	*	*	*	*
Kamehameha Highway at North Shore Marketplace primary driveway	AM	50	4.2	14	15
	PM	45	2.3	15	130
	Saturday	39	1.9	22	208
Kamehameha Highway at Cane Haul Road	AM	54	4.6	18	12
	PM	44	2.3	19	87
	Saturday	48	2.2	27	114
*Data was not included in Hale‘iwa Improvement District Project counts.					

Pedestrians and Bicycle Volumes

Pedestrian and bicycles were counted at the study intersections during the AM, PM, and Saturday two- hour peak periods. The highest volume of pedestrians during the two-hour peak period was observed at the intersection of Kamehameha Highway and North Shore Marketplace primary driveway on Saturday March 14th. During this period, 208 pedestrians were counted traveling through the intersection. The highest volume of bicycles was observed at the intersection of Kamehameha Highway and Cane Haul Road on Saturday march 14th, with 27 bicycles counted. Bicycle volumes ranged from three (3) to 19 bicycles during the weekday AM and PM peak periods counts at the three intersections.

Transit Bus Volumes

The City and County of Honolulu transit system (TheBus) has five bus routes traveling along Kamehameha Highway through the study area. The five bus routes are Route 52: Honolulu-Mililani-Hale‘iwa, Route 55: Honolulu-Kāne‘ohe-Hale‘iwa, Route 76: Waialua-Hale‘iwa, Bus Route 83: Wahiawa Town Express, and Route 88A: North Shore Express (see Table 2).

Table 3: AVERAGE TRANSIT RIDERSHIP

Route	Average No. Passengers (Daily)
52	5,000
55	3,900
76	400
52	700
88A	175

Vehicle Level of Service and Volume

Level of Service (LOS) is a term used to describe the conditions of a roadway based on factors that determine the rate of movement of vehicles along the roadway. LOS are ranked from A (free flow, the optimum condition) to F (forced or breakdown flow, the worst condition). The LOS method can be used as a tool to determine whether modification of a roadway is needed in order to prevent congestion. *A Policy on Geometric Design of Highways and Streets* (AASHTO, 2011) states that an “appropriate” LOS for an urban arterial, which is the classification of Kamehameha Highway through the study area, is LOS C or D. This assumes that appropriate LOS for study intersections and turning movements should be LOS D or better.

Another measure of intersection operation is the volume to capacity (v/c) ratio, which is the ratio of the volume of traffic utilizing the intersection compared to the maximum volume of vehicles that can be accommodated by the intersection during a specific period of time. A v/c ratio under 0.85 means the intersection is operating under capacity and excessive delays are not experienced. An intersection is operating near its capacity when v/c ratios range from 0.85 to 0.95. Unstable flows are expected when the v/c ratio is between 0.95 and 1.0. Any v/c ratio greater than or equal to 1.0 indicates that the intersection is operating at or above capacity which results in a LOS F per the *HCM* (TRB, 2010).

Existing (2015) Intersection Conditions (LOS)

Existing (2015) LOS for the unsignalized and signalized intersection and traffic movements operated at an appropriate LOS D or better during the AM, PM and Saturday midday peak hours (see Table 3). All movement V/Cs were calculated to be under capacity. However, field observations indicated that actual vehicle demand is not being met which results in long queues along Kamehameha Highway at times. This is not reflected in the intersection LOS calculations because of the inability of these vehicles to be counted traveling through these intersection.

Existing conditions reflect heavy traffic volumes in the middle of the day, not following typical peak commuter hours. High pedestrian volumes also exist in the area, especially during weekends. Even though intersection operations reflect an appropriate LOS, it is likely that current capacity constraints along the corridor restrict flow. Ongoing and proposed development in the area is meant to improve the walkability. Resulting LOS remain appropriate for Future (2025) Without Project conditions.

With the proposed trips resulting from Backyard Hale‘iwa, operations at three study intersections remain appropriate LOS D or better. Improvements should consider including a minimum of eight-foot wide sidewalks with landscaping and utilities located in the buffer zone where possible along all driveway access roads to the proposed Backyard Hale‘iwa project.

Table 4: EXISTING (2015) INTERSECTION LEVEL OF SERVICE

Unsignalized Intersection	App	Mvmt	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
			Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c	LOS
Kamehameha Highway at Opaeula Road	WB	LR	11.6	0.06	B	17.7	0.13	C	20.0	0.13	C
	SB	L	7.8	0.02	A	8.7	0.01	A	9.2	0.02	A
Kamehameha Highway at North Shore Marketplace driveway	WB	L	14.9	0.09	B	26.8	0.19	D	30.3	0.19	D
		R	10.2	0.04	B	13.5	0.11	B	14.1	0.09	B
	SB	L	8.0	0.03	A	8.8	0.05	A	9.1	0.06	A
Signalized Intersection	**App**	**Mvmt**	**AM Peak Hour**			**PM Peak Hour**			**Saturday Peak Hour**		
			Delay	**v/c**	**LOS**	**Delay**	**v/c**	**LOS**	**Delay**	**v/c**	**LOS**
Kamehameha Highway at Cane Haul Road	Intersection		1.8	-	A	1.9	-	A	3.0	-	A
	EB	LTR	-	-	-	-	-	-	37.7	0.22	D
	WB	LTR	35.9	0.09	D	36.6	0.11	D	37.0	0.20	D
	NB	LTR	1.3	0.22	A	1.7	0.33	A	2.2	0.39	A
	SB	LTR	1.3	0.20	A	1.60	0.32	A	1.9	0.32	A

Future (2025) Volumes

Changes in traffic volume along Kamehameha Highway, from HDOT *Historical Traffic Station Maps*, have been mixed over the past five years. Traffic volumes along Kamehameha Highway between Pa‘ala‘a Road and Achiu Lane showed an increase of 2.1% annually from 2008 to 2011. Traffic volumes along Kamehameha Highway between Kahalewai Place and Joseph P. Leong Highway slightly decreased from 2008 to 2013.

The *Traffic Impact Analysis Report for the Proposed Hale‘iwa Commercial Redevelopment Project* (TMC, 2011) used the *O‘ahu Regional Transportation Plan 2030* by the O‘ahu Metropolitan Planning Organization (MPO) in April 2006 to determine background growth. Over a 25-year period, the population of the North Shore of O‘ahu was expected to increase by 5%. A projected background growth in traffic of 0.5% per year was used in analysis for the *Hale‘iwa Commercial Redevelopment Project TIAR.* The *O‘ahu Regional Transportation Plan 2035* (OahuMPO, 2011) showed that over a 28-year period, the population of North Shore of O‘ahu would increase by 13%. This results in an annual growth of 0.5%. Although population growth is not directly related to traffic growth, a compounded annual increase of 0.5% was assumed for all traffic movements along Kamehameha Highway. The increase was applied to the existing traffic along Kamehameha Highway to obtain the forecasted volumes for Future (2025) Without Project conditions.

Project Related Volumes

The proposed project is assumed to be fully constructed and operational within the next 10 years. Trips generated from the proposed apartments, restaurant and retail development were calculated using nationally accepted land use rates as provided in the *Trip Generation, 8th Edition* (ITE, 2008). Table 4 provides the total project related trips generated for the proposed development.

An additional 100 parking stalls will be provided within the proposed property to accommodate parking relocation required as a result of the Hale‘iwa Improvement District Project. To determine the trips generated from the additional 100 parking stalls, an equivalent ratio of square-footage of commercial area to number of parking stalls was calculated. This calculation resulted in an approximately 27,100 square-foot development. The land use that best represents the existing commercial area in Hale‘iwa Town is “Specialty Retail” and therefore this was used for calculating trip rates.

Table 5: TOTAL PROJECT RELATED TRIP GENERATION

Land Use [ITE Code]	Quantity	Trip Generation								
		AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
		Total	In	Out	Total	In	Out	Total	In	Out
Low-Rise Apartment [221]*	156 units	72	15	57	90	59	31	90	49	41
Quality Restaurant [931]*	5,600 s.f.	0**	0**	0**	62	37	25	61	32	29
Specialty Retail [814]*	19,200 s.f.	0	0	0	52	23	29	52+	23+	29+
Farmer’s Market	5,200 s.f.	104	52	52	104	52	52	104	52	52
Additional Parking	100 stalls	0	0	0	71	31	40	71+	31+	40+
TOTAL TRIP GENERATION		176	67	109	379	202	177	378	187	191

** Source: Trip Generation, 8th Edition (ITE, 2008)*
*** = Restaurant will only be open during lunch and dinner and therefore it is assumed that no trips will be generated during the AM peak hour.*
+ = Used results from PM trip generation because Saturday rates were not available.

Project Impacts and Mitigations

Existing conditions reflect heavy traffic volumes in the middle of the day, not following typical peak commuter hours. High pedestrian volumes also exist in the area, especially during weekends. Even though intersection operations reflect an appropriate LOS, it is believed that current capacity constraints along the corridor restrict flow. Ongoing and proposed development in the area are meant to improve the walkability. Resulting LOS remain appropriate for Future (2025) Without Project conditions.

With the proposed trips resulting from the project, operations at three study intersections remain appropriate LOS D or better. Improvements should consider including a minimum of eight-foot wide sidewalks with landscaping and utilities located in the buffer zone where possible along all driveway access roads to the proposed project.

Recommendation for Intersection of Kamehameha Highway and Cane Haul Road

The recommended traffic mitigation at the intersection of Kamehameha Highway and Cane Haul Road is to construct a single-lane roundabout. A roundabout would facilitate slow speed travel and minimize delay which will provide ease of access for all modes of travel, including agricultural vehicles, buses, pedestrian and bicycle movements. This could also serve as a gateway to Hale‘iwa Town that provides the visual cue to slow down. The roundabout operation results in all approaches operating at LOS A. If signalization remains, pedestrian crosswalks and pedestrian signals should be provided to allow for safe access.

Recommendation for Intersection of Kamehameha Highway and ‘Ōpae‘ula Road

With the project and additional development in the area, the existing intersections of ‘Ōpae‘ula Road and Kewalo Lane should be considered for realignment to improve accessibility.

The recommended option to better address turning vehicle traffic conflicts and to calm traffic speeds along Kamehameha Highway at ‘Ōpae‘ula Road is the construction of a roundabout or mini-circle. This improvement would facilitate slower speed travel and minimize delay which will provide ease of access for pedestrian and bicycle movements. The analysis results for the alternative indicate a desirable LOS A for all approaches. While this option is recommended, two (2) other roadway improvement options were considered to address future with project conditions at the intersection of Kamehameha Highway and ‘Ōpae‘ula Road:

1) No change to existing two-lane roadway conditions, requiring all turns to be made through a single lane. This will likely result in added delay along Kamehameha Highway however vehicular speeds will remain low as a result of congestion. Results from this analysis indicate LOS D or better for all movements. This does not include the intersection with Kewalo Lane since it currently is offset from the intersection with ‘Ōpae‘ula Road.

2) Realign opposing streets of ‘Ōpae‘ula Road and Kewalo Lane to better align, and provide a dedicated left-turn storage lane at the intersection for each approach

along Kamehameha Highway. This will alleviate delay at the intersection while containing roadway widening to the extents of the intersection approaches. Results from the analysis indicate that when Kewalo Lane and ‘Ōpae‘ula Road are aligned, all movements operate at LOS D or better during the AM, PM, and Saturday midday peak hours, except for the eastbound approach during Saturday midday peak hour which operates at LOS E.

Coordination with City’s Hale‘iwa Improvement District Project

Resolution 09-338 (CD1), adopted by the City Council in January 2010, initiated efforts for the *Hale‘iwa Improvement District Project* tasked to the City Department of Design and Construction (DDC). Still in planning stages as of 2015, the improvement district is expected to include new pedestrian walkways, undergrounding utilities and installation of landscaping along Kamehameha Highway between ‘Ōpae‘ula Stream Bridge and Anahulu River Bridge.

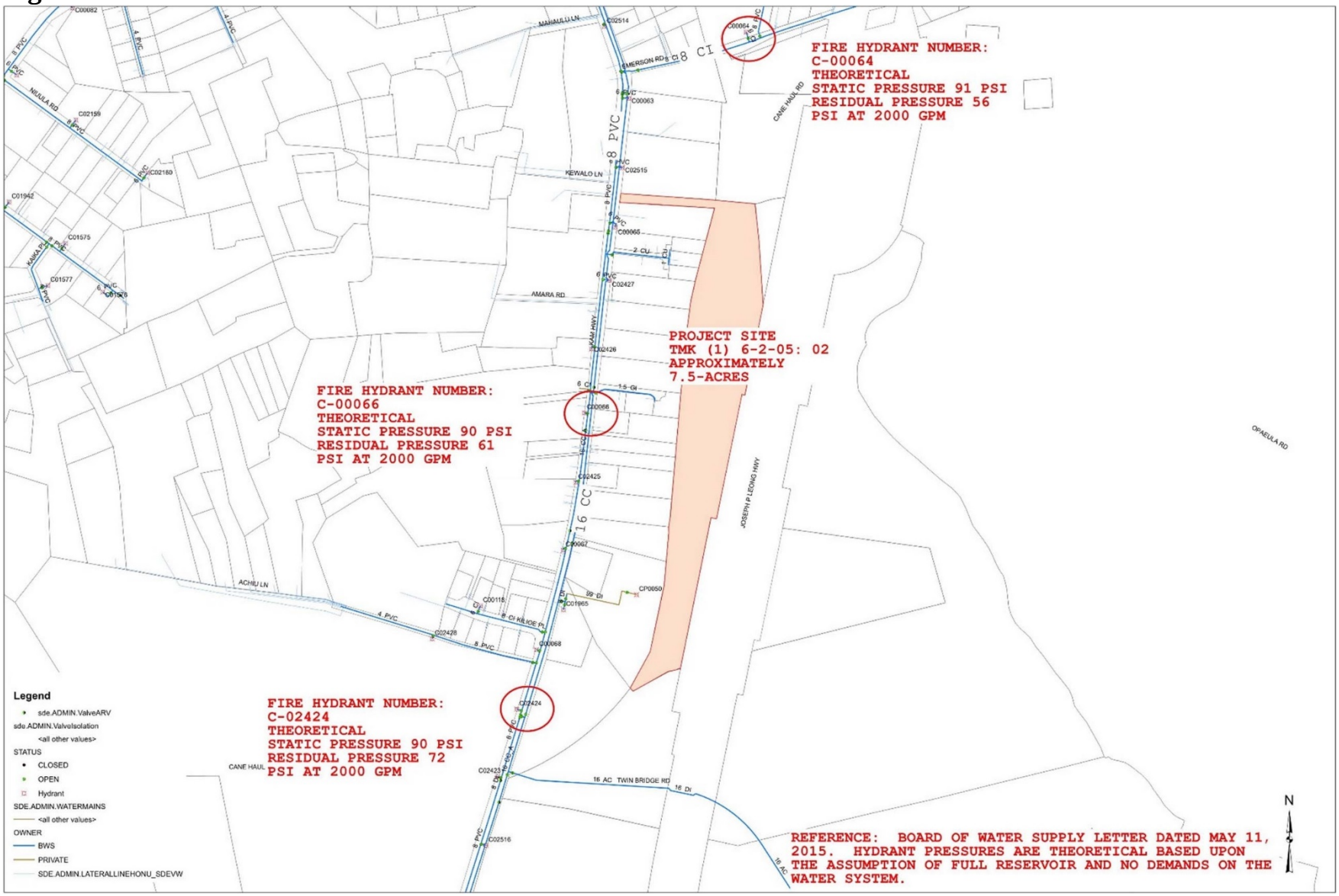
The proposed development’s intersections at Kamehameha Highway and ‘Ōpae‘ula Road, and Kamehameha Highway at Cane Haul Road fall within the limits of the proposed Hale‘iwa Improvement District project and future improvements to these intersections will require coordination with DDC. Community members attending the North Shore Neighborhood Board meetings have generally expressed a desire for a comprehensive planning effort regarding future road improvements on Kamehameha Highway through the improvement district project. Coordination with DDC regarding this project was initiated in 2015 and is ongoing. The traffic study (Appendix B of this Draft EA) prepared for this project was provided to DDC for inclusion in the project as alternatives for consideration.

Backyard Hale‘iwa, LLC. has committed land space within the project to accommodate up to 100 parking spaces to replace parking stalls that are expected to be lost as a result of the *Hale‘iwa Improvement District Project*. This would result in a significant benefit to the community and surrounding businesses who are expressing concerns about the potential loss of street parking along Kamehameha Highway. In addition, Backyard Hale‘iwa, LLC. anticipates that the City will add a dedicated pedestrian walkway on TMK (1) 6-2-005: 011, subject to agreement by the current landowner. This would increase the parking space benefit by creating an approximate 300 foot long pedestrian access way between Kamehameha Highway and future public parking on the Hale‘iwa Mixed Use Parcel site.

3.11 WATER SYSTEM

Potable water supply for Hale‘iwa and the project property is provided by the Honolulu Board of Water Supply (BWS). Currently there are two (2) 8-inch-diameter water distribution mains located along Kamehameha Highway, roughly 320-feet west of the project site. The existing access easement at the north is the recommended location for a new water meter servicing the project. The Board of Water Supply has provided pressure and flow data for three existing fire hydrants within a 600-foot radius of the project site. As shown in Figure 14, these hydrants are located on Emerson Road (north) and Kamehameha Highway (west).

Figure 14: HONOLULU BOARD OF WATER SUPPLY WATER DISTRIBUTION MAP



Project Impacts and Mitigation

An estimate of water demands resulting from the proposed development was calculated using the Honolulu BWS "Water System Standards" (2002)., the following is an approximation of the water demands based upon the May 2015 concept plan (Table 6):

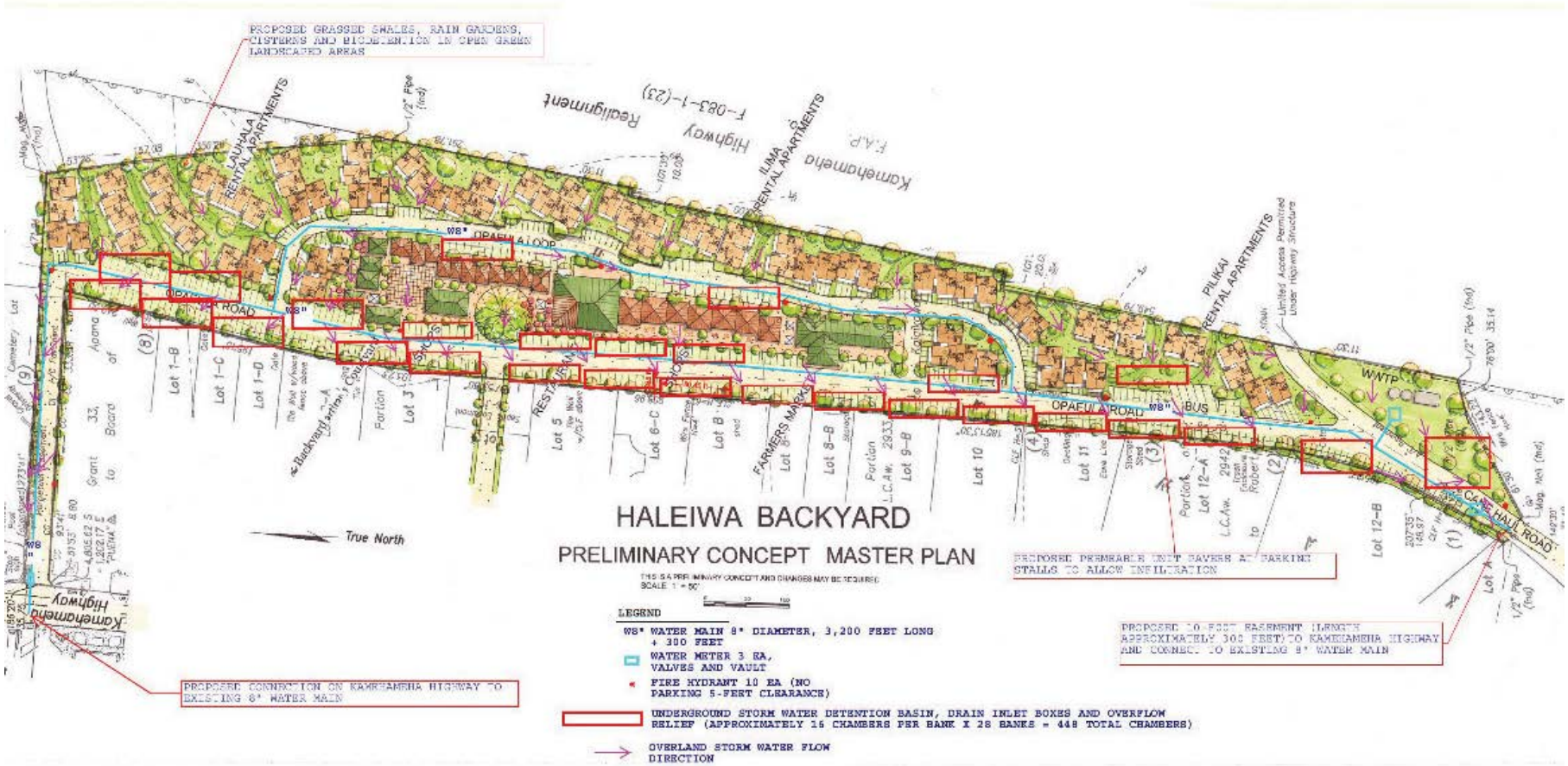
Table 6: PROJECTED WATER DEMAND

	Units	BWS Consumption Rates	Domestic Average Daily Demand	Domestic Maximum Daily Demand (1.5x)	Domestic Peak Hour Demand (3x)	Commercial/Residential Mix (120 gal/1000 sq ft)	Fire Demand
Apartments 918 Square Feet 2 Beds/1 Bath	156 Dwelling Units	400 gals/ unit	62,400 gallons	93,600 gallons	187,200 gallons	--	1,500 gallons/ 1 hr /250 ft hydrant Spacing
Commercial Including Retail/Farmers Market/ Restaurant	30,000 Square Feet	--	--	--	--	3,600 gallons	2,000 gallons/ 2 hr /250 ft hydrant Spacing

The BWS will be consulted with regard to water availability and allocation and to determine required improvements to the water system.

A conceptual layout of the water distribution and fire protection is shown in Figure 15. The proposed layout consists of two separate connections at north and south. Because access to the BWS water main on Kamehameha Highway is further away at the south end, a proposed easement is needed in order to reach this connection point. Fire hydrants will have a maximum spacing of 250 feet. Fire department connection (HDC) pedestals will be located in open areas along the roadway. Fire department access roads shall be provided such that any portion of each facility is not located more than 150 feet from access roads as measured by an approved route around the exterior of the facility. The fire department access road shall extend to within 50 feet of at least one exterior door that can be opened from the outside providing access to the interior of the building.

Figure 15: CONCEPTUAL LAYOUT OF WATER DISTRIBUTION AND FIRE PROTECTION



3.12 WASTEWATER DISPOSAL

There is no municipal sewer system that services the subject property. The City and County of Honolulu does not have any plans to construct a collection and treatment systems for the North Shore area within the proposed schedule. Currently, connection to the City's municipal wastewater system is not available. The property development will include wastewater treatment and disposal facilities that utilize one of the following processes: aeration and mixing, bioreactors, and/or septic tanks and seepage pits.

Project Impacts and Mitigation

The current projected wastewater flow for this development is about 50,000 gallon per day (GPD). An on-site wastewater treatment system is being proposed for the project. The proposed wastewater system design consolidates all the flow from the proposed development and directs it to an on-site wastewater treatment unit. The gravity sewer will convey the wastewater to a packaged wastewater treatment plant. Wastewater treatment technologies through a modular type of process like a sequencing batch reactor (SBR) or packaged treatment plant. All necessary wastewater facilities will be designed in accordance with Hawai‘i Administrative Rules Chapter 11-62, which specify the Department of Health’s rules relating to wastewater systems. The wastewater treatment system will produce disinfected secondary reclaimed water suitable for subsurface irrigation and will be monitored on a monthly basis.

The water will be treated to R-2 quality as described in the Guidelines for the Treatment and Use of Recycled Water. The wastewater treatment process shall be sized to have additional capacity and process redundancy to provide a reliable treatment process.

Disposal options

The primary disposal option will be onsite reuse of the R-2 effluent as drip irrigation on the decorative vegetation throughout the property. Additional disposal will be coordinated with local farmers where R-2 water (suitable for subsurface irrigation) is suitable. In addition to onsite reuse, a pipeline connecting to required injection well(s) will be provided for full disposal and redundancy should the grounds be too saturated for irrigation. The injection wells will be situated Makai of the State Department of Health UIC line and the Board of Water Supply No-Pass Zone.

Wastewater collection

Wastewater generated from the 156 apartments and the commercial zone will be collected into a gravity sewer system. No pump station for these facilities is anticipated however it may become a factor should the development of the land require it.

Wastewater treatment and disposal

The gravity sewer will convey the wastewater to a packaged wastewater treatment plant. Wastewater treatment technologies through a modular type of process like a sequencing batch reactor (SBR) or packaged treatment plant. The water will be treated to R-2 quality as described in the Guidelines for the Treatment and Use of Recycled Water. The wastewater treatment

process shall be sized to have additional capacity and process redundancy to provide a reliable treatment process.

3.13 DRAINAGE SYSTEM

Drainage on the site is currently subdivided into four parallel drainage basins. The terrain is generally sloped from the east down to the west, with elevations varying at 22 to 35 feet. On-site storm water runoff exits the project site along the south, west and north perimeters, either as sheet flow or shallow concentrated flow. The off-site storm water runoff at the east perimeter is intercepted by the embankment of the Joseph P Leong Highway and a grassed swale at the toe of the embankment. At the south perimeter, there are existing DOT underground storm water drain lines and inlets to intercept runoff flowing under the Cane Haul Road underpass.

The existing peak flow storm water runoff analysis for the project site is based upon the City and County’s “Rules Relating to Storm Drainage Standards (January 2000)” for the design 10-year, one-hour duration storm of about 2.57 inches. The total peak discharge distributed along the perimeter is about 10.8 cubic feet per second (cfs) using the Rational Method. Flow lengths are typically 230 feet in the east to west direction.

The estimated runoff volume of about 122,000 cubic feet (909,000 gallons) was determined by the Curve Runoff Method using the US Department of Agriculture Natural Resources Conservation Service (NRCS) TR-20/TR-55 computer program and latest 24-hour duration rainfall depths and 10-year frequency available through the National Oceanic and Atmospheric Administration.

Project Impacts and Mitigations

The project will need to comply with the “Rules Relating to Storm Drainage Standards,” Department of Planning and Permitting, City and County of Honolulu, dated January 2000. Since the drainage area within the proposed development is less than 100 acres, the recurrence interval of 10 years was selected as the design basis for the storm water management plan. Consistent with the City and County of Honolulu standards, the storm drainage system will be designed to capture and detain the 10-year storm increased runoff from impervious surfaces to ensure that there are no detrimental impacts on the downstream areas.

As required by the City’s storm drainage rules, the existing/predevelopment condition storm water peak flow and the estimated runoff volume are to be compared to the proposed/post developed condition. The City and County requires that the proposed storm water discharge rates and volumes be limited to predevelopment conditions, unless it can be shown that the increased runoff can be safely conveyed through existing or planned conveyances, and without adverse impacts further downstream to the open coastal waters.

3.14 COMMUNITY FACILITIES

Major community facilities in the vicinity of Hale‘iwa area are noted below.

Medical Facilities

The region’s primary medical facility, Wahiawā General Hospital, is located about 8 miles south of the project site at 128 Lehua Street in Wahiawā. Wahiawā General Hospital offers emergency services and all levels of general acute patient care.

Educational Facilities

The Hawai‘i Department of Education oversees public schools in the Leilehua-Mililani-Waialua Complex Area (also called the Central District). The Central District is further divided into the Leilehua Complex, Mililani Complex and Waialua Complex areas. There are four (4) public schools in the NSSCP area: three primary (K-6) schools and one combined intermediate (7-8) and high (9-12) school. The Wahiawā Community School is located in the Central District. Individual private schools are also present in this area, including St. Michael’s School (Preschool-8) and the proposed Aloha Ke Akua High School.

Emergency Responders

The Honolulu Police Department (HPD) District 2 covers central Oahu and is bounded by Kipapa Gulch and Waiahole Stream on the south, the Waianae mountains on the west, the Koolau mountains on the east, and the shoreline from Kaena Point through Sunset Beach on the north. The district includes the communities of Mililani, Kunia, Wahiawa, Whitmore, Waialua, Hale‘iwa, Waimea, and Sunset Beach. Within the district are several military installations: Wheeler Army Air Field, Kunia Communications Center, Schofield Barracks, U.S. Navy Communications Center, and U.S. Army at Helemano. Hale‘iwa is located within Sector 3 including Waialua and the North Shore.

The Honolulu Fire Department (HFD) Waialua Fire Station (Station 14) is located at 66-420 Hale‘iwa Road in Hale‘iwa, about 0.65 miles west of the project site.

Community Parks and Recreational Resources

The City and County of Honolulu, Department of Parks and Recreation (DPR) manages and maintains a system of parks on the island of O‘ahu. Hale‘iwa is located within DPR’s District 4-Windard. The closest public parks are Hale‘iwa Ali‘i Beach Park and Hale‘iwa Regional Park located along the ocean about a third of a mile away. Other public parks in the vicinity include Kaiaka Bay Beach Park, Waialua District Park, and Aweoweo Beach Park. The nearest public swimming pool is located in Waialua. The City and County of Honolulu’s Park Dedication Ordinance requires new residential projects to either dedicate land in perpetuity for park and playground purposes or to pay a fee in-lieu of dedication.

Project Impacts and Mitigation

The proposed project is not expected to have significant negative impacts on community facilities.

The project will satisfy the City’s park dedication requirements in conjunction with the subdivision application, however the proposed method of satisfying the City’s park dedication requirements, whether to be provided on-site or in-lieu, have not yet been determined.

The proposed residential development will have an impact on the areas schools through increases in area population. The DOE regularly updates enrollment projections for facilities and program planning based on current migration patterns, new housing developments, birth statistics, changes in service boundaries, changes in school organization, and attendance of students from outside the school service area by district exception. Recent enrollment figures show that all the DOE schools are operating near or below capacity (City, 2011). Waialua Elementary is operating near capacity, while other schools may have more space to accommodate additional students from outside the school’s service boundary. The DOE currently does not project any new schools for the North Shore. Prior to new residential development approval, the NSSCP recommends confirmation by DOE that areas school facilities are adequate at existing schools or proposed schools by the time residential units are occupied.

3.15 SOCIOECONOMIC ENVIRONMENT

The following discussion describes the profile of the existing community and the anticipated effects of the proposed development on the community.

Demographics

The US Census compiles demographic information on population, housing and employment every 10 years, with the most recent data available from the year 2010. The proposed development is located within Census Tract 100-Kawailoa. However, the proposed development is immediately adjacent to Census Tract 99.02-Hale‘iwa, so data from that tract is also considered. An overview of 2010 demographic characteristics for the County, Kawailoa and Hale‘iwa census tracts is provided in Table 7.

Table 7: SELECTED POPULATION AND HOUSING CHARACTERISTICS

Characteristic	Honolulu County	Census Tract 100-Kawailoa	Census Tract 99.02-Hale‘iwa
Population	953,207	3,320	3,740
Median age	37.8	24.8	37
Population in households	917,907	3,170	3,683
Number of households	311,047	1,890	1,112
Average household size	2.95	2.73	3.31
Housing units	315,988	1,309	1,231
Occupied housing units	336,899	1,163	1,112
Percent of total housing units occupied	92.3%	88.8%	90.3%
Renter occupied units	136,660	943	517
Population in renter-occupied units	376,015	2,556	1,518

Project Impacts and Mitigation

As documented in the 2014 *draft Housing O‘ahu: Islandwide Housing Strategy*, the production of rental housing is a top priority for the county. The development of the project’s residential units is intended to provided additional rental housing in Hale‘iwa for younger adults and families, particularly for those working in the area who would choose to walk or bike over driving. As the table shows, in 2010, the Kawailoa census tract has a very young population, the median age recorded was 24.8 years old compared to a county median of 37.8 years and Hale‘iwa median of 37 years. In the Kawailoa District, the average household size of 2.73 persons in 2010 was less than Honolulu County as a whole and Hale‘iwa which was even more than the County average. These figures suggest that there are larger numbers of households in Hale‘iwa with young people in the immediate study area than there are in Honolulu County. Younger adults generally earn less than those in their middle age and young people who are establishing their first households will benefit from the rental housing proposed.

Assuming a household size of approximately three (3) persons, the proposed development is expected to increase the population in the area by about 468 persons. This would result in an approximate 6% increase in population to the combined Kawailoa and Hale‘iwa areas.

Economic and fiscal impacts associated with the project will include the creation of temporary construction, real estate, legal, engineering, insurance, retail and other long-term employment opportunities. New employment opportunities will be created by the additional 30,000 gross square feet of commercial spaces proposed. New retail and restaurant establishments will need employees. Local artisans and farmers will be able to sell products in the permanent farmers market proposed. The proposed development will increase property tax revenue to the City and County and general excise tax revenue to the State.

There will be an impact from the project on government supported services such as utilities, schools, public safety, and transportation systems; however, the proposed development is anticipated to have an overall positive effect on socio-economic conditions by providing additional housing and long-term employment options for current Hale‘iwa residents. In addition, Hale‘iwa is in need of a permanent space for a farmers market. The proposed farmers market would provide an added socio-economic benefit.

4.0 CONFORMANCE WITH PLANS AND POLICIES

4.1 HAWAI‘I STATE PLAN

The Hawai‘i State Plan, codified as Chapter 226, Hawai‘i Revised Statutes, serves as a guide for the future long-range development of the State; identifies goals, objectives, policies and priorities for the State; provides a basis for determining priorities and allocating resources; improves coordination of federal, state and county activities, and establishes a system to integrate major state and county activities.

The use of the subject property for commercial and residential development would be consistent with Chapter 226, Hawai‘i Revised Statutes.

§226-4 State goals.

1. *A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawaii's present and future generations.*
2. *A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.*
3. *Physical, social, and economic well-being, for individuals and families in Hawaii, that nourishes a sense of community responsibility, of caring, and of participation in community life.*

§226-5 Objective and policies for population.

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

7. *Plan the development and availability of land and water resources in a coordinated manner so as to provide for the desired levels of growth in each geographic area.*

§226-19 Objectives and policies for socio-cultural advancement--housing.

2. *The orderly development of residential areas sensitive to community needs and other land uses.*

3. *The development and provision of affordable rental housing by the State to meet the housing needs of Hawaii's people.*

4.2 HAWAI‘I REVISED STATUTES CHAPTER 343

The proposed action requires a Change in Zoning and State Land Use Boundary Amendment to allow the creation of the mixed-use development on the infill lands between the existing Hale‘iwa Town and Joseph P. Leong Highway. According to the City and County of Honolulu’s Land Use Ordinance (LUO), the proposed rezoning action is a “significant zone change” because the parcel is more than 5 acres and involves a zone change to a commercial and mixed use zoning district. Therefore, this Draft Environmental Assessment was prepared in accordance with LUO requirements, Chapter 343 of the Hawai‘i Revised Statutes (HRS) and Title 11, Chapter 200 of the State Department of Health’s Hawai‘i Administrative Rules (HAR).

4.3 HAWAI‘I REVISED STATUES CHAPTER 205A

The Coastal Zone Management Act (CZMA) of 1972 (16 USC 1451 et seq.) encourages coastal states to protect coastal resources consistent with the state’s coastal zone management program. The objectives of the Coastal Zone Management (CZM) Program are to provide the public with recreational opportunities, protect historic resources, protect scenic and open space resources, protect coastal ecosystems, provide facilities for economic development, reduce hazards and manage development.

Within Hawai‘i, the CZM program was authorized by HRS Chapter 205A, and is administered by the Office of Planning within the State of Hawai‘i Department of Business, Economic Development, and Tourism (DBEDT). Actions anywhere within the State of Hawai‘i must comply with the CZM program. As discussed throughout this document, the proposed project is not anticipated to have adverse impacts on the area’s recreational opportunities, historic resources, scenic and open space resources, or coastal ecosystems.

4.4 STATE LAND USE LAW

The State of Hawai‘i Land Use Law, Chapter 205, Hawai‘i Revised Statutes, classifies all lands in the State into four land use districts: Urban, Rural, Agricultural, and Conservation. The proposed project would require a State Land Use District Boundary Amendment to change the designation from Agricultural to Urban. The use of the subject property for commercial and residential development would be consistent with the Urban designation.

The subject property contains soil classified under the highest productivity rating by the Land Study Bureau and as Prime Lands by the Agricultural Lands of Importance to the State of Hawai‘i. This project would result in the loss of 7.525 acres of these lands, however the proposed property is not currently being use for agricultural cultivation and has not been in use for many years due to is topography constraints and construction of the Joseph P. Leong Highway.

Important Agricultural Lands (IAL) are currently being identified by the City and County of Honolulu in accordance with Hawai‘i Revised Statutes, Chapter 205-44 which identifies eight standards and criteria that need to be considered when identifying lands that are worthy of the IAL designation. DPP has also added the ninth criterion for additional consideration. The criterion are:

1. Land currently used for agricultural production

2. Land with soil qualities and growing conditions that support agricultural production of food, fiber, or fuel- and energy-producing crops

3. Land identified under agricultural productivity rating systems, such as the agricultural lands of importance to the State of Hawai‘i (ALISH) system adopted by the Board of Agriculture on January 28, 1977

4. Land types associated with traditional native Hawaiian agricultural uses, such as taro cultivation, or unique agricultural crops and uses, such as coffee, vineyards, aquaculture, and energy production

5. Land with sufficient quantities of water to support viable agricultural production

6. Land whose designation as important agricultural lands is consistent with general, development, and community plans of the county

7. Land that contributes to maintaining a critical land mass important to agricultural operating productivity, and

8. Land with or near support infrastructure conducive to agricultural productivity, such as transportation to markets, water, or power.

9. Land with agricultural easements.

A review of the current proposed O‘ahu IAL GIS online maps show that the project site is not currently identified as IAL, but contains lands that meet two (2) of the three (3) “top criteria.” The top three ranked criteria are; 1) sufficient quantities of water, 2) current use for agricultural production, and 3) soil qualities and growing conditions that support agricultural production. However, as stated previously, the property is not currently being used for agricultural production but is identified as ALISH Prime lands. The project site is currently constricted for agricultural use by the topography and because of the Joseph P. Leong Highway. At present, there are no irrigation improvements on site.

4.5 CITY AND COUNTY OF HONOLULU GENERAL PLAN

The *General Plan* of the City and County of Honolulu is a comprehensive statement of objectives and policies which sets forth the long-range aspirations of island residents and shapes the strategies and actions needed to achieve them. The General Plan was adopted in 1992 and most recently amended in 2002. It is the first level of a comprehensive planning process that addresses physical, social, economic, and environmental concerns. The rezoning of the subject property and its use residential and commercial facilities is consistent with the following objectives and policies of the Honolulu General Plan:

- *PART II: ECONOMIC ACTIVITY. Objective A: To promote employment opportunities that will enable all the people of Oahu to attain a decent standard of living. Policy 2: Encourage the development of small businesses and larger industries which will contribute to the economic and social well-being of Oahu residents.*

- *PART III: NATURAL ENVIRONMENT. Objective A: To protect and preserve the natural environment. Policy 8: Protect plants, birds, and other animals that are unique to the State of Hawai‘i and the Island of O‘ahu.*
- *PART IV: HOUSING. Objective A: To provide decent housing for all the people of O‘ahu at prices they can afford. Policy 8: Encourage and participate in joint public-private development of low- and moderate- income housing. Policy 12: Encourage the production and maintenance of affordable rental housing. Objective C: To provide the people of Oahu with a choice of living environments which are reasonably close to employment, recreation, and commercial centers and which are adequately served by public utilities. Policy 3: Encourage residential development near employment centers.*
- *PART VII: PHYSICAL DEVELOPMENT AND URBAN DESIGN. Objective A: To coordinate changes in the physical environment of Oahu to ensure that all new developments are timely, well-designed, and appropriate for the areas in which they will be located. Policy 6: Encourage the clustering of developments to reduce the cost of providing utilities and other public services. Policy 7: Locate new industries and new commercial areas so that they will be well related to their markets and suppliers, and to residential areas and transportation facilities. Policy 8: Locate community facilities on sites that will be convenient to the people they are intended to serve.*

4.6 CITY AND COUNTY OF HONOLULU LAND USE ORDINANCE

The City and County of Honolulu Land Use Ordinance regulates land use in a manner that will encourage orderly development in accordance with the General Plan and Development Plans.

The Property is entirely located within the North Shore SCP’s “Community Growth Boundary” and “Country Town District” designations. The SCP policies for the Hale‘iwa Country Town call for a compatible mix of “commercial, service industrial and residential uses” which enhance and preserve the rural town context, while also allowing for a “diverse range of civic, retail, office, and light industrial uses that meet the needs of residents and visitors.” These policies are partially accomplished through the guideline that aims to “concentrate new development near existing built areas emphasizing redevelopment and infill along Kamehameha Highway, makai of the Hale‘iwa Bypass Road (Joseph P. Leong Highway).”

The rezoning of the subject property and its use residential and commercial facilities is consistent with the intent of the North Shore SCP’s “Community Growth Boundary” and “Country Town District” designations.

4.7 NORTH SHORE SUSTAINABLE COMMUNITIES PLAN

The City’s Development or Sustainable Communities Plans, consist of conceptual schemes for implementing the development or sustainable community objectives and policies of the City’s *General Plan*. The purpose of the plans are to set forth the desired sequence, patterns, and characteristics of future development or sustainability of a region or community. Therefore, these plans are detailed guidelines for the physical sustainability or development of the island. The plans consist of maps depicting the land use pattern, public facilities, open spaces, general

principles and common provisions, and specific urban design principles and controls. The North Shore Sustainable Communities Plan (NSSCP), adopted by the City Council via Ordinance 11-3 in May 2011, was prepared as a community-developed guidance document for orderly and coordinated public and private sector development and to maintain North Shore's rural character through growth management and to prevent an undesirable spreading of development. The proposed Hale‘iwa Mixed Use Parcel development is consistent with the following "Key Elements" of the vision for the North Shore:

- *Maintain the Community Growth Boundary to Protect Agricultural, Open Space, and Natural Resources*
- *Promote Hale‘iwa and Waialua Towns as "Country Towns"*
- *Direct New Housing to Areas Contiguous to Hale‘iwa and Waialua Towns and Use Rural Design Guidelines for Rural Residential Development*

One of the key elements of the NSSCP's Vision describes the importance of maintaining the plan's Community Growth Boundary in order to protect the region's large tracts of agricultural lands, open spaces and natural and cultural resources. The Community Growth Boundary was first established in 2000 and has remained fixed since then with no new development occurring outside of its limits, thereby successfully preserving areas outside the boundary for agriculture or other resource or open space values. In Figure 5 NSSCP Land Use Map, the proposed development is shown within the Country Town designation and within the Community Growth Boundary. The following discussion describe areas where the proposed project is consistent with policies and guidelines in the NSSCP.

Policies: Open Space and Natural Environment

- *Maintain open space around existing communities by locating new developments within or next to existing developments within the Community Growth Boundary. Encourage compact development patterns and balance the development of desired or necessary land uses such as affordable housing and public facilities such as schools with the need to preserve open space.*

Guidelines: Agricultural Areas

- *Preservation of agricultural areas is essential to promoting agriculture and maintaining the scenic open space features and rural character of the region. In addition to the Community Growth Boundary, policies and guidelines are established to protect agricultural lands from development.*

Policies: Agriculture

- *Maintain the current agricultural land use and zoning designation of agricultural lands within the Community Growth Boundary that are in the State Agricultural District and zoned for agriculture, except for limited "infill" areas contiguous to Hale‘iwa and Waialua Towns that are designated for future residential.*

Guidelines: Agricultural Lands

- *Maintain adequate physical buffers between agricultural land uses and surrounding land uses.*

Guidelines: Agriculture-Based Tourism

- *Identify and develop a convenient, suitable location in or near Hale‘iwa and/or Waialua Town to establish a farmers’ market where farmers can market products locally.*

The proposed project is consistent with these policies and guidelines. The project site is located entirely within the Community Growth Boundary and conforms to compact development design. Development proposals contained to the existing Community Growth Boundary contribute towards preservation of agricultural areas, and maintaining scenic open space features and the region’s rural character.

The proposed site is located on existing agricultural designated lands and would require a change in zoning and state land use district boundary amendment, however the project site is currently constricted for agricultural use by the topography and because of Joseph P. Leong Highway. The proposed development site meets the guideline exception of allowing for limited “infill” areas contiguous to Hale‘iwa and Waialua Towns that are designated for future residential.

The proposed permanent farmers market meets the Agriculture-Based Tourism guideline to identify and develop a convenient, suitable location in or near Hale‘iwa and/or Waialua Town to establish a farmers’ market where farmers can market products locally.

Policies: Residential Communities

- *Maintain sufficient inventory of land within the Community Growth Boundary to accommodate existing and future housing needs.*
- *Direct future residential development to Hale‘iwa and Waialua within the Community Growth Boundary, including new apartment districts adjacent to Hale‘iwa and Waialua Towns where increased densities that address affordability may be desired, subject to community and agency review.*
- *Provide a mix of housing types and prices to meet the needs of existing residents, including accommodations which are affordable to low- and moderate-income, gap group, and elderly households, and other special needs populations.*
- *Ensure safe and efficient circulation networks that provide bicycle and pedestrian travel between residential areas and neighborhood destinations such as schools, parks and neighborhood commercial facilities.*

Guidelines: Residential Communities

- *Alternative development patterns such as clustering and traditional compact layouts to preserve open space and minimize infrastructure demands*
- *Low-rise structures, generally not exceeding two stories*
- *Plantation style architecture*
- *Relatively narrow roadway widths*

- *Minimal amount of paved driveway surfaces*
- *Landscaping and design alternatives that reduce impervious surfaces, such as grassed swales rather than curbs and gutters*
- *Rural-oriented landscaping and fencing*

Guidelines: Low Density Apartments

- *Densities range from 10 to 20 units per acre. Buildings should not be more than three stories or exceed 40 feet in height.*
- *Where possible, enhance the compatibility of development within apartment districts with adjacent residential uses.*
- *Employ building form, orientation, location of entries and landscape screening that reflects single-family residential character and provides greater privacy and individual identity for housing units.*
- *Ensure compatibility of building scale, roof form and the quality of materials with those of adjacent residential areas.*

The proposed project is consistent with these policies and guidelines which emphasize the importance of maintaining the Community Growth Boundary and directing the development of new housing units, including new apartment districts, to areas in and around Hale‘iwa and Waialua where increased densities that address affordability may be desired. The project will provide rental housing to meet the needs of existing residents who desire additional housing options. The development is located in Hale‘iwa and will provide bicycle and pedestrian travel options for residents.

The development is consistent with the guidelines for residential communities and low-density apartments because all zone change applications relating to land in the NSSCP area will be reviewed by the Department of Planning and Permitting for consistency with the *General Plan*, the *North Shore Sustainable Communities Plan*, and any applicable special area plan. Projects which involve a significant zone change shall be required to submit an environmental assessment to the department of planning and permitting prior to an application for a zone change being accepted. This environmental assessment meets this requirement. The proposed design of structures is consistent with these guidelines since structures do not exceed two stories and are intended to be low-rise, plantation style architecture with building heights below 40 feet. The proposed property is located entirely within the Hale‘iwa Special District. The Special District guidelines are provided to guide aesthetic and architectural aspects of project development. The project design and architecture will comply with the Hale‘iwa Special District guidelines and will be covered in the subsequent Hale‘iwa Special Design District Permit (Major) application.

The proposed development unit density, currently at approximately 24 units per acre, is higher than suggested in the low density apartment guideline which calls for a range of 10 to 20 units per acre. This results in an additional 26 units on the site if fully developed, however the proposed density would be allowed under the proposed zoning designation apartment mixed use (AMX-1) which is considered a low density zoning designation.

Policies: Commercial Areas

- *Preserve and enhance the historic rural "small town" character and allow for a compatible mix of commercial, service industrial and residential uses that complement the rural town context. Encourage multifamily housing (low-density apartment districts) and housing for resident senior citizens in close proximity to both Hale‘iwa and Waialua town centers.*
- *Allow for a diverse range of civic, retail, office, and light industrial uses that meet the needs of residents and visitors.*

Guidelines: Hale‘iwa Country Town

- *Limit building heights to two stories, and employ building design elements which reflect the architectural characteristics of the early 1900-period architecture identified in the Hale‘iwa Special District Design Guidelines.*
- *Encourage commercial and related activities that are conducive to the pedestrian character to locate at the sidewalk level along Kamehameha Highway. Encourage less pedestrian-dependent and conducive activities (such as manufacturing areas for products and compatible light industrial uses, residences, services, etc.) to locate behind or above commercial activities so as not to detract from the commercial retail character of Kamehameha Highway.*
- *Concentrate new development near existing built areas emphasizing redevelopment and infill along Kamehameha Highway, makai of the Hale‘iwa Bypass Road (Joseph P. Leong Highway). Provide adequate landscaped buffer adjacent to the bypass.*
- *Ensure that commercial uses adjoining the Kamehameha Highway corridor include support facilities such as parking lots and rest rooms that can adequately accommodate the planned commercial activities.*
- *Provide improved, expanded, and continuous pedestrian walkways linking commercial establishments within Hale‘iwa, including connections between farmers' markets or other kinds of agricultural product and retail outlets, and open space and environmental resources (such as beach parks, Hale‘iwa Harbor and Loko Ea Pond).*
- *Maintain Kamehameha Highway as a two-lane thoroughfare through Hale‘iwa Town.*
- *Consolidate off-street parking to areas behind buildings, while retaining existing onstreet parking wherever possible and appropriate. As needed, parking should be rearranged to accommodate the pedestrian walkway system along Kamehameha Highway.*

Within the Community Growth Boundary, the Hale‘iwa Country Town District is designated for a compatible mix of "commercial, service industrial and residential uses" which must also enhance and preserve the rural town context, while also allowing for a "diverse range of civic, retail, office, and light industrial uses that meet the needs of residents and visitors." See Figure 16. The proposed project will add a mix of commercial and residential uses that complement the rural town context, including new multifamily housing (low-density apartment) in close proximity to Hale‘iwa town centers.

Rezoning of the property, which is adjacent the North Shore Marketplace, from agricultural use to urban uses, is consistent with the Hale‘iwa Country Town guideline to concentrate new development near existing built areas emphasizing redevelopment and infill along Kamehameha

Highway, makai of the Hale‘iwa Bypass Road (Joseph P. Leong Highway). The proposed project is also consistent with Hale‘iwa Country Town guidelines; to consolidate off-street parking to areas behind buildings and encourage less pedestrian-dependent and conducive activities to locate behind or above commercial activities so as not to detract from the commercial retail character of Kamehameha Highway.

Policies: Transportation Systems

- *Retain both Kamehameha Highway and Farrington Highway as two-lane thoroughfares, to maintain the North Shore's rural character. Provide roadway improvements to promote pedestrian and vehicular safety and traffic efficiency.*
- *Improve mobility and connectivity between residences, jobs, shopping, and recreation areas on the North Shore.*
- *Ensure that existing regional roadways are adequate to accommodate proposed development proposals, prior to the construction of such developments.*

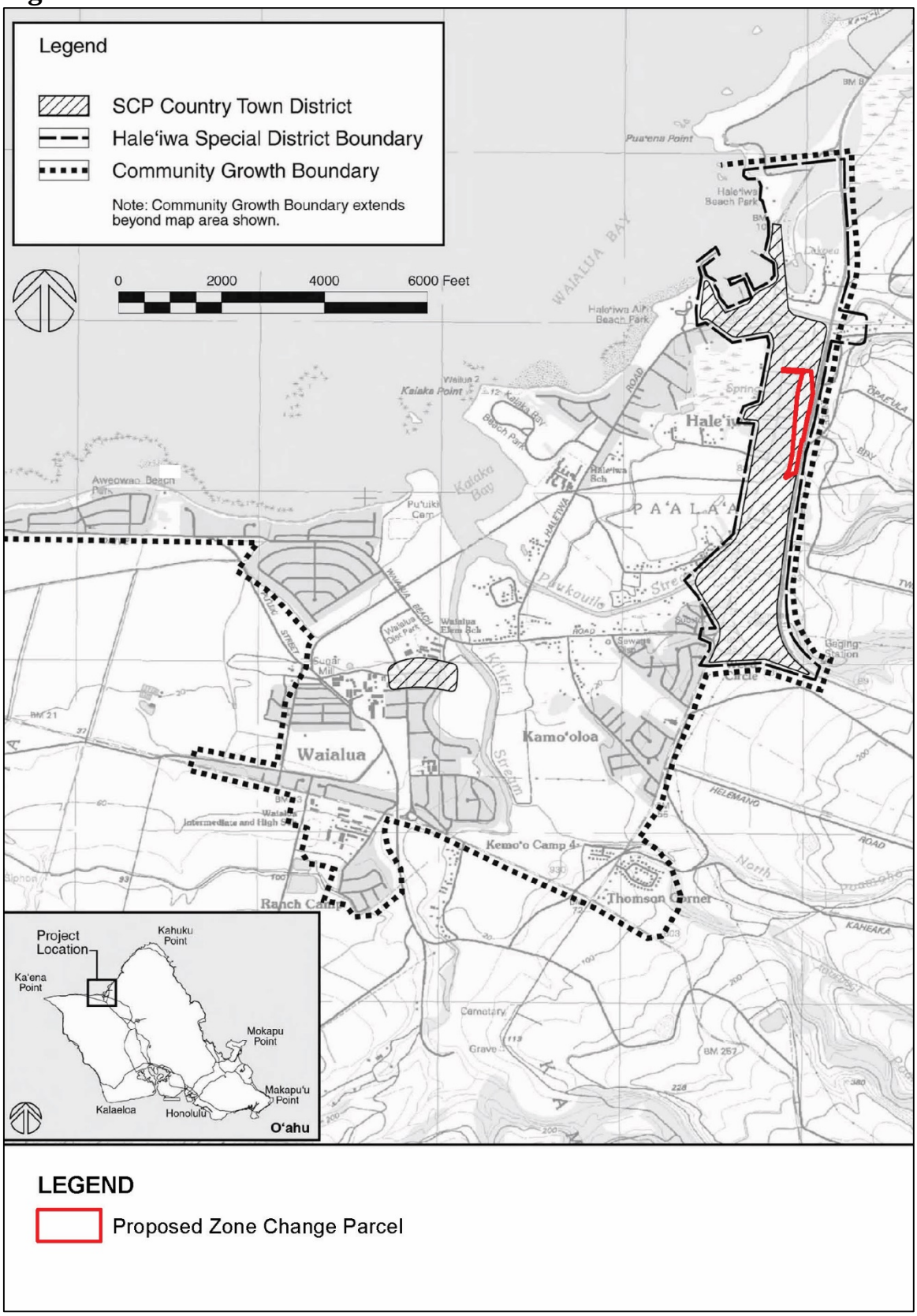
Guidelines: Transportation Systems

- *Provide pedestrian-friendly walkways, off-street parking, bus pull-outs, tour bus maneuvering areas, and drainage improvements in Hale‘iwa Town.*
- *Improve the main roadways within Hale‘iwa and Waialua Country Town Districts with shade trees, landscaping, sidewalks, street furniture, and signage to promote pedestrian orientation within these country towns.*

With the proposed project completed, Kamehameha Highway can remain as a two-lane thoroughfare. As discussed in section 3.10 of this document, the intersections at Kamehameha Highway and ‘Ōpae‘ula Road, and Kamehameha Highway at Cane Haul Road fall within the limits of the proposed *Hale‘iwa Improvement District Project* and will require coordination with DDC.

The project development will commit land to accommodate up to 100 parking spaces to replace parking stalls that are expected to be lost as a result of the *Hale‘iwa Improvement District Project*. Further, Backyard Hale‘iwa, LLC. anticipates that the City will add a dedicated pedestrian walkway on TMK (1) 6-2-005: 011, subject to agreement by the current landowner. This would potentially provide a 300 foot long pedestrian access way between Kamehameha Highway and future public parking on the Hale‘iwa Mixed Use Parcel site and improve pedestrian mobility and connectivity between residences, jobs, shopping, and recreation areas in Haleiwa.

Figure 16: NSSCP HALE‘IWA COUNTRY TOWN AND GROWTH BOUNDARY



4.8 HALE‘IWA SPECIAL DISTRICT DESIGN GUIDELINES

The proposed property is located entirely within the Hale‘iwa Special District. The Special District guidelines are provided to guide aesthetic and architectural aspects of project development. The project design and architecture will comply with the Hale‘iwa Special District guidelines and will be covered in the subsequent Hale‘iwa Special Design District Permit (Major) application.

Design controls for the Hale‘iwa Special District, set forth in Section 21-9.90-4, ROH, deal primarily with the development of buildings, structures, landscaping, parking and architectural design requirements. The objectives of the Hale‘iwa Special District are set forth in Section 21-9.90-1, ROH. A brief discussion on how the Project meets the objectives of the Hale‘iwa Special District is provided below.

(a) Preserve and enhance Haleiwa's existing rural low-rise, human–scaled form and character, especially along Kamehameha Highway and Haleiwa Road.

All buildings, structures, landscaping, parking and architectural design elements of the development will be in conformance with the Hale‘iwa Special District design controls intended to maintain Hale‘iwa's existing rural low-rise, human-scaled form and character.

(b) Preserve and restore to the extent possible buildings and sites of scenic, historic, cultural and/or architectural significance, and encourage new development which is compatible with and complements those buildings and sites, primarily through low building heights, appropriate period design features and subdued materials.

The project parcel does not contain any scenic resources, historic or archaeological resources. The proposed project would be considered "new development" and is in a location identified by the NSSCP within the Hale‘iwa Country Town designation and Community Growth Boundary. The development will consist of one-story and two-story buildings with appropriate architectural elements in conformance with the Hale‘iwa Special District design controls intended to maintain Hale‘iwa's existing rural low-rise, human-scaled form and character.

(c) As entry points to Haleiwa, Weed Junction and Anahulu Stream Bridge should be given special attention though landscaping and painting embellishment, respectively.

The project will not impact entry points to Hale‘iwa.

(d) Encourage new development which will complement the significant physical features, waterways, open space, mature trees and sites in Haleiwa.

The design will be in conformance with the Hale‘iwa Special District design controls.

(e) Retain a distinctive pedestrian-oriented commercial area for residents and visitors.

The proposed project is in close proximity (i.e., walking distance) to employment within Hale‘iwa Town Center and recognizes that being in such close proximity to Hale‘iwa’s Town Center, renters will be able to walk to work, and/or ride their bikes to work. The apartment buildings are designed with interior pedestrian and bike paths for residents. The developer is coordinating improvements with the City Department of Design and Construction efforts for the *Halwiwa Improvement District Project* which may enhance the pedestrian experience by providing a dedicated pedestrian access adjacent to Malama Market, connecting new parking stalls with shops and services along Kamehameha Highway.

(f) Provide for safe and pleasant pedestrian and vehicular circulation, while avoiding parking areas along the streetscape.

As stated above, the development will incorporate pedestrian streets to connect residents to new commercial areas and to Hale‘iwa Town. As a benefit, the proposed development will provide land for the City to construct 100 parking stalls to assist with replacing displaced street parking resulting from the City’s *Hale‘iwa Improvement District Project* which is currently in planning and design stages. The proposed parking stalls will be located off of Kamehameha Highway’

(g) Enhance the attractiveness and general landscaped open space character of the area.

Landscaping design elements will be designed in conformance with the Hale‘iwa Special District design controls intended to maintain Hale‘iwa’s existing rural low-rise, human-scaled form and character.

(h) Preserve and enhance significant views in Haleiwa, especially those within the highly developed and heavily traveled areas.

The significant views within highly developed and heavily traveled areas in Hale‘iwa will not be impacted by the Project. As such, these significant views will be preserved and enhanced.

(i) Provide public improvements such as roadways, street lights, street furniture and signage compatible with the rural character of the community, rather than at conventional urban standards.

All roadway, streetlight, street furniture and signage improvements will be developed in conformance with the Hale‘iwa Special District design controls intended to maintain Hale‘iwa’s existing rural low-rise, human-scaled form and character.

4.9 CITY AND COUNTY OF HONOLULU SPECIAL MANAGEMENT AREA

The Hawai‘i Coastal Zone Management (CZM) Program, Chapter 205A, Hawai‘i Revised Statutes (HRS), outlines control, policies and guidelines for development within an area along the shoreline referred to as the Special Management Area (SMA). CZM policies are administered by each County. In the City and County of Honolulu, management of lands located within the SMA is regulated through Chapter 25, Special Management Area, Revised Ordinances of Honolulu (ROH). Chapter 205A, HRS also establishes the shoreline setback area to further manage uses along the shoreline. The City and County of Honolulu is delegated authority to regulate uses located within the established Shoreline Setback Area (SSA) for the island of O‘ahu. The proposed development is not located within the SMA or SSA established by the City and County of Honolulu.

5.0 FINDINGS AND ANTICIPATED DETERMINATION

The proposed development of residential and commercial properties is not anticipated to have a significant impact based on the criteria set forth in the State Department of Health Rules, Chapter 200, Title 11, Section 12. The objective of this assessment is to identify and consider the "significance" of potential environmental effects which includes the sum of effects on the quality of the environment along with cumulative long-term effects.

As set forth in the State Department of Health Rules, Chapter 200, Title 11, a prescribed set of 13 Significance Criteria is used to determine the project's impact on the environment. The project's relationship to each criterion is discussed in this chapter and followed by the ensuing anticipated project determination.

5.1 FINDINGS

To determine whether a proposed action may have a significant effect on the environment under Hawai‘i Administrative Rules Title 11, Chapter 200, the Approving Agency needs to consider every phase of the action, the expected primary and secondary consequences, cumulative effect, and the short- and long-term effects. The Approving Agency's review and evaluation of the proposed action's effect on the environment would result in a determination whether: 1) the action would have a significant effect on the environment, and an Environmental Impact Statement Preparation Notice should be issued, or 2) the action would not have a significant effect warranting a Finding of No Significant Impact (FONSI).

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

The proposed action will develop agricultural lands which are currently not being used for agriculture and have been reduced in value as agricultural or natural resources as a result of the construction of Joseph P. Leong Highway. The biological survey conducted for the project determined that the habitat is highly degraded and consists primarily of a variety of non-native plant species. Because of previous disturbance to the property, the flora and fauna communities on the property are comprised of non-native birds and plants. Therefore, use of the subject property for residential and commercial development therefore does not represent an irrevocable commitment to loss or destruction of any natural flora or faunal resources.

No historic sites are known to be present on the property based on previous archaeological surveys, and no impacts to archaeological resources are anticipated according to the SHPD. No impacts to cultural resources or practices are expected as the site is not associated with ongoing cultural practices and does not possess any unique resources to support such activities. Therefore the proposed project does not represent an irrevocable commitment to loss or destruction of any cultural or archeological resource.

2. Curtails the range of beneficial use of the environment;

The proposed development will not curtail the range of potential beneficial uses of the subject parcel or surrounding environment. The residential and commercial improvements will provide a community benefit by providing needed rental housing options in Hale‘iwa, a permanent Farmers Market, and opportunities for construction-related and retail employment, while resulting in a minimal loss of beneficial uses of the environment because the property is currently vacant, highly degraded and not being used for agriculture.

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 is consistent with the State's policies, goals and guidelines established in Chapter 344, HRS. The project site has been heavily impacted by grading activities as part of the Joseph P. Leong Highway construction, resulting in the loss or displacement of all topsoil and is of minimal value for agriculture. The proposed project will improve and enhance the nature of the subject property by providing a community-based locus that includes housing, small businesses and parking, while maintaining the character Hale‘iwa Town. The project is consistent with the goals of HRS Chapter 344-3 (2) (B): "Creating opportunities for the residents of Hawaii to improve their quality of life through diverse economic activities which are stable and in balance with the physical and social environments".

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

The subject property is currently unutilized. In the long-term, the proposed action will have a beneficial economic impact through the creation of temporary construction, real estate, legal, engineering, insurance, retail and other long-term employment opportunities. New employment opportunities will be created by the additional 30,000 gross square feet of commercial spaces proposed. In addition, Hale‘iwa is in need of a permanent space for a farmers market. The proposed farmers market would provide an added socio-economic benefit. Local artisans and farmers will be able to sell products in the permanent farmers market proposed. The proposed development will increase property tax revenue to the City and County and general excise tax revenue to the State.

The proposed development is anticipated to have an overall positive effect on socio-economic conditions by providing additional housing for current Hale‘iwa residents. The proposed project will provide housing and employment opportunities, particularly for those in the area who would choose to walk or bike over driving, while maintaining the character of the area. The proposed project will have a net positive effect on the economic and social welfare of the Hale‘iwa community.

No impact to cultural practices is anticipated as the subject property is not associated with ongoing cultural activities and no archaeological sites are known to be present on the property.

5. Substantially affects public health;

The proposed action is not anticipated to have any environmental impacts that would affect public health. No hazardous materials will be used during construction, and construction impacts to water and air quality will be minimized through the implementation of best management practices. Vehicle emissions will increase slightly over current levels resulting from the transport of residents and visitors to the residences and businesses of the proposed development on the property. The slight increase in vehicle emission resulting for the proposed project is not expected to cause a significant impact to air quality in the project vicinity.

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

Between 2000 and 2010, the Hale‘iwa census tract (tract 99.02) lost 218 people and 16 housing units, and average household size shrank from 3.55 people per household to 3.31. In addition to shrinking household sizes, other recent projects in Hale‘iwa have removed homes, and others are being converted to commercial use along the highway. The project improvements will create needed additional housing and employment opportunities in Hale‘iwa. The long-term employment as a result of the retail and restaurant redevelopment and a permanent farmers market will be beneficial to the local economy.

There will be an impact from the project on government supported services such as utilities, schools, public safety, and transportation systems. However, the slight increase in population resulting from this project in not anticipated to adversely impact public facilities. The proposed development is anticipated to have an overall positive effect on socio-economic conditions by providing additional housing and long-term employment options for current Hale‘iwa residents.

7. Involves a substantial degradation of environmental quality;

The proposed action is not expected to cause a substantial degradation of environmental quality. No hazardous materials will be used during construction, and construction impacts to water and air quality will be minimized through the implementation of best management practices. No significant long-term adverse impacts are anticipated from development of the subject property for residential and commercial purposes.

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

The commercial redevelopment project is not a commitment to a larger action. Between 2000 and 2010, the Hale‘iwa census tract (tract 99.02) lost 218 people and 16 housing units, and average household size shrank from 3.55 people per household to 3.31. The development of the project’s residential units is intended to provided additional rental housing in Hale‘iwa for younger adults and families, particularly for those working in the area who would choose to walk or bike over driving. Assuming a household size of approximately three (3) persons, the proposed development is expected to increase the population in the area by about 468 persons.

The proposed development is consistent with the growth management goals from the NSSCP intended to protect the region’s large tracts of agricultural lands, open spaces and natural and

cultural resources. Rezoning of the property is consistent with the NSSCP’s “Community Growth Boundary” and “Country Town District” designations. There have been no large-scale housing projects built within the Haleiwa area since the 1970s.

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

Because of previous disturbance to the property, the flora and fauna communities on the property are comprised of non-native birds and plants. No rare, threatened, or endangered species inhabit the subject property, nor does the site provide a unique or exceptional habitat for rare, threatened, or endangered species.

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

No significant impact to air or water quality or ambient noise levels are anticipated to result from the proposed action. Short-term impacts during construction of facilities will be minimized through the implementation of best management practices to control construction dust and emissions in compliance with provisions of HAR Section 11.60.1-33. All work will be in conformance with the air pollution standards and regulations of the State Department of Health (DOH).

Long term impacts to air quality from the proposed project are expected to be minimal. Vehicle emissions will increase slightly over current levels resulting from the transport of residents and visitors to the residences and businesses of the proposed development on the property. The slight increase in vehicle emission resulting for the proposed project is not expected to cause a significant impact to air quality in the project vicinity.

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 water.

The subject property is not 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.

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

Although the proposed residential and commercial structures will be visible when traveling in along Joseph P. Leong Highway, all structures will be designed in accordance with design guidelines for the Hale‘iwa Special District. The design guidelines will control the architectural building form and landscaping screening that ensure the development is compatible with the rural character of Hale‘iwa.

Development of the subject property for residential and commercial purposes will not affect scenic vistas or view planes. The proposed development will comply with the Hale‘iwa Special District architectural design guidelines to ensure it preserves the unique character of Historic Hale‘iwa Town.

13. Requires substantial energy consumption.

Construction of the project will not require substantial energy consumption relative to other similar projects. After the project is completed, energy will be conserved by using modern energy efficient appliances and fixtures, and application of green design concepts.

5.2 ANTICIPATED DETERMINATION

Based upon the information and results of the assessments conducted for the project site, a Finding of No Significant Impact (FONSI) determination is anticipated for the proposed rezoning and development of the subject property.

6.0 AGENCY AND PUBLIC CONSULTATION

6.1 NORTH SHORE NEIGHBORHOOD BOARD MEETING

The proposed project was presented to the North Shore Neighborhood Board No. 27, at their February 2015 meeting. At the meeting, the Board took action to oppose BMX-3 zoning as well as any other zoning that does not keep with the country character of Hale‘iwa Town.

6.2 PRE-ASSESSMENT CONSULTATION

Pre-assessment consultation comments were solicited from the following government agencies and organizations. Comments received are included in Appendix A of this Environmental Assessment.

Federal Agencies
U.S. Department of Agriculture

State of Hawai‘i Agencies
Department of Agriculture
Department of Business, Economic Development & Tourism
Department of Education
Department of Health
Department of Land and Natural Resources
State Historic Preservation Division
Department of Transportation

City & County of Honolulu Agencies
Board of Water Supply
Department of Community Services
Department of Design and Construction
Department of Environmental Services
Department of Facility Maintenance
Department of Planning and Permitting
Department of Parks and Recreation
Department of Transportation Services
Honolulu Fire Department
Honolulu Police Department
North Shore Neighborhood Board No. 27
Honolulu City Council

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Appendix A: Pre-Assessment Consultation

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POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

KIRK CALDWELL
MAYOR

LOUIS M. KEALOHA
CHIEF

DAVE M. KAJIHIRO
MARIE A. McCAULEY
DEPUTY CHIEFS

OUR REFERENCE MT-DK

SSFM INTERNATIONAL, INC.
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February 23, 2015

Mr. Jared Chang, Planner
SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mr. Chang:

This is in response to your letter dated February 11, 2015, requesting comments on a Pre-Assessment, Draft Environmental Assessment, for the Haleiwa Parcel Zone Change project.

