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JOBIE M. K. MASAGATANI
CHAIRMAN DESIGNATE
HAWAIIAN HOMES COMMISSION

MICHELLE K. KAUHANE
DEPUTY TO THE CHAIRMAN

STATE OF HAWAI'I
DEPARTMENT OF HAWAIIAN HOME LANDS

P. O. BOX 1879
HONOLULU, HAWAI'I 96805

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OFC. OF ENVIRONMENTAL QUALITY CONTROL

February 22, 2013

Mr. Gary Gill, Acting Director
Office of Environmental Quality Control
State of Hawai'i
Department of Health
235 South Beretania Street, Suite 702
Honolulu, Hawai'i 96813

Dear Mr. Gill,

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT & ANTICIPATED FINDING OF NO SIGNIFICANT IMPACT (DEA-AFONSI) FOR THE KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER AT MA'ILI, TMK (1) 8-7-010:007 (PORTION), WAI'ANAE, O'AHU

The Department of Hawaiian Home Lands hereby transmits the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) for the Kamehameha Schools Community Learning Center at Ma'ili situated at TMK (1) 8-7-010:007 (portion), in the Wai'anae District on the island of O'ahu, for publication in the next available edition of the OEQC Environmental Notice.

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

If you have any questions regarding the project, please contact Julie-Ann Cachola of our Planning Office at (808)620-9483 or via email at julie-ann.cachola@hawaii.gov. If you have questions regarding the DEA, you may contact Mr. Michael Shibata of PBR Hawai'i & Associates Inc. at (808) 521-5631 or via email at mshibata@pbrhawaii.com.

Aloha and Mahalo,

Darrell Yagodich
Planning Program Manager

Enclosures

APPLICANT ACTIONS
SECTION 343-5(C), HRS
PUBLICATION FORM (JULY 2012 REVISION)

Project Name: Kamehameha Schools Community Learning Center at Ma'ili
Island: O'ahu
District: Wai'anae
TMK: 8-7-010: 007 (portion)
Permits: Building, Grading, Construction Dewatering, Noise for Construction Activities, Trenching, Industrial Wastewater Discharge, Construction within a Flood Hazard District, Drainage Connection, Sewer Connection, Site Development, Subdivision, Traffic Review Branch Approval, Water Availability Approval, Plan Review Approval, National Pollutant Discharge Elimination System, Section 6E (Hawai'i Revised Statutes), and Permit to perform work within a State Right-of-Way.

Approving Agency:
Ms. Jobie Masagatani, Chair
State of Hawai'i, Department of Hawaiian Home Lands
P.O. Box 1879, Honolulu, Hawai'i 96805
Phone: (808) 620-9501

Applicant:
Ms. Kaiulani Sodaro, AICP, Director, Enterprise Planning and Sustainability
Facilites Development and Support Division
Kamehameha Schools
567 South King Street, Suite 617, Honolulu, Hawai'i 96813
Phone: (808) 534-8499

Consultant:
Mr. Michael Shibata, AICP, Associate
PBR HAWAII
1001 Bishop Street, Suite 650, Honolulu, Hawai'i 96813
Phone: (808) 521-5631

Status (check one only):

_xDEA-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.
__Statutory hammer	

Acceptance	The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it failed to timely make a determination on the acceptance or nonacceptance of the applicant's FEIS under Section 343-5(c), HRS, and that the applicant's FEIS is deemed accepted as a matter of law.
__Section 11-200-27 Determination	The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.
__Withdrawal (explain)	

Summary:

Kamehameha Schools' mission is to fulfill Pauahi's desire to improve the capability and wellbeing of native Hawaiians into perpetuity through education. Kamehameha Schools believes that working within native Hawaiian communities to strengthen schools and other educational providers will not only serve native Hawaiian families, but will help to lift the level of education and well-being for the entire community. To that end, Kamehameha Schools' *Ka Pua* Initiative on the Wai'anae Coast will work to align commitments and investments across the entire Wai'anae Coast and make significant investments in facilities, capacity, and community infrastructure. Through *Ka Pua*, Kamehameha Schools is poised to make a significant difference through partnership and engagement.

One of the most significant commitments Kamehameha Schools is making to the Wai'anae Coast is the development of the Kamehameha Schools' Community Learning Center (KCLC) at Ma'ili that will not only symbolize a collective commitment to the community and its children, but will model innovative and collaborative supports for *keiki* and *'ohana*, fostering better educational outcomes, strengthening the community, and deepen a vibrant native Hawaiian culture. As part of the overall *Ka Pua* Education Plan, the KCLC at Ma'ili will establish state of the art educational spaces, serve as the nexus for Kamehameha Schools' presence on the Wai'anae Coast, and reduce significant barriers for community collaborators.

The KCLC at Ma'ili will be located on approximately 40 acres of land in Ma'ili (TMK 8-7-010: 007 por.). The 40-acre project site is part of a larger 89.274-acre parcel owned by the State Department of Hawaiian Home Lands. While the exact spatial requirements are still being refined, the KCLC at Ma'ili is envisioned as being developed in three phases and uses envisioned include an early childhood education complex, educational support (P-20 programs), and student and community support facilities.

KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER AT MĀ'ILI

Draft Environmental Assessment/Anticipated Finding of No Significant Impact

Prepared for:

KAMEHAMEHA SCHOOLS®

Prepared by:

PBR HAWAII
& ASSOCIATES, INC.

February 2013

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1.0

INTRODUCTION

1.0 INTRODUCTION

This Environmental Assessment (EA) is prepared in accordance with the environmental review requirements of Hawaiʻi Revised Statutes (HRS) Chapter 343, and Hawaiʻi Administrative Rules (HAR), Title 11, Chapter 200. Section 343-5, HRS, establishes nine "triggers" that require compliance with these regulations. The trigger(s) for the proposed Kamehameha Schools' (KS) Community Learning Center at Māʻili and related infrastructure improvements include, but are not limited to, the following:

- Use of State/County lands and funds.

The Proposed Project's infrastructure improvements relating to roadway, traffic, water, wastewater, utility (electricity, telephone and communications) and drainage facilities may affect State and/or County roadways or other lands.

While the specific nature of each improvement is not known at this time, this EA is intended to address all current and future instances involving the use of State and/or County lands relating to the Proposed Project.

1.1 PROJECT SUMMARY

Project Name:	Kamehameha Schools' Community Learning Center at Māʻili (KCLC at Māʻili)
Location:	Māʻili, Oʻahu (Figure 1-1)
Tax Map Key (TMK):	Portion of 8-7-010: 007 (Figure 1-2)
Applicant:	Kamehameha Schools
Landowner:	State of Hawaiʻi, Department of Hawaiian Home Lands
Existing Uses:	Vacant land (Figure 1-3)
Proposed Action:	The Proposed Project includes the KCLC at Māʻili and possible roadway and infrastructure improvements. The KCLC at Māʻili is expected to include educational, recreational and cultural facilities, internal driveways and open space.

Project Area:	Approximately 40 acres
Land Use Designations:	*State Land Use:* Agriculture (Figure 1-4) *City and County of Honolulu:* Waiʻanae Sustainable Community Plan (Figure 1-5) *City and County of Honolulu Zoning:* General Agricultural (AG-2) (Figure 1-6)
Special Management Area:	Not located within the Special Management Area (SMA) (Figure 1-7)
Actions Requested:	Compliance with Chapter 343, Hawaiʻi Revised Statutes Compliance with Hawaiʻi Administrative Rules Title 11, Chapter 200
Approving Agency:	State of Hawaiʻi, Department of Hawaiian Home Lands
Anticipated Determination:	Finding of No Significant Impact (FONSI)

1.2 LOCATION

The Proposed Project, located in the Māʻili community on the Waiʻanae Coast of Oʻahu, is located on approximately 40 acres within a roughly rectangular parcel which encompasses 89.274 acres. The project site's location is shown in Figure 1-1 and Figure 1-3.

1.3 LAND OWNERSHIP AND MAJOR APPROVALS REQUIRED

The property is owned by the State of Hawaiʻi (State) Department of Hawaiian Home Lands (DHHL) and is identified as Tax Map Key (TMK) 8-7-010: 007. The TMK plat map for the property is provided as Figure 1-2.

The property was transferred to the State from the United States of America through the Administrator of General Services (U.S. Government) in December 2010 via a Quitclaim Deed. The transfer was recorded by the Bureau of Conveyances in May 2011. A 4.857-acre portion of the 89.274-acre property was withheld from conveyance to the State until further studies and remediation work associated with possible contamination from the old transmission facility was completed. The U.S. Coast Guard is responsible for further

Path: Q:\Oahu\KS Ka pua Learning Community\GIS\Project\2013 EA Report Fig\Waianae Land Use Plan.mxd

LEGEND

Proposed Project

Tax Map Key: 8-7-010:007

FIGURE 1-1
Regional Location Map

Kamehameha Schools
Community Learning Center at Mā'ili

Kamehameha Schools North

Linear Scale (feet)

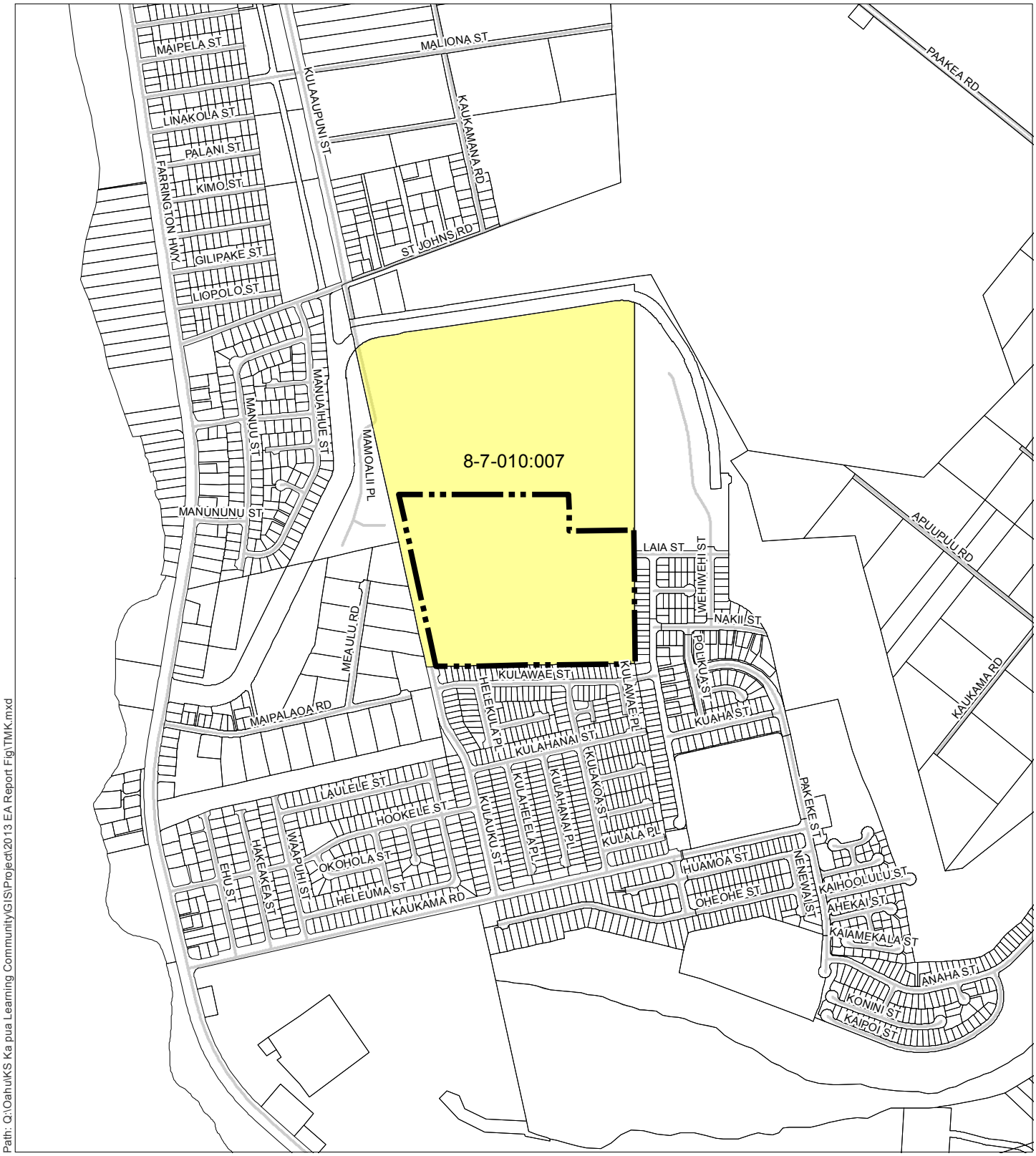
0 500 1000

Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI, USGS 2011

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.



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LEGEND

Proposed Project

Tax Map Key: 8-7-010:007

Roads

FIGURE 1-2
Tax Map Key

Kamehameha Schools
Community Learning Center at Mā'ili

Kamehameha Schools
North

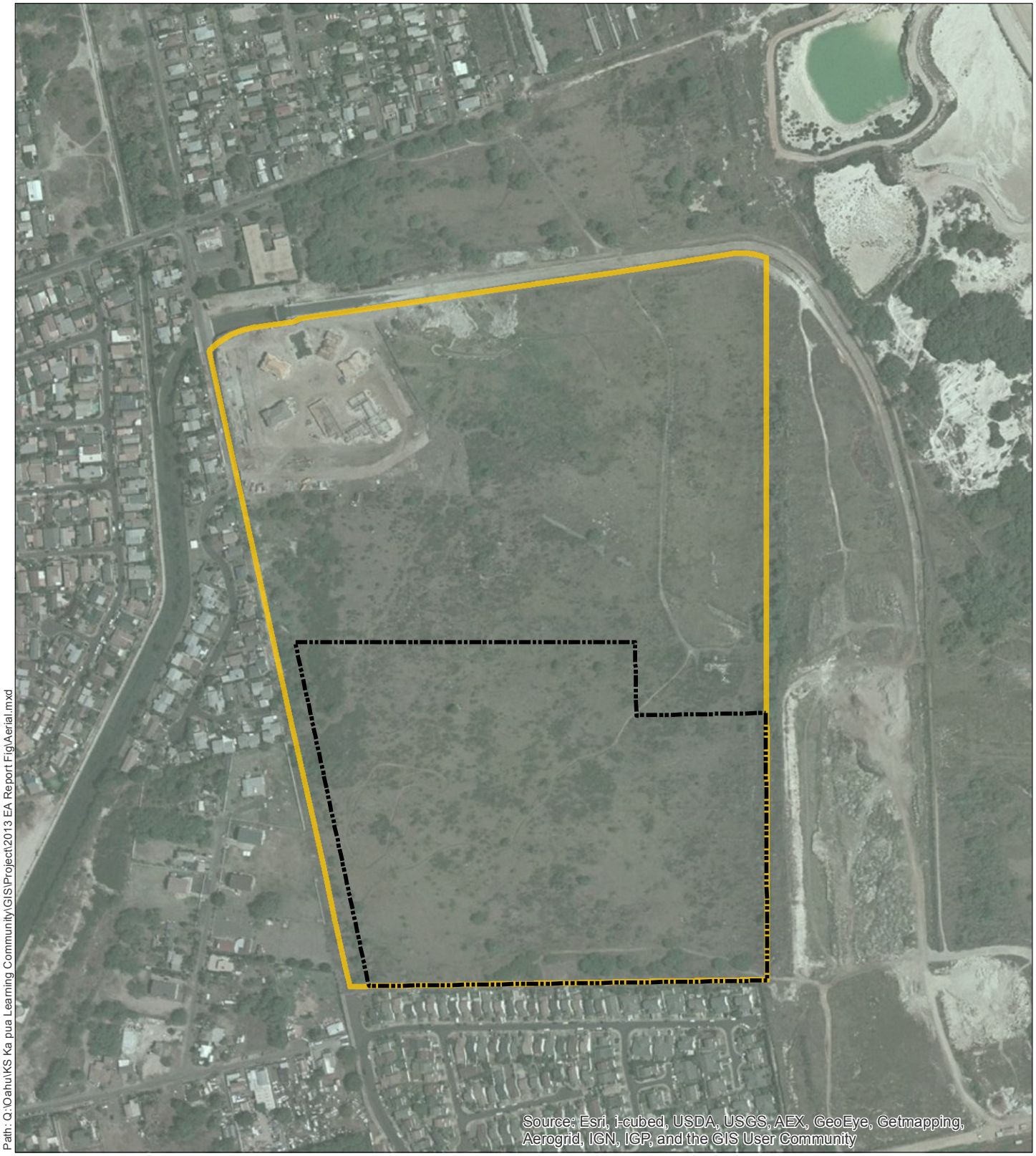
Linear Scale (feet)
0 500 1000

Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI, HOLIS, C&C of Honolulu 2012

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.



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LEGEND

Proposed Project

Tax Map Key: 8-7-010:007

FIGURE 1-3
Aerial Photograph

Kamehameha Schools Community Learning Center at Mā'ili

Kamehameha Schools North

Linear Scale (feet)

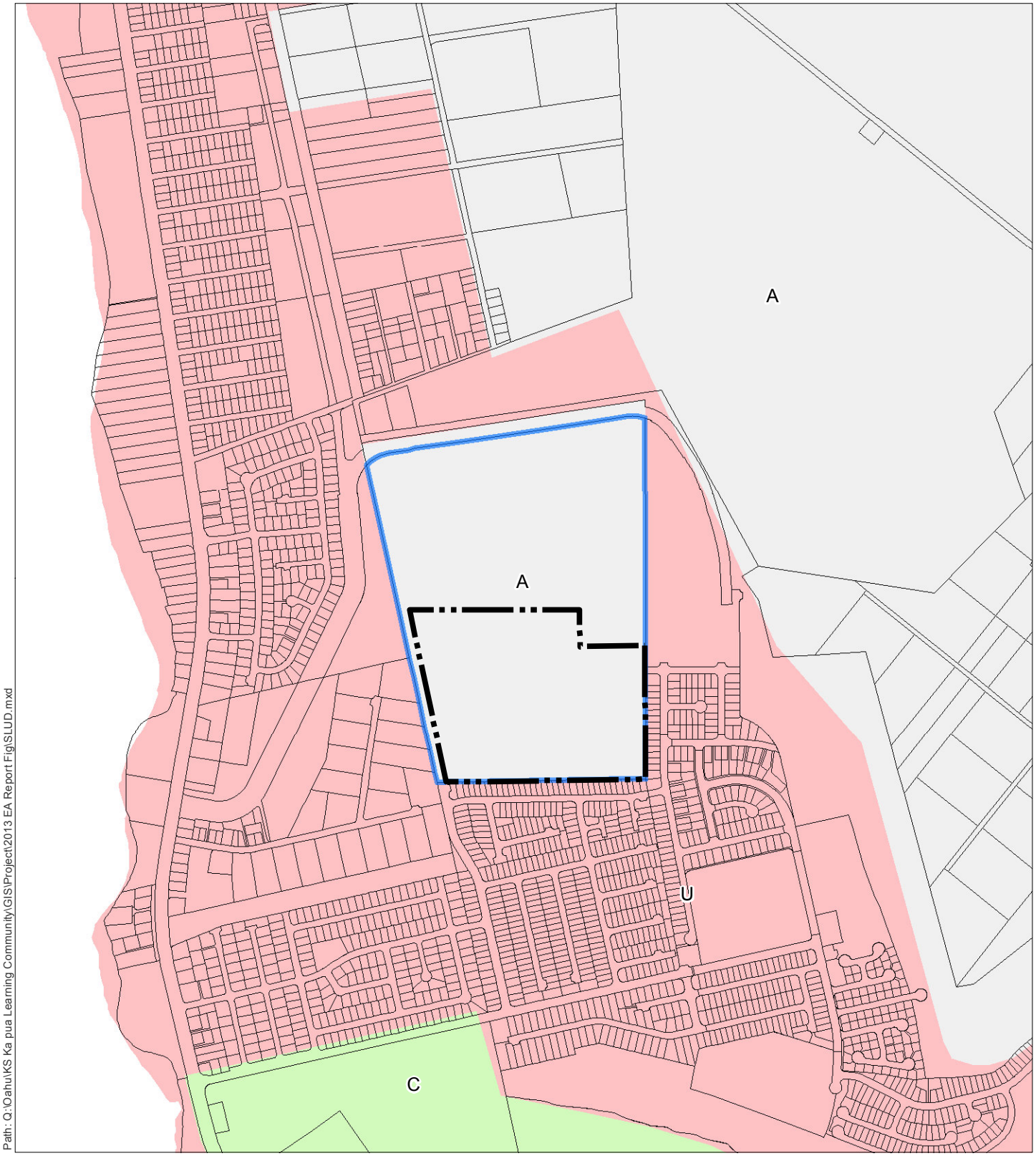
0 250 500

Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI, Bing Maps 2012, HOLIS, C&C of Honolulu 2012

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.



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LEGEND

- Proposed Project
- Tax Map Key: 8-7-010:007
- A- Agriculture
- C- Conservation
- R- Rural
- U- Urban

Source: ESRI, HOLIS, C&C of Honolulu 2012, State Land Use Commission 2011

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.

FIGURE 1-4
State Land Use Districts

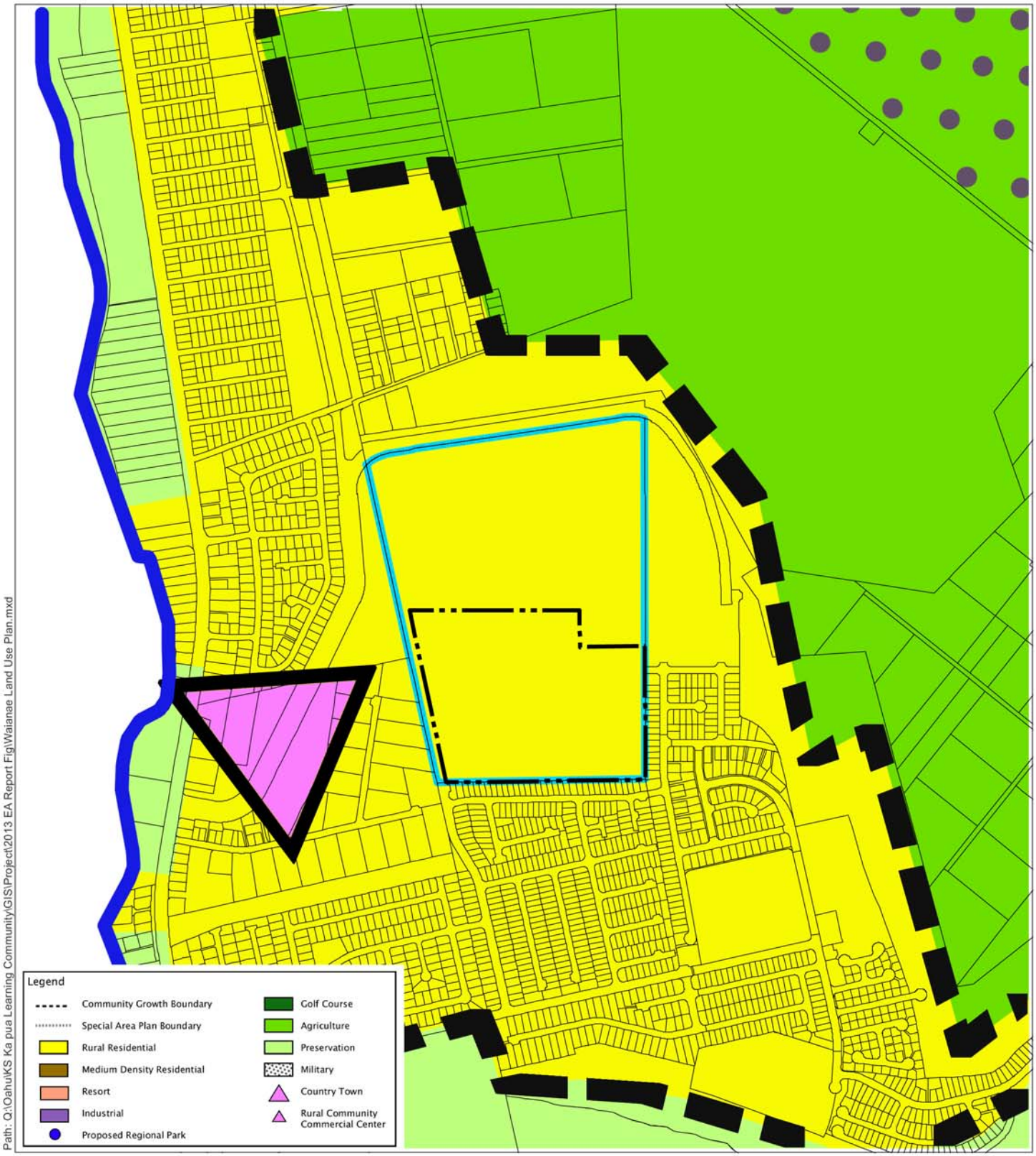
Kamehameha Schools
Community Learning Center at Mā'ili

Kamehameha Schools
North

Linear Scale (feet)
0 500 1000

Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.



LEGEND

Proposed Project

Tax Map Key: 8-7-010:007

FIGURE 1-5
Wai'anae Sustainable Communites Plan: Land Use Plan

Kamehameha Schools Community Learning Center at Mā'ili

Kamehameha Schools North

Island of O'ahu

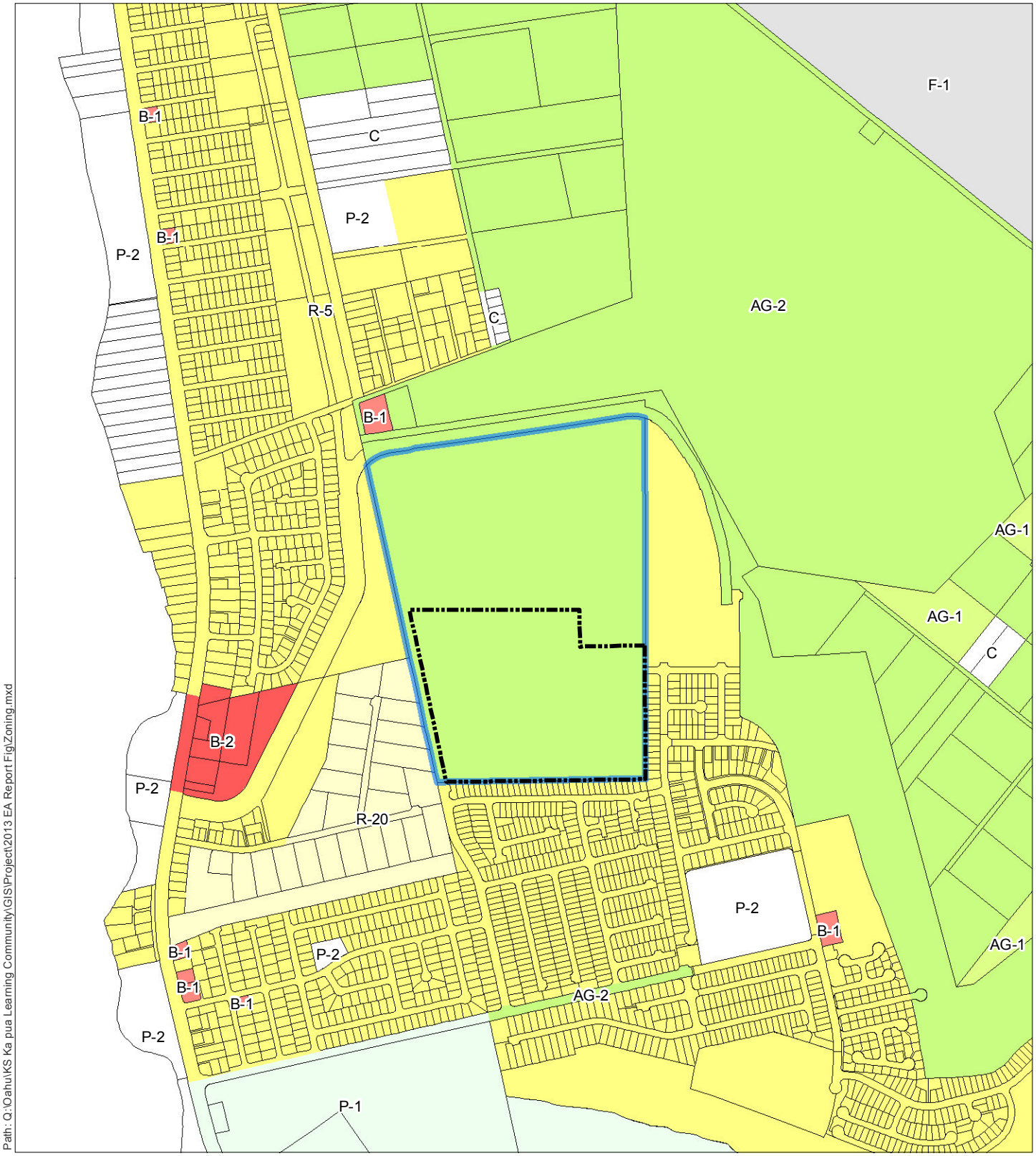
Linear Scale (feet)

0 500 1000

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI, C&C of Honolulu 2010, DPP: Wai'anae Sustainable Communities Plan 2010

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.