This project should have no significant impact on the services or operations of the Honolulu Police Department.

If there are any questions, please call Captain Larry Lawson of District 2 (Wahiawa) at 723-8703.

Thank you for the opportunity to review this project.

Sincerely,

LOUIS M. KEALOHA
Chief of Police

By
MARK TSUYEMURA
Management Analyst VI
Office of the Chief

Serving and Protecting With Aloha

SCANNED

DAVID Y. IGE
GOVERNOR

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

FORD N. FUCHIGAMI
DIRECTOR

Deputy Directors
JADE T. BUTAY
ROSS M. HIGASHI
EDWIN H. SNIFFEN
DARRELL T. YOUNG

IN REPLY REFER TO:

STP 8.1758

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February 23, 2015

Mr. Jared Chang
Planner
SSFM International
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mr. Chang:

Subject: Basin Project, Inc.
Pre-Assessment Consultation for Draft Environmental Assessment
Haleiwa, North Shore, Oahu
TMK: (1) 6-2-005:002

Our Department of Transportation's (DOT) comments on the subject project are as follows:

The Draft Environmental Assessment (DEA) should discuss and evaluate the project's contribution to the cumulative traffic impacts on State highways facilities in the area.

If there are any questions, please contact Mr. Norren Kato of the DOT Statewide Transportation Planning Office at telephone number (808) 831-7976.

Sincerely,

FORD N. FUCHIGAMI
Director of Transportation

SCANNED

DEPARTMENT OF COMMUNITY SERVICES
CITY AND COUNTY OF HONOLULU
715 SOUTH KING STREET, SUITE 311 ● HONOLULU, HAWAII 96813 ● AREA CODE 808 ● PHONE: 768-7762 ● FAX: 768-7792

KIRK CALDWELL
MAYOR

GARY K. NAKATA
ACTING DIRECTOR

SSFM INTERNATIONAL, INC.
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February 24, 2015

Mr. Jared Chang
SSFM International
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mr. Chang:

SUBJECT: Haleiwa Parcel Zone Change
Haleiwa, North Shore District, Oahu
Tax Map Key: (1) 6-2-005:002
Pre-Assessment Consultation for Draft Environmental Assessment

We have reviewed your letter dated February 11, 2015, and the attached information, for the Haleiwa Parcel Zone Change, Pre-Assessment Consultation for Draft Environmental Assessment.

Our review of the documents indicates that the proposed project will have no adverse impacts on any Department of Community Services' activities or projects at this time.

Thank you for providing us with the opportunity to comment on this matter.

Sincerely,

Gary K. Nakata
Acting Director

GKN:sgk

SCANNED

HONOLULU FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU
636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

KIRK CALDWELL
MAYOR

MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

SSFM INTERNATIONAL, INC.
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February 26, 2015

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FILE

Mr. Jared Chang, Planner
SSFM International, Inc
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mr. Chang:

Subject: Preassessment Consultation for Draft Environmental Assessment
Haleiwa Parcel Zone Change
Tax Map Key: 6-2-005: 002

In response to your letter dated February 11, 2015, regarding the above-mentioned subjects, the Honolulu Fire Department (HFD) reviewed the material provided and requires that the following be complied with:

1. Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 150 feet from fire department access roads as measured by an approved route around the exterior of the building or facility. (National Fire Protection Association [NFPA] 1, Uniform Fire Code [UFC]™, 2006 Edition, Section 18.2.3.2.2.)

   A fire department access road shall extend to within 50 feet of at least one exterior door that can be opened from the outside and that provides access to the interior of the building. (NFPA 1, UFC™, 2006 Edition, Section 18.2.3.2.1.)

2. A water supply approved by the county, capable of supplying the required fire flow for fire protection, shall be provided to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed, or moved into or within the county. When any portion of the facility or building is in excess of 150 feet from a water supply on a fire apparatus access road, as measured by an approved route around

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the exterior of the facility or building, on-site fire hydrants and mains capable of supplying the required fire flow shall be provided when required by the AHJ [Authority Having Jurisdiction]. (NFPA 1, UFC™, 2006 Edition, Section 18.3.1, as amended.)

3. The unobstructed width and unobstructed vertical clearance of a fire apparatus access road shall meet county requirements. (NFPA 1, UFC™, 2006 Edition, Section 18.2.3.4.1.1, as amended.)

4. Submit civil drawings to the HFD for review and approval.

Should you have questions, please contact Battalion Chief Terry Seelig of our Fire Prevention Bureau at 723-7151 or tseelig@honolulu.gov.

Sincerely,

SOCRATES D. BRATAKOS
Assistant Chief

SDB/SY:bh

DEPARTMENT OF FACILITY MAINTENANCE
CITY AND COUNTY OF HONOLULU
1000 Ulu'ohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

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KIRK CALDWELL
MAYOR

ROSS S. SASAMURA, P.E.
DIRECTOR AND CHIEF ENGINEER

EDUARDO P. MANGLALLAN
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 15-146E

March 2, 2015

Mr. Jared Chang
Planner
SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mr. Chang:

SUBJECT: Haleiwa Parcel Zone Change
TMK: (1) 6-2-005:002
Pre-Assessment Consultation for Draft Environmental Assessment

Thank you for the opportunity to review and provide our input regarding the above-subject project.

We have no comments at this time, as we do not have any facilities or easements on the subject property.

If you have any questions, please call Mr. Kyle Oyasato of the Division of Road Maintenance at 768-3697.

Sincerely,

for Ross S. Sasamura, P.E.
Director and Chief Engineer

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DAVID Y. IGE
GOVERNOR

KATHRYN S. MATAYOSHI
SUPERINTENDENT

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

OFFICE OF SCHOOL FACILITIES AND SUPPORT SERVICES

March 2, 2015

Mr. Jared Chang, Planner
SSFM International
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Re: Pre-Assessment Consultation for the Haleiwa Mixed Use Project, Haleiwa, Oahu

Dear Mr. Chang:

The Department of Education (DOE) is responding to your request for early comments or concerns about the proposed mixed use project in Haleiwa.

The DOE will be looking for the number of residential units being proposed for the project. It would also be useful to know the configuration of the units, whether the units would be used for transient accommodation or for senior housing.

Thank you for this opportunity to offer our comments. We look forward to reviewing the Draft Environmental Assessment.

Should you have any questions, please call Heidi Meeker of the Facilities Development Branch at 377-8301.

Respectfully,

Kenneth G. Masden
Public Works Manager
Planning Section

KGM:jmb

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OFFICE OF PLANNING
STATE OF HAWAII
235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
ACTING DIRECTOR
OFFICE OF PLANNING

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

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Ref. No. P-14672

March 5, 2015

Mr. Jared Chang
SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mr. Chang:

Subject: Pre-Assessment Consultation for a Draft Environmental Assessment – Haleiwa Parcel Zone Change, Haleiwa, North Shore District, Oahu; TMK: (1) 6-2-005:002

Thank you for the opportunity to provide comments on the pre-consultation request for a Draft Environmental Assessment (Draft EA) on the Haleiwa Parcel Zone Change. The pre-consultation review material was transmitted to our office by letter dated February 12, 2015. The parcel in question is located makai of the Joseph P. Leong Highway and mauka of Kamehameha Highway in Haleiwa. It is our understanding that this project proposes to rezone this parcel from a dual zoned General Preservation (P-2) and Restricted Agriculture (AG-1) to a Community Business Mixed Use zoning (BMX-2). If rezoning is approved, the parcel would be developed with a mix of residential and commercial uses which include: low-density apartments, commercial units, and outdoor commercial activities.

The Office of Planning (OP) has reviewed the transmitted material and has the following comments to offer:

1. The Hawaii State Plan includes diverse objectives and policies of state interest. The Draft EA should include an analysis on the Hawaii State Plan, Hawaii Revised Statutes (HRS) Chapter 226, which attests to the project's ability to meet the objectives and policies, and priority guidelines listed in HRS Chapter 226. This analysis should also include an assessment on the project's consistency with (HRS) § 226-108 – the Priority Guideline on Sustainability. For further explanation on the Priority Guideline on Sustainability, OP has created technical guidance that provides clarification on the principles that promote sustainability. This technical assistance memorandum on Sustainability can be viewed or downloaded from the Office of Planning website at http://files.hawaii.gov/dbedt/op/docs/OP_TAM_2013-12-03.pdf

2. The coastal zone management area is defined as "all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the U.S. territorial sea" see HRS § 205A-1

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(definition of "coastal zone management area").

HRS Chapter 205A requires all State and county agencies to enforce the coastal zone management (CZM) objectives and policies. The assessment on compliance with HRS Chapter 205A is an important component for satisfying the requirements of HRS Chapter 343. The Draft EA should include an assessment as to how the proposed project conforms to the CZM objectives and its supporting policies set forth in HRS § 205A-2.

3. The Draft EA should consider watershed protection and watershed management. OP has created the Hawaii Watershed Guidance to provide direction on methods to safeguard Hawaii's watersheds and implement watershed plans. The guidance includes a number of management measures that address polluted runoff from urban activities and provides summaries and links to management measures that may be implemented to minimize coastal nonpoint pollution impact. For this project, please examine, Section B – Management Measures/Urban Runoff, pages 120-122 for greater detail on urban runoff management measures. The Watershed Guidance can be viewed or downloaded from the Office of Planning website at http://files.hawaii.gov/dbedt/op/czm/initiative/nonpoint/HI Watershed Guidance Final.pdf

4. Development and land use activities can create erosion, increased stormwater runoff, and pollution that cause direct, secondary, and cumulative impacts to Hawaii's resources. Therefore, a stormwater impact evaluation should be included in the Draft EA.

   Please consider OP's Stormwater Impact Assessment in your stormwater impact evaluation for this project. This document can be used to identify and evaluate information on hydrology, stressors, sensitivity of aquatic and riparian resources, and management measures to control runoff occurrences. Mitigation measures and best management practices (BMP) listed in this guidance can be applied to water runoff strategies to prevent damage to coastal ecosystems. This guidance document will assist in integrating stormwater impact assessment within the planning and environmental review process of a project. The document can be found at http://files.hawaii.gov/dbedt/op/czm/initiative/stomwater_imapct/final_stormwater_impact_assessments_guidance.pdf.

5. Because this proposal calls for a new development, please consider Low-Impact Development (LID) design practices in the planning process. The use of LID design and BMP's will be an effective means to expedite the permitting process, reduce

construction costs, reduce operation and maintenance costs, and increase property values. LID techniques promote a range of structural BMP's for stormwater control management and urban layout that minimizes negative environmental impact. LID technique classifications include: the preservation of natural features and conservation design, the reduction of impervious cover, and utilizing natural features and source control for stormwater management. These design practices can be found in OP's Low Impact Development, A Practitioners Guide. For a complete list of LID - Best Management Practices, please examine Section 1.7, pgs. 1-4 to 1-11 for further information. This guidance can be viewed or downloaded from the OP website at http://files.hawaii.gov/dbedt/op/czm/initiative/lid/lid_guide_2006.pdf

If you have any questions regarding this comment letter, please contact Josh Hekekia of our office at 587-2845.

Sincerely,

Leo R. Asuncion
Acting Director

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 768-4730 • Internet: www.honolulu.gov

KIRK CALDWELL
MAYOR

MICHAEL D. FORMBY
DIRECTOR

MARK N. GARRITY, AICP
DEPUTY DIRECTOR

SSFM INTERNATIONAL, INC.
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TP2/15-598682R
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March 11, 2015

Mr. Jared Chang
Planner
SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mr. Chang:

SUBJECT: Pre-Assessment Consultation for Draft Environmental Assessment (DEA), Haleiwa Parcel Zone Change, Haleiwa, Oahu, Hawaii

In response to your letter dated February 11, 2015, we have the following comments:

1. The DEA should include a multi-modal Transportation Demand Management (TDM) plan for the project that encourages walking, bicycling and use of transit.

2. The design of the project should be consistent with the City's Complete Streets ordinance. Consideration should be given to the connectivity between modes to transit facilities. In addition, access to transit facilities (bus stops, etc.) should meet American with Disabilities Act requirements.

3. On-site bicycle facilities, including guest bicycle parking and secure bicycle parking for residents, should be anticipated and accommodated.

4. All access driveways to the project site should be designed for pedestrian and bicycle safety. For safety and accessibility, drop driveways are recommended.

5. All parking needs for the proposed facilities (residents and visitors) should be handled on-site.

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6. All loading and unloading needs should be handled on-site, rather than on City roadways.

7. The area Neighborhood Board, as well as the area residents, businesses, emergency personnel, Oahu Transit Services, Inc. (TheBus), etc., should be kept apprised of the details of the proposed project and the impacts, particularly during construction, the project may have on the adjoining local street area network.

8. Any construction materials and equipment should be transferred to and from the project site during off-peak traffic hours (8:30 a.m. to 3:30 p.m.) to minimize any possible disruption to traffic on the local streets.

9. A street usage permit from the City's Department of Transportation Services should be obtained for any construction-related work that may require the temporary closure of any traffic lane or on-street parking spaces on a City street.

Thank you for the opportunity to review this matter. Should you have any questions, please contact Renee Yamasaki of my staff at 768-8383.

Very truly yours,

Michael D. Formby
Director

DAVID Y. IGE
GOVERNOR OF HAWAII

CARTY S. CHANG
INTERIM CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DANIEL S. QUINN
INTERIM FIRST DEPUTY

W. ROY HARDY
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

March 11, 2015

SSFM International, Inc.
Attn: Jared Chang
501 Sumner Street, Suite 620
Honolulu, HI 96817

via email: jchang@ssfm.com

Dear Mr. Chang,

SUBJECT: Hale`iwa Parcel Zone Change, Pre-Assessment Consultation for Draft Environmental Assessment

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 comments from (1) Land Division – Oahu District; (2) Commission on Water Resource Management; and (3) Engineering Division. No other comments were received as of our suspense date. Should you have any questions, please feel free to contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)

DAVID Y. IGE
GOVERNOR OF HAWAII

CARTY S. CHANG
INTERIM CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DANIEL S. QUINN
INTERIM FIRST DEPUTY

W. ROY HARDY
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
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HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

February 13, 2015

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Hale`iwa Parcel Zone Change, Pre-Assessment Consultation for Draft Environmental Assessment
LOCATION: Hale`iwa, North Shore District, O`ahu, Tax Map Key: (1) 6-2-005:002
APPLICANT: Basin Project, Inc. by its consultant SSFM International, 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 March 9, 2015. 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 Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

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

Signed: _____
Print Name: _____
Date: 2/18/15

DAVID Y. IGE
GOVERNOR OF HAWAII

RECEIVED
LAND DIVISION
2015 MAR -9 PM 2:56
DEPT. OF LAND & NATURAL RESOURCES

CARTY S. CHANG
INTERIM CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DANIEL S. QUINN
INTERIM FIRST DEPUTY

W. ROY HARDY
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
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LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

February 13, 2015

MEMORANDUM

TO:

DLNR Agencies:
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FR:

to:

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Hale`iwa Parcel Zone Change, Pre-Assessment Consultation for Draft Environmental Assessment
LOCATION: Hale`iwa, North Shore District, O'ahu, Tax Map Key: (1) 6-2-005:002
APPLICANT: Basin Project, Inc. by its consultant SSFM International, 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 March 9, 2015. 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 Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

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

Signed: W. Roy Hardy
Print Name: W. Roy Hardy, Acting Deputy Director
Date: March 5, 2015

FILE ID: RFD. 4135.3
DOC ID: 12242

DAVID Y. IGE
GOVERNOR OF HAWAII

CARTY S. CHANG
ACTING CHAIRPERSON

DENISE ANTOLINI
KAMANA BEAMER
MICHAEL G. BUCK
MILTON D. PAVAO
VIRGINIA PRESSLER, M.D.
JONATHAN STARR

W. ROY HARDY
ACTING DEPUTY DIRECTOR

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

March 5, 2015

REF: RFD.4135.3

TO: Russell Tsuji, Administrator
Land Division

FROM: W. Roy Hardy, Acting Deputy Director
Commission on Water Resource Management

SUBJECT: Basin Project, Inc. Proposal for Haleiwa Parcel Zone Change from AG-1 to BMX-3

FILE NO.:
TMK NO.: (1) 6-2-005:002

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. We recommend coordination with the Hawaii Department of Agriculture (HDOA) to incorporate the reclassification of agricultural zoned land and the redistribution of agricultural resources into the State's Agricultural Water Use and Development Plan (AWUDP). Please contact the HDOA for more information.

☒ 4. We recommend that water efficient fixtures be installed and water efficient practices implemented throughout the development to reduce the increased demand on the area's freshwater resources. Reducing the water usage of a home or building may earn credit towards Leadership in Energy and Environmental Design (LEED) certification. More information on LEED certification is available at http://www.usgbc.org/leed. A listing of fixtures certified by the EPA as having high water efficiency can be found at http://www.epa.gov/watersense/.

☒ 5. We recommend the use of best management practices (BMP) for stormwater management to minimize the impact of the project to the existing area's hydrology while maintaining on-site infiltration and preventing polluted runoff from storm events. Stormwater management BMPs may earn credit toward LEED certification. More information on stormwater BMPs can be found at http://hawaii.gov/dbedt/czm/initiative/lid.php.

☒ 6. We recommend the use of alternative water sources, wherever practicable.

☒ 7. We recommend participating in the Hawaii Green Business Program, that assists and recognizes businesses that strive to operate in an environmentally and socially responsible manner. The program description can be found online at http://energy.hawaii.gov/green-business-program

☒ 8. We recommend adopting landscape irrigation conservation best management practices endorsed by the Landscape Industry Council of Hawaii. These practices can be found online at http://www.hawaiiscape.com/wp-content/uploads/2013/04/LICH_Irrigation_Conservation_BMPs.pdf

☐ 9. 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 http://hawaii.gov/dlnr/cwrm/info_permits.htm.

☐ 10. The proposed water supply source for the project is located in a designated water management area, and a Water Use Permit is required prior to use of water. The Water Use Permit may be conditioned on the requirement to use dual line water supply systems for new industrial and commercial developments.

☐ 11. A Well Construction Permit(s) is (are) required before any well construction work begins.

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

☐ 13. 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.

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

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

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

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

☐ 18. 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.

☒ OTHER:
The DEA should include a discussion of the water requirements for the project, both potable and non-potable, and the calculations used to derive the projected water needs; water conservation and efficiency measures that will be implemented; the proposed water sources, including any alternative sources of water that may be available to meet nonpotable needs; and BMPs for stormwater management.

If there are any questions, please contact Lenore Ohye of the Planning Branch at 587-0216.

DAVID Y. IGE
GOVERNOR OF HAWAII

Department of Land and Natural Resources
State of Hawaii

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

CARTY S. CHANG
INTERIM CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DANIEL S. QUINN
INTERIM FIRST DEPUTY

W. ROY HARDY
ACTING DEPUTY DIRECTOR - WATER

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BOATING AND OCEAN RECREATION
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COMMISSION ON WATER RESOURCE MANAGEMENT
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CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

February 13, 2015

MEMORANDUM

TO: FR:

DLNR Agencies:
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

TO:

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Hale'iwa Parcel Zone Change, Pre-Assessment Consultation for Draft Environmental Assessment
LOCATION: Hale'iwa, North Shore District, O'ahu, Tax Map Key: (1) 6-2-005:002
APPLICANT: Basin Project, Inc. by its consultant SSFM International, 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 March 9, 2015. 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 Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

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

Signed: [signature]
Print Name: Carty S. Chang, Chief Engineer
Date: 3/6/15

'15 FEB 17 AM 11:06 ENGINEERING
2015 MAR -5 AM 11:32

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/ Russell Y. Tsuji
REF: Pre-Assessment Consultation for a DEA for a Proposed Parcel Zone Change and Subsequent Development, Haleiwa
Oahu.011

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 the project site according to the Flood Insurance Rate Map (FIRM), is located in Zone X. The National Flood Insurance Program (NFIP) does not regulate developments within Zone X.

( ) 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. Mario Siu Li at (808) 768-8098 of the City and County of Honolulu, Department of Planning and Permitting.
( ) Mr. Frank DeMarco at (808) 961-8042 of the County of Hawaii, Department of Public Works.
( ) Mr. Carolyn Cortez at (808) 270-7253 of the County of Maui, Department of Planning.
( ) Mr. Stanford Iwamoto at (808) 241-4896 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 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.

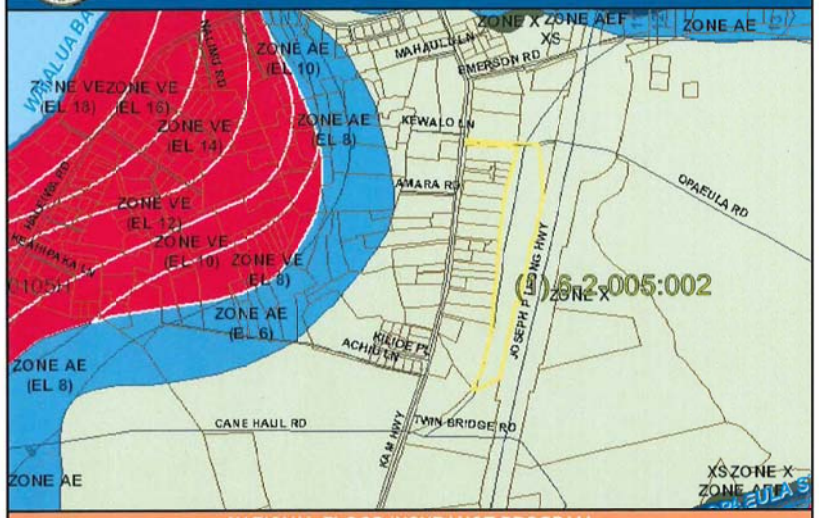
( ) Additional Comments: _____

( ) Other: _____

Should you have any questions, please call Mr. Dennis Imada of the Planning Branch at 587-0257.

Signed: Chris Fahrenkrug
for CARTY S. CHANG, CHIEF ENGINEER
Date: 3/4/15

State of Hawaii
FLOOD HAZARD ASSESSMENT REPORT



NATIONAL FLOOD INSURANCE PROGRAM

FLOOD ZONE DEFINITIONS

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD – The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zone A, AE, AH, AO, V, and VE. The Base Flood Elevation (BFE) is the water-surface elevation of the 1% annual chance flood. Mandatory flood insurance purchase applies in these zones:

- **Zone A:** No BFE determined.
- **Zone AE:** BFE determined.
- **Zone AH:** Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
- **Zone AO:** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
- **Zone V:** Coastal flood zone with velocity hazard (wave action); no BFE determined.
- **Zone VE:** Coastal flood zone with velocity hazard (wave action); BFE determined.
- **Zone AEF:** Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

NON-SPECIAL FLOOD HAZARD AREA – An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

- **Zone XS (X shaded):** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- **Zone X:** Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

- **Zone D:** Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

PROPERTY INFORMATION

COUNTY:	HONOLULU
TMK NO:	(1) 6-2-005-002
PARCEL ADDRESS:	
FIRM INDEX DATE:	NOVEMBER 05, 2014
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL(S):	15003C0105H
PANEL EFFECTIVE DATE:	JANUARY 19, 2011
PARCEL DATA FROM:	APRIL 2014
IMAGERY DATA FROM:	MAY 2006

IMPORTANT PHONE NUMBERS

County NFIP Coordinator	
City and County of Honolulu	
Mario Siu-Li, CFM	(808) 768-8098
State NFIP Coordinator	
Carol Tyau-Beam, P.E., CFM	(808) 587-0267

Disclaimer: The Department of Land and Natural Resources (DLNR) assumes no responsibility arising from the use of the information contained in this report. Viewers/Users are responsible for verifying the accuracy of the information and agree to indemnify the DLNR from any liability, which may arise from its use.

If this map has been identified as 'PRELIMINARY' or 'UNOFFICIAL', please note that it is being provided for informational purposes and is not to be used for official/legal decisions, regulatory compliance, or flood insurance rating. Contact your county NFIP coordinator for flood zone determinations to be used for compliance with local floodplain management regulations.

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

SSFM INTERNATIONAL, INC.
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KIRK CALDWELL
MAYOR

GEORGE I. ATTA, FAICP
DIRECTOR

ARTHUR D. CHALLACOMBE
DEPUTY DIRECTOR

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2015/ELOG-288 (ts)

March 13, 2015

Mr. Jared Chang
SSFM International
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mr. Chang:

The Department of Planning and Permitting (DPP) has received your letter dated February 11, 2015, requesting pre-consultation comments for a Draft Environmental Assessment (DEA) being prepared for a proposed zone change to the subject property of 7.5 acres, identified as Tax Map Key (TMK): 6-2-5: 2 (por.), located in Haleiwa and the North Shore Sustainable Communities Plan (SCP) area.

Your letter states that the landowner, Basin Project, Inc., is proposing to rezone the subject property from the AG-1 Restricted Agricultural District to the BMX-3 Community Business Mixed Use District. The proposed zone change to a mixed use district greater than five acres constitutes a significant zone change and requires an Environmental Assessment. The DPP offers the following comments:

- The subject property is in the State Agricultural District. A boundary amendment to the State Urban District is required prior to processing the proposed zone change (the DPP can process this type of boundary amendment because it is 15 acres or less and from the Agricultural District to the Urban District).

- The subject property is located within the Community Growth Boundary and the Country Town land use designation of the North Shore SCP. Country Town is intended for low-rise buildings (one to two stories) with a compatible mix of uses at a small scale. While the uses of the proposed BMX-3 District conform to the Country Town designation, the allowable density (medium to high) would conflict with the North Shore SCP (e.g. only low density apartments are specifically defined for multifamily residential). The DEA should discuss the proposed zone change's conformance to the applicable polices and guidelines of the North Shore SCP as well as the Oahu General Plan. We appreciate the expressed desire to be consistent with the North Shore SCP; however, the DEA should consider other options to the BMX-3 District (e.g. a combination of lower density commercial and residential districts to achieve a similar mix of land uses), as it is not generally associated with rural areas.

- The subject property is located within the Haleiwa Special District. The DEA should provide a detailed discussion about the proposed development, how it may impact the

surrounding uses, and how it will comply with the objectives, rules, and regulations of the special district design guidelines.

- The subject property is not serviced by the municipal sewer system.

- As applicable, the DEA needs to include a discussion explaining the project's water quality management strategy pursuant to the prevailing Rules Relating to Storm Drainage Standards.

- The subject property contains soil classified under the highest productivity rating by the Land Study Bureau and as Prime Lands by the Agricultural Lands of Importance to the State of Hawaii. The DEA should discuss the impacts of the loss of quality agricultural land on farming and agricultural opportunities.

- We recognize the Important Agricultural Lands (IAL) process for Oahu is not yet complete, but the DEA should discuss the IAL information available so far for the property. Information can be found on the DPP website for IAL Phase 1 at www.honoluludpp.org/Planning/IAL.

- A traffic assessment should be prepared for the proposed zone change that includes an analysis of the associated traffic impacts. The discussion needs to include a traffic management plan and identification of multi-modal incentives to encourage transit, bicycle, and pedestrian trips. A construction management plan may be required to mitigate traffic impacts during the construction phase of development. Please consult with the Traffic Review Branch of the DPP, as well as the Department of Transportation Services and the State Department of Transportation, as needed.

Should you have any questions, please contact Tim Streitz of our staff at 768-8042 or tstreitz@honolulu.gov.

Very truly yours,

George I. Atta, FAICP
Director

GIA:js

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

March 16, 2015

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ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

ELLEN E. KITAMURA, P.E.
Deputy Manager and Chief Engineer

FILE COPY

Mr. Jared Chang, Planner
SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mr. Chang:

Subject: Your Letter Dated February 11, 2015 on the Haleiwa Parcel Zone Change Pre-Assessment Consultation for Draft Environmental Assessment – Tax Map Key: 6-2-005: 002

Thank you for the opportunity to comment on the zone change request in Haleiwa.

The existing water system is adequate to accommodate the proposed Haleiwa Parcel Zone Change. However, please be advised that this information is based upon current data, and therefore, the Board of Water Supply reserves the right to change any position or information stated herein up until the final approval of the building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.

When water is made available, the applicant will be required to pay our Water System Facilities Charges for resource development, transmission and daily storage.

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

If you have any questions, please contact Robert Chun, Project Review Branch of our Water Resources Division at 748-5443.

Very truly yours,

for ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

Water for Life . . . Ka Wai Ola

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

SUZANNE D. CASE
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COMMISSION ON WATER RESOURCE MANAGEMENT
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CONSERVATION AND RESOURCES ENFORCEMENT
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FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

May 26, 2015

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

LOG NO: 2015.00630
DOC NO: 1505GC13
Archaeology

Dear Mr. Tsuji:

SUBJECT: **Chapter 6E-42 Historic Preservation Review –**
Request for Comments – Haleiwa Parcel Zone Change, Pre-Draft EA
Pa'ala'a Ahupua'a, Waialua District, Island of O'ahu
TMK: (1) 6-2-005:002

Thank you for the opportunity to review and comment on the proposed zone change. We received this submittal on February 18, 2015, and we apologize for the delayed review. Basin Project, Inc. (landowner and applicant) seeks rezoning of a 7.5-acre portion of an 8-acre parcel from agricultural lands to mixed community businesses. In addition, Basin Project, Inc. proposes to develop the subject property for residential and commercial uses after rezoning in accordance with the North Shore Sustainable Communities Plan.

Our records indicate an archaeological inventory survey (AIS) was completed on the subject 7.5-acre portion, and that the AIS report (Sims et al. 2015) was reviewed and accepted by SHPD on February 19, 2015 (Log No. 2015.00189, Doc. No. 1502SL19). A single historic property, identified as a Cane Haul Road (SIHP 50-80-04-7604), was documented as extending through the southern tip of the project area. McElroy and Duhaylonsod (2014) previously assessed SIHP 7604 as significant per Hawaii Administrative Rules (HAR) §13-284-6 under Criterion "d" (has yielded, or may yield information important to prehistory and/or history) and potentially under Criterion "a" (associated with events that made an important contribution to the broad patterns of history). Sims et al. (2015) stated that SIHP 7604 had been sufficiently documented and would not be impacted during the planned development, and thus no further archaeological recordation was needed; SHPD concurred (Log No. 2015.00189, Doc. No. 1502SL19). Sims et al. (2015) also indicated that in 1898, the OR&L narrow-gauge railway was constructed across the length of the project area, but that the railroad section was destroyed during the construction of Joseph P. Leong Highway in 1995. No archaeological evidence of the former OR&L railroad was found during the AIS.

Based on the information above, SHPD believes that **no historic properties will be affected** by the proposed zone change. Please contact me at (808) 692-8019 or at Susan.A.Lebo@hawaii.gov if you have questions or concerns regarding this letter.

Aloha,

Susan A. Lebo

Susan A. Lebo, PhD
O'ahu Lead Archaeologist
Acting Archaeology Branch Chief

cc: Jared Chang, Planner, SSFM International (jchang@ssfm.com)
Steve Molmen, DLNR-Land Division (Steve.Molmen@hawaii.gov)

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

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KIRK CALDWELL
MAYOR

ROBERT J. KRONING, P.E.
DIRECTOR

MARK YONAMINE, P.E.
DEPUTY DIRECTOR

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June 17, 2015

SSFM International
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Attn: Jared Chang

Dear Mr. Chang:

Subject: Haleiwa Parcel Zone Change
Haleiwa, North Shore District, Oahu
Tax Map Key: (1) 6-2-005:002
Pre-Assessment Consultation for Draft Environmental Assessment

The Department of Design and Construction does not have comments to offer on the pre-assessment consultation.

Thank you for the opportunity to review and comment. Should there be any questions, please contact me at 768-8480.

Sincerely,

Robert J. Kroning, P.E.
Director

RJK: cf (598457)

SCANNED

Appendix B: Traffic Impact Assessment

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Backyard Hale'iwa
Traffic Impact Analysis Report

Hale'iwa, O'ahu

May 21, 2015

Prepared for

The Backyard Hale'iwa, LLC

Prepared by

SSFM INTERNATIONAL

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I. PROJECT DESCRIPTION

A traffic study was conducted for "Backyard Hale'iwa," a proposed mixed-use development located within Hale'iwa Town on the north shore of the island of O'ahu. The project parcel (Tax Map Key: 6-2-005:002) is currently zoned as a Restricted Agriculture District (AG-1) although the land use map in the *North Shore Sustainable Communities Plan* (CCH-DPP, 2011) designates this parcel as "Country Town" which is defined as "the region's primary commercial districts, and include a wide range of commercial establishments and civic activities to serve both residents and visitors." The 7.5 acre parcel falls between Kamehameha Highway and Joseph P. Leong Highway, behind the existing North Shore Marketplace (see Figure 1). The mixed-use development proposes to include rental apartments, farmer's market, restaurant, studios, shops, galleries and a total of 543 parking stalls (see Figure 2). Vehicular access to the development is being proposed through Cane Haul Road on the south side of the property and through Opaeula Road on the north side with additional dedicated pedestrian access next to Malama Market. Full build-out of the development is anticipated to occur by the year 2025.

The development proposes to include a total of 156 two-bedroom apartment units with 328 parking stalls for residents and their guests. A 30,000 gross-square-feet commercial development is proposed which will include studios, shops, galleries, restaurant and a farmer's market. The farmers market is being proposed in an open air location but will ultimately be within an enclosed structure for full-build conditions. A total of 115 parking stalls are being dedicated for use by customers and employees of the commercial development. It is estimated that the restaurant will be 5,600 square-feet and the studio, shops and galleries will be located throughout the property covering a total area of 19,200 square-feet. An additional 100 parking stalls are being included within the development to account for displaced parking resulting from the Hale'iwa Improvement District Project which is currently in the planning stages. The intent of Backyard Hale'iwa is to have affordable rental apartment housing in close proximity (i.e., walking distance) to employment within Hale'iwa Town Center.

The traffic study analyzed existing conditions and impacts in the surrounding area as a result of the full build-out of the proposed development. The developer is seeking a zoning change from AG-1 to Neighborhood Business District (B-1) and Low Density Apartment Mixed-Use (AMX-1). This traffic impact analysis report (TIAR) summarizes the results of the study in support of the development's proposed zone change and Environmental Assessment (EA).

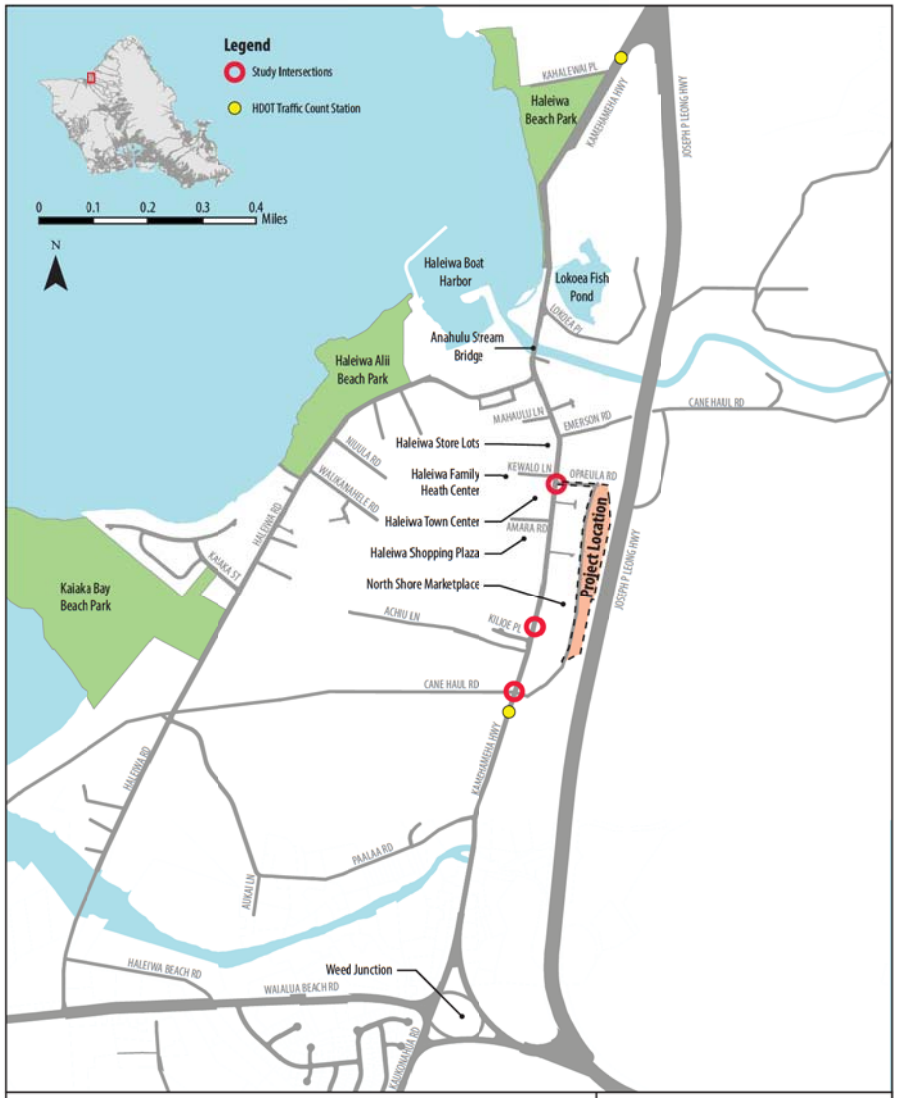

Figure 1: Location Map

Backyard Hale'iwa – Hale'iwa, O'ahu

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Figure 2: Site Plan

II. EXISTING CONDITIONS

A. Geometric Configuration

Kamehameha Highway, between Weed Junction and Joseph P. Leong Highway, is a City and County of Honolulu owned road with the functional classification of urban minor arterial. This two-lane, two-way, undivided roadway provides access to the various commercial and residential properties within Hale'iwa Town. Kamehameha Highway is oriented in the north-south direction and runs parallel to Joseph P. Leong Highway which serves as the State-owned bypass of this section of low-speed, commercial lined road. The posted speed limit along Kamehameha Highway in the study area is 25 mph. At the time of this study, construction had begun on the Hale'iwa Store Lots improvements. Currently, the cross-section of Kamehameha Highway varies throughout and includes varying five (5) to 12 foot wide paved/gravel shoulders, limited paved sidewalks, no dedicated turn lanes and several bus stops without pull-outs.

Opaeula Road is a private two-lane, two-way roadway on the east side of Kamehameha Highway. It is located between Lili'uokalani Protestant Church Cemetery and ACE Hardware. Opaeula Road primarily provides access to the parking lots for ACE Hardware. Opaeula Road is controlled by a stop sign at the T-intersection with Kamehameha Highway.

Kewalo Lane is located on the west side of Kamehameha Highway, offset 35-feet from the intersection with Opaeula Road. Kewalo Lane is a two-lane, two-way, private roadway. Kewalo Lane is controlled by a stop sign at the T-intersection with Kamehameha Highway. It provides access to the Hale'iwa Family Health Center and the Hale'iwa Town Center parking lots. However, during the time of this study and traffic counts taken in March 2015, Kewalo Lane was closed off at Kamehameha Highway due to construction on the Hale'iwa Store Lots property.

The primary driveway for the North Shore Marketplace is about 50-feet north of Kilioe Place on the east side of Kamehameha Highway. The driveway is controlled by a stop sign at the T-intersection. The driveway has a median that divides the ingress and egress lanes which include dedicated left and right turn lanes.

Cane Haul Road is primarily an agriculture road located approximately 650-feet south of the primary driveway for North Shore Marketplace. Cane Haul Road intersects Kamehameha Highway at a four-leg signalized intersection. The west leg is largely unpaved and controlled by a gate while the east leg is asphalt paved for a stretch, providing a secondary driveway for the North Shore Marketplace. Cane Haul Road has wide lanes for the large agricultural vehicles that travel along it.

Figure 3 provides the Existing (2015) lane configurations at the study intersections.

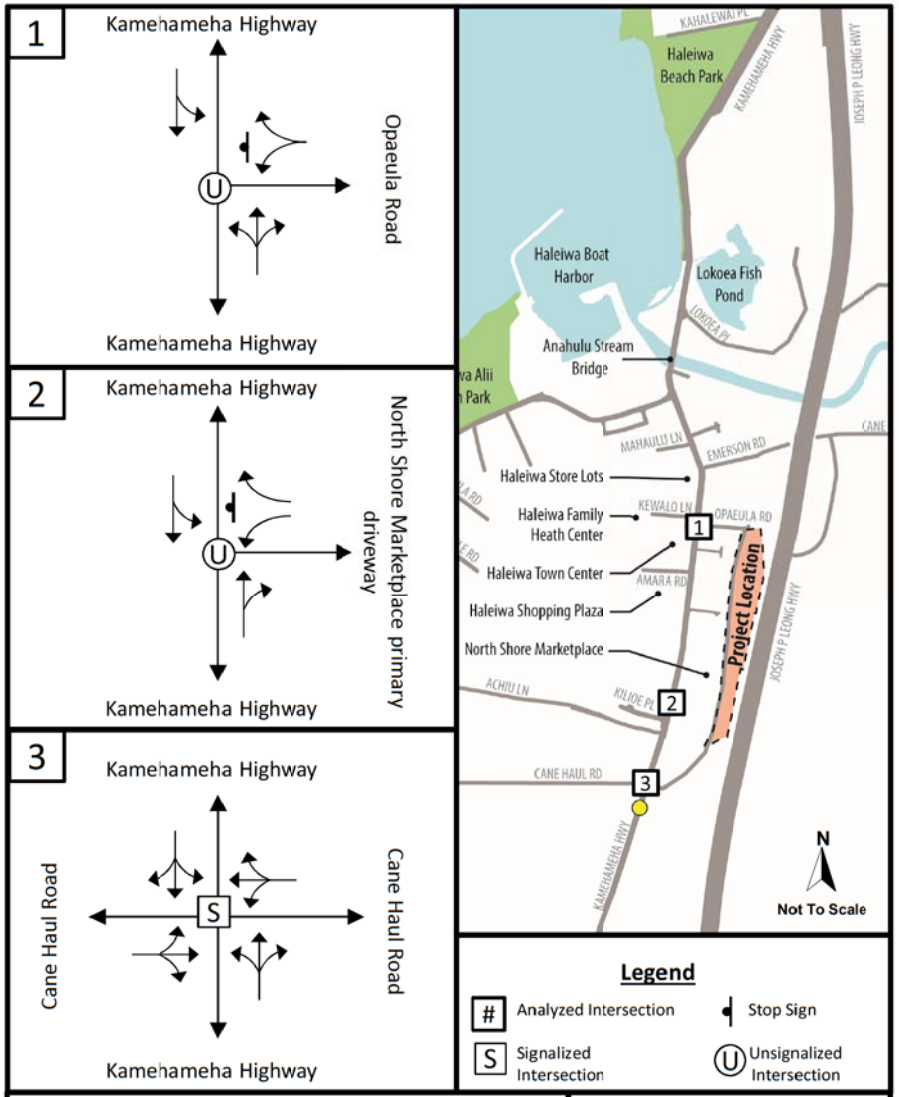

Figure 3: Existing (2015) Lane Configurations

Backyard Hale'iwa – Hale'iwa, O'ahu

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B. Volumes

1. 24-Hour Roadway Volumes

In 2013, average daily traffic (ADT) along Kamehameha Highway in the project area was 8,600-11,300 vehicles. This data is based on weekday counts taken by the Hawai'i Department of Transportation (HDOT) and included in *Historical Traffic Station Maps*. Table 1 provides the roadway weekday ADT at locations along Kamehameha Highway. Appendix A includes the detailed 24-hour HDOT traffic count data.

Table 1: Roadway Traffic Volumes

Roadway	Location	2013 ADT (vehicles)
Kamehameha Highway	Between Pa'ala'a Road and Achiu Lane	11,300
	Between Kahalewai Place and Joseph P. Leong Highway	8,600

Source: *Historical Traffic Station Maps* (HDOT)

Graphs of weekday directional hourly distribution along Kamehameha Highway are provided in Figures 4 and 5. There were no distinct AM or PM peak hour at either location which is expected along a road primarily used for commercial and retail access. The peak hour volume along Kamehameha Highway between Pa'ala'a Road and Achiu Lane occurred at 3:15-4:15 PM with a total of 950 vehicles. Of the 950 vehicles, approximately 450 vehicles were traveling in the northbound direction and 500 vehicles in the southbound direction. The hourly volumes stayed near or above 900 vehicles from 11:30 AM to 4:00 PM. The peak hour volume along Kamehameha Highway between Kahalewai Place and Joseph P. Leong Highway occurred at 2:00-3:00 PM. Of the approximately 800 vehicles traveling along this section of Kamehameha Highway during the peak hour, the northbound and southbound splits were equal with 400 vehicles traveling in each direction. The hourly volume stayed above 700 vehicles from 11:00 AM to 4:30 PM.

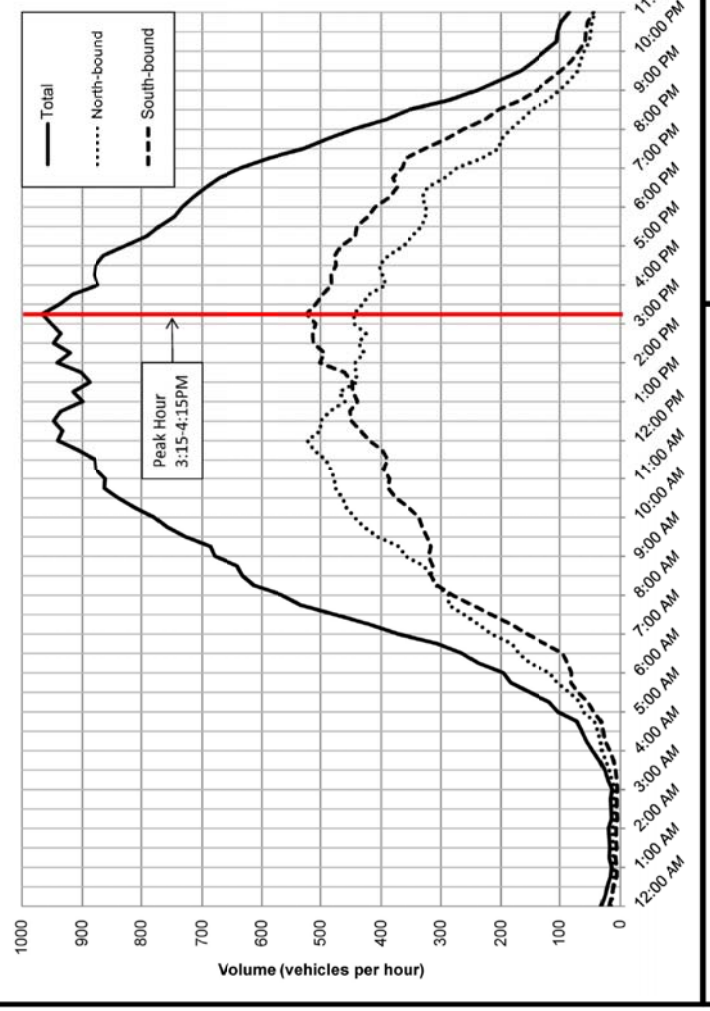

Figure 4: Kamehameha Highway between Pa'ala'a Road and Achiu Lane, 24-Hour Volume Distribution

Backyard Hale'iwa – Hale'iwa, O'ahu

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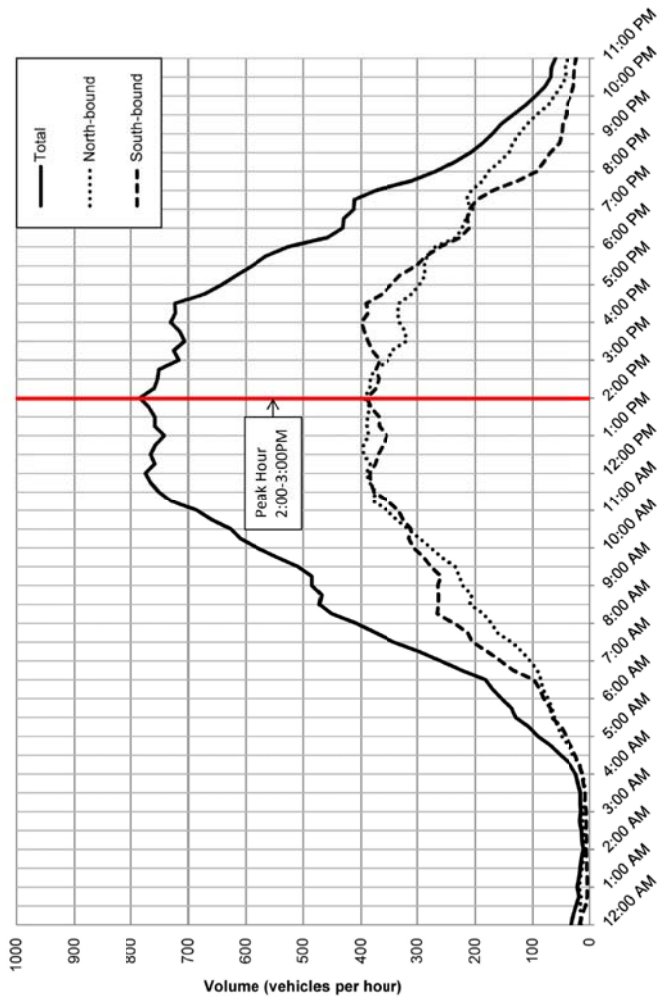

Figure 5: Kamehameha Highway between Kahalewai Place and JP Leong Highway, 24-Hour Volume Distribution

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2. Intersection Peak Hour Volumes

Intersection turning movement traffic counts were taken on Wednesday, March 11, 2015 during the weekday AM and PM peak periods (7:30-9:30 AM and 2:15-4:15 PM, respectively) and on Saturday, March 14, 2015 during the midday peak period (12:30-2:30 PM) at the intersections of Kamehameha Highway at Cane Haul Road and Kamehameha Highway at the primary driveway for the North Shore Marketplace. The AM peak period (7:30-9:30 AM) counts for the intersection of Kamehameha Highway and Opaeula Road/Kewalo Lane were taken on Thursday, March 12, 2015. As previously noted, at the time of these counts, Kewalo Lane was closed off at Kamehameha Highway due to construction on the Hale'iwa Store Lots property.

Counts taken by Austin, Tsutsumi & Associates, Inc. for the Hale'iwa Improvement District Project were provided for use with this analysis. Traffic counts at Kamehameha Highway and Opaeula Road were conducted during the PM peak period (12:00-4:00 PM) and Saturday midday peak period (1:00-3:00 PM) on Thursday, August 21, 2014 and Saturday, August 23, 2014, respectively.

The turning movement traffic counts included the classification of passenger vehicles, heavy vehicles (buses, trucks, vehicles with trailers), bicycles, and pedestrians. Table 2 provides the two-hour peak period volumes for the heavy vehicles, bicycles, and pedestrians at each intersection. The volume of heavy vehicles, as a percent of all vehicles traveling through the intersection, ranged from 1.9% to 4.6% during the AM, PM and Saturday midday peak periods. The volume of bicycles traveling through the intersections over the two-hour peak periods ranged from three (3) to 27 bicycles. The volume of pedestrians traveling through the intersections over the two-hour peak periods ranged from 12 to 208 pedestrians.

Table 2: Heavy Vehicles, Bicycles and Pedestrian Volumes during the Two-Hour Peak Period

Intersection	Time Period	Heavy Vehicle		Bicycle	Pedestrian
		Volume	%	Volume	Volume
Kamehameha Highway at Opaeula Road	AM	39	3.9	3	29
	PM	*	*	*	*
	Saturday	*	*	*	*
Kamehameha Highway at North Shore Marketplace primary driveway	AM	50	4.2	14	15
	PM	45	2.3	15	130
	Saturday	39	1.9	22	208
Kamehameha Highway at Cane Haul Road	AM	54	4.6	18	12
	PM	44	2.3	19	87
	Saturday	48	2.2	27	114
*Data was not included in Hale'iwa Improvement District Project counts.					

The peak hours varied at each study intersection and are shown in Table 3. Individual intersection peak hours were used to account for the highest traffic volume at each intersection. Peak hour turning movement volumes at each study intersection are presented in Figure 6. Appendix A includes the detailed turning movement classification count data.

Table 3: Intersection Peak Hours

Intersection- Kamehameha Highway at:	AM Peak Hour	PM Peak Hour	Saturday Peak Hour
Opaeula Road	7:45-8:45 AM	3:00-4:00 PM	1:30-2:30 PM
North Shore Marketplace primary driveway	8:30-9:30 AM	2:45-3:45 PM	1:30-2:30 PM
Cane Haul Road	8:30-9:30 AM	3:15-4:15 PM	12:45-1:45 PM

3. Pedestrians and Bicycle Volumes

Pedestrian and bicycles were counted at the study intersections during the AM, PM and Saturday two-hour peak periods. The highest volume of pedestrians over the two-hour peak period was observed at the intersection of Kamehameha Highway and North Shore Marketplace primary driveway on Saturday. 208 pedestrians were counted traveling through the intersection over this time. The highest volume of bicycles was observed at the intersection of Kamehameha Highway and Cane Haul Road on Saturday with 27 bicycles counted. Bicycle volumes ranged from three (3) to 19 bicycles during the weekday AM and PM peak periods counts at the three intersections. Although there are no dedicated bike facilities or paved sidewalks along Kamehameha Highway within Hale'iwa Town, the high volume of pedestrians shows the demand for walkable facilities.

4. Transit Bus Volumes

The City and County of Honolulu transit system (TheBus) has five bus routes traveling along Kamehameha Highway through the study area. The five bus routes are Route 52: Honolulu-Mililani-Hale'iwa, Route 55: Honolulu-Kāne'ohe-Hale'iwa, Route 76: Waialua-Hale'iwa, Bus Route 83: Wahiawa Town Express, and Route 88A: North Shore Express. Appendix B includes the detailed bus route schedule and map for these routes.

Bus Route 52: Honolulu-Mililani-Hale'iwa runs from 4:00 AM to 1:00 AM during the weekdays and from 5:00 AM to 1:00 AM during the weekends. This route serves downtown Honolulu, Mililani, Wahiawa, and Hale'iwa. There are two buses that travel in the northbound direction and two buses that travel in the southbound direction during the AM peak hour through the study are. There are two buses that travel in the northbound direction and two buses that travels in the southbound direction during the PM peak hour. The average daily ridership of Route 52 is approximately 5,000 passengers.

Bus Route 55: Honolulu-Kāne'ohe-Hale'iwa runs from 4:00 AM to 12:30 AM during the weekdays and from 4:30 AM to 12:30 AM during the weekends. This route serves downtown Honolulu, Kāne'ohe and the coastline between Kāne'ohe and Hale'iwa. There are three buses that travel in the northbound direction and three buses that travel in the southbound direction during the AM peak hour through the study area. There are two buses that travel in the northbound direction and one bus that travels in the southbound direction during the PM peak hour. The average daily ridership of Route 55 is approximately 3,900 passengers.

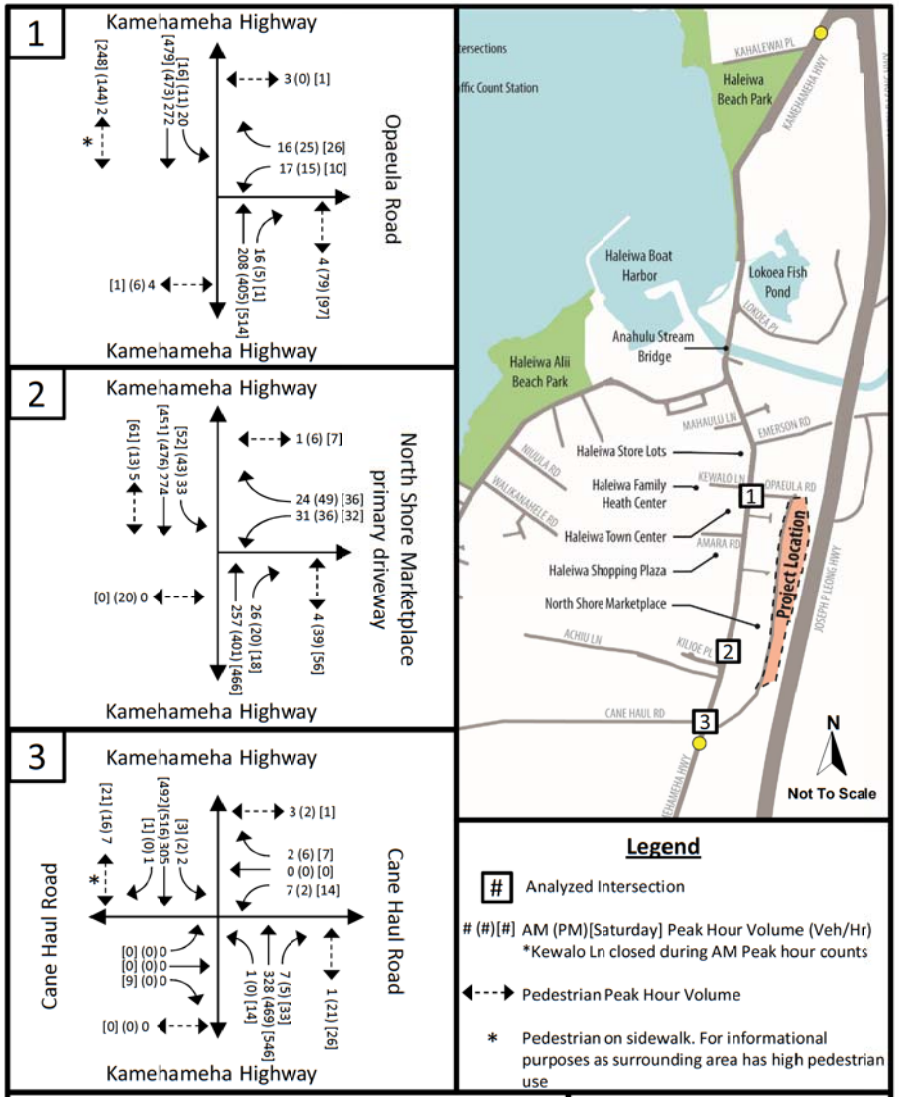

Figure 6: Existing (2015) Peak Hour Volumes

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Bus Route 76: Waialua-Hale'iwa runs from 6:00 AM to 7:15 PM during the weekdays and from 7:00 AM to 7:15 PM during the weekends. This route serves downtown Honolulu, Mililani, Wahiawa, and Hale'iwa. There is one bus that travels in both the northbound and southbound directions during the AM and PM peak hours in the study area. The average daily ridership of Route 76 is approximately 400 passengers.

Bus Route 83: Wahiawa Town Express runs from 5:00 AM to 7:00 PM during the weekdays and from 5:00 AM to 7:00 PM during the weekends. This route serves downtown Honolulu/Downtown, the University of Hawaii, Wahiawa, and Hale'iwa. There are no busses that travel through the study area during the AM and PM hours. The average daily ridership of Route 52 is approximately 700 passengers.

Bus Route 88A: North Shore Express has two buses that travel in the northbound direction from 4:00 AM to 6:45 AM and has two buses that travel in the southbound direction from 4:30 PM to 8:30 PM. This route serves the Pearl City, Mililani, North Shore, Kāne'che, downtown Honolulu and Ala Moana Center. There are no buses that travel through the study intersection during the peak hours. The average daily ridership of Route 88A is approximately 175 passengers.

C. Vehicle Level of Service

1. Methodology

Level of service (LOS) is a rating system used in traffic engineering to measure the effectiveness of roadway operating conditions. There are six LOS ranging from A to F. LOS A is defined as being the least interrupted flow conditions with little or no delays, whereas LOS F is defined as conditions where extreme delays exist. *A Policy on Geometric Design of Highways and Streets* (AASHTO, 2011) states that an "appropriate" LOS for an urban arterial, which is the classification of Kamehameha Highway through the study area, is LOS C or D. This assumes that appropriate LOS for study intersections and turning movements should be LOS D or better. Intersection LOS and delay was determined for the peak hours using *Synchro 9.0* traffic analysis software.

As stated in the *Highway Capacity Manual (HCM)* (TRB, 2010), LOS for a two-way stop controlled (TWSC) intersection is determined by the measured control delay (see Table 4) and is defined for each minor movement, not for the intersection as a whole. Vehicles traveling along the major, free-flow road, of a TWSC intersection, proceed through with minimal delay. Those vehicles approaching the intersection along the minor movement are controlled by a stop sign and thus experience delay attributable to the volume of vehicles passing along the free-flow road and the gaps available.

Table 4: LOS Criteria for Unsignalized Intersections

Average Control Delay (s/veh)	LOS by v/c Ratio	
	<=1.0	>1.0
≤ 10.0	A	F
>10 and ≤15	B	F
>15 and ≤25	C	F
>25 and ≤35	D	F
>35 and ≤50	E	F
>50	F	F

Source: *Highway Capacity Manual* (TRB, 2010)

The LOS analysis for signalized intersections is based on average total vehicle delay based on the methodologies of the *HCM* (TRB, 2010) shown in Table 5. High numbers of vehicles passing the intersection, long cycle lengths, inappropriate signal phasing, or a poor signal progression can result in long delays, and consequently poor LOS.

Table 5: LOS Criteria for Signalized Intersections

Average Control Delay (s/veh)	LOS by v/c Ratio	
	<=1.0	>1.0
≤ 10.0	A	F
>10 and ≤20	B	F
>20 and ≤35	C	F
>35 and ≤55	D	F
>55 and ≤80	E	F
>80	F	F

Source: *HCM* (TRB, 2010)

Another measure of intersection operation is the volume to capacity (v/c) ratio. This is the ratio of the volume of traffic utilizing the intersection compared to the maximum volume of vehicles that can be accommodated by the intersection during a specific period of time. A v/c ratio under 0.85 means the intersection is operating under capacity and excessive delays are not experienced. An intersection is operating near its capacity when v/c ratios range from 0.85 to 0.95. Unstable flows are expected when the v/c ratio is between 0.95 and 1.0. Any v/c ratio greater than or equal to 1.0 indicates that the intersection is operating at or above capacity which results in a LOS F per the *HCM* (TRB, 2010). A traffic movement can have a poor LOS but low v/c which suggests that the traffic volumes along that movement are low but have to wait a long time to make the movement. This is common for low volume protected turn movements or side streets that have to wait through a long cycle length for their split to come up.

It should be acknowledged that to encourage use and protect the safety of multi-modal travelers such as transit riders, pedestrians, and bicyclists, intersection LOS and delay should not be the sole measure to evaluate possible mitigation measures; instead, multi-modal access that limits road widening will be sought. It has been noted that the community intent is to control vehicular speeds, encourage multi-modal travel, and retain the character of Hale'iwa Town. In a highly commercial "main street" type of roadway, such as Kamehameha Highway through Hale'iwa, the purpose of the roadway is not as much to "move" traffic through the road, as it is to foster the current uses and desires of the community. This

includes the need for highly walkable and bikeable roads that improve safety of all users by keeping vehicular speeds low.

2. Existing (2015) Intersection Conditions

Existing (2015) LOS for the unsignalized and signalized intersection and traffic movements operated at an appropriate LOS D or better during the AM, PM and Saturday midday peak hours (see Table 6). V/C for all movements were calculated to be under capacity. However, through field observations, actual vehicle demand is not being met which results in long queues along Kamehameha Highway at times. This is not reflected in the intersection LOS calculations because of the inability of these vehicles to be counted traveling through these intersection. Appendix C provides the detailed analysis reports for the Existing (2015) conditions.

Table 6: Existing (2015) Intersection Level of Service

Unsignalized Intersection	App	Mvmt	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
			Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c	LOS
Kamehameha Highway at Opaeula Road	WB	LR	11.6	0.06	B	17.7	0.13	C	20.0	0.13	C
	SB	L	7.8	0.02	A	8.7	0.01	A	9.2	0.02	A
Kamehameha Highway at North Shore Marketplace driveway	WB	L	14.9	0.09	B	26.8	0.19	D	30.3	0.19	D
		R	10.2	0.04	B	13.5	0.11	B	14.1	0.09	B
	SB	L	8.0	0.03	A	8.8	0.05	A	9.1	0.06	A
Signalized Intersection	**App**	**Mvmt**	**AM Peak Hour**			**PM Peak Hour**			**Saturday Peak Hour**		
			Delay	**v/c**	**LOS**	**Delay**	**v/c**	**LOS**	**Delay**	**v/c**	**LOS**
Kamehameha Highway at Cane Haul Road	Intersection		1.8	-	A	1.9	-	A	3.0	-	A
	EB	LTR	-	-	-	-	-	-	37.7	0.22	D
	WB	LTR	35.9	0.09	D	36.6	0.11	D	37.0	0.20	D
	NB	LTR	1.3	0.22	A	1.7	0.33	A	2.2	0.39	A
	SB	LTR	1.3	0.20	A	1.60	0.32	A	1.9	0.32	A

III. FUTURE (2025) CONDITIONS

Full build-out of the proposed development is anticipated to be completed within the next 10 years. Therefore, future conditions are being assessed for the year 2025.

A. Surrounding Area Conditions

1. Future Surrounding Developments

Kamehameha Schools owns several agricultural properties immediately south of the proposed Backyard Hale'iwa project, on both sides of Kamehameha Highway. Kamehameha Schools has plans to develop The Town Center Commercial Development, an 85,000 square-foot commercial center, and Hale'iwa Residential Village, a residential subdivision, on the agricultural zoned lots. The Town Center Commercial Development includes restaurants, retail, agricultural retail, a full-service drug store, and a full-service grocery. The Hale'iwa Residential Village will include 125 condominium/apartment units, 150 townhouse units and 74 single-family units. Of the 350 new residential units, at least 130 units will be affordable housing. With no confirmation of when these developments will start construction or be completed, these developments were not be included in the future analysis.

No additional documents were found in the State of Hawai'i Office of Environmental Quality Control library for future developments in the surrounding area.

2. Roadway Construction

Kamehameha Schools is currently constructing the Hale'iwa Store Lots development located on the west side of Kamehameha Highway between Kewalo Lane and Mahaulu Lane. This area previously housed Matsumoto's and Aoki Shave Ice Stores. The redeveloped area now includes new buildings for additional commercial uses, a paved parking lot, paved sidewalks throughout the property and outdoor seating area away from Kamehameha Highway. According to the *Hale'iwa Commercial Redevelopment Project Traffic Impact Analysis Report* (TMC, 2011), there were four alternative roadway schemes developed for Kamehameha Highway intersections with Kewalo Lane and with Mahaulu Lane to mitigate the anticipated traffic impacts from the redeveloped Hale'iwa Store Lots. All of the mitigating alternatives at Kewalo Lane include a dedicated left-turn lane and a median shelter lane along Kamehameha Highway for the northbound-headed vehicles. However, the neighborhood board was opposed to the alternative as they did not want the widening of Kamehameha Highway. Although Kamehameha Schools has not installed the dedicated left turn lane and a median shelter lane along Kamehameha Highway, they are required to do an updated TIAR to determine the need of these mitigating measures. The *Unilateral Agreement and Declaration for Conditional Zoning* for Hale'iwa Store Lots (dated September 26, 2012) states that Kamehameha Schools must "update the Traffic Impact Analysis Report approximately one year after the completion of the Project, provided at least 80 percent of the Project is occupied or as otherwise determined by the Department of Planning and Permitting to validate projections to the trip generation rates and traffic assignment volumes at each driveway, as contained in the initial TIAR dated May 2011. The update shall identify whether additional traffic mitigation measures are necessary to support this Project." The construction of these mitigating alternatives is unknown at this time and therefore is assumed that it will not be constructed by 2025.

The City and County of Honolulu, Department of Design and Construction is in the process of developing and evaluating alternatives for the Hale'iwa Improvement District Project. Improvements will include construction of pedestrian walkways, undergrounding utilities and installation of landscaping along Kamehameha Highway between Opaeula Stream Bridge and Anahulu River Bridge. These improvements are not anticipated to modify lane configurations along Kamehameha Highway. The completion of these improvements are unknown as the project is currently in the planning stages.

From additional research into the Statewide Transportation Improvements Program (STIP), no additional roadway construction is expected to be completed along Kamehameha Highway within the study area by the year 2025.

B. Geometric Conditions

There are no anticipated lane configuration modifications at the three study intersections along Kamehameha Highway. Therefore, the lane configuration for Future (2025) Without Project conditions will be similar to existing conditions shown in Figure 6.

C. Future (2025) Volumes

1. Background Growth

Changes in traffic volume along Kamehameha Highway, from HDOT *Historical Traffic Station Maps*, have been mixed over the past five years. Traffic volumes along Kamehameha Highway between Pa'ala'a Road and Achiu Lane showed an increase of 2.1% annually from 2008 to 2011. Traffic volumes along Kamehameha Highway between Kahalewai Place and Joseph P. Leong Highway slightly decreased from 2008 to 2013.

The *Traffic Impact Analysis Report for the Proposed Hale'iwa Commercial Redevelopment Project* (TMC, 2011) used the *O'ahu Regional Transportation Plan 2030* by the O'ahu Metropolitan Planning Organization (MPO) in April 2006 to determine background growth. Over a 25-year period, the population of the North Shore of O'ahu was expected to increase by 5%. A projected background growth in traffic of 0.5% per year was used in analysis for the *Hale'iwa Commercial Redevelopment Project TIAR*. The *O'ahu Regional Transportation Plan 2035* (OahuMPO, 2011) showed that over a 28-year period, the population of North Shore of O'ahu would increase by 13%. This results in an annual growth of 0.5%. Although population growth is not directly related to traffic growth, a compounded annual increase of 0.5% was assumed for all traffic movements along Kamehameha Highway. The increase was applied to the existing traffic along Kamehameha Highway to get the forecasted volumes for Future (2025) Without Project conditions.

2. Surrounding Area Development

No additional increase in traffic volumes were assumed for future developments in the surrounding area. Figure 7 shows the Future (2025) Without Project peak hour volumes at the study intersections.

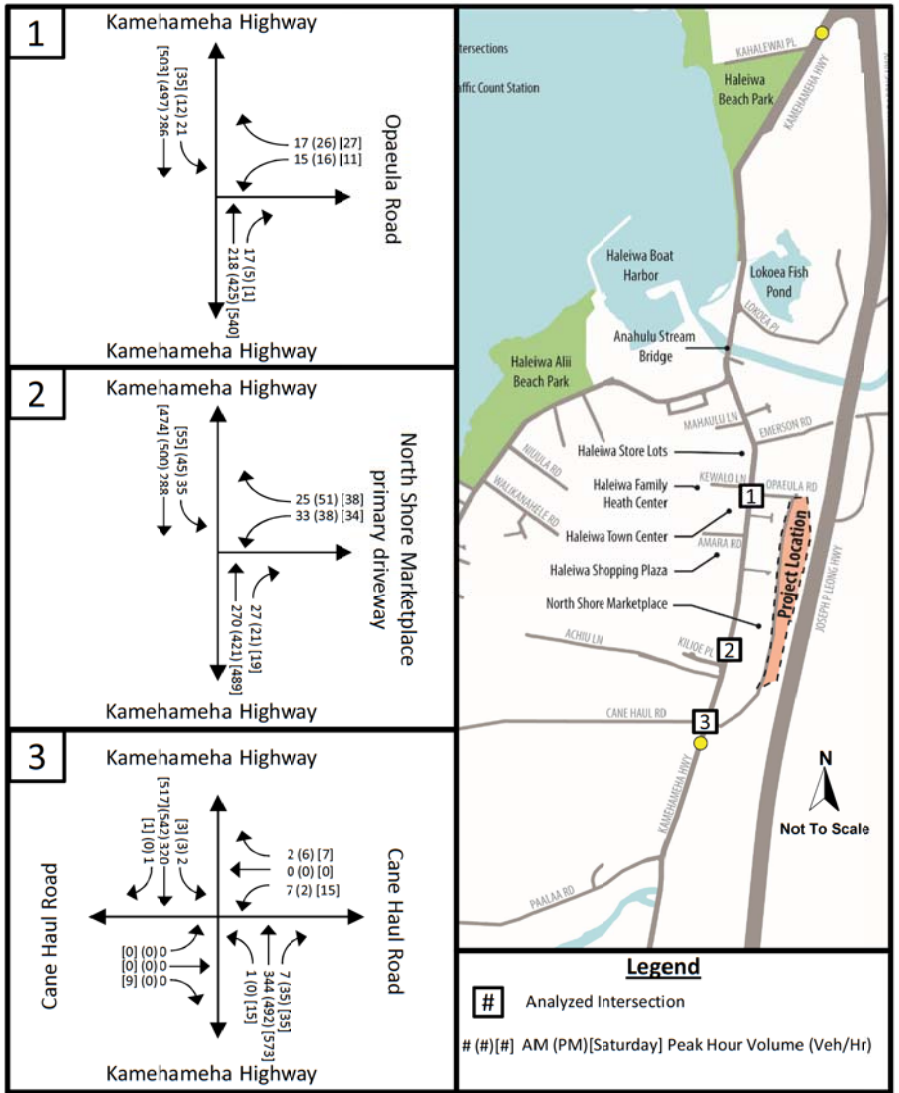

Figure 7: Future (2025) Without Project Peak Hour Volumes

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3. Project Related Volumes

The proposed Backyard Hale'iwa project is assumed to be fully constructed and operational within the next 10 years.

a) Trip Generation

The proposed Backyard Hale'iwa project will include 156 two-bedroom apartment units, an approximately 5,600 square-foot restaurant, a farmer's market, and various studios, shops and galleries spread over 19,200 square-feet. Trips generated from the proposed apartments, restaurant and retail development were calculated using nationally accepted land use rates as provided in the *Trip Generation, 8th Edition* (ITE, 2008).

The apartment buildings are expected to be at most two-stories high. Therefore, the land use "Low-Rise Apartment" was used to calculate the trips generated from the apartments.

The "Quality Restaurant" is defined as a "high quality, full-service eating establishments with typical turnover rates of at least one hour or longer. Quality restaurants generally do not serve breakfast; some do not serve lunch; all serve dinner." The proposed restaurant for Backyard Hale'iwa is anticipated to be open during lunch and dinner only. This land use was considered applicable to calculate the trips generated from the proposed restaurant.

The most comparable land use for studios, shops and galleries is "Specialty Retail." This land use is defined as "a variety of retail shops and specialize in quality apparel." This describes the smaller eclectic type of retail stores within Hale'iwa Town. Existing studios, shops and galleries typically open around 10:00 AM, after the AM peak hour of traffic. Similarly, "Specialty Retail" does not have trip generation rates for the AM peak hour. For this reason, there will be no trips generated during the AM peak hour for this land use. The trips generated during the PM peak hour was also applied for the Saturday midday peak hour since there were no trip generation rates for the Saturday midday peak hour.

The *Trip Generation, 8th Edition* (ITE, 2008) does not contain a land use that is comparable to a farmer's market. A similar use studied in the *Traffic Assessment of the Proposed Kīlauea Agricultural Park* (Ng, 2011) provided project related trips for a farmers' market. Backyard Hale'iwa is proposing to include about 65 parking stalls for customers and vendors at the farmer's market. The *Traffic Assessment of the Proposed Kīlauea Agricultural Park* (Ng, 2011) made the assumption that 20% of the parking stalls will be for vendors while 80% will be for customers. This was considered applicable for the proposed development. Peak hour traffic is based on full occupancy of the parking lot and an hour average stay by customers. Therefore, the total trips generated by the farmer's market during a peak hour is 104 vehicles per hour. This trip generation will be used for the AM, PM and Saturday midday volumes.

An additional 100 parking stalls will be provided within the proposed property to accommodate parking relocation required as a result of the Hale'iwa Improvement District Project. To determine the trips generated from the additional 100 parking stalls, an equivalent ratio of square-footage of commercial area to number of parking stalls was calculated. This calculation resulted in an approximately 27,100 square-foot development. The land use that best represents the existing commercial area in Hale'iwa Town is "Specialty Retail" and therefore this was used for calculating trip rates.

Table 7 provides the total project related trips generated for the proposed development.

Table 7: Total Project Related Trip Generation

Land Use [ITE Code]	Quantity	Trip Generation								
		AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
		Total	In	Out	Total	In	Out	Total	In	Out
Low-Rise Apartment [221]*	156 units	72	15	57	90	59	31	90	49	41
Quality Restaurant [931]*	5,600 s.f.	0**	0**	0**	62	37	25	61	32	29
Specialty Retail [814]*	19,200 s.f.	0	0	0	52	23	29	52+	23+	29+
Farmer's Market	5,200 s.f.	104	52	52	104	52	52	104	52	52
Additional Parking	100 stalls	0	0	0	71	31	40	71+	31+	40+
TOTAL TRIP GENERATION		176	67	109	379	202	177	378	187	191

** Source: Trip Generation, 8th Edition (ITE, 2008)*
*** = Restaurant will only be open during lunch and dinner and therefore it is assumed that no trips will be generated during the AM peak hour.*
+ = Used results from PM trip generation because Saturday rates were not available.

b) Trip Assignment

Although the total project related trips are calculated for individual land uses, as shown in Table 7, the total trips added to the roadway system will not necessarily be the sum of these trips. The occurrence of multiple stops/destinations within the same trip, as well as capturing trips from existing vehicles along the roadway network, may reduce the total trips added to the roadway system. The three types of project related trips considered are primary, pass-by trips, and diverted trips (see Table 8 for definitions).

Table 8: Project Related Trip Definitions

Trip Type	Definition
Primary	Trips made for the specific purpose of visiting the generator. The stop at the generator is the primary reason for the trip.
Pass-by	Traffic currently passing the site on an adjacent street or roadway that offers direct access to the generator.
Diverted	Trips that are attracted from the traffic volume on roadways within the vicinity of the generator but require a diversion from that roadway to another roadway to gain access to the site.
Source: *ITE Trip Generation Handbook, 2004*	

Primary trips may be either internal or external of the development. The *Trip Generation Handbook, Second Edition* (ITE, 2004) states that "a multi-use development is typically a single real-estate project that consists of two or more ITE land use classifications between which trips can be made without using

the off-site road system." This proposed development is considered a multi-use development as it has a few land uses.

For this analysis, primary internal trips are considered to be those made with origin and destination within the proposed Backyard Hale'iwa development. This is equivalent to someone traveling between their residence and the restaurant, retail area or farmer's market. The internal capture rates provided in the *Trip Generation Handbook, Second Edition* (ITE, 2004) ranged from 28% to 41%. The intent of Backyard Hale'iwa is to provide rental accommodations for workers on-site. Therefore, to account for the trips that will only occur within Backyard Hale'iwa, an internal capture rate of 40% was applied to the weekday AM, PM and Saturday midday peak hours of traffic for residential and commercial trips.

A pass-by reduction was also considered. The majority of the users of the additional 100 parking stalls within Backyard Hale'iwa will already be traveling to Hale'iwa Town. The users will have the option to park within Backyard Hale'iwa instead of other parking areas within Hale'iwa Town. A 50% pass-by reduction was applied to the trips generated by the additional 100 parking stalls to account. No additional pass-by reduction rate was applied to the commercial generated trips for a more conservative analysis.

Primary external trips are those that start or end within Backyard Hale'iwa with the other side of the trip being external to the development. Primary external trips are comprised of the remainder of all trips not associated with internal trips and are considered to be the majority of all trips made. Table 9 provides the breakdown of internal, pass-by and external trips generated.

Table 9: Project Related Trip Generation – Internal, Pass-by and External Trips

Trip Type	Volumes (vph)								
	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
	Total	In	Out	Total	In	Out	Total	In	Out
Total Project Related Trips	176	67	109	379	202	177	378	187	191
Internal Trips (40% of residential and commercial)	71	27	44	123	68	55	123	63	60
Pass-by Trips (50% of additional parking stalls)	0	0	0	36	16	20	36	16	20
Primary External Trips	105	40	65	220	118	102	219	108	111

c) Modal Split

Backyard Hale'iwa is being proposed to include affordable housing in close proximity to employment in the Hale'iwa Town Center in order to enable trips by foot or bike. It can therefore be assumed that there will be a low use of personal vehicles as compared to a similar sized development. Of the trips generated by the residential units it is assumed that 25% of these trips would be by passenger vehicles while the rest would be through walking, bicycle, or bus transit. Of the trips generated by the commercial uses, it is assumed that 50% of these trips would be passenger vehicles. All trips generated from the additional 100 parking stalls are considered to be through passenger vehicle since the parking is being provided to replace existing stalls used.

Table 10 provides the modal breakdown of the primary external trips. The Future (2025) With Project analysis will determine the vehicular impact of these external trips to the surrounding roadways. The vehicular volume will be distributed to the external roadways based on the trip distribution which is discussed in the next section.

Table 10: Project Related Transportation Mode for Primary External Trips

Modal Choice	Primary External Trips								
	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
	Total	In	Out	Total	In	Out	Total	In	Out
Pedestrian/Bicycle/Transit	62	22	40	105	59	46	105	54	52
Passenger Vehicles	42	18	24	115	58	57	113	54	59

d) Trip Distribution

Trip distribution matches trip maker's origins and destinations to determine the number of trips originating in each region. Traffic assignment involves the selection of routes between the specified origins and destinations. Trips were assumed to follow the distribution of HDOT traffic data and most recent peak period counts along Kamehameha Highway. Trip distribution along Kamehameha Highway had an equal split of vehicles traveling from the north and south.

Access to Backyard Hale'iwa will be off of Kamehameha Highway through Opaeula Road and through Cane Haul Road. It was assumed that vehicles traveling to and from the north will use Opaeula Road while vehicles traveling to and from the south will use Cane Haul Road.

Pass-by trips accessing the project were rerouted from their existing traffic route. Pass-by vehicles from the north traveling in the southbound direction are projected to enter and exit at Opaeula Road. Therefore, vehicles entering will make a southbound left turn from Kamehameha Highway onto Opaeula Road and vehicles exiting would make a westbound left turn from Opaeula Road onto Kamehameha Highway. Pass-by vehicles from the south traveling in the northbound direction will enter and exit at Cane Haul Road. Therefore, vehicles entering will make a northbound right turn from Kamehameha Highway onto Cane Haul Road and vehicles exiting will make a westbound right turn from Cane Haul Road onto Kamehameha Highway.

Figure 8 shows the forecasted vehicular project related trips at the three study intersections during the AM, PM and Saturday midday peak hours.

4. Future (2025) With Project Volumes

Project related trips were added to the Future (2025) Without Project volumes to calculate the Future (2025) With Project volumes (see Figure 9).

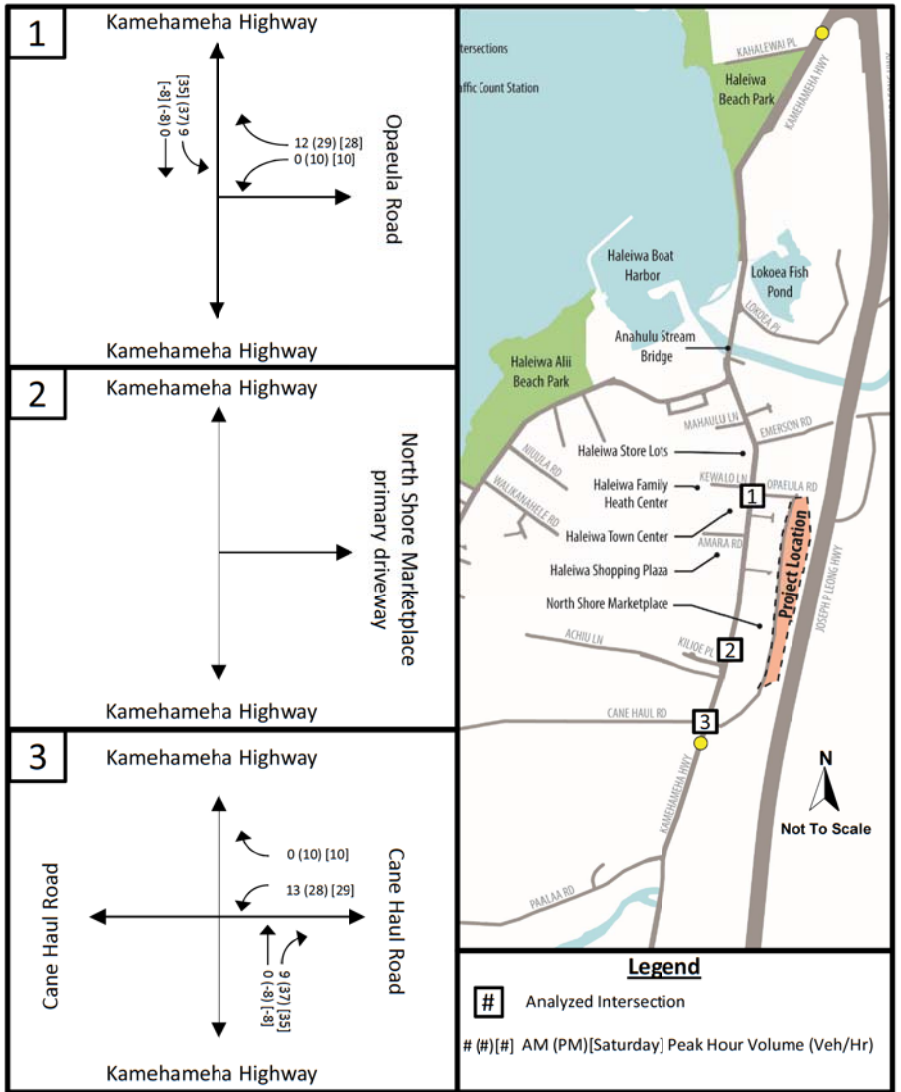

Figure 8: Project Related Peak Hour Volumes

Backyard Hale'iwa – Hale'iwa, O'ahu

SSFM INTERNATIONAL

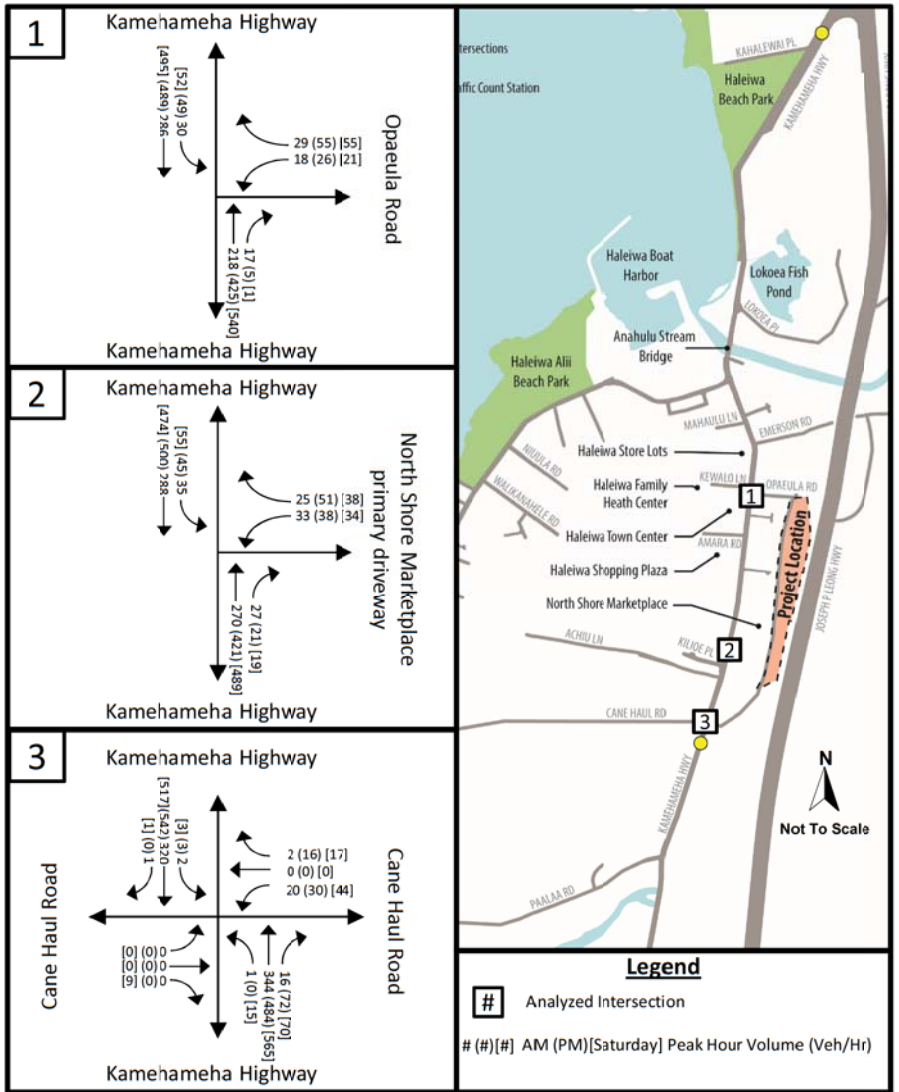

Figure 9: Future (2025) With Project Peak Hour Volumes

Backyard Hale'iwa – Hale'iwa, O'ahu

SSFM INTERNATIONAL

D. Future (2025) Level of Service

1. Intersection LOS

a) Future (2025) Without Project LOS

Future (2025) Without Project LOS for the unsignalized and signalized intersection and movements will continue to operate at an appropriate LOS D or better during the AM, PM and Saturday midday peak hours with all v/c under capacity (see Table 11). Appendix D provides the detailed analysis reports for the Future (2025) Without Project conditions.

Table 11: Future (2025) Without Project Intersection Level of Service

Unsignalized Intersection	App	Mvmt	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
			Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c	LOS
Kamehameha Highway at Opaeula Road	WB	LR	11.8	0.07	B	18.6	0.14	C	21.3	0.15	C
	SB	L	7.8	0.02	A	8.8	0.01	A	9.3	0.02	A
Kamehameha Highway at North Shore Marketplace driveway	WB	L	15.5	0.10	C	29.1	0.21	D	33.5	0.22	D
		R	10.3	0.04	B	13.8	0.12	B	14.5	0.10	B
	SB	L	8.1	0.03	A	8.8	0.05	A	9.2	0.06	A
Signalized Intersection	**App**	**Mvmt**	**AM Peak Hour**			**PM Peak Hour**			**Saturday Peak Hour**		
			Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c	LOS
Kamehameha Highway at Cane Haul Road	Intersection		1.8	-	A	2.0	-	A	3.1	-	A
	EB	LTR	-	-	-	-	-	-	37.6	0.21	D
	WB	LTR	35.9	0.09	D	36.6	0.11	D	37.0	0.20	D
	NB	LTR	1.3	0.23	A	1.7	0.34	A	2.4	0.41	A
	SB	LTR	1.3	0.21	A	1.7	0.34	A	2.0	0.34	A

b) Future (2025) With Project LOS

Future (2025) With Project LOS for the unsignalized and signalized intersection and movements continued to operate at an appropriate LOS D or better during the AM, PM and Saturday midday peak hours with all v/c under capacity (see Table 12). Some delay and v/c ratios slightly increased but not sufficient to change the LOS from Future (2025) Without Project conditions. At the signalized intersection of Kamehameha Highway and Cane Haul Road, traffic signal cycle lengths were optimized. As a result, more time was given to the side streets and the operations on the side streets improved. Appendix E provides the detailed analysis reports for the Future (2025) With Project conditions.

Table 12: Future (2025) With Project Intersection Level of Service

Unsignalized Intersection	App	Mvmt	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
			Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c	LOS
Kamehameha Highway at Opaeula Road	WB	LR	11.6	0.08	B	21.7	0.28	C	26.5	0.32	D
	SB	L	7.9	0.02	A	8.9	0.05	A	9.5	0.06	A
Kamehameha Highway at North Shore Marketplace driveway	WB	L	15.5	0.10	C	29.1	0.21	D	33.5	0.22	D
		R	10.3	0.04	B	13.8	0.12	B	14.5	0.10	B
	SB	L	8.1	0.03	A	8.8	0.05	A	9.2	0.06	A
Signalized Intersection	**App**	**Mvmt**	**AM Peak Hour**			**PM Peak Hour**			**Saturday Peak Hour**		
			Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c	LOS
Kamehameha Highway at Cane Haul Road	Intersection		2.8	-	A	4.0	-	A	4.8	-	A
	EB	LTR	-	-	-	-	-	-	20.4	0. 10	C
	WB	LTR	21.1	0.12	C	21.6	0.24	C	22.0	0.30	C
	NB	LTR	2.3	0.26	A	3.4	0.43	A	4.2	0.49	A
	SB	LTR	2.2	0.23	A	3.1	0.39	A	3.4	0.38	A

2. Mitigation Measures

All driveway access roads to Backyard Hale'iwa should include a minimum of eight-foot wide sidewalks with landscaping and utilities located in the buffer zone where possible. Roadway design should also be completed to ensure vehicles travel slow, thereby allowing for bikes to share the roadway and pedestrians to cross safely. With that, sufficient bicycle parking should be provided on site in a well-lit, visible area.

a) Kamehameha Highway at Opaeula Road

Three options were considered to address future with project conditions at the intersection of Kamehameha Highway and Opaeula Road.

(1) No change to existing two-lane roadway conditions, requiring all turns to be made through a single lane. This will likely result in added delay along Kamehameha Highway however vehicular speeds will remain low as a result of congestion. Operation results from this analysis are shown in Table 12 and are LOS D or better for all movements. This does not include the intersection with Kewalo Lane since it currently is offset from the intersection with Opaeula Road.

(2) Realign opposing streets of Opaeula Road and Kewalo Lane to better align, and provide a dedicated left-turn storage lane at the intersection for each approach along Kamehameha Highway. This will alleviate delay at the intersection while containing roadway widening to the extents of the intersection approaches. Operation results from this analysis are shown in Table 13. By aligning Kewalo Lane and Opaeula Road, all movements operate at LOS D or better during the AM, PM and Saturday midday peak hours, except for the eastbound approach during Saturday midday peak hour which operates at LOS E.

(3) Construct a roundabout or mini-circle at the intersection to facilitate slow speed travel and minimize delay which will provide ease of access for pedestrian and bicycle movements. Operation results from this analysis are shown in Table 13 and result in LOS A for all approaches.

Table 13: Kamehameha Highway and Opaeula Road/Kewalo Lane – Mitigation LOS Results

Mitigation Option	App	Mvmt	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
			Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c	LOS
Option 2: Realign opposing streets	WB	LTR	13.1	0.10	B	26.0	0.33	D	31.7	0.37	D
	SB	L	7.9	0.05	A	8.9	0.05	A	9.5	0.06	A
	NB	L	8.0	0.01	A	8.8	0.01	A	8.8	0.01	A
	EB	LTR	14.7	0.01	B	29.1	0.21	D	**39.7**	0.28	**E**
Option 3: Roundabout	WB	LTR	5.0	0.05	A	6.0	0.11	A	7.0	0.12	A
	SB	LTR	6.0	0.35	A	7.0	0.52	A	7.0	0.52	A
	NB	LTR	5.0	0.22	A	6.0	0.41	A	8.0	0.52	A
	EB	LTR	5.0	0.04	A	6.0	0.06	A	6.0	0.06	A

b) Kamehameha Highway at Cane Haul Road

An option to construct a single-lane roundabout was considered at the intersection of Kamehameha Highway and Cane Haul Road. A roundabout would facilitate slow speed travel and minimize delay which will provide ease of access for all modes of travel, including agricultural vehicles, buses, pedestrian and bicycle movements. This could also serve as a gateway to Hale'iwa Town that provides the visual cue to slow down. The roundabout operation results are included in Table 14. All approaches operate at LOS A.

Table 14: Kamehameha Highway and Cane Haul Road – Roundabout LOS Results

Mitigation Option	App	Mvmt	AM Peak Hour			PM Peak Hour			Saturday Peak Hour		
			Delay	v/c	LOS	Delay	v/c	LOS	Delay	v/c	LOS
Roundabout	WB	LTR	5.0	0.03	A	6.0	0.07	A	7.0	0.10	A
	SB	LTR	5.0	0.26	A	7.0	0.50	A	7.0	0.49	A
	NB	LTR	5.0	0.32	A	7.0	0.49	A	8.0	0.58	A
	EB	LTR	0.0	0.00	A	0.0	0.00	A	6.0	0.01	A

If signalization remains, pedestrian crosswalks and pedestrian signals should be provided to allow for safe access. Appendix E provides the detailed analysis reports for the mitigation measures for Future (2025) With Project conditions, as discussed above.

IV. SUMMARY AND RECOMMENDATIONS

A traffic study was conducted for Backyard Hale'iwa, a proposed mixed-use development within Hale'iwa Town on the north shore of the island of O'ahu. Vehicular access to the development is being proposed through Cane Haul Road on the south side of the property and through Opaeula Road on the north side with additional dedicated pedestrian access next to Malama Market. Full build-out of the development is anticipated to occur by the year 2025.

Existing conditions reflect heavy traffic volumes in the middle of the day, not following typical peak commuter hours. High pedestrian volumes also exist in the area, especially during weekends. Even though intersection operations reflect an appropriate LOS, it is believed that current capacity constraints along the corridor restrict flow. Ongoing and proposed development in the area are meant to improve the walkability. Resulting LOS remain appropriate for Future (2025) Without Project conditions.

With the proposed trips resulting from Backyard Hale'iwa, operations at three study intersections remain appropriate LOS D or better. Improvements should consider including a minimum of eight-foot wide sidewalks with landscaping and utilities located in the buffer zone where possible along all driveway access roads to the proposed Backyard Hale'iwa project.

With additional development in the area, the existing intersections of Opaeula Road and Kewalo Lane should be considered for realignment to improve accessibility. The only poorly performing turn movement in this configuration was from Kewalo Lane, across from Opaeula Road. Another option to better address turning vehicle traffic conflicts and to calm traffic speeds along Kamehameha Highway at Opaeula Road and Kewalo Lane would be the construction of a roundabout or mini-circle. This option results in appropriate LOS.

A single-lane roundabout at the intersection of Kamehameha Highway and Cane Haul Road would facilitate slow speed travel and minimize delay which will provide ease of access for all modes of travel. A roundabout could also serve as a gateway to Hale'iwa Town that provides the visual cue to slow down. The operation of a roundabout at this intersection operated at appropriate LOS. If the intersection remains signalized, pedestrian crosswalks and pedestrian signals should be provided to allow for safe access.

V. REFERENCES

American Association of State Highway and Transportation Officials. *A Policy on Geometric Design of Highways and Streets*, 2011.

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Institute of Transportation Engineers. *Trip Generation Handbook, Second Edition,* 2004.

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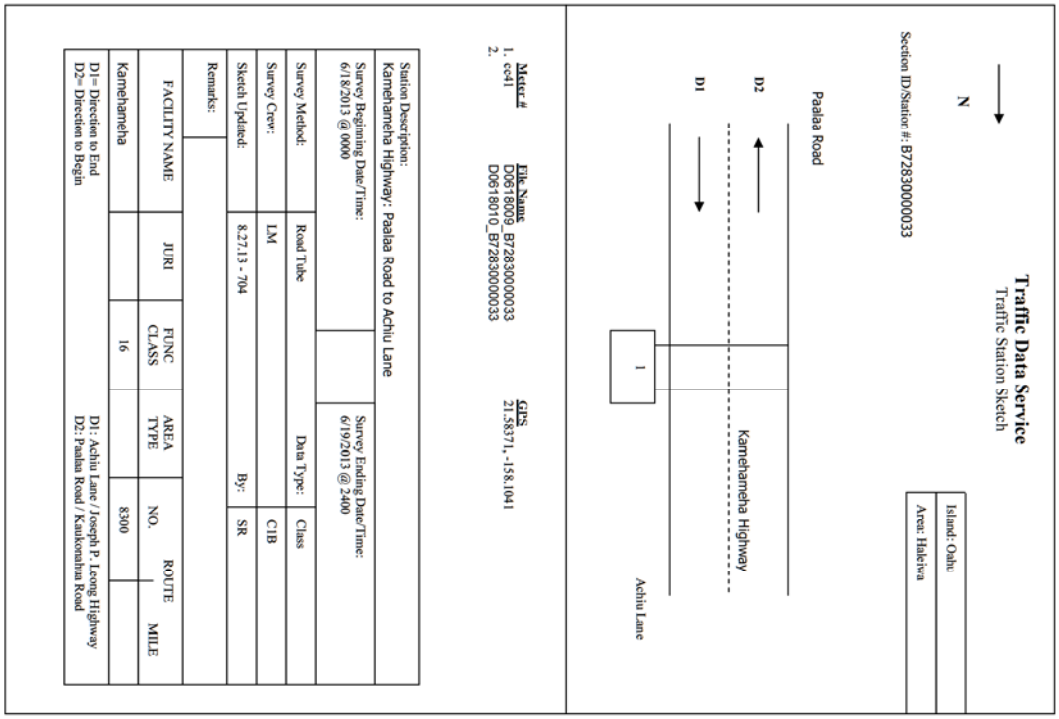
APPENDIX A

24-Hour HDOT Traffic Data and Intersection Peak Period Traffic Counts



Run Date: 2014/05/29

Hawaii Department of Transportation
Highways Division **Highways Planning Survey Section**
2013 Program Count - Summary

Site ID: B72830000033
Functional Class: URBAN:MINOR ARTERIAL
Location: Kamehameha Hwy - Paalaa Rd to Achiu Ln

Town: Oahu
Count Type: CLASS

DIR 1: +MP **DIR 2:** -MP
Counter Type: Tube

Final AADT: 11700
Route No: 8300

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 06/18/2013															
12:00-12:15	6	5	11	06:00-06:15	15	20	35	12:00-12:15	125	105	230	06:00-06:15	92	118	210
12:15-12:30	3	6	9	06:15-06:30	21	24	45	12:15-12:30	129	110	239	06:15-06:30	87	111	198
12:30-12:45	3	6	9	06:30-06:45	41	24	65	12:30-12:45	133	107	240	06:30-06:45	77	104	181
12:45-01:00	6	1	7	06:45-07:00	40	20	60	12:45-01:00	137	105	242	06:45-07:00	62	83	145
01:00-01:15	2	0	2	07:00-07:15	52	29	81	01:00-01:15	88	117	205	07:00-07:15	78	62	140
01:15-01:30	1	2	3	07:15-07:30	45	29	74	01:15-01:30	130	118	248	07:15-07:30	71	88	159
01:30-01:45	3	2	5	07:30-07:45	43	48	91	01:30-01:45	130	123	253	07:30-07:45	48	93	141
01:45-02:00	3	1	4	07:45-08:00	79	44	123	01:45-02:00	98	120	218	07:45-08:00	43	71	114
02:00-02:15	4	2	6	08:00-08:15	65	49	114	02:00-02:15	114	125	239	08:00-08:15	55	71	126
02:15-02:30	1	1	2	08:15-08:30	68	66	134	02:15-02:30	114	121	235	08:15-08:30	44	59	103
02:30-02:45	3	0	3	08:30-08:45	76	76	152	02:30-02:45	123	122	245	08:30-08:45	55	59	114
02:45-03:00	5	2	7	08:45-09:00	82	92	174	02:45-03:00	119	137	256	08:45-09:00	34	51	85
03:00-03:15	0	0	0	09:00-09:15	99	76	175	03:00-03:15	116	135	251	09:00-09:15	39	43	82
03:15-03:30	2	3	5	09:15-09:30	75	82	157	03:15-03:30	114	136	250	09:15-09:30	27	42	69
03:30-03:45	5	2	7	09:30-09:45	97	80	177	03:30-03:45	111	135	246	09:30-09:45	12	23	35
03:45-04:00	0	1	1	09:45-10:00	87	75	162	03:45-04:00	109	145	254	09:45-10:00	24	22	46
04:00-04:15	7	2	9	10:00-10:15	104	80	184	04:00-04:15	88	139	227	10:00-10:15	12	22	34
04:15-04:30	3	6	9	10:15-10:30	114	80	194	04:15-04:30	95	114	209	10:15-10:30	9	12	21
04:30-04:45	9	7	16	10:30-10:45	106	93	199	04:30-04:45	97	111	208	10:30-10:45	12	9	21
04:45-05:00	7	9	16	10:45-11:00	127	94	221	04:45-05:00	86	114	200	10:45-11:00	15	20	35
05:00-05:15	8	12	20	11:00-11:15	112	102	214	05:00-05:15	109	119	228	11:00-11:15	8	7	15
05:15-05:30	12	8	20	11:15-11:30	123	113	236	05:15-05:30	93	107	200	11:15-11:30	12	14	26
05:30-05:45	21	9	30	11:30-11:45	111	91	202	05:30-05:45	82	127	209	11:30-11:45	10	5	15
05:45-06:00	22	20	42	11:45-12:00	117	91	208	05:45-06:00	84	99	183	11:45-12:00	11	3	14

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:00 AM to 09:00 AM		
AM - PEAK HR VOLUME	291	283	574
AM - K FACTOR (%)			5.05
AM - D (%)	50.70	49.30	100.00
DIRECTIONAL PEAK			
AM - PEAK HR TIME	08:00 AM to 09:00 AM	08:00 AM to 09:00 AM	
AM - PEAK HR VOLUME	291	283	

PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2	
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:00 PM to 04:00 PM		
PM - PEAK HR VOLUME	450	551	1001
PM - K FACTOR (%)			8.81
PM - D (%)	44.96	55.04	100.00
DIRECTIONAL PEAK			
PM - PEAK HR TIME	03:00 PM to 04:00 PM	03:15 PM to 04:15 PM	
PM - PEAK HR VOLUME	450	555	

AM PERIOD (00:00-12:00)			
TWO DIRECTIONAL PEAK			
AM - PEAK HR TIME	10:45 AM to 11:45 AM		
AM - PEAK HR VOLUME	473	400	873
AM - K FACTOR (%)			7.68
AM - D (%)	54.18	45.82	100.00

PM PERIOD (12:00-24:00)			
TWO DIRECTIONAL PEAK			
PM - PEAK HR TIME	02:45 PM to 03:45 PM		
PM - PEAK HR VOLUME	460	543	1003
PM - K FACTOR (%)			8.83
PM - D (%)	45.86	54.14	100.00

NON-COMMUTER PERIOD (09:00-15:00)			
TWO DIRECTIONAL PEAK			
PEAK HR TIME	02:00 PM to 03:00 PM		
PEAK HR VOLUME	470	505	975
DIRECTIONAL PEAK			
PEAK HR TIME	12:00 PM to 01:00 PM	02:00 PM to 03:00 PM	
PEAK HR VOLUME	524	505	

6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2	Total
AM 6-HR PERIOD (06:00-12:00)	1,899	1,578	3,477
AM 12-HR PERIOD (00:00-12:00)	2,035	1,685	3,720
PM 6-HR PERIOD (12:00-18:00)	2,624	2,891	5,515
PM 12-HR PERIOD (12:00-24:00)	3,561	4,083	7,644
24 HOUR PERIOD	5,596	5,768	11,364
D (%)	49.24	50.76	100.00

Run Date: 2014/05/28

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2013

Site ID: B7283X000033 Route No: 8300 Date From: 2013/06/18 0:00
Town: Oahu Direction: +MP Date To: 2013/06/19 23:45
Location: Kamehameha Hwy - Paalaa Rd to Achiu Ln
Functional Classification: 16 URBAN:MINOR ARTERIAL
REPORT TOTALS - 48 HOURS RECORDED

	VOLUME	%	NUMBER OF AXLES
Cycles	268	1.18%	535
PC	17242	75.99%	34484
2A-4T	4750	20.94%	9500
LIGHT VEHICLE TOTALS	22260	98.11%	44519
HEAVY VEHICLES			
Bus	209	0.92%	523
SINGLE UNIT TRUCK			
2A-6T	149	0.66%	298
3A-SU	24	0.11%	72
4A-SU	1	0.00%	4
SINGLE-TRAILER TRUCKS			
4A-ST	24	0.11%	96
5A-ST	15	0.07%	75
6A-ST	4	0.02%	24
MULTI-TRAILER TRUCKS			
5A-MT	1	0.00%	5
6A-MT	1	0.00%	6
7A-MT	2	0.01%	14
HEAVY VEHICLE TOTALS	430	1.90%	1117
CLASSIFIED VEHICLES TOTALS	22690 (A)	100.00%	45636 (B)
UNCLASSIFIED VEHICLES TOTALS	-1	-0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.994

ROADTUBE EQUIVALENT(B/2) = 22818 (C)

PEAK HOUR VOLUME : 1001 2013/06/18 15:00	PEAK HOUR TRUCK VOLUME	% TOTAL PEAK HOUR VOLUME	24 HOUR TRUCK VOLUME	AADT	% OF AADT	HPMS K-FACTOR (PEAK/AADT) (ITEM 66)
SINGLE UNIT TRUCKS (TYPE 4-7)	6	(65A-1) 0.60%	191	11700	(65A-2) 1.63%	8.56%
COMBINATION (TYPE 8-13)	4	(65B-1) 0.40%	23		(65B-2) 0.20%	8.56%

Run Date: 2014/05/29

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

2013 Program Count - Summary

Site ID: B7283X000033
Functional Class: URBAN:MINOR ARTERIAL
Location: Kamehameha Hwy - Paalaa Rd to Achiu Ln

Town: Oahu
Count Type: CLASS

DIR 1: +MP DIR 2: -MP
Counter Type: Tube

Final AADT: 11700
Route No: 8300

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 06/19/2013															
12:00-12:15	2	3	5	06:00-06:15	13	18	31	12:00-12:15	122	101	223	06:00-06:15	83	102	185
12:15-12:30	2	5	7	06:15-06:30	34	22	56	12:15-12:30	124	82	206	06:15-06:30	76	98	174
12:30-12:45	4	5	9	06:30-06:45	30	15	45	12:30-12:45	144	108	252	06:30-06:45	83	89	172
12:45-01:00	2	2	4	06:45-07:00	38	15	53	12:45-01:00	127	120	247	06:45-07:00	86	112	198
01:00-01:15	2	0	2	07:00-07:15	46	23	69	01:00-01:15	116	116	232	07:00-07:15	111	109	220
01:15-01:30	0	4	4	07:15-07:30	46	33	79	01:15-01:30	124	103	227	07:15-07:30	75	95	170
01:30-01:45	2	0	2	07:30-07:45	52	51	103	01:30-01:45	116	99	215	07:30-07:45	53	114	167
01:45-02:00	2	2	4	07:45-08:00	67	53	120	01:45-02:00	117	80	197	07:45-08:00	64	94	158
02:00-02:15	3	2	5	08:00-08:15	77	57	134	02:00-02:15	107	124	231	08:00-08:15	52	87	139
02:15-02:30	2	1	3	08:15-08:30	69	63	132	02:15-02:30	81	103	184	08:15-08:30	46	61	107
02:30-02:45	3	3	6	08:30-08:45	72	86	158	02:30-02:45	126	126	252	08:30-08:45	37	76	113
02:45-03:00	1	2	3	08:45-09:00	62	70	132	02:45-03:00	98	142	240	08:45-09:00	43	59	102
03:00-03:15	2	0	2	09:00-09:15	86	82	168	03:00-03:15	76	99	175	09:00-09:15	31	42	73
03:15-03:30	1	1	2	09:15-09:30	79	68	147	03:15-03:30	99	126	225	09:15-09:30	29	33	62
03:30-03:45	2	2	4	09:30-09:45	75	75	150	03:30-03:45	114	114	228	09:30-09:45	22	36	58
03:45-04:00	1	1	2	09:45-10:00	119	101	220	03:45-04:00	148	125	273	09:45-10:00	16	33	49
04:00-04:15	7	0	7	10:00-10:15	103	70	173	04:00-04:15	104	124	228	10:00-10:15	23	24	47
04:15-04:30	8	1	9	10:15-10:30	111	83	194	04:15-04:30	91	118	209	10:15-10:30	18	21	39
04:30-04:45	11	2	13	10:30-10:45	110	78	188	04:30-04:45	107	114	221	10:30-10:45	14	14	28
04:45-05:00	6	4	10	10:45-11:00	111	91	202	04:45-05:00	116	125	241	10:45-11:00	12	11	23
05:00-05:15	10	5	15	11:00-11:15	124	63	207	05:00-05:15	94	146	240	11:00-11:15	9	17	26
05:15-05:30	8	5	13	11:15-11:30	114	92	206	05:15-05:30	102	109	211	11:15-11:30	12	17	29
05:30-05:45	10	6	16	11:30-11:45	126	106	232	05:30-05:45	91	103	194	11:30-11:45	12	13	25
05:45-06:00	30	17	47	11:45-12:00	124	90	214	05:45-06:00	66	121	187	11:45-12:00	7	9	16
AM COMMUTER PERIOD (05:00-09:00)					DIR 1	DIR 2		PM COMMUTER PERIOD (15:00-19:00)					DIR 1	DIR 2	
TWO DIRECTIONAL PEAK								TWO DIRECTIONAL PEAK							
AM - PEAK HR TIME					08:00 AM to 09:00 AM			PM - PEAK HR TIME					03:15 PM to 04:15 PM		
AM - PEAK HR VOLUME					280	276	556	PM - PEAK HR VOLUME					465	489	954
AM - K FACTOR (%)							4.91	PM - K FACTOR (%)							8.42
AM - D (%)					50.36	49.64	100.00	PM - D (%)					48.74	51.26	100.00
DIRECTIONAL PEAK								DIRECTIONAL PEAK							
AM - PEAK HR TIME					07:45 AM to 08:45 AM	08:00 AM to 09:00 AM		PM - PEAK HR TIME					03:15 PM to 04:15 PM	04:15 PM to 05:15 PM	
AM - PEAK HR VOLUME					285	276		PM - PEAK HR VOLUME					465	503	
AM PERIOD (00:00-12:00)								PM PERIOD (12:00-24:00)							
TWO DIRECTIONAL PEAK								TWO DIRECTIONAL PEAK							
AM - PEAK HR TIME					11:00 AM to 12:00 PM			PM - PEAK HR TIME					12:30 PM to 01:30 PM		
AM - PEAK HR VOLUME					488	371	859	PM - PEAK HR VOLUME					511	447	958
AM - K FACTOR (%)							7.58	PM - K FACTOR (%)							8.46
AM - D (%)					56.81	43.19	100.00	PM - D (%)					53.34	46.66	100.00
NON-COMMUTER PERIOD (09:00-15:00)								6-HR, 12-HR, 24-HR PERIODS					DIR 1	DIR 2	Total
TWO DIRECTIONAL PEAK								AM 6-HR PERIOD (06:00-12:00)					1,888	1,525	3,413
PEAK HR TIME					12:00 PM to 01:00 PM	02:00 PM to 03:00 PM		AM 12-HR PERIOD (00:00-12:00)					2,009	1,598	3,607
PEAK HR VOLUME					517	495		PM 6-HR PERIOD (12:00-18:00)					2,610	2,728	5,338
DIRECTIONAL PEAK								PM 12-HR PERIOD (12:00-24:00)					3,624	4,094	7,718
PEAK HR TIME								24 HOUR PERIOD					5,633	5,692	11,325
PEAK HR VOLUME								D (%)					49.74	50.26	100.00

Run Date: 2014/05/29

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section
2013 Program Count - Summary

Site ID: B72830000184
Functional Class: URBAN-MINOR ARTERIAL
Location: Kamehameha Hwy - Kahalewai Pl to JP Leong Hwy

Town: Oahu **DIR 1:** +MP **DIR 2:** -MP **Final AADT:** 8900
Count Type: CLASS **Counter Type:** Tube **Route No:** 8300

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 06/18/2013															
12:00-12:15	7	3	10	06:00-06:15	16	14	30	12:00-12:15	95	105	200	06:00-06:15	76	79	155
12:15-12:30	1	7	8	06:15-06:30	17	24	41	12:15-12:30	80	94	174	06:15-06:30	84	60	144
12:30-12:45	3	5	8	06:30-06:45	17	15	32	12:30-12:45	90	91	181	06:30-06:45	65	63	128
12:45-01:00	4	3	7	06:45-07:00	21	18	39	12:45-01:00	98	102	200	06:45-07:00	56	53	109
01:00-01:15	3	1	4	07:00-07:15	22	20	42	01:00-01:15	101	75	176	07:00-07:15	34	39	73
01:15-01:30	4	0	4	07:15-07:30	18	33	51	01:15-01:30	101	109	210	07:15-07:30	61	47	108
01:30-01:45	2	0	2	07:30-07:45	25	40	65	01:30-01:45	100	93	193	07:30-07:45	44	51	95
01:45-02:00	3	2	5	07:45-08:00	29	50	79	01:45-02:00	92	104	196	07:45-08:00	47	54	101
02:00-02:15	2	0	2	08:00-08:15	39	44	83	02:00-02:15	92	110	202	08:00-08:15	41	20	61
02:15-02:30	1	1	2	08:15-08:30	41	64	105	02:15-02:30	102	103	205	08:15-08:30	41	20	61
02:30-02:45	1	1	2	08:30-08:45	57	58	115	02:30-02:45	95	103	198	08:30-08:45	33	19	52
02:45-03:00	2	1	3	08:45-09:00	48	75	123	02:45-03:00	105	92	197	08:45-09:00	37	18	55
03:00-03:15	3	0	3	09:00-09:15	54	70	124	03:00-03:15	111	94	205	09:00-09:15	40	15	55
03:15-03:30	2	2	4	09:15-09:30	63	61	124	03:15-03:30	102	87	189	09:15-09:30	27	14	41
03:30-03:45	2	1	3	09:30-09:45	47	58	105	03:30-03:45	88	96	184	09:30-09:45	21	11	32
03:45-04:00	1	3	4	09:45-10:00	57	71	128	03:45-04:00	82	84	166	09:45-10:00	21	13	34
04:00-04:15	1	1	2	10:00-10:15	46	78	124	04:00-04:15	96	112	208	10:00-10:15	21	13	34
04:15-04:30	2	0	2	10:15-10:30	62	86	148	04:15-04:30	79	100	179	10:15-10:30	11	4	15
04:30-04:45	2	4	6	10:30-10:45	68	78	146	04:30-04:45	83	114	197	10:30-10:45	7	6	13
04:45-05:00	3	3	6	10:45-11:00	76	95	171	04:45-05:00	71	85	156	10:45-11:00	11	6	17
05:00-05:15	5	8	13	11:00-11:15	86	88	174	05:00-05:15	87	84	171	11:00-11:15	14	8	22
05:15-05:30	12	6	18	11:15-11:30	91	72	163	05:15-05:30	62	95	157	11:15-11:30	7	8	15
05:30-05:45	17	12	29	11:30-11:45	88	90	178	05:30-05:45	64	89	153	11:30-11:45	7	4	11
05:45-06:00	14	16	30	11:45-12:00	87	100	187	05:45-06:00	65	65	130	11:45-12:00	10	3	13

AM COMMUTER PERIOD (05:00-09:00)	DIR 1	DIR 2	PM COMMUTER PERIOD (15:00-19:00)	DIR 1	DIR 2
TWO DIRECTIONAL PEAK			TWO DIRECTIONAL PEAK		
AM - PEAK HR TIME	08:00 AM to 09:00 AM		PM - PEAK HR TIME	03:45 PM to 04:45 PM	
AM - PEAK HR VOLUME	185	241	PM - PEAK HR VOLUME	340	410
AM - K FACTOR (%)		4.94	PM - K FACTOR (%)		8.70
AM - D (%)	43.43	56.57	PM - D (%)	45.33	54.67
DIRECTIONAL PEAK			DIRECTIONAL PEAK		
AM - PEAK HR TIME	08:00 AM to 09:00 AM	08:00 AM to 09:00 AM	PM - PEAK HR TIME	03:00 PM to 04:00 PM	04:00 PM to 05:00 PM
AM - PEAK HR VOLUME	185	241	PM - PEAK HR VOLUME	383	411
AM PERIOD (00:00-12:00)			PM PERIOD (12:00-24:00)		
TWO DIRECTIONAL PEAK			TWO DIRECTIONAL PEAK		
AM - PEAK HR TIME	11:00 AM to 12:00 PM		PM - PEAK HR TIME	02:15 PM to 03:15 PM	
AM - PEAK HR VOLUME	352	350	PM - PEAK HR VOLUME	413	392
AM - K FACTOR (%)		702	PM - K FACTOR (%)		805
AM - D (%)	50.14	49.86	PM - D (%)	51.30	48.70
NON-COMMUTER PERIOD (09:00-15:00)			6-HR, 12-HR, 24-HR PERIODS	DIR 1	DIR 2
TWO DIRECTIONAL PEAK			AM 6-HR PERIOD (06:00-12:00)	1,175	1,402
PEAK HR TIME	02:00 PM to 03:00 PM		AM 12-HR PERIOD (00:00-12:00)	1,272	1,482
PEAK HR VOLUME	394	408	PM 6-HR PERIOD (12:00-18:00)	2,141	2,286
DIRECTIONAL PEAK			PM 12-HR PERIOD (12:00-24:00)	2,957	2,914
PEAK HR TIME	12:45 PM to 01:45 PM	01:45 PM to 02:45 PM	24 HOUR PERIOD	4,229	4,396
PEAK HR VOLUME	400	420	D (%)	49.03	50.97

	Total	TOTAL
TWO DIRECTIONAL PEAK		
PEAK HR TIME	2,577	
PEAK HR VOLUME	2,754	
PEAK HR TIME	4,427	
DIRECTIONAL PEAK	5,871	
PEAK HR TIME	8,625	
PEAK HR VOLUME	100.00	

Run Date: 2014/05/28

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

Vehicle Classification Data Summary
2013

Site ID: B7283X000184 — Route No: 8300 — Date From: 2013/06/18 0:00
Town: Oahu — Direction: +MP — Date To: 2013/06/19 23:45
Location: Kamehameha Hwy - Kahalewai Pl to JP Leong Hwy

Functional Classification: 16 URBAN:MINOR ARTERIAL

REPORT TOTALS - 48 HOURS RECORDED

	VOLUME	%	NUMBER OF AXLES
Cycles	239	1.38%	477
PC	10510	60.80%	21020
2A-4T	5990	34.65%	11980
LIGHT VEHICLE TOTALS	16739	96.83%	33477
HEAVY VEHICLES			
Bus	144	0.83%	360
SINGLE UNIT TRUCK			
2A-6T	107	0.62%	214
3A-SU	221	1.28%	663
4A-SU	7	0.04%	28
SINGLE-TRAILER TRUCKS			
4A-ST	22	0.13%	88
5A-ST	3	0.02%	15
6A-ST	6	0.03%	36
MULTI-TRAILER TRUCKS			
5A-MT	19	0.11%	95
6A-MT	0	0.00%	0
7A-MT	18	0.10%	126
HEAVY VEHICLE TOTALS	547	3.16%	1625
CLASSIFIED VEHICLES TOTALS	17286 (A)	100.00%	35102 (B)
UNCLASSIFIED VEHICLES TOTALS	0	0.00%	

AXLE CORRECTION FACTOR (A/C) = 0.985

ROADTUBE EQUIVALENT(B/2) = 17551 (C)

PEAK HOUR VOLUME : 802 2013/06/18 14:00	PEAK HOUR TRUCK VOLUME	% TOTAL PEAK HOUR VOLUME	24 HOUR TRUCK VOLUME	AADT	% OF AADT	HPMS K-FACTOR (PEAK/AADT) (ITEM 66)
SINGLE UNIT TRUCKS (TYPE 4-7)	7	(65A-1) 0.87%	239	8900	(65A-2) 2.69%	9.01%
COMBINATION (TYPE 8-13)	1	(65B-1) 0.12%	34		(65B-2) 0.38%	9.01%

Run Date: 2014/05/29

Hawaii Department of Transportation
Highways Division
Highways Planning Survey Section

2013 Program Count - Summary

Site ID: B7283X000184 — Town: Oahu — DIR 1: +MP — DIR 2: -MP — Final AADT: 8900
Functional Class: URBAN:MINOR ARTERIAL — Count Type: CLASS — Counter Type: Tube — Route No: 8300
Location: Kamehameha Hwy - Kahalewai Pl to JP Leong Hwy

TIME-AM	DIR 1	DIR 2	TOTAL	TIME-AM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL	TIME-PM	DIR 1	DIR 2	TOTAL
DATE : 06/19/2013															
12:00-12:15	1	6	7	06:00-06:15	14	17	31	12:00-12:15	110	88	198	06:00-06:15	79	65	144
12:15-12:30	4	5	9	06:15-06:30	20	26	46	12:15-12:30	92	102	194	06:15-06:30	55	81	136
12:30-12:45	4	3	7	06:30-06:45	17	15	32	12:30-12:45	105	90	195	06:30-06:45	58	60	118
12:45-01:00	3	1	4	06:45-07:00	24	31	55	12:45-01:00	110	95	205	06:45-07:00	60	56	116
01:00-01:15	4	1	5	07:00-07:15	26	25	51	01:00-01:15	91	98	189	07:00-07:15	52	38	90
01:15-01:30	4	0	4	07:15-07:30	25	36	61	01:15-01:30	95	76	171	07:15-07:30	58	61	119
01:30-01:45	3	1	4	07:30-07:45	21	62	83	01:30-01:45	95	71	166	07:30-07:45	66	81	147
01:45-02:00	11	2	13	07:45-08:00	43	43	86	01:45-02:00	98	80	178	07:45-08:00	44	47	91
02:00-02:15	1	1	2	08:00-08:15	37	48	85	02:00-02:15	106	91	197	08:00-08:15	49	32	81
02:15-02:30	1	0	1	08:15-08:30	39	58	97	02:15-02:30	91	85	176	08:15-08:30	40	31	71
02:30-02:45	0	0	0	08:30-08:45	39	60	99	02:30-02:45	93	89	182	08:30-08:45	36	26	62
02:45-03:00	4	4	8	08:45-09:00	44	67	111	02:45-03:00	103	106	209	08:45-09:00	34	18	52
03:00-03:15	4	0	4	09:00-09:15	50	77	127	03:00-03:15	69	76	145	09:00-09:15	31	12	43
03:15-03:30	1	1	2	09:15-09:30	63	57	120	03:15-03:30	89	91	180	09:15-09:30	40	15	55
03:30-03:45	3	1	4	09:30-09:45	42	59	101	03:30-03:45	85	106	191	09:30-09:45	37	3	40
03:45-04:00	1	2	3	09:45-10:00	67	72	139	03:45-04:00	71	99	170	09:45-10:00	26	14	40
04:00-04:15	4	3	7	10:00-10:15	69	59	128	04:00-04:15	74	85	159	10:00-10:15	24	10	34
04:15-04:30	0	3	3	10:15-10:30	78	65	143	04:15-04:30	61	91	152	10:15-10:30	25	13	38
04:30-04:45	6	4	10	10:30-10:45	67	66	133	04:30-04:45	94	100	194	10:30-10:45	11	6	17
04:45-05:00	4	6	10	10:45-11:00	83	82	165	04:45-05:00	103	108	211	10:45-11:00	15	5	20
05:00-05:15	10	6	16	11:00-11:15	70	66	136	05:00-05:15	68	92	160	11:00-11:15	9	5	14
05:15-05:30	13	11	24	11:15-11:30	89	71	160	05:15-05:30	74	102	176	11:15-11:30	11	7	18
05:30-05:45	8	12	20	11:30-11:45	88	81	169	05:30-05:45	70	68	138	11:30-11:45	12	5	17
05:45-06:00	18	11	29	11:45-12:00	108	93	201	05:45-06:00	80	95	175	11:45-12:00	7	3	10
AM COMMUTER PERIOD (05:00-09:00)					DIR 1	DIR 2		PM COMMUTER PERIOD (15:00-19:00)				DIR 1		DIR 2	
TWO DIRECTIONAL PEAK								TWO DIRECTIONAL PEAK							
AM - PEAK HR TIME					08:00 AM to 09:00 AM			PM - PEAK HR TIME				04:30 PM to 05:30 PM			
AM - PEAK HR VOLUME					159	233	392	PM - PEAK HR VOLUME				402		359	
AM - K FACTOR (%)							4.53	PM - K FACTOR (%)				8.79			
AM - D (%)					40.56	59.44	100.00	PM - D (%)				52.83		47.17	
DIRECTIONAL PEAK								DIRECTIONAL PEAK							
AM - PEAK HR TIME					08:00 AM to 09:00 AM			PM - PEAK HR TIME				04:30 PM to 05:30 PM			
AM - PEAK HR VOLUME					159	233		PM - PEAK HR VOLUME				402		359	
AM PERIOD (00:00-12:00)								PM PERIOD (12:00-24:00)							
TWO DIRECTIONAL PEAK								TWO DIRECTIONAL PEAK							
AM - PEAK HR TIME					11:00 AM to 12:00 PM			PM - PEAK HR TIME				12:00 PM to 01:00 PM			
AM - PEAK HR VOLUME					355	313	668	PM - PEAK HR VOLUME				375		417	
AM - K FACTOR (%)							7.71	PM - K FACTOR (%)				9.14			
AM - D (%)					53.14	46.86	100.00	PM - D (%)				47.35		52.65	
NON-COMMUTER PERIOD (09:00-15:00)								6-HR, 12-HR, 24-HR PERIODS					DIR 1	DIR 2	Total
TWO DIRECTIONAL PEAK								AM 6-HR PERIOD (06:00-12:00)					1,223	1,338	2,561
PEAK HR TIME					12:00 PM to 01:00 PM			AM 12-HR PERIOD (00:00-12:00)					1,335	1,422	2,757
PEAK HR VOLUME					417	375	792	PM 6-HR PERIOD (12:00-18:00)					2,147	2,184	4,331
DIRECTIONAL PEAK								PM 12-HR PERIOD (12:00-24:00)					3,026	2,878	5,904
PEAK HR TIME					12:15 PM to 01:15 PM			24 HOUR PERIOD					4,361	4,300	8,661
PEAK HR VOLUME					417	385		D (%)					50.35	49.65	100.00

SSFM International, Inc
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817
(808) 531-1308

File Name : 150311 CaneHaul_Kam AM
Site Code : 00000000
Start Date : 3/11/2015
Page No : 1

Groups Printed- Passenger - Bicycle - Heavy Vehicles

	Kamehameha Highway Southbound					Twin Bridge Road Westbound					Kamehameha Highway Northbound					Cane Haul Road Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:30 AM	0	48	0	0	48	0	0	0	0	0	0	81	4	0	85	0	0	0	0	0	133
07:45 AM	0	70	0	0	70	1	0	1	0	2	0	83	3	1	87	0	0	0	0	0	159
Total	0	118	0	0	118	1	0	1	0	2	0	164	7	1	172	0	0	0	0	0	292
08:00 AM	2	67	1	0	70	0	0	0	0	0	1	73	4	0	78	1	1	0	0	2	150
08:15 AM	0	68	0	0	68	1	0	0	0	1	0	78	0	0	78	0	0	0	0	0	147
08:30 AM	0	69	1	0	70	1	0	1	3	5	0	88	2	0	90	0	0	0	0	0	165
08:45 AM	2	74	0	2	78	2	0	0	0	2	0	79	2	0	81	0	0	0	0	0	161
Total	4	278	2	2	286	4	0	1	3	8	1	318	8	0	327	1	1	0	0	2	623
09:00 AM	0	87	0	2	89	2	0	0	0	2	0	80	1	0	81	0	0	0	0	0	172
09:15 AM	0	75	0	3	78	2	0	1	0	3	1	81	2	1	85	0	0	0	0	0	166
Grand Total	4	558	2	7	571	9	0	3	3	15	2	643	18	2	665	1	1	0	0	2	1253
Apprch %	0.7	97.7	0.4	1.2		60	0	20	20		0.3	96.7	2.7	0.3		50	50	0	0		
Total %	0.3	44.5	0.2	0.6	45.6	0.7	0	0.2	0.2	1.2	0.2	51.3	1.4	0.2	53.1	0.1	0.1	0	0	0.2	
Passenger	3	530	2	7	542	5	0	3	3	11	2	610	12	2	626	1	1	0	0	2	1181
% Passenger	75	95	100	100	94.9	55.6	0	100	100	73.3	100	94.9	66.7	100	94.1	100	100	0	0	100	94.3
Bicycle	1	5	0	0	6	2	0	0	0	2	0	6	4	0	10	0	0	0	0	0	18
% Bicycle	25	0.9	0	0	1.1	22.2	0	0	0	13.3	0	0.9	22.2	0	1.5	0	0	0	0	0	1.4
Heavy Vehicles	0	23	0	0	23	2	0	0	0	2	0	27	2	0	29	0	0	0	0	0	54
% Heavy Vehicles	0	4.1	0	0	4	22.2	0	0	0	13.3	0	4.2	11.1	0	4.4	0	0	0	0	0	4.3

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File Name : 150311 CaneHaul_Kam AM
Site Code : 00000000
Start Date : 3/11/2015
Page No : 2

	Kamehameha Highway Southbound					Twin Bridge Road Westbound					Kamehameha Highway Northbound					Cane Haul Road Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:30 AM																					
08:30 AM	0	69	**1**	0	70	1	0	**1**	**3**	**5**	0	**88**	**2**	0	**90**	0	0	0	0	0	165
08:45 AM	**2**	74	0	2	78	**2**	0	0	0	2	0	79	2	0	81	0	0	0	0	0	161
09:00 AM	**0**	**87**	0	**2**	**89**	2	0	0	0	2	0	80	1	0	81	0	0	0	0	0	**172**
09:15 AM	0	75	0	**3**	78	2	0	1	0	3	**1**	81	2	**1**	85	0	0	0	0	0	166
Total Volume	2	305	1	7	315	7	0	2	3	12	1	328	7	1	337	0	0	0	0	0	664
% App. Total	0.6	96.8	0.3	2.2		58.3	0	16.7	25		0.3	97.3	2.1	0.3		0	0	0	0		
PHF	.250	.876	.250	.583	.885	.875	.000	.500	.250	.600	.250	.932	.875	.250	.936	.000	.000	.000	.000	.000	.965

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Groups Printed- Passenger - Bicycle - Heavy Vehicles

	Kamehameha Highway Southbound					Twin Bridge Road Westbound					Kamehameha Highway Northbound					Cane Haul Road Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
02:15 PM	0	141	0	2	143	6	0	1	0	7	0	121	2	8	131	0	0	0	0	0	281
02:30 PM	0	113	0	4	117	3	0	0	0	3	0	103	4	10	117	0	0	0	0	0	237
02:45 PM	0	127	0	7	134	4	0	1	1	6	0	119	2	8	129	0	0	1	0	1	270
Total	0	381	0	13	394	13	0	2	1	16	0	343	8	26	377	0	0	1	0	1	788
03:00 PM	2	121	0	0	123	5	0	1	0	6	0	101	2	8	111	0	0	0	0	0	240
03:15 PM	0	126	0	2	128	0	0	2	0	2	0	105	3	8	116	0	0	0	0	0	246
03:30 PM	2	131	0	9	142	1	0	3	2	6	0	109	0	6	115	0	0	0	0	0	263
03:45 PM	0	125	0	1	126	1	0	1	0	2	0	129	1	7	137	0	0	0	0	0	265
Total	4	503	0	12	519	7	0	7	2	16	0	444	6	29	479	0	0	0	0	0	1014
04:00 PM	0	134	0	4	138	0	0	0	0	0	0	126	1	0	127	0	0	0	0	0	265
Grand Total	4	1018	0	29	1051	20	0	9	3	32	0	913	15	55	983	0	0	1	0	1	2067
Apprch %	0.4	96.9	0	2.8		62.5	0	28.1	9.4		0	92.9	1.5	5.6		0	0	100	0		
Total %	0.2	49.3	0	1.4	50.8	1	0	0.4	0.1	1.5	0	44.2	0.7	2.7	47.6	0	0	0	0	0	
Passenger	4	977	0	29	1010	19	0	9	3	31	0	894	13	55	962	0	0	1	0	1	2004
% Passenger	100	96	0	100	96.1	95	0	100	100	96.9	0	97.9	86.7	100	97.9	0	0	100	0	100	97
Bicycle	0	7	0	0	7	1	0	0	0	1	0	10	1	0	11	0	0	0	0	0	19
% Bicycle	0	0.7	0	0	0.7	5	0	0	0	3.1	0	1.1	6.7	0	1.1	0	0	0	0	0	0.9
Heavy Vehicles	0	34	0	0	34	0	0	0	0	0	0	9	1	0	10	0	0	0	0	0	44
% Heavy Vehicles	0	3.3	0	0	3.2	0	0	0	0	0	0	1	6.7	0	1	0	0	0	0	0	2.1

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	Kamehameha Highway Southbound					Twin Bridge Road Westbound					Kamehameha Highway Northbound					Cane Haul Road Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:15 PM to 04:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:15 PM																					
03:15 PM	0	126	0	2	128	0	0	2	0	2	0	105	**3**	**8**	116	0	0	0	0	0	246
03:30 PM	**2**	131	0	**9**	**142**	**1**	0	**3**	**2**	**6**	0	109	0	6	115	0	0	0	0	0	263
03:45 PM	0	125	0	1	126	1	0	1	0	2	0	**129**	1	7	**137**	0	0	0	0	0	**265**
04:00 PM	0	**134**	0	4	138	0	0	0	0	0	0	126	1	0	127	0	0	0	0	0	265
Total Volume	2	516	0	16	534	2	0	6	2	10	0	469	5	21	495	0	0	0	0	0	1039
% App. Total	0.4	96.6	0	3		20	0	60	20		0	94.7	1	4.2		0	0	0	0		
PHF	.250	.963	.000	.444	.940	.500	.000	.500	.250	.417	.000	.909	.417	.656	.903	.000	.000	.000	.000	.000	.980

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Groups Printed- Passenger - Bicycle - Heavy Vehicles

	Kamehameha Highway Southbound					Twin Bridge Road Westbound					Kamehameha Highway Northbound					Cane Haul Road Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
12:30 PM	3	129	0	1	133	5	0	2	0	7	0	145	10	0	155	0	0	0	0	0	295
12:45 PM	2	114	0	5	121	1	0	6	1	8	0	151	13	9	173	0	0	0	0	0	302
Total	5	243	0	6	254	6	0	8	1	15	0	296	23	9	328	0	0	0	0	0	597
01:00 PM	0	124	0	9	133	4	0	0	0	4	3	124	11	11	149	0	0	0	0	0	286
01:15 PM	0	119	0	6	125	6	0	1	0	7	2	142	2	6	152	0	0	0	0	0	284
01:30 PM	1	135	1	3	140	3	0	0	3	6	0	129	7	5	141	0	0	0	2	2	289
01:45 PM	0	124	0	4	128	4	0	3	0	7	0	133	8	14	155	1	0	1	2	4	294
Total	1	502	1	22	526	17	0	4	3	24	5	528	28	36	597	1	0	1	4	6	1153
02:00 PM	0	119	0	3	122	4	0	4	0	8	0	132	8	17	157	0	0	0	0	0	287
02:15 PM	0	138	0	2	140	2	0	2	0	4	1	126	3	11	141	0	0	1	0	1	286
Grand Total	6	1002	1	33	1042	29	0	18	4	51	6	1082	62	73	1223	1	0	2	4	7	2323
Apprch %	0.6	96.2	0.1	3.2		56.9	0	35.3	7.8		0.5	88.5	5.1	6		14.3	0	28.6	57.1		
Total %	0.3	43.1	0	1.4	44.9	1.2	0	0.8	0.2	2.2	0.3	46.6	2.7	3.1	52.6	0	0	0.1	0.2	0.3	
Passenger	5	959	1	33	998	29	0	17	4	50	6	1056	58	73	1193	1	0	2	4	7	2248
% Passenger	83.3	95.7	100	100	95.8	100	0	94.4	100	98	100	97.6	93.5	100	97.5	100	0	100	100	100	96.8
Bicycle	0	12	0	0	12	0	0	0	0	0	0	14	1	0	15	0	0	0	0	0	27
% Bicycle	0	1.2	0	0	1.2	0	0	0	0	0	0	1.3	1.6	0	1.2	0	0	0	0	0	1.2
Heavy Vehicles	1	31	0	0	32	0	0	1	0	1	0	12	3	0	15	0	0	0	0	0	48
% Heavy Vehicles	16.7	3.1	0	0	3.1	0	0	5.6	0	2	0	1.1	4.8	0	1.2	0	0	0	0	0	2.1

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	Kamehameha Highway Southbound					Twin Bridge Road Westbound					Kamehameha Highway Northbound					Cane Haul Road Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:30 PM to 02:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:30 PM																					
12:30 PM	**3**	**129**	0	1	**133**	5	0	2	0	7	0	145	10	0	155	0	0	0	0	0	295
12:45 PM	2	114	0	5	121	1	0	**6**	**1**	**8**	0	**151**	**13**	9	**173**	0	0	0	0	0	**302**
01:00 PM	0	124	0	**9**	133	4	0	0	0	4	**3**	124	11	**11**	149	0	0	0	0	0	286
01:15 PM	0	119	0	6	125	**6**	0	1	0	7	2	142	2	6	152	0	0	0	0	0	284
Total Volume	5	486	0	21	512	16	0	9	1	26	5	562	36	26	629	0	0	0	0	0	1167
% App. Total	1	94.9	0	4.1		61.5	0	34.6	3.8		0.8	89.3	5.7	4.1		0	0	0	0		
PHF	.417	.942	.000	.583	.962	.667	.000	.375	.250	.813	.417	.930	.692	.591	.909	.000	.000	.000	.000	.000	.966

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Groups Printed- Passenger - Bicycle - Heavy Vehicles