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LEGEND

- Proposed Project
- Tax Map Key: 8-7-010:007
- P-1
- AG-1
- AG-2
- R-20
- R-5
- B-1
- B-2
- F-1

FIGURE 1-6
City and County of Honolulu Zoning

Kamehameha Schools
Community Learning Center at Mā'ili

Kamehameha Schools
North

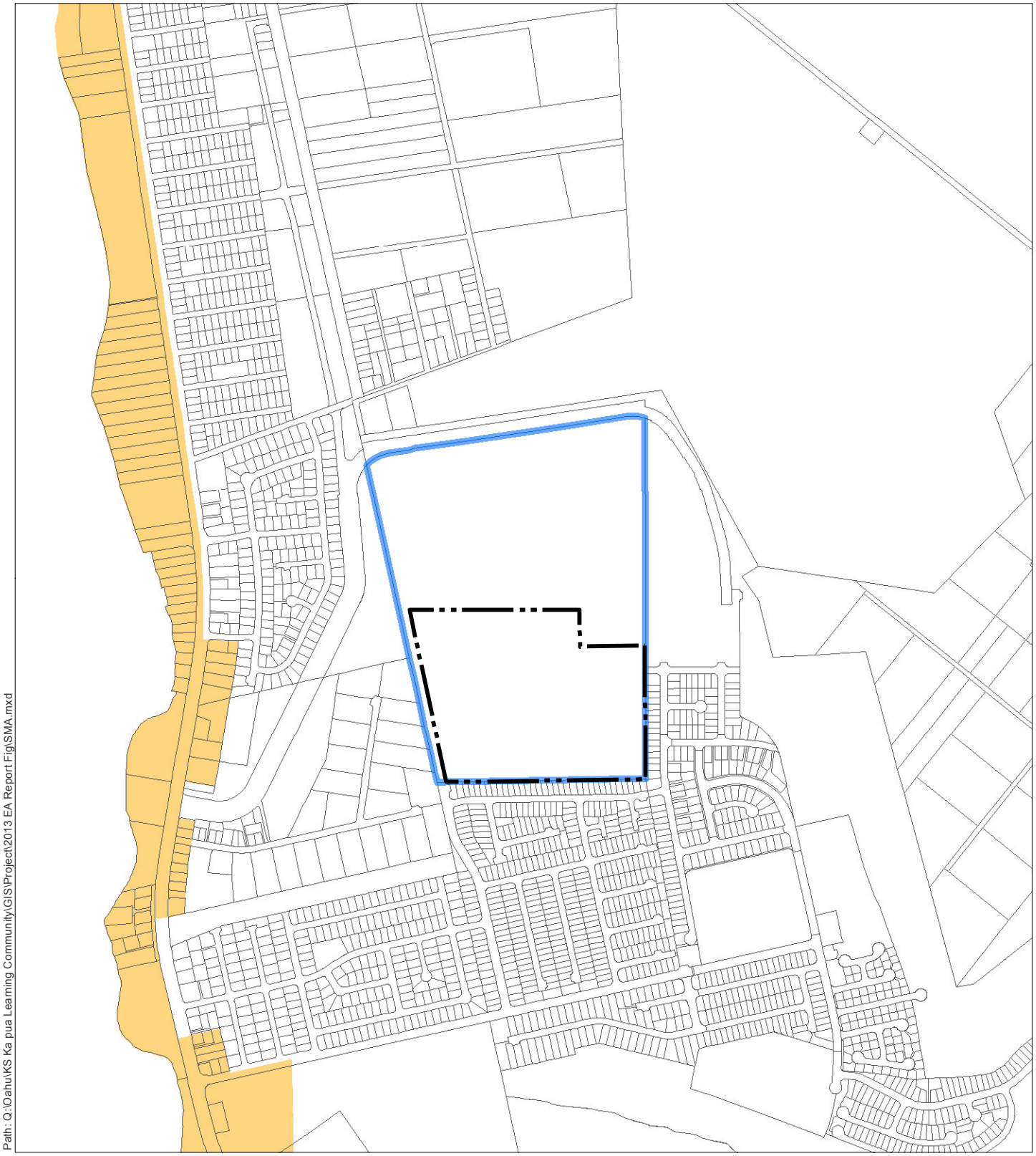
Linear Scale (feet)
0 500 1000

Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI, C&C of Honolulu 2010

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.



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LEGEND

- Proposed Project
- Tax Map Key: 8-7-010:007
- Within a Special Management Area

FIGURE 1-7
Special Management Areas

Kamehameha Schools
Community Learning Center at Mā'ili

Kamehameha Schools
North

Linear Scale (feet)
0 500 1000

Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI, C&C of Honolulu 2010

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.

evaluating the 4.857-acre property and DHHL has indicated that once appropriate action has been taken, the excluded land will be transferred to the State. At this time, the total land area that has been transferred to DHHL is 84.417 acres.

1.3.1 Identification of Applicant

Kamehameha Schools is the project applicant.

Contact: Ms. Kaiulani Sodaro, AICP, Director
Enterprise Planning and Sustainability
Facilities Development and Support Division
Kamehameha Schools
567 South King Street, Suite 617
Honolulu, Hawaiʻi 96813
Phone: (808) 534-8499
Fax: (808) 534-3848

1.3.2 Identification of Environmental Consultant

The environmental consultant is PBR HAWAII & Associates, Inc. (PBR HAWAII).

Contact: Mr. Michael Shibata, AICP, Associate
PBR HAWAII
1001 Bishop Street, Suite 650
Honolulu, Hawaiʻi 96813
Phone: (808) 521-5631
Fax: (808) 523-1402

1.3.3 Environmental Requirements

Preparation of this document is in accordance with the provisions of Chapter 343, HRS and Title 11, Chapter 200, HAR pertaining to Environmental Impact Statements (EIS). Section 343-5, HRS established nine "triggers" that require either an EA or an EIS. The use of State or County lands or funds requires the preparation of this EA.

1.3.4 List of Anticipated Permits and Approvals

A list of anticipated permits and approvals are outlined in the table below. It is acknowledged that at some point in the future, other permits and approvals (i.e. zoning, conditional use permit, existing use permit) may be necessary if land tenure changes.

Table 1-1: Anticipated Permits and Approvals

AGENCY	ANTICIPATED PERMIT/APPROVAL
State of Hawaiʻi	
Department of Land and Natural Resources, Historic Preservation Division	• Section 6E, HRS Review
Department of Transportation	• Permit to perform work within a State Right-of-Way
Department of Health	• National Pollutant Discharge Elimination System permit
City and County of Honolulu	
Department of Planning and Permitting	• Building permit • Grading permit • Construction Dewatering permit • Noise Permit for Construction Activities • Trenching permit • Industrial Wastewater Discharge permit • Construction within a Flood Hazard District approval • Approval for Sewer Connection • Site Development approval • Subdivision approval • Traffic Review Branch approval • Drainage Connection approval
Department of Transportation Services	• Plan Review approval, included in Traffic Review Branch approval
Board of Water Supply	• Water Availability approval • Plan Review approval, included in Site Development approval

1.3.5 Identification of Approving Agency

The State of Hawaiʻi, Department of Hawaiian Home Lands is the approving agency.

Contact: Ms. Jobie Masagatani, Chair
State of Hawaiʻi
Department of Hawaiian Home Lands
P.O. Box 1879
Honolulu, Hawaiʻi 96805
Phone: (808) 620-9501
Fax: (808) 620-9529

1.4 SURROUNDING LAND USES

The Proposed Project is bordered by Lualualei Homesteads (a large lot residential subdivision) and other residences to the west, vacant lands owned by DHHL to the north, the Ulu Ke Kukui transitional housing project and Hoʻomalu O Nā Kamaliʻi to the northwest, land that is currently under construction for housing as part of D.R. Horton's Sea Country residential development to the east, and the Māʻili Kai residential community to the south.

As previously mentioned, TMK 8-7-010: 007 is an 89.274-acre property. Based on discussions with DHHL, a 4.857-acre portion of the 89.274-acre property was withheld from conveyance to the State. The U.S. Coast Guard is responsible for further evaluating the 4.857-acre property and DHHL has indicated that once appropriate action has been taken, the excluded land will be transferred to the State. At this time, the total land area that has been transferred to DHHL is 84.417 acres. KS plans to develop approximately 40 acres for the KCLC at Māʻili.

Other uses within TMK 8-7-010: 007 include approximately 8.7 acres leased to the Ulu Ke Kukui transitional housing project and Hoʻomalu O Nā Kamaliʻi. The Ulu Ke Kukui transitional housing project opened in December 2008, and maintains 78 multi-family units. Eligible families can stay for up to two years and participate in classes and programs. Hoʻomalu O Na Kamaliʻi is a receiving home for children entering the child welfare system and opened in April 2009. The ten bedroom home accommodates up to 15 children and provides staffing, access to social workers, and other health professionals.

While no formal action has been taken by DHHL to date, DHHL's current intentions are to develop approximately 33.5 acres of vacant land on the property, adjacent to the northern boundary of the Proposed Project, as a residential community. The DHHL residential community is anticipated to be developed in phases and consist of a mix of single-family and multi-family units. Phase 1 includes 100 single-family units and is

anticipated to be under construction in 2016. Phase 2 includes 80 multi-family units and is anticipated to be under construction in 2018. The last phase, Phase 3, includes 80 multi-family units and is expected to be under construction in 2020. The DHHL residential community is not a part of the Proposed Project, and is therefore, not covered in this EA.

An abandoned quarry site operated by Pacific Aggregate is located northeast of the Proposed Project. Pacific Aggregate had proposed a construction and demolition waste landfill at the quarry site, however, their application for a Special Use Permit was denied by the State Land Use Commission in 2006.

Farming and other agricultural activities also occur further inland, to the east of the Proposed Project.

1.5 GENERAL BACKGROUND

Kamehameha Schools' mission is to fulfill Pauahi's desire to improve the capability and wellbeing of native Hawaiians into perpetuity through education. KS believes that working within native Hawaiian communities to strengthen schools and other educational providers will not only serve native Hawaiian families, but will help to lift the level of education and well-being for the entire community. To that end, Kamehameha Schools' *Ka Pua* Initiative on the Wai'anae Coast will work to align commitments and investments across the entire Wai'anae Coast and make significant investments in facilities, capacity, and community infrastructure. Through *Ka Pua*, Kamehameha Schools is poised to make a significant difference through partnership and engagement.

One of the most significant commitments Kamehameha Schools is making to the Waiʻanae Coast is the development of the KCLC at Māʻili that will not only symbolize a collective commitment to the community and its children, but will model innovative and collaborative supports for *keiki* (child) and *ʻohana* (family), fostering better educational outcomes, strengthening the community, and deepen a vibrant native Hawaiian culture. As part of the overall *Ka Pua* Education Plan, the KCLC at Māʻili will:

- Establish state of the art educational spaces that promote academic success, recognize the importance of culture-, ʻāina- and ocean- based learning; span the P-20 continuum; and manifest the aspirations and goals of the people of the Waiʻanae Coast.
- Serve as the nexus Kamehameha Schools' presence on the Waiʻanae Coast, providing KS programs a venue to operate in service to the community.

- Reduce significant barriers for community collaborators to expand or replicate successful practices on the Waiʻanae Coast by providing free to low cost facilities while ensuring greater cross collaboration among providers.

DHHL's mission is to manage the Hawaiian Home Lands trust effectively, and develop and deliver land to native Hawaiians. The proposed action will be implemented under the provisions of the Hawaiian Homes Commission Act (HHCA), 1920, as amended. The HHCA authorizes DHHL to lease to native Hawaiians the right to use and occupy Hawaiian Home Lands for agricultural, pastoral, and residential purposes, and to grant licenses to public utilities and others for various purposes. In accordance with the HHCA, the Hawaiian Homes Commission has the power to designate land uses. As such, Hawaiian Home Lands are not subject to County zoning or other land use controls. DHHL is committed to enhancing the quality of life for native Hawaiians. This commitment extends beyond the provision of homestead lots and affordable homes. DHHL recognizes that to rejuvenate the native Hawaiian population, education needs to be factored into the equation.

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2.0

PROJECT DESCRIPTION

2.0 PROJECT DESCRIPTION

This section provides background information and a general description of the proposed KCLC at Māʻili and infrastructure improvements to support the Proposed Project.

2.1 LOCATION

The KCLC at Māʻili will be located on approximately 40 acres of land in Māʻili. The 40-acre project site is part of a larger 89.274-acre parcel owned by DHHL (See Figure 1-1). As described in Section 1.4, the DHHL intends to develop approximately 33.5 acres, adjacent to the northern boundary of the KCLC at Māʻili, as a residential community. Photographs of the project site are included as Figure 2-1.

2.2 NEED FOR THE PROJECT

Kamehameha Schools' (KS) mission is to fulfill Princess Bernice Pauahi Bishop's desire to create educational opportunities in perpetuity to improve the capability and well being of people of native Hawaiian ancestry. Although their campuses on Oʻahu, Maui and Hawaiʻi island have served many young native Hawaiians well, KS realizes that to successfully improve the capability and well-being of native Hawaiians through education, the single most important place for KS to be is working in tandem with the Hawaiʻi public education system. Of the 75,000 school aged native Hawaiian children in Hawaiʻi, about 60,000 attend a public school.

To address this need, KS launched the *Ka Pua* (Figuratively – the child) Initiative in 2009. This long-term initiative aims to significantly deepen the support of and increase the intergenerational impact of Pauahi's legacy on children, families, and communities. Geographically, the Waiʻanae Coast was selected for this initiative because it contains the highest number of native Hawaiians per census tract in the nation. KS believes that by working with the community where native Hawaiians reside to strengthen schools and other educational providers, they will not only serve native Hawaiian families but will also help to uplift the entire level of education and well-being for the entire region.

It is also apparent that schools along the Waiʻanae Coast have a dedicated staff working hard to meet the needs of these students. Many unique and extremely successful programs have been created at various schools along the Waiʻanae Coast to assist students to become productive members of society as adults. Recognizing this, the *Ka Pua* Initiative plans to work with the educational framework established by public and private community collaborators, including the DOE, to serve as a catalyst to build on successful

programs already in the community, and to create new programs that would improve the educational success of families (from infancy to *kupuna* (ancestor), including prenatal education), particularly those of native Hawaiian descent.

2.3 KEY ELEMENTS OF THE PROPOSED PROJECT

2.3.1 Vision Statement

The vision of the *Ka Pua* Initiative is as follows:

> *All children on the Waiʻanae Coast are **connected** to place, **supported** in their learning and are **succeeding** as tomorrow's local and global leaders.*

2.3.2 Key Concepts

This vision will be achieved through three key strategies designed to strengthen the web of educational opportunities, services, and infrastructure on the Waiʻanae Coast of Oʻahu. Each strategy brings focused partnerships, collaborations, and new educational innovations that aim to connect learning from infancy through adulthood, to deepen and flex the bridges linking social service, health, and educational providers, and to design new spaces for collaborative student learning.

1. Intensively support **needle-moving collaborations** focused on key impact areas for student success which includes building capacity among key providers on the Waiʻanae Coast.
2. Ensure **schools are centers of the community**, providing effective learning opportunities, integrated supports for students, and, most importantly, an unshakeable commitment to student success.
3. Build two state of the art **community learning centers** that provide excellent programming and anchor collaborative, capacity building strategies.

Current Focus

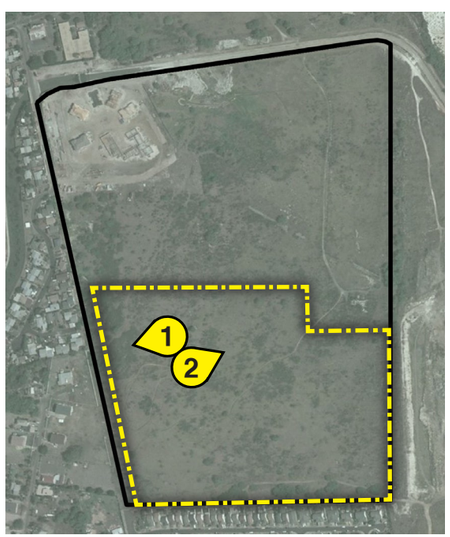
The current focus for the *Ka Pua* Initiative includes the following strategic priorities to enhance community engagement and build capacity. They include:

- **All Children Connected** - Recognizes that a strong sense of personal self can be anchored by an in-depth understanding of where you come from and the relationship lays a foundation that *keiki* and their families can build upon.
- **All Children Supported** - Focuses on an innovative wrap-around system of care at Nānākuli/Waiʻanae complex area schools that reduces all barriers to learning

1. Panoramic makai view from the project site.

2. Panoramic mauka view from the project site.

Key Map



Tax Map Key: 8-7-010:007

Proposed Project

FIGURE 2-1

Site Photographs

Kamehameha Schools
Community Learning Center at Mā'ili

Kamehameha Schools ISLAND OF O'AHU

NORTH

NOT TO SCALE

PBR HAWAII & ASSOCIATES, INC.

while creating a positive and engaging school culture. Several schools are in the early planning process for next year to deliver comprehensive services and programs on site.

- **All Children Succeed** - Supports the academic, social and family college readiness pathway, from cradle to career (P-20).

To successfully implement the *Ka Pua* Initiative, KS seeks to expand the opportunity to significantly impact education by building community learning centers along the Waiʻanae Coast. These learning centers will help to establish educational spaces that recognize the importance of *ʻāina* (place)-based learning, will span across the P-20 continuum, and are specific to the aspirations and goals of the people of the Waiʻanae Coast. They will provide a venue to model innovative and collaboration in support of *keiki* and *ʻohana* that will in turn foster better educational outcomes. This will help to uplift the community as a whole, and deepen their collective connection to a vibrant native Hawaiian culture. The proposed KCLC at Māʻili, the subject of this EA, is one of the community learning center sites that will serve to implement *Ka Puaʻs* transformative initiative.

Community Consultation and Program Development

The *Ka Pua* Initiative has made significant in-roads in defining a program for the KCLC at Māʻili within the context of the community. The community consultation process commenced with a listening tour of the Waiʻanae Coast. The listening tour included meetings with community leaders and *huakaʻi* (journey) to *wahi kupuna* (ancestral places) of the Waiʻanae Coast, and culminated in March 2012 with the Waiʻanae Coast Community Forums on Education. These forums engaged hundreds of community residents on focused conversations about education. Much *manaʻo* (ideas/suggestions) was gathered through these discussions and the process has helped shape the following principles of program design to date. They will ultimately guide the design of the educational programming for the KCLC at Māʻili. Guiding principles include:

- Focus on improved educational outcome for *keiki*;
- Reflect our cultural heritage and support its strengthening into the future;
- Help our *keiki* thrive, from birth to a productive life reflected by the ability to complete post-secondary education, to secure a living wage job, and to live a happy, healthy and satisfied life;
- Listen to the voices of residents of the Waiʻanae Coast; and
- Complement the good work of cultural practitioners and providers already in place and to enhance their efforts.

By honoring these principles, KS will be grounded in a shared vision of what the community has shared as necessary to improve educational opportunities on the Waiʻanae Coast and attain better outcomes for *keiki* and families.

The *Ka Pua* staff continues to convene small work groups to further design and develop individual areas of the facility. It is their belief that only through the collective contribution and design with community members that this facility will be successful.

2.3.3 Site Development

Based on the input obtained from the community consultation and as a part of the overall *Ka Pua* Education Plan, the following site goals for the development of the KCLC at Māʻili were developed:

- Establish state of the art educational spaces that promote academic success, recognize the importance of culture-, ʻāina- and ocean- based learning; span the P-20 continuum; and manifests the aspirations and goals of the people of the Waiʻanae Coast.
- Serve as the nexus for Kamehameha Schools' presence on the Waiʻanae Coast, providing KS programs a venue to operate in service to the community.
- Reduce significant barriers for community collaborators to expand or replicate successful practices on the Waiʻanae Coast by providing free to low cost facilities while ensuring greater cross collaboration among providers.

KS also realizes that critical to the success of the KCLC at Māʻili, will be their ability to maximize services to native Hawaiians on the Waiʻanae Coast. This will be accomplished through the following strategies:

1. Draw upon strengths of the forward vision and lasting legacies of Princess Bernice Pauahi and Prince Jonah Kūhiō by integrating the KCLC at Māʻili with a potential native Hawaiian residential community to be developed by DHHL.
2. Foster transportation that connects *keiki* and families to and from the learning center from and along the entire Waiʻanae Coast.
3. Develop a suite of programs that reflects the aspirations of the Waiʻanae Coast residents that will attract native Hawaiian students.

2.3.4 Conceptual Plan

The community consultation process and site development goals described above set the foundation for the initial program and conceptual plan developed for the KCLC at Māʻili. During the conceptual plan development, it became apparent that to be successful, the KCLC at Māʻili needed to fit within the fabric of the surrounding residential community and proposed DHHL residential community. This served to guide the layout of the concept plan. In addition, as the community input process continues, the site development and the layout of buildings for the KCLC at Māʻili are expected to be refined

to ensure that long-range uses of the project site are consistent with the Proposed Project's vision. Wherever appropriate, sustainable development concepts will be incorporated into the plan as indicated in Section 2.4 below.

The current plan for the KCLC at Māʻili includes approximately 180,000 square feet of built space, catering to a total student population of roughly 1,450 students and 400 staff. The built structures being planned on the KCLC at Māʻili are expected to cover approximately 4.13 acres of the roughly 40-acre project site. The structures on the KCLC at Māʻili are being planned with heights of one- to two-stories, to blend-in with the surrounding residential context and to allow better connection to outdoor facilities from the indoor learning spaces. The spaces within the buildings are being designed to ensure maximum flexibility as programs are developed and refined.

While the exact spatial requirements are still being refined, the KCLC at Māʻili is envisioned as being developed in three phases and uses envisioned include an early childhood education complex, educational support (P-20 programs), and student and community support facilities. The major land use elements of the conceptual plan envisioned for the three phases of the KCLC at Māʻili are described below and illustrated in Figure 2-2.

Phase 1: Early Childhood Education Complex

The Early Childhood Education Complex (ECE Complex) will focus on the youngest members of the *lāhui* (people) and is planned to be constructed as the first phase of the KCLC at Māʻili. The ECE Complex will provide coordination of early childhood education programs and services at the learning center and across the community, while engaging parents and caregivers in meaningful learning about the importance of their roles as their children's first teachers. The programs envisioned for the ECE Complex will include working in collaboration with several high quality ECE program providers to operate classrooms at the KCLC at Māʻili, and developing a center to support professional development, learning for early childhood educators and program managers, and increasing access to information for families across the Waiʻanae Coast. The population for this phase may be in the range of about 330 students and 170 faculty and staff.

Anticipated activities within the ECE Complex will include the following:

- Educational activities such as an infant toddler care program, preschool programs, and a prenatal to third grade learning *council.* These facilities could be run by KS or other educational providers along the Waiʻanae Coast.
- A *kauhale* for the KS Community Education and Implementation Division (CEI Kauhale) is proposed to ensure greater KS CEI coordination in the Nānākuli-Waiʻanae region that would help to maximize the natural synergies between KS CEI programs to strengthen family education on the Waiʻanae Coast.

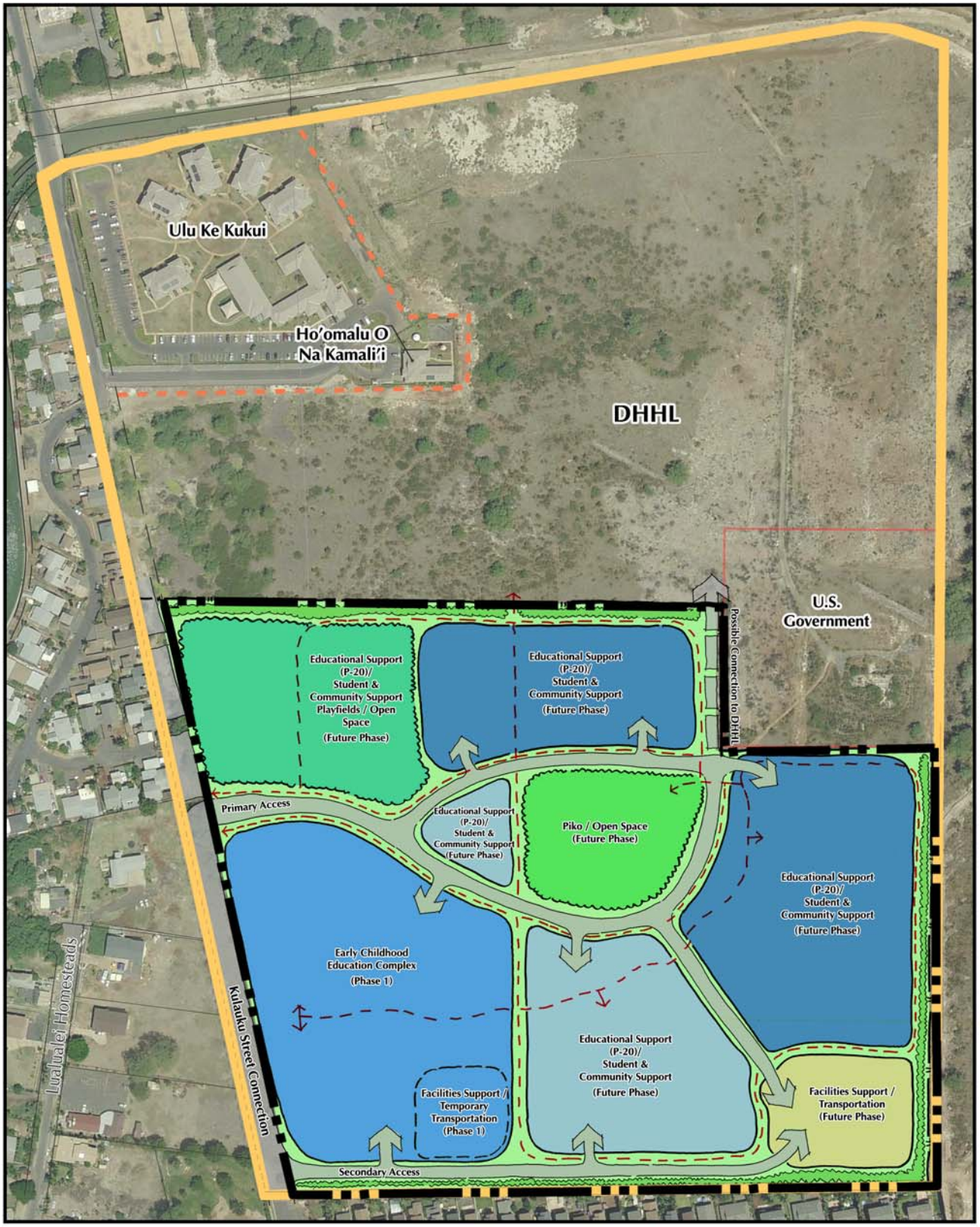
- A transportation solution, facilitating a coordinated transportation system to connect people to educational opportunities, including other KCLC sites, collaborator program offices, and *ʻāina*-based learning sites to help address the need for transportation obstacles for individuals along the Waiʻanae Coast. The first phase of this facility may be located near the Phase 1 development in temporary facilities.

As the initial phase of the development, the ECE Complex is located in the *southwestern* portion of the property, close to the initial access to the property (which is proposed to be an extension of the Kulauku Street right-of-way). This would also allow for convenient and safe access and drop-off of toddlers, preschoolers and others visiting the ECE Complex. The proposed permanent location for the transportation solution may be located in the *mauka* (inland) portion of the property, with a temporary facility located closer to the entrance during the initial phase of development.

Phase 2: Educational Support (P-20)

Phase 2 of the KCLC at Māʻili would provide educational support. The total population for this phase may be in the range of about 820 students and 170 faculty and staff. This phase could include:

- Two Hawaiian-focused public charter K-12 schools.
- A student enrichment center that would deliver specialty learning and tutoring spaces that enhance and further develop the strengths and talents of students on the Waiʻanae Coast, both through a school environment and through enrichment activities not typically offered to Waiʻanae Coast students.
- A health and wellness complex that supports *Ka Pua's* holistic approach to well-being, aimed at educating learners and complementing existing services on the Waiʻanae Coast that help all residents develop and maintain a healthy lifestyle, as well as provide for the basic first needs of its users. Activities in this complex could include a clinic for KCLC at Māʻili learners, a facility for community-sponsored health workshops, group fitness classes, programs offered through community collaborators, walking and biking paths, a pool, play courts and outdoor play fields.
- Of importance to the community, at their request, a transportation solution, facilitating a coordinated transportation system, would include the development of the permanent transportation and support facilities on the mauka (southern) corner of the property may occur in Phase 2 or Phase 3, as the need for these services expands beyond that of demand generated by the facilities provided in Phase 1.
- A *piko* (focal point, or in this case, a large, central gathering area) may accommodate 500 people at its maximum capacity in a naturally landscaped gathering place that will offer users of the KCLC at Māʻili a chance to become



LEGEND

Proposed Project

Tax Map Key: 8-7-010:007

Pedestrian / Walk / Jogging Trail

FIGURE 2-2
Conceptual Site Plan

Kamehameha Schools
Community Learning Center at Mā'ili

Kamehameha Schools — Island of O'ahu

North

Linear Scale (feet)

0 250 500

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Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.

centered with *ke Akua* and *nā kupuna* as the day begins. Development of the *piko* may occur in Phase 2 or Phase 3, as the need for larger gathering areas expands beyond that of demand generated by the facilities provided in Phase 1.

The proposed Hawaiian-focused charter schools may be located in the mauka portion of the project site. The health and wellness complex, pool, courts and outdoor play areas may be located on the northern side of the project site, adjacent to the vacant lands to be developed by DHHL, since these facilities may be utilized by the residents of the proposed DHHL residential community. A buffer would be provided between the KCLC at Māʻili and the proposed DHHL residential community, but the facilities would be within walking distance from each other and a roadway and pedestrian access between the two project sites could be provided, as appropriate.

The *piko* (focal point) would be prominently located within the KCLC with a large green open space and naturally landscaped gathering space, with convenient pedestrian and vehicular access to all of the educational program and activities within the KCLC at Māʻili. The proposed permanent location for the transportation solution may be located in the *mauka* portion of the property, with a temporary facility located closer to the entrance during the initial phase of development.

Phase 3: Student and Community Support Facilities

Phase 3 would address the need of one of the most frequently voiced requests by community members for safe spaces for youth, with culturally-appropriate learning opportunities that can help students on the path toward a career and college. Thus, in this phase, much of the planning effort will be focused on developing mutually supportive programs and spaces which reflect the community's *manaʻo*, along with other support facilities that will be identified during the program refinement phase of the project. Phase 3 is estimated to have a total population in the range of 300 students and 60 faculty and staff. This phase of the project could include:

- A Student Support Complex that would provide for art-focused learning opportunities and enrichment, and educational services to support what students are learning in area schools. It is intended that the Student Support Complex be accessible to both regular learners of the KCLC at Māʻili and to any student from the Waiʻanae Coast. The facility will provide students with a safe, quiet place to study, educational resources, on-site academic support services, computers and printers.
- A Community Learning Complex is proposed to serve as the primary meeting and workshop facility for the entire learning center.
- Other student support facilities may include a dining facility and other student/community support uses. Such a facility may cater to learners of the KCLC at Māʻili and possibly other student learners.

Because the Student and Community Support Facilities may be shared with learners from the KCLC at Māʻili, as well as other learners from the Waiʻanae Coast, the facilities are proposed to be located closer to the primary entrance for convenient access to parking and drop-off/pick-ups.

Outdoor Learning Opportunities

Recognizing that learning does not necessarily need to occur under a roof, a large portion of the project site is being planned to be left in open space to allow for outdoor learning opportunities. Outdoor activities and learning opportunities envisioned for the KCLC at Māʻili include the *piko*, ethnobotanical gardens, and recreational activities. Indigenous gardens and educational gardens are planned to be incorporated within the learning center so students and the community can learn about endemic, Polynesian-introduced and other plants of cultural value to Hawaiʻi. Also proposed is a variety of indoor and outdoor recreational facilities, including walking and bike paths, play courts (covered and/or uncovered), recreational fields, and a swimming pool. Restrooms and other site amenities (such as benches and water stations) would be sited for convenient access to the recreational areas.

Access and Circulation

The initial access to the KCLC at Māʻili would be from Farrington Highway via Kaukama Road and Kulauku Street which would connect to an existing roadway easement along the *makai* side of the project site (herein referred to as the Kulauku Street Extension). Two access points from the Kulauku Street Extension are proposed, with the primary access to the property located toward the south side and a secondary access located further north. The primary access to the project site will provide access to all of three phases of development through a loop system providing interconnected access throughout the KCLC at Māʻili. The loop system will also help to facilitate bus drop-off and pick-ups for the various programs envisioned within the project site. A pedestrian circulation network of sidewalks and separated paths provide access from the north to south and mauka to makai side of the project site. A jogging/walking path is also provided along the periphery of the KCLC at Māʻili.

During the first phase of development, the primary access road may serve as the initial access to the Phase 1 facilities. As traffic conditions and development phasing warrants, the Kulauku Street Extension will be extended toward the northern side of the project site and the secondary access will be constructed to provide service to the various facilities on the KCLC at Māʻili. It is contemplated that when the proposed DHHL residential community commences and with further development of the KCLC at Māʻili facilities, the Kulauku Street Extension may be extended to connect to Kulaaupuni Street on the northern side of the DHHL property, subject to the development of DHHL. This would provide an access to St. John's Road, and provide an additional access to the KCLC at

Māʻili from the north. When ultimately developed, the Kulauku Street Extension would be a 60-foot right-of-way, however the road may not be developed to the ultimate right-of-way width during the earlier phases of development.

2.4 ENVIRONMENTAL SUSTAINABILITY

KS has expressed their desire for the KCLC at Māʻili to be a sustainable cultural and educational learning center that supports the entire Waiʻanae Coast. It is the design intent of the KCLC at Māʻili to blend with the fabric of the existing Māʻili community and proposed DHHL residential community, incorporating applicable sustainable concepts into the design and construction of the KCLC at Māʻili. For example, to maintain the low-density character of the existing development in this portion of Māʻili, the proposed structures are expected to be low-rise. In addition, the Proposed Project will be designed to encourage walking and jogging with an interconnected trail and pathway system incorporated throughout the KCLC at Māʻili and as part of the fitness program. Because of the significance of *ʻāina*-based learning in teaching indigenous practices that sustain Hawaiian lands and communities, large areas of the KCLC at Māʻili will be designated for open space, edible landscaping, ethnobotanical gardens, recreational facilities and outdoor gathering areas. Other sustainable design concepts including the use of renewable energy sources, water and energy conservation methods, low impact development, and green building technology will be explored and incorporated as appropriate, into the KCLC at Māʻili.

2.5 PROJECT IMPLEMENTATION

2.5.1 Timing of Action

Due to unforeseen sustainable State funding for early childhood education, KS desires to commence project construction in 2013 and to complete it incrementally. Initial program delivery of the KCLC at Māʻili is expected to occur in the fall of 2014. KS intends to complete construction of all phases of the project in approximately 6 years. Thus a 6-year time horizon was utilized as a base for the preparation of the conceptual plan. However, unforeseen delays (economic, funding, market, development construction and other factors beyond KS control) could extend completion of construction to 15 years (See Table 2-1). As such, a 6- to 15-year project phasing timeframe is being assumed.

Table 2-1: Preliminary Project Phasing

PHASE	ESTIMATED TIME TO COMPLETE COMPLETION	SITE DEVELOPMENT
Phase 1	Proposed construction may occur as early as 2013 and may be operational as early as 2014	• Early Childhood Education Complex • Infant/Toddler Care Center • Prenatal to Third Grade Learning Kauhale • CEI Kauhale • Transportation/Facilities Support (Temporary) • Gathering spaces • Indigenous gardens • On-site infrastructure (portion) • Off-site infrastructure (portion)
Phase 2	Proposed construction may occur from as early as 2016 with operation from 2017 (but may extend out till 2022 for construction and 2023 for operation)	• Hawaiian-Focused Public Charter Schools • Student Enrichment Center • Health and Wellness Complex including pool, playcourts and sports field • Transportation/Facilities Support (Permanent) • *Piko* • Gathering spaces • Indigenous gardens • Off-site infrastructure (expansion) • On-site infrastructure (expansion)
Phase 3	Proposed construction may occur as early as 2018 with operation from 2019 (but may extend out 2028 for construction and 2029 for operation)	• Student Support Complex • Community Learning Complex • Transportation/Facilities Support (Permanent-as needed) • *Piko* (as needed) • Gathering spaces • Indigenous gardens • Off-site Infrastructure (expansion) • On-site Infrastructure (expansion)

2.5.2 Estimated Infrastructure Costs

The estimated off-site and on-site infrastructure costs for the Proposed Project are $29,016,175.00 in 2013 dollars.

Table 2-2: Estimated Infrastructure Costs

ACTIVITY	COST
Off-site Infrastructure Costs o Roadway o Water System o Drainage o Wastewater o Electrical	$7,850,225.00
On-site Infrastructure Costs	$20,428,650.00
Facilities Charges o Water System Facilities Charge o Wastewater Facilities Charge	$737,300.00
TOTAL	**$29,016,175.00**

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3.0

RELATION TO PLANS AND POLICIES

3.0 RELATION TO PLANS AND POLICIES

The State of Hawaiʻi and City and County of Honolulu land use plans, policies, required permits and approvals relevant to the Proposed Project are described below.

3.1 STATE OF HAWAIʻI

3.1.1 State Land Use Law, Chapter 205, Hawaiʻi Revised Statutes

The State Land Use Law (Chapter 205, HRS), establishes the State Land Use Commission (LUC) and authorizes this body to designate all lands in the State into one of four districts: Urban, Rural, Agricultural, or Conservation. These districts are defined and mapped by the LUC in order to ensure compatibility with neighboring land uses and protection of public health.

Discussion: The Proposed Project is located within the State Agricultural District (Figure 1-4). In accordance with the HHCA, Hawaiian Home Lands are not subject to land use controls by the State or County. However, the Proposed Project is fully intended to be developed in conformance with appropriate State and County standards. In the future, should KS acquire the project site from DHHL, KS would then, as necessary, obtain the required approvals to conform with the appropriate State and County standards.

3.1.2 Coastal Zone Management Act, Chapter 205A, Hawaiʻi Revised Statutes

The Coastal Zone Management (CZM) Area, as defined in Chapter 205A, HRS, includes all the lands of the State of Hawaiʻi. The project site sits inland from the shoreline and is located outside of the SMA (Figure 1-7). The proposed actions have been assessed and should have little to no negative impact on the goals set forth in the State's ten management objectives. CZM Act Program management objectives and applicability to the Proposed Project are discussed below:

<u>Recreational Resources</u>

Objective: Provide coastal recreational opportunities accessible to the public.

> *Policy A: Improve coordination and funding of coastal recreational planning and management; and*

Policy B: Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;
(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;
(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;
(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and
(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and County authorities; and crediting such dedication against the requirements of section 46-6.

Discussion: The Proposed Project will be located inland, approximately 1/3 miles away from the shoreline; therefore, it is anticipated that there will be no effect on existing coastal recreational resources.

Historic Resources

Objective: Protect, preserve and, where desirable, restore those natural and man-made historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policy A: Identify and analyze significant archaeological resources;

Policy B: Maximize information retention through preservation of remains and artifacts or salvage operations; and

Policy C: Support State goals for protection, restoration, interpretation, and display of historic resources.

Discussion: An Archaeological Inventory Survey was conducted for the Proposed Project, and re-located three previously identified State Sites: 50-80-07-7081, 50-80-07-7082, and 50-80-07-7083. The Archaeological Inventory Survey recommends no further archaeological work for the survey area. Should any unknown sites be encountered during project development, work in the immediate area will halt and the State Historic Preservation Division will be notified in accordance with State regulations.

Scenic and Open Space Resources

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

Policy A: Identify valued scenic resources in the coastal zone management area;

Policy B: Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

Policy C: Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

Policy D: Encourage those developments which are not coastal dependent to locate in inland areas.

Discussion: The Proposed Project will be located inland, approximately 1/3 miles away from the shoreline. This region has open space with outstanding views of the Waiʻanae Mountain Range to the north. The project site will be transformed from vacant land to an educational learning center. Best Management Practices (BMPs) will be employed during construction to reduce erosion of soils and fugitive dust during construction, particularly in the vicinity of the drainage structures along the Waiʻanae Coast. It is anticipated that there will be no effect on the quality of the coastal scenic resources.

Coastal Ecosystems

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

Policy A: Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

Policy B: Improve the technical basis for natural resource management;

Policy C: Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

Policy D: Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

Policy E: Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Discussion: Although the Proposed Project is located inland and approximately 1/3 miles away from the shoreline, its development will incorporate measures to mitigate any water quality impacts from surface runoff in accordance with applicable State and County drainage regulations. Controlling runoff particularly helps to ensure that the construction does not increase inputs of sediment into Māʻili Channel.

It is anticipated that over the long term the Proposed Project will not have a deleterious effect on the quality of the coastal ecosystems. To address storm water quality, a civil engineer has been retained to design an on-site storm water management system that maintains run-off quantity and quality at pre-development conditions. A variety of sustainable design features being considered include water quality swales, porous pavements, landscaping and detention basins to limit off-site discharges to pre development conditions.

Economic Uses

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

Policy A: Concentrate coastal dependent development in appropriate areas;

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

Discussion: The Proposed Project does not directly impact the State's coastal-dependent economy, however, during construction it will generate short-term employment (and accompanying State income and excise tax revenue).

Coastal Hazards

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

Policy A: Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and non-point source pollution hazards;

Policy B: Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and non-point source pollution hazards;

Policy C: Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

Policy D: Prevent coastal flooding from inland projects.

Discussion: A portion of the project site is located within the tsunami evacuation zone, however the Proposed Project is more than 1/3-miles inland and is located near a tsunami refuge area. During construction, BMPs are expected to be employed to reduce non-point source pollution caused by the potential erosion of soils and fugitive dust, etc.

Managing Development

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

Policy A: Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;

Policy B: Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements; and

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

Discussion: All improvements will be developed in accordance with all Federal, State, and County requirements and standards affecting health and safety. As with all construction projects that cause soil disturbance, there is the potential for the creation of non-point source pollution. The KCLC at Māʻili and associated infrastructure improvements will include both structural and non-structural controls to reduce the impact during construction. Due to the project site's inland location, it should not be considered a "significant coastal development." However, this EA is intended to communicate the impacts of the KCLC at Māʻili.

Public Participation

Objective: Stimulate public awareness, education, and participation in coastal management.

Policy A: Promote public involvement in coastal zone management processes;

Policy B: Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and

Policy C: Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Discussion: KS has met with various stakeholders in the community and has also provided the public several opportunities to participate in the *Ka Pua* Initiative. KS began meeting with community leaders in 2011, including participation in several *huakaʻi* (journey) to *wahi kupuna* (ancestral places) of the Waiʻanae Coast. In March of 2012, KS hosted five Community Forums on Education that engaged hundreds of community residents. These forums provided an opportunity for the community to shape the principles and program design for the *Ka Pua* Initiative and the KCLC at Māʻili. KS has been in coordination with the area Neighborhood Boards (NB), and made presentations to the Nānākuli-Māʻili NB on February 19, 2013, and the Waiʻanae NB Education Committee on February 14, 2013. This Draft EA also provides a means for public input. Prior to and throughout the development of the Draft EA, various agencies were consulted (See Section 7.0). The Draft EA will be distributed to various agencies and interested parties, and submitted to the Office of Environmental Quality Control, commencing a 30-day public review period.

Beach Protection

Objective: Protect beaches for public use and recreation.

Policy A: Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

Policy B: Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

Policy C: Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion: Due to the distance from the shoreline, no adverse impact to area beaches is anticipated by the structures and infrastructure proposed as part of the KCLC at Māʻili.

Marine Resources

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

Policy A: Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

Policy B: Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

Policy C: Assert and articulate the interests of the State as a partner with Federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

Policy D: Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

Policy E: Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Discussion: The project site is located approximately 1/3 miles inland from the shoreline. Due to the distance from the shoreline, no adverse impact to marine resources is anticipated.

3.1.3 Hawaiʻi State Planning Act, Chapter 226, Hawaiʻi Revised Statutes

The Hawaiʻi State Plan, Chapter 226 HRS (2007) provides guidelines for the future growth of the State of Hawaiʻi. The Hawaiʻi State Plan identifies goals, objectives, policies, and priorities for allocating the State's resources, including public funds, services, human resources, land, energy, and water. The plan was enacted to achieve "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." Chapter 226 HRS (2007).

Discussion: The Proposed Project is consistent with and implements many of the planning goals and policies specified in Chapter 226, HRS. Section 226-21 sets forth goals relating to the support of educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups and promote programs enhancing understanding of the cultural heritage of Hawaiʻi. Section 226-23 sets forth goals relating to the availability of sufficient resources to provide for recreational needs and adequate, accessible physical fitness programs to promote the physical and mental well-being of the people of Hawaiʻi, and support of cultural activities. Section 226-25 sets forth goals relating to improve knowledge and cultural heritage and support cultural values. The KCLC at Māʻili is consistent with the State's goals for individual and family self-sufficiency, social mobility, and community well-being.

3.2 CITY AND COUNTY OF HONOLULU PLANS

3.2.1 Oʻahu General Plan

The Oʻahu General Plan is the policy document for the long-range development of the Island of Oʻahu. The Oʻahu General Plan is a statement of general conditions to be sought in the 20-year planning horizon and policies to help direct attainment of the plan's objectives.

Although DHHL lands are not subject to the City and County of Honolulu land use plans and policies, including the Oʻahu General Plan, specific General Plan goals and policies relevant to the Proposed Project are discussed below.

<u>Health and Education</u>

Objective B – To provide a wide range of educational opportunities for the people of Oʻahu.

(1) Support education programs that encourage the development of employable skills.

(2) Encourage the provision of informal educational programs for people of all age groups.

(3) Facilitate the appropriate location of learning institutions from the preschool through the university levels.

Discussion: The KCLC at Māʻili is expected to be a sustainable, cultural and educational learning center that will support and help to uplift the entire Waiʻanae Coast. It can serve as a model for delivery of an innovative and collaborative educational program for learners of all age groups that are integrated with public and private educational facilities,

programs and opportunities along the Waiʻanae Coast and beyond. While the learning center is still conceptual at this stage, it is envisioned as a multi-generational learning venue that blends the best of indigenous and western knowledge and experiences. These learning centers will help to establish educational spaces that recognize the importance of *ʻāina*-based learning, will span across the P-20 continuum, and are specific to the aspirations and goals of the people of the Waiʻanae Coast. They will provide a venue to model innovative and collaboration in support of *keiki* and *ʻohana* that will in turn foster better educational outcomes. This will help to uplift the community as a whole, and deepen their collective connection to a vibrant native Hawaiian culture.

3.2.2 Waiʻanae Sustainable Community Plan

The City and County of Honolulu has adopted the Waiʻanae Sustainable Community Plan (WSCP) as one of eight community-oriented plans to guide public policy, investment and decision making through the 2025 planning horizon. The WSCP was developed by DPP and its consulting team in partnership with the community. The document contains policies specific to the Waiʻanae Coast. These policies are then adopted through ordinances. The current version of the WSCP (which includes the Public Review Draft of the Revised WSCP) was adopted on March 2, 2012 as Ordinance 12-3.

Discussion: Although DHHL lands are not subject to the City and County of Honolulu land use plans and policies, including the WSCP, the KCLC at Māʻili is consistent with the WSCP's Vision Statement and Community Values. The project site is within the confines of the Rural Community Boundary, which is intended to define the extent of built-up or settled areas of the Waiʻanae District. The WSCP Land Use Map, which is intended to reflect the policy statements contained in the WSCP, designates the property as "Rural Residential" (See Figure 1-5). The Rural Residential designation is intended to include single family homes, low-density multi-family homes, and low-density community support facilities including schools and churches.

3.2.3 Land Use Ordinance

The Land Use Ordinance (LUO) implements the goals and objectives of the Oʻahu General Plan and the *Waiʻanae SCP*. All lands within the City and County of Honolulu are zoned into specific districts. The KCLC portion of the property is zoned "AG-2 General Agricultural". The purpose of the AG-2 zoning district is to conserve and protect agricultural activities on smaller parcels of land. The LUO developed the following guidelines for identifying lands for consideration for the AG-2 zoning district:

(1) Lands which are in the State-designated agricultural or urban district and designated agricultural by adopted City land use policies; (2) Lands which are predominantly

classified as other under the Agricultural Lands of Importance to the State of Hawaiʻi system; and (3) Lands which are used or are suitable for agricultural purposes and where a substantial number of parcels are less than five acres in size.

According to the LUO Master Use Table (Table 21-3), "day care" is a permitted use under a Conditional Use Permit-Major and "meeting facility" and "schools: Elementary, Intermediate, and High" are permitted uses under a Conditional Use Permit-Minor in districts zoned AG-2.

Discussion: The KCLC at Māʻili is a permitted use in the AG-2 and other residential-zoning districts with a Conditional Use Permit. During the pre-consultation process, the City and County of Honolulu Department of Planning and Permitting (DPP) noted that the "Attorney General opinion of August 6, 1992, clearly states that lands under the jurisdiction of the DHHL may be exempt from county zoning and Special Management Area (SMA) permits and processes, at the discretion of the DHHL. Upon receipt of a letter from the DHHL exempting the subject site from the Land Use Ordinance (LUO) and SMA requirements, the DPP will relinquish authority concerning all matters pertaining to zoning and/or SMA issues for the subject properties." As previously mentioned, DHHL intends to exercise its right to exempt the Proposed Project from the LUO and a letter will be provided to DPP. In the future, should KS acquire the project site from DHHL, KS would then, as necessary, obtain the required approvals (i.e. zoning, conditional use permit, existing use permit) to conform with the appropriate State and County standards.

3.2.4 Special Management Area Guidelines

The Proposed Project is located well inland of the Special Management Area (SMA). However, in the future, there may be infrastructure improvement(s) that may be required of the project by governmental agencies, that may lie in part or in whole within the SMA. The following guidelines are from Section 25-3.2, ROH, and are used by DPP in the review of developments proposed in the special management area.

(a) All development in the special management area shall be subject to reasonable terms and conditions set by the council to ensure that:

(1) Adequate access, by dedication or other means, to publicly owned or used beaches, recreation areas and natural reserves is provided to the extent consistent with sound conservation principles;

Discussion: The Proposed Project is located well inland from publicly owned or used beaches, recreation areas and natural reserves. While there are significant cultural resources off-site, the KCLC at Māʻili is not sited such that it restricts access to these sites or cultural religious practices. The infrastructure improvements that may be required as a

result of the Proposed Project may extend into the SMA area. Although the exact nature of the off-site improvements that may be required are undetermined, these improvements are likely to be at ground level, or incorporated into existing utility/infrastructure facilities and once constructed are not expected to restrict access to any sites or cultural religious practices.

(2) Adequate and properly located public recreation areas and wildlife preserves are reserved;

Discussion: This guideline is not applicable to the Proposed Project as there are no adjoining public recreation areas and wildlife preserves.

(3) Provisions are made for solid and liquid waste treatment, disposition and management which will minimize adverse effects upon special management area resources; and

Discussion: The Proposed Project includes provisions for solid and liquid waste treatment, disposition and management.

(4) Alterations to existing land forms and vegetation; except crops, and construction of structures shall cause minimum adverse effect to water resources and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltation or failure in the event of earthquake.

Discussion: The KCLC at Māʻili can be characterized as low-density and the land alteration required for the project is not anticipated to result in an adverse effect to water resources with the implementation of BMPs. The future buildings will be one- to two-stories in height and are unlikely to be visible from the SMA or affect recreational facilities in the SMA. The KCLC at Māʻili will be designed to maintain drainage on-site to current quality and quantity, as well as to minimize erosion and siltation. The future buildings will be designed to meet the International Building Code as a means of addressing potential damage from earthquakes. Any off-site infrastructure improvements within the SMA may temporarily affect scenic amenities during construction. Any proposed off-site infrastructure improvements within the SMA should not affect movement of flood waters or increase the risks of flooding.

(b) No development shall be approved unless the council has first found that:

(1) The development will not have any substantial, adverse environmental or ecological effect except as such adverse effect is minimized to the extent practicable and clearly outweighed by public health and safety, or compelling public interest. Such adverse effect shall include, but not be limited to, the

potential cumulative impact of individual developments, each one of which taken in itself might not have a substantial adverse effect and the elimination of planning options;

Discussion: As previously mentioned, the Proposed Project is located well inland of the SMA, and is not expected to have either a direct or indirect adverse environmental or ecological effect, or eliminate planning options.

(2) The development is consistent with the objectives and policies set forth in Section 25-3.1 and area guidelines contained in HRS Section 205A-26;

Discussion: Section 25-3.1 states: "The objectives and policies of this chapter shall be those contained in HRS Section 205A-2." The consistency of the Proposed Project to the objectives and policies HRS Section 205A-2 is discussed in Section 3.1.1 of this EA. The guidelines contained in HRS Section 205A-26 are copied nearly verbatim in Section 25-3.2, ROH, which is the topic of this section of the EA.

(3) The development is consistent with the county general plan, development plans and zoning. Such a finding of consistency does not preclude concurrent processing where a development plan amendment or zone change may also be required.

Discussion: Consistency of the Proposed Project with the Oʻahu General Plan, Waiʻanae Sustainable Communities Plan, and zoning are found in Sections 3.2.1, 3.2.2 and 3.2.3 of this EA.

(c) The council shall seek to minimize, where reasonable:

(1) Dredging, filling or otherwise altering any bay, estuary, salt marsh, river mouth, slough or lagoon;

Discussion: The Proposed Project will not involve actions that dredge, fill or otherwise alter any wetlands identified on the National Wetland Inventory, including bays, estuaries, salt marshes, rivers, sloughs or lagoons.

(2) Any development which would reduce the size of any beach or other area usable for public recreation;

Discussion: The Proposed Project will not reduce the size of any beach or other area usable for public recreation.

(3) Any development which would reduce or impose restrictions upon public access to tidal and submerged lands, beaches, portions of rivers and streams within the special management area and the mean high tide line where there is no beach;

Discussion: The Proposed Project will not reduce or impose restrictions to public access to tidal and submerged lands, beaches, portions of rivers and streams within the special management area, and the mean high tide line where there is no beach, as all actions will occur mauka of Farrington Highway.

(4) Any development which would substantially interfere with or detract from the line of sight toward the sea from the state highway nearest the coast; and

Discussion: The Proposed Project will be located inland, away from the shoreline.

(5) Any development which would adversely affect water quality, existing areas of open water free of visible structures, existing and potential fisheries and fishing grounds, wildlife habitats, or potential or existing agricultural uses of land.

Discussion: The Proposed Project will not occur on or next to open water free of visible structures, existing and potential fisheries and fishing grounds, wildlife habitats or existing agricultural areas. As previously mentioned, BMPs will be implemented to minimize adverse effects on water quality. While portions of the project site have historically been used for various forms of agriculture, including sugar cane cultivation and ranching, the site has been fallow for many years. However, the Proposed Project includes preliminary plans for some on-site productive landscape for educational purposes and to enhance learning experiences.

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4.0

DESCRIPTION OF THE NATURAL AND HUMAN ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATIVE MEASURES

4.0 DESCRIPTION OF THE NATURAL AND HUMAN ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATIVE MEASURES

This section describes the existing conditions of the natural and human environment, potential impacts of the Proposed Project to these environments, and mitigation measures to minimize impacts.

4.1 CLIMATE

The geological features on Oʻahu heavily influence its climate. The Waiʻanae Mountain Range dominates ground-based atmospheric influences within Māʻili. Located on the northwest coastline of Oʻahu, Māʻili is generally warm and dry. The average daily temperature ranges from 70 to 90 degrees Fahrenheit with an average rainfall of approximately 20 inches per year at the coast (NOAA, 2010). Trade winds are typical of the Hawaiian Islands, blowing predominantly from a northeast direction, and averaging approximately seven (7) miles per hour (mph). The tradewinds are generated by semi-permanent Pacific high-pressure cells; however, their impact is less prominent in Māʻili, as the Waiʻanae Mountain Range obstructs winds from the Oʻahu windward coast from making their way over to the leeward side. In the absence of the trades, or winds from the southwest associated with "Kona" storms occurring predominately in the winter months, winds in Māʻili are generally light to variable. For the most part, the diurnal heating and cooling of the island gives rise to light onshore sea breezes during the day, and gentle offshore land breezes at night.

Potential Impacts and Mitigation Measures

The Proposed Project is not anticipated to have significant impact on regional climatic conditions. Some localized temperature increases resulting from paved surfaces and roof tops are to be expected. Within the KCLC, roughly 4.13 acres of the approximately 40-acre project site is expected to be covered by facilities. A large portion of the project site would be free of structures and should not result in significant temperature increases from roadways and buildings. No additional mitigation measures are planned.

4.2 GEOLOGY AND TOPOGRAPHY

Geology

The Island of Oʻahu was formed by two volcanoes; Koʻolau to the east and the older Waiʻanae, to the west. The volcanoes are believed to have formed during the late tertiary to early Pleistocene periods (Macdonald et al., 1983). The Waiʻanae Volcano is thought to be approximately 4 million years old with the caldera located in what is now the Lualualei

Valley. Extensive erosion and stream activity carved deep valleys into the mountain range. The Proposed Project is located within the Lualualei Ahupuaʻa, part of the Waiʻanae Mountain Range. The Lualualei Ahupuaʻa features two major ridges, the Puʻu Māʻiliʻili and Puʻu o Hulu.