	Kamehemeha Highway Southbound					North Shore Market Place Westbound					Kamehemeha Highway Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:30 AM	8	46	0	1	55	4	0	6	0	10	0	67	6	0	73	0	0	0	1	1	139
07:45 AM	15	64	0	0	79	12	0	7	0	19	0	69	5	1	75	0	0	0	0	0	173
Total	23	110	0	1	134	16	0	13	0	29	0	136	11	1	148	0	0	0	1	1	312
08:00 AM	5	56	0	2	63	6	0	4	0	10	0	57	2	2	61	0	0	0	1	1	135
08:15 AM	9	60	0	0	69	8	0	3	0	11	0	71	8	0	79	0	0	0	0	0	159
08:30 AM	5	66	0	0	71	9	0	3	0	12	0	56	9	2	67	0	0	0	0	0	150
08:45 AM	7	75	0	0	82	9	0	6	1	16	0	69	10	1	80	0	0	0	0	0	178
Total	26	257	0	2	285	32	0	16	1	49	0	253	29	5	287	0	0	0	1	1	622
09:00 AM	7	63	0	3	73	3	0	5	0	8	0	61	5	0	66	0	0	0	0	0	147
09:15 AM	14	70	0	2	86	10	0	10	0	20	0	71	2	1	74	0	0	0	0	0	180
Grand Total	70	500	0	8	578	61	0	44	1	106	0	521	47	7	575	0	0	0	2	2	1261
Apprch %	12.1	86.5	0	1.4		57.5	0	41.5	0.9		0	90.6	8.2	1.2		0	0	0	100		
Total %	5.6	39.7	0	0.6	45.8	4.8	0	3.5	0.1	8.4	0	41.3	3.7	0.6	45.6	0	0	0	0.2	0.2	
Passenger	69	471	0	6	546	61	0	42	1	104	0	494	45	6	545	0	0	0	2	2	1197
% Passenger	98.6	94.2	0	75	94.5	100	0	95.5	100	98.1	0	94.8	95.7	85.7	94.8	0	0	0	100	100	94.9
Bicycle	1	5	0	2	8	0	0	0	0	0	0	3	2	1	6	0	0	0	0	0	14
% Bicycle	1.4	1	0	25	1.4	0	0	0	0	0	0	0.6	4.3	14.3	1	0	0	0	0	0	1.1
Heavy Vehicles	0	24	0	0	24	0	0	2	0	2	0	24	0	0	24	0	0	0	0	0	50
% Heavy Vehicles	0	4.8	0	0	4.2	0	0	4.5	0	1.9	0	4.6	0	0	4.2	0	0	0	0	0	4

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	Kamehemeha Highway Southbound					North Shore Market Place Westbound					Kamehemeha Highway Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:30 AM																					
08:30 AM	5	66	0	0	71	9	0	3	0	12	0	56	9	2	67	0	0	0	0	0	150
08:45 AM	7	75	0	0	82	9	0	6	1	16	0	69	10	1	80	0	0	0	0	0	178
09:00 AM	7	63	0	3	73	3	0	5	0	8	0	61	5	0	66	0	0	0	0	0	147
09:15 AM	14	70	0	2	86	10	0	10	0	20	0	71	2	1	74	0	0	0	0	0	180
Total Volume	33	274	0	5	312	31	0	24	1	56	0	257	26	4	287	0	0	0	0	0	655
% App. Total	10.6	87.8	0	1.6		55.4	0	42.9	1.8		0	89.5	9.1	1.4		0	0	0	0		
PHF	.589	.913	.000	.417	.907	.775	.000	.600	.250	.700	.000	.905	.650	.500	.897	.000	.000	.000	.000	.000	.910

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Groups Printed- Passenger - Bicycle - Heavy Vehicles

	Kamehameha Highway Southbound					North Shore Market Place Westbound					Kamehameha Highway Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
02:15 PM	8	129	0	4	141	7	0	9	4	20	0	104	6	12	122	0	0	0	1	1	284
02:30 PM	15	92	0	6	113	8	0	9	7	24	0	102	3	6	111	0	0	0	0	0	248
02:45 PM	7	116	0	1	124	16	0	13	3	32	0	105	8	16	129	0	0	0	5	5	290
Total	30	337	0	11	378	31	0	31	14	76	0	311	17	34	362	0	0	0	6	6	822
03:00 PM	10	109	0	2	121	9	0	18	11	38	0	99	4	4	107	0	0	0	0	0	266
03:15 PM	18	125	0	4	147	5	0	9	6	20	0	98	2	9	109	0	0	0	0	0	276
03:30 PM	8	126	0	6	140	6	0	9	0	15	0	99	6	10	115	0	0	0	1	1	271
03:45 PM	11	112	0	4	127	9	0	9	2	20	0	110	9	2	121	0	0	0	0	0	268
Total	47	472	0	16	535	29	0	45	19	93	0	406	21	25	452	0	0	0	1	1	1081
04:00 PM	11	111	0	3	125	10	0	8	0	18	0	107	10	0	117	0	0	0	1	1	261
Grand Total	88	920	0	30	1038	70	0	84	33	187	0	824	48	59	931	0	0	0	8	8	2164
Apprch %	8.5	88.6	0	2.9		37.4	0	44.9	17.6		0	88.5	5.2	6.3		0	0	0	100		
Total %	4.1	42.5	0	1.4	48	3.2	0	3.9	1.5	8.6	0	38.1	2.2	2.7	43	0	0	0	0.4	0.4	
Passenger	87	882	0	30	999	68	0	83	33	184	0	806	48	59	913	0	0	0	8	8	2104
% Passenger	98.9	95.9	0	100	96.2	97.1	0	98.8	100	98.4	0	97.8	100	100	98.1	0	0	0	100	100	97.2
Bicycle	1	6	0	0	7	1	0	0	0	1	0	7	0	0	7	0	0	0	0	0	15
% Bicycle	1.1	0.7	0	0	0.7	1.4	0	0	0	0.5	0	0.8	0	0	0.8	0	0	0	0	0	0.7
Heavy Vehicles	0	32	0	0	32	1	0	1	0	2	0	11	0	0	11	0	0	0	0	0	45
% Heavy Vehicles	0	3.5	0	0	3.1	1.4	0	1.2	0	1.1	0	1.3	0	0	1.2	0	0	0	0	0	2.1

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	Kamehameha Highway Southbound					North Shore Market Place Westbound					Kamehameha Highway Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 02:15 PM to 04:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 02:45 PM																					
02:45 PM	7	116	0	1	124	**16**	0	13	3	32	0	**105**	**8**	**16**	**129**	0	0	0	**5**	**5**	**290**
03:00 PM	10	109	0	2	121	9	0	**18**	**11**	**38**	0	99	4	4	107	0	0	0	0	0	266
03:15 PM	**18**	125	0	4	**147**	5	0	9	6	20	0	98	2	9	109	0	0	0	0	0	276
03:30 PM	8	**126**	0	**6**	140	6	0	9	0	15	0	99	6	10	115	0	0	0	1	1	271
Total Volume	43	476	0	13	532	36	0	49	20	105	0	401	20	39	460	0	0	0	6	6	1103
% App. Total	8.1	89.5	0	2.4		34.3	0	46.7	19		0	87.2	4.3	8.5		0	0	0	100		
PHF	.597	.944	.000	.542	.905	.563	.000	.681	.455	.691	.000	.955	.625	.609	.891	.000	.000	.000	.300	.300	.951

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Groups Printed- Passenger - Bicycle - Heavy Vehicles

	Kamehameha Highway Southbound					North Shore Market Place Westbound					Kamehameha Highway Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
12:30 PM	12	104	0	3	119	4	0	10	6	20	0	119	4	18	141	0	0	0	0	0	280
12:45 PM	13	118	0	10	141	7	0	8	0	15	0	129	3	10	142	0	0	0	4	4	302
Total	25	222	0	13	260	11	0	18	6	35	0	248	7	28	283	0	0	0	4	4	582
01:00 PM	10	103	0	11	124	9	0	7	0	16	0	112	2	1	115	0	0	0	1	1	256
01:15 PM	11	122	0	18	151	8	0	10	0	18	0	113	5	0	118	0	0	0	2	2	289
01:30 PM	6	127	0	26	159	9	0	9	0	18	0	119	3	4	126	0	0	0	0	0	303
01:45 PM	14	81	0	20	115	10	0	9	0	19	0	116	4	4	124	0	0	0	0	0	258
Total	41	433	0	75	549	36	0	35	0	71	0	460	14	9	483	0	0	0	3	3	1106
02:00 PM	11	122	0	7	140	7	0	8	0	15	0	113	2	28	143	0	0	0	7	7	305
02:15 PM	21	121	0	8	150	6	0	10	0	16	0	118	9	20	147	0	0	0	0	0	313
Grand Total	98	898	0	103	1099	60	0	71	6	137	0	939	32	85	1056	0	0	0	14	14	2306
Apprch %	8.9	81.7	0	9.4		43.8	0	51.8	4.4		0	88.9	3	8		0	0	0	100		
Total %	4.2	38.9	0	4.5	47.7	2.6	0	3.1	0.3	5.9	0	40.7	1.4	3.7	45.8	0	0	0	0.6	0.6	
Passenger	89	857	0	95	1041	60	0	71	6	137	0	928	32	85	1045	0	0	0	14	14	2237
% Passenger	90.8	95.4	0	92.2	94.7	100	0	100	100	100	0	98.8	100	100	99	0	0	0	100	100	97
Bicycle	5	15	0	8	28	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	30
% Bicycle	5.1	1.7	0	7.8	2.5	0	0	0	0	0	0	0.2	0	0	0.2	0	0	0	0	0	1.3
Heavy Vehicles	4	26	0	0	30	0	0	0	0	0	0	9	0	0	9	0	0	0	0	0	39
% Heavy Vehicles	4.1	2.9	0	0	2.7	0	0	0	0	0	0	1	0	0	0.9	0	0	0	0	0	1.7

SSFM International, Inc

501 Sumner Street, Suite 620
Honolulu, Hawaii 96817
(808) 531-1308

File Name : 150314 North Shore Market_Kam SAT
Site Code : 00000000
Start Date : 3/14/2015
Page No : 2

	Kamehameha Highway Southbound					North Shore Market Place Westbound					Kamehameha Highway Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:30 PM to 02:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 01:30 PM																					
01:30 PM	6	**127**	0	**26**	**159**	9	0	9	0	18	0	**119**	3	4	126	0	0	0	0	0	303
01:45 PM	14	81	0	20	115	**10**	0	9	0	**19**	0	116	4	4	124	0	0	0	0	0	258
02:00 PM	11	122	0	7	140	7	0	8	0	15	0	113	2	**28**	143	0	0	0	**7**	**7**	305
02:15 PM	**21**	121	0	8	150	6	0	**10**	0	16	0	118	**9**	20	**147**	0	0	0	0	0	**313**
Total Volume	52	451	0	61	564	32	0	36	0	68	0	466	18	56	540	0	0	0	7	7	1179
% App. Total	9.2	80	0	10.8		47.1	0	52.9	0		0	86.3	3.3	10.4		0	0	0	100		
PHF	.619	.888	.000	.587	.887	.800	.000	.900	.000	.895	.000	.979	.500	.500	.918	.000	.000	.000	.250	.250	.942

SSFM International, Inc
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817
(808) 531-1308

File Name : 150312 Opaeula_Kam AM
Site Code : 00000000
Start Date : 3/12/2015
Page No : 1

Groups Printed- Passenger - Bicycle - Heavy Vehicles

	Kamehameha Highway Southbound					Opaeula Road Westbound					Kamehameha Highway Northbound					Kewalo Road Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
07:30 AM	5	49	0	3	57	2	0	4	0	6	0	49	1	0	50	0	0	0	0	0	113
07:45 AM	5	72	0	2	79	4	0	4	1	9	0	52	4	0	56	0	0	0	2	2	146
Total	10	121	0	5	136	6	0	8	1	15	0	101	5	0	106	0	0	0	2	2	259
08:00 AM	6	72	0	0	78	3	0	7	2	12	0	42	3	0	45	0	0	0	0	0	135
08:15 AM	6	59	0	0	65	6	0	2	0	8	0	65	4	4	73	0	0	0	2	2	148
08:30 AM	3	69	0	0	72	4	0	3	0	7	0	49	5	0	54	0	0	0	0	0	133
08:45 AM	0	46	0	2	48	4	0	5	0	9	0	57	3	2	62	0	0	0	2	2	121
Total	15	246	0	2	263	17	0	17	2	36	0	213	15	6	234	0	0	0	4	4	537
09:00 AM	3	57	0	4	64	2	0	4	0	6	0	50	9	0	59	0	0	0	0	0	129
09:15 AM	5	77	0	2	84	9	0	2	1	12	0	58	3	0	61	0	0	0	0	0	157
Grand Total	33	501	0	13	547	34	0	31	4	69	0	422	32	6	460	0	0	0	6	6	1082
Apprch %	6	91.6	0	2.4		49.3	0	44.9	5.8		0	91.7	7	1.3		0	0	0	100		
Total %	3	46.3	0	1.2	50.6	3.1	0	2.9	0.4	6.4	0	39	3	0.6	42.5	0	0	0	0.6	0.6	
Passenger	33	476	0	13	522	33	0	31	4	68	0	406	32	6	444	0	0	0	6	6	1040
% Passenger	100	95	0	100	95.4	97.1	0	100	100	98.6	0	96.2	100	100	96.5	0	0	0	100	100	96.1
Bicycle	0	1	0	0	1	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	3
% Bicycle	0	0.2	0	0	0.2	0	0	0	0	0	0	0.5	0	0	0.4	0	0	0	0	0	0.3
Heavy Vehicles	0	24	0	0	24	1	0	0	0	1	0	14	0	0	14	0	0	0	0	0	39
% Heavy Vehicles	0	4.8	0	0	4.4	2.9	0	0	0	1.4	0	3.3	0	0	3	0	0	0	0	0	3.6

SSFM International, Inc
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817
(808) 531-1308

File Name : 150312 Opaeula_Kam AM
Site Code : 00000000
Start Date : 3/12/2015
Page No : 2

	Kamehameha Highway Southbound					Opaeula Road Westbound					Kamehameha Highway Northbound					Kewalo Road Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 07:30 AM to 09:15 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	5	**72**	0	**2**	**79**	4	0	4	1	9	0	52	4	0	56	0	0	0	**2**	**2**	146
08:00 AM	**6**	72	0	0	78	3	0	**7**	**2**	**12**	0	42	3	0	45	0	0	0	0	0	135
08:15 AM	6	59	0	0	65	**6**	0	2	0	8	0	**65**	4	**4**	**73**	0	0	0	2	2	**148**
08:30 AM	3	69	0	0	72	4	0	3	0	7	0	49	**5**	0	54	0	0	0	0	0	133
Total Volume	20	272	0	2	294	17	0	16	3	36	0	208	16	4	228	0	0	0	4	4	562
% App. Total	6.8	92.5	0	0.7		47.2	0	44.4	8.3		0	91.2	7	1.8		0	0	0	100		
PHF	.833	.944	.000	.250	.930	.708	.000	.571	.375	.750	.000	.800	.800	.250	.781	.000	.000	.000	.500	.500	.949

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

TERRANCE S. ARASHIRO, P.E.
STANLEY T. WATANABE
IVAN K. NAKATSUKA, P.E.
ADRIENNE W. L. H. WONG, P.E., LEED AP
DEANNA HAYASHI, P.E.
PAUL K. ARITA, P.E.
ERIK S. KANESHIRO, L.P.L.S, LEED AP

14-055

January 14, 2015

Mr. James Niermann
R.M. Towill Corp.
2024 North King Street Suite 200
Honolulu, Hawaii 96819

Dear Mr. Niermann:

Subject: Haleiwa Improvement District Project
DRAFT Traffic Count Summary
Honolulu, Oahu, Hawaii

As part of the Traffic Engineering Services for the Haleiwa Improvement District Project, traffic counts were conducted on August 21, 2014 and August 23, 2014 to determine the existing traffic flow within the study area. Draft traffic counts are enclosed.

Sincerely,

AUSTIN, TSUTSUMI & ASSOCIATES, INC.

By Karen C Sakai

KAREN SAKAI, P.E.
Project Manager

KCS: cl

Enclosure:

Figure 1 – Draft Existing Traffic Volume and Lane Configurations
Appendix A – Draft Traffic Count Data

REPLY TO:
501 SUMNER STREET, SUITE 521 • HONOLULU, HAWAII 96817-5031
PHONE (808) 533-3646 • FAX (808) 526-1267

OFFICES IN:
HONOLULU, HAWAII
WAILUKU, MAUI, HAWAII

Austin Tsutsumi & Associates
501 Sumner Street, Suite 521
Honolulu, HI 96817-5031
Phone: (808) 533-3646 Fax: (808) 526-1267

File Name : PM_Kamehameha Hwy - Kewalo Ln-Opaeula Rd
Site Code : 00000000
Start Date : 8/21/2014
Page No : 1

Groups Printed- Unshifted

	KAMEHAMEHA HWY From North				OPAEULA RD From East				KAMEHAMEHA HWY From South				KEWALO LN From West				
Start Time	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Int. Total
12:00 PM	12	102	3	4	5	0	7	18	2	94	2	0	2	1	6	29	287
12:15 PM	4	88	1	3	6	2	3	12	0	113	1	0	2	0	5	34	274
12:30 PM	6	87	1	0	7	0	4	14	3	99	4	4	2	0	2	30	263
12:45 PM	12	98	2	1	8	0	4	13	1	115	1	0	3	0	7	46	311
Total	34	375	7	8	26	2	18	57	6	421	8	4	9	1	20	139	1135
01:00 PM	6	90	2	0	2	0	4	9	1	88	0	0	4	0	2	47	255
01:15 PM	10	104	2	0	6	1	1	35	0	114	3	0	5	0	3	37	321
01:30 PM	8	125	2	1	6	0	2	8	3	102	2	0	8	0	5	36	309
01:45 PM	10	116	1	0	3	1	3	15	1	116	0	0	2	0	6	30	304
Total	34	435	7	1	17	2	10	67	5	420	5	0	19	0	16	150	1189
02:00 PM	3	96	0	0	7	0	4	23	1	101	1	0	3	0	5	21	265
02:15 PM	10	80	3	0	4	1	2	20	0	95	3	0	1	0	4	31	224
02:30 PM	10	114	2	0	6	0	1	14	0	114	2	0	3	0	4	29	299
02:45 PM	6	103	3	4	6	0	4	7	0	89	1	0	8	0	9	47	287
Total	29	393	8	4	23	1	11	64	1	369	7	0	15	0	22	128	1075
03:00 PM	6	118	0	4	7	1	5	30	0	96	0	0	4	0	3	44	318
03:15 PM	8	116	3	2	4	0	3	22	1	89	4	0	3	0	6	37	298
03:30 PM	9	116	3	0	9	0	4	15	2	112	0	0	2	0	11	31	314
03:45 PM	15	109	5	0	4	0	3	12	2	103	1	0	5	0	9	32	300
Total	38	459	11	6	24	1	15	79	5	400	5	0	14	0	29	144	1230
04:00 PM	9	95	3	0	5	1	5	12	0	100	0	0	2	0	8	17	257
04:15 PM	12	98	3	3	3	0	4	14	0	78	2	0	1	0	13	29	260
Grand Total	156	1856	39	22	98	7	63	293	17	1788	27	4	60	1	108	607	5146
Apprch %	7.5	89.5	1.9	1.1	21.3	1.5	13.7	63.6	0.9	97.4	1.5	0.2	7.7	0.1	13.9	78.2	
Total %	3	36.1	0.8	0.4	1.9	0.1	1.2	5.7	0.3	34.7	0.5	0.1	1.2	0	2.1	11.8	

DRAFT

Type of peak hour being reported: System Peak

Method for determining peak hour: Total Entering Volume

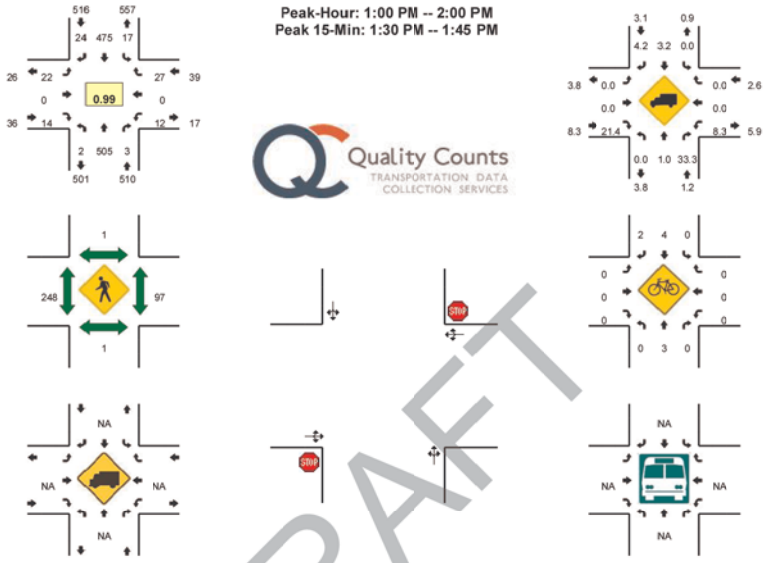
LOCATION: Kamehameha Hwy -- Kewalo Ln/Opaeula Rd

CITY/STATE: Haleiwa, HI

QC JOB #: 12772604

DATE: Sat, Aug 23 2014

Peak-Hour: 1:00 PM -- 2:00 PM
Peak 15-Min: 1:30 PM -- 1:45 PM



Quality Counts
TRANSPORTATION DATA COLLECTION SERVICES

5-Min Count Period Beginning At	Kamehameha Hwy (Northbound)				Kamehameha Hwy (Southbound)				Kewalo Ln/Opaeula Rd (Eastbound)				Kewalo Ln/Opaeula Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
1:00 PM	2	42	0	0	0	44	6	0	2	0	2	0	2	0	2	0	102	
1:05 PM	0	47	1	0	2	35	1	0	3	0	0	0	0	0	1	0	90	
1:10 PM	0	42	1	0	1	35	0	0	3	0	1	0	1	0	3	0	87	
1:15 PM	0	34	0	0	2	46	2	0	1	0	2	0	4	0	0	0	91	
1:20 PM	0	42	0	0	2	36	1	0	0	0	1	0	0	0	2	0	84	
1:25 PM	0	43	1	0	2	41	0	3	3	0	1	0	0	0	3	0	97	
1:30 PM	0	44	0	0	0	47	5	0	1	0	0	0	0	0	4	0	101	
1:35 PM	0	43	0	0	1	36	4	0	3	0	1	0	2	0	4	0	94	
1:40 PM	0	37	0	0	0	41	1	0	1	0	1	0	2	0	1	0	84	
1:45 PM	0	35	0	0	2	44	1	0	0	0	4	0	0	0	2	0	88	
1:50 PM	0	53	0	0	1	26	0	0	3	0	1	0	1	0	4	0	89	
1:55 PM	0	43	0	0	1	44	3	0	2	0	0	0	0	0	1	0	94	1101
2:00 PM	0	38	0	0	3	40	3	0	5	0	1	0	1	0	0	0	91	1090
2:05 PM	0	40	0	0	2	44	7	0	3	0	2	0	1	0	1	0	100	1100
2:10 PM	0	46	0	0	1	27	1	0	3	0	1	0	1	0	4	0	84	1097
2:15 PM	0	42	0	0	0	31	2	0	1	0	0	0	1	1	1	0	79	1085
2:20 PM	0	54	0	0	3	40	2	0	1	0	2	0	1	0	1	0	104	1105
2:25 PM	0	39	1	0	2	45	5	1	4	0	1	0	0	0	2	0	100	1108
2:30 PM	1	40	1	0	1	41	0	0	3	0	0	0	1	0	4	0	92	1099
2:35 PM	1	51	1	0	1	23	1	0	2	0	0	0	1	0	1	0	82	1087
2:40 PM	1	36	0	0	0	35	1	0	3	0	2	0	0	0	3	0	81	1084
2:45 PM	1	35	0	0	1	27	2	0	3	0	2	0	2	0	1	0	74	1070
2:50 PM	0	37	2	0	1	41	1	0	3	0	1	0	3	1	4	0	94	1075
2:55 PM	0	30	0	0	0	33	1	0	2	0	1	0	2	1	2	0	72	1053

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	496	0	0	4	496	40	0	20	0	8	0	16	0	36	0	1116
Heavy Trucks	0	0	0		0	4	0		0	0	4		0	0	0		8
Pedestrians		0				0				292				72			364
Bicycles	0	0	0		0	1	1		0	0	0		0	0	0		2
Railroad																	
Stopped Buses																	

Comments:

Report generated on 8/28/2014 6:48 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

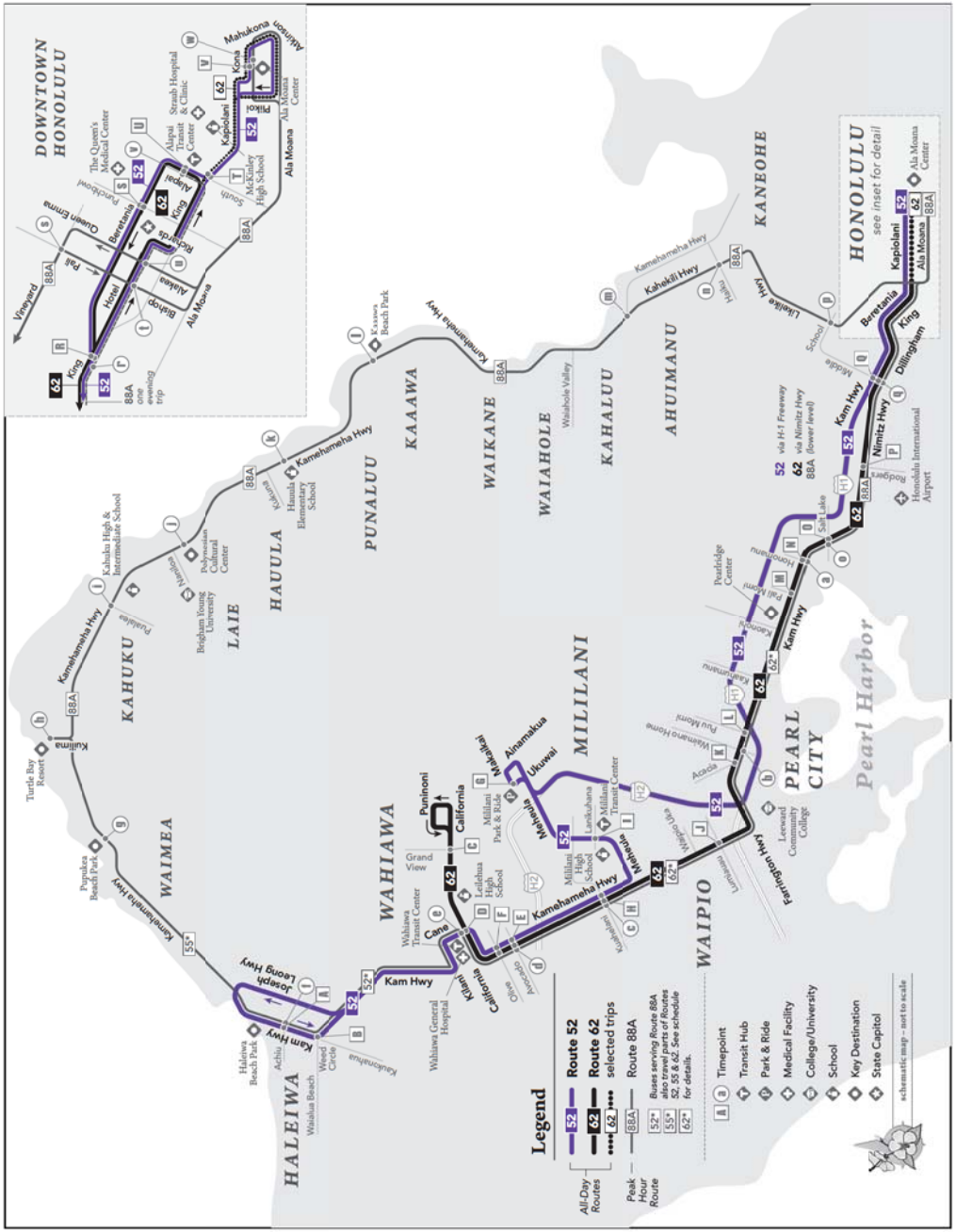
DRAFT

Kamehameha Highway - Kewalo Ln/Opaeula Rd 15-min intervals

15 Min Counts	Kamehameha Highway Northbound				Kamehameha Highway Southbound				Kewalo Lane				Opaeula Rd				15-min	Hourly
Beginning at	Left	Through	Right	U	Left	Through	Right	U	Left	Through	Right	U	Left	Through	Right	U	Total	Total
1:00-1:15 PM	2	131	2	0	3	114	7	0	8	0	3	0	3	0	6	0	279	
1:15-1:30 PM	0	119	1	0	6	123	3	3	4	0	4	0	4	0	5	0	272	
1:30-1:45 PM	0	124	0	0	1	124	10	0	5	0	2	0	4	0	9	0	279	
1:45-2:00 PM	0	131	0	0	4	114	4	0	5	0	5	0	1	0	7	0	271	1101
2:00-2:15 PM	0	124	0	0	6	111	11	0	11	0	4	0	3	0	5	0	275	1097
2:15-2:30 PM	0	135	1	0	5	116	9	1	6	0	3	0	2	1	4	0	283	1108
2:30-2:45 PM	3	127	2	0	2	99	2	0	8	0	2	0	2	0	8	0	255	1084
2:45-3:00 PM	1	102	2	0	2	101	4	0	8	0	4	0	7	2	7	0	240	1053

APPENDIX B

TheBus Route Schedules and Maps



Route 52 Honolulu - Mililani - Haleiwa and Route 62 Honolulu - Wahiawa

Effective 3/2/15

Weekday: Westbound: To Mililani/Wahiawa/Wahiawa Heights/Haleiwa

	Ala Moana Ctr Kona St (#426) V	Downtown Alapai Transit Ctr (#2268) U	Downtown Beretania/Punchbowl (#45) S	Downtown King/Beretania (#440) R	Kalihi Kam Hwy/Middle (#453) Q	Airport Rodgers/Nimitz (#470) P	Aiea Kam Hwy/Salt Lake (#479) O	Aiea Kam Hwy/Honomanu (#480) N	Pearlridge Kam Hwy/Pali Momi (#481) M	Pearl City Kam Hwy/Puu Momi (#490) L	Waipio Kam Hwy/Lumiauau (#1922) J	Mililani Park & Ride (#1620) G	Mililani Transit Center (#4418) I	Mililani Kam Hwy/Kuahelani (#1627) H	Wahiawa Kam Hwy/Avocado (#1630) E	Wahiawa Transit Center (#4426) D	Wahiawa Heights California/Grand View (#1656) C	Kam Hwy Weed Circle (#2215) B	Haleiwa Kam Hwy/Achiu (#2216) A
62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	418a	420a	430a	.....	.....
62	.....	.....	.....	.....	.....	.....	.....	428a	429a	434a	440a	.....	.....	450a	456a	458a	.....	.....	.....
52	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	459a	.....	515a	.....
62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	458a	500a	510a	.....	.....
62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	528a	530a	540a	.....	.....
52	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	533a	.....	550a	.....
62	.....	.....	.....	.....	.....	.....	.....	505a	506a	511a	517a	.....	.....	527a	533a	535a	.....	.....	.....
62	.....	445a	447a	451a	501a	506a	513a	515a	516a	521a	527a	.....	.....	537a	544a	545a	555a	.....	.....
62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	548a	550a	600a	.....	.....
52	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	559a	.....	618a	.....
62	.....	515a	517a	521a	531a	538a	545a	547a	548a	553a	600a	.....	.....	611a	619a	620a	630a	.....	.....
52	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	617a	622a	627a	635a	637a	.....	.....	701a
52	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	640a	.....	659a	.....
62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	645a	647a	657a	.....	.....
62	536a	545a	547a	551a	601a	608a	616a	618a	619a	626a	634a	.....	.....	645a	655a	657a	708a	.....	.....
62	(School Day Operation; Cancelled on School Holidays) Kam Hwy/Acacia-646a										652a	.....	.....	704a	715a	717a	728a	.....	.....
62	.....	.....	.....	.....	.....	.....	.....	(School Holiday Operation, does not run on School Days)							715a	717a	728a	.....	.....
52	606a	615a	617a	623a	634a	.....	.....	.....	.....	.....	.....	657a	702a	708a	719a	721a	.....	.....	745a
62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	742a	744a	755a	.....	.....
62	.....	630a	632a	638a	649a	656a	705a	707a	708a	715a	723a	.....	.....	735a	746a	749a	800a	.....	.....
52	634a	645a	647a	653a	704a	.....	.....	.....	.....	.....	.....	728a	733a	740a	752a	754a	.....	.....	818a
62	.....	700a	702a	708a	719a	726a	735a	737a	738a	745a	753a	.....	.....	805a	815a	817a	828a	.....	.....
52	702a	715a	717a	723a	734a	.....	.....	.....	.....	.....	.....	758a	803a	810a	820a	822a	.....	.....	845a
62	717a	730a	732a	738a	749a	756a	805a	807a	808a	815a	824a	.....	.....	836a	845a	847a	858a	.....	.....
52	732a	745a	747a	753a	804a	.....	.....	.....	.....	.....	.....	828a	833a	837a	846a	848a	.....	.....	911a
62	.....	800a	802a	808a	819a	826a	835a	837a	838a	845a	854a	.....	.....	906a	915a	917a	928a	.....	.....
52	802a	815a	817a	823a	834a	.....	.....	.....	.....	.....	.....	857a	902a	906a	915a	917a	.....	.....	940a
62	.....	830a	832a	838a	849a	856a	905a	907a	908a	915a	924a	.....	.....	936a	945a	947a	958a	.....	.....
52	833a	845a	847a	853a	904a	.....	.....	.....	.....	.....	.....	926a	931a	937a	946a	948a	.....	.....	1012a
62	.....	900a	902a	908a	919a	926a	935a	937a	938a	945a	954a	.....	.....	1006a	1015a	1017a	1028a	.....	.....
52	903a	915a	917a	924a	935a	.....	.....	.....	.....	.....	.....	956a	1001a	1007a	1016a	1018a	.....	.....	1045a
62	.....	930a	932a	939a	950a	957a	1006a	1008a	1009a	1016a	1025a	.....	.....	1037a	1046a	1048a	1059a	.....	.....
52	933a	945a	947a	954a	1005a	.....	.....	.....	.....	.....	.....	1027a	1032a	1038a	1047a	1049a	.....	.....	1116a
62	.....	1000a	1002a	1009a	1021a	1028a	1037a	1039a	1040a	1047a	1056a	.....	.....	1108a	1118a	1120a	1131a	.....	.....
52	1002a	1015a	1017a	1024a	1036a	.....	.....	.....	.....	.....	.....	1058a	1103a	1109a	1119a	1121a	.....	.....	1147a
62	.....	1030a	1032a	1039a	1051a	1058a	1107a	1109a	1110a	1117a	1126a	.....	.....	1138a	1148a	1150a	**1201p**	.....	.....
52	1032a	1045a	1047a	1054a	1106a	.....	.....	.....	.....	.....	.....	1128a	1133a	1139a	1149a	1151a	.....	.....	**1217p**
62	.....	1100a	1102a	1109a	1121a	1128a	1137a	1139a	1140a	1147a	1156a	.....	.....	**1208p**	**1218p**	**1220p**	**1231p**	.....	.....
52	1102a	1115a	1117a	1124a	1136a	.....	.....	.....	.....	.....	.....	1158a	**1203p**	**1209p**	**1220p**	**1222p**	.....	.....	**1248p**
62	.....	1130a	1132a	1139a	1151a	1158a	**1207p**	**1209p**	**1210p**	**1217p**	**1226p**	.....	.....	**1238p**	**1248p**	**1251p**	**102p**	.....	.....
52	1132a	1145a	1147a	1154a	**1206p**	.....	.....	.....	.....	.....	.....	**1228p**	**1233p**	**1239p**	**1250p**	**1252p**	.....	.....	**118p**

Route 52 Destination Signs:

Westbound:
To Haleiwa - 52 WAHIAWA- HALEIWA
To Wahiawa Transit Center - 52 WAHIAWA
Eastbound:
To Ala Moana Center-Kona Street - 52 HONOLULU-Ala Moana Ctr
To Alapai Street - 52 ALAPAI TRANSIT CTR

Route 62 Destination Signs:

Westbound:
To Wahiawa Heights - 62 WAHIAWA HEIGHTS
To Wahiawa Transit Center - 62 WAHIAWA
Eastbound:
To Alapai Street - 62 ALAPAI TRANSIT CTR
To Pearlridge - 62 PEARLRIDGE
To Kam Hwy/Acacia - 62 PEARL CITY

Route 52 and 62 Symbols

▼ - Starts at Haleiwa Beach Park 2 minutes earlier
■ - Ends at Kam Hwy/California Ave 2 minutes later
● - Ends at Puninoni/Nonohe 2 minutes later
SA - Saturday Operation Only
SH - State Holiday Operation Only

Bold indicates PM service.
Schedule to change without notice.
All buses are lift and bicycle rack equipped.

NOTE - Numbers next to timepoints are **HEA** (Honolulu Estimated Arrival) stop numbers.Go to the **HEA** website at http://hea.thebus.org.

Route 52 Honolulu - Mililani - Haleiwa and Route 62 Honolulu - Wahiawa

Effective 3/2/15

Weekday: Westbound: To Mililani/Wahiawa/Wahiawa Heights/Haleiwa

	Ala Moana Ctr Kona St (#426) V	Downtown Alapai Transit Ctr (#2268) U	Downtown Beretania/Punchbowl (#45) S	Downtown King/Beretania (#440) R	Kalihi Kam Hwy/Middle (#453) Q	Airport Rodgers/Nimitz (#470) P	Aiea Kam Hwy/Salt Lake (#479) O	Aiea Kam Hwy/Honomanu (#480) N	Pearlridge Kam Hwy/Pali Momi (#481) M	Pearl City Kam Hwy/Puu Momi (#490) L	Waipio Kam Hwy/Lumiauau (#1922) J	Mililani Park & Ride (#1620) G	Mililani Transit Center (#4418) I	Mililani Kam Hwy/Kuahelani (#1627) H	Wahiawa Kam Hwy/Avocado (#1630) E	Wahiawa Transit Center (#4426) D	Wahiawa Heights California/Grand View (#1656) C	Kam Hwy Weed Circle (#2215) B	Haleiwa Kam Hwy/Achiu (#2216) A
62	.....	1200p	1202p	1209p	1221p	1228p	1237p	1239p	1240p	1247p	1256p	.....	.....	108p	118p	121p	132p	.....	.....
52	1202p	1215p	1217p	1224p	1236p	.....	.....	.....	.....	.....	.....	1257p	102p	108p	119p	121p	.....	.....	147p
62	.....	1230p	1232p	1239p	1251p	1258p	107p	109p	110p	117p	126p	.....	.....	138p	148p	151p	202p	.....	.....
52	1231p	1245p	1247p	1254p	106p	.....	.....	.....	.....	.....	.....	127p	132p	138p	149p	151p	.....	.....	217p
62	.....	100p	102p	109p	121p	128p	137p	139p	140p	147p	156p	.....	.....	209p	219p	222p	233p	.....	.....
52	101p	115p	117p	124p	136p	.....	.....	.....	.....	.....	.....	157p	203p	210p	221p	223p	.....	.....	249p
52	131p	145p	147p	154p	206p	.....	.....	.....	.....	.....	.....	227p	233p	240p	251p	253p	.....	.....	320p
62	.....	130p	132p	139p	151p	159p	209p	211p	212p	219p	228p	.....	.....	241p	251p	254p	305p	.....	.....
62	.....	200p	202p	210p	222p	230p	240p	242p	243p	250p	259p	.....	.....	312p	322p	325p	335p	.....	.....
52	201p	215p	217p	225p	237p	.....	.....	.....	.....	.....	.....	259p	305p	312p	323p	325p	.....	.....	353p
62	.....	.....	.....	.....	.....	.....	.....	.....	304p	311p	320p	.....	.....	333p	344p	346p	● 356p	.....	.....
62	.....	230p	232p	240p	252p	300p	310p	312p	313p	321p	330p	.....	.....	343p	353p	356p	406p	.....	.....
52	231p	245p	247p	255p	307p	.....	.....	.....	.....	.....	.....	333p	339p	346p	357p	359p	.....	.....	427p
62	.....	300p	302p	310p	322p	330p	341p	344p	345p	354p	403p	.....	.....	416p	426p	429p	439p	.....	.....
52	301p	315p	317p	325p	338p	.....	.....	.....	.....	.....	.....	408p	414p	419p	430p	432p	.....	.....	458p
62	.....	330p	332p	340p	353p	401p	412p	415p	416p	425p	434p	.....	.....	447p	457p	500p	510p	.....	.....
52	330p	345p	347p	355p	408p	.....	.....	.....	.....	.....	.....	443p	449p	454p	505p	507p	.....	.....	533p
52	400p	415p	417p	425p	438p	.....	.....	.....	.....	.....	.....	513p	518p	522p	533p	535p	.....	.....	601p
62	.....	400p	402p	410p	423p	431p	442p	445p	446p	501p	513p	.....	.....	525p	535p	538p	548p	.....	.....
52	425p	440p	442p	449p	502p	.....	.....	.....	.....	.....	.....	537p	542p	546p	557p	559p	.....	.....	622p
62	.....	430p	432p	440p	453p	501p	513p	516p	517p	532p	544p	.....	.....	556p	606p	609p	● 619p	.....	.....
52	445p	500p	502p	509p	522p	.....	.....	.....	.....	.....	.....	557p	602p	606p	617p	619p	.....	.....	642p
62	.....	500p	502p	509p	522p	530p	542p	545p	546p	601p	613p	.....	.....	625p	635p	637p	647p	.....	.....
52	515p	530p	532p	539p	552p	.....	.....	.....	.....	.....	.....	627p	632p	636p	646p	648p	.....	.....	711p
62	.....	525p	527p	534p	547p	555p	606p	609p	610p	622p	634p	.....	.....	646p	656p	658p	● 708p	.....	.....
52	545p	600p	602p	609p	622p	.....	.....	.....	.....	.....	.....	649p	654p	658p	707p	709p	.....	.....	729p
62	.....	555p	557p	604p	617p	625p	634p	636p	637p	644p	656p	.....	.....	708p	717p	719p	729p	.....	.....
62	.....	630p	632p	639p	652p	700p	709p	711p	712p	719p	731p	.....	.....	743p	753p	755p	805p	.....	.....
52	648p	700p	702p	707p	719p	.....	.....	.....	.....	.....	.....	741p	746p	750p	759p	801p	.....	.....	821p
62	718p	730p	732p	739p	749p	756p	804p	806p	807p	813p	821p	.....	.....	833p	841p	843p	852p	.....	.....
52	748p	800p	802p	807p	817p	.....	.....	.....	.....	.....	.....	838p	843p	847p	855p	■ 857p	.....	.....	.....
62	820p	830p	832p	837p	847p	854p	902p	904p	905p	911p	919p	.....	.....	931p	939p	941p	950p	.....	.....
52	850p	900p	902p	907p	917p	.....	.....	.....	.....	.....	.....	938p	943p	947p	956p	958p	.....	.....	.....
62	920p	930p	932p	937p	947p	954p	1002p	1004p	1005p	1011p	1017p	.....	.....	1028p	1036p	1038p	●1047p	.....	.....
52	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Kam Hwy/Whitmore - 912p				.....	930p
52	950p	1000p	1002p	1007p	1017p	.....	.....	.....	.....	.....	.....	1038p	1043p	1047p	1056p	1058p	.....	.....	.....
62	.....	1030p	1032p	1037p	1047p	1052p	1100p	1102p	1103p	1109p	1115p	.....	.....	1126p	1134p	1136p	1145p	.....	.....

Route 52 Destination Signs:

Westbound:
To Haleiwa - 52 WAHIAWA- HALEIWA
To Wahiawa Transit Center - 52 WAHIAWA
Eastbound:
To Ala Moana Center-Kona Street - 52 HONOLULU-Ala Moana Ctr
To Alapai Street - 52 ALAPAI TRANSIT CTR

Route 62 Destination Signs:

Westbound:
To Wahiawa Heights - 62 WAHIAWA HEIGHTS
To Wahiawa Transit Center - 62 WAHIAWA
Eastbound:
To Alapai Street - 62 ALAPAI TRANSIT CTR
To Pearlridge - 62 PEARLRIDGE
To Kam Hwy/Acacia - 62 PEARL CITY

Route 52 and 62 Symbols

▼ - Starts at Haleiwa Beach Park 2 minutes earlier
■ - Ends at Kam Hwy/California Ave 2 minutes later
● - Ends at Puninoni/Nonohe 2 minutes later
SA - Saturday Operation Only
SH - State Holiday Operation Only

Bold indicates PM service.
Schedule to change without notice.
All buses are lift and bicycle rack equipped.

NOTE - Numbers next to timepoints are **HEA** (Honolulu Estimated Arrival) stop numbers.Go to the **HEA** website at http://hea.thebus.org.

Route 52 Honolulu - Mililani - Haleiwa and Route 62 Honolulu - Wahiawa

Effective 3/2/15

Weekday: Eastbound: To Downtown/Alapai Transit Center/Ala Moana Center

	Haleiwa Kam Hwy/Achiu (#2216)	Kam Hwy Weed Circle (#2206)	Wahiawa Heights California/Grand View (#1656)	Wahiawa Transit Center (#4525)	Wahiawa Kam Hwy/Olive (#1684)	Mililani Kam Hwy/Kuahelani (#1613)	Mililani Transit Center (#4419)	Mililani Park & Ride (#1620)	Waipio Kam Hwy/Lumiauau (#1694)	Pearl City Kam Hwy/Acacia (#1695)	Pearl City Kam Hwy/Puu Momi (#692)	Pearlridge Kam Hwy/Pali Momi (#692)	Aiea Kam Hwy/Salt Lake (#695)	Airport Rodgers/Nimitz (#704)	Kalihi Kam Hwy/Middle (#579)	Downtown King/Beretania (#591)	Downtown Alapai Transit Ctr (#1003)	Downtown Kapiolani/South (#595)	Ala Moana Ctr Kona St (#1313)
	A	B	C	D	F	H	I	G	J	K	L	M	O	P	Q	R	U	T	V
62	.....	.....	431a	440a	441a	450a	.....	.....	500a	503a	505a	510a	513a	522a	527a	537a	.....	544a	553a
62	.....	.....	.....	500a	501a	510a	.....	.....	520a	524a	526a	532a	535a	545a	550a	600a	607a	.....	.....
52	449a	452a	.....	510a	511a	520a	523a	528a	.....	.....	.....	.....	.....	.....	547a	557a	.....	605a	616a
62	.....	.....	511a	520a	521a	531a	.....	.....	541a	545a	547a	554a	557a	607a	612a	622a	.....	631a	643a
62	.....	.....	.....	535a	536a	546a	.....	.....	557a	602a	604a	611a	614a	624a	630a	640a	.....	650a	702a
52	.....	.....	.....	540a	541a	551a	554a	600a	.....	.....	.....	.....	.....	.....	620a	630a	640a	.....	.....
62	.....	.....	541a	550a	551a	601a	.....	.....	613a	618a	620a	627a	630a	640a	647a	657a	.....	707a	719a
52	549a	552a	.....	610a	611a	621a	624a	632a	.....	.....	.....	.....	.....	.....	655a	706a	.....	716a	728a
62	.....	.....	600a	610a	611a	621a	.....	.....	633a	638a	640a	647a	650a	700a	707a	719a	728a	.....	.....
62	.....	.....	618a	630a	631a	641a	.....	.....	653a	658a	700a	707a	710a	720a	727a	739a	748a	.....	.....
52	▼618a	621a	.....	640a	642a	652a	655a	703a	.....	.....	.....	.....	.....	.....	727a	739a	.....	750a	802a
62	.....	.....	638a	650a	652a	702a	.....	.....	714a	719a	721a	728a	731a	741a	748a	800a	809a	.....	.....
52	647a	650a	.....	710a	712a	722a	725a	734a	.....	.....	.....	.....	.....	.....	800a	812a	.....	823a	835a
62	.....	.....	658a	710a	712a	722a	.....	.....	734a	739a	741a	748a	751a	801a	808a	820a	829a	.....	.....
52	707a	710a	.....	730a	732a	743a	746a	755a	.....	.....	.....	.....	.....	.....	819a	831a	.....	843a	855a
62	.....	.....	718a	730a	732a	743a	.....	.....	755a	800a	802a	809a	812a	822a	829a	841a	853a	.....	.....
52	727a	730a	.....	750a	752a	803a	806a	815a	.....	.....	.....	.....	.....	.....	837a	849a	.....	901a	913a
62	.....	.....	738a	750a	752a	803a	.....	.....	815a	820a	822a	829a	832a	842a	849a	901a	913a	.....	.....
52	747a	750a	.....	810a	812a	822a	825a	833a	.....	.....	.....	.....	.....	.....	854a	906a	.....	918a	930a
62	.....	.....	758a	810a	812a	822a	.....	.....	834a	839a	841a	848a	851a	901a	908a	920a	932a	.....	.....
52	802a	805a	.....	825a	827a	837a	840a	847a	.....	.....	.....	.....	.....	.....	908a	920a	.....	932a	944a
62	.....	.....	828a	840a	842a	852a	.....	.....	904a	909a	911a	918a	921a	931a	938a	950a	1002a	.....	.....
52	832a	835a	.....	855a	857a	908a	911a	919a	.....	.....	.....	.....	.....	.....	939a	951a	.....	1003a	1015a
62	.....	.....	858a	910a	912a	923a	.....	.....	935a	940a	942a	949a	952a	1002a	1009a	1021a	1033a	.....	.....
52	902a	905a	.....	925a	927a	938a	941a	949a	.....	.....	.....	.....	.....	.....	1008a	1021a	.....	1033a	1045a
62	.....	.....	928a	940a	942a	953a	.....	.....	1005a	1010a	1012a	1019a	1022a	1032a	1039a	1051a	1103a	.....	.....
52	932a	935a	.....	955a	957a	1008a	1011a	1019a	.....	.....	.....	.....	.....	.....	1038a	1052a	.....	1104a	1116a
62	.....	.....	958a	1010a	1012a	1023a	.....	.....	1035a	1040a	1042a	1049a	1052a	1102a	1109a	1121a	1133a	.....	.....
52	1002a	1005a	.....	1025a	1027a	1038a	1041a	1049a	.....	.....	.....	.....	.....	.....	1108a	1122a	.....	1134a	1146a
62	.....	.....	1028a	1040a	1042a	1053a	.....	.....	1105a	1110a	1112a	1119a	1122a	1132a	1139a	1153a	**1205p**	.....	.....
52	1032a	1035a	.....	1055a	1057a	1108a	1111a	1119a	.....	.....	.....	.....	.....	.....	1139a	1153a	.....	**1205p**	**1217p**
62	.....	.....	1058a	1110a	1112a	1123a	.....	.....	1135a	1140a	1142a	1149a	1152a	**1202p**	**1209p**	**1223p**	**1235p**	.....	.....
52	1102a	1105a	.....	1125a	1127a	1138a	1141a	1149a	.....	.....	.....	.....	.....	.....	**1211p**	**1225p**	.....	**1237p**	**1249p**
62	.....	.....	1128a	1140a	1142a	1153a	.....	.....	**1205p**	**1210p**	**1212p**	**1219p**	**1222p**	**1232p**	**1239p**	**1253p**	**105p**	.....	.....
52	1132a	1135a	.....	1155a	1157a	**1208p**	**1211p**	**1219p**	.....	.....	.....	.....	.....	.....	**1241p**	**1255p**	.....	**107p**	**119p**
62	.....	.....	1158a	**1210p**	**1212p**	**1223p**	.....	.....	**1235p**	**1240p**	**1242p**	**1249p**	**1252p**	**102p**	**109p**	**123p**	**135p**	.....	.....
52	**1202p**	**1205p**	.....	**1225p**	**1227p**	**1238p**	**1241p**	**1249p**	.....	.....	.....	.....	.....	.....	**111p**	**125p**	.....	**137p**	**149p**
62	.....	.....	**1228p**	**1240p**	**1242p**	**1253p**	.....	.....	**105p**	**110p**	**112p**	**119p**	**122p**	**132p**	**139p**	**153p**	**205p**	.....	.....
52	**1232p**	**1235p**	.....	**1255p**	**1257p**	**108p**	**111p**	**119p**	.....	.....	.....	.....	.....	.....	**140p**	**154p**	.....	**206p**	**218p**

Route 52 Destination Signs:

Westbound:
To Haleiwa - 52 WAHIAWA- HALEIWA
To Wahiawa Transit Center - 52 WAHIAWA
Eastbound:
To Ala Moana Center-Kona Street - 52 HONOLULU-Ala Moana Ctr
To Alapai Street - 52 ALAPAI TRANSIT CTR

Route 62 Destination Signs:

Westbound:
To Wahiawa Heights - 62 WAHIAWA HEIGHTS
To Wahiawa Transit Center - 62 WAHIAWA
Eastbound:
To Alapai Street - 62 ALAPAI TRANSIT CTR
To Pearlridge - 62 PEARLRIDGE
To Kam Hwy/Acacia - 62 PEARL CITY

Route 52 and 62 Symbols

▼ - Starts at Haleiwa Beach Park 2 minutes earlier
■ - Ends at Kam Hwy/California Ave 2 minutes later
● - Ends at Puninoni/Nonohe 2 minutes later
SA - Saturday Operation Only
SH - State Holiday Operation Only

Bold indicates PM service.
Schedule to change without notice.
All buses are lift and bicycle rack equipped.

NOTE - Numbers next to timepoints are **HEA** (Honolulu Estimated Arrival) stop numbers.Go to the **HEA** website at http://hea.thebus.org.

Route 52 Honolulu - Mililani - Haleiwa and Route 62 Honolulu - Wahiawa

Effective 3/2/15

Weekday: Eastbound: To Downtown/Alapai Transit Center/Ala Moana Center

	Haleiwa Kam Hwy/Achiu (#2216)	Kam Hwy Weed Circle (#2206)	Wahiawa Heights California/Grand View (#1656)	Wahiawa Transit Center (#4525)	Wahiawa Kam Hwy/Olive (#1684)	Mililani Kam Hwy/Kuahelani (#1613)	Mililani Transit Center (#4419)	Mililani Park & Ride (#1620)	Waipio Kam Hwy/Lumiauau (#1694)	Pearl City Kam Hwy/Acacia (#1695)	Pearl City Kam Hwy/Puu Momi (#692)	Pearlridge Kam Hwy/Pali Momi (#692)	Aiea Kam Hwy/Salt Lake (#695)	Airport Rodgers/Nimitz (#704)	Kalihi Kam Hwy/Middle (#579)	Downtown King/Beretania (#591)	Downtown Alapai Transit Ctr (#1003)	Downtown Kapiolani/South (#595)	Ala Moana Ctr Kona St (#1313)
	A	B	C	D	F	H	I	G	J	K	L	M	O	P	Q	R	U	T	V
62	.....	.....	**1258p**	**110p**	**112p**	**123p**	.....	.....	**135p**	**140p**	**142p**	**149p**	**152p**	**202p**	**209p**	**223p**	**235p**	.....	.....
52	**102p**	**105p**	.....	**125p**	**127p**	**139p**	**142p**	**150p**	.....	.....	.....	.....	.....	.....	**209p**	**223p**	.....	**235p**	**247p**
62	.....	.....	**128p**	**140p**	**142p**	**154p**	.....	.....	**206p**	**211p**	**213p**	**220p**	**223p**	**233p**	**240p**	**253p**	**310p**	.....	.....
52	**132p**	**135p**	.....	**155p**	**157p**	**209p**	**212p**	**220p**	.....	.....	.....	.....	.....	.....	**239p**	**252p**	.....	**304p**	**316p**
62	.....	.....	**158p**	**210p**	**212p**	**224p**	.....	.....	**236p**	**241p**	**243p**	**250p**	**253p**	**303p**	**310p**	**323p**	**340p**	.....	.....
52	**202p**	**205p**	.....	**225p**	**227p**	**239p**	**242p**	**250p**	.....	.....	.....	.....	.....	.....	**310p**	**323p**	.....	**335p**	**347p**
62	.....	.....	**228p**	**240p**	**242p**	**255p**	.....	.....	**307p**	**312p**	**315p**	**322p**	**325p**	**335p**	**342p**	**355p**	**412p**	.....	.....
52	**229p**	**232p**	.....	**255p**	**257p**	**311p**	**314p**	**322p**	.....	.....	.....	.....	.....	.....	**344p**	**357p**	.....	**409p**	**421p**
62	.....	.....	**256p**	**310p**	**312p**	**326p**	.....	.....	**338p**	**343p**	**346p**	**353p**	**356p**	**406p**	**413p**	**426p**	**443p**	.....	.....
52	**257p**	**300p**	.....	**325p**	**327p**	**341p**	**344p**	**352p**	.....	.....	.....	.....	.....	.....	**411p**	**424p**	.....	**436p**	**448p**
62	.....	.....	**326p**	**340p**	**342p**	**356p**	.....	.....	**409p**	**414p**	**417p**	**424p**	**427p**	**437p**	**444p**	**457p**	**514p**	.....	.....
52	**327p**	**330p**	.....	**355p**	**357p**	**409p**	**412p**	**420p**	.....	.....	.....	.....	.....	.....	**439p**	**452p**	.....	**504p**	**516p**
62	.....	.....	**356p**	**410p**	**412p**	**425p**	.....	.....	**438p**	**444p**	**447p**	**454p**	**457p**	**507p**	**514p**	**527p**	**540p**	.....	.....
52	**359p**	**402p**	.....	**425p**	**427p**	**439p**	**442p**	**450p**	.....	.....	.....	.....	.....	.....	**509p**	**522p**	.....	**533p**	**545p**
62	.....	.....	**428p**	**440p**	**442p**	**454p**	.....	.....	**507p**	**512p**	**515p**	**522p**	**525p**	**535p**	**542p**	**553p**	**605p**	.....	.....
52	**429p**	**432p**	.....	**455p**	**457p**	**509p**	**512p**	**520p**	.....	.....	.....	.....	.....	.....	**539p**	**551p**	.....	**602p**	**612p**
62	.....	.....	**458p**	**510p**	**512p**	**524p**	.....	.....	**537p**	**542p**	**545p**	**552p**	**555p**	**604p**	**609p**	**619p**	**630p**	.....	.....
52	**457p**	**500p**	.....	**523p**	**525p**	**537p**	**540p**	**548p**	.....	.....	.....	.....	.....	.....	**607p**	**617p**	.....	**628p**	**637p**
62	.....	.....	**528p**	**540p**	**542p**	**554p**	.....	.....	**605p**	**609p**	**611p**	**616p**	**619p**	**627p**	**632p**	**642p**	**651p**	.....	.....
52	**532p**	**535p**	.....	**555p**	**557p**	**607p**	**610p**	**618p**	.....	.....	.....	.....	.....	.....	**637p**	**647p**	.....	**656p**	**705p**
62	.....	.....	**601p**	**610p**	**612p**	**622p**	.....	.....	**632p**	**636p**	**638p**	**643p**	**646p**	**654p**	**659p**	**709p**	.....	**718p**	**727p**
52	**632p**	**635p**	.....	**655p**	**656p**	**706p**	**709p**	**716p**	.....	.....	.....	.....	.....	.....	**735p**	**745p**	.....	**753p**	**802p**
62	.....	.....	**706p**	**715p**	**716p**	**726p**	.....	.....	**736p**	**740p**	**742p**	**747p**	**749p**	**756p**	**801p**	**811p**	.....	**819p**	**828p**
62	.....	.....	**729p**	**738p**	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
52	**735p**	**737p**	.....	**755p**	**756p**	**805p**	**808p**	**813p**	.....	.....	.....	.....	.....	.....	**832p**	**842p**	.....	**849p**	**856p**
52	**750p**	**752p**	.....	**810p**	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
62	.....	.....	**805p**	**814p**	**815p** (On Fridays ONLY, bus changes to Route 72 and continues to Schofield Barracks)														
62	.....	.....	.....	**815p**	**816p**	**825p**	.....	.....	**835p**	**839p**	**841p**	**846p**	**848p**	**855p**	**900p**	**908p**	.....	**914p**	**922p**
52	**835p**	**837p**	.....	**852p**	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
62	.....	.....	**901p**	**910p**	**911p**	**920p**	.....	.....	**930p**	**934p**	**936p**	**941p**	**943p**	**950p**	**955p**	**1003p**	**1009p**	.....	.....
52	**939p**	**941p**	.....	**956p**	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
62	.....	.....	**1011p**	**1020p**	**1021p**	**1030p**	.....	.....	**1040p**	**1044p**	**1046p**	**1051p**	**1053p**	**1100p**	**1105p**	**1113p**	**1119p**	.....	.....
52	▼**1008p**	**1010p**	.....	**1025p**	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
62	.....	.....	.....	**1035p**	**1036p**	**1045p**	.....	.....	**1055p**	**1059p**	.....	.....	.....	.....	.....	.....	.....	.....	.....
52	▼**1122p**	**1124p**	.....	**1139p**	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
62	.....	.....	.....	**1150p**	**1151p**	**1157p**	.....	.....	1204a	1207a	1209a	1214a	1216a	1223a	1228a	1236a	1242a	.....	.....
62	.....	.....	**1151p**	1200a	1201a (On Fridays ONLY, bus changes to Route 72 and continues to Schofield Barracks)														
52	▼1235a	1237a	.....	1252a	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
62	.....	.....	.....	100a	101a	107a	.....	.....	114a	117a	.....	.....	.....	.....	.....	.....	.....	.....	.....

Route 52 Destination Signs:

Westbound:
To Haleiwa - 52 WAHIAWA- HALEIWA
To Wahiawa Transit Center - 52 WAHIAWA
Eastbound:
To Ala Moana Center-Kona Street - 52 HONOLULU-Ala Moana Ctr
To Alapai Street - 52 ALAPAI TRANSIT CTR

Route 62 Destination Signs:

Westbound:
To Wahiawa Heights - 62 WAHIAWA HEIGHTS
To Wahiawa Transit Center - 62 WAHIAWA
Eastbound:
To Alapai Street - 62 ALAPAI TRANSIT CTR
To Pearlridge - 62 PEARLRIDGE
To Kam Hwy/Acacia - 62 PEARL CITY

Route 52 and 62 Symbols

▼ - Starts at Haleiwa Beach Park 2 minutes earlier
■ - Ends at Kam Hwy/California Ave 2 minutes later
● - Ends at Puninoni/Nonohe 2 minutes later
SA - Saturday Operation Only
SH - State Holiday Operation Only

Bold indicates PM service.
Schedule to change without notice.
All buses are lift and bicycle rack equipped.

NOTE - Numbers next to timepoints are **HEA** (Honolulu Estimated Arrival) stop numbers.Go to the **HEA** website at http://hea.thebus.org.

Route 52 Honolulu - Mililani - Haleiwa and Route 62 Honolulu - Wahiawa

Effective 3/2/15

Saturday & State Holiday: Westbound: To Mililani/Wahiawa/Wahiawa Heights/Haleiwa

		V	U	S	R	Q	P	O	N	M	L	J	G	I	H	E	D	C	B	A
		Ala Moana Ctr Kona St (#4426)	Downtown Alapai Transit Ctr (#2288)	Downtown Beretania/Punchbowl (#45)	Downtown King/Beretania (#440)	Kalihi Kam Hwy/Middle (#453)	Airport Rodgers/Nimitz (#470)	Aiea Kam Hwy/Salt Lake (#479)	Aiea Kam Hwy/Honomanu (#480)	Pearlridge Kam Hwy/Pali Momi (#481)	Pearl City Kam Hwy/Puu Momi (#490)	Waipio Kam Hwy/Lumiauau (#1622)	Mililani Park & Ride (#1620)	Mililani Transit Center (#4418)	Mililani Kam Hwy/Kuahelani (#1627)	Wahiawa Kam Hwy/Avocado (#1632)	Wahiawa Transit Center (#4326)	Wahiawa Heights California/Grand View (#1656)	Kam Hwy Weed Circle (#2215)	Haleiwa Kam Hwy/Achiu (#2216)
62		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	430a	432a	439a	.....	.....
62	SH	.....	.....	.....	.....	.....	.....	.....	404a	405a	412a	419a	.....	.....	429a	437a	439a	.....	.....	.....
52	SH	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	439a	.....	455a	.....
62	SH	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	444a	446a	453a	.....	.....
62	SA	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	505a	507a	514a	.....	.....
62	SH	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	509a	511a	518a	.....	.....
62		.....	.....	.....	.....	.....	.....	.....	442a	443a	450a	457a	.....	.....	507a	515a	517a	.....	.....	.....
52		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	517a	.....	533a	.....
62	SH	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	521a	523a	530a	.....	.....
62	SA	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	535a	537a	544a	.....	.....
62	SH	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	551a	553a	600a	.....	.....
62		.....	453a	455a	500a	510a	516a	524a	526a	527a	534a	541a	.....	.....	551a	559a	601a	608a	.....	.....
62		505a	515a	517a	522a	532a	538a	546a	548a	549a	556a	603a	.....	.....	613a	621a	623a	630a	.....	.....
52		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	645a	.....	701a	.....
62		.....	545a	547a	552a	602a	608a	616a	618a	619a	626a	633a	.....	.....	643a	651a	653a	700a	.....	.....
62		605a	615a	617a	622a	632a	638a	646a	648a	649a	656a	703a	.....	.....	713a	722a	724a	731a	.....	.....
62		.....	630a	632a	637a	647a	653a	701a	703a	704a	711a	718a	.....	.....	728a	737a	739a	746a	.....	.....
52		635a	645a	647a	652a	702a	.....	.....	.....	.....	.....	.....	722a	726a	729a	738a	740a	.....	.....	805a
62		650a	700a	702a	708a	719a	725a	733a	735a	736a	743a	750a	.....	.....	800a	809a	811a	818a	.....	.....
52		715a	725a	727a	733a	744a	.....	.....	.....	.....	.....	.....	804a	808a	811a	820a	822a	.....	.....	848a
62		740a	750a	752a	758a	809a	815a	823a	825a	826a	833a	840a	.....	.....	850a	859a	901a	908a	.....	.....
52		800a	810a	812a	818a	829a	.....	.....	.....	.....	.....	.....	849a	853a	856a	905a	907a	.....	.....	933a
62		.....	830a	832a	838a	849a	855a	903a	905a	906a	913a	920a	.....	.....	930a	939a	941a	948a	.....	.....
52		840a	850a	852a	858a	909a	.....	.....	.....	.....	.....	.....	920a	934a	938a	947a	940a	.....	.....	1015a
62		.....	910a	912a	918a	929a	935a	943a	945a	946a	953a	1000a	.....	.....	1013a	1022a	1024a	1031a	.....	.....
52		917a	930a	932a	938a	949a	.....	.....	.....	.....	.....	.....	1009a	1014a	1018a	1027a	1029a	.....	.....	1059a
52		956a	1010a	1013a	1020a	1031a	.....	.....	.....	.....	.....	.....	1051a	1056a	1100a	1110a	1112a	.....	.....	1142a
62		.....	950a	952a	958a	1009a	1015a	1025a	1027a	1028a	1038a	1050a	.....	.....	1103a	1113a	1115a	1122a	.....	.....
52		1036a	1050a	1053a	1100a	1111a	.....	.....	.....	.....	.....	.....	1131a	1137a	1142a	1152a	1154a	.....	.....	**1223p**
62		.....	1030a	1033a	1040a	1051a	1057a	1107a	1109a	1110a	1120a	1132a	.....	.....	1145a	1155a	1157a	**1204p**	.....	.....
52		1116a	1130a	1133a	1140a	1151a	.....	.....	.....	.....	.....	.....	**1211p**	**1217p**	**1222p**	**1232p**	**1234p**	.....	.....	**101p**
62		.....	1110a	1113a	1120a	1131a	1137a	1147a	1149a	1150a	**1200p**	**1212p**	.....	.....	**1225p**	**1235p**	**1237p**	**1244p**	.....	.....
52		1156a	**1210p**	**1213p**	**1220p**	**1231p**	.....	.....	.....	.....	.....	.....	**1251p**	**1257p**	**102p**	**112p**	**114p**	.....	.....	**141p**
62		.....	1150a	1153a	**1200p**	**1211p**	**1217p**	**1227p**	**1229p**	**1230p**	**1240p**	**1252p**	.....	.....	**105p**	**115p**	**117p**	**124p**	.....	.....
52		**1236p**	**1250p**	**1253p**	**100p**	**111p**	.....	.....	.....	.....	.....	.....	**131p**	**137p**	**142p**	**152p**	**154p**	.....	.....	**221p**
62		.....	**1230p**	**1233p**	**1240p**	**1251p**	**1257p**	**107p**	**109p**	**110p**	**120p**	**132p**	.....	.....	**145p**	**155p**	**157p**	**204p**	.....	.....
52		**113p**	**130p**	**132p**	**139p**	**150p**	.....	.....	.....	.....	.....	.....	**210p**	**216p**	**221p**	**231p**	**233p**	.....	.....	**300p**

Route 52 Destination Signs:

Westbound:
To Haleiwa - 52 WAHIAWA- HALEIWA
To Wahiawa Transit Center - 52 WAHIAWA
Eastbound:
To Ala Moana Center-Kona Street - 52 HONOLULU-Ala Moana Ctr
To Alapai Street - 52 ALAPAI TRANSIT CTR

Route 62 Destination Signs:

Westbound:
To Wahiawa Heights - 62 WAHIAWA HEIGHTS
To Wahiawa Transit Center - 62 WAHIAWA
Eastbound:
To Alapai Street - 62 ALAPAI TRANSIT CTR
To Pearlridge - 62 PEARLRIDGE
To Kam Hwy/Acacia - 62 PEARL CITY

Route 52 and 62 Symbols

▼ - Starts at Haleiwa Beach Park 2 minutes earlier
■ - Ends at Kam Hwy/California Ave 2 minutes later
● - Ends at Puninoni/Nonohe 2 minutes later
SA - Saturday Operation Only
SH - State Holiday Operation Only

Bold indicates PM service.
Schedule to change without notice.
All buses are lift and bicycle rack equipped.

NOTE - Numbers next to timepoints are **HEA** (Honolulu Estimated Arrival) stop numbers.Go to the **HEA** website at http://hea.thebus.org.