Fossilized coral reefs are also an important component of the geology of the Hawaiian Islands. According to Macdonald et al. (1983), "The emerged reefs on Oʻahu are more extensive than those of any other of the Hawaiian Islands". Most of the southern edges of Oʻahu are underlain by a broad, elevated coral reef. The plains were formed from emerged coral reefs and alluvial deposits that developed along the southern edge of the island during interglacial sea level highs. Most of the fossil reefs of southern Oʻahu are about 25 feet above current sea level, and reef limestone extends up to 66 feet above sea level, and covered by approximately ten feet of sand near Waiʻanae (Macdonald et al., 1983). It has been suggested that, historically, sea level changes in Hawaiʻi may have ranged from 250 feet above present levels to as low as 300 feet below current sea levels. Various other sedimentary deposits intersperse the nearby shoreline. These include Holocene beach deposits and alluvium, which are composed mainly of unconsolidated sediment, and are mostly found along the coastline and in drainage ways.

Topography

The project site is on the coastal plain at the foothills of the Waiʻanae Mountain Range. Geologic features in the vicinity of the project site include Puʻu Māʻiliʻili and Māʻiliʻili stream to the north, Puʻu o Hulu to the south, and the Waiʻanae mountain range to the east. No particularly prominent geographic features are present on the property. Elevations at the property range from about 5 to 25 feet above sea level. Most of the project site is relatively flat, with an average slope of less than 1 percent. Figure 4-1 illustrates general slopes at the project site. Steeper slopes are located along the eastern edge of the Proposed Project, with the most significant change in elevation occurring along the southeastern edge of the project site. Along the southeastern edge of the property, the adjacent Sea Country residential subdivision, currently under construction, appears to be about 10-feet higher than the project site.

Potential Impacts and Mitigation Measures

While some grading is likely necessary to accommodate the Proposed Project, much of the site is relatively flat or already extensively graded. To the extent possible, improvements are expected to conform to the existing contours of the land to limit grading. Grading plans will attempt to balance excavation and embankment quantities to the extent practicable. Appropriate engineering, design, and construction measures will be undertaken to minimize potential erosion of soils during construction. All ground-altering activities are expected to incorporate appropriate erosion and sedimentation control.

Path: Q:\Oahu\KS Ka pua Learning Community\GIS\Project\2013 EA Report Fig\Topo.mxd

LEGEND

Proposed Project

Tax Map Key: 8-7-101:007

FIGURE 4-1
Topographic Map

Kamehameha Schools
Community Learning Center at Mā'ili

Kamehameha Schools
North

Linear Scale (feet)
0 250 500

Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI, Bing Maps 2012, HOLIS, C&C of Honolulu 2012

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.

Adverse impact to topography and landforms, attributable to grading activity, is not anticipated as a result of the Proposed Project.

4.2.1 Ground Water Resources/Hydrology

There are no streams or wetlands identified on the property. Māʻili Channel flows near the northwestern portion of the project site. It is designated by the U.S. Fish and Wildlife Service wetlands map as a type E1UBLx and R4SBCx wetland. E1UBLx wetlands are estuarine, subtidal wetlands with an unconsolidated bottom within an excavated basin or channel. R4SBCx wetlands are riverine intermittent wetlands that are seasonally flooded and within an excavated basin or channel.

Potential Impacts and Mitigation Measures

The Proposed Project will result in an increase in impervious area. The increase in impervious area may result in a reduction in water infiltration. However, storm water BMPs, including detention ponds and water quality swales will help to mitigate the impacts. The City and County of Honolulu, Department of Planning and Permitting's Rules Relating to Storm Drainage Standards, January 2000 will be incorporated in drainage design to ensure the Proposed Project does not impact the existing storm water quality. Detention basins are planned for development to maintain the existing design storm peak flows and storm water quality exiting the Proposed Project site. The potential drainage impacts and mitigation are described in greater detail in Section 4.12.3. Where possible, groundwater infiltration rates will be maximized through the implementation of various sustainability features. These could include landscaping features, pervious pavement, vegetative swales, etc.

Protection of ground water quality is also a concern. During construction, BMPs should be implemented to reduce the potential for storm water pollution. Once operational, the KCLC at Māʻili is anticipated to establish management plans to ensure that any hazardous materials utilized are properly stored to reduce the potential for spills. Appropriate spill prevention control and counter measures planning can reduce the potential of spills and releases that may impact the groundwater.

4.3 SOILS AND AGRICULTURE IMPACT

Three soil suitability studies prepared for lands in Hawaiʻi principally focus on the relative agricultural productivity of different land types. These studies are: 1) the USDA Natural Resources Conservation Service (NRCS) Soil Survey; 2) the University of Hawaiʻi Land Study Bureau (LSB) Detailed Land Classification; and 3) the State Department of Agriculture's Agricultural Lands of Importance to the State of Hawaiʻi (ALISH).

4.3.1 Natural Resources Conservation Service

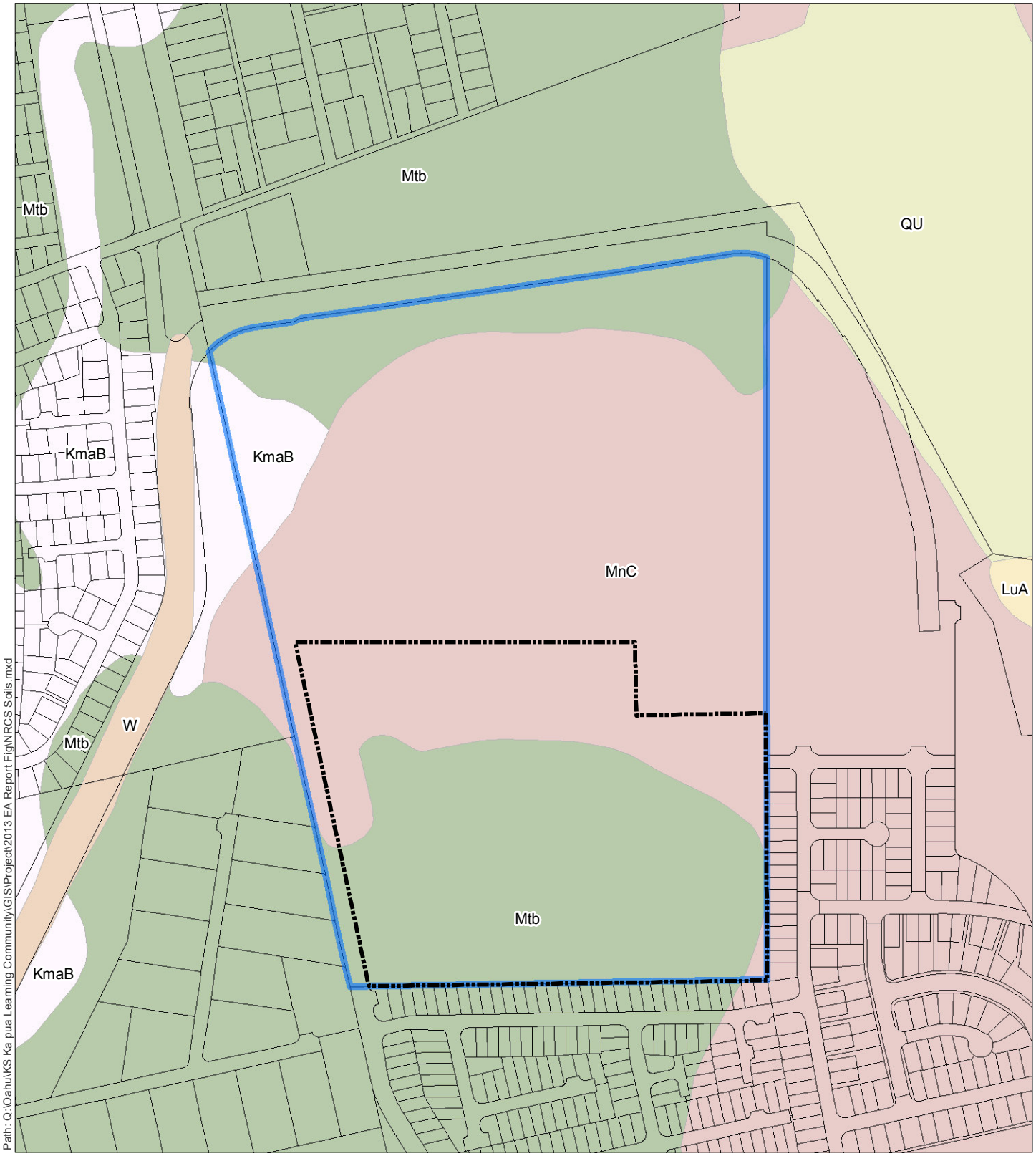
According to the USDA NRCS soil survey, two soil types are found on the project site, Mamala stony silty clay loam, 0-12% slope (MnC) and Mokulēʻia clay (Mtb) (See Figure 4-2).

Mamala stony silty clay loam is present in the central portion of the project site. This soil is known to have favorable properties as foundation materials for low buildings and general fill, and has moderate shrink and swell potential. This soil type is typically found in areas with slopes of not more than six percent slope. Stones, mostly coral fragments are common in the surface layer and in the profile. In a representative profile the surface layer is dark reddish-brown stony silty clay loam about eight inches thick, underlain by dark reddish-brown silty clay loam about 11 inches thick and coral limestone and consolidated calcareous sand. Permeability is moderate and runoff is very slow to medium. This soil type has been used for sugarcane, truck crops, and pasture.

Mokulēʻia clay soils are present in both the northern and southern portions of the project site. This soil is characterized as poor construction material, very sticky and very plastic, has low shear strength, poor work ability, slow permeability, and has a very high shrink swell potential. These soils are found on nearly level areas on the coastal plains. In a representative profile, the surface layer is very dark grayish-brown clay about 16 inches thick, underlain by 34 to 48 inches of single-grain sand and loamy sand. Permeability is slow in the surface layer and workability is difficult because of the sticky plastic clay. This soil type has been used for sugarcane and pasture.

Based on a review of the various soil types identified within the USDA NRCS study, the underlying soils for the majority of the project site appear to be mostly favorable for the Proposed Project. Within the northern portion of the project site, the soils are very workable. However the soils to the central and southern portions of the project site are anticipated to contain expansive clays near the surface.

The soils on-site are capable of supporting the KCLC at Māʻili. There are areas consisting of expansive soils that may creep in the future. At areas where expansive soil is present, it is recommended that soils be over-excavated and replaced with non-expansive material to prevent swelling and shrinking of the soil. Over-excavation and fill will be done within and three feet around the perimeter of the proposed structures. The existing project site should be cleared and grubbed of all materials including boulders prior to excavation of expansive soil. Further geotechnical investigation is recommended and anticipated for the site as the KCLC at Māʻili moves forward.



LEGEND

- Proposed Project
- Tax Map Key: 8-7-010:007
- KmaB-Keaau stony clay, 2 to 6 percent slopes
- LuA-Lualualei clay, 0 to 2 percent slopes
- MnC-Mamala stony silty clay loam, 0 to 12 percent slopes
- Mtb-Mokuleia clay
- QU-Quarry
- W-Water > 40 acres

Source: USDA Natural Resources Conservation Service, Hawaii, 2007

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.

FIGURE 4-2
NRCS Soil Survey Map

Kamehameha Schools
Community Learning Center at Mā'ili

Kamehameha Schools North

Linear Scale (feet)

0 250 500

Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

4.3.2 Land Study Bureau Detailed Land Classification

The University of Hawaiʻi LSB *Detailed Land Classification, Island of Oʻahu* classifies non-urban land by a five-class agricultural productivity rating system, using the letters A, B, C, D and E, where "A" represents the highest class of productivity and "E" the lowest. The productivity rating system was based on soil texture, structure, depth, drainage, parent material, stoniness, topography, climate, and rainfall in a given area. The LSB classified the majority of the project site as very poor, "E". The eastern portion of the project site has "No Data" provided for by the LSB (See Figure 4-3).

4.3.3 Agricultural Lands of Importance to the State of Hawaiʻi

The Agricultural Lands of Importance to the State of Hawaiʻi (ALISH) system rates agricultural land into three classes: "Prime," "Unique" or "Other", with all remaining lands termed "Unclassified". The majority of the project site is rated as "Other" important agricultural land. A small portion of the project site is "Unclassified" (See Figure 4-4). Lands with this classification exhibits properties such as seasonal wetness, erodibility, limited rooting zone, slope, flooding, or susceptibility to drought, that exclude them from Prime or Unique classification.

4.3.4 Regional Agriculture History

Agriculture has helped to shape the history of the Waiʻanae region. The entire region is recognized as a Major Agricultural Area by the State of Hawaiʻi (State of Hawaiʻi DOA, 2010). The agricultural history of Waiʻanae goes back many generations. Traditional subsistence lifestyle methods which sought to minimize water use, while maximizing food production to grow taro and other crops in the Waiʻanae region proved successful despite the dry and hot climate. This is demonstrated through multiple agricultural remains sited throughout the region (such as irrigation channels, traces of intricate terracing, and other indications of past agricultural practices), which serve as evidence that Waiʻanae once supported a large population (State of Hawaiʻi DBEDT, 2010).

From around 1811 to 1829, the trading of sandalwood thrived in the region. Livestock then became an important operation around the mid-1800's. Later in the century, sugar became the predominant crop. The Waiʻanae Sugar Mill was the first sugar mill on Oʻahu. Built in 1880, the Mill operated for over 70 years in Waiʻanae. In 1946, the Waiʻanae Sugar Plantation closed due to economic and environmental pressures (McGrath, 1973).

Potential Impacts and Mitigation Measures

The development of the KCLC at Māʻili is expected to cause some land disturbance, including removal of existing vegetation (clearing and grubbing) and some mass grading. Typical impacts to the soils include the temporary exposure of soils to wind and storm water runoff.

Grading plans will attempt to achieve a balanced excavation and embankment quantities to minimize disturbance to the topography and soils as much as practicable. A NPDES Notice of General Permit Coverage for Storm Water Associated with Construction Activity will likely be required.

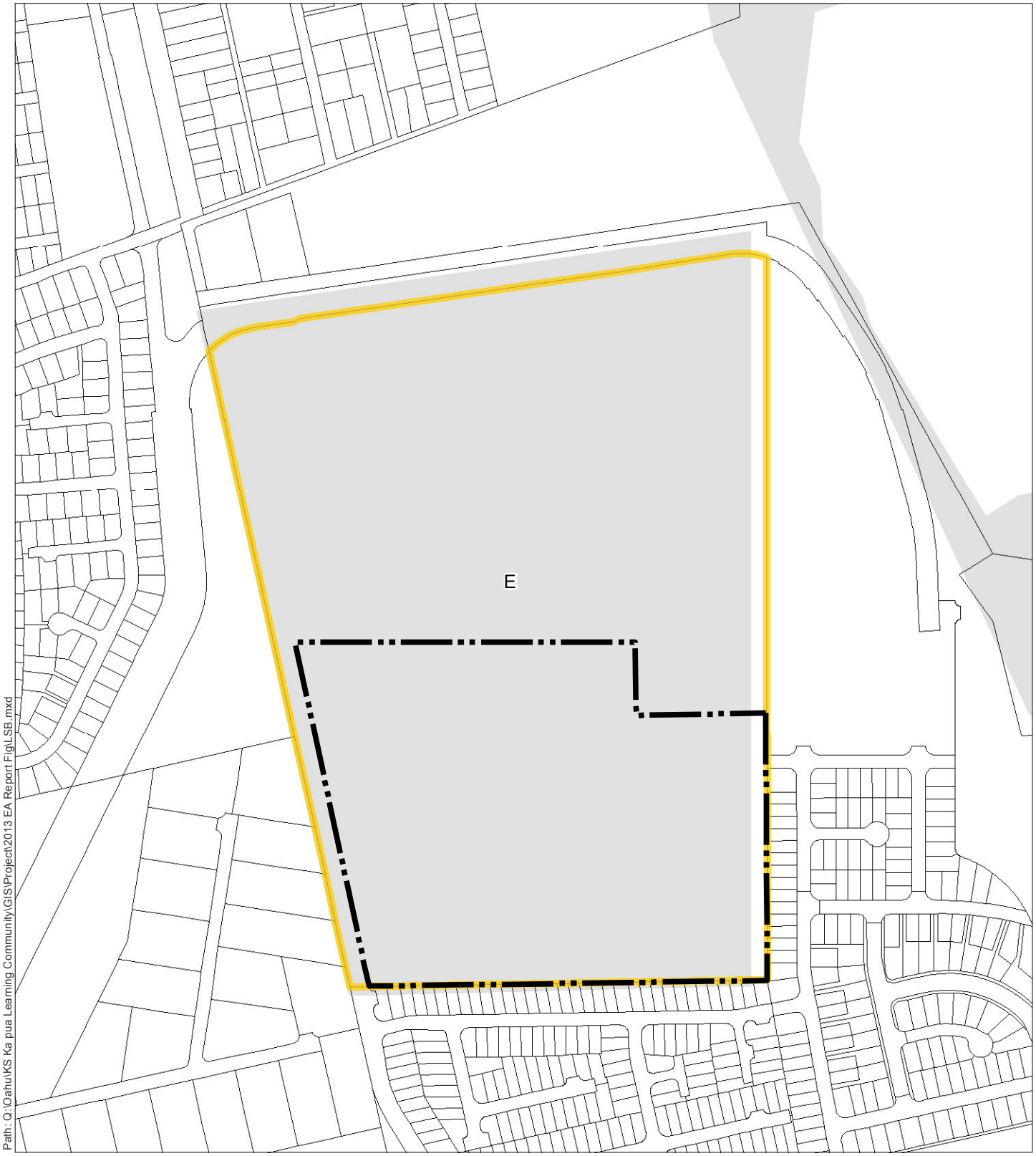
During site grading and all other construction activities, implementation of BMPs, which may include use of silt fences, sediment traps, and diversion swales, temporary groundcover, hydro-mulching, etc., will minimize erosion and the discharge of other pollutants. After construction, landscaping should provide long-term erosion control. The Proposed Project is not expected to have a deleterious effect on the soil within the site.

The soils of the Proposed Project are not well suited for agricultural cultivation or production. As such, the KCLC at Māʻili and necessary infrastructure improvements are not expected to influence the availability of agricultural land. Therefore, no mitigation measures are proposed.

4.4 FLORA AND FAUNA

4.4.1 Botanical Survey

A Flora and Fauna Survey was prepared by Robert Hobdy in December 2012 (Appendix A). The survey found that the majority of the property is dominated by non-native species. One grass was abundant across the entire area: buffelgrass (*Cenchrus ciliaris*). Also common were sourbush (*Pluchea carolinensis*), Indian fleabane (*Pluchea indica*), hybrid pluchea (*Pluchea x fosbergii*), klu (*Acacia farnesiana*), kiawe (*Prosopis pallida*) and ʻuhaloa (*Waltheria indica*). A total of six native species were found scattered throughout the area, however all six of these species are quite common in Hawaiʻi and are not of any special conservation concern. No Endangered or Threatened species were found during the survey, nor were any that are candidates for each status found. No special native plant habitats or communities were found either.



LEGEND

- Proposed Project
- Tax Map Key: 8-7-010:007
- A - Very Good
- B - Good
- C - Fair
- D - Poor
- E - Very Poor

FIGURE 4-3
Land Study Bureau's Detailed Agricultural Land Productivity Ratings Map

Kamehameha Schools
Community Learning Center at Mā'ili

Kamehameha Schools
North

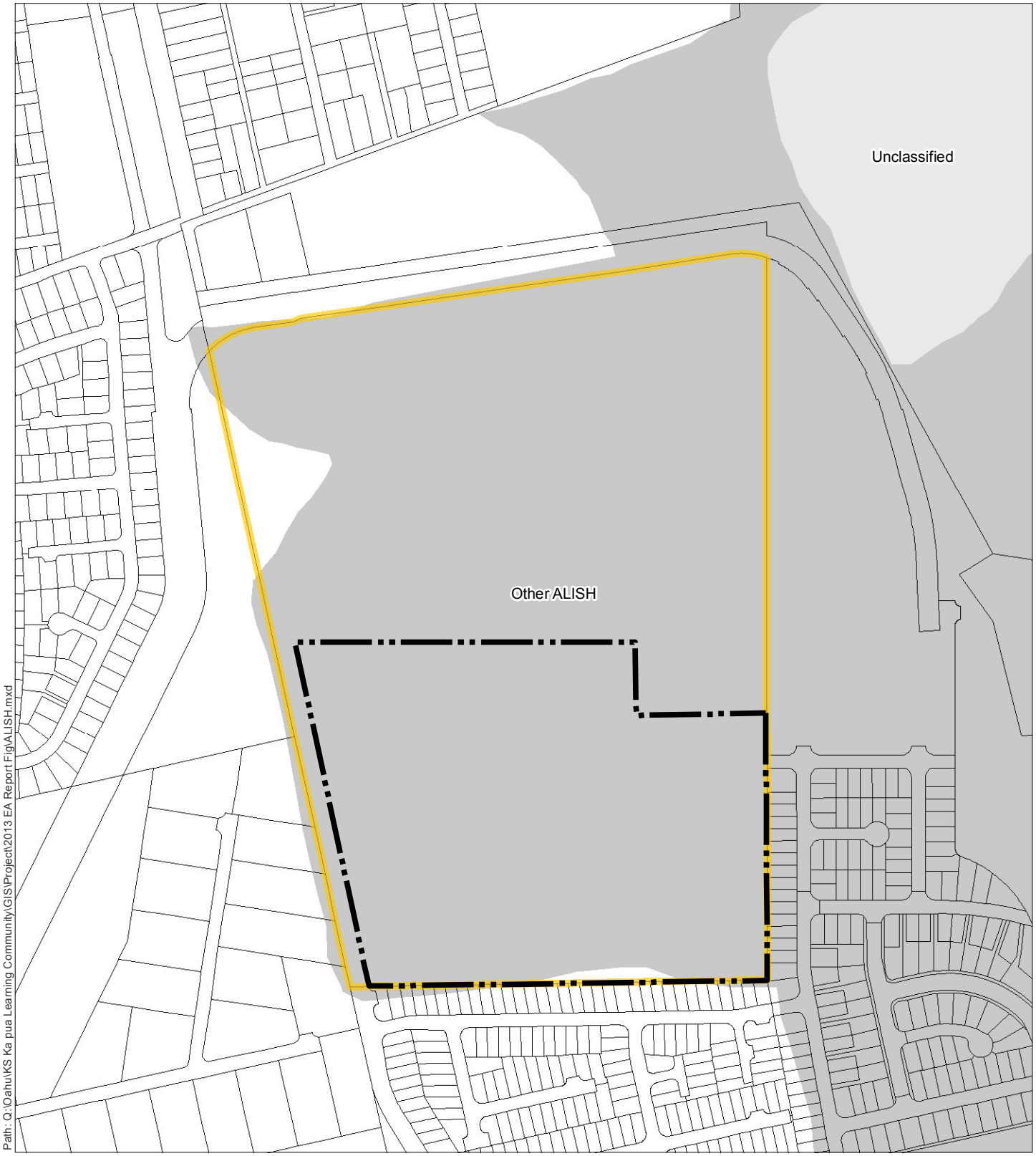
Linear Scale (feet)
0 250 500

Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI, Bing Maps 2012, HOLIS, C&C of Honolulu 2012

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.



LEGEND

- Proposed Project
- Tax Map Key: 8-7-010:007
- Prime ALISH
- Unique ALISH
- Other ALISH
- Unclassified

FIGURE 4-4
Agricultural Lands of Importance to the State of Hawai'i

Kamehameha Schools
Community Learning Center at Mā'ili

Kamehameha Schools
North

Linear Scale (feet)
0 250 500

Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI, HOLIS, C&C of Honolulu 2012, State Dept. of Ag, 1977

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.

4.4.2 Wetland Survey

There are no streams or wetlands identified on the project site. The drainage channel adjacent to the project site is designated on the U.S. Fish and Wildlife Service wetlands map as a type E1UBLx and R4SBCx wetland. E1UBLx wetlands are estuarine, subtidal wetlands with an unconsolidated bottom within an excavated basin or channel. R4SBCx wetlands are riverine intermittent wetlands that are seasonally flooded and within an excavated basin or channel.

4.4.3 Wildlife Survey

A Flora and Fauna Survey was prepared by Robert Hobdy in December 2012 (Appendix A). The wildlife on the project site was rather sparse in diversity and mostly non-native species. A common indigenous dragonfly was discovered, however the globe skimmer dragonfly (*Pantala favesccens*) is widespread, common, and of no heightened conservation concern. No special fauna habitats occur on or around the project site and no Critical Habitat for any Endangered wildlife species is designated within the project site. A special effort was made to look for the native Hawaiian hoary bat (*Lasiurus cinereus semotus*), however, no evidence of the presence of the bat was detected.

Potential Impacts and Mitigation Measures

No Federally listed Endangered or Threatened native plants were encountered during the course of the survey nor were any species that are candidate for such status seen within the project site. No special critical habitats essential for native fauna were seen on the project site. The Proposed Project will not have a significant negative impact on the botanical or wildlife resources of the project site.

4.5 NATURAL HAZARDS

Natural hazards such as flooding, tsunami inundation, hurricanes, earthquakes, volcanic eruptions, and wildfires have historically affected the State of Hawaiʻi.

Flooding

Flood Insurance Rate Maps (FIRM) indicate areas that would be flooded during 100- and 500-year flood events. Areas recognized as falling within a 100-year flood area are further divided into special flood hazard areas, which are insurance risk rate zones which range from moderate flood hazard areas (100- and 500-year flood boundaries) to minimal flood areas (for anything greater that 500-year flood level). Special flood hazard areas are further

classified into zones "V" and "A", which are zones that have the highest risk of flooding; and zone "X" which represents minimal-risk zones. Areas identified as zone "D" have undetermined flood hazards. During the pre-consultation process, the State Department of Land and Natural Resources Engineering Division commented that the Proposed Project is located in Flood Zone D. The Flood Insurance Program does not have any regulations for developments within Flood Zone D. Flood hazard classification for the project site and vicinity are shown in Figure 4-5.

Tsunami

In 2010, the City and County of Honolulu Department of Emergency Management revised the Oʻahu tsunami evacuation zone maps. The evacuation zones were developed by taking tsunami inundation data created by the Tsunami Inundation Mapping Project and applying a public safety buffer. Those residing in a tsunami evacuation zone must leave immediately when a tsunami warning is issued. As illustrated in Figure 4-6, the western portion of the project site is within the tsunami evacuation zone.

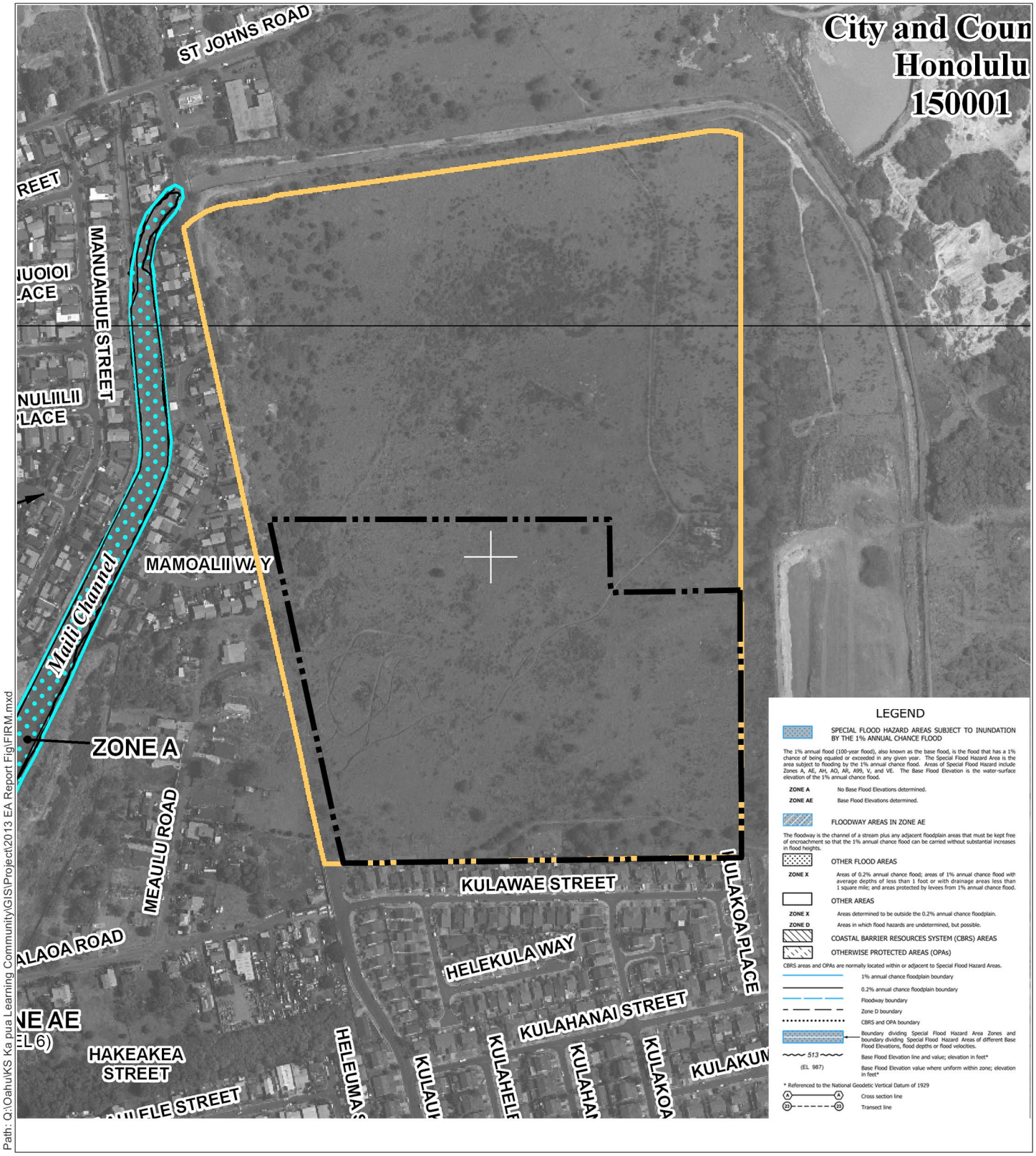
Hurricanes

The State of Hawaiʻi has been affected twice in the past three decades by devastating hurricanes-Hurricane ʻIwa in 1982, and Hurricane ʻIniki in 1992. While it is difficult to predict these natural occurrences, it is reasonable to assume that Hurricanes will occur again. As in other parts of Oʻahu, the property would be vulnerable to destructive winds and torrential rains associated with hurricanes. Emergency evacuation centers near the property include Leihōkū Elementary School, Nānākuli Elementary School, Nānākuli High and Intermediate School, and Waiʻanae Elementary School.

Earthquake & Volcanic Hazards

In Hawaiʻi, volcanic activity produces more earthquakes than most other areas sitting on tectonic plate margins. Thousands of earthquakes occur in Hawaiʻi each year. However, the vast majority of them are undetectable through normal human senses. A few historical earthquakes have reached moderate and even disastrous magnitudes.

The last earthquakes felt statewide were magnitudes of 6.7 and 6.0. These earthquakes occurred at Kīholo Bay along Hawaiʻi Island's Kona Coast on October 15, 2006. These earthquakes resulted in more than $100 million in damages to the northwest area of Hawaiʻi Island and minimal damage on Oʻahu. From that same event, Oʻahu was also subject to an earthquake-induced electrical blackout that paralyzed the City and County of Honolulu and shut down the Honolulu International Airport for nearly a day. While it is difficult to predict such natural occurrences, it is reasonable to assume that future incidents are probable, given historical events.



Path: Q:\Oahu\KS Ka pua Learning Community\GIS\Project\2013 EA Report Fig\FIRM.mxd

LEGEND

Proposed Project

Tax Map Key: 8-7-010:007

FIGURE 4-5
FIRM Map

Kamehameha Schools
Community Learning Center at Mā'ili

Kamehameha Schools North

Linear Scale (feet)

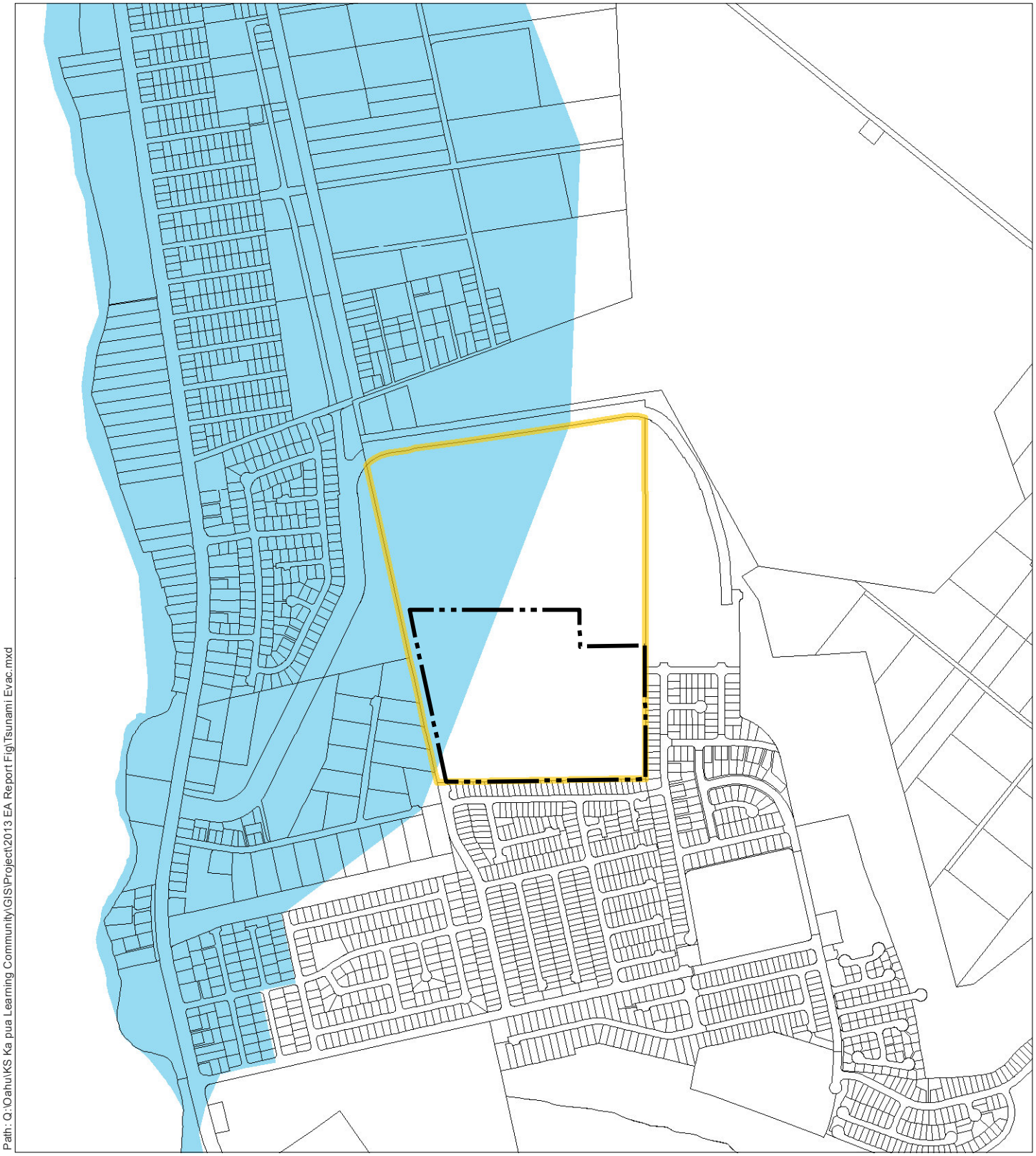
0 250 500

Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI, C&C of Honolulu 2010

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.



Path: Q:\Oahu\KS Ka pua Learning Community\GIS\Project\2013 EA Report Fig\Tsunami Evac.mxd

LEGEND

- Proposed Project
- Tax Map Key: 8-7-010:007
- Tsunami Evacuation Zone

FIGURE 4-6
Tsunami Evacuation Zone

Kamehameha Schools
Community Learning Center at Mā'ili

Kamehameha Schools
North

Linear Scale (feet)
0 500 1000

Island of O'ahu

PBR HAWAII & ASSOCIATES, INC.

Source: ESRI, C&C of Honolulu 2010

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.

Rockfall Hazards

As the project site is not next to sloping areas, it is anticipated that the potential for rockfalls would be very low.

Wildfires

According to the City and County of Honolulu, the greatest danger of fire is where wildland (trees and brush) border urban areas. Although all the Hawaiian Islands are vulnerable to wildland fires (especially during the summer months, prolonged drought and/or high winds), the great majority of wildfires are human-caused (intentionally caused or by negligence) and start along roadsides. Wildfires can and do also occur naturally. Fires occur frequently on the Waiʻanae Coast, particularly along the hillsides and mountains, but also on unoccupied properties. As a result, the Waiʻanae Fire Station is one of the busiest stations on the island.

Potential Impacts and Mitigation Measures

The project site is located in an area of undetermined flood hazards. This area has been designated as zone D on the FIRM. While the northwestern portion of the project site is located in a tsunami evacuation zone, a tsunami refuge area is located nearby at Puʻu o Hulu Community Park.

Fire hazards, particularly on lands adjacent to large undeveloped parcels are always a possibility during summer months, drought periods and/or high winds. Development of the KCLC at Māʻili would reduce the likelihood of wildfires starting on the project site as the land would be better maintained. Appropriate fire breaks are expected to be maintained around the Proposed Project to reduce the risk of wildfires burning buildings. KS anticipates the development of an emergency plan for man-made and natural disasters. It is expected that it will include provisions for the safe evacuation of students, staff, and visitors.

4.6 HISTORIC, ARCHAEOLOGICAL AND CULTURAL RESOURCES

An archaeological consultant, Scientific Consultant Services, Inc. (SCS), was contracted to conduct an Archaeological Inventory Survey (AIS) and Cultural Impact Assessment (CIA). See Appendices B and C.

4.6.1 Historic and Archaeological Resources

Based on research conducted for a Phase I Environmental Site Assessment prepared in 2007, a portion of the property was previously used for a Voice of America (VOA) transmitter facility from 1948 to 1971. Historic topographic maps from 1963 and 1983 indicate that the transmitter facility consisted of three small structures in the central

eastern portion of the property. The property was acquired by the U.S. Coast Guard in 1971 with the intent to continue the use of the facility as a transmitter station, however, it does not appear that the Coast Guard used the facility. In 1977, the property was reported as surplus Federal government property and in 1989, the transmitter buildings and wooden antennae poles were demolished. The property was conveyed to the State in December 2010, and subsequently transferred to DHHL.

SCS conducted an Archaeological Inventory Survey to investigate the presence or absence of archaeological features and to assess the function, age, and construction methods of those features. The survey area consisted of TMK 8-7-010: 007 excluding 8.7 acres leased to Ulu Ke Kukui and Hoʻomalu O Nā Kamaliʻi and 4.857-acres that have not been conveyed by the U.S. Coast Guard to the State.

In 2007, Cultural Surveys Hawaiʻi, Inc. conducted an Archaeological Inventory Survey-level study of 6-acres of land for what is currently the site of the Leeward Coast Emergency Homeless Shelter Project, Lualualei Ahupuaʻa, Waiʻanae District, Island of Oʻahu [TMK: (1) 8-7-010:007] (Tulchin and Hammatt 2007). The Tulchin and Hammatt (2007) study, located in the northwest corner of the subject parcel, included archaeological monitoring of tree removal and subsurface geotechnical testing. No archaeological sites were identified.

Subsequent to the above-described inventory survey, Cultural Surveys Hawaiʻi, Inc. conducted Archaeological Monitoring of 6.5-acres of land during ground altering activities associated with the construction of the Leeward Coast Emergency Homeless Shelter, Lualualei Ahupuaʻa, Waiʻanae District, Oʻahu Island [TMK: (1) 8-7-010:007 (Hunkin and Hammatt 2008). No archaeological sites were identified.

In 2008, Cultural Surveys Hawaiʻi, Inc. conducted an Archaeological Inventory Survey-level study of approximately 0.5-acres of land for the Leeward Coast Emergency Homeless Shelter, Lualualei Ahupuaʻa, Waiʻanae District, Oʻahu Island [TMK: (1) 8-7-010:007 (Tulchin and Hammatt 2008). The Tulchin and Hammatt 2008 project area was located immediately adjacent to the southeast corner of the two above-described project areas. No archaeological sites were identified.

In 2009, International Archaeological Research Institute conducted an Archaeological Inventory Survey of the property. Therefore, a portion of the current survey work was dedicated to the re-location of previously identified archaeological sites within the survey area: State Site 50-80-07-7081, the VOA antennae system; State Site 50-80-07-7082, VOA transmitter buildings and ancillary features; and State Site 50-80-7-7083, raised railroad bed remnant from the Waiʻanae Sugar Company.

During the current survey, 16 surface features (1 through 6, 8, 9, 11 through 13, 15 through 18, and 21) comprising State Site 50-80-07-7081 were re-located. Three surface features, two VOA antennae foundations and a Historic trash dump, were newly identified during the current inventory survey. Based on proximity, these features were incorporated into State Site 50-80-07-7081. The buildings and the ancillary features of State Site 50-80-07-7082, were not re-located, as this site was located in the exclusion zone (see Rieth 2009). However, State Site 50-80-07-7082, Feature 7, a series of fencelines which traverse the survey area, was re-located. The previously identified State Site 50-80-7-7083 was re-located. State Site 50-80-7-7083, was initially interpreted by Reith (2009) as a raised rail bed remnant from the Waiʻanae Sugar Company. However, given the absence of evidence supporting this functional interpretation, State Site 50-80-07-7083 was re-interpreted as a cart path associated with the Plantation Era. Limited subsurface testing was conducted, but did not produce archaeological cultural material.

The current Archaeological Inventory Survey also found intensive mechanical ground disturbance on more than 90 percent of the survey area's surface as suggested by the multiple push piles of basalt and limestone, multiple dirt roads or trails used for mountain biking, motocross bikes, and hiking; the unauthorized dumping of modern household debris, including plastic containers, steel composite wire cables, and automobile parts, etc. The wire cables appear to have been associated with the VOA Transmission Towers that were located on the property during World War II. In addition, portions of the survey area have been subjected to wildfires, as evidenced by the presence of charred vegetation and remnant kiawe trees.

In addition, SCS conducted limited subsurface testing, in the form of four manually excavated stratigraphic trenches, which yielded negative results. The synthesis of previous archaeological work [(Cordy 1976; Mayberry and Rosendahl (1994), and Jimenez (1994)] suggests the type of landscape on which the survey area is situated may have contained a few scattered temporary or seasonal habitations sites. However, given the extent of the previous land alterations, no evidence of pre-Contact utilization of the survey area remained on the ground surface or within subsurface contexts.

Potential Impacts and Mitigation Measures

All of the previously identified features associated with State Sites 50-80-07-7081 (and the three newly identified surface features which have been incorporated into State Site 50-80-07-7081), State Site 50-80-07-7082, and 50-80-07-7083 were assessed for their significance as outlined in Hawaiʻi Administrative Rules §13-275-6 (HAR §13-275-6).

To be assessed as significant a site must be characterized by one or more of the following five criteria:

(A) It must be associated with events that have made a significant contribution to the broad patterns of our history, or be considered a traditional cultural property.
(B) It must be associated with the lives of persons significant in the past.
(C) It must embody distinctive characteristics of a type, period, or method of construction, or represent a significant and distinguishable entity whose components may lack individual distinction.
(D) It must have yielded or may be likely to yield, information important in prehistory or history.
(E) Have important value to native Hawaiian people or other ethnicities in the state, due to associations with cultural practices and traditional beliefs that were, or still are, carried out.

The previously identified State Site 50-80-07-7081 and State Site 50-80-07-7082, Feature 7, were re-evaluated for significance and found to be significant under Criteria A, associated with historic events or activities, and Criterion D, for information content. The three newly identified surfaced features (Features 22, 23, and 24) which have been incorporated into State Site 50-80-07-7081, were found to be significant under Criteria A and Criteria D. However, as these sites are not structurally unique, they are not recommended for preservation. State Site 50-80-07-7083 was re-evaluated and found to be significant under Criterion A, D, and C, as an excellent example of a feature type. Thus, State Site 50-80-07-7083, in its entirety or in segment(s), is recommended for preservation. No further archaeological work is recommended for this project. The development of the KCLC at Māʻili will aim to avoid impacts to these historical features.

The Archaeological Inventory Survey recommends no further archaeological work for the survey area.

4.6.2 Cultural Resources

The generally accepted paradigm of Hawaiian settlement is that the earliest settlements were located in the wet, windward regions. As population pressure increased or politics changed, populations began to branch out into leeward, less hospitable regions of Hawaiʻi, adapting their cultivation strategies as they moved into dryer climates (Cordy 2002). According to Kirch's (1985) Hawaiian Settlement Model, the Waiʻanae area was settled during the Expansion Period (A.D. 1100–1650) during which time Oʻahu's population was growing faster than any other period of Hawaiian prehistory. Prior to the Expansion Period, Waiʻanae District, including Lualualei, was likely visited by travelers and its rich offshore fisheries may have attracted seasonal fishermen (*ibid*).

Waiʻanae likely gets its name from a large freshwater fishpond west of Waiʻanae Stream. Mullet were grown in this pond, thus the name *wai* (water) *ʻanae* (mullet) (Handy and Handy 1972). The region is renowned for its fruitful deep sea fisheries, especially in the

waters off Kaʻena Point. Waiʻanae's fisheries are noted in Hawaiian legend. Chief Kawelo distinguished himself as an able fisherman in these waters (*ibid*; Sterling and Summers 1978). Handy and Handy (1972) also explain that it is here, at Kaʻena Point, that the demigod Maui is said to have cast his line and attempted to pull Kauaʻi toward Oʻahu, creating a single island of the two. When he felt he had hooked Kauaʻi firmly, he gave a mighty tug and pulled up an enormous boulder from the sea floor. This rock is known today as Pohaku o Kauaʻi. The hook flew from its line and was lost in Pālolo Valley (Emerson in Sterling and Summers 1978).

Waiʻanae District society was punctuated by a distinct need to trade and share resources. This reliance on trade defined the culture in Waiʻanae, perhaps to a greater extent than in other regions of Oʻahu. The people of Nānākuli, for example, are said to have pretended to be deaf and dumb to passers-by, as they had no fresh water to offer travelers (McGrath *et al.* 1973:10). This, according to Pukui *et al.* (1974) is why this place is called Nānākuli, "looking at the knees." Resource availability, or lack thereof, undoubtedly had a great impact on Waiʻanae society.

According to one legend, the origins of *niu* (coconut palm) in the Hawaiian Islands, as well as the naming of Pōkaʻī Bay was described as:

> "In very ancient times, when the great Hawaiian chiefs and navigators sailed across the vast Pacific between Hawaiʻi and Kahiki, a legend arose about a voyaging chief named Pōkaʻī. It said that he brought and planted at Waiʻanae the first coconut tree in Hawaiʻi, from which grew in time a famous grove, Ka Ulu Niu o Pōkaʻī. The grove stretched from the site of the present police station to that of the Sacred Hearts Church...the bay *makai* of the grove, formerly known as Māʻalaea, eventually took the name of the legendary planter" (Clark 1977:87).

Lualualei Valley was important during the pre-Contact Period, as evidenced by the many named *ʻili* across the valley landscape, these locales especially prosperous for growing seasonal crops in the back of the valley where water resources were more plentiful (Kelly in Haun *et al.* 1991:343). In mid-valley reaches, pili grass was acquired and used for housing thatch, while lower valley areas were successfully utilized for salt mining and marine resource acquisition (*ibid*). As noted below, a diversity of site types were present in the valley, the sites reflecting soil and water resources available (or not) in each zone.

Lualualei has been interpreted to mean "beloved are spared". The meaning is based on a story about a boy named Kahkua, whose life was spared by the king after he was falsely accused of wearing the king's loin cloth or *malo* (Kelly in Haun *et al.* 1991:313). Two trails known from prehistoric times cross through the valley and over the mountains. Particularly noted is the Kolekole Pass Trail which connects this Leeward valley with the

present-day Schofield Plateau. These trails were lifelines for food, travel, and communication between those living or working on both sides of the Waiʻanae Range.

Numerous stories of Māui, the demigod, are associated with Lualualei Ahupuaʻa. These stories include a large rock (McAllister Site 148), located approximately 1.1 miles northwest of Nānākuli Station. which is said to be named after Māui (McAllister 1933:110). According to legend,

"Maui...landed here when he first came to the Hawaiian Islands from the south. This stone at the time was surrounded by water, and it is here that Maui reposed and sunned himself. In the bluff to the northeast of the rock is the shelter in which he lived, and in the vicinity was a spring where he obtained water...".

Another legend tells how Māui was able to obtain fire from the "Mud-hen-of-Hina. According to this story, the gods had taken fire away from men and Māui-a-Kalani (Māui son of Kalani) wanted to find the source of fire. Māui was able to trace the fire to a mapele (temple, heiau) in Waiʻanae District. A woman named ʻAlae-huapipi owned the fire, called "the fire of Pele", which she kept in the mapele. ʻAlae-huapipi and another woman, named ʻAlaenuahini, "had the fire in the mapele and from them fire was obtained. From that time men had fire. The source of the fire was in the possession of these two double-bodied women who could take bird form....". So, by observing these to women over a period of time, Māui was able to find out the source of fire" (Kamakau in Sterling and Silver 1978:64).

Another legend pertaining to Lualualei involves the legend of the goddess Pele and her younger sister, Hiʻiaka. In this story, Hiʻiaka and two traveling companions, Wahine-ʻōmaʻo and Pāʻū-o-Palaʻā, traveled from the island of Hawaiʻi to Kauaʻi Island in order to bring the chief Lohiʻau-ipo (Lohiʻau) back to the Big Island from Hāʻena, Kauaʻi. During their journey, Hiʻiaka and her friend stopped and visited many locations on the islands of Hawaiʻi, Maui, Molokaʻi, and Oʻahu. Once they reached Kauaʻi, Hiʻiaka found that Lohiʻau had died. Once the funerary ceremonies were concluded, Hiʻiaka revived Lohiʻau and began the journey to return with Lohiʻau to Pele's domain at Kīlauea, Hawaiʻi. During their journey from Kauaʻi back to Hawaiʻi Island, Hiʻiaka and her companions stopped at Lualualei, on the island of Oʻahu. During this segment of the trip (translated by Maly 1998):

> Hiʻiaka and her companions then prepared to depart from Pōkaʻī. She told Lohiʻau and Wahineʻōmaʻo, that they would travel by canoe, while she would travel for a while over land, and that they would meet again at Kou [Honolulu]… Hiʻiaka then continued her journey along the upland trail. Now the trail upon which Hiʻiaka chose to travel, is the trail which passes above Pōhākea. Hiʻiaka passed along the

kula (plain) of Māʻili, and then turned to look at the uplands. She saw the dazzling light of the sun on the uplands of Lualualei and Hiʻiaka chanted:

Wela ka lā e!	*The sun is hot!*
Wela ka lā e!	*The sun is hot!*
Ua wela i ka lā ke kula o Lualualei	*The heat of the sun is on the plain of Lualualei*
Ua nau ia e ka lä a ʻokaʻoka... entirely...	*The sun chews it up*

By the time of Contact with Westerners (1778), Waiʻanae Valley was the political and social center of the *moku* (district) of Waiʻanae. However, Lualualei Valley was also occupied, as was Mākaha Valley to the north. Slightly earlier, this region became the center for sweeping political changes in the late pre-Contact and early Historic Periods. Puʻu Kawiwi, at the rear of Waiʻanae Valley, was the scene of the last stand of Maui Chief Kahekili against the Oʻahu warriors. In this last battle of 1784, Kahekili overthrew the Oʻahu chiefs, becoming ruling chief of the island. Ten years later, after Kahekili's death, a power struggle ensued between his son and his brother (Kuykendall 1938). Waiʻanae warriors sided with Kaeo, and they lost the deciding battle at ʻAiea. A Waiʻanae *kahuna* (priest) prophesied the coming of a "big fish" who "would eat all the little fish." The following year, Kamehameha invaded Oʻahu.

Following Kamehameha's succession as ruling chief, "the despoiled people in large numbers fled to Waiʻanae District and settled there. This part of Oʻahu being hot, arid, isolated, with little water, was not coveted by the invaders" (Mouritz in Sterling and Summers 1978). The status Waiʻanae once carried as a ruling center was now gone.

In the 1840s, traditional land tenure shifted drastically with the introduction of private land ownership based on Western law. The Māhele of 1848 divided Hawaiian lands between the king, the chiefs, the government, and began the process of private ownership of lands. The subsequently awarded parcels were called Land Commission Awards (LCAs). According to the Waihona ʻAina Database (2013), there were 13 Land Court Award claims made in Lualualei Ahupuaʻa during the Māhele, none of which were within the Proposed Project. However, the REDI Realty Tax Map Key [TMK: (1) 8-7-010:007] indicated that the proposed undertaking is located within the western portion of Land Grant 4751. Archival research indicated Land Grant 4751, comprised of 2,629 acres, was purchased by H.M von Holt for $1.00.

Sugar cultivation began in 1878 with a small operation owned by Hermann Widemann and Julius Richardson. Two years later, George and Albert Wilcox purchased and chartered the Waiʻanae Sugar Company (Condè and Best 1973). Sugar in Waiʻanae, like other operations throughout Oʻahu, was limited by a lack of arable land and available

water resources. This adversity was punctuated in the Waiʻanae, Lualualei, and Mākaha Valleys, where water tunnels were eventually constructed to provide irrigation to the plantations. Despite this challenge, Waiʻanae Sugar Company was among the most efficient sugar plantations in Hawaiʻi. At its peak, the plantation produced 13.79 tons of sugar per acre in 1935 (Dorrance and Morgan 2000). High yields did not make up for a lack of growing room. The plantation was closed in 1946.

According to Kelly (in Haun *et al.* 1991:339), by Executive Order in 1923, Kolokole Pass and road were noted, which commenced military presence in the valley. In 1929, Lualualei Depot was constructed and in 1934, ammunition was first stored in Lualualei Valley. This started a long use of the valley by the U.S. Military, primarily the U.S. Navy, which continues today. Although the U.S. Navy is the largest land tenet within Lualualei Ahupuaʻa, there are multiple residential land parcels and various industrial business and farms *(i.e.,* agriculture and livestock.

Potential Impacts and Mitigation Measures

Consultation was sought from a kupuna learning group, Waiʻanae; Lualualei Hawaiian Civic Club, the Oʻahu Island Burial Council (ʻEwa District Representative), Office of Hawaiian Affairs, Oʻahu; State Historic Preservation Division, Kapolei, and individuals recognized by the community. In addition, legal notices were placed in The Honolulu Star-Advertiser and the OHA newspaper, *Ka Wai Ola*. None of the individuals interviewed indicated in their responses that any traditional cultural practices would be affected by the proposed KCLC at Māʻili.

Consultation efforts for the CIA resulted in four responses. Two of these responses were received by telephone, one response was received via e-mail, and one response was received via the U.S. Postal Service. These responses are summarized below:

On January 2, 2013, Albert Silva, a community member, stated, via telephone, that he did not know of any traditional cultural practices associated with the project area or Lualualei, but recommended contacting Charles Holt; Milton Holt, son of Charles; or Victoria Holt-Takamine, daughter of Charles, as they are long-time residents of the area (personal communication January 21, 2013. Attempts to confirm address and email for Charles Holt and Milton Holt were unsuccessful however, a Letter of Inquiry was sent to Mrs. Holt-Takamine, via e-mail, on January 14, 2013.

The Office of Hawaiian Affairs (OHA) responded, via the U.S. Postal Service (letter dated January 7, 2013 from Dr. Kamanaʻopono M. Crabbe, OHA to Cathleen Dagher, SCS Senior Archaeologist. In this letter OHA applauded Kamehameha Schools for "moving forward with this project" and indicated OHA was looking forward to the completion of the Learning Center, as the "new facilities, events, classes, and services" will be beneficial

to the "Waiʻanae Coast and the larger community." OHA did not indicate in this transmittal that the proposed undertaking would impact any traditional cultural places or impact access rights.

On January 9, 2013, Eric Enos, a community member and resident, stated, via e-mail, the cultural significance of Lualualei Ahupuaʻa "is still being revealed." Mr. Enos indicated that Lualualei Ahupuaʻa has been impacted by a variety of human activities from the pre-Contact Period to the present, with the most significant alterations to Lualualei during the "American occupation leading up to and after the war years." As long time resident of the area, Mr. Enos and his family experienced "massive flooding" during periods of heavy rains, prior to the construction of the flood drainage channels. Mr. Enos explained that the stories of Māui, the demi-god, and the mud hens are pertinent mythologies specific to this area because the area was in marshlands during the pre-Contact Period. In summary, Mr. Enos states that the area has been heavily compromised by previous grading activities and the construction of military structures. Mr. Enos did not indicate in his transmittal that the proposed undertaking would impact any traditional cultural places or impact access rights.

During a January 8, 2013 telephone interview, William Aila, Jr. (community member, resident, and State Department of Land and Natural Resources Chairperson) provided a wealth of information pertaining to Lualualei. This information is paraphrased below.