Route 52 Honolulu - Mililani - Haleiwa and Route 62 Honolulu - Wahiawa

Effective 3/2/15

Saturday & State Holiday: Westbound: To Mililani/Wahiawa/Wahiawa Heights/Haleiwa

		V	U	S	R	Q	P	O	N	M	L	J	G	I	H	E	D	C	B	A
		Ala Moana Ctr Kona St (#4426)	Downtown Alapai Transit Ctr (#2288)	Downtown Beretania/Punchbowl (#45)	Downtown King/Beretania (#440)	Kalihi Kam Hwy/Middle (#453)	Airport Rodgers/Nimitz (#470)	Aiea Kam Hwy/Salt Lake (#479)	Aiea Kam Hwy/Honomanu (#480)	Pearlridge Kam Hwy/Pali Momi (#481)	Pearl City Kam Hwy/Puu Momi (#490)	Waipio Kam Hwy/Lumiauau (#1622)	Mililani Park & Ride (#1620)	Mililani Transit Center (#4418)	Mililani Kam Hwy/Kuahelani (#1627)	Wahiawa Kam Hwy/Avocado (#1632)	Wahiawa Transit Center (#4326)	Wahiawa Heights California/Grand View (#1656)	Kam Hwy Weed Circle (#2215)	Haleiwa Kam Hwy/Achiu (#2216)
62		.....	110p	113p	120p	131p	137p	147p	149p	150p	200p	212p	.....	.....	225p	235p	237p	245p	.....	.....
52		153p	210p	212p	219p	230p	.....	.....	.....	.....	.....	.....	250p	256p	301p	311p	313p	.....	.....	340p
62		.....	150p	152p	159p	210p	216p	226p	228p	229p	239p	251p	.....	.....	304p	314p	316p	324p	.....	.....
52		233p	250p	252p	259p	310p	.....	.....	.....	.....	.....	.....	330p	336p	341p	351p	353p	.....	.....	418p
62		.....	230p	232p	239p	250p	256p	306p	308p	309p	319p	331p	.....	.....	344p	354p	356p	404p	.....	.....
62		.....	310p	312p	319p	330p	336p	346p	348p	349p	359p	411p	.....	.....	424p	434p	436p	444p	.....	.....
52		313p	330p	332p	339p	350p	.....	.....	.....	.....	.....	.....	415p	421p	426p	436p	438p	.....	.....	502p
62		.....	350p	352p	359p	410p	416p	426p	428p	429p	436p	444p	.....	.....	457p	507p	509p	517p	.....	.....
52		353p	410p	412p	419p	430p	-----	-----	-----	-----	-----	-----	455p	501p	506p	514p	516p	-----	-----	540p
52		425p	440p	442p	449p	500p	.....	.....	.....	.....	.....	.....	520p	526p	531p	539p	541p	.....	.....	605p
62		.....	425p	427p	434p	445p	451p	501p	503p	504p	511p	519p	.....	.....	532p	542p	544p	552p	.....	.....
62		.....	455p	457p	504p	515p	521p	531p	533p	534p	541p	549p	.....	.....	600p	608p	610p	●618p	.....	.....
52		457p	510p	512p	519p	530p	-----	-----	-----	-----	-----	-----	550p	556p	601p	609p	611p	-----	-----	635p
62	SA	.....	525p	527p	534p	545p	550p	558p	600p	601p	607p	615p	.....	.....	626p	634p	636p	644p	.....	.....
62	SH	.....	525p	527p	534p	545p	551p	600p	602p	603p	609p	617p	.....	.....	628p	636p	638p	646p	.....	.....
52		528p	540p	542p	549p	600p	.....	.....	.....	.....	.....	.....	620p	625p	629p	637p	639p	.....	.....	703p
62		.....	600p	602p	609p	617p	622p	630p	632p	633p	639p	647p	.....	.....	658p	706p	708p	●716p	.....	.....
52		608p	620p	622p	629p	637p	.....	.....	.....	.....	.....	.....	657p	702p	706p	714p	716p	.....	.....	740p
62		.....	640p	642p	649p	657p	702p	710p	712p	713p	719p	727p	.....	.....	738p	746p	748p	756p	.....	.....
52	SA	648p	700p	702p	709p	717p	.....	.....	.....	.....	.....	.....	737p	742p	746p	754p	756p	.....	.....	817p
52	SH	648p	700p	702p	709p	717p	.....	.....	.....	.....	.....	.....	737p	742p	746p	754p	756p	Haleiwa Bch Pk		818p
62		.....	720p	722p	729p	737p	742p	750p	752p	753p	759p	807p	.....	.....	818p	826p	828p	836p	.....	.....
52		728p	740p	742p	749p	757p	.....	.....	.....	.....	.....	.....	817p	822p	826p	834p	836p	.....	.....	.....
62		753p	805p	807p	814p	822p	827p	835p	837p	838p	844p	852p	.....	.....	903p	911p	913p	●921p	.....	.....
52		818p	830p	832p	839p	847p	.....	.....	.....	.....	.....	.....	907p	912p	916p	924p	926p	.....	944p	.....
62		930p	940p	942p	947p	955p	1000p	1008p	1010p	1011p	1017p	1023p	.....	.....	1034p	1042p	1044p	●1052p	.....	.....
62		1025p	1035p	1037p	1042p	1050p	1055p	1103p	1105p	1106p	1112p	1118p	.....	.....	1129p	1137p	1139p	1147p	.....	.....

Route 52 Destination Signs:

Westbound:
To Haleiwa - 52 WAHIAWA- HALEIWA
To Wahiawa Transit Center - 52 WAHIAWA
Eastbound:
To Ala Moana Center-Kona Street - 52 HONOLULU-Ala Moana Ctr
To Alapai Street - 52 ALAPAI TRANSIT CTR

Route 62 Destination Signs:

Westbound:
To Wahiawa Heights - 62 WAHIAWA HEIGHTS
To Wahiawa Transit Center - 62 WAHIAWA
Eastbound:
To Alapai Street - 62 ALAPAI TRANSIT CTR
To Pearlridge - 62 PEARLRIDGE
To Kam Hwy/Acacia - 62 PEARL CITY

Route 52 and 62 Symbols

▼ - Starts at Haleiwa Beach Park 2 minutes earlier
■ - Ends at Kam Hwy/California Ave 2 minutes later
● - Ends at Puninoni/Nonohe 2 minutes later
SA - Saturday Operation Only
SH - State Holiday Operation Only

Bold indicates PM service.
Schedule to change without notice.
All buses are lift and bicycle rack equipped.

NOTE - Numbers next to timepoints are **HEA** (Honolulu Estimated Arrival) stop numbers.Go to the **HEA** website at http://hea.thebus.org.

Route 52 Honolulu - Mililani - Haleiwa and Route 62 Honolulu - Wahiawa

Effective 3/2/15

Saturday & State Holiday: Eastbound: To Downtown/Alapai Transit Center/Ala Moana Center

	A	B	C	D	F	H	I	G	J	K	L	M	O	P	Q	R	U	T	V
	Haleiwa Kam Hwy/Achiu (#2216)	Kam Hwy West Circle (#2206)	Wahiawa Heights California/Grand View (#1656)	Wahiawa Transit Center (#4535)	Wahiawa Kam Hwy/Olive (#1684)	Mililani Kam Hwy/Kuahelani (#1613)	Mililani Transit Center (#4419)	Mililani Park & Ride (#1620)	Waipio Kam Hwy/Lumiaiau (#1694)	Pearl City Kam Hwy/Acacia (#1695)	Pearl City Kam Hwy/Puu Momi (#692)	Pearlridge Kam Hwy/Pali Momi (#695)	Aiea Kam Hwy/Salt Lake (#696)	Airport Rodgers/Nimitz (#704)	Kalihi Kam Hwy/Middle (#579)	Downtown King/Beretania (#581)	Downtown Alapai Transit Ctr (#1033)	Downtown Kapiolani/South (#5565)	Ala Moana Ctr Kona St (#1313)
62	.....	.....	440a	449a	450a	459a	.....	.....	509a	514a	515a	521a	523a	529a	533a	543a	.....	548a	554a
62 SH	.....	.....	453a	502a	503a	512a	.....	.....	522a	527a	528a	534a	536a	542a	546a	556a	.....	601a	607a
52 SH▼	457a	500a	.....	518a	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
62 SH	.....	.....	.....	516a	517a	526a	.....	.....	536a	541a	542a	548a	550a	556a	600a	610a	.....	615a	621a
62 SA	.....	.....	515a	525a	526a	535a	.....	.....	545a	550a	551a	557a	559a	605a	609a	619a	.....	624a	630a
62 SH	.....	.....	518a	528a	529a	538a	.....	.....	548a	553a	554a	600a	602a	608a	612a	622a	.....	627a	633a
62 SH	.....	.....	530a	540a	541a	550a	.....	.....	600a	605a	606a	612a	614a	620a	624a	634a	.....	639a	645a
52 SH▼	534a	537a	.....	555a	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
62 SH	.....	.....	.....	555a	556a	605a	.....	.....	615a	620a	621a	627a	629a	635a	639a	649a	.....	654a	700a
62 SA	.....	.....	545a	555a	556a	605a	.....	.....	615a	620a	621a	627a	629a	635a	639a	649a	.....	654a	700a
62 SH	.....	.....	600a	610a	611a	620a	.....	.....	630a	635a	636a	642a	644a	650a	654a	704a	.....	709a	715a
62	.....	.....	615a	625a	626a	635a	.....	.....	645a	650a	651a	657a	659a	705a	709a	719a	.....	727a	733a
52 ▼	619a	622a	.....	640a	641a	650a	654a	700a	.....	.....	.....	.....	.....	.....	719a	729a	.....	736a	743a
62	.....	.....	645a	655a	656a	705a	.....	.....	715a	720a	721a	727a	729a	735a	739a	749a	.....	757a	803a
62	.....	.....	702a	712a	713a	723a	.....	.....	733a	738a	739a	745a	747a	753a	758a	808a	.....	816a	822a
52 ▼	707a	710a	.....	728a	729a	739a	743a	749a	.....	.....	.....	.....	.....	.....	808a	818a	.....	825a	832a
62	.....	.....	731a	742a	743a	753a	.....	.....	803a	809a	810a	818a	821a	829a	834a	844a	855a	.....	.....
52 SA	734a	737a	.....	755a	756a	806a	810a	816a	.....	.....	.....	.....	.....	.....	835a	845a	.....	855a	902a
52 SH▼	734a	736a	.....	755a	756a	806a	810a	816a	.....	.....	.....	.....	.....	.....	835a	845a	.....	855a	902a
62	.....	.....	758a	810a	811a	821a	.....	.....	831a	837a	838a	846a	849a	857a	902a	914a	925a	.....	.....
52	808a	811a	.....	830a	831a	841a	845a	851a	.....	.....	.....	.....	.....	.....	910a	922a	.....	933a	941a
62	.....	.....	838a	850a	851a	901a	.....	.....	913a	922a	923a	931a	934a	942a	947a	959a	1010a	.....	.....
52 ▼	847a	850a	.....	910a	911a	921a	925a	931a	.....	.....	.....	.....	.....	.....	950a	1002a	.....	1013a	1021a
62	.....	.....	918a	930a	931a	941a	.....	.....	953a	1002a	1003a	1011a	1014a	1022a	1027a	1039a	1050a	.....	.....
52	927a	930a	.....	950a	951a	1001a	1005a	1011a	.....	.....	.....	.....	.....	.....	1030a	1042a	.....	1053a	1101a
62	.....	.....	958a	1010a	1011a	1021a	.....	.....	1033a	1042a	1043a	1051a	1054a	1102a	1107a	1119a	1130a	.....	.....
52	1007a	1010a	.....	1030a	1031a	1041a	1045a	1051a	.....	.....	.....	.....	.....	.....	1110a	1122a	.....	1133a	1141a
62	.....	.....	1038a	1050a	1051a	1101a	.....	.....	1113a	1122a	1123a	1131a	1134a	1142a	1147a	1159a	**1210p**	.....	.....
52	1047a	1050a	.....	1110a	1111a	1121a	1125a	1131a	.....	.....	.....	.....	.....	.....	1150a	**1202p**	.....	**1213p**	**1221p**
62	.....	.....	1118a	1130a	1132a	1143a	.....	.....	1155a	**1204p**	**1205p**	**1213p**	**1216p**	**1224p**	**1229p**	**1241p**	**1252p**	.....	.....
52	1127a	1130a	.....	1150a	1152a	**1203p**	**1207p**	**1213p**	.....	.....	.....	.....	.....	.....	**1232p**	**1244p**	.....	**1255p**	**103p**
62	.....	.....	1158a	**1210p**	**1212p**	**1223p**	.....	.....	**1235p**	**1244p**	**1245p**	**1253p**	**1256p**	**104p**	**109p**	**121p**	**132p**	.....	.....
52	**1207p**	**1210p**	.....	**1230p**	**1232p**	**1243p**	**1247p**	**1253p**	.....	.....	.....	.....	.....	.....	**112p**	**124p**	.....	**135p**	**143p**
62	.....	.....	**1238p**	**1250p**	**1252p**	**103p**	.....	.....	**115p**	**124p**	**125p**	**133p**	**136p**	**144p**	**149p**	**201p**	**212p**	.....	.....
52	**1247p**	**1250p**	.....	**110p**	**112p**	**123p**	**127p**	**133p**	.....	.....	.....	.....	.....	.....	**152p**	**204p**	.....	**215p**	**223p**
62	.....	.....	**118p**	**130p**	**132p**	**143p**	.....	.....	**155p**	**204p**	**205p**	**212p**	**215p**	**223p**	**228p**	**240p**	**251p**	.....	.....
52	**127p**	**130p**	.....	**150p**	**152p**	**203p**	**207p**	**213p**	.....	.....	.....	.....	.....	.....	**232p**	**244p**	.....	**255p**	**303p**
62	.....	.....	**158p**	**210p**	**212p**	**223p**	.....	.....	**235p**	**244p**	**245p**	**252p**	**255p**	**303p**	**308p**	**320p**	**331p**	.....	.....
52	**207p**	**210p**	.....	**230p**	**232p**	**243p**	**247p**	**253p**	.....	.....	.....	.....	.....	.....	**312p**	**324p**	.....	**334p**	**342p**

Route 52 Destination Signs:

Westbound:
To Haleiwa - 52 WAHIAWA- HALEIWA
To Wahiawa Transit Center - 52 WAHIAWA
Eastbound:
To Ala Moana Center-Kona Street - 52 HONOLULU-Ala Moana Ctr
To Alapai Street - 52 ALAPAI TRANSIT CTR

Route 62 Destination Signs:

Westbound:
To Wahiawa Heights - 62 WAHIAWA HEIGHTS
To Wahiawa Transit Center - 62 WAHIAWA
Eastbound:
To Alapai Street - 62 ALAPAI TRANSIT CTR
To Pearlridge - 62 PEARLRIDGE
To Kam Hwy/Acacia - 62 PEARL CITY

Route 52 and 62 Symbols

▼ - Starts at Haleiwa Beach Park 2 minutes earlier
■ - Ends at Kam Hwy/California Ave 2 minutes later
● - Ends at Puninoni/Nonohe 2 minutes later
SA - Saturday Operation Only
SH - State Holiday Operation Only

Bold indicates PM service.
Schedule to change without notice.
All buses are lift and bicycle rack equipped.

NOTE - Numbers next to timepoints are **HEA** (Honolulu Estimated Arrival) stop numbers.Go to the **HEA** website at http://hea.thebus.org.

Route 52 Honolulu - Mililani - Haleiwa and Route 62 Honolulu - Wahiawa

Effective 3/2/15

Saturday & State Holiday: Eastbound: To Downtown/Alapai Transit Center/Ala Moana Center

	A	B	C	D	F	H	I	G	J	K	L	M	O	P	Q	R	U	T	V
	Haleiwa Kam Hwy/Achiu (#2216)	Kam Hwy West Circle (#2206)	Wahiawa Heights California/Grand View (#1656)	Wahiawa Transit Center (#4535)	Wahiawa Kam Hwy/Olive (#1684)	Mililani Kam Hwy/Kuahelani (#1613)	Mililani Transit Center (#4419)	Mililani Park & Ride (#1620)	Waipio Kam Hwy/Lumiaiau (#1694)	Pearl City Kam Hwy/Acacia (#1695)	Pearl City Kam Hwy/Puu Momi (#692)	Pearlridge Kam Hwy/Pali Momi (#695)	Aiea Kam Hwy/Salt Lake (#696)	Airport Rodgers/Nimitz (#704)	Kalihi Kam Hwy/Middle (#579)	Downtown King/Beretania (#581)	Downtown Alapai Transit Ctr (#1033)	Downtown Kapiolani/South (#5565)	Ala Moana Ctr Kona St (#1313)
62	.....	.....	238p	250p	252p	303p	.....	.....	315p	324p	325p	332p	335p	343p	348p	359p	407p	.....	.....
52	247p	250p	.....	310p	312p	323p	327p	333p	.....	.....	.....	.....	.....	.....	358p	409p	.....	417p	425p
62	.....	.....	318p	330p	332p	343p	.....	.....	355p	404p	405p	412p	415p	423p	428p	439p	447p	.....	.....
52	327p	330p	.....	350p	352p	403p	407p	413p	.....	.....	.....	.....	.....	.....	436p	447p	.....	455p	503p
62	.....	.....	358p	410p	411p	421p	.....	.....	433p	439p	440p	447p	450p	458p	503p	514p	522p	.....	.....
52	407p	410p	.....	430p	431p	441p	445p	451p	.....	.....	.....	.....	.....	.....	510p	521p	.....	529p	537p
62	.....	.....	433p	445p	446p	456p	.....	.....	508p	514p	515p	522p	525p	533p	538p	549p	557p	.....	.....
52	437p	440p	.....	500p	501p	511p	515p	521p	.....	.....	.....	.....	.....	.....	540p	551p	.....	559p	607p
62	.....	.....	505p	515p	516p	526p	.....	.....	538p	544p	545p	552p	554p	602p	606p	615p	623p	.....	.....
52	517p	520p	.....	540p	541p	551p	555p	601p	.....	.....	.....	.....	.....	.....	620p	629p	.....	637p	645p
62	.....	.....	545p	555p	556p	606p	.....	.....	618p	624p	625p	632p	634p	641p	645p	654p	702p	.....	.....
52	552p	555p	.....	615p	616p	626p	630p	636p	.....	.....	.....	.....	.....	.....	655p	704p	.....	711p	718p
62	.....	.....	620p	630p	631p	641p	.....	.....	653p	659p	700p	707p	709p	716p	720p	729p	.....	736p	743p
52	630p	633p	.....	653p	654p	704p	708p	714p	.....	.....	.....	.....	.....	.....	733p	742p	.....	749p	756p
62	.....	.....	705p	715p	716p	726p	.....	.....	738p	744p	745p	752p	.....	.....	.....	.....	.....	.....	.....
52	705p	708p	.....	728p	729p	739p	743p	749p	.....	.....	.....	.....	.....	.....	808p	817p	.....	824p	831p
62	.....	.....	800p	810p	811p	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
52	757p	800p	.....	818p	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
62	.....	.....	.....	818p	819p	827p	.....	.....	836p	842p	843p	848p	850p	855p	858p	907p	.....	914p	921p
52 SA	844p	847p	.....	903p	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
52 SH▼	849p	852p	.....	908p	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
62	.....	.....	856p	906p	907p	915p	.....	.....	924p	930p	931p	936p	938p	943p	946p	955p	.....	1002p	1009p
52 ▼	949p	952p	.....	1008p	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
62	.....	.....	.....	1003p	1004p	1012p	.....	.....	1021p	1024p	.....	.....	.....	.....	.....	.....	.....	.....	.....
52 ▼	1043p	1046p	.....	1102p	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
62	.....	.....	.....	1125p	1126p	1134p	.....	.....	1143p	1146p	1147p	1152p	1154p	1159p	1202a	1211a	1218a	.....	.....
62	.....	.....	1147p	1157p	1158p	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
52 ▼	1143p	1146p	.....	1202a	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
52 ▼	1228a	1231a	.....	1247a	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
62	.....	.....	.....	1243a	1244a	1252a	.....	.....	101a	104a	.....	.....	.....	.....	.....	.....	.....	.....	.....

Route 52 Destination Signs:

Westbound:
To Haleiwa - 52 WAHIAWA- HALEIWA
To Wahiawa Transit Center - 52 WAHIAWA
Eastbound:
To Ala Moana Center-Kona Street - 52 HONOLULU-Ala Moana Ctr
To Alapai Street - 52 ALAPAI TRANSIT CTR

Route 62 Destination Signs:

Westbound:
To Wahiawa Heights - 62 WAHIAWA HEIGHTS
To Wahiawa Transit Center - 62 WAHIAWA
Eastbound:
To Alapai Street - 62 ALAPAI TRANSIT CTR
To Pearlridge - 62 PEARLRIDGE
To Kam Hwy/Acacia - 62 PEARL CITY

Route 52 and 62 Symbols

▼ - Starts at Haleiwa Beach Park 2 minutes earlier
■ - Ends at Kam Hwy/California Ave 2 minutes later
● - Ends at Puninoni/Nonohe 2 minutes later
SA - Saturday Operation Only
SH - State Holiday Operation Only

Bold indicates PM service.
Schedule to change without notice.
All buses are lift and bicycle rack equipped.

NOTE - Numbers next to timepoints are **HEA** (Honolulu Estimated Arrival) stop numbers.Go to the **HEA** website at http://hea.thebus.org.

Route 52 Honolulu - Mililani - Haleiwa and Route 62 Honolulu - Wahiawa

Effective 3/2/15

Sunday: Westbound: To Mililani/Wahiawa/Wahiawa Heights/Haleiwa

	V	U	S	R	Q	P	O	N	M	L	J	G	I	H	E	D	C	B	A
	Ala Moana Ctr Kona St (#426)	Downtown Alapai Transit Ctr (#2288)	Downtown Beretania/Punchbowl (#45)	Downtown King/Beretania (#440)	Kalihi Kam Hwy/Middle (#453)	Airport Rodgers/Nimitz (#470)	Aiea Kam Hwy/Salt Lake (#479)	Aiea Kam Hwy/Honomanu (#485)	Pearlridge Kam Hwy/Pali Momi (#481)	Pearl City Kam Hwy/Pua Momi (#480)	Waipio Kam Hwy/Lumiauau (#1922)	Mililani Park & Ride (#1620)	Mililani Transit Center (#4416)	Mililani Kam Hwy/Kuahelani (#1627)	Wahiawa Kam Hwy/Avocado (#1632)	Wahiawa Transit Center (#4526)	Wahiawa Heights California/Grand View (#1656)	Kam Hwy Weed Circle (#2215)	Haleiwa Kam Hwy/Aoliu (#2216)
62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	507a	509a	515a	.....	.....
52	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	518a	.....	536a	.....
62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	532a	534a	540a	.....	.....
52	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	554a	.....	612a	.....
62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	607a	609a	615a	.....	.....
62	.....	515a	517a	522a	533a	538a	545a	547a	548a	554a	601a	.....	.....	612a	620a	622a	628a	.....	.....
62	.....	545a	547a	552a	603a	608a	615a	617a	618a	624a	631a	.....	.....	642a	650a	652a	700a	.....	.....
52	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	654a	.....	.....	717a
62	604a	615a	617a	622a	633a	638a	645a	647a	648a	654a	701a	.....	.....	712a	720a	722a	●730a	.....	.....
62	.....	630a	632a	637a	648a	653a	702a	704a	705a	711a	718a	.....	.....	729a	737a	739a	747a	.....	.....
52	636a	645a	647a	652a	702a	.....	.....	.....	.....	.....	.....	719a	724a	729a	737a	739a	.....	.....	802a
62	.....	700a	702a	707a	718a	723a	732a	734a	735a	741a	748a	.....	.....	759a	807a	809a	817a	.....	.....
52	711a	720a	722a	728a	738a	.....	.....	.....	.....	.....	.....	757a	802a	807a	815a	817a	.....	.....	840a
62	.....	740a	742a	747a	758a	804a	813a	815a	816a	822a	829a	.....	.....	840a	848a	850a	858a	.....	.....
52	750a	800a	802a	808a	818a	.....	.....	.....	.....	.....	.....	839a	844a	849a	857a	859a	.....	.....	926a
62	.....	820a	822a	827a	838a	844a	853a	855a	856a	902a	909a	.....	.....	920a	929a	931a	939a	.....	.....
52	830a	840a	842a	848a	858a	.....	.....	.....	.....	.....	.....	919a	924a	929a	937a	939a	.....	.....	1006a
62	.....	900a	902a	907a	918a	924a	934a	936a	937a	943a	950a	.....	.....	1001a	1010a	1012a	1020a	.....	.....
52	909a	920a	922a	928a	938a	.....	.....	.....	.....	.....	.....	959a	1004a	1009a	1017a	1019a	.....	.....	1046a
62	.....	940a	942a	947a	958a	1004a	1014a	1016a	1017a	1023a	1030a	.....	.....	1041a	1050a	1052a	1100a	.....	.....
52	949a	1000a	1002a	1008a	1018a	.....	.....	.....	.....	.....	.....	1039a	1044a	1049a	1057a	1059a	.....	.....	1126a
62	.....	1020a	1022a	1027a	1038a	1044a	1054a	1056a	1057a	1103a	1110a	.....	.....	1121a	1130a	1132a	1140a	.....	.....
52	1029a	1040a	1042a	1048a	1058a	.....	.....	.....	.....	.....	.....	1119a	1124a	1129a	1138a	1140a	.....	.....	**1207p**
62	.....	1100a	1102a	1107a	1118a	1124a	1134a	1136a	1137a	1143a	1154a	.....	.....	1200p	1218p	1220p	1228p	.....	.....
52	1108a	1120a	1122a	1128a	1138a	.....	.....	.....	.....	.....	.....	1159a	**1204p**	**1209p**	**1218p**	**1220p**	.....	.....	**1247p**
62	.....	1140a	1142a	1147a	1158a	**1204p**	**1214p**	**1216p**	**1217p**	**1223p**	**1234p**	.....	.....	**1249p**	**1258p**	**100p**	**108p**	.....	.....
52	1148a	**1200p**	**1202p**	**1208p**	**1218p**	.....	.....	.....	.....	.....	.....	**1239p**	**1244p**	**1249p**	**1258p**	**100p**	.....	.....	**129p**
52	**1228p**	**1240p**	**1242p**	**1248p**	**1258p**	.....	.....	.....	.....	.....	.....	**119p**	**124p**	**129p**	**138p**	**140p**	.....	.....	**209p**
62	.....	**1220p**	**1222p**	**1227p**	**1238p**	**1244p**	**1254p**	**1256p**	**1257p**	**104p**	**115p**	.....	.....	**130p**	**139p**	**141p**	**149p**	.....	.....
62	.....	**100p**	**102p**	**107p**	**118p**	**124p**	**134p**	**136p**	**137p**	**144p**	**155p**	.....	.....	**208p**	**216p**	**218p**	**225p**	.....	.....
52	**105p**	**120p**	**122p**	**127p**	**138p**	.....	.....	.....	.....	.....	.....	**159p**	**204p**	**209p**	**218p**	**220p**	.....	.....	**249p**
62	.....	**140p**	**142p**	**147p**	**158p**	**204p**	**214p**	**216p**	**217p**	**224p**	**232p**	.....	.....	**244p**	**252p**	**254p**	**301p**	.....	.....
52	**145p**	**200p**	**202p**	**207p**	**218p**	.....	.....	.....	.....	.....	.....	**239p**	**244p**	**249p**	**258p**	**300p**	.....	.....	**325p**
62	.....	**220p**	**222p**	**227p**	**238p**	**244p**	**254p**	**256p**	**257p**	**304p**	**312p**	.....	.....	**324p**	**332p**	**334p**	**341p**	.....	.....
52	**225p**	**240p**	**242p**	**247p**	**258p**	.....	.....	.....	.....	.....	.....	**319p**	**324p**	**329p**	**338p**	**340p**	.....	.....	**405p**
62	.....	**300p**	**302p**	**307p**	**318p**	**324p**	**334p**	**336p**	**337p**	**344p**	**352p**	.....	.....	**404p**	**412p**	**414p**	**421p**	.....	.....
52	**305p**	**320p**	**322p**	**327p**	**338p**	.....	.....	.....	.....	.....	.....	**359p**	**404p**	**407p**	**416p**	**418p**	.....	.....	**443p**

Route 52 Destination Signs:

Westbound:
To Haleiwa - 52 WAHIAWA- HALEIWA
To Wahiawa Transit Center - 52 WAHIAWA
Eastbound:
To Ala Moana Center-Kona Street - 52 HONOLULU-Ala Moana Ctr
To Alapai Street - 52 ALAPAI TRANSIT CTR

Route 62 Destination Signs:

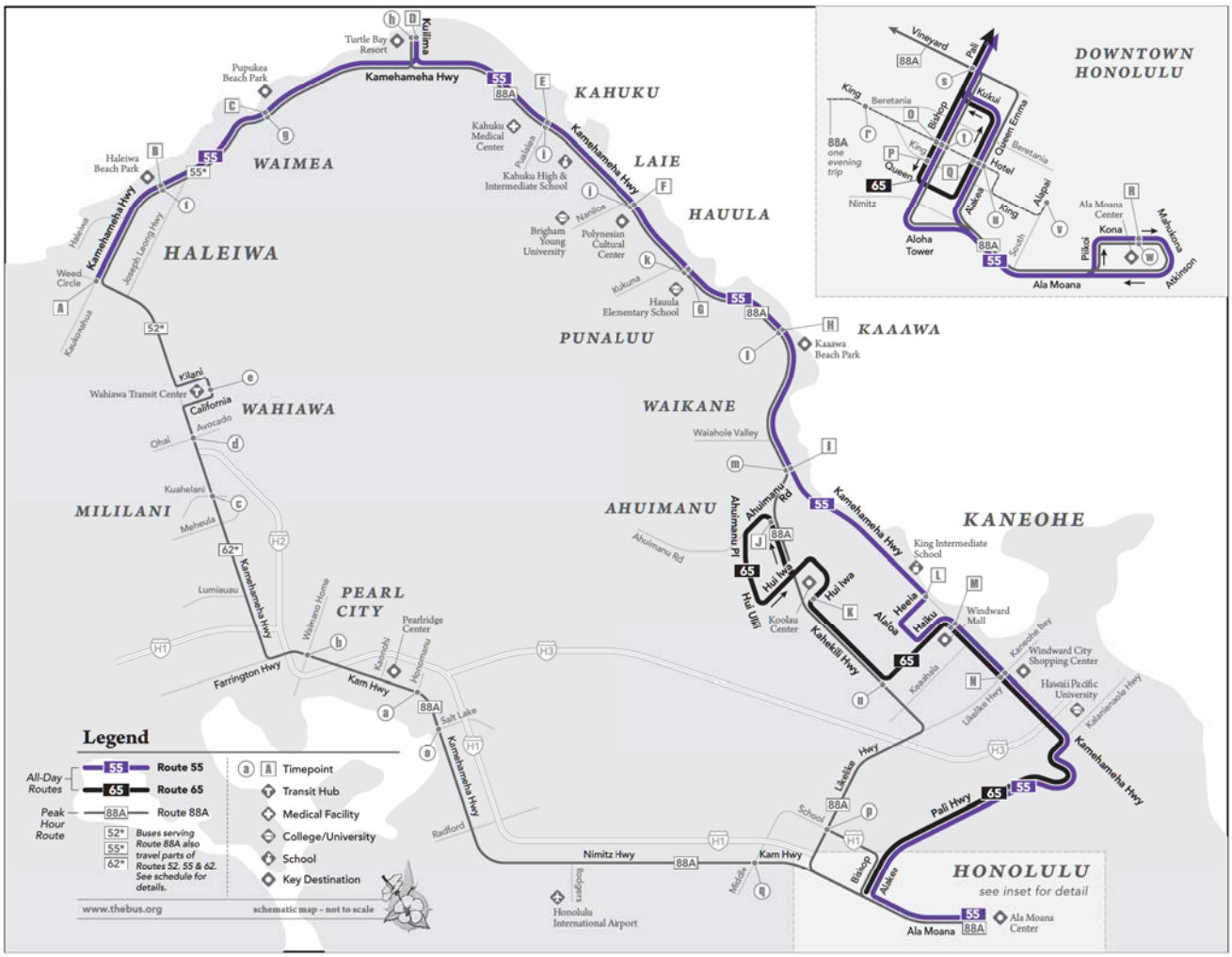
Westbound:
To Wahiawa Heights - 62 WAHIAWA HEIGHTS
To Wahiawa Transit Center - 62 WAHIAWA
Eastbound:
To Alapai Street - 62 ALAPAI TRANSIT CTR
To Pearlridge - 62 PEARLRIDGE
To Kam Hwy/Acacia - 62 PEARL CITY

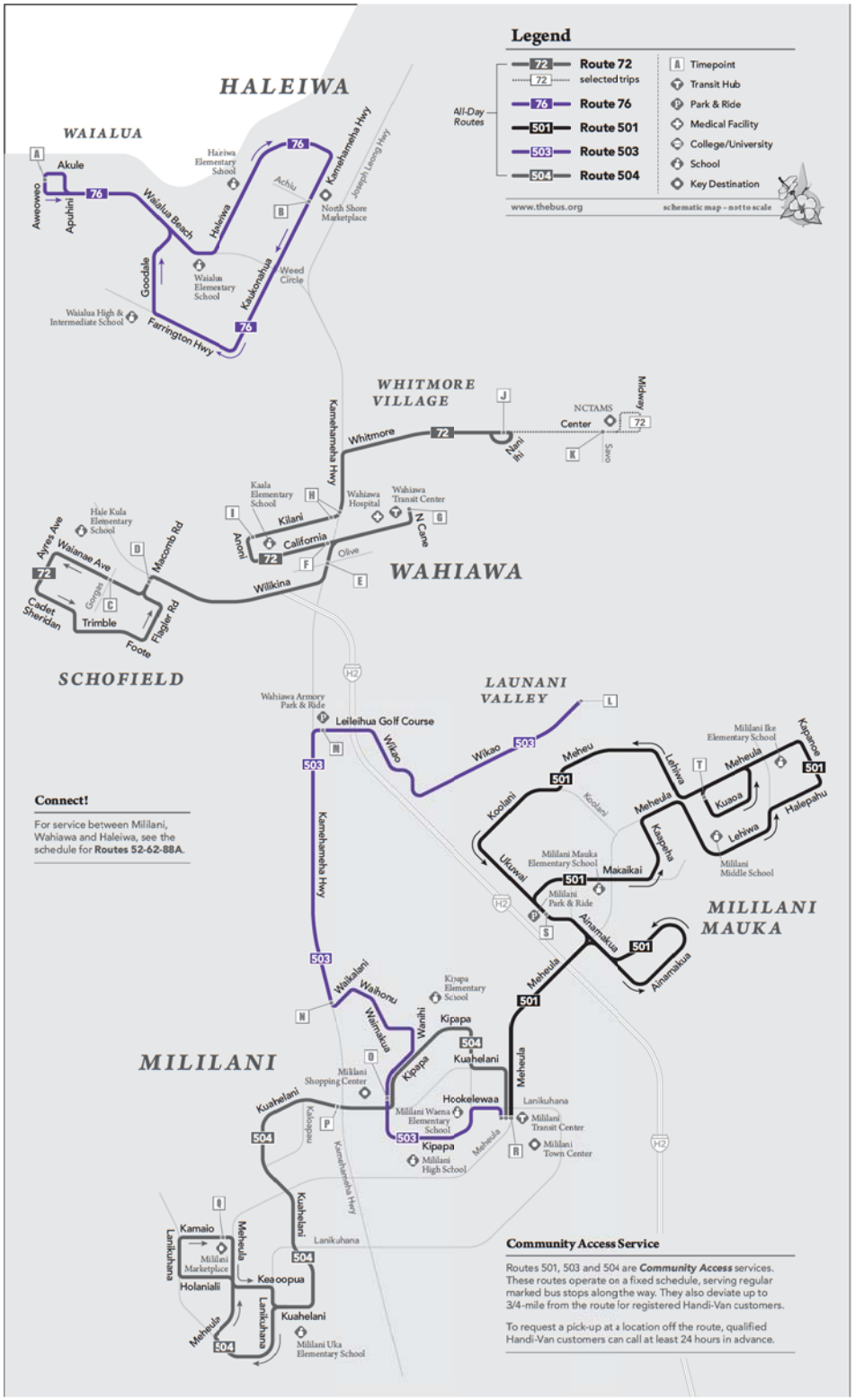
Route 52 and 62 Symbols

▼ - Starts at Haleiwa Beach Park 2 minutes earlier
■ - Ends at Kam Hwy/California Ave 2 minutes later
● - Ends at Puninoni/Nonohe 2 minutes later
SA - Saturday Operation Only
SH - State Holiday Operation Only

Bold indicates PM service.
Schedule to change without notice.
All buses are lift and bicycle rack equipped.

NOTE - Numbers next to timepoints are **HEA** (Honolulu Estimated Arrival) stop numbers.Go to the **HEA** website at http://hea.thebus.org.





Route 76 - Waialua - Haleiwa

Revised 12/7/08

Weekday: To Waialua

B: Haleiwa Kamehameha Hwy & Achiu Lane (#2216)	A: Waialua Awawono & Akule (#2224)
■ 600a	613a
640a	655a
720a	735a
805a	820a
845a	900a
925a	940a
1005a	1020a
1045a	1100a
1125a	1140a
1205p	**1220p**
1245p	**100p**
125p	**140p**
205p	**220p**
245p	**300p**
325p	**340p**
405p	**420p**
445p	**500p**
525p	**540p**
605p	**620p**
645p	**700p**

Saturday/ State Holiday

B	A
★ 600a	★ 610a
★ 640a	★ 655a
▼■ 640a	▼ 650a
720a	735a
800a	815a
840a	855a
920a	935a
1000a	1015a
1040a	1055a
1120a	1135a
1200p	**1215p**
1240p	**1255p**
120p	**135p**
200p	**215p**
240p	**255p**
320p	**335p**
400p	**415p**
440p	**455p**
520p	**535p**
600p	**615p**
640p	**655p**

Sunday

B	A
■ 720a	730a
800a	815a
840a	855a
920a	935a
1000a	1015a
1040a	1055a
1120a	1135a
1200p	**1215p**
1240p	**1255p**
120p	**135p**
200p	**215p**
240p	**255p**
320p	**335p**
400p	**415p**
440p	**455p**
520p	**535p**
600p	**615p**
640p	**655p**

Weekday: To Haleiwa

A: Waialua Awawono & Akule (#2224)	B: Haleiwa Kamehameha Hwy & Achiu Lane (#2216)
615a	630a
655a	710a
740a	755a
820a	835a
900a	915a
940a	955a
1020a	1035a
1100a	1115a
1140a	1155a
1220p	**1235p**
100p	**115p**
140p	**155p**
220p	**235p**
300p	**315p**
340p	**355p**
420p	**435p**
500p	**515p**
540p	**555p**
620p	**635p**
700p	**715p**

Saturday/ State Holiday

A	B
★ 620a	★ 635a
655a	710a
740a	755a
820a	835a
900a	915a
940a	955a
1020a	1035a
1100a	1115a
1140a	1155a
1220p	**1235p**
100p	**115p**
140p	**155p**
220p	**235p**
300p	**315p**
340p	**355p**
420p	**435p**
500p	**515p**
540p	**555p**
620p	**635p**
700p	**715p**

Sunday

A	B
740a	755a
820a	835a
900a	915a
940a	955a
1020a	1035a
1100a	1115a
1140a	1155a
1220p	**1235p**
100p	**115p**
140p	**155p**
220p	**235p**
300p	**315p**
340p	**355p**
420p	**435p**
500p	**515p**
540p	**555p**
620p	**635p**
700p	**715p**

Route 76 Destination Signs

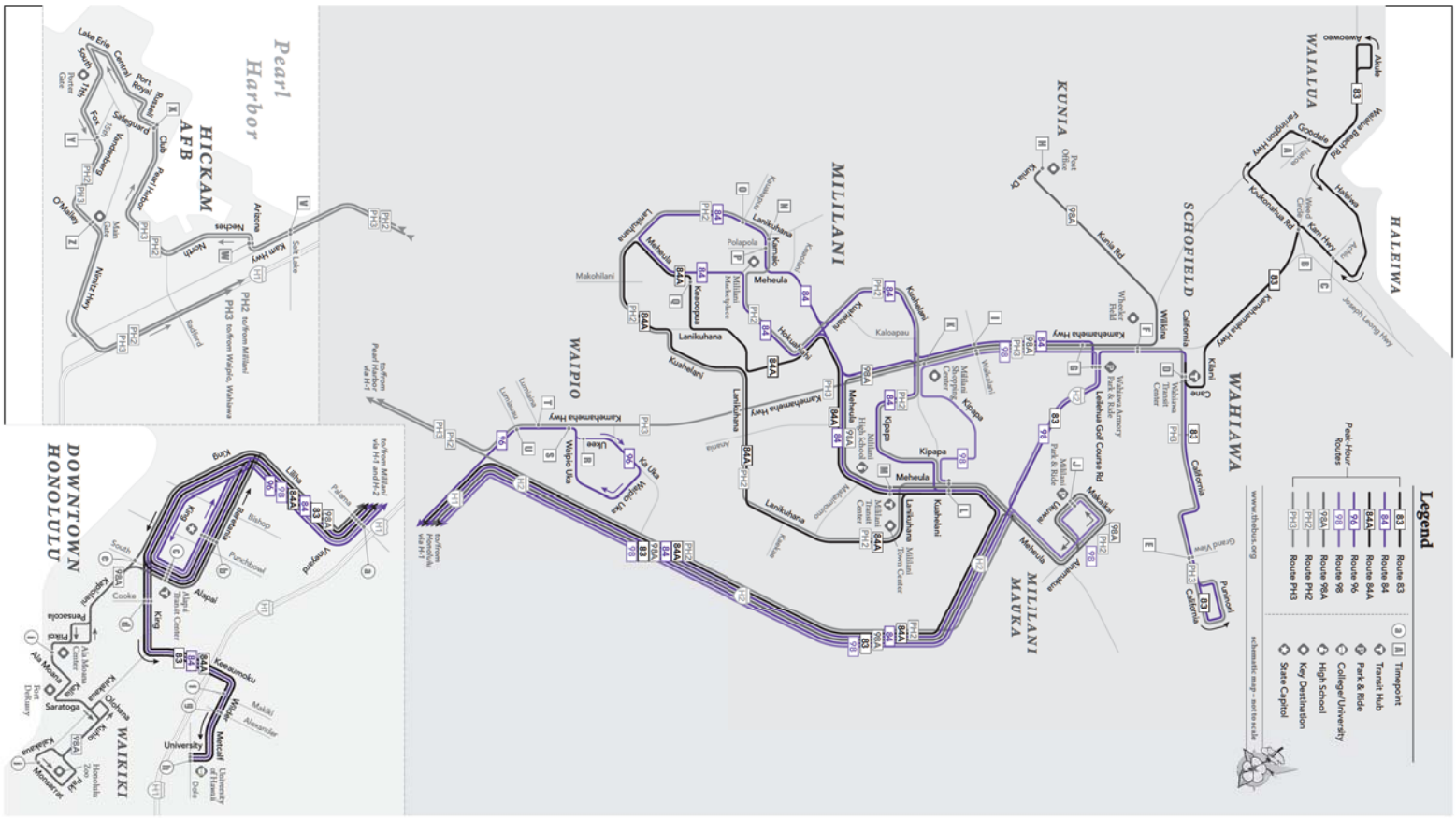
Westbound:
To Waialua - WAIALUA
EASTBOUND:
To Haleiwa - HALEIWA

Route 76 Symbols

■ - In service from Weed Junction.
★ - Operates on State Holidays only.
▼ - Operates on Saturdays only.

NOTE - Numbers next to timepoints are **HEA** (Honolulu Estimated Arrival) stop numbers.
Go to the **HEA** website at http://hea.thebus.org.

Bold indicates PM service.
Schedule to change without notice.
All buses are lift and bicycle rack equipped.



Route 83 - Wahiawa Town Express (Downtown/University of Hawaii)

Effective 3/5/12

A.M. Weekday Only: To Downtown Honolulu and University of Hawaii at Manoa

Waialua Kam Hwy & Weed Circle (B)	Haleiwa Kam Hwy & Achiu Ln (C)	Wahiawa Hts California & Grand View (E)	Wahiawa Transit Center (D)	Wheeler Kam Hwy & Wright Gate (F)	Wahiawa Park & Ride (Armory) (G)	Vineyard & Palama (a)	Downtown Alapai & King (c)	Beretania & Punchbowl (b)	King & Cooke (d)	Makiki Wilder & Makiki (f)	U of H University & Dole (h)
.....	.....	.....	500a	505a	507a	535a	545a	547a	.....	.....	.....
.....	.....	514a	524a	529a	531a	559a	.....	.....	611a	626a	630a
458a	520a	.....	540a	545a	547a	621a	631a	633a	.....	.....	.....
.....	.....	547a	557a	602a	604a	642a	.....	.....	654a	709a	713a
528a	550a	.....	610a	615a	617a	655a	705a	707a	.....	.....	.....
.....	.....	617a	628a	633a	635a	713a	.....	.....	725a	740a	744a
.....	.....	.....	645a	650a	652a	730a	740a	742a	.....	.....	.....
State Holiday											
.....	.....	.....	500a	505a	507a	535a	545a	546a	.....	.....	.....
458a	520a	.....	540a	545a	547a	622a	632a	633a	.....	.....	.....
528a	550a	.....	610a	615a	617a	657a	707a	708a	.....	.....	.....
.....	.....	617a	625a	630a	632a	708a	718a	719a	.....	.....	.....

P.M. Weekday Only: To Wahiawa/Wahiawa Heights/Waialua/Haleiwa

Alapai Transit Center (c)	Beretania & Punchbowl (b)	Vineyard & Palama (a)	Wahiawa Park & Ride (Armory) (G)	Wahiawa Transit Center (D)	Wahiawa Hts California & Grand View (E)	Wahiawa Transit Center (D)	Waialua Goodale & Nahua (A)	Waialua Kam Hwy & Weed Circle (B)
340p	345p	354p	423p	430p	.....	.....	.....	.....
405p	410p	419p	454p	501p	511p	522p	.....	.....
425p	430p	442p	517p	524p	.....	.....	547p	604p
435p	440p	452p	527p	534p	544p	555p	.....	.....
450p	455p	507p	544p	551p	601p	612p	.....	.....
510p	515p	527p	607p	614p	.....	.....	637p	654p
540p	545p	557p	637p	644p	.....	.....	.....	.....
State Holiday								
400p	404p	412p	445p	453p	503p	513p	.....	.....
420p	424p	432p	505p	513p	.....	.....	533p	550p
450p	454p	502p	535p	543p	553p	603p	.....	.....
510p	514p	522p	555p	603p	.....	.....	623p	640p

Route 83 Destination Signs

AM:

To Downtown & UH - 83 EXPRESS DOWNTOWN UNIVERSITY

To Downtown Only - 83 EXPRESS DOWNTOWN

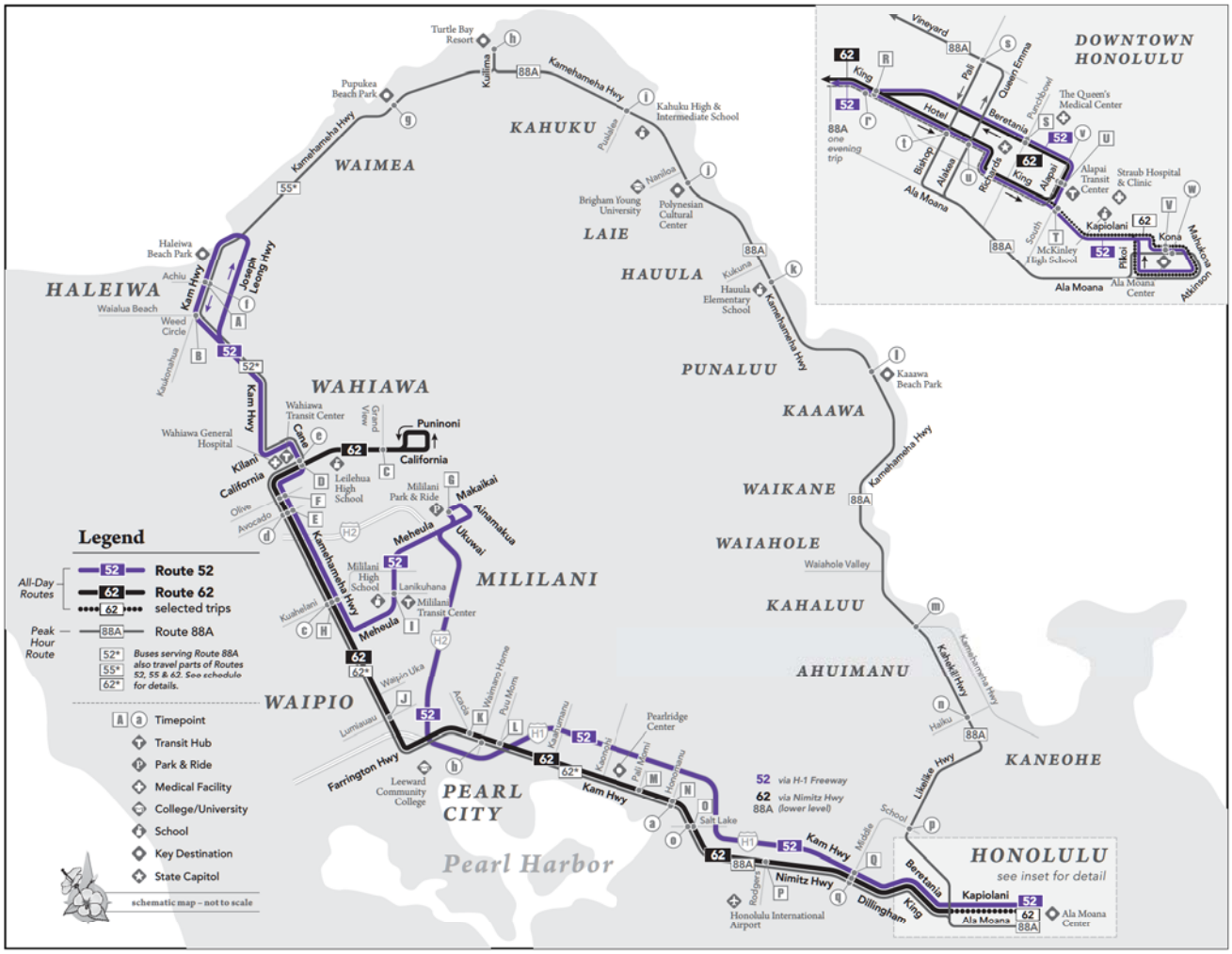
PM:

To Waialua/Haleiwa - 83 EXPRESS WAHIAWA WAIALUA HALEIWA

To Wahiawa Heights - 83 EXPRESS WAHIAWA HEIGHTS

To Wahiawa Only - 83 EXPRESS WAHIAWA

Bold indicates PM service.
Schedule to change without notice.
All buses are lift and bicycle rack equipped.



Route 88A - North Shore Express

Effective 3/2/15

Weekday A.M. to Aiea/Mililani/Wahiawa/North Shore/Kaneohe/Honolulu

Aiea Kam Hwy/Honomanu (a)	Pearl City/Kam Hwy Waimano Home Rd (h)	Mililani Kam Hwy/Kuahelani (c)	Wahiawa Kam Hwy/Avocado (d)	Wahiawa Transit Center (e)	Haleiwa Beach Park (f)	Pupukea Beach Park (g)	Turtle Bay Resort (h)	Kahuku Kam Hwy/Pualalea (i)	Laie/Polynesian Cultural Center (j)	Hauula Elementary School (k)	Kaaawa Beach Park (l)	Kamehameha/Kahekili (m)	Kahekili/Haiku (n)	School/Likelike (p)	Downtown Pali/Vineyard (s)	Downtown Bishop/Hotel (t)	Ala Moana Center Kona St (w)
.....	.....	.....	351a	353a	413a	421a	433a	440a	448a	455a	510a	525a	532a	547a	552a	555a	611a
353a	403a	419a	427a	428a	448a	456a	508a	516a	524a	532a	547a	600a	608a	623a	628a	631a	647a

State Holiday

.....	.....	.....	411a	413a	432a	440a	453a	501a	509a	515a	530a	545a	554a	611a	618a	621a	634a
409a	414a	426a	431a	432a	451a	500a	513a	521a	529a	535a	550a	604a	613a	630a	637a	640a	653a

Weekday P.M. to Kaneohe/North Shore/Wahiawa/Mililani/Aiea/Honolulu

Ala Moana Center Kona St (w)	Downtown Alakea/Hotel (u)	Kalihi School/Likelike (p)	Kaneohe Kahekili Hwy/Haiku (n)	Kahuku Kam Hwy/Kahekili (m)	Kaaawa Beach Park (l)	Hauula Elementary School (k)	Laie/Polynesian Cultural Center (j)	Kahuku Kam Hwy/Pualalea (i)	Turtle Bay Resort (h)	Haleiwa Beach Park (f)	Wahiawa Transit Center (e)	Mililani Kam Hwy/Kuahelani (c)	Pearl City Kam Hwy Waimano Home Rd (h)	Aiea Kam Hwy/Honomanu (a)	Aiea Kam Hwy/Salt Lake (o)	Kalihi Kam Hwy/Middle (q)	Downtown King/Beretania (r)	Downtown Alapai/King (v)
425p	449p	506p	526p	535p	550p	605p	613p	621p	628p	656p	721p	731p	747p	.....	757p	811p	821p	831p
505p	529p	546p	606p	615p	630p	645p	653p	701p	708p	736p	801p	811p	827p	835p	.....	.....	.....	.....

State Holiday

425p	446p	502p	522p	530p	544p	558p	603p	610p	617p	639p	700p	711p	728p	.....	736p	748p	759p	808p
505p	530p	545p	601p	608p	620p	632p	637p	644p	651p	714p	736p	747p	800p	807p	.....	.....	.....	.....

Route 88A Destination Signs:

AM:

From Kam/Honomanu & Kam/Avocado - 62 WAHIAWA - TURTLE BAY
From Wahiawa Transit Center to Haleiwa - 52 HALEIWA
From Haleiwa to Turtle Bay - 55 HONOLULU - ALA MOANA
From Turtle Bay Resort to Pali/Vineyard - 88A EXPRESS DOWNTOWN VIA KAHEKILI
From Pali/Vineyard to Ala Moana Center - 55 HONOLULU ALA MOANA

PM:

From Ala Moana Center to Kam/Kahekili - 88A EXPRESS NORTH SHORE VIA KAHEKILI
From Kam/Kahekili to Turtle Bay - 55 KANEOHE - NORTH SHORE - HALEIWA
From Turtle Bay Resort to Haleiwa - 55 HALEIWA - Connection to Honolulu
From Haleiwa Beach Park to Wahiawa Transit Center - 52 - WAHIAWA TRANSIT CTR - Connection to Honolulu
From Wahiawa Transit Center to Alapai Transit Center - 62 ALAPAI TRANSIT CTR
From Wahiawa Transit Center to Kam Hwy/Honomanu - 62 PEARLRIDGE

Bold indicates PM service.
Schedule to change without notice.
All buses are lift and bicycle rack equipped.

APPENDIX C
Analysis Reports
Existing (2015) Conditions

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	17	16	208	16	20	272
Conflicting Peds, #/hr	8	7	0	8	7	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	18	17	219	17	21	286

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	563	242	0	0	244	0
Stage 1	235	-	-	-	-	-
Stage 2	328	-	-	-	-	-
Critical Hdwy	6.44	6.24	-	-	4.14	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	-	-	2.236	-
Pot Cap-1 Maneuver	484	792	-	-	1311	-
Stage 1	799	-	-	-	-	-
Stage 2	725	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	468	781	-	-	1302	-
Mov Cap-2 Maneuver	468	-	-	-	-	-
Stage 1	793	-	-	-	-	-
Stage 2	706	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.6	0	0.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	581	1302	-
HCM Lane V/C Ratio	-	-	0.06	0.016	-
HCM Control Delay (s)	-	-	11.6	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	31	24	257	26	33	274
Conflicting Peds, #/hr	4	5	0	4	5	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	34	26	282	29	36	301

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	676	307	0	0	316	0
Stage 1	302	-	-	-	-	-
Stage 2	374	-	-	-	-	-
Critical Hdwy	6.44	6.24	-	-	4.14	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	-	-	2.236	-
Pot Cap-1 Maneuver	416	728	-	-	1233	-
Stage 1	745	-	-	-	-	-
Stage 2	691	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	398	721	-	-	1227	-
Mov Cap-2 Maneuver	398	-	-	-	-	-
Stage 1	741	-	-	-	-	-
Stage 2	664	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	12.8	0	0.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	398	721	1227	-
HCM Lane V/C Ratio	-	-	0.086	0.037	0.03	-
HCM Control Delay (s)	-	-	14.9	10.2	8	0
HCM Lane LOS	-	-	B	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	7	0	2	1	328	7	2	305	1
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	0.56		0.97	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1827	1900	1900	1827	1900	1900	1827	1900	1900	1827	1900
Adj Flow Rate, veh/h	0	0	0	7	0	2	1	338	7	2	314	1
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	0	21	0	97	0	2	51	1514	31	52	1543	5
Arrive On Green	0.00	0.00	0.00	0.01	0.00	0.01	0.85	0.85	0.85	0.85	0.85	0.85
Sat Flow, veh/h	0	1827	0	679	0	194	1	1782	37	2	1817	6
Grp Volume(v), veh/h	0	0	0	9	0	0	346	0	0	317	0	0
Grp Sat Flow(s),veh/h/ln	0	1827	0	873	0	0	1820	0	0	1825	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.7	0.0	0.0	2.5	0.0	0.0	2.3	0.0	0.0
Prop In Lane	0.00		0.00	0.78		0.22	0.00		0.02	0.01		0.00
Lane Grp Cap(c), veh/h	0	21	0	99	0	0	1596	0	0	1600	0	0
V/C Ratio(X)	0.00	0.00	0.00	0.09	0.00	0.00	0.22	0.00	0.00	0.20	0.00	0.00
Avail Cap(c_a), veh/h	0	483	0	320	0	0	1596	0	0	1600	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	35.5	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.4	0.0	0.0	0.3	0.0	0.0	0.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.2	0.0	0.0	1.4	0.0	0.0	1.2	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	0.0	35.9	0.0	0.0	1.3	0.0	0.0	1.3	0.0	0.0
LnGrp LOS				D			A			A		
Approach Vol, veh/h		0			9			346			317	
Approach Delay, s/veh		0.0			35.9			1.3			1.3	
Approach LOS					D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		66.0		5.8		66.0		5.8
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0
Max Green Setting (Gmax), s		61.0		19.0		61.0		19.0
Max Q Clear Time (g_c+I1), s		4.5		0.0		4.3		2.7
Green Ext Time (p_c), s		5.0		0.0		5.0		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	1.8
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	15	25	405	5	11	473
Conflicting Peds, #/hr	71	79	0	71	79	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	15	26	418	5	11	488

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1009	578	0	0	502	0
Stage 1	499	-	-	-	-	-
Stage 2	510	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	266	516	-	-	1062	-
Stage 1	610	-	-	-	-	-
Stage 2	603	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	226	441	-	-	982	-
Mov Cap-2 Maneuver	226	-	-	-	-	-
Stage 1	564	-	-	-	-	-
Stage 2	554	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17.7	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	325	982	-
HCM Lane V/C Ratio	-	-	0.127	0.012	-
HCM Control Delay (s)	-	-	17.7	8.7	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.4	0	-

Intersection	
Int Delay, s/veh	1.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	36	49	401	20	43	476
Conflicting Peds, #/hr	45	59	0	45	59	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	52	422	21	45	501

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1084	551	0	0	502	0
Stage 1	492	-	-	-	-	-
Stage 2	592	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	240	534	-	-	1062	-
Stage 1	615	-	-	-	-	-
Stage 2	553	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	203	476	-	-	1002	-
Mov Cap-2 Maneuver	203	-	-	-	-	-
Stage 1	580	-	-	-	-	-
Stage 2	496	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	19.1	0	0.7
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	203	476	1002	-
HCM Lane V/C Ratio	-	-	0.187	0.108	0.045	-
HCM Control Delay (s)	-	-	26.8	13.5	8.8	0
HCM Lane LOS	-	-	D	B	A	A
HCM 95th %tile Q(veh)	-	-	0.7	0.4	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	0	2	0	6	0	469	33	2	516	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	0.42		0.83	1.00		0.99	0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	0	0	0	2	0	6	0	479	34	2	527	0
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	19	0	64	0	8	0	1464	104	51	1586	0
Arrive On Green	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.85	0.85	0.85	0.85	0.00
Sat Flow, veh/h	0	1863	0	254	0	761	0	1718	122	1	1861	0
Grp Volume(v), veh/h	0	0	0	8	0	0	0	0	513	529	0	0
Grp Sat Flow(s),veh/h/ln	0	1863	0	1014	0	0	0	0	1839	1862	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	4.2	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	4.2	4.3	0.0	0.0
Prop In Lane	0.00		0.00	0.25		0.75	0.00		0.07	0.00		0.00
Lane Grp Cap(c), veh/h	0	19	0	72	0	0	0	0	1568	1636	0	0
V/C Ratio(X)	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.33	0.32	0.00	0.00
Avail Cap(c_a), veh/h	0	461	0	313	0	0	0	0	1568	1636	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	35.9	0.0	0.0	0.0	0.0	1.1	1.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.6	0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	2.2	2.3	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	0.0	36.6	0.0	0.0	0.0	0.0	1.7	1.6	0.0	0.0
LnGrp LOS				D					A	A		
Approach Vol, veh/h		0			8			513			529	
Approach Delay, s/veh		0.0			36.6			1.7			1.6	
Approach LOS					D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		67.0		5.7		67.0		5.7
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0
Max Green Setting (Gmax), s		62.0		18.0		62.0		18.0
Max Q Clear Time (g_c+I1), s		6.2		0.0		6.3		2.6
Green Ext Time (p_c), s		9.5		0.0		9.5		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	1.9
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	0.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	10	26	514	1	16	479
Conflicting Peds, #/hr	98	98	0	98	98	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	27	524	1	16	489

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1144	721	0	0	624	0
Stage 1	623	-	-	-	-	-
Stage 2	521	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	221	427	-	-	957	-
Stage 1	535	-	-	-	-	-
Stage 2	596	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	177	351	-	-	868	-
Mov Cap-2 Maneuver	177	-	-	-	-	-
Stage 1	485	-	-	-	-	-
Stage 2	527	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	276	868	-
HCM Lane V/C Ratio	-	-	0.133	0.019	-
HCM Control Delay (s)	-	-	20	9.2	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	32	36	466	18	52	451
Conflicting Peds, #/hr	63	56	0	63	56	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	34	38	496	19	55	480

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1158	624	0	0	578	0
Stage 1	568	-	-	-	-	-
Stage 2	590	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	217	485	-	-	996	-
Stage 1	567	-	-	-	-	-
Stage 2	554	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	176	432	-	-	943	-
Mov Cap-2 Maneuver	176	-	-	-	-	-
Stage 1	533	-	-	-	-	-
Stage 2	479	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21.7	0	0.9
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	176	432	943	-
HCM Lane V/C Ratio	-	-	0.193	0.089	0.059	-
HCM Control Delay (s)	-	-	30.3	14.1	9.1	0
HCM Lane LOS	-	-	D	B	A	A
HCM 95th %tile Q(veh)	-	-	0.7	0.3	0.2	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	0	0	9	14	0	7	14	546	33	3	492	1
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.84	0.69		0.80	0.99		0.98	0.99		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	0	0	9	14	0	7	14	563	34	3	507	1
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	0	41	98	0	9	62	1427	85	50	1547	3
Arrive On Green	0.00	0.00	0.03	0.03	0.00	0.03	0.83	0.83	0.83	0.83	0.83	0.83
Sat Flow, veh/h	0	0	1324	549	0	274	15	1710	102	2	1854	4
Grp Volume(v), veh/h	0	0	9	21	0	0	611	0	0	511	0	0
Grp Sat Flow(s),veh/h/ln	0	0	1324	823	0	0	1826	0	0	1860	0	0
Q Serve(g_s), s	0.0	0.0	0.5	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.5	2.0	0.0	0.0	6.1	0.0	0.0	4.7	0.0	0.0
Prop In Lane	0.00		1.00	0.67		0.33	0.02		0.06	0.01		0.00
Lane Grp Cap(c), veh/h	0	0	41	106	0	0	1574	0	0	1600	0	0
V/C Ratio(X)	0.00	0.00	0.22	0.20	0.00	0.00	0.39	0.00	0.00	0.32	0.00	0.00
Avail Cap(c_a), veh/h	0	0	321	327	0	0	1574	0	0	1600	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	35.1	36.1	0.0	0.0	1.5	0.0	0.0	1.4	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	2.6	0.9	0.0	0.0	0.7	0.0	0.0	0.5	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.2	0.5	0.0	0.0	3.4	0.0	0.0	2.5	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	37.7	37.0	0.0	0.0	2.2	0.0	0.0	1.9	0.0	0.0
LnGrp LOS			D	D			A			A		
Approach Vol, veh/h		9			21			611			511	
Approach Delay, s/veh		37.7			37.0			2.2			1.9	
Approach LOS		D			D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		67.0		7.3		67.0		7.3
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0
Max Green Setting (Gmax), s		62.0		18.0		62.0		18.0
Max Q Clear Time (g_c+I1), s		8.1		2.5		6.7		4.0
Green Ext Time (p_c), s		10.9		0.1		10.9		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	3.0
HCM 2010 LOS	A

APPENDIX D

Analysis Reports
Future (2025) Without Project Conditions

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	18	17	218	17	21	286
Future Vol, veh/h	18	17	218	17	21	286
Conflicting Peds, #/hr	8	7	0	8	7	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	19	18	229	18	22	301

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	591	253	0	0	255	0
Stage 1	246	-	-	-	-	-
Stage 2	345	-	-	-	-	-
Critical Hdwy	6.44	6.24	-	-	4.14	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	-	-	2.236	-
Pot Cap-1 Maneuver	466	781	-	-	1298	-
Stage 1	790	-	-	-	-	-
Stage 2	713	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	450	770	-	-	1289	-
Mov Cap-2 Maneuver	450	-	-	-	-	-
Stage 1	784	-	-	-	-	-
Stage 2	693	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.8	0	0.5
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	564	1289	-
HCM Lane V/C Ratio	-	-	0.065	0.017	-
HCM Control Delay (s)	-	-	11.8	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0.1	-

Intersection	
Int Delay, s/veh	1.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	33	25	270	27	35	288
Future Vol, veh/h	33	25	270	27	35	288
Conflicting Peds, #/hr	4	5	0	4	5	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	36	27	297	30	38	316

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	710	322	0	0	331	0
Stage 1	317	-	-	-	-	-
Stage 2	393	-	-	-	-	-
Critical Hdwy	6.44	6.24	-	-	4.14	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	-	-	2.236	-
Pot Cap-1 Maneuver	397	714	-	-	1217	-
Stage 1	734	-	-	-	-	-
Stage 2	678	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	379	707	-	-	1211	-
Mov Cap-2 Maneuver	379	-	-	-	-	-
Stage 1	731	-	-	-	-	-
Stage 2	650	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.3	0	0.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	379	707	1211	-
HCM Lane V/C Ratio	-	-	0.096	0.039	0.032	-
HCM Control Delay (s)	-	-	15.5	10.3	8.1	0
HCM Lane LOS	-	-	C	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	7	0	2	1	344	7	2	320	1
Future Volume (veh/h)	0	0	0	7	0	2	1	344	7	2	320	1
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	0.56		0.97	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1827	1900	1900	1827	1900	1900	1827	1900	1900	1827	1900
Adj Flow Rate, veh/h	0	0	0	7	0	2	1	355	7	2	330	1
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	0	21	0	97	0	2	51	1516	30	52	1544	5
Arrive On Green	0.00	0.00	0.00	0.01	0.00	0.01	0.85	0.85	0.85	0.85	0.85	0.85
Sat Flow, veh/h	0	1827	0	679	0	194	1	1785	35	2	1818	5
Grp Volume(v), veh/h	0	0	0	9	0	0	363	0	0	333	0	0
Grp Sat Flow(s),veh/h/ln	0	1827	0	873	0	0	1820	0	0	1825	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.7	0.0	0.0	2.7	0.0	0.0	2.4	0.0	0.0
Prop In Lane	0.00		0.00	0.78		0.22	0.00		0.02	0.01		0.00
Lane Grp Cap(c), veh/h	0	21	0	99	0	0	1596	0	0	1600	0	0
V/C Ratio(X)	0.00	0.00	0.00	0.09	0.00	0.00	0.23	0.00	0.00	0.21	0.00	0.00
Avail Cap(c_a), veh/h	0	483	0	320	0	0	1596	0	0	1600	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	35.5	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.4	0.0	0.0	0.3	0.0	0.0	0.3	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.2	0.0	0.0	1.5	0.0	0.0	1.3	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	0.0	35.9	0.0	0.0	1.3	0.0	0.0	1.3	0.0	0.0
LnGrp LOS				D			A			A		
Approach Vol, veh/h		0			9			363			333	
Approach Delay, s/veh		0.0			35.9			1.3			1.3	
Approach LOS					D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		66.0		5.8		66.0		5.8
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0
Max Green Setting (Gmax), s		61.0		19.0		61.0		19.0
Max Q Clear Time (g_c+I1), s		4.7		0.0		4.4		2.7
Green Ext Time (p_c), s		5.4		0.0		5.4		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	1.8
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	16	26	425	5	12	497
Future Vol, veh/h	16	26	425	5	12	497
Conflicting Peds, #/hr	71	79	0	71	79	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	27	438	5	12	512

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1057	599	0	0	522	0
Stage 1	520	-	-	-	-	-
Stage 2	537	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	249	502	-	-	1044	-
Stage 1	597	-	-	-	-	-
Stage 2	586	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	211	429	-	-	965	-
Mov Cap-2 Maneuver	211	-	-	-	-	-
Stage 1	552	-	-	-	-	-
Stage 2	537	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.6	0	0.2
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	308	965	-
HCM Lane V/C Ratio	-	-	0.141	0.013	-
HCM Control Delay (s)	-	-	18.6	8.8	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0	-

Intersection	
Int Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	38	51	421	21	45	500
Future Vol, veh/h	38	51	421	21	45	500
Conflicting Peds, #/hr	45	59	0	45	59	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	54	443	22	47	526