The Aila family has lived in Lualualei for three generations. Mr. Aila, Jr., has lived in Lualualei for 54 years. When asked if he knew of any Traditional Cultural Practices conducted in Lualualei, Mr. Aila, Jr., responded that fishing for specific types of fish in specific areas was conducted in Lualualei and along the entire Waiʻanae Coast to provide fish for specific ceremonies. Limu was gathered from the coastal area for religious and burial ceremonies. The ocean was utilized for gathering marine resources and for subsistence fishing. The environment provided other resources, such as rocks, which were gathered in Lualualei for constructing ahu (shrines), and traditional plants, including olena (*Curcuma domestica*, tumeric), ti (kī, *Cordyline fruticosa*), maiʻa (banana, *Musa*), ʻawa (*Piper methysticum*), ʻuala (sweet potato, *Ipomoea batatas*), kalo (taro, *Colocasia esculenta*), and lauhala (*Pandanus tectorius*) were grown and gathered for food and ceremonies.

Numerous legends are associated with Lualualei. According to Mr. Aila, Jr., Nioiʻula Heiau is associated with the aliʻi Kawelo (see Sterling and Summers 1978:66; Handy and Handy 1972:467); Pāheʻeheʻe Ridge, which separates Waiʻanae Ahupuaʻa and Lualualei Ahupuaʻa, was the site of a holua slide. In another story related by Mr. Aila, Jr., three mountains (Puʻu Huluhulu, Puʻu Māʻiliʻili, and Puʻu Pāheʻeheʻe) are associated with an amorous chief who was in love with twin sisters and could not choose between them. So, either the father of the chief or a kahuna (priest) turned the three of them into mountains

so that they could be together forever. On January 9, 2013, Mr. Aila, Jr., affirmed, via telephone, that the proposed undertaking would not impact any traditional cultural places or impact access rights.

Analysis of the potential effect of the KCLC at Māʻili on cultural resources, practices or beliefs, its potential to isolate cultural resources, practices or beliefs from their setting, and the potential of the project to introduce elements which may alter the setting in which cultural practices take place is also a suggested guideline of the Office of Environmental Quality Control. To our knowledge, the project area has not been used for traditional cultural purposes within recent times.

Based on the initial findings in the CIA, it is reasonable to conclude that pursuant to Act 50, the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities will not be affected by the KCLC at Māʻili.

4.7 ROADWAYS AND TRAFFIC

Roadways/Traffic

The property is approximately one-quarter mile mauka (northeast) of Farrington Highway. It is anticipated that the project's primary access will be provided with an extension of Kulauku Street. Kulauku Street is owned by the City and County, which is accessed from Farrington Highway via Kaukama Road. The intersection of Kaukama Road and Farrington Highway is signalized and channelized.

Secondary access to the site could be provided from Kulaaupuni Street, which intersects with St. John's Road to the north. St. John's Road has a signalized and channelized connection to Farrington Highway.

Farrington Highway is owned by the State of Hawaiʻi, and is a four-lane, generally north-south, divided highway in the vicinity of Māʻili that extends along the western coast of the island, from Waiʻanae at the north end to Nānākuli at the south end of the Waiʻanae Coast. Farrington Highway has a posted speed limit of 35 mph in the vicinity of the site. Separate left and right turn lanes are provided at intersections.

Kaukama Road is owned by the City and County of Honolulu, and is an east-west, two-lane roadway that terminates at Farrington Highway to the west and Pakeke Street to the east. It is an improved road, with a 40-foot roadway and 56-foot right-of-way. This facility serves two-way traffic and includes shoulders along most of its length between Farrington Highway and Pakeke Street. The intersection of Kaukama Road and Farrington Highway is signalized. The posted speed limit for this roadway is 25 miles per hour.

Kulaaupuni Street is owned by the City and County of Honolulu and has a 20- to 24-foot paved roadway within a 40-foot easement. It is a narrow, two-lane roadway which runs north-south and is unimproved (no curb, gutter, or sidewalks). The roadway is offset at the intersection with St. John's Road and terminates at Mamoaliʻi Place, just south of Holt Road. The unpaved shoulder areas are often used for parking. The posted speed limit is 25 miles per hour, north of St. John's Road. There is no posted speed limit on the southern leg of the roadway.

Kulauku Street is owned by the City and County of Honolulu and is accessed from Farrington Highway via Kaukama Road. It is an improved roadway with a 40-ft paved roadway in a 56-foot right-of-way. It is two-lane roadway which terminates at Kaukama Road to the south, and dead ends just north of Kulawae Street. The roadway runs through a residential neighborhood and on-street parking is permitted. The posted speed limit is 25 miles per hour.

St. John's Road is owned by the City and County of Honolulu from Farrington Highway to the corner of Kulaaupuni Street and has an approximately 20-foot paved roadway in a 40-foot right-of-way. This two-lane roadway is unimproved (no curb, gutter, or sidewalks). This narrower street is fronted by single-family residential uses, and its unpaved shoulder areas are often used for parking. Vehicles use St. John's Road to access Māʻili Elementary School to the north, via Kulaaupuni Street. The intersection of St. John's Road and Farrington Highway is signalized. The posted speed limit for this roadway is 15 miles per hour.

Farrington Highway is the highest vehicle volume roadway on the Waiʻanae Coast and includes distinct directional traffic as residents travel to jobs in Kapolei and the primary urban center of Honolulu in the morning (AM) peak period and return in the evening (PM) peak period. Kaukama Road does experience some moderate vehicle traffic volumes as it serves as a collector for a substantial portion of Māʻili residences.

A transportation impact analysis report (TIAR) was prepared by Fehr & Peers in February 2013. The TIAR is summarized below and attached to this report as Appendix D.

Traffic counts were conducted in November 2012 at four study intersection: (1) Kaukama Road and Kulauku Street; (2) Kaukama Road and Farrington Highway; (3) St. John's Road and Farrington Highway; and (4) St. John's Road and Kulaaupuni Street. . This count data confirmed the AM peak hour to be between 7:00 AM and 9:00 AM, and the evening peak hour to be between 4:00 PM and 6:00 PM. A comparison between the 2010 vehicle traffic volumes and the recent traffic count data concluded that there has not been substantial growth in the project area since 2010.

The highway capacity analysis performed in this Traffic Impact Report was based upon established traffic engineering procedures and is based on the concept of Level of Service (LOS). LOS is quantitative and qualitative assessment of traffic operations. Levels of Service are defined by LOS "A" through "F"; with LOS "A" representing ideal or free-flow traffic operating conditions and LOS "F", unacceptable or potentially congested traffic operating conditions.

The four study intersections operate at either LOS A or B for both existing peak periods, with the exception of the intersection of St. John's Road and Kulaaupuni Street which operates at LOS E during the existing AM peak hour. This is due to traffic generated by Māʻili Elementary School located north of the intersection, and congestion generally only occurs for less than 30 minutes within the AM peak hour. Under these existing conditions, the intersection does not warrant signalization.

Table 4-1: Existing Intersection Levels of Service

INTERSECTION	INTERSECTION CONTROL	EXISTING			
		AM PEAK HOUR		PM PEAK HOUR	
		LOS	DELAY	LOS	DELAY
Kaukama Road/Kulauku Street	Side-Street Stop	B	11.4	B	11.5
Kaukama Road/Farrington Highway	Signalized	B	12.1	A	9.8
St. John's Road/Farrington Highway	Signalized	B	15.0	A	9.6
St. John's Road/Kulaaupuni Street	Side-Street Stop	E*	38.2	B	11.4

Notes:
LOS - Level of Service
* - For side-street stop control intersections, the worst-case movement data is reported.

Source: Fehr & Peers, February 2013

Public Transportation

TheBus is a public transportation service provided by the City and County of Honolulu. It provides bus service along the Waiʻanae Coast. The closet bus stops require a walk of between one-half miles to three-quarter miles to access the project site. These service routes include:

Route C – Country Express bus service connects the Waiʻanae Coast to the Ala Moana Shopping Center, and several points in-between, including Kapolei, Kalihi, and downtown Honolulu. Service frequency on Route C varies from 4:00 AM to 10:30 PM with 30 minute headways.

Route PH1 – Pearl Harbor and Hickam AFB follows a similar route as Route C, with an additional loop through the Pearl Harbor/Hickam Air Force Base. Service frequency on Route PH1 varies from 4:00 AM to 10:30 PM with 30 minute headways.

Route 40 – Honolulu-Mākaha connects the Mākaha Towers to the Ala Moana Center. The route follows Farrington Highway with stops at Mākaha Valley Road, the Waiʻanae Transit Center, the Wet n' Wild Hawaiʻi Water Park and Kapolei. The route continues on to Honolulu via the Kamehameha Highway to Nimitz Highway, Dillingham Boulevard, King Street and Kapiʻolani Boulevard. Route 40 operates 24 hours per day with 30 minute headways during the peak hours.

Route 90 – Waiʻanae Coast Express connects the Waiʻanae Coast to downtown Honolulu as far east as Alapaʻi and King Street. It follows a similar route as Route C, Country Express, except that it does not continue to Ala Moana Center, instead offering stops on Vineyard and continuing along Middle Street before returning to the Waiʻanae Coast. Route 90 is an express route which operates in the eastbound direction during the morning peak hour at 20 minute headways, and operates during the evening peak hour with an average of 15 minute headways.

Potential Impacts and Mitigation Measures

Roadways/Traffic

Based on the conceptual site plan and phasing of the KCLC at Māʻili, Fehr & Peers estimated the Proposed Project-related traffic. The TIAR summarizes the adjusted Proposed Project trip generation characteristics applied to the AM and PM peak hours of traffic to measure the impact resulting from the proposed traffic for three future scenarios corresponding with its development phasing: years 2014 (Phase 1), 2017 (Phase 2), and 2019 (Phase 3 and estimated full-build out of the Proposed Project). In each case a baseline scenario was identified assuming no development of the KCLC at Māʻili, followed by the addition of traffic from each development phase. Each phase of development includes an assumed annual growth factor, as well as approved and other projects within a relevant distance to the project site.

Traffic Operations under Year 2014 Without the Proposed Project – To describe the future traffic without the Proposed Project, Fehr & Peers calculated annual average growth rates in traffic based on 2006 and 2010 historic State Department of Transportation (DOT) roadway volumes. The rates were applied to the existing traffic volumes to estimate future 2014 Baseline traffic volumes, and accounts for general growth in traffic along the Waiʻanae Coast. In addition to general growth, traffic from two residential developments

planned or under construction in the immediate vicinity of the Proposed Project were included in the 2014 Baseline traffic volumes.

The four study intersections operate at LOS B for both existing peak periods, with the exception of the intersection of St. John's Road and Kulaaupuni Street which operates at LOS F during the existing AM peak hour. This is due to the Māʻili Elementary School traffic plus the addition of traffic from some of the planned housing in the area. The intersection traffic volumes do not warrant signalization under these conditions.

Traffic Operations under Year 2014 With the Proposed Project – The KCLC at Māʻili is intended to serve the residents of the Waiʻanae Coast. Thus, the vast majority of the trips will be confined to the communities along Farrington Highway, with the exception of some staff that may live in other areas and commute in. Based on the distribution of residences along the Waiʻanae Coast, the project trips were generally distributed as follows: 60% to and from the north, and 40% to and from the south. For all three project phases, the operations analysis was conducted assuming that all traffic related to the KCLC at Māʻili would use Kulauku Street and Kaukama Road to access Farrington Highway. The trip distribution and assignment of project trips to each turning movement were applied accordingly.

This scenario includes the trips generated by Phase 1 of the Proposed Project, which were added to the 2014 Baseline volumes. The table below shows the results of the 2014 With Proposed Project analysis.

Table 4-2: 2014 Intersection Levels of Service

Intersection	Intersection Control	2014 BASELINE				2014 WITH PROJECT			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Kaukama Road/Kulauku Street	Side-Street Stop	B	11.2	B	12.0	C	16.4	B	12.6
Kaukama Road/ Farrington Highway	Signalized	B	18.7	B	11.6	C	23.6	B	15.4
St. John's Road/ Farrington Highway	Signalized	B	17.6	B	12.5	B	18.4	B	13.4
St. John's Road/ Kulaaupuni Street	Side-Street Stop	F*	83.3	B	14.0	F	84.9	B	14.1

Notes:
LOS - Level of Service
* - For side-street stop control intersections, the worst-case movement data is reported.

Source: Fehr & Peers, February 2013

The table shows that the intersection of St. John's Road and Kulaaupuni Street is projected to continue to operate at LOS F during the AM peak hour under this scenario. The peak hour vehicle traffic volumes do not warrant signalization of the intersection under this scenario.

Traffic Operations under Year 2017 Without the Proposed Project – Traffic volumes under this scenario are comprised of three components: 1) Existing volumes plus five (5) years of regional growth (based on historic counts); 2) Traffic from three approved residential developments within the study area; and 3) Traffic from a portion of the proposed DHHL residential development.

While no formal action has been taken, 33.5 acres north of the project site are anticipated to be developed by the DHHL and are intended for residential development to be completed in three phases. The first phase contemplates 100 single-family dwelling units to be constructed in 2016, and was therefore assumed to be constructed and occupied under Phase 2 2017 Baseline conditions. All DHHL-generated trips were assumed to use Kulaaupuni Street and St. John's Road to access Farrington Highway, and they were distributed and assigned to the study intersections based on existing travel patterns.

The four study intersections operate at an acceptable LOS for both existing peak periods, with the exception of the intersection of St. John's Road and Kulaaupuni Street which operates at LOS F during the existing AM peak hour. This is due to the Māʻili Elementary School traffic plus the addition of traffic from new residential developments, including DHHL. The intersection traffic volumes do not warrant signalization under these conditions.

Traffic Operations under Year 2017 <u>With</u> the Proposed Project – Traffic volumes under the 2017 With Proposed Project scenario are comprised of the following components: 2014 Without Proposed Project Volumes, KCLC Phases 1 and 2 Volumes, three years of additional regional growth, and anticipated traffic from a portion of a proposed DHHL residential community. The table below shows the results of the 2017 With Proposed Project analysis.

Table 4-3: 2017 Intersection Levels of Service

INTERSECTION	INTERSECTION CONTROL	2017 BASELINE				2017 WITH PROJECT			
		AM PEAK HOUR		PM PEAK HOUR		AM PEAK HOUR		PM PEAK HOUR	
		LOS	DELAY	LOS	DELAY	LOS	DELAY	LOS	DELAY
Kaukama Road/Kulauku Street	Side-Street Stop	B	11.7	B	12.8	D	29.8	C	15.5
Kaukama Road/ Farrington Highway	Signalized	B	13.7	B	17.1	C	29.8	C	30.8
St. John's Road/ Farrington Highway	Signalized	C	23.8	B	19.4	C	26.2	C	26.8
St. John's Road/ Kulaaupuni Street	Side-Street Stop	F*	>150	C	17.0	F	>150	B	17.1

Notes:
LOS - Level of Service
* - For side-street stop control intersections, the worst-case movement data is reported.

Source: Fehr & Peers, February 2013

The table shows the intersection of St. John's Road and Kulaaupuni Street is projected to operate at LOS F during the AM peak hour with excessive delay and congested conditions. The combination of Ma'ili Elementary School traffic and traffic from new residential developments, including DHHL, contribute to these operations, while the amount of traffic generated by the KCLC at Māʻili is negligible for this intersection. Under these conditions, the vehicle traffic volumes do not warrant signalization of the intersection as they are just under the threshold. All other intersections operate at an acceptable level of service in both the AM and PM peak hours.

Traffic Operations under Year 2019 Without the Proposed Project – Traffic volumes under this scenario are comprised of three components: 1) Existing volumes plus seven (7) years of regional growth (based on historic counts); 2) Traffic from three approved residential developments within the study area; and 3) Traffic from the first and second phases of the proposed DHHL residential development.

The second phase of the DHHL residential development is currently anticipated to include 80 units of multi-family housing to be constructed in 2018, and was therefore assumed to be constructed and occupied under Phase 3 2019 conditions. Similar to the first phase, these DHHL trips are assumed to access Farrington Highway via St. John's Road and Kulaaupuni Street, and they were distributed and assigned to the study intersections based on existing travel patterns. Lastly, an additional two years of regional growth was added to the Phase 2 2017 baseline volumes to account for other development in the area. Thus, the combination of traffic anticipated from the first two phases of DHHL (180 residential

units), a total of seven (7) years of background growth (2012 to 2019), and existing conditions comprise the Phase 3 2019 baseline traffic volumes. The DHHL residential project also contemplates a third development phase which was not included in this TIAR analysis since the KCLC at Māʻili is intended to be built out before DHHL's remaining 80 units are constructed in 2020.

The four study intersections operate at an acceptable LOS for both existing peak periods, with the exception of the intersection of St. John's Road and Kulaaupuni Street which operates at LOS F during the existing AM peak hour. This is due to the Māʻili Elementary School traffic plus the addition of traffic from new residential developments, including DHHL. The intersection traffic volumes do not warrant signalization under these conditions.

Traffic Operations under Year 2019 With the Proposed Project – Traffic volumes under 2017 With Proposed Project scenario are comprised of the following components: 2014 Without Proposed Project Volumes, full buildout of the KCLC at Māʻili, five years of additional regional growth, and anticipated traffic from the proposed DHHL residential community. The table below shows the results of the 2019 With Proposed Project analysis.

Table 4-4: 2019 Intersection Levels of Service

Intersection	Intersection Control	2019 BASELINE				2019 WITH PROJECT			
		AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
		LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Kaukama Road/Kulauku Street	Side-Street Stop	B	12.1	B	13.3	F	52.3	C	18.8
Kaukama Road/ Farrington Highway	Signalized	C	21.8	B	18.8	D	48.3	E	66.7
St. John's Road/ Farrington Highway	Signalized	C	29.6	C	32.7	C	33.9	C	54.8
St. John's Road/ Kulaaupuni Street	Side-Street Stop	F*	>150	C	19.7	F	>150	C	20.2

Notes:
LOS - Level of Service
* - For side-street stop control intersections, the worst-case movement data is reported.

Source: Fehr & Peers, February 2013

During the AM peak period, the addition of project traffic will degrade operations at the Kaukama Road and Kulauku Street intersection from LOS B to LOS F in 2019. According to the impact criteria, this results in a significant project-specific impact, as the traffic volumes do warrant signalization. Also, the addition of project traffic will degrade PM

peak hour operations from LOS B to LOS E at the Kaukama Road and Farrington Highway intersection in 2019. This constitutes a project-specific impact.

The intersection of St. John's Road and Kulaaupuni Street is projected to operate at LOS F during the AM peak hour with excessive delay and congested conditions. The combination of Ma'ili Elementary School traffic and traffic from new residential developments including the DHHL project contribute to these operations, while the amount of KCLC traffic contributing to this intersection is negligible. However, under these conditions, the vehicle traffic volumes do not warrant signalization of the intersection as they are just under the threshold. Thus, no project impact is identified at this location in 2019.

The TIAR's findings are that no roadway improvements are needed for construction and occupancy of Phases 1 and 2 of the KCLC at Māʻili. Phase 3 of the KCLC at Māʻili would result in impacts to the Kaukama Road and Kulauku Street intersection and Kaukama Road and Farrington Highway intersection. Roadways improvements have been identified as potential mitigation options to address projected capacity deficiencies.

To minimize the number of vehicles traveling to and from the site and to encourage those students in the general vicinity of the project site to walk, streets directly serving the KCLC at Māʻili should include formal paths or sidewalks that are separated from vehicle travel lanes. Accordingly, the extension of Kulauku Street from north of Kulawae Street along the project frontage should include sidewalks on both sides of the street consistent with other streets in the neighborhood.

For students walking from the north, a separate pedestrian path should be provided from the southern terminus of Kulaaupuni Street to the site regardless of the timing of the planned street extension. In addition, the existing path on the east side of Kulaaupuni Street (south of the drainage channel bridge) currently terminates just north of Holt Drive. At a minimum, this path should be formalized with at least an AC berm separating it from the travel lanes, and extended to the site (adjacent to the DHHL site frontage). In addition, a graded path should be constructed north of the bridge to St. John's Road and parking should be prohibited on this side of the street as needed to keep the path clear of obstructions. Once the street is fully extended between Kulaaupuni Street and Kulauku Street, the path could become a raised sidewalk.

Public Transportation

The KCLC at Māʻili will not significantly impact transit service within the vicinity of the project site. This is due to the fact that limited students are anticipated to use transit to access the KCLC, and some students will be bused to and from the site. Some staff are expected to use public transit operated by the City and County of Honolulu, including the

Handi-Van Service for disabled persons, however the number is not significant enough to result in an impact on the transit service. Designated parking spaces should be provided on-site for Handi-Van vehicles, as well as for vehicles with disabled permits per City and County of Honolulu ordinance. KS will continue to work with the City and County of Honolulu to insure appropriate roadway improvements are incorporated into the Proposed Project design. There are no anticipated impacts to Public Transit or paratransit operations during project construction.

4.8 NOISE

Current sources of noise in the vicinity of the project site include vehicular traffic, typical residential noise, occasional aircraft, and natural sounds associated with weather and birds.

Potential Impacts and Mitigation Measures

Construction Noise

The Proposed Project is expected to produce increased noise levels both during construction and once operational. The development of the KCLC at Māʻili could be a concern to residents in the surrounding neighborhoods.

In general, construction activities cannot exceed the permissible noise levels for more than ten percent of the time within any twenty minute period except by permit or variance. Any noise source that emits noise levels in excess of the maximum permissible sound levels cannot be operated without first obtaining a noise permit from the State Department of Health (DOH). Although the permit does not attenuate noise, it regulates the hours during which excessive noise is allowed.

Exposure to noise is expected to vary by construction activity, and the type of equipment used during the different activities. The general contractor(s) is expected to be responsible for obtaining necessary permits and complying with all permit conditions. There is a need to balance work activities to meet permit conditions for "acoustical" zoning districts while minimizing traffic disruptions. Work is expected to be scheduled primarily for daytime hours, as described in HAR Title 11, Chapter 46 (7:00 AM to 10:00 PM), Monday through Friday. The contractor is also expected to ensure that all construction equipment with motors are properly equipped with mufflers in good operating condition. The contractor may employ other mitigation measures to minimize those temporary noise impacts.

The closest existing school to the Proposed Project, Māʻili Elementary School, is less than one mile away. The distance from the KCLC at Māʻili is anticipated to effectively attenuate construction and operation noise from the Proposed Project on Māʻili Elementary School.

The KCLC at Māʻili is not planned to be constructed all at once, but expected to be developed in phases. The KCLC at Māʻili includes the creation of an early childhood education complex during the first phase of construction. As each facility is constructed, it is anticipated that the surrounding buildings and residences within the Proposed Project are also likely to experience the temporary inconvenience of construction noise.

Operational Noise

Once operational, the noise levels at and immediately adjacent to the project site are expected to mimic those typical of an educational center with relatively longer periods of quiet, and periods of noise levels during student movement and outdoor activities. According to Community Noise Control regulations (HAR 1-46-5(7)), school activities approved by school authorities are exempt from these regulations provided that the activities occur between 7:00 AM and 10:00 PM.

It is anticipated that noise may be generated from several different types of sources. One substantial noise generator is the need for mechanical equipment such as heating and cooling systems, rotating or reciprocating equipment, active piping or ducting, etc. Whenever required, noise impact can be reduced by the use of sound enclosures, mufflers, etc. Another source of operational noise is from the buses and cars dropping off and picking up students and staff from the facility. The buses servicing the KCLC at Māʻili will be properly maintained and appropriate mufflers will be in place. The third source of operational noise is a result in the increased number of people within the educational center. The project site is currently vacant, and recreational and educational activities located outside of the proposed buildings are expected to increase the ambient noise level at the site.

4.9 AIR QUALITY

The State's good air quality is largely a function of the predominant tradewinds blowing from the northeast. The typical tradewinds pattern blows anthropogenic and volcanic pollutants toward the ocean. However, during non-tradewind periods, both anthropogenic and volcanic pollutants can accumulate on island, affecting both visibility and air quality (increase in sulfur oxides (SOx) and particulates). According to the EPA, there are no "non-attainment" areas on the island of Oʻahu. A non-attainment area is defined as a locality where air pollution levels caused by anthropogenic sources persistently exceed National Ambient Air Quality Standards (NAAQS). Most of the existing airborne pollutants are attributed primarily to vehicle-generated exhaust from the region's roadways.

Potential Impacts and Mitigation Measures

Short-term air quality impacts due to the Proposed Project may result from construction activities. During construction, air quality in the area may be impacted by exhaust generated from construction equipment and fugitive dust. All construction activities will implement BMPs necessary to comply with the provisions of HAR, Chapter 11-60.1, "Air Pollution Control," Section 11-60.1-33, Fugitive Dust and to reduce any negative air quality impacts.

A combination of measures to mitigate potential air quality impacts (i.e., watering exposed soils, grassing, minimizing the amount of disturbed area, and rapidly establishing plant materials) will be implemented as appropriate. The General Contractor is expected to develop standard procedures should dirt be tracked onto the highway, to prevent fugitive dust formation. Exhaust emissions from construction equipment and increased vehicular traffic should not violate State or Federal air quality standards based on the moderate level of existing traffic volumes in the region.

Long-term air quality impacts due to the Proposed Project are not expected. Once the KCLC at Māʻili is built and occupied/operational, the number of vehicles waiting to enter Farrington Highway are expected to increase, particularly during the morning hours. However, the winds (tradewinds and on-shore breezes) and the short periods that the vehicles stop before entering Farrington Highway should rapidly dissipate any potential impacts from noxious gasses. As part of the consideration regarding air quality, plans are to bus a portion of the students attending the KCLC at Māʻili. This should significantly reduce the number of cars traveling to and from the project site reducing the potential impact from single occupancy vehicles. While the project designs are still under development, the concept of sustainability is being incorporated into the design. The Proposed Project is being designed to incorporate multi-modal transportation within the project site. Facilities for biking and walking are proposed within the KCLC at Māʻili, reducing potential emissions generated by cars. No additional mitigation measures are proposed.

4.10 VISUAL RESOURCES

According to the Waiʻanae Sustainable Communities Plan (WSCP), visual resources in the Waiʻanae district include coastal lands, steep ridges and puʻu near the coast, and the peaks of the Waiʻanae Mountain range. The property's central location within the ahupuaʻa ʻo Lualualei and its proximity to Puʻu Māʻiliʻili and Puʻu o Hulu provide for panoramic views from within the property of the ridgeline of the ahupuaʻa and the two landforms to the north and south of the property. Due to the sites low elevation, makai views of the ocean are limited (See Figure 2-1).

Potential Impacts and Mitigation Measures

The visual appearance of the project site is expected to change from vacant land overgrown with weeds, grasses, and shrubbery to a learning center. To maintain the visual appearance, the covered structures being planned as part of the KCLC at Māʻili are expected to cover approximately 4.13 acres, or roughly 10 percent of the approximately 40-acre project site.

The buildings within the KCLC at Māʻili are anticipated to be one or two stories in height. Given the existing grade of the project site and the low building height, ocean views from residences mauka of the project site are not expected to be obstructed. Landscaping should further mitigate the visual impact of rooflines. The WSCP indicates that mauka and makai views are important, but does not specifically recognize any specific view planes encompassing any portion of the project site that require consideration and accommodation. As such, the Proposed Project is not expected to significantly impact public views. KS does not expect any of the views in Māʻili, identified as significant within the Coastal View Study, to be impacted by the KCLC at Māʻili.

4.11 SOCIAL & ECONOMIC CHARACTERISTICS

Data from the U.S. Census Bureau can provide general characteristics of the population in the vicinity of the property. Demographic data for the Māʻili Census Designated Place (CDP) are from the 2006-2010 American Community Survey 5-Year Estimate while data for Oʻahu is from the 2010 American Community Survey 1-Year Estimate. The American Community Survey Estimates represent the average characteristics of population and housing for a time range, rather than for a single point in time. The Māʻili CDP extends from Māʻiliʻili Road to the north, Paʻakea Road and the Sea Country community to the east, Puʻu o Hulu Kai to the south, and the coastline to the west.

Between 2006 and 2010, the Māʻili CDP had an average population of 8,065 persons. The median age of the population was 31.4 years, 756 persons (9.4%) were under 5 years of age, 5,611 (69.9%) were 18 years and over, and 550 persons (6.8%) were 65 years and over.

With regard to educational attainment, of the population 25 years of age and older 13.1% did not graduate from high school, 47% are high school graduates or equivalent, 20.3% attended college but did not receive a degree, 5.9% received an Associate's degree, 10.3% received a Bachelor's Degree, and 3.3% received a Graduate or professional degree.

In terms of race, 54.9% of the Māʻili CDP's population reported belonging to one race and 45.1% reported belonging to two or more races. Of those identifying with one race only,

"Native Hawaiian or Other Pacific Islander" comprised 24.9% of the population, "Asian" 14.8%, "White" 10.6%, "African American" 2.9%, and "American Indian and Alaska Native" 0.4%. Those reporting only "Native Hawaiian" comprised 12.1% of the population.