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1134	572	0	0	524	0
Stage 1	513	-	-	-	-	-
Stage 2	621	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	224	520	-	-	1043	-
Stage 1	601	-	-	-	-	-
Stage 2	536	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	189	463	-	-	984	-
Mov Cap-2 Maneuver	189	-	-	-	-	-
Stage 1	567	-	-	-	-	-
Stage 2	478	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.3	0	0.7
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	189	463	984	-
HCM Lane V/C Ratio	-	-	0.212	0.116	0.048	-
HCM Control Delay (s)	-	-	29.1	13.8	8.8	0
HCM Lane LOS	-	-	D	B	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.4	0.2	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	2	0	6	0	492	35	3	542	0
Future Volume (veh/h)	0	0	0	2	0	6	0	492	35	3	542	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	0.42		0.83	1.00		0.99	0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	0	0	0	2	0	6	0	502	36	3	553	0
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	19	0	64	0	8	0	1463	105	51	1584	0
Arrive On Green	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.85	0.85	0.85	0.85	0.00
Sat Flow, veh/h	0	1863	0	254	0	761	0	1716	123	2	1859	0
Grp Volume(v), veh/h	0	0	0	8	0	0	0	0	538	556	0	0
Grp Sat Flow(s),veh/h/ln	0	1863	0	1014	0	0	0	0	1839	1861	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	4.4	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	4.4	4.6	0.0	0.0
Prop In Lane	0.00		0.00	0.25		0.75	0.00		0.07	0.01		0.00
Lane Grp Cap(c), veh/h	0	19	0	72	0	0	0	0	1568	1636	0	0
V/C Ratio(X)	0.00	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.34	0.34	0.00	0.00
Avail Cap(c_a), veh/h	0	461	0	313	0	0	0	0	1568	1636	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	35.9	0.0	0.0	0.0	0.0	1.1	1.1	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.6	0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	2.4	2.4	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	0.0	36.6	0.0	0.0	0.0	0.0	1.7	1.7	0.0	0.0
LnGrp LOS				D					A	A		
Approach Vol, veh/h		0			8			538			556	
Approach Delay, s/veh		0.0			36.6			1.7			1.7	
Approach LOS					D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		67.0		5.7		67.0		5.7
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0
Max Green Setting (Gmax), s		62.0		18.0		62.0		18.0
Max Q Clear Time (g_c+I1), s		6.4		0.0		6.6		2.6
Green Ext Time (p_c), s		10.3		0.0		10.3		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	2.0
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	0.9

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	11	27	540	1	17	503
Future Vol, veh/h	11	27	540	1	17	503
Conflicting Peds, #/hr	98	98	0	98	98	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	28	551	1	17	513

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1198	748	0	0	650	0
Stage 1	650	-	-	-	-	-
Stage 2	548	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	205	412	-	-	936	-
Stage 1	520	-	-	-	-	-
Stage 2	579	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	164	339	-	-	849	-
Mov Cap-2 Maneuver	164	-	-	-	-	-
Stage 1	471	-	-	-	-	-
Stage 2	510	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21.3	0	0.3
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	259	849	-
HCM Lane V/C Ratio	-	-	0.15	0.02	-
HCM Control Delay (s)	-	-	21.3	9.3	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	0.5	0.1	-

Intersection	
Int Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	34	38	489	19	55	474
Future Vol, veh/h	34	38	489	19	55	474
Conflicting Peds, #/hr	63	56	0	63	56	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	40	520	20	59	504

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1214	649	0	0	603	0
Stage 1	593	-	-	-	-	-
Stage 2	621	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	201	470	-	-	975	-
Stage 1	552	-	-	-	-	-
Stage 2	536	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	162	418	-	-	923	-
Mov Cap-2 Maneuver	162	-	-	-	-	-
Stage 1	519	-	-	-	-	-
Stage 2	459	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.5	0	1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	162	418	923	-
HCM Lane V/C Ratio	-	-	0.223	0.097	0.063	-
HCM Control Delay (s)	-	-	33.5	14.5	9.2	0
HCM Lane LOS	-	-	D	B	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.3	0.2	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	9	15	0	7	15	573	35	3	517	1
Future Volume (veh/h)	0	0	9	15	0	7	15	573	35	3	517	1
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.84	0.69		0.80	0.99		0.98	0.99		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	0	0	9	15	0	7	15	591	36	3	533	1
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	0	42	99	0	8	62	1423	85	50	1546	3
Arrive On Green	0.00	0.00	0.03	0.03	0.00	0.03	0.83	0.83	0.83	0.83	0.83	0.83
Sat Flow, veh/h	0	0	1324	566	0	264	15	1707	102	2	1854	3
Grp Volume(v), veh/h	0	0	9	22	0	0	642	0	0	537	0	0
Grp Sat Flow(s),veh/h/ln	0	0	1324	831	0	0	1825	0	0	1860	0	0
Q Serve(g_s), s	0.0	0.0	0.5	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.5	2.0	0.0	0.0	6.6	0.0	0.0	5.0	0.0	0.0
Prop In Lane	0.00		1.00	0.68		0.32	0.02		0.06	0.01		0.00
Lane Grp Cap(c), veh/h	0	0	42	108	0	0	1571	0	0	1599	0	0
V/C Ratio(X)	0.00	0.00	0.21	0.20	0.00	0.00	0.41	0.00	0.00	0.34	0.00	0.00
Avail Cap(c_a), veh/h	0	0	321	328	0	0	1571	0	0	1599	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	35.1	36.1	0.0	0.0	1.6	0.0	0.0	1.4	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	2.5	0.9	0.0	0.0	0.8	0.0	0.0	0.6	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.2	0.5	0.0	0.0	3.6	0.0	0.0	2.8	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	37.6	37.0	0.0	0.0	2.4	0.0	0.0	2.0	0.0	0.0
LnGrp LOS			D	D			A			A		
Approach Vol, veh/h		9			22			642			537	
Approach Delay, s/veh		37.6			37.0			2.4			2.0	
Approach LOS		D			D			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		67.0		7.4		67.0		7.4
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0
Max Green Setting (Gmax), s		62.0		18.0		62.0		18.0
Max Q Clear Time (g_c+I1), s		8.6		2.5		7.0		4.0
Green Ext Time (p_c), s		11.8		0.1		11.8		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	3.1
HCM 2010 LOS	A

APPENDIX E

Analysis Reports

Future (2025) With Project Conditions

Intersection	
Int Delay, s/veh	1.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	18	29	218	17	30	286
Future Vol, veh/h	18	29	218	17	30	286
Conflicting Peds, #/hr	8	7	0	8	7	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	19	31	229	18	32	301

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	610	253	0	0	255	0
Stage 1	246	-	-	-	-	-
Stage 2	364	-	-	-	-	-
Critical Hdwy	6.44	6.24	-	-	4.14	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	-	-	2.236	-
Pot Cap-1 Maneuver	454	781	-	-	1298	-
Stage 1	790	-	-	-	-	-
Stage 2	699	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	434	770	-	-	1289	-
Mov Cap-2 Maneuver	434	-	-	-	-	-
Stage 1	784	-	-	-	-	-
Stage 2	673	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.6	0	0.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	594	1289	-
HCM Lane V/C Ratio	-	-	0.083	0.024	-
HCM Control Delay (s)	-	-	11.6	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

Intersection	
Int Delay, s/veh	1.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	33	25	270	27	35	288
Future Vol, veh/h	33	25	270	27	35	288
Conflicting Peds, #/hr	4	5	0	4	5	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	91	91	91	91	91	91
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	36	27	297	30	38	316

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	710	322	0	0	331	0
Stage 1	317	-	-	-	-	-
Stage 2	393	-	-	-	-	-
Critical Hdwy	6.44	6.24	-	-	4.14	-
Critical Hdwy Stg 1	5.44	-	-	-	-	-
Critical Hdwy Stg 2	5.44	-	-	-	-	-
Follow-up Hdwy	3.536	3.336	-	-	2.236	-
Pot Cap-1 Maneuver	397	714	-	-	1217	-
Stage 1	734	-	-	-	-	-
Stage 2	678	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	379	707	-	-	1211	-
Mov Cap-2 Maneuver	379	-	-	-	-	-
Stage 1	731	-	-	-	-	-
Stage 2	650	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.3	0	0.9
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	379	707	1211	-
HCM Lane V/C Ratio	-	-	0.096	0.039	0.032	-
HCM Control Delay (s)	-	-	15.5	10.3	8.1	0
HCM Lane LOS	-	-	C	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	0.1	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	20	0	2	1	344	16	2	320	1
Future Volume (veh/h)	0	0	0	20	0	2	1	344	16	2	320	1
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	0.82		0.98	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1827	1900	1900	1827	1900	1900	1827	1900	1900	1827	1900
Adj Flow Rate, veh/h	0	0	0	21	0	2	1	355	16	2	330	1
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	4	4	4	4	4	4	4	4	4	4	4	4
Cap, veh/h	0	51	0	189	0	3	84	1284	58	85	1346	4
Arrive On Green	0.00	0.00	0.00	0.03	0.00	0.03	0.74	0.74	0.74	0.74	0.74	0.74
Sat Flow, veh/h	0	1827	0	1061	0	101	1	1734	78	2	1818	5
Grp Volume(v), veh/h	0	0	0	23	0	0	372	0	0	333	0	0
Grp Sat Flow(s),veh/h/ln	0	1827	0	1162	0	0	1812	0	0	1825	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	0.8	0.0	0.0	2.9	0.0	0.0	2.5	0.0	0.0
Prop In Lane	0.00		0.00	0.91		0.09	0.00		0.04	0.01		0.00
Lane Grp Cap(c), veh/h	0	51	0	192	0	0	1426	0	0	1435	0	0
V/C Ratio(X)	0.00	0.00	0.00	0.12	0.00	0.00	0.26	0.00	0.00	0.23	0.00	0.00
Avail Cap(c_a), veh/h	0	761	0	644	0	0	1426	0	0	1435	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	20.8	0.0	0.0	1.8	0.0	0.0	1.8	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.3	0.0	0.0	0.4	0.0	0.0	0.4	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.3	0.0	0.0	1.5	0.0	0.0	1.4	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	0.0	21.1	0.0	0.0	2.3	0.0	0.0	2.2	0.0	0.0
LnGrp LOS				C			A			A		
Approach Vol, veh/h		0			23			372			333	
Approach Delay, s/veh		0.0			21.1			2.3			2.2	
Approach LOS					C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		37.0		6.2		37.0		6.2
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0
Max Green Setting (Gmax), s		32.0		18.0		32.0		18.0
Max Q Clear Time (g_c+I1), s		4.9		0.0		4.5		2.8
Green Ext Time (p_c), s		5.0		0.0		5.0		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	2.8
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	2.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	26	55	425	5	49	489
Future Vol, veh/h	26	55	425	5	49	489
Conflicting Peds, #/hr	71	79	0	71	79	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	27	57	438	5	51	504

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1125	599	0	0	522	0
Stage 1	520	-	-	-	-	-
Stage 2	605	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	227	502	-	-	1044	-
Stage 1	597	-	-	-	-	-
Stage 2	545	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	181	429	-	-	965	-
Mov Cap-2 Maneuver	181	-	-	-	-	-
Stage 1	552	-	-	-	-	-
Stage 2	471	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21.7	0	0.8
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	298	965	-
HCM Lane V/C Ratio	-	-	0.28	0.052	-
HCM Control Delay (s)	-	-	21.7	8.9	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	1.1	0.2	-

Intersection	
Int Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	38	51	421	21	45	500
Future Vol, veh/h	38	51	421	21	45	500
Conflicting Peds, #/hr	45	59	0	45	59	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	40	54	443	22	47	526

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1134	572	0	0	524	0
Stage 1	513	-	-	-	-	-
Stage 2	621	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	224	520	-	-	1043	-
Stage 1	601	-	-	-	-	-
Stage 2	536	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	189	463	-	-	984	-
Mov Cap-2 Maneuver	189	-	-	-	-	-
Stage 1	567	-	-	-	-	-
Stage 2	478	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.3	0	0.7
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	189	463	984	-
HCM Lane V/C Ratio	-	-	0.212	0.116	0.048	-
HCM Control Delay (s)	-	-	29.1	13.8	8.8	0
HCM Lane LOS	-	-	D	B	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.4	0.2	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	0	30	0	16	0	484	72	3	542	0
Future Volume (veh/h)	0	0	0	30	0	16	0	484	72	3	542	0
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	0.82		0.90	1.00		0.99	0.99		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	0	0	0	31	0	16	0	494	73	3	553	0
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	92	0	174	0	21	0	1151	170	82	1351	0
Arrive On Green	0.00	0.00	0.00	0.05	0.00	0.05	0.00	0.73	0.73	0.73	0.73	0.00
Sat Flow, veh/h	0	1863	0	813	0	420	0	1583	234	2	1859	0
Grp Volume(v), veh/h	0	0	0	47	0	0	0	0	567	556	0	0
Grp Sat Flow(s),veh/h/ln	0	1863	0	1233	0	0	0	0	1817	1861	0	0
Q Serve(g_s), s	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	5.5	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	5.5	5.2	0.0	0.0
Prop In Lane	0.00		0.00	0.66		0.34	0.00		0.13	0.01		0.00
Lane Grp Cap(c), veh/h	0	92	0	195	0	0	0	0	1321	1433	0	0
V/C Ratio(X)	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.43	0.39	0.00	0.00
Avail Cap(c_a), veh/h	0	729	0	616	0	0	0	0	1321	1433	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	1.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	0.0	21.0	0.0	0.0	0.0	0.0	2.4	2.4	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	1.0	0.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	3.1	2.9	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	0.0	21.6	0.0	0.0	0.0	0.0	3.4	3.2	0.0	0.0
LnGrp LOS				C					A	A		
Approach Vol, veh/h		0			47			567			556	
Approach Delay, s/veh		0.0			21.6			3.4			3.2	
Approach LOS					C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		37.5		7.2		37.5		7.2
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0
Max Green Setting (Gmax), s		32.5		17.5		32.5		17.5
Max Q Clear Time (g_c+I1), s		7.5		0.0		7.2		3.7
Green Ext Time (p_c), s		9.0		0.0		9.0		0.1

Intersection Summary	
HCM 2010 Ctrl Delay	4.0
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	2.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	21	55	540	1	52	495
Future Vol, veh/h	21	55	540	1	52	495
Conflicting Peds, #/hr	98	98	0	98	98	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	21	56	551	1	53	505

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1261	748	0	0	650	0
Stage 1	650	-	-	-	-	-
Stage 2	611	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	188	412	-	-	936	-
Stage 1	520	-	-	-	-	-
Stage 2	542	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	141	339	-	-	849	-
Mov Cap-2 Maneuver	141	-	-	-	-	-
Stage 1	471	-	-	-	-	-
Stage 2	449	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	26.5	0	0.9
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	244	849	-
HCM Lane V/C Ratio	-	-	0.318	0.062	-
HCM Control Delay (s)	-	-	26.5	9.5	0
HCM Lane LOS	-	-	D	A	A
HCM 95th %tile Q(veh)	-	-	1.3	0.2	-

Intersection	
Int Delay, s/veh	2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	34	38	489	19	55	474
Future Vol, veh/h	34	38	489	19	55	474
Conflicting Peds, #/hr	63	56	0	63	56	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	36	40	520	20	59	504

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	1214	649	0	0	603	0
Stage 1	593	-	-	-	-	-
Stage 2	621	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	201	470	-	-	975	-
Stage 1	552	-	-	-	-	-
Stage 2	536	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	162	418	-	-	923	-
Mov Cap-2 Maneuver	162	-	-	-	-	-
Stage 1	519	-	-	-	-	-
Stage 2	459	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	23.5	0	1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	162	418	923	-
HCM Lane V/C Ratio	-	-	0.223	0.097	0.063	-
HCM Control Delay (s)	-	-	33.5	14.5	9.2	0
HCM Lane LOS	-	-	D	B	A	A
HCM 95th %tile Q(veh)	-	-	0.8	0.3	0.2	-

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	0	9	44	0	17	15	565	70	3	517	1
Future Volume (veh/h)	0	0	9	44	0	17	15	565	70	3	517	1
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.90	0.84		0.88	0.99		0.98	0.99		0.98
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1900	1863	1900	1900	1863	1900	1900	1863	1900	1900	1863	1900
Adj Flow Rate, veh/h	0	0	9	45	0	18	15	582	72	3	533	1
Adj No. of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	0	0	94	188	0	21	90	1144	139	81	1325	2
Arrive On Green	0.00	0.00	0.07	0.07	0.00	0.07	0.71	0.71	0.71	0.71	0.71	0.71
Sat Flow, veh/h	0	0	1425	801	0	320	13	1602	195	2	1854	3
Grp Volume(v), veh/h	0	0	9	63	0	0	669	0	0	537	0	0
Grp Sat Flow(s),veh/h/ln	0	0	1425	1121	0	0	1809	0	0	1860	0	0
Q Serve(g_s), s	0.0	0.0	0.3	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cycle Q Clear(g_c), s	0.0	0.0	0.3	2.6	0.0	0.0	7.5	0.0	0.0	5.3	0.0	0.0
Prop In Lane	0.00		1.00	0.71		0.29	0.02		0.11	0.01		0.00
Lane Grp Cap(c), veh/h	0	0	94	209	0	0	1374	0	0	1408	0	0
V/C Ratio(X)	0.00	0.00	0.10	0.30	0.00	0.00	0.49	0.00	0.00	0.38	0.00	0.00
Avail Cap(c_a), veh/h	0	0	548	602	0	0	1374	0	0	1408	0	0
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	0.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	0.0	0.0	20.0	21.2	0.0	0.0	2.9	0.0	0.0	2.6	0.0	0.0
Incr Delay (d2), s/veh	0.0	0.0	0.4	0.8	0.0	0.0	1.2	0.0	0.0	0.8	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.1	0.8	0.0	0.0	4.0	0.0	0.0	2.8	0.0	0.0
LnGrp Delay(d),s/veh	0.0	0.0	20.4	22.0	0.0	0.0	4.2	0.0	0.0	3.4	0.0	0.0
LnGrp LOS			C	C			A			A		
Approach Vol, veh/h		9			63			669			537	
Approach Delay, s/veh		20.4			22.0			4.2			3.4	
Approach LOS		C			C			A			A	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2		4		6		8
Phs Duration (G+Y+Rc), s		37.5		8.0		37.5		8.0
Change Period (Y+Rc), s		5.0		5.0		5.0		5.0
Max Green Setting (Gmax), s		32.5		17.5		32.5		17.5
Max Q Clear Time (g_c+I1), s		9.5		2.3		7.3		4.6
Green Ext Time (p_c), s		9.6		0.3		10.0		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	4.8
HCM 2010 LOS	A

Intersection	
Int Delay, s/veh	2.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	20	0	16	18	0	29	6	218	17	65	286	32
Future Vol, veh/h	20	0	16	18	0	29	6	218	17	65	286	32
Conflicting Peds, #/hr	0	0	0	8	0	7	0	0	8	7	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	95	92	95	92	95	95	95	95	92
Heavy Vehicles, %	2	2	2	4	2	4	2	4	4	4	4	2
Mvmt Flow	22	0	17	19	0	31	7	229	18	68	301	35

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	730	723	326	723	732	253	336	0	0	255	0	0
Stage 1	455	455	-	259	259	-	-	-	-	-	-	-
Stage 2	275	268	-	464	473	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.14	6.52	6.24	4.12	-	-	4.14	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.14	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.14	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.536	4.018	3.336	2.218	-	-	2.236	-	-
Pot Cap-1 Maneuver	338	352	715	339	348	781	1223	-	-	1298	-	-
Stage 1	585	569	-	741	694	-	-	-	-	-	-	-
Stage 2	731	687	-	575	558	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	308	329	710	311	325	770	1214	-	-	1289	-	-
Mov Cap-2 Maneuver	308	329	-	311	325	-	-	-	-	-	-	-
Stage 1	582	539	-	731	685	-	-	-	-	-	-	-
Stage 2	693	678	-	527	529	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	14.7	13.1	0.2	1.3
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1214	-	-	412	492	1289	-	-
HCM Lane V/C Ratio	0.005	-	-	0.095	0.101	0.053	-	-
HCM Control Delay (s)	8	-	-	14.7	13.1	7.9	-	-
HCM Lane LOS	A	-	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.3	0.2	-	-

Intersection	
Int Delay, s/veh	3.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	20	0	16	26	0	55	6	425	5	49	489	32
Future Vol, veh/h	20	0	16	26	0	55	6	425	5	49	489	32
Conflicting Peds, #/hr	0	0	0	71	0	79	0	0	71	79	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	97	92	97	92	97	97	97	97	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	0	17	27	0	57	7	438	5	51	504	35

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1184	1158	593	1164	1173	599	539	0	0	522	0	0
Stage 1	623	623	-	533	533	-	-	-	-	-	-	-
Stage 2	561	535	-	631	640	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	166	196	506	171	192	502	1029	-	-	1044	-	-
Stage 1	474	478	-	531	525	-	-	-	-	-	-	-
Stage 2	512	524	-	469	470	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	127	170	472	136	167	429	959	-	-	965	-	-
Mov Cap-2 Maneuver	127	170	-	136	167	-	-	-	-	-	-	-
Stage 1	471	453	-	487	482	-	-	-	-	-	-	-
Stage 2	408	481	-	399	445	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	29.1	26	0.1	0.8
HCM LOS	D	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	959	-	-	188	254	965	-	-
HCM Lane V/C Ratio	0.007	-	-	0.208	0.329	0.052	-	-
HCM Control Delay (s)	8.8	-	-	29.1	26	8.9	-	-
HCM Lane LOS	A	-	-	D	D	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.8	1.4	0.2	-	-

Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	22	0	14	21	0	55	2	540	1	52	495	24
Future Vol, veh/h	22	0	14	21	0	55	2	540	1	52	495	24
Conflicting Peds, #/hr	0	0	0	98	0	98	0	0	98	98	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	98	92	98	92	98	98	98	98	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	24	0	15	21	0	56	2	551	1	53	505	26

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	1306	1278	616	1286	1291	748	531	0	0	650	0	0
Stage 1	624	624	-	654	654	-	-	-	-	-	-	-
Stage 2	682	654	-	632	637	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	137	166	491	141	163	412	1036	-	-	936	-	-
Stage 1	473	478	-	456	463	-	-	-	-	-	-	-
Stage 2	440	463	-	468	471	-	-	-	-	-	-	-
Platoon blocked, %									-		-	-
Mov Cap-1 Maneuver	99	141	445	106	138	339	939	-	-	849	-	-
Mov Cap-2 Maneuver	99	141	-	106	138	-	-	-	-	-	-	-
Stage 1	472	448	-	413	419	-	-	-	-	-	-	-
Stage 2	332	419	-	384	442	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	39.7	31.7	0	0.9
HCM LOS	E	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	939	-	-	142	211	849	-	-
HCM Lane V/C Ratio	0.002	-	-	0.276	0.368	0.062	-	-
HCM Control Delay (s)	8.8	-	-	39.7	31.7	9.5	-	-
HCM Lane LOS	A	-	-	E	D	A	-	-
HCM 95th %ile Q(veh)	0	-	-	1.1	1.6	0.2	-	-

Kamehameha Highway at Opaeula Road/Kewalo
Future (2025) AM Peak Hour

SINGLE LANE ROUNDABOUT OPERATIONAL ANALYSIS (based on NCHRP Report 572)

Design Hour Volumes	EB	WB	NB	SB
LT traffic	V_{EL} = 20	V_{WL} = 18	V_{NL} = 6	V_{SL} = 30
TH traffic	V_{ET} = 0	V_{WT} = 0	V_{NT} = 218	V_{ST} = 286
RT traffic	V_{ER} = 16	V_{WR} = 29	V_{NR} = 17	V_{SR} = 65
U-Turn traffic	V_{EU} = 0	V_{WU} = 0	V_{NU} = 0	V_{SU} = 0

Conflicting Flow Volumes by Leg (veh/hr)	Conflicting Flows	Entering Volumes by Leg (veh/hr)
$V_{c(EB)}$ = V_{WL} + V_{WU} + V_{SL} + V_{SU} + V_{ST} =	334	V_{EB} = V_{EL} + V_{ET} + V_{ER} + V_{EU} = 36
$V_{c(WB)}$ = V_{EL} + V_{EU} + V_{NL} + V_{NU} + V_{NT} =	244	V_{WB} = V_{WL} + V_{WT} + V_{WR} + V_{WU} = 47
$V_{c(NB)}$ = V_{SL} + V_{SU} + V_{EL} + V_{EU} + V_{ET} =	50	V_{NB} = V_{NL} + V_{NT} + V_{NR} + V_{NU} = 241
$V_{c(SB)}$ = V_{NL} + V_{NU} + V_{WL} + V_{WU} + V_{WT} =	24	V_{SB} = V_{SL} + V_{ST} + V_{SR} + V_{SU} = 381

Capacity Analysis	EB Leg	WB Leg	NB Leg	SB Leg
Entry Volume by Leg, v (veh/hr)	36	47	241	381
Entry Capacity by Leg (veh/hr)	809	885	1075	1103
(v/c) Ratio by Leg	0.04	0.05	0.22	0.35
Control Delay by Leg (sec/veh)	5	5	5	6
95th Percentile Back of Queue by Leg (veh)	1	1	1	2

$$c = 1130 \cdot \exp(-0.0010 \cdot v_c)$$

where

c = entry capacity (pcu/h)

v_c = conflicting flow (pcu/h)

$$Q_{95} = 900T\left[\frac{v_x}{c_{m,x}} - 1 + \sqrt{\left(1 - \frac{v_x}{c_{m,x}}\right)^2 + \frac{\left(\frac{3600}{c_{m,x}}\right)\left(\frac{v_x}{c_{m,x}}\right)}{150T}}\right]\left(\frac{c_{m,x}}{3600}\right)$$

$$d = \frac{3600}{c_{m,x}} + 900T \times \left[\frac{v_x}{c_{m,x}} - 1 + \sqrt{\left(\frac{v_x}{c_{m,x}} - 1\right)^2 + \frac{\left(\frac{3600}{c_{m,x}}\right)\left(\frac{v_x}{c_{m,x}}\right)}{450T}}\right]$$

Kamehameha Highway at Opaeula Road/Kewalo
Future (2025) PM Peak Hour

SINGLE LANE ROUNDABOUT OPERATIONAL ANALYSIS (based on NCHRP Report 572)

Design Hour Volumes	EB		WB		NB		SB	
LT traffic	v_{EL} =	20	v_{WL} =	26	v_{NL} =	6	v_{SL} =	49
TH traffic	v_{ET} =	0	v_{WT} =	0	v_{NT} =	425	v_{ST} =	489
RT traffic	v_{ER} =	16	v_{WR} =	55	v_{NR} =	5	v_{SR} =	32
U-Turn traffic	v_{EU} =	0	v_{WU} =	0	v_{NU} =	0	v_{SU} =	0

Conflicting Flow Volumes by Leg (veh/hr)	Conflicting Flows	Entering Volumes by Leg (veh/hr)	
$v_{c(EB)} = v_{WL} + v_{WU} + v_{SL} + v_{SU} + v_{ST} =$	564	$v_{EB} = v_{EL} + v_{ET} + v_{ER} + v_{EU} =$	36
$v_{c(WB)} = v_{EL} + v_{EU} + v_{NL} + v_{NU} + v_{NT} =$	451	$v_{WB} = v_{WL} + v_{WT} + v_{WR} + v_{WU} =$	81
$v_{c(NB)} = v_{SL} + v_{SU} + v_{EL} + v_{EU} + v_{ET} =$	69	$v_{NB} = v_{NL} + v_{NT} + v_{NR} + v_{NU} =$	436
$v_{c(SB)} = v_{NL} + v_{NU} + v_{WL} + v_{WU} + v_{WT} =$	32	$v_{SB} = v_{SL} + v_{ST} + v_{SR} + v_{SU} =$	570

Capacity Analysis	EB Leg	WB Leg	NB Leg	SB Leg
Entry Volume by Leg, v (veh/hr)	36	81	436	570
Entry Capacity by Leg (veh/hr)	643	720	1055	1094
(v/c) Ratio by Leg	0.06	0.11	0.41	0.52
Control Delay by Leg (sec/veh)	6	6	6	7
95th Percentile Back of Queue by Leg (veh)	1	1	3	4

$$c = 1130 \cdot \exp(-0.0010 \cdot v_c)$$

where

c = entry capacity (pcu/h)

v_c = conflicting flow (pcu/h)

$$Q_{95} \approx 900T\left[\frac{v_x}{c_{m,x}} - 1 + \sqrt{\left(1 - \frac{v_x}{c_{m,x}}\right)^2 + \frac{\left(\frac{3600}{c_{m,x}}\right)\left(\frac{v_x}{c_{m,x}}\right)}{150T}}\right]\left(\frac{c_{m,x}}{3600}\right)$$

$$d = \frac{3600}{c_{m,x}} + 900T \times \left[\frac{v_x}{c_{m,x}} - 1 + \sqrt{\left(\frac{v_x}{c_{m,x}} - 1\right)^2 + \frac{\left(\frac{3600}{c_{m,x}}\right)\left(\frac{v_x}{c_{m,x}}\right)}{450T}}\right]$$

Kamehameha Highway at Opaeula Road/Kewalo Lane
Future (2025) Saturday Peak Hour

SINGLE LANE ROUNDABOUT OPERATIONAL ANALYSIS (based on NCHRP Report 572)

Design Hour Volumes	EB		WB		NB		SB	
LT traffic	v_{EL} =	22	v_{WL} =	21	v_{NL} =	2	v_{SL} =	52
TH traffic	v_{ET} =	0	v_{WT} =	0	v_{NT} =	540	v_{ST} =	495
RT traffic	v_{ER} =	14	v_{WR} =	55	v_{NR} =	1	v_{SR} =	24
U-Turn traffic	v_{EU} =	0	v_{WU} =	0	v_{NU} =	0	v_{SU} =	0

Conflicting Flow Volumes by Leg (veh/hr)	Conflicting Flows	Entering Volumes by Leg (veh/hr)	
$v_{c(EB)} = v_{WL} + v_{WU} + v_{SL} + v_{SU} + v_{ST} =$	568	$v_{EB} = v_{EL} + v_{ET} + v_{ER} + v_{EU} =$	36
$v_{c(WB)} = v_{EL} + v_{EU} + v_{NL} + v_{NU} + v_{NT} =$	564	$v_{WB} = v_{WL} + v_{WT} + v_{WR} + v_{WU} =$	76
$v_{c(NB)} = v_{SL} + v_{SU} + v_{EL} + v_{EU} + v_{ET} =$	74	$v_{NB} = v_{NL} + v_{NT} + v_{NR} + v_{NU} =$	543
$v_{c(SB)} = v_{NL} + v_{NU} + v_{WL} + v_{WU} + v_{WT} =$	23	$v_{SB} = v_{SL} + v_{ST} + v_{SR} + v_{SU} =$	571

Capacity Analysis	EB Leg	WB Leg	NB Leg	SB Leg
Entry Volume by Leg, v (veh/hr)	36	76	543	571
Entry Capacity by Leg (veh/hr)	640	643	1049	1104
(v/c) Ratio by Leg	0.06	0.12	0.52	0.52
Control Delay by Leg (sec/veh)	6	7	8	7
95th Percentile Back of Queue by Leg (veh)	1	1	4	4

$$c = 1130 \cdot \exp(-0.0010 \cdot v_c)$$

where

c = entry capacity (pcu/h)

v_c = conflicting flow (pcu/h)

$$Q_{95} \approx 900T\left[\frac{v_x}{c_{m,x}} - 1 + \sqrt{\left(1 - \frac{v_x}{c_{m,x}}\right)^2 + \frac{\left(\frac{3600}{c_{m,x}}\right)\left(\frac{v_x}{c_{m,x}}\right)}{150T}}\right]\left(\frac{c_{m,x}}{3600}\right)$$

$$d = \frac{3600}{c_{m,x}} + 900T \times \left[\frac{v_x}{c_{m,x}} - 1 + \sqrt{\left(\frac{v_x}{c_{m,x}} - 1\right)^2 + \frac{\left(\frac{3600}{c_{m,x}}\right)\left(\frac{v_x}{c_{m,x}}\right)}{450T}}\right]$$

Kamehameha Highway at Cane Haul Road
Future (2025) AM Peak Hour

SINGLE LANE ROUNDABOUT OPERATIONAL ANALYSIS (based on NCHRP Report 572)

Design Hour Volumes	EB	WB	NB	SB
LT traffic	v_{EL} = 0	v_{WL} = 20	v_{NL} = 1	v_{SL} = 2
TH traffic	v_{ET} = 0	v_{WT} = 0	v_{NT} = 344	v_{ST} = 320
RT traffic	v_{ER} = 0	v_{WR} = 2	v_{NR} = 16	v_{SR} = 1
U-Turn traffic	v_{EU} = 0	v_{WU} = 0	v_{NU} = 0	v_{SU} = 0

Conflicting Flow Volumes by Leg (veh/hr)	Conflicting Flows	Entering Volumes by Leg (veh/hr)	
$v_{c(EB)} = v_{WL} + v_{WU} + v_{SL} + v_{SU} + v_{ST} =$	342	$v_{EB} = v_{EL} + v_{ET} + v_{ER} + v_{EU} =$	0
$v_{c(WB)} = v_{EL} + v_{EU} + v_{NL} + v_{NU} + v_{NT} =$	345	$v_{WB} = v_{WL} + v_{WT} + v_{WR} + v_{WU} =$	22
$v_{c(NB)} = v_{SL} + v_{SU} + v_{EL} + v_{EU} + v_{ET} =$	2	$v_{NB} = v_{NL} + v_{NT} + v_{NR} + v_{NU} =$	361
$v_{c(SB)} = v_{NL} + v_{NU} + v_{WL} + v_{WU} + v_{WT} =$	21	$v_{SB} = v_{SL} + v_{ST} + v_{SR} + v_{SU} =$	323

Capacity Analysis	EB Leg	WB Leg	NB Leg	SB Leg
Entry Volume by Leg, v (veh/hr)	0	22	361	323
Entry Capacity by Leg (veh/hr)	803	800	1128	1107
(v/c) Ratio by Leg	0.00	0.03	0.32	0.29
Control Delay by Leg (sec/veh)	0	5	5	5
95th Percentile Back of Queue by Leg (veh)	0	1	2	2

$$c = 1130 \cdot \exp(-0.0010 \cdot v_c)$$

where

c = entry capacity (pcu/h)

v_c = conflicting flow (pcu/h)

$$Q_{95} \approx 900T\left[\frac{v_x}{c_{m,x}} - 1 + \sqrt{\left(1 - \frac{v_x}{c_{m,x}}\right)^2 + \frac{\left(\frac{3600}{c_{m,x}}\right)\left(\frac{v_x}{c_{m,x}}\right)}{150T}}\right]\left(\frac{c_{m,x}}{3600}\right)$$

$$d = \frac{3600}{c_{m,x}} + 900T \times \left[\frac{v_x}{c_{m,x}} - 1 + \sqrt{\left(\frac{v_x}{c_{m,x}} - 1\right)^2 + \frac{\left(\frac{3600}{c_{m,x}}\right)\left(\frac{v_x}{c_{m,x}}\right)}{450T}}\right]$$

Backyard Haleiwa

SSFM International

Kamehameha Highway at Cane Haul Road
Future (2025) PM Peak Hour

SINGLE LANE ROUNDABOUT OPERATIONAL ANALYSIS (based on NCHRP Report 572)

Design Hour Volumes	EB	WB	NB	SB
LT traffic	v_{EL} = 0	v_{WL} = 30	v_{NL} = 0	v_{SL} = 3
TH traffic	v_{ET} = 0	v_{WT} = 0	v_{NT} = 484	v_{ST} = 542
RT traffic	v_{ER} = 0	v_{WR} = 16	v_{NR} = 72	v_{SR} = 0
U-Turn traffic	v_{EU} = 0	v_{WU} = 0	v_{NU} = 0	v_{SU} = 0

Conflicting Flow Volumes by Leg (veh/hr)	Conflicting Flows	Entering Volumes by Leg (veh/hr)	
$v_{c(EB)} = v_{WL} + v_{WU} + v_{SL} + v_{SU} + v_{ST} =$	575	$v_{EB} = v_{EL} + v_{ET} + v_{ER} + v_{EU} =$	0
$v_{c(WB)} = v_{EL} + v_{EU} + v_{NL} + v_{NU} + v_{NT} =$	484	$v_{WB} = v_{WL} + v_{WT} + v_{WR} + v_{WU} =$	46
$v_{c(NB)} = v_{SL} + v_{SU} + v_{EL} + v_{EU} + v_{ET} =$	3	$v_{NB} = v_{NL} + v_{NT} + v_{NR} + v_{NU} =$	556
$v_{c(SB)} = v_{NL} + v_{NU} + v_{WL} + v_{WU} + v_{WT} =$	30	$v_{SB} = v_{SL} + v_{ST} + v_{SR} + v_{SU} =$	545

Capacity Analysis	EB Leg	WB Leg	NB Leg	SB Leg
Entry Volume by Leg, v (veh/hr)	0	46	556	545
Entry Capacity by Leg (veh/hr)	636	696	1127	1097
(v/c) Ratio by Leg	0.00	0.07	0.49	0.50
Control Delay by Leg (sec/veh)	0	6	7	7
95th Percentile Back of Queue by Leg (veh)	0	1	3	3

$$c = 1130 \cdot \exp(-0.0010 \cdot v_c)$$

where

c = entry capacity (pcu/h)

v_c = conflicting flow (pcu/h)

$$Q_{95} \approx 900T\left[\frac{v_x}{c_{m,x}} - 1 + \sqrt{\left(1 - \frac{v_x}{c_{m,x}}\right)^2 + \frac{\left(\frac{3600}{c_{m,x}}\right)\left(\frac{v_x}{c_{m,x}}\right)}{150T}}\right]\left(\frac{c_{m,x}}{3600}\right)$$

$$d = \frac{3600}{c_{m,x}} + 900T \times \left[\frac{v_x}{c_{m,x}} - 1 + \sqrt{\left(\frac{v_x}{c_{m,x}} - 1\right)^2 + \frac{\left(\frac{3600}{c_{m,x}}\right)\left(\frac{v_x}{c_{m,x}}\right)}{450T}}\right]$$

Backyard Haleiwa

SSFM International

Kamehameha Highway at Cane Haul Road
Future (2025) Saturday Peak Hour

SINGLE LANE ROUNDABOUT OPERATIONAL ANALYSIS (based on NCHRP Report 572)

Design Hour Volumes	EB		WB		NB		SB	
LT traffic	v_{EL} =	0	v_{WL} =	44	v_{NL} =	15	v_{SL} =	3
TH traffic	v_{ET} =	0	v_{WT} =	0	v_{NT} =	565	v_{ST} =	517
RT traffic	v_{ER} =	9	v_{WR} =	17	v_{NR} =	70	v_{SR} =	1
U-Turn traffic	v_{EU} =	0	v_{WU} =	0	v_{NU} =	0	v_{SU} =	0

Conflicting Flow Volumes by Leg (veh/hr)	Conflicting Flows	Entering Volumes by Leg (veh/hr)	
$v_{c(EB)} = v_{WL} + v_{WU} + v_{SL} + v_{SU} + v_{ST} =$	564	$v_{EB} = v_{EL} + v_{ET} + v_{ER} + v_{EU} =$	9
$v_{c(WB)} = v_{EL} + v_{EU} + v_{NL} + v_{NU} + v_{NT} =$	580	$v_{WB} = v_{WL} + v_{WT} + v_{WR} + v_{WU} =$	61
$v_{c(NB)} = v_{SL} + v_{SU} + v_{EL} + v_{EU} + v_{ET} =$	3	$v_{NB} = v_{NL} + v_{NT} + v_{NR} + v_{NU} =$	650
$v_{c(SB)} = v_{NL} + v_{NU} + v_{WL} + v_{WU} + v_{WT} =$	59	$v_{SB} = v_{SL} + v_{ST} + v_{SR} + v_{SU} =$	521

Capacity Analysis	EB Leg	WB Leg	NB Leg	SB Leg
Entry Volume by Leg, v (veh/hr)	9	61	650	521
Entry Capacity by Leg (veh/hr)	643	633	1127	1065
(v/c) Ratio by Leg	0.01	0.10	0.58	0.49
Control Delay by Leg (sec/veh)	6	7	8	7
95th Percentile Back of Queue by Leg (veh)	1	1	4	3

$$c = 1130 \cdot \exp(-0.0010 \cdot v_c)$$

where

c = entry capacity (pcu/h)

v_c = conflicting flow (pcu/h)

$$Q_{95} = 900T\left[\frac{v_x}{c_{m,x}} - 1 + \sqrt{\left(1 - \frac{v_x}{c_{m,x}}\right)^2 + \frac{\left(\frac{3600}{c_{m,x}}\right)\left(\frac{v_x}{c_{m,x}}\right)}{150T}}\right]\left(\frac{c_{m,x}}{3600}\right)$$

$$d = \frac{3600}{c_{m,x}} + 900T \times \left[\frac{v_x}{c_{m,x}} - 1 + \sqrt{\left(\frac{v_x}{c_{m,x}} - 1\right)^2 + \frac{\left(\frac{3600}{c_{m,x}}\right)\left(\frac{v_x}{c_{m,x}}\right)}{450T}}\right]$$

Appendix C: Archaeological Assessment

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DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

May 26, 2015

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

LOG NO: 2015.00630
DOC NO: 1505GC13
Archaeology

Dear Mr. Tsuji:

SUBJECT: **Chapter 6E-42 Historic Preservation Review –**
Request for Comments – Haleiwa Parcel Zone Change, Pre-Draft EA
Pa'ala'a Ahupua'a, Waialua District, Island of O'ahu
TMK: (1) 6-2-005:002

Thank you for the opportunity to review and comment on the proposed zone change. We received this submittal on February 18, 2015, and we apologize for the delayed review. Basin Project, Inc. (landowner and applicant) seeks rezoning of a 7.5-acre portion of an 8-acre parcel from agricultural lands to mixed community businesses. In addition, Basin Project, Inc. proposes to develop the subject property for residential and commercial uses after rezoning in accordance with the North Shore Sustainable Communities Plan.

Our records indicate an archaeological inventory survey (AIS) was completed on the subject 7.5-acre portion, and that the AIS report (Sims et al. 2015) was reviewed and accepted by SHPD on February 19, 2015 (Log No. 2015.00189, Doc. No. 1502SL19). A single historic property, identified as a Cane Haul Road (SIHP 50-80-04-7604), was documented as extending through the southern tip of the project area. McElroy and Duhaylonsod (2014) previously assessed SIHP 7604 as significant per Hawaii Administrative Rules (HAR) §13-284-6 under Criterion "d" (has yielded, or may yield information important to prehistory and/or history) and potentially under Criterion "a" (associated with events that made an important contribution to the broad patterns of history). Sims et al. (2015) stated that SIHP 7604 had been sufficiently documented and would not be impacted during the planned development, and thus no further archaeological recordation was needed; SHPD concurred (Log No. 2015.00189, Doc. No. 1502SL19). Sims et al. (2015) also indicated that in 1898, the OR&L narrow-gauge railway was constructed across the length of the project area, but that the railroad section was destroyed during the construction of Joseph P. Leong Highway in 1995. No archaeological evidence of the former OR&L railroad was found during the AIS.

Based on the information above, SHPD believes that **no historic properties will be affected** by the proposed zone change. Please contact me at (808) 692-8019 or at Susan.A.Lebo@hawaii.gov if you have questions or concerns regarding this letter.
Aloha,

Susan A. Lebo

Susan A. Lebo, PhD
O'ahu Lead Archaeologist
Acting Archaeology Branch Chief

cc: Jared Chang, Planner, SSFM International (jchang@ssfm.com)
Steve Molmen, DLNR-Land Division (Steve.Molmen@hawaii.gov)

REVISED DRAFT—Archaeological Assessment of 7.5 Acre Parcel in Hale'iwa, Pa'ala'a and Kawailoa Ahupua'a, Waialua District, O'ahu Island, Hawai'i

TMK (1) 6-2-005:002

Prepared For:

Jonathan Grobe
4391 Kahala Avenue
Honolulu, HI 96816

Prepared By:

Amanda Sims, B.A.
Jolie Liston, PhD
and
David Byerly, B.A.

Garcia and Associates
146 Hekili St., Suite 101
Kailua, Hawai'i 96734

GANDA Report No. 2315-1

GANDA

15 January 2014

MANAGEMENT SUMMARY

At the request of Jonathan Grobe on behalf of Basin Project Incorporated, Garcia and Associates conducted an Archaeological Assessment of a 7.5 acre parcel (TMK (1) 6-2-005:002) in Hale‘iwa, Pa‘ala‘a and Kawailoa Ahupua‘a, Waialua District, O‘ahu. The objective of the archaeological investigation was to sample the property for historic resources, evaluate their significance, and make recommendations for avoidance or mitigation.

A single re-deposited historic artifact, an Oahu Railway and Land Company Railroad iron spike, and a paved portion of the previously recorded Cane Haul Road (SIHP 50-80-04-7604) were the only historic resources encountered in the parcel.

Disturbed by construction of the adjacent Joseph P. Leong Highway in the 1990s, all six of the mechanically excavated, stratigraphic trenches display topsoil and alluvium capping mixed construction fill overlying intact B- and C-horizons. No buried A-horizons were identified in the parcel. The slightly grey color of the top of intact B-horizons in two trenches (Nos. 2 and 4) resemble that of gleyed soil. The color likely results from water retention and percolation. Without an intact A-horizon or other corroborating evidence, these intact basal soils cannot be interpreted as identifying historic period agriculture, as they could have just as likely formed through natural processes.

A trash dump, containing artifacts dated from the 1960s to at least the early 1980s and the re-deposited railroad spike, was encountered in Trench 3. A cow bone displaying evidence of modern butchering was unearthed in the Trench 2 construction fill.

No evidence of the Oahu Railway and Land Company Railroad (SIHP 50-80-04-5791) which formerly extended diagonally through the project area was found in the excavations.

The parcel’s southern terminus is defined by 80 m of the currently paved Cane Haul Road (SIHP 50-80-04-7604). Cane Haul Road was evaluated as significant under National Register Criterion D, and possibly Criterion A (McElroy and Duhaylonsod 2014:55–56). As the location has been documented, there is no further reasonable and adequate information that can be collected from the road in the project area.

Due to currently changing zoning requirements, there are as yet no project details or construction plans. Regardless, development of this parcel is unlikely to affect historic properties as the project area has a low probability for containing archaeological deposits and Cane Haul Road is planned to be kept intact and to continue to be used as a thoroughfare. No further archaeological investigations are recommended.

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1.0 INTRODUCTION

At the request of Mr. Jonathan Grobe on behalf of Basin Project Incorporated, Garcia and Associates conducted an Archaeological Assessment of a 7.5 acre parcel (TMK (1) 6-2-005:002) in Hale'iwa, Pa'ala'a and Kawailoa Ahupua'a, Waialua District, O'ahu. The archaeological investigations were conducted in support of an Environmental Assessment being conducted by the landowner, Basin Project Incorporated, prior to planned commercial development. The objective of the survey was to sample the property for historic resources, evaluate their significance, and make recommendations for avoidance or mitigation.

Basin Project Incorporated plans to develop a mixed-use project in accordance with the North Shore Sustainable Communities Plan. The project will include residential and retail structures and will be constructed in a least two construction phases. Cane Haul Road and 'Ōpae'ula Road will provide access to the construction site and the completed development. At the time of the archaeological investigations, there was no firm master plan or project detail due to the plans being dictated by currently changing zoning requirements.

The assessment was conducted under the authority of the Hawai'i Environmental Policy Act (HEPA) as codified in Hawai'i Revised Statues Chapter 343, *Environmental Impact Statements*, and is being completed in anticipation of future permitting needs under Hawai'i Revised Statutes §6E-42, Review of Proposed Projects. It was completed in accordance with Hawai'i Administrative Rules §13-276, Rules Governing Standards for Archaeological Inventory Surveys and Reports. Since no new cultural properties were documented during the investigations, this document is submitted as an Archaeological Assessment in accordance with HAR §13-276-5.

1.1 Project Area

The project area is on the border of Pa'ala'a and Kawailoa Ahupua'a in eastern Waialua District, O'ahu. The two large *ahupua'a* extended from Waialua Bay to the summit of the Ko'olau Range. Most of the parcel is in Pa'ala'a Kai, the seaward section of the *ahupua'a*, about a kilometer inland from the coast of Waialua Bay.

The 7.5 acre project area comprises the entirety of TMK (1) 6-2-005:002, a narrow strip of undeveloped land between Hale'iwa town and the Joseph P. Leong Highway (Hawai'i Route 83) in north O'ahu (Figure 1, Figure 2). The parcel is from 40 to 80 meters (m) wide and 525 m long with a north-south axis. Off the parcel's northwest corner, a 10 m wide strip of land extends for 100 m to Kamehameha Highway along the south border of 'Ōpae'ula Road.

The parcel's southern width is roughly equivalent to the paved two-lane Cane Haul Road (SIHP 50-80-04-7604) that is in use by vehicular traffic. A gravel one-lane access road extends the entire length of the parcel's west side and separates the undeveloped land from Hale'iwa's commercial and residential district.

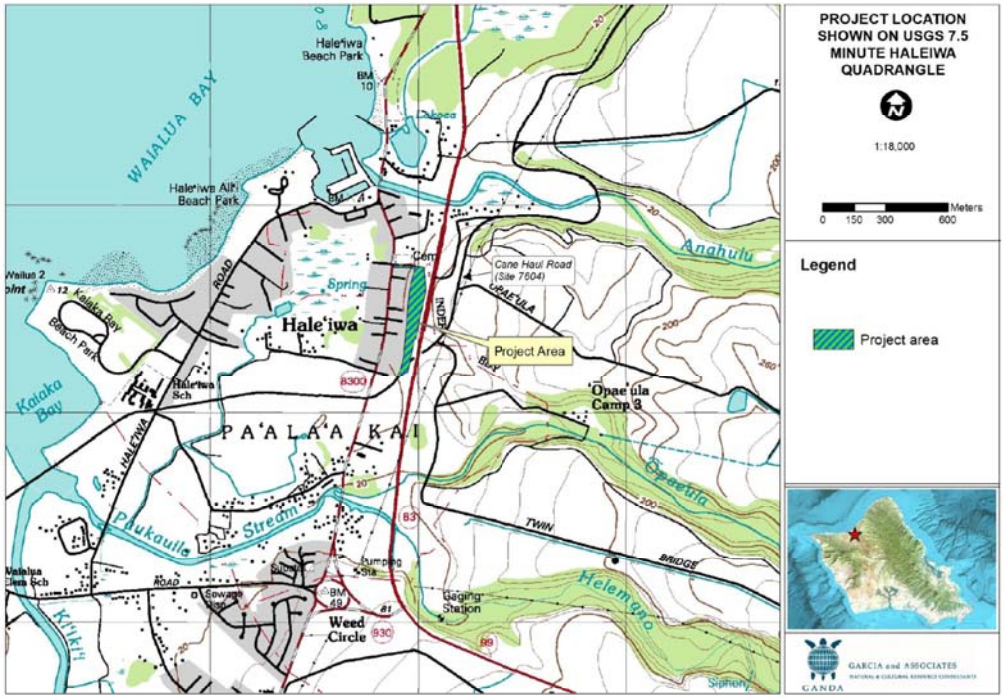

Figure 1. Location of project area in Hale'iwa, Pa'ala'a and Kawailoa Ahupua'a, O'ahu.

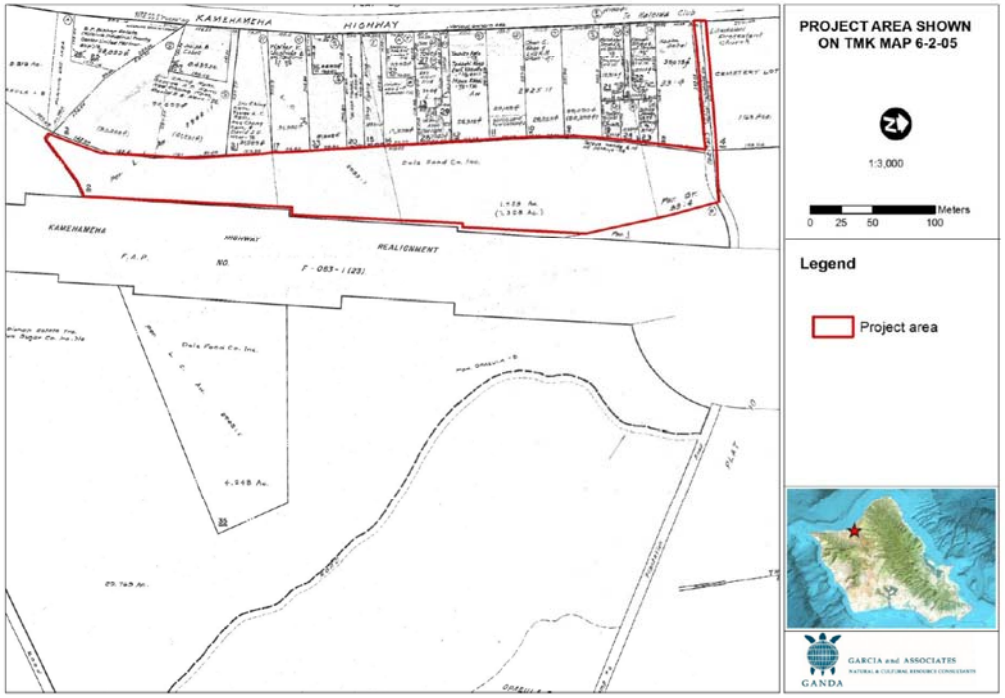

Figure 2. Tax map showing location of TMK (1) 6-2-005:002.

1.2 Personnel and Schedule

Dr. Jolie Liston served as the Principal Investigator. Liston meets the professional qualifications outlined in Hawai'i Administrative Rules §13-281-3 and is permitted to conduct archaeological investigations under Hawai'i State Historic Preservation Division Permit No. 14-12. Archaeological field investigations were conducted on 10 and 11 November 2014 by Dr. Liston, Amanda Sims, B.A., and David Byerly, B.A.

2.0 Environmental, Traditional, and Historic Context

Background information is presented below to provide context and assist in developing expectations regarding the nature of potential pre-Contact and historic resources in the study area. Documents for this study were collected from the Garcia and Associates Kailua library, the author's personal collection, off the internet, and from the State Historic Preservation Division library. The section includes summary descriptions of environmental conditions, cultural history, and previous archaeology that are directly related to the study area. More detailed information can be found in the anthropological history study of Anahulu conducted by Kirch (1992) and Sahlins (1992) and a recent cultural impact assessment in Hale'iwa (McMillen et al. 2011).

2.1 Physical Environment

O'ahu is a "volcanic doublet" of shield volcanoes that is formed by the Ko'olau Range along the east side of the island and the Wai'anae Range on the west (MacDonald et al. 1983:420). After the Waianae volcano became dormant, lava flows from the Ko'olau volcano formed the Schofield Plateau and the Waialua Plain. Eventually the plateau was bounded by a broad coastal plain formed by detritus sediments derived from the deeply eroded stream valleys and aeolian coastal dune sands (Armstrong 1983:34). The parcel lies at 20 m above sea level on the Schofield Plateau, close to the juncture with the coastal plain.

The coastal plains fronting the project area contain numerous wetlands used for traditional subsistence practices including Lokoea Pond and 'Uko'a Marsh, both *loko pu'uone* (brackish, sand banked ponds near the shore connected to the sea by a stream or ditch). The densely vegetated Haleiwa Marsh is 250 m to the west of the parcel, on the opposite side of Hale'iwa commercial district.

The parcel lies between two major streams, Arahulu and Ōpau'ulu. Flowing from the Ko'olau Mountains to the Waialua coast, the Anahulu Stream is about 360 m to the north of the project area. At 11.4 km long, Anahulu is O'ahu's longest watercourse. Beginning in the Wahiawa-Helemano area of the Central Plateau, a tributary of the Paukauila Stream, the Ōpau'ulu Stream, is some 550 m to the south (Figure 3). The confluence of the Ōpau'ulu and the Helemano then forms the Paukauila Stream, just seaward of the project area.

Hale'iwa has a moderate and coastal climate with daily temperatures between approximately 15.7 and 25.6° C (62 and 78° F) in January, and 20 and 30.6° C (68 and 87° F) in July. The dominant northeast trades follow the north shoreline. Mean annual rainfall is 819 mm. Most of the rainfall occurs in the winter months with approximately 100 to 125 mm of rainfall in the months of December and January. The driest months of the year are June and July with approximately 30 to 40 mm of rainfall (Giambelluca et al. 2013).

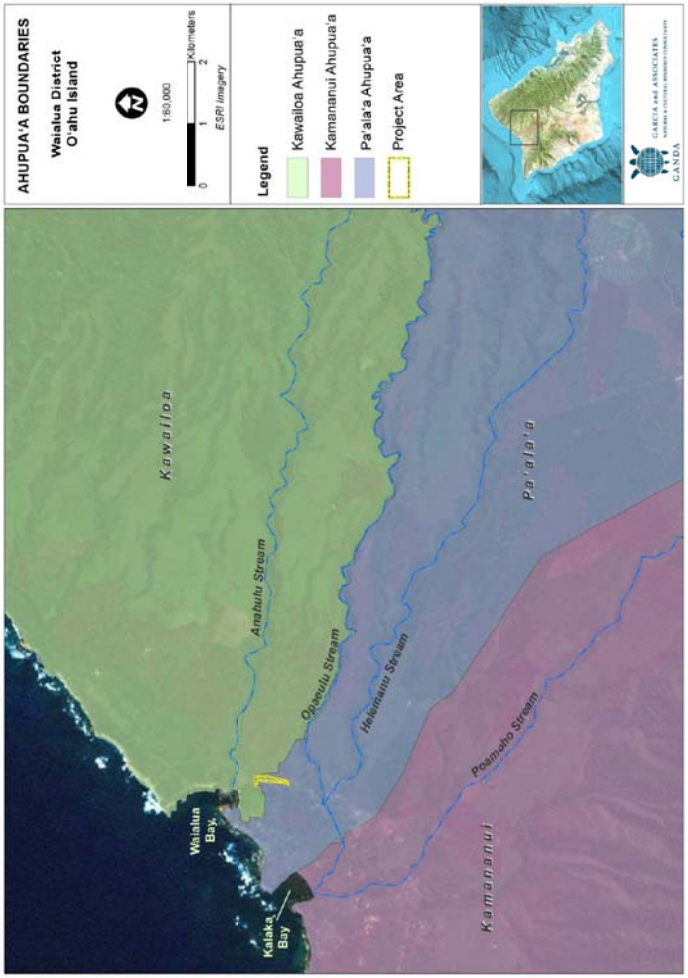

Figure 3. Project area in relation to streams and Kawailoa and Pa'ala'a Ahupua'a.

The majority of the project area's soils are classified as Ewa silty clay loam with slopes of up to two percent (USDA 2013) (Figure 4). Soils in the northern portion of the parcel are classified as Kawaihapai clay loam, with two to six percent slopes. These well-drained soils formed in alluvium derived from basic igneous rock that washed from the adjacent uplands.

The project area has been previously reworked, most recently during construction of the Joseph P. Leong Highway, and is highly degraded. The majority of the parcel is overgrown by post-Contact introductions of Guinea grass (*Megathyrsus maximus*) with scattered young *koa haole* (*Leucena leucocephala*). The project area can be classified as Koa Haole Shrubland in an early stage of succession (Gagne and Cuddihy 1999). Other species found include perennial soybean (*Neonotonia wightii*) and several small trees (*Melia azedarach* and *Spathodea campanulata*).

2.2 Traditional and Historic Background

Pa'ala'a and Kawailoa Ahupua'a are replete with traditional legends, place names, and historical accounts that denote a long history of traditional and historic occupation in the region, particularly along the coast. The following cultural and historical background provides an overview of historical aspects relevant to the project area.

2.2.1 Mo'olelo

2.2.1.1 Place Names

Pa'ala'a means "sacred firmness" (Pukui et al. 1974:173) which may refer to the sanctity of the area suggested by the many *heiau* the *ahupua'a* once contained (O'Hare et al. 2004:7). Pa'ala'a is also the name for a specific wind that creates a breath of air around *ka'alani* ("those about the chief") (Pukui and Elbert 1971:100, 273). Pukui and Elbert (1986:297) consider it a Maui wind.

Kawailoa translates literally to "the long water" (Pukui et al. 1974:98) referring to the long Anahulu Stream contained within Kawailoa Gulch (Sterling and Summers 1978:117, quoting Bryan in 1954). Hale'iwa means "house [of] the frigate bird" (Pukui et al. 1974:37) and was named by missionaries for their first mission house at the mouth of Anahulu Stream (Douglas, in Sterling and Summers 1978:116).

Anahulu is literally translated as "period of ten days" (Pukui and Elbert 1986:24), although the underlying meaning is unknown. 'Ōpae'ula means "red shrimp" (Sterling and Summers 1978:91, 181) while Helemano Stream is named for Halemano or Helemano, the youngest child of Kūkaniloko and her husband Wahiawā.

2.2.1.2 Legends

The people of Pa'ala'a consider themselves descendants of Lono Ka'ihikapumahana, son of a ruling chief of Ka'u and Puna on Hawai'i Island, Lono-i-Ka-Makahiki (Kamakau 1992:47, 54).

One legend associated with Pa'ala'a Ahupua'a is of the cannibal chief 'Aikanaka. The many sources for this story attest to his notoriety. The story relates that around the early Contact period,

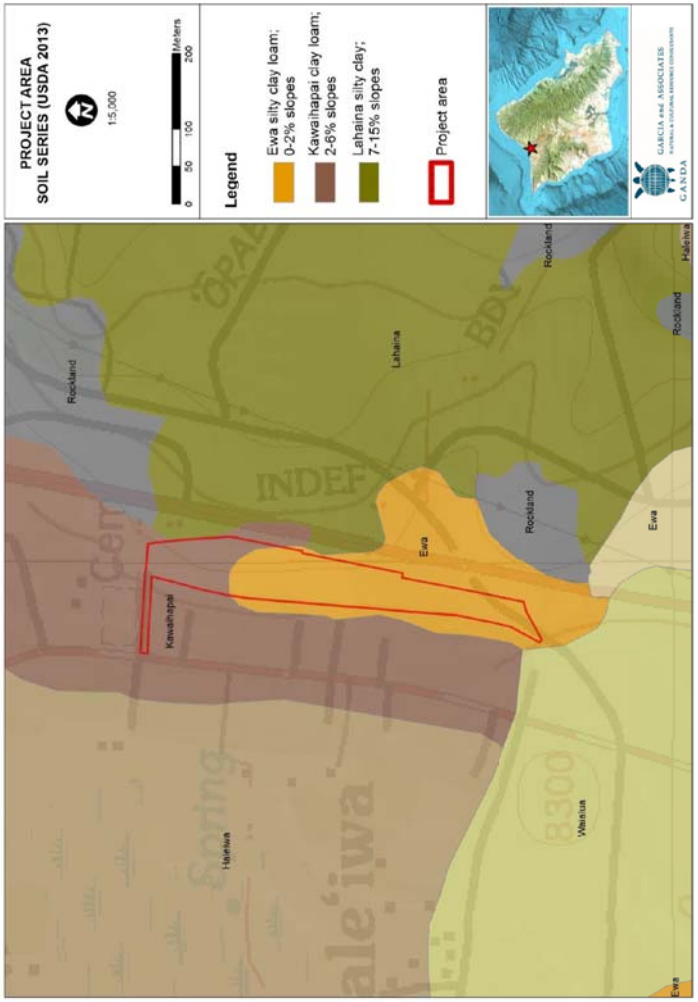

Figure 4. Soil survey classifications in the project area (USDA 2013).

‘Aikanaka, a powerful wrestler and boxer, sometimes said to be a foreigner, retired with a few followers in the uplands of Pa‘ala‘a where they dined on the flesh of hapless travelers. Eventually ‘Aikanaka was killed by a victim’s brother. McAllister (1933) placed the area known as the Pā ‘Aikanaka (“Man-eater’s enclosure”) eight miles east of Hale‘iwa.

The *mo‘o* Laniwahine is recounted by many as the guardian of the ‘Uko‘a fishpond. Laniwahine lived at ‘Uko‘a with her brother Puhiula (McAllister 1933:142) and both were also considered shark gods (Emerson, in Sterling and Summers 1978:118). Kamakau (in Sterling and Summers 1978:119–120) describes the unusual fish in ‘Uko‘a that belonged to Laniwahine:

> Laniwahine was the guardian of Uko‘a at Waialua, and Uko‘a was regarded as the long house in which she lived. She was a native of Uko‘a and all her deeds centered about that place. The natives of Uko‘a never failed to recognize her deeds, but few of her descendants are now left or perhaps none. Uko‘a was a strange fish pond in which lived extraordinary fish. A fish might be a kumu fish on one side and on the other a mullet; or one side weke pueo and on the other mullet; or one side might be silver white like a white cock; when scaled the skin might be striped and variegated inside. It was clear to all her descendants that these strange fish belonged to Laniwahine and it was no right to eat them. But the mullet of Uko‘a were full of fat when, as in all such ponds, the native guardian of the pond was remembered; [at other times] the fish had the thin bodies and heads like wood or sometimes disappeared.

2.2.2 Early Land Use

A paleoenvironmental study of ‘Uko‘a Pond for the Hale‘iwa Bypass Road project (Athens et al. 1995) identified the potential initial settlement of the region. The investigation identified the dominant vegetation types found in the area prior to Polynesian settlement and detected rapid environmental changes occurring in response to Polynesian settlement—notably the replacement of a lowland forest with open shrubland (Athens et al. 1995:118). Based on the dating of charcoal particulates that might indicate fires related to early agriculture clearing, Athens et al. (1995) suggest that initial settlement in the Kawailoa-Waialua region began around AD 800, and in correlation with pollen data, most likely by AD 950. The latter date, potentially based on an “old wood” date, corresponds with the Foundation Period (AD 1000–1200) when Polynesians first settled the more favorable places on O‘ahu (Kirch 2010:128).

Waialua was likely a focus of early Polynesian settlement on O‘ahu because of the abundance of fertile agricultural lands, abundant water, and rich marine resources (Kirch 1992:165). Likewise, political control of Waialua became important to Hawaiian chiefs because of the agricultural and aquacultural production capabilities of the region, “notably the extensive taro irrigation complexes and ‘Uko‘a and Lokoea fishponds” (Kirch 1992:19). Handy et al. (1972:466) also attribute the two fishponds at Lokoea and ‘Uko‘a as “Waialua’s greatest assets”:

> Ukoa was a narrow fresh-water pond about a mile in length. Laniwai [Sky-water] was its mo‘o guardian. With her lived her brother Puhi-‘ula (Red-eel). The pond was said to be connected with the ocean by a tunnel, through which the mo‘o would go to bathe in the sea.

The consolidation of political power in the region began sometime in AD 1100, when Chief Kapawa at Waialua was established as the first ruling chief in the islands (Kamakau 1964:3). Just before Western contact in 1778, Kamananui Ahupua‘a was the ritual and political center for Waialua District, while Pa‘ala‘a and Kawailoa formed the district’s fertile heartland (Sahlins 1992:20).

In John Papa ‘Ī‘ī’s (1993) post-Contact narrative of a coastal trail through Waialua, he mentions the village of Maeaea on the Kawailoa coast near Lokoea and ‘Uko‘a to the north:

> . . . thence across the mouth of the Kaiaka River and over the sands to the plains of Paalaa and Kawailoa to Kamani, a village with a pond, the boundary wall of which separated it from the Anahulu River.
>
> On the opposite bank lies Maeaea, a sandy beach with a canoe landing and a good harbor for ships. A village stood at Leepoko Point, and nearby the ponds of Ukoa and Lokoea, with many homes about them. Between the sandy stretch of Maeaea and the houses at Ukoa, on the seaward side, was the trail from Kamani to the place in front of the sluice gate of Lokoea, and on to Koolauloa. [‘Ī‘ī 1993:98]

‘Ī‘ī’s description of where the houses and taro patches were located suggests the project parcel may be slightly too far inland to have supported a substantial traditional population.

> From the stream of Anahulu and from Kamani, above the houses and taro patches, a trail stretched along in front of Kuokoa’s house lot and the church. This trail went on to meet the creeks of Opaeula and Halemano, the sources of the stream of Paalaa, on down to the stream of Poo a Moho, and on to the junction where the Mokuleia trail branched off to Kamananui and Keawawahie, to Kukaniloko, the birthplace of chiefs. [‘Ī‘ī 1993:98]

2.2.3 Post-Contact History

The post-Contact period in the Hawaiian Islands began with the arrival of Cook in 1778. Captain Charles Clerke, commander of the HMS Resolution, arrived in Waimea Bay on the northern boundary of Kawailoa following the death of Captain Cook in 1779. Clerke described the northwest coast of O‘ahu as:

> The most beautiful Country we have seen among these isles, here was a fine expanse of Low Land bounteously cloath’d with Verdure, on which were situate many large Villages and extensive plantations. [Beaglehole 1967:569]

In the decades following Cook’s arrival, interisland wars ensued resulting in Kamehameha’s conquest of O‘ahu in 1795. This gave the Hawai‘i Island paramount chief control of the whole archipelago except for Kaua‘i. Kaumuali‘i, the chief of Kaua‘i, surrendered to Kamehameha in 1810, thereby establishing a unified Hawaiian Kingdom. This brought significant change throughout the archipelago, as a cadre of four to five Hawai‘i Island chiefs became governors of the various islands, except for Kaua‘i. After conquest, Kamehameha traveled around the island of O‘ahu encouraging his people to fish, farm, and maintain fishponds.

2.2.3.1 Sandalwood Trade

By 1784, sandalwood (*'iliahi, Santalum* spp., particularly *S. freycinetianum*) was commercially harvested for shipment to China and became Hawai'i's most important export. Kamehameha I, who had become "a fervent consumer of high-priced western goods" (Kent 1983:17–20), was gaining immense profit from the royal monopoly on *'iliahi*. Farmers and fishermen were forced to abandon the maintenance of their agricultural fields and fishponds to travel inland and harvest sandalwood. This resulted in severe disruption to the subsistence economy and bouts of famine (Kirch 1992:82–97). The trade in sandalwood peaked between 1810 and 1820 to finally end about1840 with the depletion of most of Hawai'i's *'iliahi*.

Waialua had productive forests and the *ali'i* forced the *maka'āinana* to harvest the trees and transport them to harbors. One of the prominent Waialua *ali'i* to avidly support sandalwood collection was Kahekili Ke'eaumoku, the son of Ke'eaumoku, who had inherited control over Waialua (Sahlins 1992:59). In fact, when all the chiefs were asked to help in the construction of the Honolulu fort, "the district chief of Waialua, Kahekili Ke'eaumoku, was so busy collecting sandalwood that his district alone failed to respond to the call" (Kamakau 1992:206).

2.2.3.2 Post- Contact Land Tenure

After his conquest of the islands in 1795, Kamehameha redistributed Waialua to the powerful Hawai'i and Maui chief Ke'eaumoku (Sahlins 1992:45). After Ke'eaumoku's death in 1804, his eldest son, Kahekili Ke'eaumoku (also known as George Cox) was given Waialua. Cox resided in Kamananui, the political center of Waialua, but retained ownership to the Lokoea and 'Uko'a fishponds. Upon his passing in 1824, the land was transferred to his brother Kuakuni although it was actually controlled by his younger sister Pi'ia Nāmāhana. She shifted the political center from Kamananui to Kawailoa (Sahlins 1992:46).