There were 2,362 housing units in the Māʻili CDP of which 233 (9.9%) were vacant and 2,129 (90.1%) were occupied. Of the occupied units, 64% were owner occupied and 36% were renter occupied. For units with a mortgage, the median monthly mortgage amount was $2,157 and for rental units the median monthly rent was $1,159. The median value of owner-occupied units was $372,500.

The median household income in the Māʻili CDP was $72,593. Approximately 21% of Māʻili's population was below the poverty level and for those under 18, about 31% were below the poverty level.

Comparing characteristics of the Māʻili CDP to Oʻahu as a whole, Māʻili's population is younger (median age 31.4 years vs. 38.0 years) with a higher percentage of children under 18 years of age (30.4% vs. 22.0%) and fewer persons 65 years or over (6.8% vs. 14.7%). Māʻili's population is comparable to Oʻahu's in terms of graduating from high school (86.8% vs. 89.9%), however, fewer persons received a bachelor's degree or higher (13.6% vs. 31.9%). In terms of race, a substantially higher percentage of Māʻili's population reported as "Native Hawaiian" (12.4% vs. 4.5%).

For housing units, a greater percentage of units in Māʻili were reported as owner occupied than Oʻahu as a whole (64.0% vs. 56.1%). The median mortgage amount in Māʻili was lower than Oahu's ($2,157 vs. $2,326) as was the median rent ($1,159 vs. $1,363).

Māʻili's household income was higher than Oʻahu's ($72,593 vs. $68,537). However, a higher percentage of the population was below the poverty level (20.6% vs. 9.1%) and the difference is even higher for those under 18 years of age (30.7% vs. 11.0%).

Between 1903 and 1912, the Territorial Government sold homesteads in Lualualei in three series. The first series of homesteads was purchased by Link McCandless who ranched most of the land until 1929. The second and third series were for lots in the lower valley and near the coast. The 1928-1929 USGS Nānākuli Quadrangle shows the Site immediately *mauka* of the Māʻili Tract of the Lualualei Homesteads.

Many of the single-family home lots in the area were created in the 1950's to 1970's. The Māʻili Kai community, located immediately to the south of the site, was created in the 1990's and D.R. Horton is continuing the build-out of the Sea Country community, which will eventually extend along the site's eastern border.

There are a number of educational facilities and programs in the vicinity of the project site. Facilities within a one-mile radius of the property include Māʻili Elementary School, Kamehameha Schools Waiʻanae 1 Preschool, Kamehameha Schools Hoaliku Drake Preschool, INPEACE Keiki Steps (Māʻili Elementary School), Head Start Māʻili Elementary School, Head Start Ulu Ke Kukui, Head Start Keiki Country, Māʻili Bible School, Butler Enterprises Child Care, and Nina's Learning Day Care.

Public schools serving the property include Māʻili Elementary School, Waiʻanae Intermediate School, and Waiʻanae High School. Charter schools along the Waiʻanae Coast include the Ka Waihona o ka Naʻauao K-8 School in Nānākuli and the Kamaile Academy K-9 School in Waiʻanae.

Only two of the 11 DOE public or charter schools in the Nānākuli-Waiʻanae Complex Area are in good standing with the "No Child Left Behind" (NCLB) program. Six schools are under restructuring, one school is planning for restructuring, one school is in "Year 2", for school improvement status, and one school is under corrective action in "Year 1". In addition to tracking school accountability through the NCLB program, the DOE also tracks readiness of students entering kindergarten through its Hawaiʻi State School Readiness Assessment. This is a profile that shows the proportion of children entering kindergarten that display characteristics and skills considered important for successful early learning experiences. Based on a review of the data provided for each school, the median score for kindergarten readiness is 3.55, indicating that just over half of the children are prepared for the rigors of kindergarten. A summary of each school's status regarding school accountability and school readiness (if applicable) is shown in Table 4-5. Both of these assessments tell just part of the story of the educational situation on the Waiʻanae Coast. Many schools have transient populations. Additionally, most of the schools also receive federal title one funds which are based on poverty level. While all of the schools struggle to meet the requirements of NCLB, they are filled with dedicated staff that work hard at educating their pupils.

Table 4-5: School Accountability and School Readiness

School	No Child Left Behind School Accountability				Hawaiʻi State School Readiness	
	School Year	Adequate Progress Made?	No. of Targets Met	Status for 12-13 School Year*	School Year	Mean Rating**
Nānāikapono Elementary	11-12	no	15 of 19	restructuring	12-13	3.9
Nānākuli Elementary	11-12	yes	15 of 15	in good standing,	12-13	4.0

SCHOOL	NO CHILD LEFT BEHIND SCHOOL ACCOUNTABILITY				HAWAIʻI STATE SCHOOL READINESS	
	SCHOOL YEAR	ADEQUATE PROGRESS MADE?	NO. OF TARGETS MET	STATUS FOR 12-13 SCHOOL YEAR*	SCHOOL YEAR	MEAN RATING**
				unconditional		
Nānākuli High & Intermediate	11-12	no	7 of 19	restructuring	not applicable	
Leihōkū Elementary	11-12	no	9 of 17	planning for restructuring	12-13	3.6
Māʻili Elementary	11-12	no	14 of 19	In good standing, pending	12-13	3.2
Mākaha Elementary	11-12	no	8 of 17	corrective action year 1	12-13	3.1
Waiʻanae Elementary	11-12	no	15 of 17	restructuring	12-13	3.5
Ka Waihona o Ka Naʻauao NCPCS	11-12	yes	13 of 13	school improvement year 2	not available	
Kamaile Academy PCS	11-12	no	11 of 19	restructuring	not available	
Waiʻanae Intermediate	11-12	no	19 of 23	restructuring	not applicable	
Waiʻanae High	11-12	no	1 of 21	restructuring	not applicable	

Notes:
* - A Schools status as "in Good Standing" is affected when adequate progress is not made for two consecutive years.
** - A score of 1 indicates nearly none of the children consistently display the key characteristics. A score of 5 indicates almost all children consistently display the key characteristics.

Potential Impacts and Mitigation Measures

The largest native Hawaiian population in the world resides between Mākaha Valley and Honokai Hale. The KCLC at Māʻili is anticipated to have a positive impact on this population by providing improved access to educational opportunities, and opportunities

for cultural education from pre-natal through *kūpuna*. Other positive impacts include the operational jobs generated by the KCLC at Māʻili.

KS recognizes the struggles and successes of the Waiʻanae-Nānākuli Educational Complex and has identified this Project as an opportunity to work with existing programs and generate new ones to improve the educational success of families, particularly those of native Hawaiian descent along the Waiʻanae Coast. The KCLC at Māʻili is being designed based on community input to support, not replace, the varied educational network already in existence on the Waiʻanae Coast. As part of the project's community outreach, the programmatic components of P-20 have been developed over the last few years with community consultation. The programming is anticipated to increase the educational opportunities for preschoolers through young adults.

The Proposed Project is expected to generate short-term employment in the construction of on- and off-site infrastructure improvements, as well as on-site building and landscape improvements. At full build out, the KCLC at Māʻili is anticipated employ up to 400 staff.

4.12 INFRASTRUCTURE AND UTILITIES

Mitsunaga and Associates, Inc., has been retained to prepare a Preliminary Engineering Report to address infrastructure and utility issues as they pertain to the development of the Proposed Project (See Appendix E).

4.12.1 Water System

The project site is within the Waiʻanae Service Area of the Board of Water Supply's (BWS) Development Plan for the island of Oʻahu. The Waiʻanae Service Area (potable supply) is estimated to have a water demand of 9.3 million gallons a day (MGD). The wells in the Waiʻanae Service Area contribute approximately 4.8 MGD. The Lualualei booster pump provides approximately 4.5 MGD to the Waiʻanae Area from Central Oʻahu.

The property is within the Waiʻanae 242' Service Zone. Currently, BWS has a 50 single-family home or 25,000 GPD limit per project west of the Lualualei Pumping Station. An upgrade to the Lualualei booster pump is scheduled to be funded in 2013, and expected to come on line in 2015. The booster pump will be upgraded from a 5 MGD capacity to 8 MGD. BWS has indicated that the upgraded booster pump will lift the 50 single-family home equivalent restriction. Discussions with BWS have indicated that the Ulu Ke Kukui transitional housing project has encumbered the 25,000 GPD Limit for the property (TMK 8-7-010: 007). Further discussion with BWS needs to be conducted to examine the options the KCLC at Māʻili has to secure water allocation for Phase 1 (Early Childhood Education Complex).

Potential Impacts and Mitigation

The estimated average daily demands (gallons per day) for the KCLC at Māʻili is 164,000 gpd. The estimated total fire flow requirement for the project is 240,000 gallons. During the pre- consultation process, the BWS noted that the existing water system is presently not adequate to accommodate the Proposed Project. Currently, Kamehameha Schools is in discussions with BWS on mitigation measures that can help reduce the need for potable water requirements and are investigating potential solutions to address this water capacity issue.

Off-site Improvements
As described above, an upgrade to the Lualualei Booster Pump may be necessary before the BWS allocates water for the KCLC at Māʻili.

On-site Improvements
A new connection to the existing BWS water system will provide water service to the KCLC at Māʻili. The water system will need to be designed in conformance with the BWS Water System Standards and Standard Details. The project's water system is expected to be serviced by the BWS 242 Service Zone. Connection to the BWS system is anticipated near the intersection of Kulawae Street and Kulauku Street.

4.12.2 Wastewater System

An existing 18-inch sewer line meets at the intersection of Kulawae Street and Kulauku Street. The sewer line increases to a 24-inch along Maipalaoa Road. The 24-inch Maipalaoa Road sewer connects to the 36-inch Māʻili interceptor sewer at Māʻili Channel. The 36-inch sewer line continues north parallel to Kulaaupuni Street (175 ft west) to Makone Street where it jogs east onto Kulaaupuni Street and continues north toward Māʻiliʻili Stream. The sewer crosses Māʻiliʻilii Stream and then heads west (makai) towards Farrington Highway. The 36-inch continues north along Farrington Highway until it reaches the Waiʻanae Wastewater Treatment Plant. The City and County of Honolulu has indicated that the Waiʻanae Wastewater Treatment Plant has enough capacity for the project. The Waiʻanae Wastewater Treatment Plant provides secondary treatment of the wastewater.

Potential Impacts and Mitigation Measures

The Proposed Project is anticipated to generate a design average flow of 48,000 gpd, a design maximum flow of 190,000 gpd, and a peak flow (maximum flow + wet weather I/I) of 241,588 gpd.

Off-site Improvements

Preliminary telephone communication with the City and County of Honolulu Department of Planning and Permitting Wastewater Branch indicates that there is capacity in the 18-inch sewer and down-stream system to accommodate the Proposed Project. Mitsunaga & Associates has submitted a sewer connection application to the City.

On-site Improvements

The wastewater system for the KCLC at Māʻili will be designed in conformance with the City and County of Honolulu Wastewater Standards and Standard Details. The anticipated connection for the KCLC at Māʻili is to an existing 18-inch sewer at the intersection of Kulawae Street and Kulauku Street.

4.12.3 Drainage System

The project site sheet flows towards the western edge of the project site near Mamoaliʻi Place. An existing catch basin is located north of the project site (near Mamoaliʻi Place) with a 48″ drain line pipe, which drains into Māʻili Channel. Māʻili Channel runs in a southwesterly direction towards Farrington Highway and conveys the run-off to the Pacific Ocean. Māʻili Channel circumnavigates the property on the north and west sides.

Potential Impacts and Mitigation Measures

The development of the KCLC at Māʻili will increase the impervious area to 14.98 acres. The peak storm water runoff from the proposed drainage system (101.45 cubic feet per second [cfs]) is greater than the existing system (86.96 cfs). The addition 14.49 cfs of runoff due to the increase in impervious surface area will be detained on-site. Therefore, the Proposed Project will have no adverse drainage impact on the surrounding areas.

As required by the City and County of Honolulu, the KCLC at Māʻili will maintain existing drainage patterns and detain additional run-off caused by the increase in impervious area due to the development of the project site. It is anticipated that sustainable design practices and post construction best management practices (BMPs) will be implemented to limit the increase in runoff volume and help improve the quality of the storm water discharged. Detention ponds, water quality swales, structural BMPs, and pervious pavements may be utilized to help minimize the discharge from the project site to be equal to or less than the existing run-off quantity. In addition, the KCLC at Māʻili will comply with the City and County of Honolulu's Rules Relating to Storm Drainage Standards.

The Proposed Project is expected to include disturbances of over one acre of land area. Therefore, a NPDES permit will be required. To prevent pollution and protect the environment, required BMPs will be implemented.

4.12.4 Energy and Communications Systems

Energy System

Hawaiian Electric Company, Inc.'s (HECO) has three circuits that serve properties adjacent to the KCLC at Māʻili. Each circuit consists of overhead lines energized at 12.47 KV. The first two circuits are on the Nanakuli side of the project site consisting of a single phase primary overhead system along Maipalaoa Road and a single phase underground system in the D.R. Horton subdivision. Both of these primary power sources would require alterations to adequately serve the KCLC at Māʻili. The third overhead circuit is a three phase primary line installed from St. John's Road to Kulaaupuni Street, and terminates at a riser pole (pole 4/9Y) on Kulaaupuni Street that feeds the Ulu Ke Kukui transitional housing project.

Communications Systems

The existing Hawaiian Telcom and Oceanic Time Warner Cable infrastructure consists of an overhead system along St. John's Road, which risers down to an underground system along Kulaaupuni Street. The underground system, 2x4 pullboxes, serve existing residences on Kulaaupuni Street and the Ulu Ke Kukui transitional housing.

Potential Impacts and Mitigation Measures

Energy System

A total electrical load of approximately 3 megawatts (MW) has been estimated for the KCLC at Māʻili and the proposed DHHL residential development. HECO has determined that the existing three phase circuit along Kulaaupuni Street has adequate capacity to accommodate both projects.

The proposed improvements will include an underground electric system of ductlines, handholes, and concrete pads along the interior development roadways to provide for HECO's underground cables, pad mounted switching equipment, and transformers. Stub out ducts will be provided for service extension to accommodate project phasing.

Communications Systems

The existing underground telephone and cable TV system seem antiquated and may not be adequate to accommodate the Proposed Project. Two are being evaluated. The first option would route a new underground system from St John's Road and extend the system down Kulaaupuni Street to the Proposed Project. The other option would extend a new

overhead line from St John's Road, down Kulaaupuni Street. The current HECO power poles on Kulaaupuni Street would be used with new intermediates poles to meet Hawaiian Telcom and Oceanic Time Warner Cable span standards. Both systems would enter the Proposed Project underground.

Within the KCLC at Māʻili, proposed improvements will include an underground telephone and cable TV system of ductlines and pullboxes along the interior development roadways to provide for Hawaiian Telcom's and Oceanic Time Warner Cable's underground cables and equipment. Stub out ducts will be provided for service extension to accommodate project phasing.

4.12.5 Solid Waste

It is the County Department of Environmental Services, Refuse Division's responsibility to collect, recycle, burn and dispose of the Island's solid waste. The project site is currently vacant and does not generate waste.

Potential Impacts and Mitigation Measures

The Proposed Project will generate solid waste during construction and after development. Construction wastes will include vegetation, rocks and debris from the grading and grubbing of the project site. The typical range of per capita solid waste from a residential source is 2.0 to 5.0 pounds per capita per day. Ultimately, it is estimated the KCLC at Māʻili will generate 2.8 tons/day (1,850 students & faculty x 3.0 lbs./person/day / 2,000 lbs./ton). The composition of the solid waste is expected to be typical for a municipal source.

Any KCLC at Māʻili refuse that is not recycled is anticipated to be collected by a private refuse company to transport it to a County Department of Environmental Services, Refuse Division transfer station, for burning at the City's H-POWER facility and eventual disposal in a sanitary landfill.

KS strives to incorporate sustainability as one of its foremost project goals. Low-impact development and construction practices are expected to be implemented, including recycling and limiting waste generation.

4.13 PUBLIC SERVICES AND FACILITIES

Police Protection
The site is located within Honolulu Police Department District 8. The Waiʻanae Police Substation is located at the intersection of Farrington Highway and Waiʻanae Valley Road.

Fire Protection
The Waiʻanae Fire Station is located at 85-645 Farrington Highway and is approximately three miles away from the project site.

Health Care Services
The Waiʻanae Coast Comprehensive Health Center, which includes emergency services, is located at 86-260 Farrington Highway, and is approximately two miles from the project site.

Recreational and Cultural Facilities
Recreational facilities near the proposed project include Puʻu o Hulu Community Park, Māʻili Community Park, Māʻili Beach Park, Ulehawa Beach Park, Nānākuli Beach Park, Lualualei Beach Park, Pokai Beach Park, Herbert K Pililaau Community Park, Waiʻanae District Park.

Community Facilities
Community services and public facilities in the vicinity of the Proposed Project include the following:

- Churches in Waiʻanae and Nānākuli;
- Public library in Waiʻanae;
- Post office in Waiʻanae on Farrington Highway;
- Māʻili Elementary School;
- Waiʻanae District Park; and
- Commercial centers in Waiʻanae and Nānākuli.

Educational Facilities
There are a number of educational facilities and programs in the vicinity of the property. Facilities within a one-mile radius of the property include Māʻili Elementary School, Kamehameha Schools Waiʻanae 1 Preschool, Kamehameha Schools Hoaliku Drake Preschool, INPEACE Keiki Steps (Māʻili Elementary School), Head Start Māʻili Elementary School, Head Start Ulu Ke Kukui, Head Start Keiki Country, Māʻili Bible School, Butler Enterprises Child Care, and Nina's Learning Day Care.

Public schools serving the property include Māʻili Elementary School, Waiʻanae Intermediate School, and Waiʻanae High School. Charter schools along the Waiʻanae

Coast include the Ka Waihona o ka Naʻauao K-8 School in Nānākuli and the Kamaile Academy K-9 School in Waiʻanae.

Potential Impacts and Mitigation Measures

Police Protection
KS anticipate an occasional and unavoidable demand for police protection. KS is expected to develop a site specific safety plan for the KCLC at Māʻili. The site is located within minutes of the Waiʻanae Police Substation. During the pre-consultation process, the Honolulu Police Department noted that the project should have no significant impact on its facilities or operations.

Fire Protection
KS anticipate an occasional and unavoidable demand for fire protection. KS is expected to develop a site specific safety plan for the KCLC at Māʻili. Facilities will include appropriate fire safety features. The site is located within minutes of the Fire Station. The Proposed Project will be designed and built to include adequate fire flow to support firefighters as required.

Health Care Services
KS anticipate an occasional and unavoidable demand for emergency health care. The nearest emergency health center, the Waiʻanae Coast Comprehensive Health Center, is located approximately two miles from the project site. A clinic for KS learners along with a health and wellness complex is proposed for the KCLC at Māʻili to help residents develop and maintain a healthy lifestyle, as well as provide for the basic first needs of its users.

Recreational and Cultural Facilities
The KCLC at Māʻili is expected to provide recreational facilities (recreational fields, play courts, pool, exercise rooms, and health/wellness) to support its students and the community, and help promote a healthy lifestyle for area residents. The KCLC at Māʻili will also expand cultural educational opportunities along the Waiʻanae Coast.

Educational Facilities
The Proposed Project is anticipated to have a positive impact on the Waiʻanae Coast by providing improved access to educational opportunities, and opportunities for cultural education from pre-natal through *kūpuna*. KS has identified the KCLC at Māʻili as an opportunity to work with existing schools/programs and generate new ones to improve the educational success of families, particularly those of native Hawaiian descent along the Waiʻanae Coast. The KCLC at Māʻili is being designed based on community input to support, not replace, the varied educational network already in existence on the Waiʻanae Coast. As part of the project's community outreach, the programmatic components of P-20 have been developed over the last two years with community consultation. The

programming is anticipated to increase the educational opportunities for preschoolers through young adults.

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5.0

ALTERNATIVES

5.0 ALTERNATIVES

In compliance with the provisions of Section 11-200-17(f), HAR, an EA must discuss all potential practicable alternatives to the proposed action.

The alternatives considered include:

5.1 NO ACTION

The no-action alternative results in no change in use of the project site. Under this alternative, the KCLC at Māʻili would not be built and the project site would remain in its current, mostly undeveloped state. No short-term construction jobs or long term operational jobs would be generated. While the *Ka Pua* Initiative would continue to move forward, the keystone portion of the project, the KCLC at Māʻili would be absent. This may delay or hinder educational and cultural opportunities for native Hawaiians and residents along the Waiʻanae Coast.

5.2 ALTERNATIVES SITES

Previously, a learning center was proposed to be sited inside of Mākaha Valley. The impacts to Mākaha Valley, changes in use, and views were addressed in the State of Hawaiʻi, Department of Hawaiian Home Lands Residential Community and Kamehameha Schools Learning Community on The Stone Family Lands Draft Environmental Assessment. While this alternative location was seriously considered, the proposed development agreement with the private landowner was never consummated.

During the search for an acceptable location, siting criteria included: (1) the need for the DHHL and KS land uses to be located adjacent to one another; and (2) the parcels be located on the Waiʻanae Coast. In addition, KS had specific organizational requirements regarding site criteria that needed to be met. Potential project sites along the Waiʻanae Coast locations were analyzed and ultimately rejected by KS because they did not meet the siting criteria or the specific organizational requirements. The current project site includes adequate land for the KCLC at Māʻili.

5.3 ALTERNATIVE RELATED TO DIFFERENT DESIGNS OR DETAILS OF THE PROPOSED ACTIONS WHICH WOULD PRESENT DIFFERENT ENVIRONMENTAL IMPACTS

Different designs related to density and design capacity could be applied to the Proposed Project and would result in different environmental impacts. For example, a higher density development would reduce the buildable area and quantity of surface runoff, although more land-efficient, would not be appropriate to the character of the surrounding area. The quantities of water used and solid waste, wastewater, and traffic generated would also be greater with a higher density design than currently proposed. However, much more students could potentially be served under this scenario. With a lower density development than what is currently proposed, infrastructure costs would be greater since the development would be more spread out. In addition, there is a possibility that less students could be served. The Proposed Project is compatible with the surrounding areas. The current plans for the KCLC at Māʻili that have been developed were based on public input and collaborating with the community.

6.0

FINDINGS, SUPPORTING REASONS, AND ANTICIPATED DETERMINATION

6.0 FINDINGS, SUPPORTING REASONS, AND ANTICIPATED DETERMINATION

To determine whether the Proposed Project may have a significant impact on the physical and human environment, all phases and expected consequences of the KCLC at Māʻili have been evaluated, including potential primary, secondary, short-range, long-range, and cumulative impacts. Based on this evaluation, the Approving Agency (DHHL) is expected to issue a FONSI for the KCLC at Māʻili. The supporting rationale for this anticipated finding is presented in this chapter.

6.1 PROBABLE IMPACT, INCLUDING CUMULATIVE IMPACTS

Cumulative impacts are impacts on the environment that result from the action when added to other past, present, and foreseeable future actions by other agencies or persons. As discussed throughout this document, this project is being proposed to address some of the educational shortfalls along the Waiʻanae Coast.

The long-term cumulative impact of the Proposed Project as presented includes an increase in educational, cultural, and recreational opportunities within the Waiʻanae Coast. Overall, the anticipated cumulative impacts are beneficial.

Socio-economic impacts resulting from the Proposed Project are anticipated to be beneficial. By working with existing DOE programs, the KCLC at Māʻili may help bridge any gaps that exist in educational and cultural opportunities along the Waiʻanae Coast.

6.2 SIGNIFICANCE CRITERIA

Based upon the previous information presented in this document, the proposed permitting and construction of the KCLC at Māʻili is not expected to have a significant impact on the environment. This determination is based upon the Significance Criteria outlined in Chapter 343, HRS, as amended and Title 11 Chapter 200, HAR 1996, discussed below.

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

Discussion: No aspect of the Proposed Project is located within any wetlands based on U.S. Army Corps of Engineers definition of a wetland. The Proposed Project will not involve an irrevocable commitment to loss or destruction of any natural or cultural resource.

(2) Curtails the range of beneficial uses of the environment;

Discussion: While the Proposed Project forecloses other uses (open space, potential agricultural, residential, and/or industrial development), the range of beneficial uses of the property will likely increase over status quo to include cultural uses, recreation, and education. The KCLC at Māʻili will increase, not curtail, the beneficial uses of the subject properties.

(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;

Discussion: The environmental policies enumerated in Chapter 344, HRS promote conservation of natural resources, and an enhanced quality of life for all citizens. The Proposed Project is consistent with the environmental policies, goals, and guidelines. This EA has addressed such issues as: natural resources conservation (to the extent possible); enhancement of the quality of life; population; land, water, visual, air, and other natural resources; flora and fauna; parks, recreation, and open space; economic development; transportation; energy; education and culture; and citizen participation.

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

Discussion: KS believes that by working with the community to strengthen schools and other educational providers, they will not only serve native Hawaiian families but will also help to uplift the entire level of education and well-being for the Waiʻanae Coast. The Proposed Project is expected to build upon the strengths of the community schools and educational providers, by providing additional educational resources, curricula and programs to elevate the level of education of students along the Waiʻanae Coast, positively affecting social welfare in the region. There will be an increase in recreational facilities available to community members.

Construction of the Proposed Project may also benefit the State by creating temporary construction and permanent operational jobs on the Waiʻanae Coast. The City and County of Honolulu has projected a decrease in the number of jobs available along the Waiʻanae Coast. The Proposed Project is expected to have a positive impact on the number of jobs available on the Waiʻanae Coast and is expected to generate approximately 400 new jobs to staff the KCLC at Māʻili. The Proposed Project will through a multiplier effect indirectly generate new jobs within the community, providing services to residents, students and staff. Income taxes, and sales taxes from the purchase of construction materials and the expenditure of employees' wages, will also be generated as a result of this development.

As previously noted, cultural uses of the underlying properties are expected to increase within the KCLC at Māʻili.

(5) Substantially affects public health;

Discussion: Construction of the Proposed Project may pose the potential for temporary impacts to noise, air, and water quality; however, these potential impacts will be of a short-term duration and are not expected to substantially affect public health. All construction activities will comply with applicable regulations and appropriate mitigation measures will be implemented as necessary.

After construction, the KCLC at Māʻili should have minimal impact on ambient air and water quality. Ambient noise level within the Proposed Project is expected to be similar to the existing surrounding residential subdivisions. Ambient noise levels associated with the KCLC at Māʻili are expected to be similar to other recreational areas and existing schools along the Waiʻanae Coast, and buffers and setbacks will be provided to help mitigate noise impacts. It is anticipated that public health will also be positively affected by the development of recreational areas within the KCLC at Māʻili.

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

Discussion: The demand for water, as well as solid waste and wastewater generation, should not increase significantly, either regionally or island-wide. The Proposed Project is expected to create new jobs in Māʻili. If developed, the KCLC at Māʻili has the potential to act as an educational and economic development anchor for the Waiʻanae Coast. New development enhances regional economic prosperity and provides new opportunities for residents to work on the Waiʻanae Coast, opportunities, that do not exist without the KCLC at Māʻili.

(7) Involves a substantial degradation of environmental quality;

Discussion: The Proposed Project will utilize previously disturbed vacant land and is not expected to substantially degrade environmental quality of these lands. The property was substantially modified in the past and today lacks any significant natural resources. Potential impacts to the environment resulting from development, and appropriate mitigation measures have been identified throughout this EA.

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

Discussion: The proposed action is not expected to have any substantial negative secondary impacts on the environment. The Proposed Project is consistent with the Oʻahu General Plan and Waiʻanae Sustainable Communities Plan, and should not generate any additional actions having a cumulative effect on the environment. Potential off-site impacts (associated with infrastructure improvements) have been identified and addressed throughout this EA.

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

Discussion: The site contains no habitat for rare, threatened or endangered plant or animal species listed by the USFWS or in the Endangered Species Act. Therefore, none are expected to be affected by the Proposed Project.

(10) Detrimentally affects air or water quality or ambient noise levels;

Discussion: No State or Federal air quality or water standards should be violated during or after the construction of the Proposed Project. Construction activities for the development of the property including infrastructure improvements will inevitably create temporary noise impacts. Mitigation measures to minimize temporary noise impacts may include the use of mufflers and implementing construction curfew periods. Upon completion of the project, noise generated is anticipated to be similar to the surrounding residential communities, recreational areas, and schools.

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

Discussion: The Proposed Project is not located in an environmentally sensitive area, such as a flood plain, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters. A portion of the project site is located within the tsunami evacuation zone, however the Proposed Project is more than 1/3-miles inland and is located near a tsunami refuge area.