When Pi'ia Nāmāhana died in 1829, she left Waialua to her sister Ka'ahumanu, Kamehameha's second wife and his Kuhina Nui. When she passed on four years later, Waialua went to Elizabeth Kahō'anokū Kīna'u, daughter of Kamehameha and Pi'ia Nāmāhana (Kame'eleihiwa 1992:58–60, 120–124). In 1839, Kīna'u died without a will and the Ali'i Nui (privy council) decided her lands would pass to her infant daughter Victoria Kamāmalu, although they would be managed by her father Kēkuanao'a and John Papa 'Ī'ī until she came of age.

2.2.3.3 Land Commission Awards (LCA)

The Māhele of 1848 divided the lands of Hawai'i, instituting legal land ownership in the islands. All land in Hawai'i was divided between the king (crown lands), the Government (government lands), and the *ali'i* and commoners (*konohiki* lands). *Ali'i* and commoners were required to submit claims for property to the Land Commission. All claims were assigned Land Commission Award (LCA) numbers, whether or not they were eventually granted. In many areas, more lands claims were submitted than were accepted. Government lands, available for purchase in 1848, were attractive as they came with pasturage and forest lands that were not usually included in the Land Commission Awards.

Western Waialua, from Kamananui to Ka'ena, was ceded as Government lands, with Kamāmalu keeping the *ahupua'a* of Pa'ala'a and Kawailoa (Land Commission Award 7713,

'Apana 34). Upon the death of Kamāmalu in 1866, her land holdings, including Pa'ala'a Ahupua'a, were passed on to her heirs and eventually became part of the Princess Bernice Pauahi Bishop Estate (Kamehameha Schools).

The Pa'ala'a and Kawailoa lands claimed by *maka'āinana* were the most productive taro land along the lower river valleys and the coastal wetlands (Sahlins 1992:167). A Waialua Agricultural Company map by W.A. Wall in 1900 shows that portions of three LCAs (2925 'Apana 1, 2933 'Apana 1, and 2942 'Apana 1) and a Royal Patent Grant (33:4) are in the study area (Figure 5; Table 1).

The northwest strip of the project area crosses the top of Royal Patent Grant 33:4 which was purchased by the Board of Education. Two buildings are shown on the 1900 map (Figure 5). On 19 December 1896 the parcel, described as containing a cottage, was sold at auction (*The Pacific Commercial Advertiser*, Honolulu).

LCA 2925 was awarded to Keali'ihuluhulu, the tax collector (Sahlins 1992:189). Although *lo'i* (taro patches) were part of the award, the 1900 map (Figure 5) illustrates that 'Apana 1, within the project area, contained the house lot. The house is shown to the west of the parcel, adjacent to the Government road, in what is now Hale'iwa town.

LCA 2933 was awarded to Kai'aikawaha and included a house lot and nine *lo'i*. The project parcel cuts through the middle of 'Apana 1 of the LCA but it is not clear what the land was being used for. Kai'aikawaha, the local teacher, was a graduate of Lahāinaluna High School, confidant of the missionary J.S. Emerson, and sometime assistant magistrate of Waialua (Sahlins 1992:92).

LCA 2942 was awarded to Robert S. Barker (Baker on the 1900 map) with 'Apana 1 containing a house lot. Barker was one of ten foreigners, apart from the missionaries, living in Waialua in 1850 (Sahlins 1992:166). A New Yorker married to a Hawaiian, he received land in Pa'ala'a from the *konohiki* Ka'u'ukuali'i in about 1837 (Sahlins 1992:166).

2.2.3.4 Missionaries

The missionary Reverend John S. Emerson and his wife, Ursula, arrived from the east coast of the U.S. in the settlement that became Hale'iwa town in the summer of 1832. Within a year they had established their first church in a grass house near a former meeting house built by the Waialua Chief La'anui. In 1840, the Waialua Mission Church was relocated from what is now the corner of Kamehameha Highway and Hale'iwa Road (later the location of the Hale'iwa Hotel) to the south of Anahulu Stream, on land now occupied by the cemetery just north of the project area (Liliuokalani Church 2014). In 1890, the church was moved again to the present location of the Lili'uokalani Church, named after Queen Lili'uokalani, the last Hawaiian monarch, who spent summers on the shores of Anahulu River and attended services there.

Emerson served the area he named Hale'iwa (Sterling and Summers 1978:116) until 1864, except for a four year stint on Maui. During their years of service at the Hale'iwa mission, the Emersons spread the word of Christianity, attended to the sick, and translated English-language books into Hawaiian.

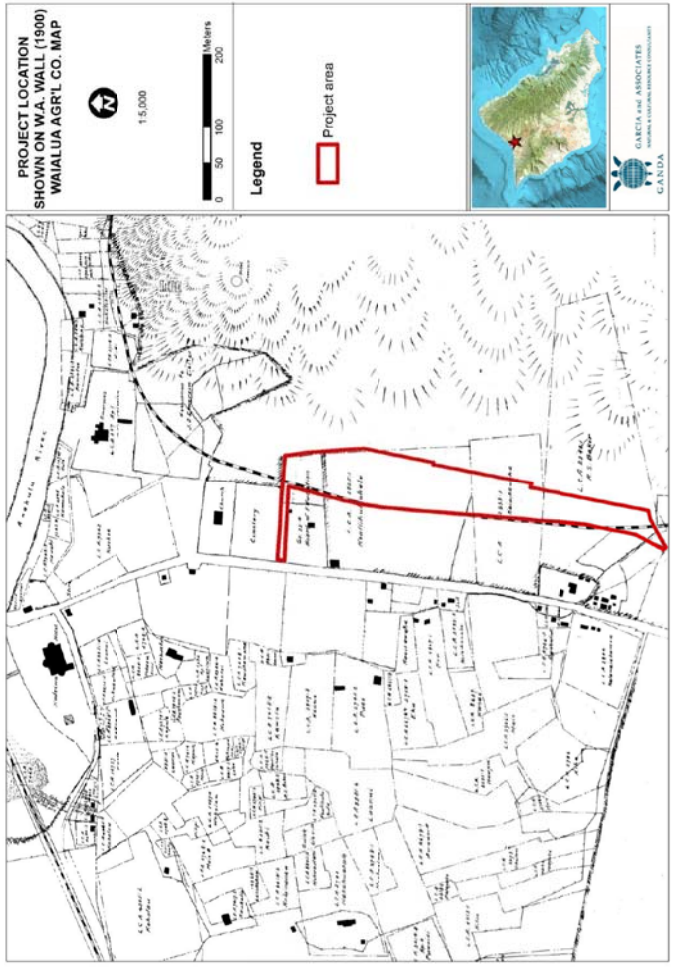

Figure 5. Land Commission Awards and Royal Patent Grants in the project area as shown on 1900 Waialua Agricultural Company Map (Registered Map No. 2055, W.A. Wall 1900).

Table 1. Land Claim Awards and Royal Patent Grants in the Project Area

Claim No.	Claimant	*'Ili*	Land Use*	Reference
2925:1	Kealiʻihuluhulu	Poopohaku, Haehae, Hanaewa, Aakala, Aeikala	0.46 acre; house lot 6 *loʻi*	Book 8:109
2933:1	Kaiʻaikawaha	Aakala, Kuleana, Hanauewa	house lot 5 *loʻi* 4 *loʻi*	Book 5:286
2942:1	Robert S. Barker	Kaneiipuolono, Kapaapaa, Kulioiki	house lot	Book 3:95
Royal Patent Grant 33:4	Board of Education			

*Land Use refers to entire LCA and not necessarily the *ʻapana* within the project area.

2.2.3.5 Commercial Agriculture

Land use in Waialua changed with the overall decline of the Hawaiian population and an increased presence of non-Hawaiian residents. Soon after Chinese immigrants began arriving in 1852, Paʻalaʻa and Kawailoa's abandoned taro fields were converted to rice (*Oryza sativa)* cultivation. The rice supplied a burgeoning local market with excess exported to California.

Cattle ranching also came to the area, with between 3,000 and 4,000 cattle pastured in Waialua by 1846. One of the investors in northern Oʻahu's ranching operations was B. Frank Dillingham. Dillingham and Castle & Cooke, Ltd., organized the Waialua Agricultural Company to grow sugarcane on extensive tracts of land in Kawailoa, Kamananui, and Paʻalaʻa Ahupuaʻa. Current residents of the houses adjoining the project area state that it was planted in cane when they were young.

By 1898, Dillingham extended his Oahu Railway and Land Company (OR&L) narrow-gauge railway (SIHP 50-80-04-5791) to Haleʻiwa and the Waialua Sugar Mill. A 1928 USGS Haleiwa Quadrangle shows the railroad cutting the length of the project area (Figure 6). The railroad fueled the expansion of sugarcane cultivation and brought more missionaries and entrepreneurs to Waialua. Dillingham built the Haleʻiwa Hotel in 1899 to increase the profits of his railroad. The hotel was open until 1928, after which it became a private club, then a World War II officers' clubhouse before being demolished in 1952.

The gravel one-lane road extending the length of the west edge of the project area first appears on a 1935 USGS quadrangle map. It appears to run under and along the railroad track and may have once been used for access during construction, maintenance, and use of the railroad. However, as georefere

From 1900 to 1950, the Waialua Agricultural Company continued to expand sugarcane operations. They acquired more land and built irrigation ditches, eventually developing into one of

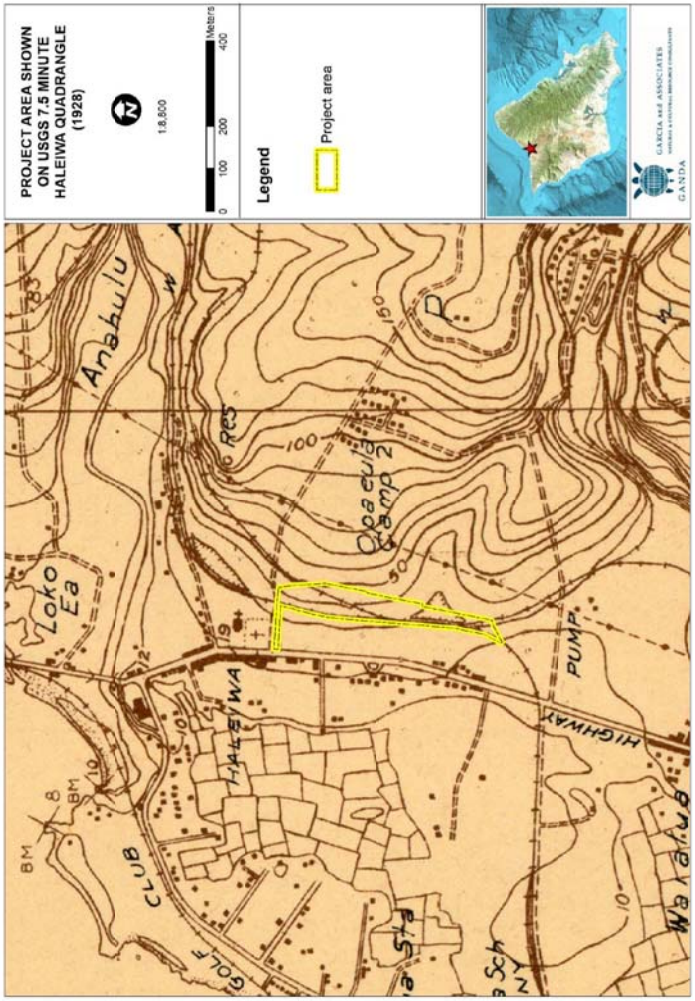

Figure 6. 1928 USGS Haleiwa Quadrangle map showing OR&L Railroad in the project area.

the largest sugar producers in Hawai'i. Housing, social, and recreational facilities for Waialua Agricultural Company workers were built in Kawailoa and Pa'ala'a Ahupua'a. One of these, the Opaeula Camp 2, was located to the east of the project area (Figure 6).

Significant infrastructure improvements were also made in the area during World War II, including the construction of houses and other military buildings and improvements at Hale'iwa Airfield. The sugar industry and the military buildup of the area during World War II also spurred increases in the local population. These historical developments, plus recent projects such as construction of the Hale'iwa Small Boat Harbor in the 1960s, completely altered the coastline and configuration of the Anahulu River mouth.

In 1985, Castle & Cooke merged with the FlexiVan Corp. to become the Dole Food Company. By 1991, the Waialua Sugar Company, a subsidiary of Dole Food Company, produced eight percent of Hawai'i's sugar, but in the next few years the plantation became unprofitable. In 1996, the plantation was shut down by the Dole Food Company (Dorrance and Morgan 2000: 142). The Waialua Sugar Mill was the last functioning sugar mill on O'ahu.

The Government Road, passing through Hale'iwa and up O'ahu's North Shore, became Kamehameha Highway (Route 83) at its junction with Route 99 just southeast of Hale'iwa. In 1995, the 3.7 km (2.3 mi) Joseph P. Leong Highway was completed to bypass Hale'iwa town on the inland side, rejoining Kamehameha Highway north of Hale'iwa. This highway is adjacent to the length of the project area's east side (Figure 1).

2.3 Previous Archaeological Investigations

The earliest archaeological investigations in the area were conducted by McAllister (1933) in 1930 during his comprehensive survey of O'ahu sites. Since this early work, various research and cultural resource management projects have been conducted, including fifteen in the general vicinity of the current project area (Figure 7; Table 2). Two of these investigations were in close proximity to the project area and are discussed in more detail below.

McAllister (1933) recorded numerous pre-Contact and historical resources within Hale'iwa town and in Pa'ala'a and Kawailoa Ahupua'a. In Pa'ala'a, McAllister (1933:132–43) documented six *heiau* (Kamani, Kapukapuākea, Lonoakeahu, Pu'upilo, Kepuwai, and Hekili), the altars of Punakai and Kumailia unu, the Ka'ohe *ko'a* (fishing shrine), the Pōhaku Lana'i at Kaiaka Point, Kūpaoa Point, Punakai (a *kahuna*'s residence), Pā'aikana enclosure in Halemano, and Laukī'aha Spring.

The project area was within a 1979 archaeological survey for the Kamehameha Highway re-alignment around Hale'iwa (Chiniago 1979). No sites were recorded in the current project area and none of the limited excavation conducted during the 1979 investigations were placed in the parcel. The previous work recorded four archaeological sites including an historic cultural deposit (SIHP 50-10-04-1439), a wall remnant (SIHP 50-10-04-1440), remnants of wetland taro terrace system (SIHP 50-10-04-1441), and an historic church (SIHP 50-10-04-1443).

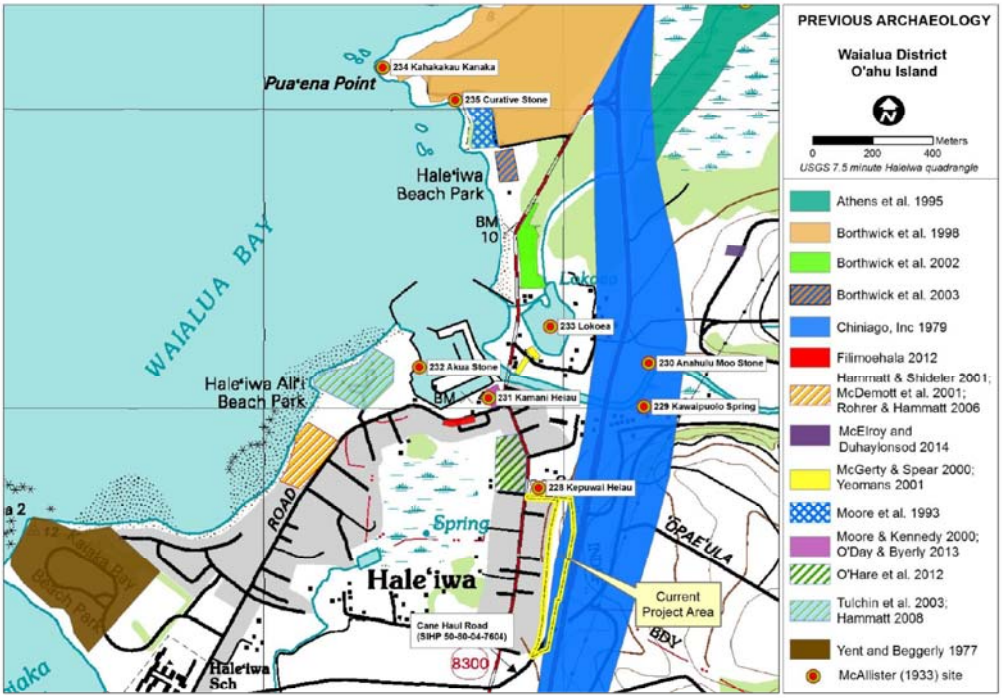

Figure 7. Location of McAllister (1933) sites and previous archaeological studies near the project area.

Table 2. Summary of Previous Archaeological Investigations in Vicinity of Project

Year	Author(s)	Investigation	Findings
1933	McAllister	Island-wide survey	Recorded *heiau*, sacred stones, Lokoea and 'Uko'a fishponds, named spring, and legendary place.
1979	Chiniago Inc.	Survey	Recorded historic cultural deposit (50-10-04-1439), wall remnant (50-10-04-1440), agricultural terrace (50-10-04-1441), and an historic church (50-10-04-1443).
1993	Moore et al.	Inventory survey of the Hale'iwa Beach Park Extension; TMK 6-2-001:004, 005, 006, and 008	Confirmed location of sacred stone (Site 235) recorded by McAllister 1933, and identified human burials (50-80-04-4593 and -4595), historic house site (50-80-04-4589), fire pits (50-80-04-4590), and posthole and charcoal lens.
1995	Athens et al.	Paleoenvironmental coring at 'Uko'a Pond (SIHP 50-80-04-236)	Environmental changes in soil study suggesting early Hawaiian settlement AD 800–950.
1998	Borthwick et al.	Inventory survey; TMK 6-1-004:023 and 058, and 6-2-001:001 and 010	Identified World War II era resources and a pre-Contact Hawaiian burial (Site No. unknown).
2000	McGerty and Spear	Inventory survey, Lokoea Pond area; TMK 6-2-003:006 and 009	Identified charcoal deposits (50-80-04-5795) and stacked boulder wall (50-80-04-5839).
2000	Moore and Kennedy	Inadvertent discovery of human remains at Hale'iwa Joe's Restaurant; TMK 6-6-001:032	Identified human skeletal remains of an adult and a child (50-80-04-5838).
2001	McDermott et al.	Inventory survey, Hale'iwa Ali'i Beach Park; TMK 6-6-002: por. 001	Identified former OR&L Railroad (SIHP 50-80-04-5791) and cultural deposit with human skeletal remains (50-80-04-5850).
2001	Hammatt and Shideler	Burial reinterment (SIHP Site 50-80-04-5850)	Reinterred burial (50-80-04-5850) in its original pit.
2002	Borthwick et al.	Inventory survey, North Shore Skateboard Park; TMK 6-2-003:017, 019, 020, 022, and 038	Identified section of former OR&L Railroad (SIHP 50-80-04-5791), basalt boulder structure, and subsurface cultural layer.
2003	Borthwick et al.	Inventory survey, Hale'iwa Ali'i Beach Park; TMK 6-6-002: por. 002	No cultural resources encountered.
2003	Tulchin et al.	Archaeological assessment, Hale'iwa Ali'i Beach Park; TMK 6-6-002: por. 001	No cultural resources encountered.
2006	Rohrer and Hammatt	Archaeological monitoring, Hale'iwa Ali'i Beach Park; TMK 6-6-002:01	Identified additional human remains related to SIHP 50-80-04-5850 (a subsurface cultural layer containing a human burial).
2008	Hammatt	Archaeological monitoring, Hale'iwa Ali'i Beach Park; TMK 6-6-002, por. 001	No cultural resources encountered.

Table 2. (continued)

Year	Author(s)	Investigation	Findings
2012	Fillmoebala	Archaeological monitoring of guardrail improvements at 66-101 and 66-826 Hale'iwa Road	No cultural resources encountered.
2012	O'Hare et al.	Archaeological inventory survey of Hale'iwa redevelopment project: TMK 6-6-004: 013–019, 027, 028, and 032	Identified historic concrete features (SIHP 50-10-04-7152) and agricultural *lo'i* sediment (SIHP 50-10-04-7152).
2013	O'Day and Byerly	Archaeological monitoring of Hale'iwa Joe's construction activities	Identified skeletal remains of three pre-Contact individuals (SIHP 50-10-04-7561) and historic retaining wall associated with former Hale'iwa Hotel.
2014	McElroy and Duhaylonsod	Archaeological inventory survey: TMK 6-2-002:042	Identified SIHP 50-80-04-7604, an historic road cane haul road.

Cultural Surveys Hawai'i conducted an archaeological inventory survey (O'Hare et al. 2012) and a cultural impact assessment (McMillen et al. 2011) for the Hale'iwa Redevelopment Entitlements Project just to the northwest of the current parcel. The studies identified historic concrete features (SIHP 50-10-04-7152) and agricultural *lo'i* sediment (SIHP 50-10-04-7152).

The archaeological sites closest to the project area include a long-destroyed *heiau* and a cane haul road. Bordering the parcel's northwest extension is the location of Kepuwai Heiau (Site 228). The *heiau* was completely destroyed during McAllister's (1933:141) work, with a cemetery marking the site. No other ethnohistoric or archaeological information exists for the *heiau*.

Cane Haul Road (SIHP 50-80-04-7604) cuts through the southern base of the project area (Figures 1, 7, 8, and 11). The 9.4 km (5.8 mi) long road extends from Kawailoa Road in the north to just beyond Kahui Street in the south. McElroy and Duhaylonsod (2014:39) identified the site as first showing up on a 1956 map. Rechtman et al. (2011:20) note that portions of Cane Haul Road were built over the old Waialua Sugar Company railroad.

> The road was built by the Waialua Sugar Company to load the trucks and drive back to the sugar mill in Waialua (Nellis, pers. comm. 2014). Prior to delivering sugar in trucks, they were using railroad, mules and carts. In order for the trucks to get through, a series of roads were created to all lead back to the sugar mill. There were roads that were permanent year round thoroughfares that were weather-proofed, and there were also some less traveled roads that became overgrown.
>
> Cane Haul Road was one of those that was permanent year round. The road was built only for sugarcane harvesting, not for real estate development, and was never intended for use by residents of the area (Nellis, pers. comm. 2014). [McElroy and Duhaylonsod 2014:54]

2.3.1 Summary and Archaeological Expectations

During the pre-Contact period, the coastal sections of Pa'ala'a and Kawailoa Ahupua'a were an important source of food production for Waialua District. Their produce supplied the district's ritual and political center in Kamananui Ahupua'a.

The fertile riverbanks of the Ōpau'ulu and Anahulu Streams to the north and south of the project area and the wetlands, such as the Haleiwa Marsh, to the west would have supported wetland taro fields. The fishponds at Lokoea Pond and 'Ūko'a Marsh were considered Waialua's most significant assets. Despite not being adjacent to a streambed or in a marshy area, the project area may have supported traditional wet or dryland agriculture. There is no archival evidence of this, as the land documentation associated with the Māhele and associated maps indicate only small house lots.

Pi'ia Nāmāhana shifted Waialua's political center from Kamananui to Kawailoa in the 1820s. Soon after, in 1832, Reverend Emerson established a mission station on lands he named Hale'iwa. The earliest maps of the area illustrate that the settlement extended along either side of the Government Road (to become Kamehameha Highway) and on towards the coastline. Although almost the entire project area was awarded as LCAs, it appears that this was the eastern extent of settlement with perhaps activity in the project area limited to the few house lots.

In 1898, the OR&L narrow-gauge railway was constructed across the length of the project area. The railroad spurred local economy by connecting the residents of Honolulu with northern O'ahu and facilitating transport of sugarcane to various shipping locations. The project area's surface and to some extent the subsurface would have been heavily disturbed by railroad construction and use.

The rail bed was subsequently destroyed during construction of the following century's transportation focus, namely the Joseph P. Leong Highway, in 1995. During highway construction, the parcel adjacent to the eastern length of the narrow project area appears to have been used as both a staging area for heavy equipment and a spoil pile for disposal of excess soil generated by highway construction. The northern two-thirds of the parcel are (perhaps artificially) elevated some five to seven meters above the southern third. The size, leveled top, and angled sides of the elevated land mass are highly suggestive of a construction spoil pile.

Based on the background information, it is almost certain no archaeological features remain on the surface. If the northern third of the property is indeed a spoil pile, then any potential cultural deposits are deeply buried. Intact cultural deposits might be found in the area that is not capped by the spoil pile in the southern third of the parcel. Encountering these deposits might identify some of the traditional agricultural fields that Pa'ala'a Ahupua'a was known to contain in the pre-Contact period.

3.0 Field and Laboratory Methods

Archaeological field investigations were conducted on 10 and 11 November 2014 by Dr. Jolie Liston, Amanda Sims, B.A., and David Byerly, B.A. The surface of the project area was visually inspected for structures, features, and artifacts. The parcel is heavily overgrown with Guinea grass and surface visibility is very poor.

Subsurface testing consisted of backhoe excavation of six stratigraphic trenches (Figure 8). Trenches 1 through 5 were excavated perpendicular to the length of the parcel, or with a general east-west bearing, while Trench 6 was dug parallel with the parcel on a general north-south bearing. The trenches were excavated to intact B- or C-horizons. Although attaining C-horizons is preferable, at times the trench became dangerously deep to enter and draw stratigraphic profiles.

All excavation work was closely monitored by the archaeologists and investigated more thoroughly for subsurface archaeological deposits when trenching was completed. Profiles were drawn of a faced segment of each trench that best represented the stratigraphy encountered. Backdirt from the trenches was also examined for the presence or absence of artifacts and midden remains.

Trench and stratigraphic profile locations were recorded with a sub-meter accurate Trimble GeoXH Global Positioning System unit and photographically documented with a digital camera using a metric tape as a scale. The U.S. National Resource Conservation Service and Munsell color notation reference systems were used to describe soil strata.

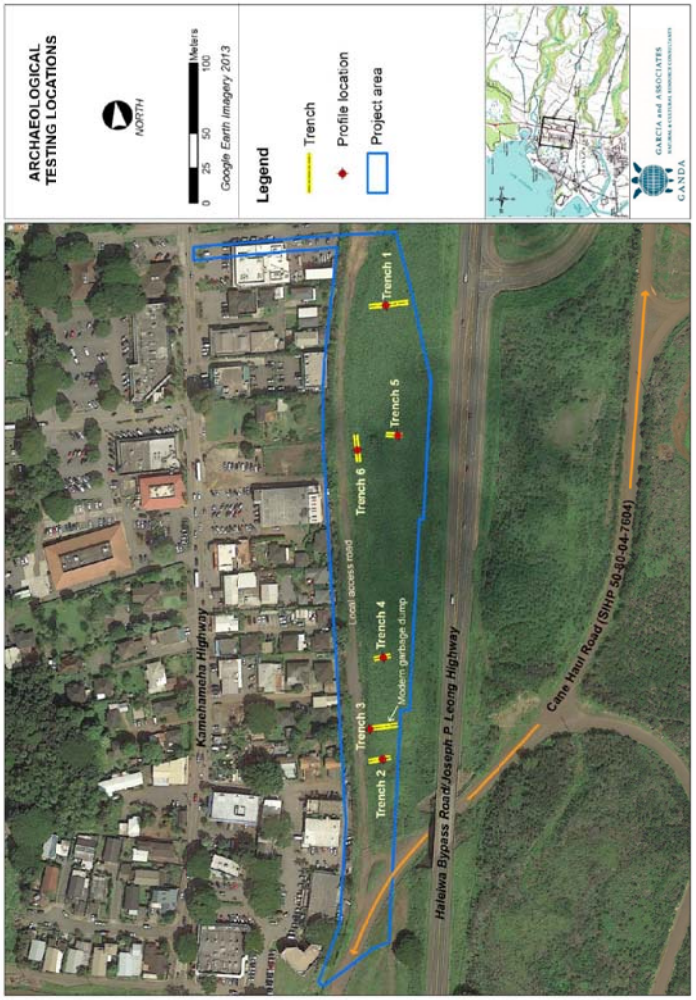

Figure 8. Location of backhoe trenches in the project parcel.

Artifacts collected in the field were securely packaged in re-sealable polyethylene bags, or where too large, were tagged with flagging tape. Provenience information, date, content, and name of collecting archaeologist were placed on each bag or tag before leaving the project area. Laboratory analysis was conducted at the Garcia and Associates' laboratory in Kailua, O'ahu where each artifact was washed, measured, weighed, and identified to time period and function. Final disposition will be determined in consultation with the landowner and Hawai'i State Historic Preservation Division per HAR §13-276-6.

4.0 Archaeological Fieldwork Results

The project area is currently vacant and covered in grasses. Disturbed in the recent past by construction of the adjacent Joseph P. Leong Highway, there are no structures or artifacts on the surface.

Six backhoe trenches, totaling 108.5 linear meters (194.5 m^3) or roughly 4 percent of the parcel, were excavated to determine the presence or absence of traditional Hawaiian or historic era archaeological resources (Figure 8). Trenches 1 and 5 were placed on the potential spoil pile; Trenches 2 and 3 were located on what appears to the natural surface; and Trenches 4 and 6 were excavated along the outer edges of the potential spoil pile where it meets the natural surface.

Table 3 provides technical soil descriptions for all six trenches.

4.1 Trench 1

Trench 1 is located at the parcel's north end (Figure 8). It measured 28.0 m long by 1.3 m wide, was excavated to a maximum depth of 1.9 m below surface, and had a bearing of 92 degrees. The trench contained four stratigraphic layers designated Layers I, IIa, IIb, and III (Figure 9, Table 3). A stratigraphic profile was drawn of a portion of the center of the trench's north wall.

Layer I extends from the surface to five centimeters below surface (cmbs) and is composed of humic material in a loose loamy silt matrix. Layer IIa extends from 5 to 68 cmbs and consists of very gravelly medium compact silty clay. The layer contains a few scattered charcoal pieces most likely originating from localized surface burns. Layer IIb extends from 63 to 130 cmbs. The layer resembles the silty clay texture of Layer IIa but is slightly more compact and contains large cobbles and far less gravel. Layer III extends from 113 to 185 cmbs and is a sterile, very compact silty clay.

Layer I is naturally deposited topsoil and humic material. The gravelly content and highly mixed nature of Layers IIa and IIb strongly suggest that they are excess material deposited during construction of the nearby Joseph P. Leong Highway. It is likely that Layer IIb is far more compact than Layer IIa due to heavy equipment driving on top of it prior to the deposition of Layer IIa. Layer III appears to be a B-horizon; it may be intact but is more likely a B-horizon that was redeposited during highway construction. As in Layer II, Layer III may have become compacted due to the passage of heavy equipment.

Table 3. Backhoe Trench Stratigraphy

Trench	Layer	Depth (cmbs)	Description	Interpretation
1	I	0–5	7.5YR 3/2 (dark brown) loamy silt; loose humic material; moist; low plasticity; fine subangular blocky; lots of roots (70%) and tiny rootlets; distinct lower boundary.	Topsoil
	IIa	5–68	2.5YR 2.5/2 (very dusky red) silty clay; medium compact; very gravelly (70%) with pebbles and cobbles; few roots; few and scattered charcoal from surface burns; diffuse, wavy lower boundary.	Fill from highway construction
	IIb	63–130	5YR 2.5/2 (dark reddish brown) silty clay; similar to Layer IIa except much more compact, less gravel, and more large cobbles (40%); few roots; heavy plastic piece (not kind used in agriculture); unclear, wavy lower boundary.	Fill from highway construction
	III	113–185	2.5YR 3/2 (dusky red) silty clay; very compact; dry; no roots; few gravel; no cultural material.	Intact B-horizon
2	I	0–10	7.5YR 3/2 (dark brown) loamy silt; loose humic material; moist; low plasticity; fine subangular blocky; lots of roots (70%) and tiny rootlets; distinct lower boundary.	Topsoil
	II	10–20	10R 4/1 (dark reddish gray) silty loam mixed with 80% gravel; loose; some rootlets; no cultural material; clear, straight lower boundary.	Gravel fill from road resurfacing
	III	20–108	5YR 2.5/2 (dark reddish brown) silty loam mixed with 40% gravel; slightly compact but crumbly; dry; medium plasticity; fine to medium subangular blocky; many rootlets; butchered cow bone (Artifact 1); unclear, wavy lower boundary.	Mixed A-horizon with highway construction fill
	IV	60–118	7.5YR 3/2 (dark brown) silty clay with few gravel; compact, hard; few rootlets; subangular blocky; no cultural material; wavy lower boundary.	Intact B-horizon
	V	105–143	2.5YR 3/1 (dark reddish gray) clay; compact, hard as rock; no roots; no rocks; no cultural material; clear, distinct lower boundary.	Intact B-horizon
	VI	135–157	5YR 4/2 (dark reddish gray) sandy silt; decomposing bedrock; compact but powders off in hand; dry; no roots; no cultural material.	Intact C-horizon
3	I	0–10	2.5YR 2.5/1 (reddish black) loamy silt; loose humic material; moist; low plasticity; fine subangular blocky; lots of roots (70%) and tiny rootlets; distinct lower boundary.	Topsoil
	II	7–64	5YR 2.5/2 (dark reddish brown) silty loam mixed with 40% gravel; slightly compact but crumbly; dry; medium plasticity; fine to medium subangular blocky; few roots; lots of trash (95% modern, 5% historic) in central and eastern sections; wavy lower boundary.	Fill from highway construction mixed with trash fill
	III	37–106	7.5YR 3/2 (dark brown) silty clay mixed with 70% cobbles/pebbles and 20% Layer II silty clay; compact; dry; high plasticity; fine to medium subangular blocky; few roots; no cultural material; wavy lower boundary.	Mixed A-horizon with highway construction fill

Table 3. (continued)

Trench	Layer	Depth (cmbs)	Description	Interpretation
3	IV	93–125	2.5YR 2.5/3 (dark reddish brown) clay; compact, hard as rock; dry; high plasticity; fine to medium subangular blocky; no roots; no rocks; no cultural material; clear, distinct lower boundary.	Intact B-horizon
	V	108–177	5YR 4/2 (dark reddish gray) sandy silt; decomposing bedrock; compact but powders off in hand; dry; medium plasticity; fine to medium subangular blocky; no roots; no cultural material.	Intact C-horizon
4	I	0–10	5YR 2.5/1 (black) loamy silt; loose humic material; moist; low plasticity; fine subangular blocky; lots of roots (70%) and tiny rootlets; distinct lower boundary.	Topsoil
	II	9–88	2.5YR 3/2 (dusky red) silty clay with 30% pebbles; crumbly; moist; low plasticity; fine to medium subangular blocky; some roots; no cultural material; distinct lower boundary.	Mixed A-horizon with highway construction fill
	III	78–147	2.5YR 3/3 (dark reddish brown) clay; compact; moist; high plasticity; fine to medium subangular blocky; very few roots; some degrading rock; no cultural material; distinct lower boundary.	Intact B-horizon
	IV	123–161	7.5YR 4/1 (dark gray) clay; hard, compact; dry; high plasticity; fine to medium subangular blocky; no roots; no cultural material; distinct lower boundary.	Intact B-horizon
	V	144–201	5YR 5/2 (reddish gray) sandy silt mixed with 10% red clay; decomposing bedrock; crumbly; dry; low plasticity; medium subangular blocky; no roots; no cultural material.	Intact C-horizon
5	I	0–10	2.5YR 2.5/1 (reddish black) loamy silt; loose humic material; moist; low plasticity; fine subangular blocky; lots of roots (70%) and tiny rootlets; distinct lower boundary.	Topsoil
	II	9–37	5YR 3/2 (dark reddish brown) silty loam with 60% gravel (pebbles, cobbles); slightly compact but crumbly; some roots; medium plasticity; fine to medium subangular blocky; many rootlets; some coral pieces; no cultural material; distinct lower boundary.	Mixed A-horizon with highway construction fill
	III	32–70	2.5YR 2.5/2 (very dusky red) silty clay with 20% pebbles; crumbly; moist; low plasticity; fine to medium subangular blocky; some roots; no cultural material; distinct lower boundary.	Mixed highway construction fill
	IV	64–179	2.5YR 3/2 (dusky red) clay; compact; moist; high plasticity; fine to medium subangular blocky; some roots; no cultural material; distinct lower boundary.	Intact B-horizon
	V	172–224	10YR 4/1 (dark gray) sandy silt mixed with 10% red clay; decomposing bedrock; crumbly; dry; low plasticity; medium subangular blocky; no roots; no cultural material.	Intact C-horizon

Table 3. (continued)

6	I	0–10	2.5YR 3/1 (dark reddish gray) loamy silt; loose humic material; moist; low plasticity; fine subangular blocky; lots of roots (70%) and tiny rootlets; distinct lower boundary.	Topsoil
	II	10–60	2.5YR 2.5/2 (very dusky red) clay with 20% gravels; moist; chunky; low plasticity; fine to medium subangular blocky; some small roots; no cultural material; distinct lower boundary.	Eroded material (construction fill and topsoil) from adjacent elevated topography
	III	51–130	2.5YR 3/3 (dark reddish brown) silty clay; compact; moist; high plasticity; fine to medium subangular blocky; very few roots; degrading bedrock at bottom border; no cultural material; diffuse lower boundary.	Intact B-horizon
	IV	120–150	7.5YR 3/2 (dark brown) clay; hard, compact; dry; fine to medium subangular blocky; no roots; no cultural material; diffuse lower boundary.	Intact B-horizon
	V	140–190	10YR 5/2 (grayish brown) sandy silt mixed with 10% red clay; decomposing bedrock; crumbly; dry; low plasticity; medium subangular blocky; no roots; no cultural material.	Intact C-horizon

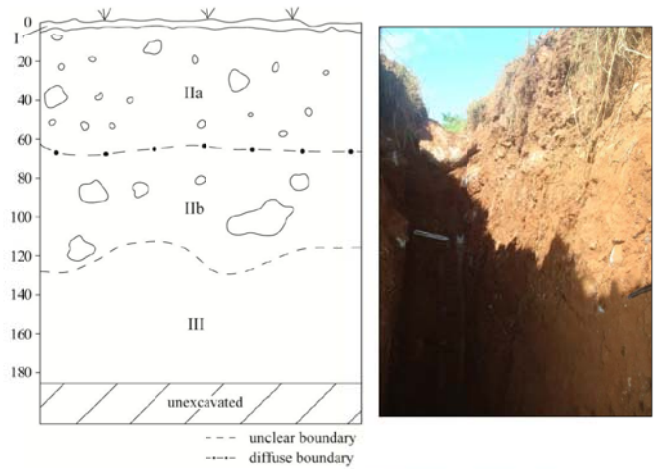

Figure 9. Profile of center of north wall Trench 1. Photograph facing west with profile in right foreground. Profile scale in centimeters.

Trench 1 shows signs of modern construction disturbance and produced no evidence of traditional Hawaiian or early historic cultural deposits.

4.2 Trench 2

Trench 2 is located at the far southern extent of the project area. The trench measured 16.2 m long by 0.8 m wide, was excavated to a maximum depth of 1.7 m below surface, and had a bearing of 80 degrees. Trench 2 contained six stratigraphic layers designated Layers I–VI (Figures 8 and 10, Table 3). A profile was drawn of a portion of the east end of the north wall. One artifact (Artifact 1), a piece of a cow rib, was collected.

Much of the trench was only excavated to the base of Layer III due to large boulders obstructing the backhoe. Similar boulders line Cane Haul Road under the nearby highway bridge (Figure 11). Apparently previous construction activity had encountered these boulders deep in the area's intact deposits and incorporated them into the landscape.

Layer I of Trench 2, extending from surface to 10 cmbs, is a loose humic material consisting of roots and loamy silt. Layer II, with a depth of 10 to 20 cmbs, displays a clear, straight lower boundary. The layer is composed of a dark reddish gray (10R 4/1) silt loam mixed with 80 percent gravel. Layer III is found from 20 to 108 cmbs. The layer is a silty loam containing 40 percent gravel and many rootlets. A butchered cow bone (Artifact 1) was found in Layer III.

Layer IV, with a depth of 60 to 118 cmbs, is composed of dark brown (7.5YR 3/2), very compact, silty clay. Layer V, extending from 105 to 143 cmbs, consists of a hard compact clay. Its dark reddish grey (2.5YR 3/1) color resembles that of a gleyed soil and may result from long-term water percolation. Layer VI is found at 135 to 157 cmbs. It is a compact, sandy silt that turns powdery when touched.

Layer I is naturally deposited topsoil and humic material. Layer II is interpreted as remnants of the gravel fill transported to the site during resurfacing of the adjacent west graveled road. Layer III appears to be a mix of an A-horizon with fill material brought in for construction of the nearby Joseph P. Leong Highway. Layers IV–VI are likely intact soil horizons with Layers IV and V being a B-horizon and Layer VI composing the C-horizon.

Trench 2 produced no evidence of traditional Hawaiian or early historic cultural deposition.

4.2.1 Artifact 1

Artifact 1 is a small piece of cow rib (*Bos taurus*) collected from Layer III at a depth of 1.0 m (Figure 12, Table 4). The artifact was located 7.8 m from the west end of the trench. The section of rib includes the head that posteriorly articulates with the vertebral column and a portion of the rib body. The rib bone exhibits evidence of butchering as the end of the bone has been finely cut. The bone measures 17.5 cm x 4.0 cm, has a width of 1.4 cm, and weighs 61.7 g.

Butchering procedures are largely dependent on cultural practices (O'Connor 2000). They are therefore not the best indicator to determine age; however, the butchering method may reveal how the animal was processed. The cut on the bone is very fine and precise which points toward a processing facility with a meat saw as opposed to the use of a serrated knife or heavy chopping tool, like a cleaver.

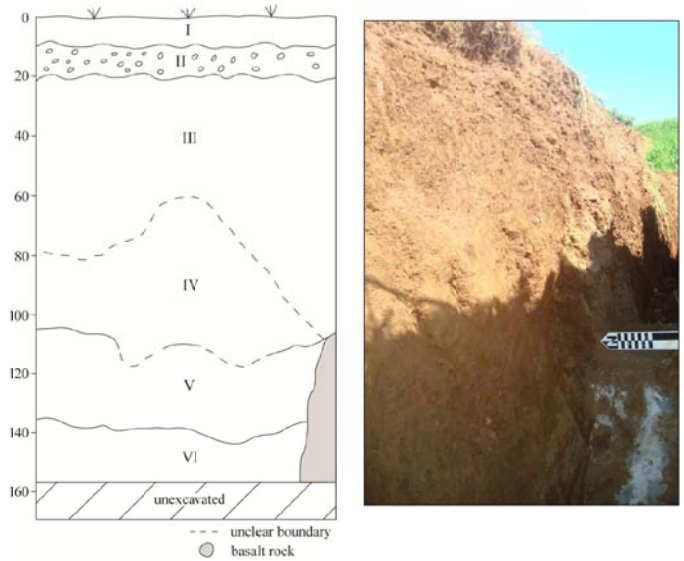

Figure 10. Profile of north wall close to east end of Trench 2. Photograph facing east with profile in right foreground. Profile scale in centimeters.

Figure 11. Large boulders similar to those found at the base of Trench 2 lining the south edge of Cane Haul Road (SIHP 50-80-04-7604) at south end of project area.

Figure 12. Artifacts collected from project area.

Table 4. Artifacts in Trenches 2 and 3

Artifact No.	Provenience	Identification	Dimensions	Weight (g)	Comments
1	TR 2, L. III, 100 cmbs	cow (*Bos taurus*) rib fragment	4.0 x 17.5 cm, 1.4 cm wide	61.7	Evidence of butchering
2	TR 3, L. II modern trash deposit	portable, one-band, seven-transistor Panasonic radio	7.0 x 11.0 cm, 3.5 cm wide	269.1	Produced in 1970, Model No. R-1077
3	TR 3, L. II modern trash deposit	7-oz Miller High Life beer bottle	13.5 cm high, base diameter of 5.5 cm	132.5	Manufactured in 1981
4	TR 3, L. II modern trash deposit	clear glass bottle base fragment	4.1 x 7.4 cm, 4.5 high	74.2	Manufactured by Owens-Illinois Glass Company
5	TR 3, L. II modern trash deposit	brown glass bottle, white plastic screw-on safety cap	12.1 cm high, 4.8 cm diameter	126.6	Manufactured in 1977 by Owens-Illinois Glass Company
6	TR 3, L. II modern trash deposit	aluminum automobile hubcap	27.5 cm diameter, 3.0 cm thick	318.1	Standard on 1961–1962 Chevrolet Bel Air and Impala
7	TR 3, L. II modern trash deposit	small aluminum container	6.1 x 14.0 cm, 10.0 cm high	161.4	Cup over canteen base?
8	TR 3, L. II modern trash deposit	iron rail spike	spike = 1.3 cm^2, 13.2 cm long; head = 3.3 x 2.8 cm	102.5	Remnant of OR&L railroad?

4.3 Trench 3

Trench 3 is located at the south end of the parcel, between Trenches 2 and 4 (Figure 8). It measured 20.0 m long by 0.7 m wide, was excavated to a maximum depth of 1.9 m below surface, and had a bearing of 94 degrees. The trench contained five stratigraphic layers designated Layers I–V (Table 3). A profile was drawn of a section of the west end of the north wall (Figure 13). A sample of one historic and seven modern artifacts (Artifacts 2–8) was collected from Layer II (Figure 12).

Layer I extends from 0 to 10 cmbs and consists of humic material in a silty clay matrix. Layer II extends from 7 to 64 cmbs. The layer is a dark reddish brown (5YR 2.5/2) silty loam mixed with 40 percent gravel. Roughly 70 percent of the central and eastern segment of Layer II is composed of modern trash. The trash deposit does not form a pit or distinct feature but is simply mixed into the matrix.

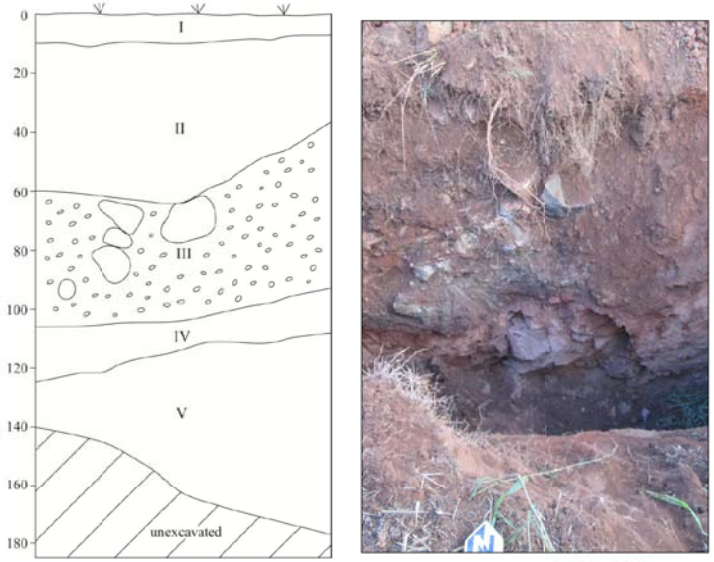

Figure 13. Profile of north wall of west end of Trench 3. Photograph to north. Profile scale in centimeters.

Layer III extends from 37 to 106 cmbs. It is a dark brown (7.5YR 3/2) silty clay mixed with 70 percent pebbles and cobbles and 20 percent of the Layer II sediment. Layer IV has a depth of 93 to 125 cmbs. The layer is composed of a compact clay with no roots or rocks. Layer V extends from 108 to 177 cmbs and is a compact sandy silt that turns powdery when touched.

Layer I is naturally deposited topsoil and humic material. Layer II is largely composed of a modern trash deposit (Figure 14). According to Mr. Gao, this area was filled with miscellaneous nearby material during Joseph P. Leong Highway construction because there was a 'big dip' in the terrain (Mr. Gao, personal communication, November 2014). Layer III is interpreted as a mixture of the old A-horizon and construction fill material. Layers IV and V are intact B and C-horizons.

Trench 3 produced no evidence of traditional Hawaiian cultural deposition. It is probable the single historic artifact (a railroad spike) encountered in the Layer II modern trash deposit had already been displaced before it was once again relocated to help level the depression in the landscape.

Figure 14. Overview of Trench 3 trash fill, facing west.

4.3.1 Artifacts 2 Through 8

Due to the sheer volume of modern refuse deposited in Trench 3, a sample assemblage representative of the material observed was collected. The assemblage consists of seven artifacts: a radio, two glass bottles, a glass bottle base, a hubcap, an aluminum container, and an iron spike (Table 4, Figure 12). In addition to the seven artifacts in the assemblage, trash observed included broken glass, black plastic sheeting, an iron pipe, a rusted bed frame, other pieces of various size metals, plastic bottles, broken plastic slippers, aluminum food cans, and cloth rags.

Artifact 2 is a portable, one-band, seven-transistor radio with a model number of R-1077. Manufactured by Panasonic Matsushita in Japan, the radio was produced in 1970. The R-1077 consists of five AM circuits and seven transistors (2SA102, 2SA101, 2SA101, 2SB171, 2SB175, 2SB176, and, 2SB176) (Leclercq 2014). The tuning range of the radio is AM 525 to 1605 kHz. The small radio housed a 5 cm permanent magnet loudspeaker (PDyn) and was powered by a 9-volt battery. The outer case was molded from modern plastics. The R-1077 measures 7.0 cm by 11.0 cm with a width of 3.5 cm. The radio weighs 269.1 g.

Artifact 3 is a small seven ounce Miller High Life beer bottle. This bottle was manufactured by an automatic bottling machine, as the vertical side seams run over the screw cap lip of the

bottle and an ejection scar is clearly visible on the base. Embossed at the 12 o'clock position on the bottle base is the "B in a circle" maker's mark. This manufacture's mark was used by the Brockway Glass Company, which was formed in 1907 and merged with Brockway Sales Company to form the Brockway Glass Company in 1933. Owens-Illinois, Inc., purchased Brockway Glass Company in 1988 to form Owens-Brockway Glass Containers, Inc. (Glass Bottle Marks 2014a). A year code is embossed at the 3 o'clock position of the bottle base, indicating the bottle was manufactured in 1981. The bottle measures 13.5 cm in height, has a base diameter of 5.5 cm, and weighs 132.5 g.

Artifact 4 is a clear glass bottle base fragment. The round shape of the base fragment is consistent with the shape and size of 375 ml distilled alcohol bottles. Embossed on the base is the "I in a O" maker's mark, indicating that the glass was manufactured by the Owens-Illinois Glass Company. The "I in a O" mark was the manufacture's second identification mark phased in during the early 1950s and is still in use today. The Owens-Illinois Glass Company began manufacturing glass bottles in 1929 after the merger of the Illinois Glass Company and the Owens Bottling Company (Glass Bottle Marks 2014b). There was no year code on the bottle fragment so the glass could not be precisely dated. The base fragment measures 7.4 cm by 4.1 cm with a height of 4.5 cm and weighs 74.2 g.

Artifact 5 is a small brown glass bottle with a white plastic screw-on safety cap. The size, shape, and safety cap of the bottle is consistent with over-counter liquid cold medication bottles. Like Artifact 4, embossed on the base is the "I in a O" maker's mark, indicating that the glass was manufactured by the Owens-Illinois Glass Company (Class Bottle Marks 2014b). The year code on the bottle base indicates that the glass was manufactured in 1977. The bottle measures 12.1 cm in height, has a diameter of 4.8 cm, and weighs 126.6 g.

Artifact 6 is an aluminum automobile hubcap. Automobile parts are excellent indicators of age since unique items, like hubcaps, are usually model specific and manufactured between a set number of years. This hubcap came standard on the 1961–1962 fourth generation Chevrolet Bel Air and the third generation Chevrolet Impala. The hubcap would have originally had a convex shape but has been crushed flat. The hubcap measures 27.5 cm in diameter, has a thickness of 3.0 cm, and weighs 318.1 g.

Artifact 7 is a small aluminum container. The size and shape of the container is consistent with the shape of the aluminum cup that would fit over the base of a canteen. The container measures 14.0 cm by 6.1 cm with a height of 10.0 cm and weighs 161.4 g.

Artifact 8 is an iron rail spike. The rail spike is a large nail with an offset head and a square cross section. The rail spike measures 1.3 cm x 1.3 cm with a height of 13.2 cm. The spike head measures 3.3 cm x 2.8 cm. The spike has a net weight of 102.5 g. Typically, rail spikes were utilized to secure the railroad track to the railroad tie. Railroad material in Hale'iwa is largely associated with the sugarcane industry and the transport of sugarcane to the Waialua sugar mill on the OR&L Railroad, which crossed the length of the project parcel. It is likely the spike is a remnant of this section of rail. As no other evidence of the railroad was encountered in the investigations, it is probable the spike had already been displaced before it was dumped into the low-lying area along with other garbage.

4.4 Trench 4

Trench 4 was placed on the lower terrain adjacent to the south side of the potential spoil pile (Figure 8). The trench measured 12.3 m long by 0.9 m wide, was excavated to a maximum depth of 2.0 m below surface, and had a bearing of 86 degrees. Trench 4 contained five stratigraphic layers designated Layers I–V (Figure 15, Table 3). A profile was drawn of a segment of the north wall in the center of Trench 4.

Layer I extends from surface to 10 cmbs and is composed of humic material in a loamy silt matrix. Layer II is from 9 to 88 cm deep. The layer is dusky red (2.5YR 3/2) silty clay with 30 percent pebbles. Layer III with a depth of 78 to 147 cmbs, is a dark reddish brown (2.5YR 3/3) compact clay with some degrading rock visible. Layer IV extends from 123 to 161 cmbs. It is a hard, compact clay. Its dark gray (7.5YR 4/1) color resembles that of a gleyed soil and may result from long-term water percolation. Layer V, extending from 144 to 201 cmbs, is the same reddish gray (5YR 5/2) sandy silt with decomposing bedrock encountered in the lowest levels of Trenches 2 and 3.

Layer I is naturally deposited topsoil and humic material. Layer II appears to be a mix of an A-horizon with fill material brought in for construction of the nearby Joseph P. Leong Highway. Layers III through V are intact soils with Layers II and III being various phases of the B-horizon and Layer V a C-horizon. The upper natural B-horizon appears to have been in the process of becoming gleyed due to water seepage from above.

Trench 4 unearthed no evidence of traditional Hawaiian or historic cultural deposits or features.

4.5 Trench 5

Trench 5 was located on the potential spoil pile, south of Trench 1 (Figure 8). The trench measured 12.0 m long by 0.8 m wide, was excavated to a maximum depth of 2.25 m below surface, and had a bearing of 102 degrees. Trench 5 trench contained five stratigraphic layers, designated Layers I–V (Figure 16, Table 3). A profile was drawn of a segment of the south wall of Trench 5's west end.

Layer I extends from the surface to 10 cmbs and consists of humic material in a loamy silt matrix. Layer II, descending from 9 to 37 cmbs, is a dark reddish brown (5YR 3/2) silty loam with 60 percent gravels. Layer III extends from 32 to 70 cmbs. It is a very dusky red (2.5YR 2.5/2) silty clay with 20 percent gravels. Layer IV is found from 64 to 179 cmbs and is a compact, dusky red (2.5YR 3/2) clay. Layer V, with a depth of 172 to 224 cmbs, is a dark gray (10YR 4/1) sandy silt mixed with 10 percent red clay and decomposing bedrock.

Layer I is naturally deposited topsoil and humic material. Layers II and III appear to be a mix of an A-horizon with fill material brought in for construction of the nearby Joseph P. Leong Highway. Layers IV and V are interpreted as intact soils with the upper layer being a B-horizon and the lower the C-horizon.

Trench 5 produced no evidence of traditional Hawaiian or historic cultural deposition.

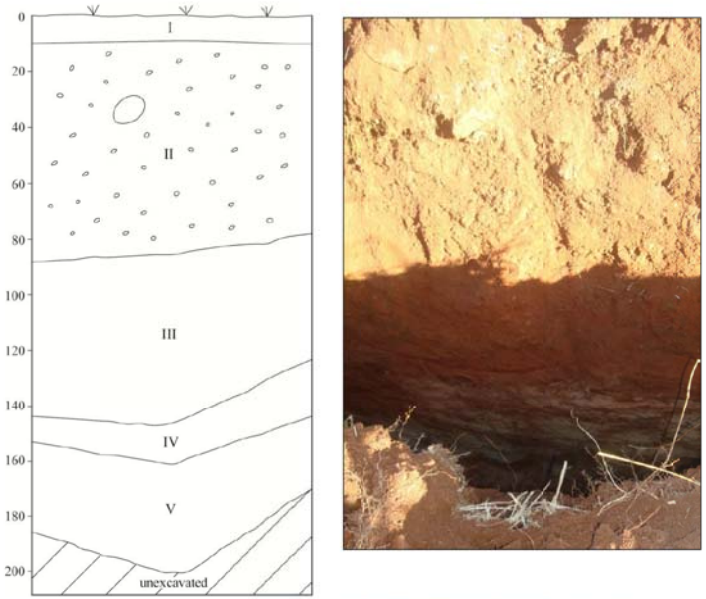

Figure 15. Profile of north wall in center of Trench 4. Photograph facing north. Profile scale in centimeters.

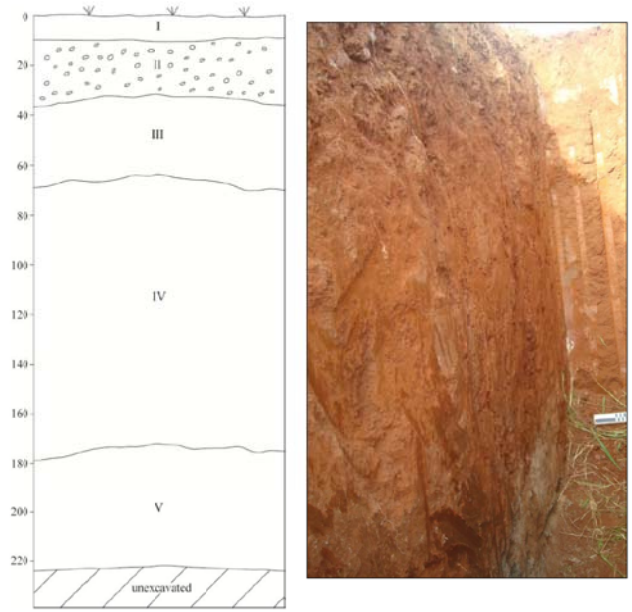

Figure 16. Profile of south wall at west end of Trench 5. Photograph facing west with profile in left foreground. Profile scale in centimeters.

4.6 Trench 6

Trench 6 was excavated on the west side of the parcel on the level land between the gravel road and the potential spoil pile (Figure 8). The trench measured 20.0 m long by 0.9 m wide, was excavated to a maximum depth of 1.9 m below surface, and had a bearing of 2 degrees. Trench 6 contained five stratigraphic layers, designated Layers I–V (Figure 17, Table 3). A profile was drawn of a portion of the center of the trench's east wall.

Layer I extends from the surface to 10 cmbs and is composed of humic material in a loamy silt matrix. Layer II, descending from 10 to 60 cmbs, consists of a very dusky red (2.5YR 2.5/2) clay with 20 percent gravels. Layer III is found from 51 to 130 cmbs. It is a compact, dark reddish brown (2.5YR 3/3) silty clay with some degrading bedrock at the lower boundary. Layer IV, from 120 to 150 cmbs, is a hard, compact, dark brown (7.5YR 3/2) clay.

Layer I is naturally deposited topsoil and humic material. Layer II appears to be sediment eroded down from the elevated topography to the east. This erosion likely occurred during highway construction as the fill material was placed on the potential spoil pile. Layers III through V are interpreted as intact soil horizons, with Layers III and IV being B-horizons and Layer V being the C-horizon.

Trench 6 produced no evidence of traditional Hawaiian or early historic cultural deposition.

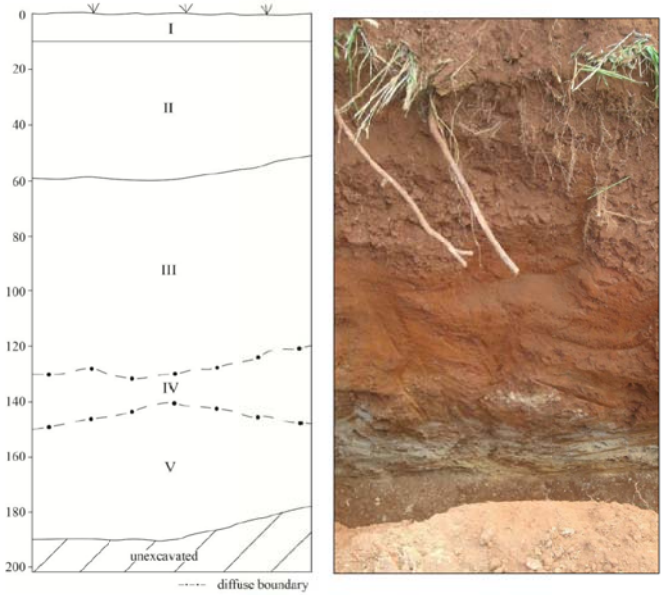

Figure 17. Profile of east wall in center of Trench 6 profile. Photograph to east. Profile scale in centimeters.

4.7 Discussion

No traditional or historic cultural deposits were encountered during mechanical excavation of 108.5 linear meters (194.5 m^3) of stratigraphic trenches. Testing reveals that the 1990s construction of the adjacent Joseph P. Leong Highway resulted in the deposition of an approximately 1.3 m thick spoil pile on top of the parcel as well as associated alluvial deposits. As these fill materials overlie the undisturbed B- and C-horizon soils, it appears that the landscape was graded or leveled to remove the A-horizon prior to construction activities. A local resident, Mr. Gao, confirmed this with a personal account of witnessing the change in topography during highway construction.

Prior to the highway construction, local residents indicate the parcel was planted in sugarcane. Except for possible evidence of long-term water saturation in the southern third of the parcel, there is no potential archaeological evidence for the land being cultivated. Two of the trenches (Trenches 2 and 4) contain an upper intact B-horizon in a color slightly resembling gleyed soil. It is just as likely these deposits result from natural processes of water retention followed by percolation than from historic cultivation. Without an intact A-horizon or other corroborating evidence, these intact basal soils cannot be interpreted as identifying historic period agriculture.

There is no evidence of the OR&L Railroad (SIHP 50-80-04-5791) that once crossed diagonally through the project parcel. An 80 m long segment of Cane Haul Road (SIHP 50-80-04-7604) defines the width of the southern extent of the parcel. This segment is currently a two-lane paved road used for vehicular traffic.

Eight historic or modern artifacts were collected from two trenches. No traditional Hawaiian artifacts were observed. The artifact assemblage includes a modern trash dump just under the thin layer of alluvium in Trench 3 and one isolated cow bone recovered in the construction fill material of Trench 2. The representative sample of seven artifacts analyzed from the Trench 3 trash dump range in date from the 1960s to the early 1980s, indicating it was placed there during and after highway construction. The only historic artifact documented in the dump was a railroad spike, likely associated with the OR&L Railroad. The spike was probably secondarily deposited after being discarded elsewhere. The cow bone is a butchered rib with a cut so fine that butchering likely occurred at a processing facility with a bone saw.

5.0 Historic Property Description

An 80 m paved segment of Cane Haul Road (SIHP 50-80-04-7604) transects the width of the southern base of the project area (Figures 1, 7, 8, and 11). The 9.4 km (5.8 mi) long road extends from Kawailoa Road in the north to just beyond Kahui Street in the south. McElroy and Duhaylonsod (2014:39) identified the site as first showing up on a 1956 map.

Rechtman et al. (2011:20) note that portions of Cane Haul Road were built over the old Waialua Sugar Company railroad.

> The road was built by the Waialua Sugar Company to load the trucks and drive back to the sugar mill in Waialua (Nellis, pers. comm. 2014). Prior to

> delivering sugar in trucks, they were using railroad, mules and carts. In order for the trucks to get through, a series of roads were created to all lead back to the sugar mill. There were roads that were permanent year round thoroughfares that were weather-proofed, and there were also some less traveled roads that became overgrown.
>
> Cane Haul Road was one of those that was permanent year round. The road was built only for sugarcane harvesting, not for real estate development, and was never intended for use by residents of the area (Nellis, pers. comm. 2014). [McElroy and Duhaylonsod 2014:54]

The segment of Cane Haul Road within the project area is currently a paved two-lane road used by commercial and private vehicles. Although a gate currently blocks the road's south end, by Hale'iwa town, delivery trucks were noted using the road during fieldwork. Large boulders removed from previous excavations, likely of the adjacent Joseph P. Leong Highway that traverses across the top of Cane Haul Road, line the road's south edge (Figure 11). No artifacts were found associated with the road.

6.0 Significance and Recommendations

Archaeological test excavations were conducted in a 7.5 acre parcel (TMK (1) 6-2-005:002) in Hale'iwa on 10 and 11 November 2014 in preparation for development of a mixed-use residential and retail project by Basin Project Incorporated. Due to currently changing zoning requirements, there are as yet no project details or construction plans. As Cane Haul Road is a substantial thoroughfare, the paved road will remain in its current state, used to access the parcel by construction personnel and future residents, and not be moved or impacted by construction.

Disturbed by construction of the adjacent Joseph P. Leong Highway in the 1990s, there are no structures or artifacts on the surface of TMK (1) 6-2-005:002. A single re-deposited historic artifact, an OR&L Railroad iron spike, and a paved portion of the previously recorded Cane Haul Road (SIHP 50-80-04-7604), were the only historic resources encountered in the parcel.

Disturbed by construction of the adjacent Joseph P. Leong Highway in the 1990s, all six of the backhoe trenches display topsoil and alluvium capping mixed construction fill overlying intact B- and C-horizons. No buried A-horizons were identified in the parcel. The slightly grey color of the top of intact B-horizons in two trenches (Nos. 2 and 4) resemble that of gleyed soil. This likely results from water retention and percolation. Without an intact A-horizon or other corroborating evidence, these intact basal soils cannot be interpreted as identifying historic period agriculture, as they could have just as likely formed through natural processes.

A trash dump, containing artifacts dated to the 1960s to at least the early 1980s and a re-deposited railroad spike, was encountered in Trench 3.

Other than the railroad spike in the Trench 3 trash dump, no signs of the OR&L Railroad (SIHP 50-80-04-5791) that once crossed diagonally through the project parcel remain. An 80 m long segment of the previously recorded Cane Haul Road (SIHP 50-80-04-7604) defines the width of the southern extent of the parcel. This segment is currently a two-lane paved road used for vehicular traffic.

6.1 Significance

An 80 m portion of a single historic property, Cane Haul Road (SIHP 50-80-04-7604), was identified on the project parcel. The road is evaluated as significant under Criterion D, as further study may yield more information on the road (McElroy and Duhaylonsod 2014:55–56).

> The road is related to Waialua Sugar Company pursuits, and future research might reveal details of sugar-era activity in Kawailoa. The event of sugarcane cultivation made a significant contribution to the history of Hawai'i, thus the road may also be significant under Criterion A, for its association with Hawai'i's sugar era. [McElroy and Duhaylonsod 2014:55–56]

Within the project area, the site has been paved and is currently in use by vehicular traffic.

6.2 Recommendations

The location of Cane Haul Road (SIHP 50-80-04-7604) has been documented on topographic maps since at least 1956. There is no further reasonable and adequate information that can be collected about the 80 m length of the road that defines the southern base of the project area. The proposed undertaking will have no effect on Cane Haul Road as it is planned to be kept intact and to continue to be used as a thoroughfare. No further work is recommended for the site.

Archaeological test excavations indicate that the entire project area has been extensively covered with construction fill and alluvium during and after construction of the Joseph P. Leong Highway in the 1990s. The sugarcane field deposits that local informants report once capped the parcel were removed by grading or leveling prior to the deposition of the construction fill as the only remaining intact soils are the B- and C-horizons. Hence, development of this parcel is very unlikely to affect historic properties. As the project area has a low probability for containing archaeological deposits, no further work is recommended.

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Appendix D: Biological Survey

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5 December 2014

Jonathan Grobe
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808.366.5587
jongrobe@gmail.com

RE: Biological Survey and Assessment for Parcel TMK: (1) 6-2-005:002, Hale'iwa, O'ahu Island, Hawai'i

Dear Mr. Grobe,

This letter report summarizes the results of a biological reconnaissance survey and assessment for plants and wildlife that are listed under the Endangered Species Act (50 CFR 17.11 and 50 CFR 17.12), the Migratory Bird Treaty Act (50 CFR 10.13), and the state listed threatened or endangered wildlife (Exhibit 2 and 3, HAR 13-124) for potential impact of a proposed development. The main objective of the investigation is to document the natural resources present on the project area in order to evaluate the potential impact that may be caused by the proposed project.

The project parcel (TMK: (1) 1-6-2-005:002) is located in Hale'iwa, north O'ahu. The 7.4 acre parcel is bordered by the Joseph P. Leong Highway to the east and Hale'iwa's main business district to the west. A short section of Opae'ula Road defines the parcel's north end, with Cane Haul Road at the south end, and an unnamed, and blocked off, paved road along the west side. The gentle westerly sloping parcel has an elevation of from 20 to 50 feet above mean sea level. The majority of the project area is overgrown by Guinea grass (*Megathyrsus maximus*) and *koa haole* (*Leucena leucocephala*) scrubs (Figures 1 and 2).

The biological reconnaissance survey was conducted on October 21, 2014 and consisted of a pedestrian survey for botanical and terrestrial animal resources and a point count survey for avian resources. The following describes survey methodology and findings for each major taxonomic group.

Flora

The botanical survey involved identifying the plant community and compiling a checklist of vascular plants that occur in the project area. The botanical survey was performed by walking 35 transects spaced at 15 meters to provide 100 percent visual coverage of the project area (Figure 1).

No listed threatened or endangered plants are present. The botanical survey identified 52 species of vascular plants in 22 families (Attachment A). The habitat is highly degraded with a single individual of a native plant species remaining. Two plant communities occur in the project area: Koa Haole Shrubland and roadside vegetation.

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The majority of the project area can be classified as early stage succession *Koa Haole Shrubland* (Figure 2). This coastal dry shrubland community occurs throughout the coastal area of the main Hawaiian Islands, especially on abandoned ranch lands (Gagne and Cuddihy 1999). *Koa haole* on the project area are young, the majority being less than five feet tall and less than one inch in diameter at breast height (DBH), indicating re-vegetation following recent disturbance. Currently Guinea grass is the most dominant species in area of coverage. Stems of dead Christmas candlestick (*Leonotis nepetifolia*) are patchily distributed throughout the project area. Other species found include perennial soybean (*Neonotonia wightii*) and several small trees (*Melia azedarach* and *Spathodea campanulata*). This plant community has very low species richness (no=9); none of which are native to the Hawaiian Islands (see Attachment A).

The remaining vegetation is found in roadside areas that support a wide variety of grass, herbs, vines, and scrubs (Figure 3). Commonly observed species include *koa haole*, hairy beggarticks (*Bidens pilosa*), pillpod sandmat (*Euphorbia hirta*), obscure morning-glory (*Ipomoea obscura*), hyssopleaf sandmat (*Euphorbia hyssopifolia*), perennial soybean, three-lobe false mallow (*Malvastrum coromandelianum*), bracted fanpetals (*Sida ciliaris*), and swollen fingergrass (*Chloris barbata*). Some of the ornamentals or food plants encountered were either cultivated or escaped from the gardens of neighboring residences. These include African milk tree (*Euphorbia trigona*), mango (*Mangifera indica*), and macadamia nut (*Macadamia integrifolia*). Despite relatively high species richness, the roadside vegetation predominantly consists of naturalized species. Among the 48 species observed, only one individual, *'ilima pua kea* (*Abutilon incanum*), is indigenous (Attachment A).

Fauna

The terrestrial wildlife survey documented all terrestrial animals observed in the transects and identified them to the lowest taxa possible.

Mollusks: The Giant African snail (*Achatina fulica*) and Asian trampsnail (*Bradybaena similaris*) are very common in the project area. The project area does not provide a suitable habitat for any listed threatened or endangered land snails, which are generally restricted to high elevation native mesic and wet forests.

Arthropods: One spider and ten insects were identified in the project area. Only two dragonflies, globe skimmer (*Pantala flavescens*) and the common green darner (*Anax junius*), are native to the Hawaiian Islands. Although the coastal dry environment can potentially support the federally listed endangered Blackburn's sphinx moth (*Manduca blackburni*), the species is currently extirpated on O'ahu. Several listed yellow-faced bees (*Hylaeus* spp.) can be found in coastal areas but the project area does not provide their preferred native plant community habitat.

Reptiles: Brown anoles (*Anolis sagrei*) were occasionally observed along the roadside but not observed in the *koa haole* shrubland community. The project area does not provide the habitat for any ESA listed reptiles of Hawai'i (i.e., sea turtles).

Mammals: No mammals were observed during the pedestrian survey; however, two small mammal burrows were found. Judging from the size of the entrance, the burrows are likely of mice or rats. Although the federally listed *'ōpe'ape'a* (Hawaiian hoary bat, *Lasiurus cinereus semotus*) has been recorded in the region, the project area does not have ≥15 feet tall trees that provide a bat roosting habitat. The project is unlikely to adversely affect Hawaiian hoary bats.

Birds: Avian resources in the project area were surveyed using timed point counts from three stations using visual as well as audio detection. Time point counts were performed in the early morning, during a period of high bird activity. The point count stations were at the north, center, and south of the project area and each provided a radius of a 100 m of visual coverage (Figure 1). Weather conditions were cloudy, with about 50 percent cloud cover and no rain. The temperature ranged from 24.6°C at 7:13 a.m. to 28.2°C at 8:04 a.m. A light wind from the south-southeast averaged 0–1.5 miles per hour.

During the three eight-minute counts, 39 birds from six species were detected. Birds observed include 15 Japanese white-eye (*Zosterops japonicus*), rine zebra dove (*Geopelia striata*), five spotted dove (*Spilopelia chinensis*), five common waxbill (*Estrilda astrild*), three red-vented bulbul (*Pycnonotus cafer*), and two common myna (*Acridotheres tristis*). The vast majority (85%) of the birds detected were flying over the project area. Additional birds observed between counts and during the transect survey include the cattle egret (*Bubulcus ibis*), rock dove (*Columba livia*), and red-whiskered bulbul (*Pycnonotus jocosus*). All these birds are introduced species commonly found near urban environments.

The project area does not provide suitable habitat for Hawai'i's ESA listed avian species, which are either forest birds limited to high elevation native forests or water birds that require open water or a wetland environment.

The *pueo* (Hawaiian short-eared owl, *Asio flammeus sandwichensis*) is listed as endangered on O'ahu and protected under the Migratory Bird Treaty Act. It can potentially use the project area for foraging or nesting. However, the owls are extremely rare on O'ahu with none detected from 1974 to 2009 during the annual Christmas count (Pyle and Pyle 2009). As other subspecies of short-eared owls, *pueo* nest on the ground usually under low vegetation. The tall and dense Guinea grass in the project area does not provide this preferable nesting habitat. Construction activities may temporarily disturb the owl, but are unlikely to cause lasting impact to *pueo*.

Migratory birds such as the Pacific golden plover (*Pluvialis fulva*) and ruddy turnstone (*Arenaria interpres*) may temporarily use the project area for foraging or resting. As these species do not nest in Hawai'i, they are unlikely to be harmed by construction activities.

Recommendation

The biological reconnaissance indicated that the project area's habitat is highly degraded and in its current state provides little value for listed species. However, project activities have the potential to adversely affect natural resources residing in adjacent areas.

Although the project area does not provide any deepwater or wetland habitats, it is close to several wetland areas, including Hale'iwa Marsh (0.1 miles), Loko Ea Pond (0.3 miles), 'Uko'a Marsh (0.5 miles), and Hale'iwa Lotus and Taro Fields/Waialua Lotus Fields (1.2 miles). These wetlands support a number of endangered waterbirds including *ae'o* or Hawaiian stilt (*Himantopus mexicanus knudseni*), *'alae kea* or Hawaiian coot (*Fulica alai*), *'alae 'ula* or Hawaiian moorhen (*Gallinula galeata sandvicensis*), and *koloa* or Hawaiian duck (*Anas wyviliana*). 'Uko'a Marsh and Hale'iwa Lotus and Taro Fields/Waialua Lotus Fields were identified as supporting wetlands important to the protection and management of recovering these endangered Hawaiian waterbirds (USFWS 2011). Construction activities have the potential to impact the water quality of the nearby Hale'iwa Marsh and coastal waters. Best management practices should be implemented to minimize risk of siltation and pollution through stormwater runoff.

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Outdoor lighting associated with the project has the potential to disorient seabirds and cause fallout due to collision or exhaustion. To minimize this risk, all outdoor lightings associated with this project should be shielded from reaching the sky especially during peak fallout season between September 15 and December 15.

Sincerely,

Huang-Chi Kuo, Ph.D.
Garcia and Associates

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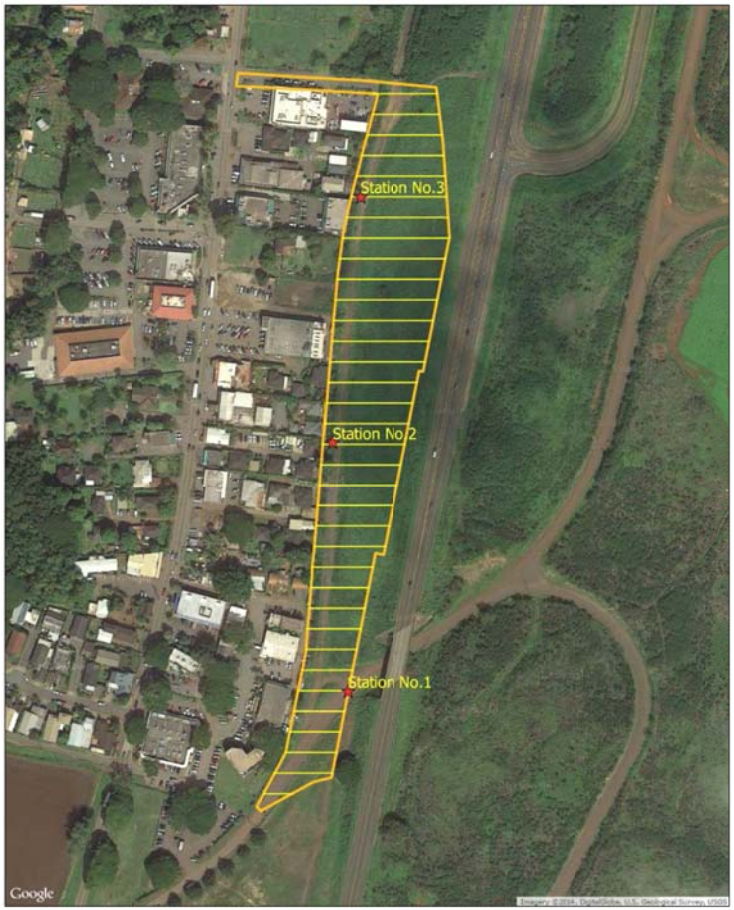

Figure 1. Project area showing survey transects as yellow lines and point count stations in red asterisks.

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Figure 2. Koa Haole Shrubland currently dominated by Guinea grass. Dead stems of Christmas candlestick in the right foreground. Facing south.

Figure 3. Roadside vegetation. Facing north.

Attachment A: Checklist of Vascular Plants Observed in the Project Area

Family	Scientific name	Common Name	Nativity	Koa Haole Shrubland	Roadside
Dicotyledons					
Acanthaceae	*Thunbergia grandiflora* Roxb.	Bengal trumpet	naturalized	*	rare
Aizoaceae	*Trianthema portulacastrum* L.	desert horsepurslane	naturalized		uncommon
Amaranthaceae	*Amaranthus blitum* L.	purple amaranth	naturalized		uncommon
Anacardiaceae	*Mangifera indica* L.	mango	cultivated		rare
Asteraceae	*Bidens pilosa* L.	hairy beggarticks	naturalized		common
Asteraceae	*Conyza canadensis* (L.) Cronquist	Canadian horseweed	naturalized		rare
Asteraceae	*Pluchea carolinensis* (Jacq.) G. Don	cure for all	naturalized		rare
Asteraceae	*Tridax procumbens* L.	coat buttons	naturalized		uncommon
Asteraceae	*Verbesina encelioides* (Cav.) Benth. & Hook. f. ex A. Gray	golden crownbeard	naturalized		common
Bignoniaceae	*Spathodea campanulata* P. Beauv.	African tulip tree	naturalized	rare	
Boraginaceae	*Heliotropium procumbens* Mill.	four-spike heliotrope	naturalized		uncommon
Brassicaceae	*Lepidium virginicum* L.	Virginia pepperweed	naturalized		uncommon
Cactaceae	*Hylocereus undatus* (Haw.) Britton & Rose	night-blooming cactus	naturalized		uncommon
Cactaceae	*Opuntia ficus-indica* (L.) Mill.	barbary fig	naturalized		rare
Convolvulaceae	*Ipomoea cairica* (L.) Sweet	mile a minute vine	naturalized		uncommon
Convolvulaceae	*Ipomoea obscura* (L.) Ker Gawl.	obscure morning-glory	naturalized		common
Cucurbitaceae	*Momordica charantia* L.	Balsam pear	naturalized	rare	uncommon
Euphorbiaceae	*Euphorbia hirta* L.	pillpod sandmat	naturalized		abundant
Euphorbiaceae	*Euphorbia hyssopifolia* L.	hyssopleaf sandmat	naturalized		common
Euphorbiaceae	*Euphorbia prostrata* Aiton	prostrate sandmat	naturalized		uncommon
Euphorbiaceae	*Euphorbia trigona* Mill.	African milk tree	cultivated		rare
Euphorbiaceae	*Ricinus communis* L.	castor bean	naturalized		uncommon
Fabaceae	*Desmanthus pernambucanus* (L.) Thell.	pigeon bundleflower	naturalized		common
Fabaceae	*Indigofera spicata* Forssk.	trailing indigo	naturalized		uncommon
Fabaceae	*Indigofera suffruticosa* Mill.	anil indigo			uncommon
Fabaceae	*Leucaena leucocephala* (Lam.) de Wit	koa haole	naturalized	abundant	common
Fabaceae	*Macroptilium atropurpureum* (Moc. & Sessé ex DC.) Urb.	purple bushbean	naturalized	rare	
Fabaceae	*Neonotonia wightii* (Wight & Arn.)	perennial soybean	naturalized	abundant	abundant
Fabaceae	*Pithecellobium dulce* (Roxb.) Benth.	Manila tamarind	naturalized	rare	
Lamiaceae	*Hyptis pectinata* (L.) Poit.	comb bushmint	naturalized		uncommon

Attachment A (continued)

Family	Scientific name	Common Name	Nativity	Koa Haole Shrubland	Roadside
Lamiaceae	*Leonotis nepetifolia* (L.) R. Br.	Christmas candlestick	naturalized	abundant	uncommon
Malvaceae	*Abelmoschus manihot* (L.) Medik.	edible hibiscus	cultivated		rare
Malvaceae	*Abutilon grandifolium* (Willd.) Sweet	hairy Indian mallow	naturalized		common
Malvaceae	*Abutilon incanum* (Link) Sweet	*'ilima pua kea*	indigenous		rare
Malvaceae	*Malvastrum coromandelianum* (L.) Garcke	three-lobe false mallow	naturalized		abundant
Malvaceae	*Sida ciliaris* L.	bracted fanpetals	naturalized		abundant
Malvaceae	*Sida spinosa* L.	prickly fanpetals	naturalized		common
Malvaceae	*Sidastrum micranthum* (St. Hil.) Fryxell	dainty sandmallow	naturalized		uncommon
Meliaceae	*Melia azedarach* L.	China-berry tree	naturalized	uncommon	uncommon
Nyctaginaceae	*Boerhavia coccinea* Mill.	scarlet spiderling	naturalized		common
Portulacaceae	*Portulaca oleracea* L.	little hogweed	naturalized		uncommon
Portulacaceae	*Portulaca pilosa* L.	kiss me quick	naturalized		common
Portulacaceae	*Talinum paniculatum* (Jacq.) Gaertn.	jewels of Opar	naturalized		rare
Proteaceae	*Macadamia integrifolia* Maiden & Betche	macadamia nut	cultivated		rare
Rubiaceae	*Morinda citrifolia* L.	noni	Polynesian introduction		rare
Monocotyledons					
Liliaceae	*Sansevieria trifasciata* hort. ex Prain	vipers bowstring hemp	cultivated		rare
Poaceae	*Chloris barbata* Sw.	swollen fingergrass	naturalized		abundant
Poaceae	*Chloris divaricata* R. Br.	stargrass	naturalized		uncommon
Poaceae	*Cynodon dactylon* (L.) Pers.	Bermuda grass	naturalized		common
Poaceae	*Eleusine indica* (L.) Gaertn.	Indian goosegrass	naturalized		common
Poaceae	*Eragrostis pectinacea* (Michx.) Nees ex Steud	tufted lovegrass	naturalized		common
Poaceae	*Megathyrsus maximus* (Jacq.) B.K. Simon & S.W.L. Jacobs	Guinea grass	naturalized	dominant	abundant

*blank: not observed; dominant: >25% area of coverage; abundant: > 100 individuals per 100m transect surveyed but not dominant; common: 5-100 individuals per 100m transect surveyed; uncommon: 1-4 individuals per 100m transect surveyed ; rare: <1 individual per 100m transect surveyed.

GANDA

GARCIA AND ASSOCIATES — PACIFIC REGION

HAWAI'I: 146 HEKILI STREET, SUITE 101, KAILUA, HAWAI'I 96734 PHONE 808.262.1387 FAX 808.262.1384
GUAM: GARDEN VILLA H302, 800 PALE SAN VITORES ROAD, TUMON, GUAM 96913 PHONE 671.488.2005 FAX 671.647.0870

Attachment B: Checklist of Animals Observed in the Project Area

Scientific Name	Common Name	Family/Order	Nativity	Frequency*
Birds				
Bubulcus ibis	cattle egret	Ardeidae/Ciconiiformes	naturalized	rare
Columba livia	rock dove	Columbidae/Columbiformes	naturalized	uncommon
Geopelia striata	zebra dove	Columbidae/Columbiformes	naturalized	common
Spilopelia chinensis	spotted dove	Columbidae/Columbiformes	naturalized	common
Estrilda astrild	common waxbill	Estrildidae/Passeriformes	naturalized	uncommon
Pycnonotus jocosus	red-whiskered bulbul	Pycnonotidae/Passeriformes	naturalized	uncommon
Pycnonotus cafer	red-vented bulbul	Pycnonotidae/Passeriformes	naturalized	common
Acridotheres tristis	common myna	Sturnidae/Passeriformes	naturalized	common
Zosterops japonicus	Japanese white-eye	Zosteropidae/Passeriformes	naturalized	common
Reptile				
Anolis sagrei	brown anole	Polychrotidae/Squamata	naturalized	uncommon
Arthropods				
Argiope appensa	garden spider	Araneidae/Araneae	naturalized	uncommon
Apis mellifera	western honey bee	Apidae/Hymenoptera	naturalized	common
Xylocopa sonorina	Sonoran carpenter bee	Apidae/Hymenoptera	naturalized	common
Anoplolepis gracilipes	yellow crazy ant	Formicidae/Hymenoptera	naturalized	common
Macaria abydata	koa haole moth	Geometridae /Lepidoptera	naturalized	uncommon
Agraulis vanillae	passion butterfly	Nymphalidae/Lepidoptera	naturalized	rare
Zizina otis	less grass blue	Lycaenidae/Lepidoptera	naturalized	uncommon
Phoebis agarithe	large orange sulphur	Pieridae/Lepidoptera	naturalized	rare
Anax junius	green darner	Aeshnidae/Odonata	indigenous	rare
Pantala flavescens	globe skimmer	Libellulidae/Odonata	indigenous	common
Schistocerca nitens	vagrant grasshopper	Acrididae/Orthoptera	naturalized	abundant
Molluscs				
Achatina fulica	giant African snail	Achatinicae/Achatinoidea	naturalized	common
Bradybaena similaris	Asian trampsnail	Bradybaenidae/Helicoidea	naturalized	common

* abundant: > 100 individuals per 100m transect surveyed; common: 5-100 individuals per 100m transect surveyed; uncommon: 1-4 individuals per 100m transect surveyed; rare: <1 individuals per 100m transect surveyed.

Appendix E: Water and Drainage Report

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WATER DISTRIBUTION & DRAINAGE REPORT

for

Hale'iwa Mixed Use Parcel

TMK: (1) 6-2-005:002

Submitted to

Jared K. Chang
Deputy Planning Manager
SSFM International

Submitted By

SSFM INTERNATIONAL, INC.
Project Managers, Planners, & Engineers

501 Sumner Street, Suite 620
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June 2015

SSFM INTERNATIONAL, INC.
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Project Managers, Planners, & Engineers
American Council of Engineering Companies, Member

Statement of SSFM International, Inc.'s Quality Process

It is the policy of SSFM to have a consistent and systematic approach to the development and review of its reports and other project deliverables.

All projects and products of our service are subject to a quality process and in no case will the quality review be eliminated. The main purpose of this process is to assure:

- Clarity, completeness, coordination, and accuracy of documents.
- That the project, study or investigation meets the Client's objectives.
- That the requirements of our Agreement with the Client have been met, and the Client has received the value of the fee to be paid.

The Preparation of This Report Was The Responsibility Of and Completed By:

Signature Lance K. Tokuda — June 5, 2015 (date)

The Quality Review of This Report Was The Responsibility Of and Completed By:

Signature Robin Barnes — June 5, 2015 (date)

SSFM INTERNATIONAL

I. General

The existing 7.5-acre parcel TMK (1) 6-2-005:002 (project site) is undeveloped land zoned for agriculture (AG-1) and is bounded by the State of Hawaii Depart of Transportation (DOT) Route 83, Joseph P Leong Highway (aka. Haleiwa by pass road) on the east perimeter, and a combination of mixed use (parking/shops/restaurant/service) and individual private residences on the south perimeter. The parcel includes an access easement at the north end, and existing cane haul road at the south end. The purpose of this report is to summarize both existing pre-developed and proposed developed conditions for potable water distribution and storm water drainage utilities.

II. Pre-Developed Condition

Drainage: The drainage criteria presented in this report is consistent with the "Rules Relating to Storm Drainage Standards," Department of Planning and Permitting, City and County of Honolulu, dated January 2000. Since the drainage area within the proposed development is less than 100 acres, the recurrence interval of 10 years was selected as the design basis for the storm water management plan. Consistent with the City and County of Horolulu standards, the storm drainage system will be designed to capture and detain the 10-year storm increased runoff from impervious surfaces to ensure that there are no detrimental impacts on the downstream areas.

Figure 1 presents the project location with the U.S. Geological Survey map. The 7.5-acre project site is bounded by the 'Anahulu River at the north and Paukauila Stream at the south. The project drainage basins are located within the Paukauila watershed, where the Paukauila Stream ultimately drains into Kaiaka Bay. Kaiaka Bay is located about 5,730 feet southwest from the project site.

According to the City and County's geographic information maps (HoLIS) and the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM), the parcel is within Zone X, having a 0.2% annual chance for flooding during a 500-year storm event, which is outside of the Zone AE floodplain, having a 0.1% annual chance of flooding during a 100-year storm event. There are AE flood zones located at the north and south. A flood elevation of 10 feet at the Route 83 Anahulu Stream bridge is located about 0.2 miles due north from the project site; and a flood elevation of 14-feet at Paukuila Stream bridge at Kamehameha Highway is located about 0.4 miles due south.

SSFM INTERNATIONAL

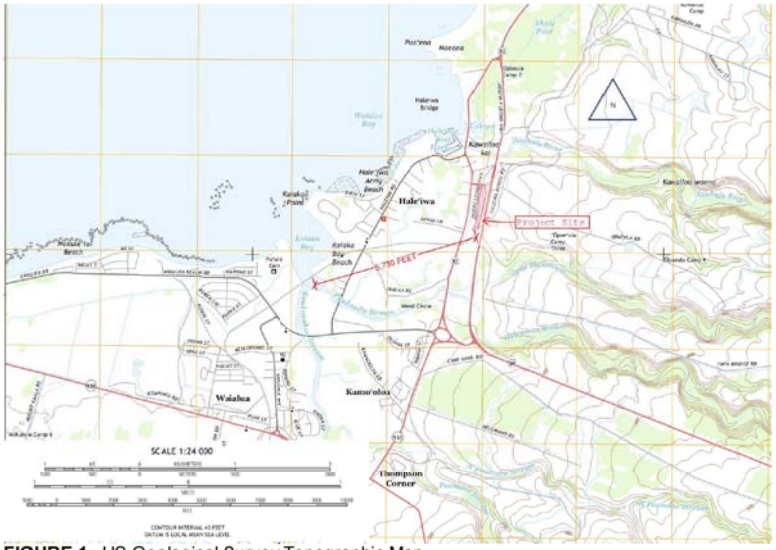


FIGURE 1. US Geological Survey Topographic Map

Figure 2 illustrates the existing terrain and 7.5-acre project site subdivided into four parallel drainage basins, Basin "A" (north) through Basin "D" (south). The terrain is generally sloped from the east down to the west, with elevations varying at 22 to 35 feet. The off-site storm water runoff at the east perimeter is intercepted at the Route 83 embankment and flows within a grassed swale around the east perimeter. On-site storm water runoff exits the project site along the south, west and north perimeters, either as sheet flow or shallow concentrated flow.

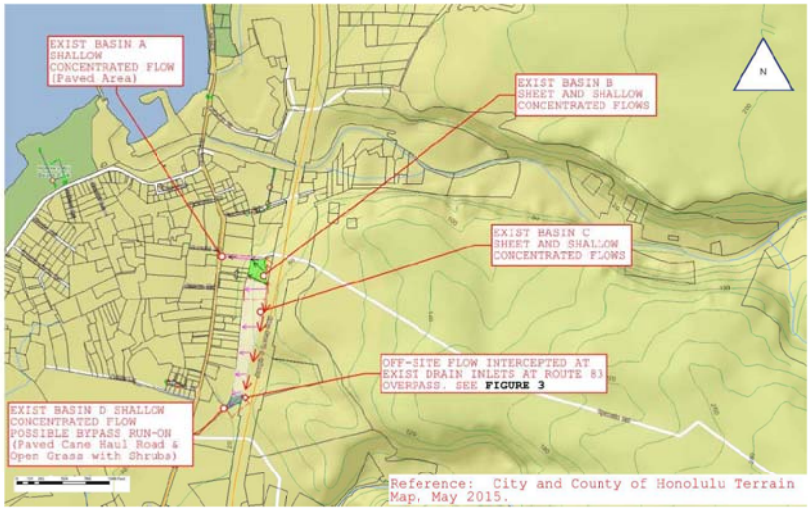


FIGURE 2. Existing Terrain and Project Drainage Basins

The off-site storm water runoff at the east perimeter is intercepted by the embankment of the Joseph P Leong Highway and a grassed swale at the toe of the embankment. At the south perimeter, there are existing DOT underground storm water drain lines and inlets to intercept runoff flowing under the Cane Haul Road "A" underpass.

Figure 3 is the DOT record drawing illustrating the existing drain layout within the State right-of-way and adjacent to the project area. A drainage outfall is located along the bank of the Paukauila Stream Bridge located further south from Drainage Basin D. Paukauila Stream discharges into Kaiaka Bay (see **Figure 1**).

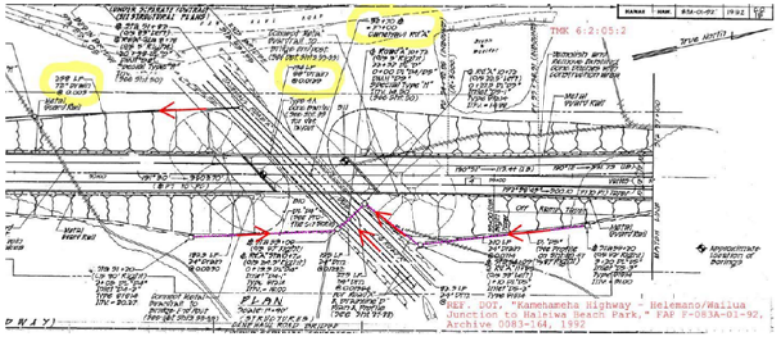


FIGURE 3. Existing Storm Drain Located at South End of Project Site

The existing peak flow storm water runoff analysis is based upon the City and County's "Rules Relating to Storm Drainage Standards (January 2000)" for the design 10-year, one-hour duration storm of about 2.57 inches. The total peak discharge distributed along the perimeter is about 10.8 cubic feet per second (cfs) using the Rational Method. Flow lengths are typically 230 feet in the east to west direction.

The estimated runoff volume of about 122,000 cubic feet (909,000 gallons) was determined by the Curve Runoff Method using the US Department of Agriculture Natural Resources Conservation Service (NRCS) TR-20/TR-55 computer program and latest 24-hour duration rainfall depths and 10-year frequency available through the National Oceanic and Atmospheric Administration.

As required by the storm drainage rules, the existing/predevelopment condition storm water peak flow and the estimated runoff volume are to be compared to the proposed/post developed condition. The City and County generally requires that the proposed storm water discharge rates and volumes be limited to predevelopment conditions, unless it can be shown that the increased runoff can be safely conveyed through existing or planned conveyances, and without adverse impacts further downstream to the open coastal waters. Detailed calculations are provided in the **Appendix "A."**

Soils: A majority of the existing ground cover consists mostly of vegetation, shrubs and a gravel access road (located along the west perimeter). The exceptions are Basin "A" AC paved driveway and a portion of Basin "D" Cane Haul Road. According to the NRCS, the existing soil is classified as Ewa silty clay loam (EmA) and Kawaihapai clay loam (KIB). The clay loam soils are ideal for supporting vegetation and retaining moisture. A copy of the soils map is shown in **Figure 4**.

A geotechnical investigation including percolation testing at the 5-foot depth is recommended prior to the design phase for this project. The percolation data will be used to refine the drainage analysis and sizing of infiltration basins for the developed condition.

FIGURE 4. Natural Resources Conservation Service Soils Map

Water: The City and County of Honolulu Board of Water Supply (BWS) 8-inch-diameter water distribution mains are located along Kamehameha Highway, roughly 320-feet west of the project site. According to the Route 83 record plans, there are no existing water service connections, irrigation lines and water supply wells at the project site. The Board of Water Supply has provided pressure and flow data for three existing fire hydrants within a 600-foot radius of the project site. As shown in **Figure 5**, these hydrants are located on Emerson Road (north) and Kamehameha Highway (west).

In general, static water pressure is about 90 pounds per square inch (psi), and the residual water pressure varies from 56 to 72 psi when flowing at about 2,000 gallons per minute. The Board of Water Supply has indicated that the existing water system is adequate to accommodate the proposed Parcel Zone Change. The final decision on water availability from BWS is to be confirmed when the building permit application is submitted for approvals by the City and County of Honolulu Department of Planning and Permitting and BWS.

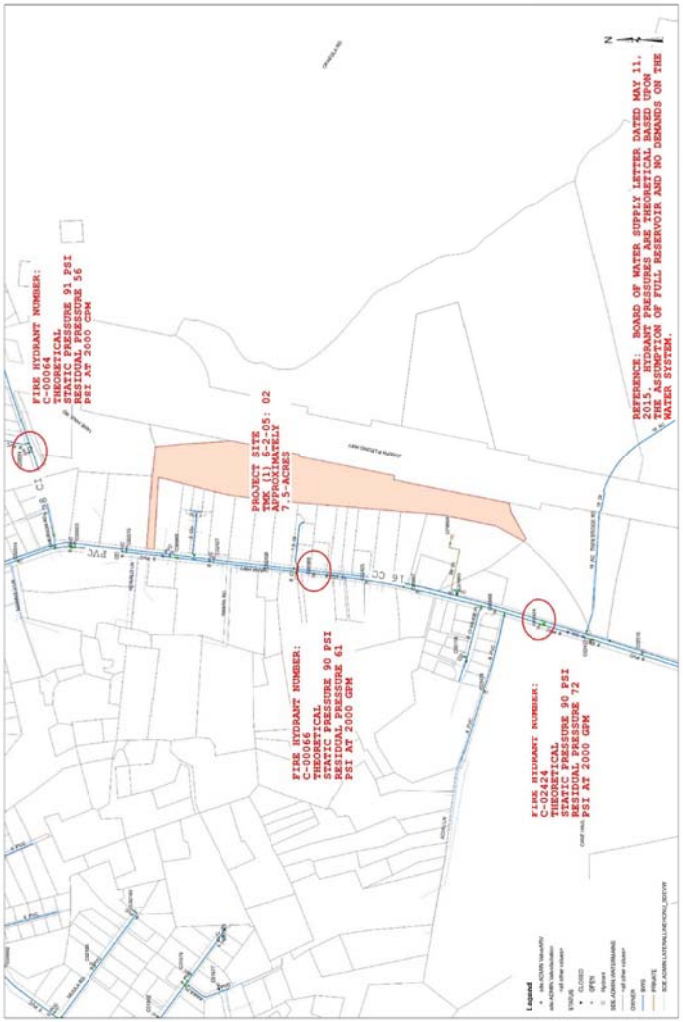


FIGURE 5. Honolulu Board of Water Supply Distribution Map and Fire Hydrant Data

III. Post Developed Conditions

Drainage: The mixed-use project will develop the existing 7.5-acre parcel for residential units, retail shops and service, restaurant, open parking, bazaar and an individual wastewater treatment plant.

In general, there are four storm water management requirements administered by City and County and also by the State of Hawaii Department of Health Clean Water Branch (CWB) under the amended Hawaii Administrative Rules Chapters 11-54 Water Quality Standards, and 11-55 Water Pollution Control:

1. Provide a storm water management plan, for the 10-year recurrence interval that will mitigate the impacts of the increased storm water runoff, and ensure that there are no adverse impacts on the downstream systems. The City and County will review and approve construction documents, then issue a building permit.
2. Provide a site-specific storm water quality best management practices (BMPs) for the more frequent rainfall events. City and County will review and approve construction documents, then issue a building permit.
3. Provide a site-specific sedimentation and erosion control plan during construction for the area of land to be disturbed by grading. The City and County will review and approve plans and analysis, then issue a grading permit.
4. Provide a site-specific storm water pollution prevention plan (SWPPP) to be reviewed and enforced by the CWB.

According to the amended Chapter 11-54 Hawaii Administrative Rules, Paukauila Stream is classified as a perennial stream with fresh water flowing year-round. The downstream receiving water, Kaiaka Bay, is located within the designated Class A Marine Waters and Embayment protected receiving water (ref. Water Quality Standards Map of the Island of Oahu, June 2014). For this project, the proposed land use activities and implemented storm water management plan must be designed to ensure that there is no adverse impact to the receiving water quality.

Based upon the May 2015 development plan for the backyard concept, as shown in **Figure 6**, the 7.5-acre site will consist of an increase of impervious surfaces (e.g. structural roofs, walkways, and roads) and a land use change from agriculture to mixed use development. The runoff flow paths for post development are longer than the existing condition due to the grading of swales running along the parking lot and roads, having an impact on the design peak flow, as compared to short flow paths resulting in a higher design peak flow.

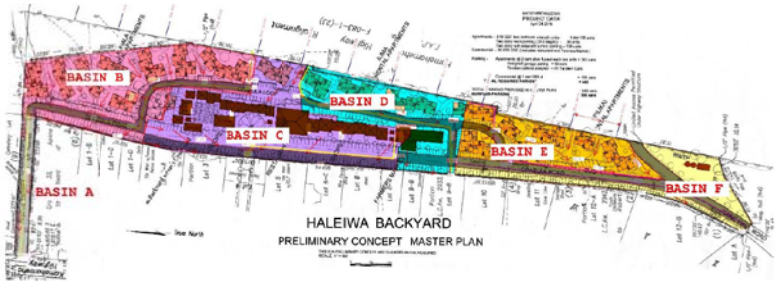


FIGURE 6. Post Development Drainage Basins (June 2015)

The anticipated increase in peak flow and runoff volume will be mitigated so that the proposed peak flow is attenuated to match predevelopment peak flow. The concept level hydrologic analysis for the pre-developed and post developed conditions for the 10-year storm event is provided in Appendix "A" and summarized in **Table 1**, below.

	Area, Acres	**Design Storm, Inches**	**10-Year Design Peak Flow, CFS**	**10-Year Design Runoff Volume for 24-Hour Duration, Cubic Feet**	**Comment**
Pre-Development	7.5	2.57 for 1-hr Duration; 8.02 for 24-hr Duration	10.8	122,000	--
Post Development	7.5	2.57 for 1-hr Duration; 8.02 for 24-hr Duration	20.2	142,000	Recommend Storm Water Detention and Infiltration BMPs for Net Zero Increase Due to Development
Estimated Increase to be Mitigated by Best Management Practices to the Maximum Extent Practicable	--	--	9.4	20,000	--

Table 1. Comparison Table for Storm Water (May 2015)

The results of this conceptual hydrologic analysis is a pre-development peak runoff flow at roughly 10.8 cubic feet per second (cfs). In comparison, the post-development peak runoff flow of 20.2 cfs is larger, and therefore storm water best management practices will be used to reduce the post-development peak runoff by at least 9.4 cfs, and not to exceed the pre-development peak runoff. Use of storm water detention basins, infiltration chambers, and outlet flow control devices will be used in the storm drain design in order to reduce the peak flow and not to exceed the pre developed peak flow for the design 10-year storm event.

Likewise, the pre-development runoff volume is based upon the 10-year storm event with a 24-hour duration, roughly 122,000 cubic feet, compared to the post-development 142,000 cubic feet. The excess volume will be detained and partially infiltrated by proposed storm water storage chambers, so that the volume of discharge will not exceed the pre-development volume. Overflow will spread across the parking stalls before following the existing flow paths.

Although conceptual at this stage, it is anticipated that the storm water management plan will include proven and effective measures to meet the requirements as listed above. These measures are likely to incorporate on-site storm water drain inlets with sedimentation or filtration pretreatment, retention basins with controlled release rates and detention/infiltration facilities where soil conditions are conducive, to help mimic the existing runoff conditions. In addition, a suite of water quality enhancement measures will be explored and implemented as applicable to reduce sediment and pollutant loadings that are typically associated with urban runoff. The water quality enhancement measures may include elements such as grass-lined filter strips, bioswales, infiltration chambers, rain gardens, cisterns and permeable pavers. A conceptual site-specific storm drain layout is shown in **Figure 7**. The City and County of Honolulu provides storm water quality best management practices guidelines. These guidelines will be used in the design process to assess the suitability, size and selection of the most appropriate measures.

Water: Potable water will be supplied by an existing City and County of Honolulu BWS 8-inch-diameter water distribution main along Kamehameha Highway, roughly 320-feet west of the project site. **Appendix "B"** includes the BWS letter acknowledging that the water main could be used to supply the post development projected water demand. Additional analysis and coordination with the Board of Water Supply will be required to confirm if the existing supply system has capacity to meet the maximum daily demand and peak hour demand rates for the proposed development. Field verification of flow and pressure is required as noted in the BWS letter.

As this project progresses, a detailed fire protection sprinkler system will be designed by a mechanical or fire protection engineer. The scope of this report however, is to make an assessment of the availability to connect to the existing water distribution, and to estimate the post developed water demands. Based upon the BWS "Water System Standards" (2002), the following **Table 2** is an approximation of the water demands based upon the May 2015 concept plan. The estimated maximum daily demand is about 122,400 gallons for both domestic and commercial water demands combined. The fire protection demand will depend upon the future water sprinkler demands plus the BWS fire flow demands of 1,500 gallon per minute (gpm) for one-hour duration at apartments, and 2,000 gpm for a two-hour duration at commercial activities.

				Estimated Demand			Fire Flow Requirements	
Land Use Type	Quantity	Units	Average Day Demand Rate	Ave Day (gal)	Max Day (gal)	Peak Hour (gpm)	Flow (gpm)	Duration (hours)
Apartments	156	Dwelling Units	500 gal/unit	78,000	117,000	163	1,500	1
Commercial	30,000	ft2	120 gal/1000ft2	3,600	5,400	23	2,000	2
Total				81,600	122,400	185		
Note: Fire Sprinkler Demand is NOT included.								

Table 2. Projected Water Demand (June 2015)

A conceptual layout of the water distribution and fire protection is shown in **Figure 7**. The proposed layout consists of two separate connections at the north and south ends of the project site. Since access to the BWS water main on Kamehameha Highway is further away at the south end, a proposed easement is needed in order to reach this connection point, and depending upon the alignment, the easement could be in the range of 300 to 500 feet cutting through parcels. Fire hydrants will have a maximum spacing of 250 feet. Note that a fire protection designer will determine each building's fire sprinkler connection requirements. Fire department connection (FDC) pedestals will be located in open areas along the roadway. Depending upon the FDC pedestal locations, parking stalls along the curbs may be replaced with no parking zones.

IV. Conclusion

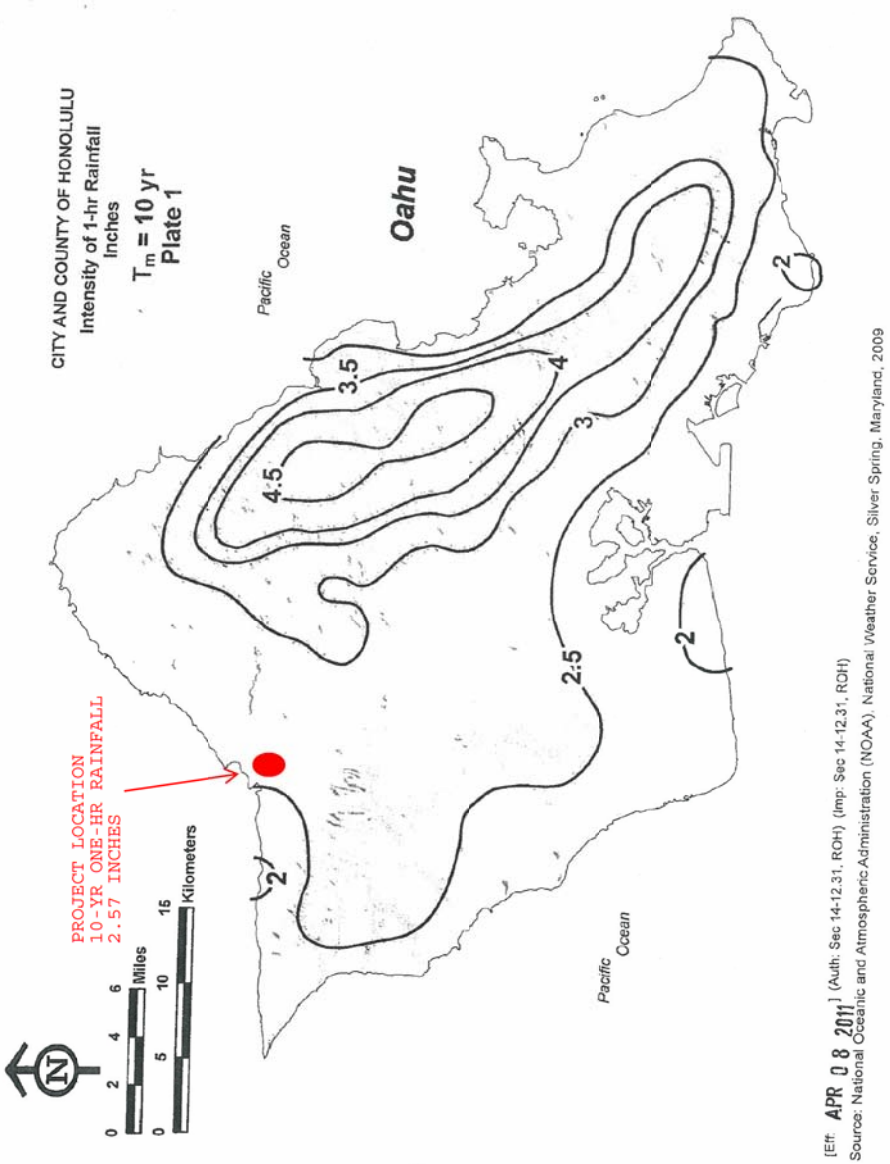
The proposed land use change from agriculture to mixed development will have an impact on site drainage conditions due to anticipated changes in groundcover, from the existing permeable grass and shrubs, to the less permeable pavements and roofs. The conceptual hydrologic analysis indicates an increased design runoff peak flow and volume due to development. Storm water mitigation measures will include the use of typical storm water best management practices compatible to the site development plan and storm drainage rules. **Figure 7** highlights a conceptual site-specific storm water drainage plan for a 10-year storm event. A geotechnical investigation including percolation testing is recommended since the rate of percolation will have an impact on the sizing and number of infiltration basins.

The proposed land use change will also impact the existing water utilities. The City and County of Honolulu Board of Water Supply (BWS) has provided water distribution maps and fire hydrant pressure and flow data for this report and has acknowledged that connections to the existing 8-inch diameter water main are feasible.

In conclusion, the enclosed analysis shows that the proposed project will not have an adverse drainage impact to neighboring properties and the existing drainage system. Also, the added water demand will be met by the BWS water distribution system. A rough order of magnitude conceptual construction cost estimate is provided in **Appendix "C"** for the storm drainage elements and water distribution.

APPENDIX "A"

Drainage Calculations



[Eff: APR 0 8 2011] (Auth: Sec 14-12.31, ROH) (Imp: Sec 14-12.31, ROH)
Source: National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Silver Spring, Maryland, 2009

Point precipitation frequency estimates (inches)
NOAA Atlas 14 Volume 4 Version 3
Data type: Precipitation depth
Time series type: Partial duration
Project area: Hawaiian Islands
Location name: Haleiwa, Hawaii, US*
Station Name: -
Latitude: 21.5822°
Longitude: -158.1136°
Elevation: 3 ft*
* source: Google Maps

PRECIPITATION FREQUENCY ESTIMATES

by duratio	1	2	5	10	25	50	100	200	500
5-min:	0.36	0.47	0.61	0.72	0.86	0.96	1.07	1.18	1.32
10-min:	0.54	0.7	0.91	1.06	1.27	1.43	1.59	1.75	1.96
15-min:	0.68	0.88	1.14	1.34	1.6	1.8	2	2.2	2.46
30-min:	0.95	1.24	1.6	1.88	2.25	2.53	2.81	3.1	3.47
60-min:	1.25	1.63	2.11	2.48	2.96	3.33	3.7	4.07	4.56
2-hr:	1.73	2.26	2.93	3.45	4.15	4.68	5.21	5.75	6.46
3-hr:	1.98	2.63	3.43	4.03	4.83	5.44	6.04	6.65	7.46
6-hr:	2.51	3.32	4.36	5.14	6.15	6.9	7.64	8.38	9.35
12-hr:	3	4.03	5.42	6.5	7.94	9.05	10.16	11.3	12.81
24-hr:	3.47	4.76	6.58	8.02	10.03	11.63	13.3	15.07	17.52
2-day:	3.75	5.22	7.29	8.93	11.24	13.07	14.99	17.01	19.84
3-day:	3.98	5.57	7.8	9.56	12.03	13.99	16.03	18.19	21.18
4-day:	4.22	5.92	8.31	10.19	12.82	14.9	17.07	19.36	22.53
7-day:	4.71	6.6	9.27	11.38	14.35	16.72	19.19	21.81	25.48
10-day:	5.13	7.19	10.08	12.38	15.61	18.18	20.88	23.74	27.75
20-day:	6.35	8.87	12.37	15.12	18.94	21.96	25.07	28.34	32.85
30-day:	7.4	10.31	14.29	17.4	21.64	24.95	28.34	31.84	36.64
45-day:	8.88	12.28	16.86	20.37	25.06	28.66	32.28	35.97	40.9
60-day:	10.29	14.08	19.12	22.9	27.9	31.66	35.39	39.16	44.12

Date/time (GMT): Mon Jun 1 23:17:42 2015
pyRunTime: 0.0443868637085

Drainage Area Existing Condition **Date:** 4/28/2015

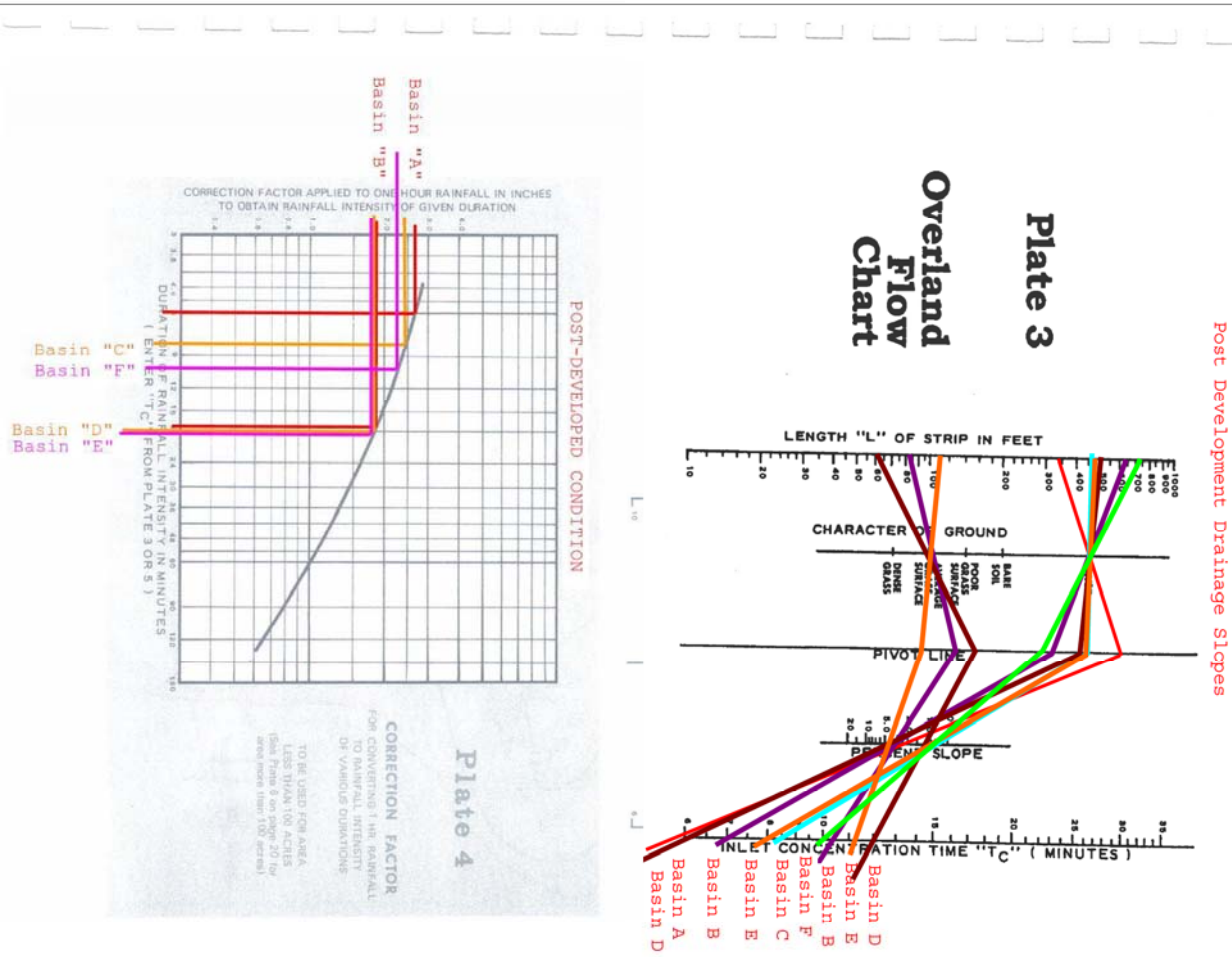
Project 20140127 DGA Haleiwa Mixed-Use Parcel Wet Utilities Data Gathering **By:** David Ardo

	Basin A Area	C*A	Basin B Area	C*A	Basin C	C*A	Basin D	C*A
AC Pavement, acres	0.298	0.268	0.000	0.000	0.000	0.000	0.160	0.144
Landscape, acres	0.000	0.000	1.062	0.234	5.759	1.267	0.224	0.049
Total, acres	**0.298**		**1.062**		**5.759**		**0.384**	
Weighted Average C	0.900		0.220		0.220		0.504	

Runoff Coefficients:	"Table 4: C, Runoff Coefficients for Water Quality Flow Calculations" from Rules Relating to Storm Drainage Standards, January 2000 pg.52
AC Pavement	0.9
Landscaped, Grass	0.22

From Map: I 2.57

	L (ft)	Ground	Slope (%)	Tc, minutes	Tc, hours	Correction	Adjusted I	Q, cfs
Basin A	485.32	Paved	4.74	6.25	0.10	2.6	6.682	1.79
Basin B	229.77	Ave Grass	8.27	13.3	0.22	2.1	5.397	1.26
Basin C	253.24	Ave Grass	9.48	13.3	0.22	2.1	5.397	6.84
Basin D	248.59	Ave Grass	4.02	16	0.27	1.9	4.883	0.94
							Total	**10.84**



```
                    INPUT REPORT FOR
PRE-DEVELOPMENT TOTAL RUNOFF VOLUME ESTIMATE
BASED UPON 10-YEAR RAINFALL, 24-HOUR DURATION

WinTR-55 Current Data Description

   --- Identification Data ---

User:    LKT                    Date:     6/1/2015
Project: Haleiwa Exist Cond     Units:    English
SubTitle: AG-2 Land Use with Cane Haul Road     Areal Units: Acres
State:   Hawaii
County:  Haleiwa
Filename: C:\Users\ltokuda\Documents\20140127 Haleiwa Mixed Use Parcel\NRCS\Exist Cond.w55

   --- Sub-Area Data ---

Name      Description        Reach     Area(ac)   RCN   Tc
-------------------------------------------------------------
Basin A   North              Outlet      0.3      98   0.100
Basin B   North Central      Outlet     1.06      69   0.220
Basin C   South Central      Outlet     5.76      69   0.220
Basin D   South              Outlet     0.38      87   0.270

Total area: 7.50 (ac)

   --- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr    5-Yr    10-Yr   25-Yr   50-Yr   100-Yr  1-Yr
(in)    (in)    (in)    (in)    (in)    (in)    (in)
-------------------------------------------------------------
4.76    6.58    8.02    10.03   11.63   13.3    3.47

Storm Data Source:          User-provided custom storm data
Rainfall Distribution Type:  Type IA
Dimensionless Unit Hydrograph: <standard>
```

Drainage Area Developed Condition
Project 20140127 DGA Haleiwa Mixed-Use Parcel Wet Utilities Data Gathering

Date: 6/5/2015
By: LKT

	Basin A Area, AC	CFA	Basin B Area, AC	CFA	Basin C Area, AC	CFA	Basin D Area, AC	CFA	Basin E Area, AC	CFA	Basin F Area, AC	CFA
Roofs, AC Pavement	0.210	0.18	0.84	0.71	0.90	0.76	0.62	0.53	0.46	0.39	0.50	0.42
Landscape, acres	0.05	0.01	0.92	0.20	1.09	0.24	0.65	0.14	0.64	0.14	0.62	0.14
Total, acres	0.260		1.77		1.99		1.270		1.098		1.118	
Weighted Average C	0.73		0.52		0.50		0.53		0.48		0.50	

Runoff Coefficients:	"Table 4-C Runoff Coefficients for Water Quality Flow Calculations" from Rules Relating to Storm Drainage Standards, January 2000 pg.52
Roofs, AC Pavement	0.85
Landscaped, Grass	0.22

	L (ft)	Ground	Slope (%)	Tc, minutes	Tc, hours	Adjustment Factor	Adjusted i	Q, cfs
Basin A	346	Paved	2.89	6	0.10	2.7	6.94	1.31
Basin B	83	Ave Grass	3.59	10.4	0.17	--	--	--
Basin B	636	Paved	3.46	7	0.12	--	--	--
Total				17.4	0.29	1.9	4.88	4.48
Basin C	460	Paved	0.65	8.5	0.14	2.45	6.30	6.31
Basin D	61	Ave Grass	1.15	12	0.20	--	--	--
Basin D	502	Paved	4.48	6	0.10	--	--	--
				18	0.3	1.8	4.63	3.10
Basin E	116	Ave Grass	4.66	11.2	0.19	--	--	--
Basin E	476	Paved	0.99	8	0.13	--	--	--
				19.2	0.32	1.78	4.72	2.42
Basin F	738	Paved	0.69	10	0.17	1.76	4.52	2.54
TOTAL								20.16

From Map: i 2.57

LKT Haleiwa Exist Cond
AG-2 Land Use with Cane Haul Road
Haleiwa County, Hawaii

Watershed Peak Table

Sub-Area or Reach Identifier	Peak Flow by Rainfall Return Period 10-Yr (cfs)	50-Yr (cfs)	1-Yr (cfs)
SUBAREAS			
Basin A	0.58	0.84	0.25
Basin B	1.10	2.01	0.15
Basin C	5.98	10.90	0.84
Basin D	0.62	0.95	0.20
REACHES			
OUTLET	8.24	14.66	1.40

LKT Haleiwa Exist Cond
AG-2 Land Use with Cane Haul Road
Haleiwa County, Hawaii

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)	50-Yr (cfs) (hr)	1-Yr (cfs) (hr)
SUBAREAS			
Basin A	0.58	0.84	0.25
	7.84	7.83	7.84
Basin B	1.10	2.01	0.15
	8.02	8.01	8.06
Basin C	5.98	10.90	0.84
	8.02	8.01	8.06
Basin D	0.62	0.95	0.20
	8.01	8.00	8.03
REACHES			
OUTLET	8.24	14.66	1.40

LKT Haleiwa Exist Cond
AG-2 Land Use with Cane Haul Road
Haleiwa County, Hawaii

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Basin A	.30	0.100	98	Outlet	North
Basin B	1.06	0.220	69	Outlet	North Central
Basin C	5.76	0.220	69	Outlet	South Central
Basin D	.38	0.270	87	Outlet	South

Total Area: 7.50 (ac)

LKT Haleiwa Exist Cond
AG-2 Land Use with Cane Haul Road
Haleiwa County, Hawaii

Sub-Area Time of Concentration Details

Sub-Area Identifier/	Flow Length (ft)	Slope (ft/ft)	Mannings's n	End Area (sq ft)	Wetted Perimeter (ft)	Travel Velocity (ft/sec)	Time (hr)
Basin A							
User-provided					0.100		
			Time of Concentration		0.100		
			========				
Basin B							
User-provided					0.220		
			Time of Concentration		0.220		
			========				
Basin C							
User-provided					0.220		
			Time of Concentration		0.220		
			========				
Basin D							
User-provided					0.270		
			Time of Concentration		0.270		
			========				

LKT Haleiwa Exist Cond
AG-2 Land Use with Cane Haul Road
Haleiwa County, Hawaii

Sub-Area Land Use and Curve Number Details

Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Number
Basin A	Paved parking lots, roofs, driveways	B	.3	98
	Total Area / Weighted Curve Number		.3	98
			==	==
Basin B	Pasture, grassland or range (fair)	B	1.06	69
	Total Area / Weighted Curve Number		1.06	69
			====	==
Basin C	Pasture, grassland or range (fair)	B	5.76	69
	Total Area / Weighted Curve Number		5.76	69
			====	==
Basin D	Paved parking lots, roofs, driveways	B	.16	98
	Pasture, grassland or range (poor)	B	.224	79
	Total Area / Weighted Curve Number		**.38**	**87**
			===	==

INPUT REPORT FOR
POST-DEVELOPMENT TOTAL RUNOFF VOLUME ESTIMATE
EASED UPON 10-YEAR RAINFALL, 24-HOUR DURATION

WinTR-55 Current Data Description

--- Identification Data ---

User: LKT Date: 6/1/2015
Project: **Backyard Develop Cond** Units: English
SubTitle: Areal Units: Acres
State: Hawaii
County: Haleiwa
Filename: C:\Users\ltokuda\Documents\201400127 Haleiwa Mixed Use Parcel\NRCS\Develop Cond.w55

--- Sub-Area Data ---

Name	Description	Reach	Area(ac)	RCN	Tc
Basin A		Outlet	0.26	90	0.100
Basin B		Outlet	1.76	76	0.170
Basin C		Outlet	1.99	82	0.140
Basin D		Outlet	1.27	77	0.120
Basin E		Outlet	1.1	74	0.190
Basin F		Outlet	1.12	75	0.170

Total area: 7.50 (ac)

--- Storm Data --

Rainfall Depth by Rainfall Return Period

2-Yr (in)	5-Yr (in)	10-Yr (in)	25-Yr (in)	50-Yr (in)	100-Yr (in)	1-Yr
4.76	6.58	8.02	10.03	11.63	13.3	3.47

Storm Data Source: User-provided custom storm data
Rainfall Distribution Type: Type IA
Dimensionless Unit Hydrograph: <standard>

LKT Backyard Develop Cond

Haleiwa County, Hawaii

Hydrograph Peak/Peak Time Table

Sub-Area or Reach Identifier	Peak Flow and Peak Time (hr) by Rainfall Return Period 10-Yr (cfs) (hr)	50-Yr (cfs) (hr)	1-Yr (cfs) (hr)
SUBAREAS			
Basin A	0.47	0.70	0.16
	7.90	7.84	7.92
Basin B	2.30	3.88	0.49
	7.97	7.96	8.02
Basin C	3.04	4.86	0.82
	7.93	7.92	7.99
Basin D	1.71	2.87	0.39
	7.93	7.92	8.01
Basin E	1.35	2.33	0.26
	8.00	7.97	8.04
Basin F	1.42	2.43	0.29
	7.97	7.95	8.03
REACHES			
OUTLET	10.26	17.04	2.41

LKT Backyard Develop Cond

Haleiwa County, Hawaii

Sub-Area Summary Table

Sub-Area Identifier	Drainage Area (ac)	Time of Concentration (hr)	Curve Number	Receiving Reach	Sub-Area Description
Basin A	.26	0.100	90	Outlet	
Basin B	1.76	0.170	76	Outlet	
Basin C	1.99	0.140	82	Outlet	
Basin D	1.27	0.120	77	Outlet	
Basin E	1.10	0.190	74	Outlet	
Basin F	1.12	0.170	75	Outlet	

Total Area: 7.50 (ac)

LKT Backyard Develop Cond

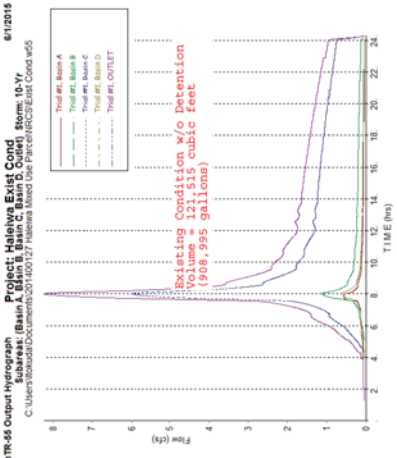
Haleiwa County, Hawaii

Sub-Area Land Use and Curve Number Details

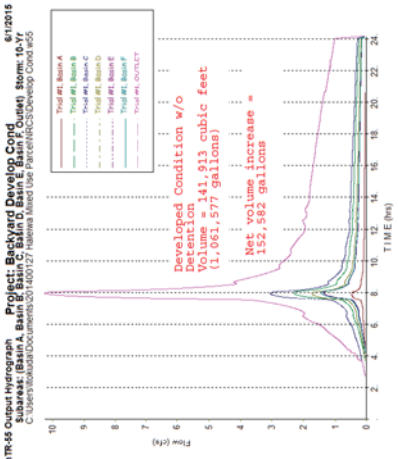
Sub-Area Identifier	Land Use	Hydrologic Soil Group	Sub-Area Area (ac)	Curve Runoff Number
Basin A	Paved parking lots, roofs, driveways	B	.21	98
	Brush - brush, weed, grass mix (fair)	B	.05	56
	Total Area / Weighted Curve Number		.26	90
			===	==
Basin B	Paved parking lots, roofs, driveways	B	.84	98
	Brush - brush, weed, grass mix (fair)	B	.92	56
	Total Area / Weighted Curve Number		1.76	76
			====	==
Basin C	Paved parking lots, roofs, driveways	B	.9	98
	Pasture, grassland or range (fair)	B	1.09	69
	Total Area / Weighted Curve Number		1.99	82
			====	==
Basin D	Paved parking lots, roofs, driveways	B	.62	98
	Brush - brush, weed, grass mix (fair)	B	.65	56
	Total Area / Weighted Curve Number		1.27	77
			====	==
Basin E	Paved parking lots, roofs, driveways	B	.46	98
	Brush - brush, weed, grass mix (fair)	B	.64	56
	Total Area / Weighted Curve Number		1.1	74
			===	==
Basin F	Paved parking lots, roofs, driveways	B	.5	98
	Brush - brush, weed, grass mix (fair)	B	.62	56
	Total Area / Weighted Curve Number		1.12	75
			====	==

TR-20 HYDROGRAPH OUTPUT
PRE VS POST CONDITION RUNOFF VOLUMES

Peak 10-year Flow 8.24 cubic feet per second (cfs)



Peak 10-year Flow 10.26 cubic feet per second (cfs)



SSFM INTERNATIONAL

APPENDIX "B"

Board of Water Supply Letter

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

May 11, 2015

SSFM INTERNATIONAL, INC.
RECEIVED
MAY 14 2015

KIRK CALDWELL, MAYOR

DUANE R. MIYASHIRO, Chair
ADAM C. WONG, Vice Chair
THERESIA C. McMURDO
DAVID C. HULIHEE
KAPUA SPROAT

ROSS S. SASAMURA, Ex-Officio
FORD N. FUCHIGAMI, Ex-Officio

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

ELLEN E. KITAMURA, P.E.
Deputy Manager and Chief Engineer

FILE

Mr. Lance Tokuda
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mr. Tokuda:

Subject: Your Email Dated April 10, 2015 Requesting Flow and Pressure Data for the Haleiwa Utility Investigation

The Board of Water Supply has suspended fire flow tests on fire hydrants as a water conservation measure. However, you may use the following calculated flow data for Fire Hydrant Nos. C-02424, C-00066, and C-00064:

Fire Hydrant Number	Location	Static Pressure (psi)	Residual Pressure (psi)	Flow (gpm)
C-02424	Kamehameha Hwy	90	72	2000
C-00066	Kamehameha Hwy	90	61	2000
C-00064	Emerson Road	91	56	2000

The data are based on the existing water system, and the static pressure represents the theoretical pressure at the point of calculation with the reservoir full and no demands on the water system. The static pressure is not indicative of the actual pressure in the field. Therefore, in order to determine the flows that are available to the site, you will have to determine the actual field pressure by taking on-site pressure readings at various times of the day and correlating that field data with the above hydraulic design data.

The map showing the location of the fire hydrants is attached.

If you have any questions, please contact Robert Chun, Project Review Branch of our Water Resources Division at 748-5443.

Very truly yours,

Robert Chun

ROBERT CHUN
Project Review Branch

Attachment

Water for Life . . . Ka Wai Ola

SCANNED

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

March 16, 2015

SSFM INTERNATIONAL, INC.
RECEIVED
MAR 2 3 2015
FILE

KIRK CALDWELL, MAYOR

DUANE R. MIYASHIRO, Chair
ADAM C. WONG, Vice Chair
THERESIA C. McMURDO
DAVID C. HULIHEE

ROSS S. SASAMURA, Ex-Officio
FORD N. FUCHIGAMI, Ex-Officio

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

ELLEN E. KITAMURA, P.E.
Deputy Manager and Chief Engineer

FILE COPY

Mr. Jared Chang, Planner
SSFM International, Inc.
501 Sumner Street, Suite 620
Honolulu, Hawaii 96817

Dear Mr. Chang:

Subject: Your Letter Dated February 11, 2015 on the Haleiwa Parcel Zone Change Pre-Assessment Consultation for Draft Environmental Assessment – Tax Map Key: 6-2-005: 002

Thank you for the opportunity to comment on the zone change request in Haleiwa.

The existing water system is adequate to accommodate the proposed Haleiwa Parcel Zone Change. However, please be advised that this information is based upon current data, and therefore, the Board of Water Supply reserves the right to change any position or information stated herein up until the final approval of the building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.

When water is made available, the applicant will be required to pay our Water System Facilities Charges for resource development, transmission and daily storage.

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

If you have any questions, please contact Robert Chun, Project Review Branch of our Water Resources Division at 748-5443.

Very truly yours,

for ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

Water for Life . . . Ka Wai Ola

SSFM INTERNATIONAL

APPENDIX "C"

Conceptual Construction Cost Estimate

ROUGH CONCEPTUAL CONSTRUCTION COST ESTIMATE FOR BACKYARD DEVELOPMENT

Engineer: LKT Date 6/4/2015

ITEM	QUANTITY	UNIT	UNIT PRICE	COST
Water System				
BWS WATER SYSTEM FACILITIES CHARGES ARE FEE NOT INCLUDED				
Compound Area Water Meter & Conc Box	2	EA	$5,000.00	$10,000
W8 PVC	3,500	LF	$120.00	$420,000
W2 PVC Laterals (160 units)	16,000	LF	$20.00	$320,000
W2 Water Meters (BWS)	160	EA	$1,500.00	$240,000
Hydrants	10	EA	$5,000.00	$50,000
Tapping Tee 8x8	2	EA	$5,000.00	$10,000
Tapping Valve 8"	2	EA	$3,000.00	$6,000
Air Relief Valve & Conc Box	3	EA	$1,100.00	$3,300
Gate Valve 8" & Conc Box	9	EA	$1,100.00	$9,900
Kamehameha Highway Restoration Work (AC/TRAFFIC CONTROL)				$75,000
Total Water				$1,144,200
Storm Drainage				
Landscaping, Rain Gardens and Cisterns are not included in this estimate				
Underground Storm Water Chambers	448	EA	$750.00	$336,000
Geotextile	4,500	SY	$2.00	$9,000
Pretrmt Drain Inlet Grates and Precast Conc Box	20	EA	$5,000.00	$100,000
Drain Manhole (Overflow to Existing Drain Collection)	1	EA	$15,000	$15,000
D15 PVC & Cleanouts	400	LF	$175.00	$70,000
Bioswale Strips 2-FT WIDE	2,500	SY	$50.00	$125,000
Aggregrate Fill	1,500	CY	$100.00	$150,000
Cane Haul Road Restoration Work	1	LS		$25,000
Total Drainage				$805,000
MISCELLANEOUS				
Shoring				
5' - 10' Deep	8,940	LF	$11.20	$100,128
			Subtotal	$2,049,328
		20.00%	**Plus Contingency**	$409,866
				$2,459,194

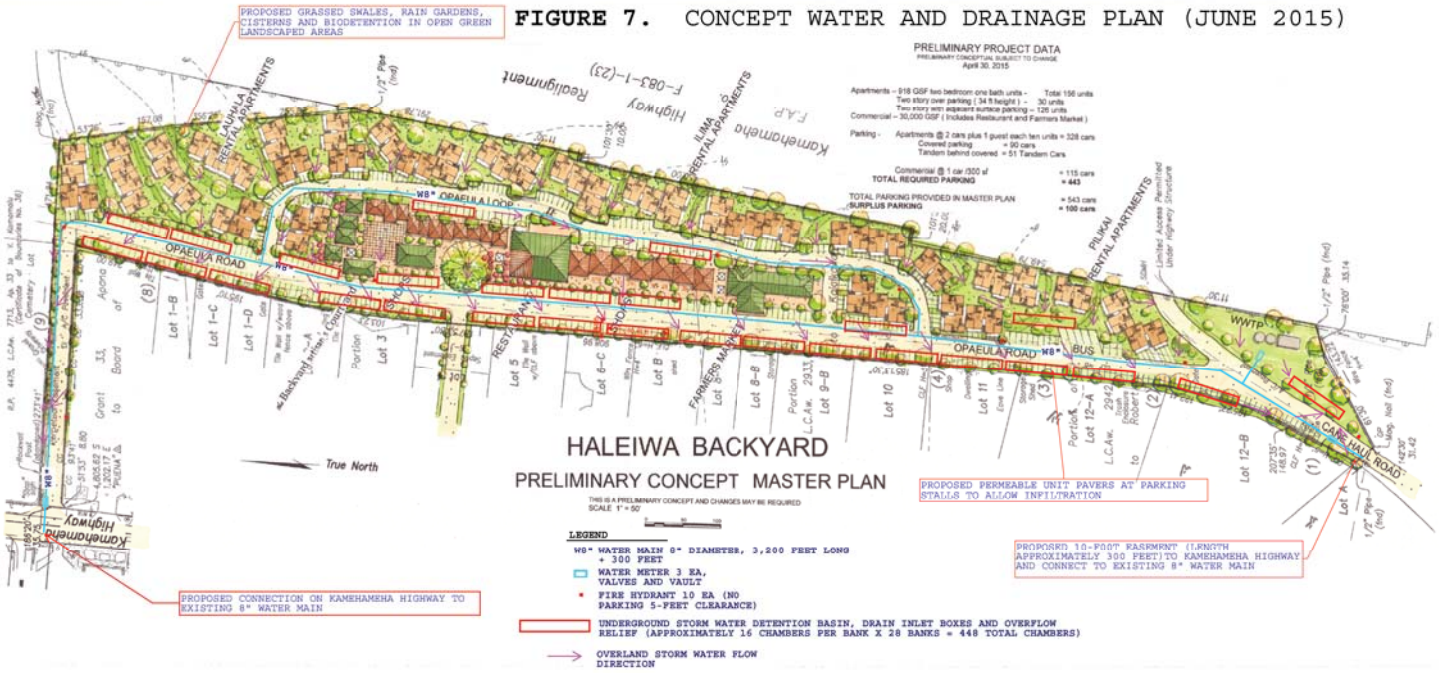



FIGURE 7. CONCEPT WATER AND DRAINAGE PLAN (JUNE 2015)