(12) Substantially affects scenic vistas and view planes identified in County or State plans or studies; or,

Discussion: It is anticipated that the Proposed Project will be designed to conform with City and County of Honolulu building codes. Structures within the KCLC at Māʻili are also anticipated to be one to two stories in height. Working with the existing topography of the Proposed Project and program requirements, buildings will be sited to reduce visual impact. All buildings are low-rise; therefore, views from residences adjacent to the KCLC at Māʻili are not expected to be obstructed. Landscaping can further reduce the visual

impact of rooflines. KS does not anticipate that scenic vistas or view planes specifically identified in City and County of Honolulu plans, such as the Waiʻanae Sustainable Communities Plan will be affected. In addition, KS does not anticipate that the significant views identified in the Coastal Views Study will be affected at full buildout.

(13) Requires substantial energy consumption.

Discussion: Construction of the Proposed Project is not expected to require more energy than other projects of similar size and scale. Sustainable features that reduce overall energy consumption will be integrated into the design of the KCLC at Māʻili, where appropriate. Such features could include considerations for orienting structures to maximize solar energy production, incorporating energy-saving fixtures and appliances, maximizing day lighting, reducing heat island effect, optimizing energy performance, and utilizing on-site renewable energy.

6.3 ANTICIPATED DETERMINATION

On the basis of impacts and mitigation measures examined in this document and analyzed under the above criteria, it is anticipated that the KCLC at Māʻili will not have a significant effect on the physical or human environments. Pursuant to Chapter 343, HRS, it is anticipated that the approving agency (DHHL) will issue a FONSI.

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7.0

CONSULTED PARTIES AND PARTICIPANTS IN THE EA PROCESS

7.0 CONSULTED PARTIES AND PARTICIPANTS IN THE EA PROCESS

Various agencies (or agency documents) were consulted in preparation of this EA.

7.1 PRE-CONSULTATION

A pre-consultation letter was sent to various agencies, organizations, and individuals listed in the following table. Those that submitted comments on the Draft EA are listed in bold. Comment and response letters have been reproduced and are provided in Appendix F.

Table 7-1: Pre-consultation Letters

AGENCY	LETTER SENT	COMMENT RECEIVED
State of Hawaiʻi		
Department of Business, Economic Development & Tourism – Office of Planning	11-28-2012	-
Department of Business, Economic Development & Tourism – Hawaiʻi Housing Finance and Development Corporation	11-28-2012	Yes
Department of Defense	11-28-2012	-
Department of Health	11-28-2012	Yes
Department of Health – Hazard Evaluation and Emergency Response Office	11-28-2012	-
Department of Land and Natural Resources	11-28-2012	Yes
Department of Land and Natural Resources – State Historic Preservation Division	11-28-2012	-
Department of Transportation	11-28-2012	Yes
Office of Hawaiian Affairs	11-28-2012	-
University of Hawaiʻi – Environmental Center	11-28-2012	-
City and County of Honolulu		
Board of Water Supply	11-28-2012	Yes
Department of Community Services	11-28-2012	-
Department of Design & Construction	11-28-2012	Yes
Department of Environmental Services	11-28-2012	-
Department of Facility Maintenance	11-28-2012	-
Department of Parks and Recreation	11-28-2012	-

AGENCY	LETTER SENT	COMMENT RECEIVED
Department of Planning & Permitting	11-28-2012	Yes
Department of Transportation Services	11-28-2012	Yes
Fire Department	11-28-2012	Yes
Office of the Mayor	11-28-2012	-
Police Department	11-28-2012	Yes
Federal		
U.S. Army Engineer District	11-28-2012	Yes
U.S. Fish and Wildlife Service	11-28-2012	-
Private Organizations & Individuals		
State Senator Maile Shimabukuro	11-28-2012	Yes
State Representative Jo Jordan	11-28-2012	-
Councilmember Kymberly Pine	11-28-2012	-
Neighborhood Board #36	11-28-2012	-

8.0

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8.0 REFERENCES

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Appendix A

FLORA AND FAUNA SURVEY

KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER

FLORA AND FAUNA STUDY

MÄ'ILI, O'AHU

by:

Robert Hobdy
Environmental Consultant
Kokomo, Maui
December 2012

Prepared for:
PBR HAWAII

KAMEHAMEHA SCHOOLS – COMMUNITY LEARING CENTER
FLORA AND FAUNA STUDY
MÄ'ILI, O'AHU

INTRODUCTION

The proposed Kamehameha Schools – Community Learning Center at Mā'ili, Oahu project lies on approximately 40 acres of undeveloped land in Mā'ili, Lualualei, Wai'anae District, O'ahu TMK 8-7-10:07 (por.) see (Figures 1 & 2). The property is situated to the south and east of the Maipalaoa Stream Channel, to the north of Kulawae Street and about 1,500 feet inland from Mā'ili Beach. This biological resources study was initiated in fulfillment of environmental requirements of the planning process.

SITE DESCRIPTION

The State of Hawai'i Department of Hawaiian Home Lands (DHHL) is the landowner of TMK 8-7-10:07. The entire parcel consists of approximately 89.274 acres, however the following acreages have been excluded from the survey area for this study. 7.9 acres in the northwest corner of the parcel that has been developed for the Ulu Ke Kukui and Ho'omalu O Na Kamali'i housing projects, and 4.8 acres along the central eastern portion of the parcel that contains former military structures (see Figure 2). The survey area covers 76.6 acres, of which approximately 40 acres is proposed for the Kamehameha Schools Community Learning Center.

The survey area lies on a nearly level coastal plain that was inundated by the sea several thousand years ago. Soils are shallow clays and silty clay loams that over lie a thick layer of coralline limestone. Elevations range between 7 and 10 feet above sea level. Vegetation consists of open grasslands with scattered trees and dense patches of halophytic shrubs. Rainfall averages about 18 inches per year.

SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna study of the proposed Kamehameha Schools Community Learning Center at Mā'ili, O'ahu that was conducted in December 2012. The objectives of the survey were to:

1. Document what plant and animal species occur on the survey area or may likely occur in the existing habitat.

2. Document the status and abundance of each species.

3. Determine the presence or likely occurrence of any native flora and fauna particularly any that are Federally listed as Threatened or Endangered. If such occur, identify what features of the habitat may be essential for these species.

4. Determine if the survey area contains any special habitats which if lost or altered might result in a significant negative impact on the native flora and fauna in this part of the island.

BOTANICAL SURVEY REPORT

SURVEY METHODS

A walk-through botanical survey was used to cover this 76.6 acre survey area. All representative habitats were examined including grasslands, brush lands and open fields. An inventory was made of all plant species found during the survey. Close attention was given to ascertaining whether any native Hawaiian plants or Endangered species were present.

DESCRIPTION OF THE VEGETATION

The vegetation in the survey area is a mixture of mostly non-native grasses, shrubs and trees. One grass was abundant across the entire area: buffelgrass (*Cenchrus ciliaris*). Also common were: sourbush (*Pluchea carolinensis*), Indian fleabane (*Pluchea indica*), hybrid pluchea (*Pluchea x fosbergii*), klu (*Acacia farnesiana*), kiawe (*Prosopis pallida*) and ‘uhaloa (*Waltheria indica*). A total of 42 plant species were recorded during the survey. Six of these were native species: the endemic pā'ū o Hi'iaka (*Jacquemontia ovalifolia* subsp. *sandwicensis*) that is found only in Hawai'i and five indigenous species koali'ai (*Ipomoea carica*), 'ākulikuli (*Sesuvium portulacastrum*), kīpūkai (*Heliotropium curassavicum*), 'ilima (*Sida fallax*) and 'uhaloa which are native to Hawaii as well as to other Pacific islands. The remaining 36 plants were non-native species that are of no particular concern.

DISCUSSION AND RECOMMENDATIONS

The vegetation in this survey area is dominated by non-native species. Six native species were found scattered around the area. All six of these species are quite common in Hawai'i, being found on all of the islands. None are of any special conservation concern. No Endangered or Threatened species were found during the survey, nor were any that are candidates for such status found. No special native plant habitats or communities were found either.

Because the vegetation in this survey area is dominated by common non-native plants, and because there are no rare or protected native species in or near this area, there is little of botanical concern with regard to this project. The proposed development is not expected to have a significant negative impact on the botanical resources in this part of O'ahu.

No special recommendations with reference to plants are deemed appropriate or necessary.

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PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically within each of two groups: Monocots and Dicots. Taxonomy and nomenclature of the flowering plants (Monocots and Dicots) are in accordance with Wagner et al. (1999) and Staples & Herbst, 2005.

For each species, the following information is provided:

1. Scientific name with author citation.

2. Common English or Hawaiian name.

3. Bio-geographical status. The following symbols are used:

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

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

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

   polynesian = brought by the Hawaiians during Polynesian migrations.

4. Abundance of each species within the survey area:

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

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

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

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

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
MONOCOTS			
ALOEACEAE (Aloe Family)			
Aloe vera (L.) N. L. Burman	aloe	non-native	rare
ARECACEAE (Palm Family)			
Cenchrus ciliaris L.	buffelgrass	non-native	abundant
Chloris barbata (L.) Sw.	swollen fingergrass	non-native	uncommon
Cynodon dactylon (L.) Pers.	Bermuda grass	non-native	rare
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	non-native	rare
Megathyrsus maximus (Jacq.) Simon & Jacobs	Guinea grass	non-native	uncommon
Sporobolus sp.	----------	non-native	rare
DICOTS			
AIZOACEAE (Fig-marigold Family)			
Sesuvium portulacastrum (L.) L.	'ākulikuli	indigenous	uncommon
AMARANTHACEAE (Amaranth Family)			
Atriplex semibaccata R. Br.	Australian saltbush	non-native	rare
Atriplex suberecta Verd.	saltbush	non-native	uncommon
Chenopodium murale L.	'āheahea	non-native	rare
ANACARDIACEAE (Mango Family)			
Schinus terebinthifolius Raddi	Christmas berry	non-native	uncommon
ASTERACEAE (Sunflower Family)			
Flaveria trinervia (Spreng.) C. Mohr	clustered yellowtops	non-native	rare
Pluchea carolinensis (Jacq.) G. Don	sourbush	non-native	common
Pluchea indica L. Less.	Indian fleabane	non-native	common
Pluchea x fosbergii Cooperrider & Galang	hybrid pluchea	non-native	common
Tridax procumbens L.	coat buttons	non-native	uncommon
Verbesina encelioides (Cav.) Bentham & Hooker	golden crown-beard	non-native	rare
BATACEAE (Saltwort Family)			
Batis maritima L.	pickleweed	non-native	rare
BORAGINACEAE (Borage Family)			
Heliotropium curassavicum L.	kīpūkai	indigenous	rare
*Heliotropium procumbens*Mill.	four-spike heliotrope	non-native	rare
CONVOLVULACEAE (Morning Glory Family)			
Ipomoea cairica (L.) Sweet	koali 'ai	indigneous	uncommon
Ipomoea obscura (L.) Ker-Gawler	----------	non-native	rare
Jacquemontia ovalifolia (Choisy) H. Hallier subsp. *sandwicensis* (A.Gray)K.Robertson	pā'ū o Hi'iaka	endemic	uncommon
Merremia aegyptia (L.) Urb.	hairy merremia	non-native	rare
EUPHORBIACEAE (Spurge Family)			
Euphorbia hypericifolia L.	graceful spurge	non-native	rare
FABACEAE (Pea Family)			
Acacia farnesiana (L.) Willd.	klu	non-native	common
Desmanthus pernambucanus (L.) Thellung	slender mimosa	non-native	uncommon
Leucaena leucocephala (Lam.) de Wit	koa haole	non-native	abundant
Prosopis pallida (Humb. & Bonpl.exWilld) Kunth	kiawe	non-native	common

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
LAMIACEAE (Mint Family)			
Leonotis nepetifolia (L.) R. Br.	lion's ear	non-native	rare
MALVACEAE (Mallow Family)			
Abutilon incanum (Link) Sweet	hoary abutilon	non-native	rare
Sida ciliaris L.	red ilima	non-native	uncommon
Sida fallax Walp.	'ilima	indigenous	rare
Sida spinosa L.	prickly sida	non-native	rare
Waltheria indica L.	'uhaloa	indigenous	common
MELIACEAE (Mahogany Family)			
Azadirachta indica Adr. Jussieu	neem	non-native	rare
MORACEAE (Mulberry Family)			
Ficus microcarpa L. fil.	Chinese banyan	non-native	rare
NYCTAGINACEAE (Four-o'clock Family)			
*Bougainvillea spectabilis*Willdenow	bougainvillea	non-native	rare
SOLANACEAE (Nightshade Family)			
Datura stramonium L.	jimson weed	non-native	rare
Nicotiana glauca R. C. Graham	tree tobacco	non-native	uncommon
VERBENACEAE (Verbena Family)			
Lantana camara L.	lantana	non-native	rare

FAUNA SURVEY REPORT

SURVEY METHODS

A walk-through fauna survey was conducted in conjunction with the flora survey. Field observations were made and listening to vocalizations. Notes were made on species, numbers, distribution and behavior as well as trails, tracks, scat and signs of feeding. A bat detector was used during an evening study to see if there was evidence of occurrence of the Hawaiian hoary bat (*Lasiurus cinereus semotus*).

RESULTS

MAMMALS

Signs of three non-native mammals were observed in the survey area during the two site visits. Taxonomy and nomenclature follow Tomich (1986). These included: domestic dogs (*Canis familiaris*), domestic cats (*Felis catus*) and mongoose (*Herpestes auropunctatus*). While not seen, this habitat is also suitable for rats (*Rattus* spp.) and mice (*Mus domesticus*). The cats and mongoose would prey on these rodents as well as on birds.

A special effort was made to look for the native Hawaiian hoary bat which is a federally listed Endangered species. An evening survey was conducted at two locations using both visual and electronic techniques. When present in an area these bats are clearly visible in the glow of twilight as they forage for insects that become active during evening hours. In addition a bat detecting device (Batbox IIID) was used after dark, set to the frequencies of 27,000 to 28,000 hertz which these bats are known to use for echolocation. No evidence of the presence of the Hawaiian hoary bat was detected.

BIRDS

Birdlife was moderate both in numbers of species present and in the numbers of individuals seen. Ten non-native bird species were observed during the two site visits to the survey area. Identifications were made with the aid of binoculars and by listening to vocalizations. Taxonomy and nomenclature follow the American Ornithologists' Union (2011).

A few other non-native birds may also occasionally use this property. The habitat, however, is not suitable for O'ahu's native forest birds which are presently restricted to good quality native forests at higher elevations. The habitat is also not suitable for native seabirds such as the Endangered 'ua'u (*Pterodroma sandwichensis*) and the Threatened 'a'o (*Puffinus newelli*) which nests in dense, wet fern shrubland near the summits of the mountains.

INSECTS

Insect life was sparse to moderate across the survey area. Thirteen species representing five insect orders were observed during the two site visits. Taxonomy and nomenclature follow Nishida et al (1992). Four insect species were common: the blow fly (*Calliphora vomitoria*), the dung fly (*Musca sorbens*), the big-headed ant (*Pheidole megacephala*) and the western pygmy blue butterfly (*Brephidium exilis*). The remaining nine insect species were uncommon to rare in occurrence. One native dragonfly, the globe skimmer (*Pantala favesccens*), was recorded. The globe skimmer is widespread throughout Hawai'i and is also native worldwide throughout the tropics.

REPTILES

Just one non-native reptile, the mourning gecko (*Lepidodactylus lugubris*), was seen during the evening survey.

DISCUSSION AND RECOMMENDATIONS

The fauna on this survey area was rather sparse in diversity and mostly non-native in species. Just one common indigenous dragonfly was present. The globe skimmer dragonfly is widespread and common and is of no heightened conservation concern. No special fauna habitats occur on or around this survey area and no Critical Habitat for any Endangered animal species is designated within the survey area or its vicinity.

It is determined that this proposed project will not have a significant negative impact on the fauna resources in this part of O'ahu. No recommendations with regard to fauna are considered to be necessary for this project.

ANIMAL SPECIES LIST

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

1. Common name

2. Scientific name

3. Bio-geographical status. The following symbols are used:

   endemic = native only to Hawai'i; not naturally occurring anywhere else in the world.

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

   migratory = bird species that spend the fall and winter months in Hawai'i and the spring and summer months breeding in the arctic.

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

4. Abundance of each species within the project area:

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

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

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

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

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
MAMMALS			
Canis familiaris L.	domestic dog	non-native	uncommon
Felis catus L.	feral cat	non-native	uncommon
Herpestes auropunctatus Hodgson	mongoose	non-native	uncommon
BIRDS			
Geopelia striata L.	zebra dove	non-native	abundant
Streptopelia chinensis Scopoli	spotted dove	non-native	common
Pycnonotus cafer L.	red-vented bulbul	non-native	common
Estrilda astrild L.	common waxbill	non-native	uncommon
Carpodacus mexicanus Muller	house finch	non-native	rare
Passer domesticus L.	house sparrow	non-native	rare
Francolinus pondicerianus Gmelin	gray francolin	non-native	rare
Paroaria coronata Miller	red-crested cardinal	non-native	rare
Columba livia Gmelin	rock dove	non-native	rare
Acridotheres tristis L.	common myna	non-native	rare
REPTILES			
Lepidodactylus lugubris Dumeril & Bibron	mourning gecko	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
INSECTS			
Order DIPTERA - flies			
CALLIPHORIDAE (Blow Fly Family)			
Calliphora vomitoria L.	blow fly	non-native	common
MUSCIDAE (House Fly Family)			
Musca sorbens Wiedmann	dung fly	non-native	common
Order HYMENOPTERA - bees, wasps & ants			
APIDAE (Honey Bee Family)			
Apis mellifera L.	honey bee	non-native	uncommon
FORMICIDAE (Ant Family)			
Pheidole megacephala Fabricius	big-headed ant	non-native	common
Order LEPIDOPTERA - butterflies & moths			
LYCAENIDAE (Gossamer-winged Butterfly Family)			
Brephidium exilis Boisduval	Western pygmy blue	non-native	common
Lampides boeticus L.	long-tailed blue butterfly	non-native	rare
NYMPHALIDAE (Brush-footed Butterfly Family)			
Agraulis vanillae L.	passion flower butterfly	non-native	uncommon
Danaus plexippus L.	monarch butterfly	non-native	uncommon
PIERIDAE (White and Sulphur Butterfly Family)			
Pieris rapae L.	cabbage butterfly	non-native	uncommon
Order ODONATA - dragonflies & damselflies			
COENAGRIONIDAE (Damselfy Family)			
Enallagma civile Hagen	familiar bluet	non-native	rare
LIBELLULIDAE (Skimmer Dragonfly Family)			
Pantala flavescens Fabricius	globe skimmer	indigenous	rare
Order ORTHOPTERA - grasshoppers & crickets			
ACRIDIDAE (Grasshopper Family)			
Oedaleus abruptus Thunberg	short-horned grasshopper	non-native	rare
TETTIGONIIDAE (Katydid Family)			
Elimaea punctifera Walker	narrow-winged katydid	non-native	rare

Path: Q:\Oahu\KS Ka pua Learning Community\GIS\Project\Survey\Regional Location.mxd

LEGEND

Tax Map Key 8-7-010:007

Survey Area

KS Community Learning Center

Regional Location

Kamehameha Schools Community Learning Center

Kamehameha Schools — Island of Oahu

North

Linear Scale (feet) 0 500 1,000 2,000

PBR HAWAII & ASSOCIATES, INC.

Source: USGS 2011

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.

Figure 1 Project Area

Figure 2 Project Area

Figure 3 Mixture of grass, shrubs and trees. Looking south from the northwest corner.

Figure 4 Open grassland in northeast corner looking south.

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Appendix B

ARCHAEOLOGICAL INVENTORY SURVEY

SCS Project Number 1355-AIS-1

AN ARCHAEOLOGICAL INVENTORY SURVEY FOR THE KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER AT MĀ`ILI, LUALUALEI AHUPUA`A, WAI`ANAE DISTRICT, ISLAND OF O`AHU, HAWAI`I [TMK: (1) 8-7-010:007 (POR.)]

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February 2013
DRAFT

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ABSTRACT

At the request of Mr. Grant Murakami of PBR-Hawaii, Scientific Consultant Services, Inc. (SCS) conducted an Archaeological Inventory Survey of approximately 90-acres of land in Mā`ili, Lualualei Ahupua`a, Wai`anae District, Island of O`ahu, Hawai`i [TMK: (1) 8-7-010:007 portion].

Archaeological Inventory Survey was performed in order to investigate the presence or absence of archaeological features and to assess the function, age, and construction methods of those features. International Archaeological Research Institute conducted an Archaeological Inventory Survey of the current survey area (Rieth 2009). The current survey included the relocation of previously identified archaeological sites within the survey area: State Site 50-80-07-7081, the Voice of America (VOA) antennae system; State Site 50-80-07-7082, VOA transmitter buildings and ancillary features; and State Site 50-80-7-7083, interpreted by Reith (2009) as a raised railroad bed remnant from the Waianae Sugar Company.

The current survey re-located the sixteen surface features (1 through 6, 8, 9, 11 through 13, 15 through 18, and 21) comprising State Site 50-80-07-7081. The buildings and the ancillary features of State Site 50-80-07-7082, were not re-located, as this site was located in the exclusion zone (see Rieth 2009). State Site 50-80-07-7082, Feature 7, a series of fencelines which traverse the survey area, was re-located. The previously identified State Site 50-80-07-7083 was re-located. As no archaeological evidence to support the functional interpretation of a railroad bed was identified during the current survey, State Site 50-80-07-7083 was re-interpreted as a possible cart path associated with the Waianae Sugar Company. Three surface features, two VOA antennae foundations and a Historic trash dump, were newly. Based on proximity, these features were incorporated into State Site 50-80-07-7081. Limited subsurface testing was conducted, but did not produce archaeological cultural material.

The current study found intensive mechanical ground disturbance on more than 90 percent of the survey area's surface as suggested by the multiple push piles of basalt and limestone, multiple dirt roads or trails used for mountain biking, motocross bikes, and hiking; the unauthorized dumping of modern household debris, including plastic containers, automobile parts, etc.; and steel composite wire cables. The wire cables appear to have been associated with the VOA Transmission Towers that were located on the property during World War II. In addition, portions of the overall survey area have been subjected to wildfires, as evidenced by the presence of charred vegetation and remnant kiawe trees.

The previously identified State Site 50-80-07-7081 and State Site 50-80-07-7082, Feature 7, were re-evaluated for significance, as outlined in Hawai‘i Administrative Rules §13-275-6, and found to be significant under Criteria A, associated with historic events or activities, and Criterion D, for information content. The three newly identified surfaced features incorporated into State Site 50-80-07-7081, were also found to be significant under Criteria A and Criteria D. However, as these sites are not structurally unique, they are not recommended for preservation. State Site 50-80-07-7083 was found to be significant under Criterion A, D, and C, as an excellent example of a feature type. Thus, State Site 50-80-07-7083, in its entirety or segment(s), is recommended for preservation. No further archaeological work is recommended for the subject property.

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INTRODUCTION

At the request of Mr. Grant Murakami of PBR Hawaii & Associates, Inc., Scientific Consultant Services, Inc. (SCS), conducted an Archaeological Inventory Survey (AIS) of approximately 90-acres of land, located in Mā`ili, Lualualei Ahupua`a, Wai`anae District, Island of O`ahu, Hawai`i [TMK: (1) 8-7-010:007 por.] (Figures 1 through 4). The Department of Hawaiian Home Lands (DHHL) is the owner of the entire survey area. Approximately 40-acres of land located in the southern portion of the current survey area will be the site of the Kamehameha Schools Community Learning Center (KCLC) project. The KCLC project area is a part of Kamehameha Schools' Ka Pua initiative on the Wai`anae Coast of O`ahu (see Figures 1 and 2).

Fieldwork was conducted from November 26 through December 7, 2012 by SCS archaeologist Guerin Tome, B.A., under the direction of Robert L. Spear, Ph.D., Principal Investigator. The Archaeological Inventory Survey was performed in order to identify and document archaeological sites; to gather sufficient information on the sites; to evaluate the significance of the sites, and to compile the information. In 2009, International Archaeological Research Institute, Inc. (IARII) conducted an Archaeological Inventory Survey of the current survey area which identified a total of twenty-one surface features which were incorporated into three archaeological sites: State Site 50-80-07-7081, the Voice of America (VOA) antennae system; State Site 50-80-07-7082,VOA transmitter buildings and ancillary features; and State Site 50-80-07-7083, initially interpreted by Reith (2009) as a raised railroad bed remnant from the Waianae Sugar Company. However, given the absence of evidence supporting this functional interpretation, State Site 50-80-07-7083 was re-interpreted as a possible cart path associated with the Waianae Sugar Company. Limited subsurface testing was conducted, but did not produce Traditional- or Historic-type cultural material.

GEOGRAPHIC SETTING

The survey area is located in the coastal region on the leeward (west) side of the island of O`ahu. At its closest point, the current survey area is located approximately 805 meters (m) from the leeward coast of O`ahu and situated between 5 and 25 feet [1.5 - 7.62 meters (m)] above mean sea level (amsl), approximately 0.5 miles north of on the northern flank of the Pu`u O Hulu Kai Summit, and approximately 1.0 miles northwest of the Pu`u O Hulu Uka Summit (see Figure 1).

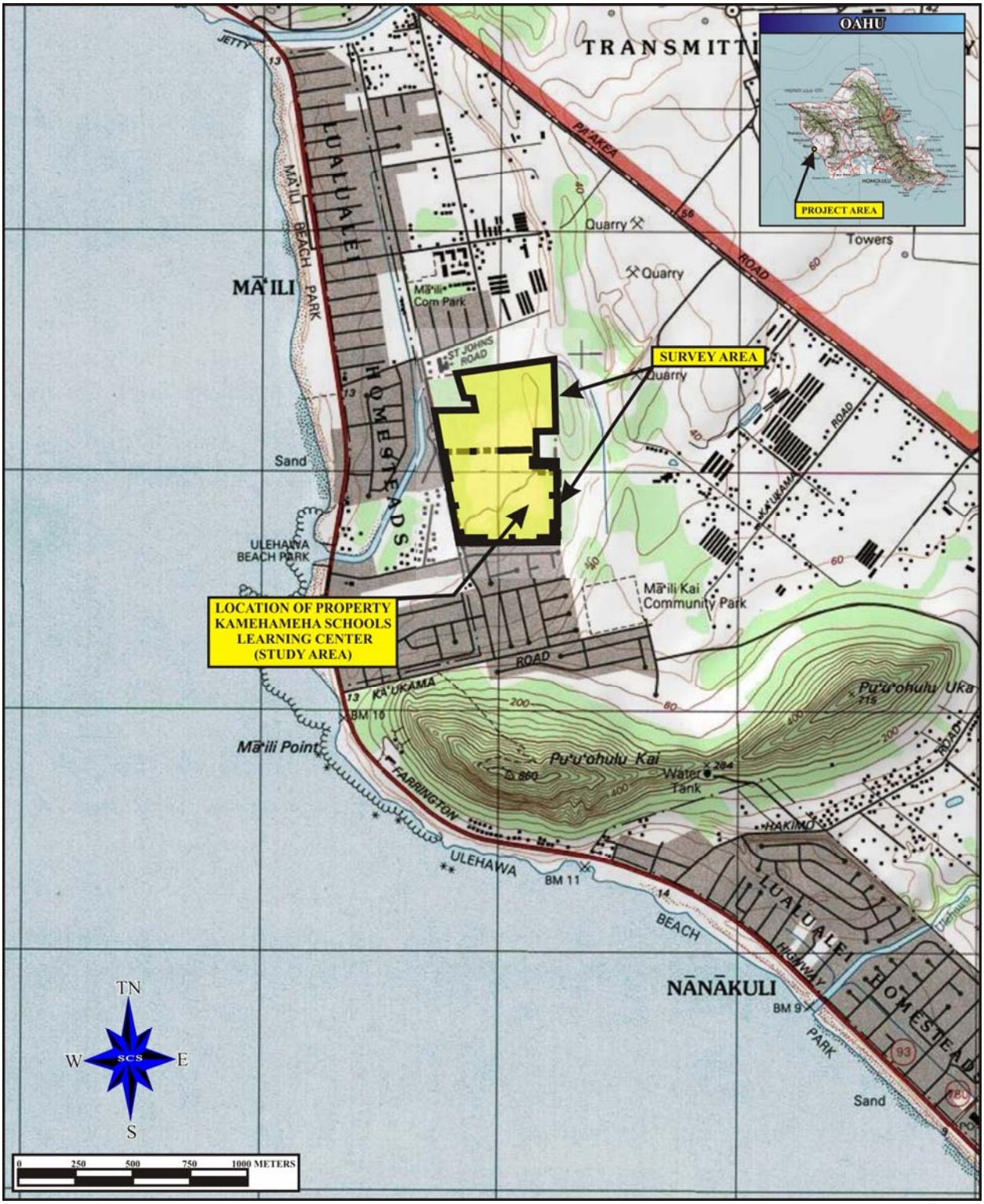

Figure 1: USGS Quadrangle (Waianae 1998) Map Showing Survey Area and Site of the Proposed Kamehameha Schools Community Learning Center.

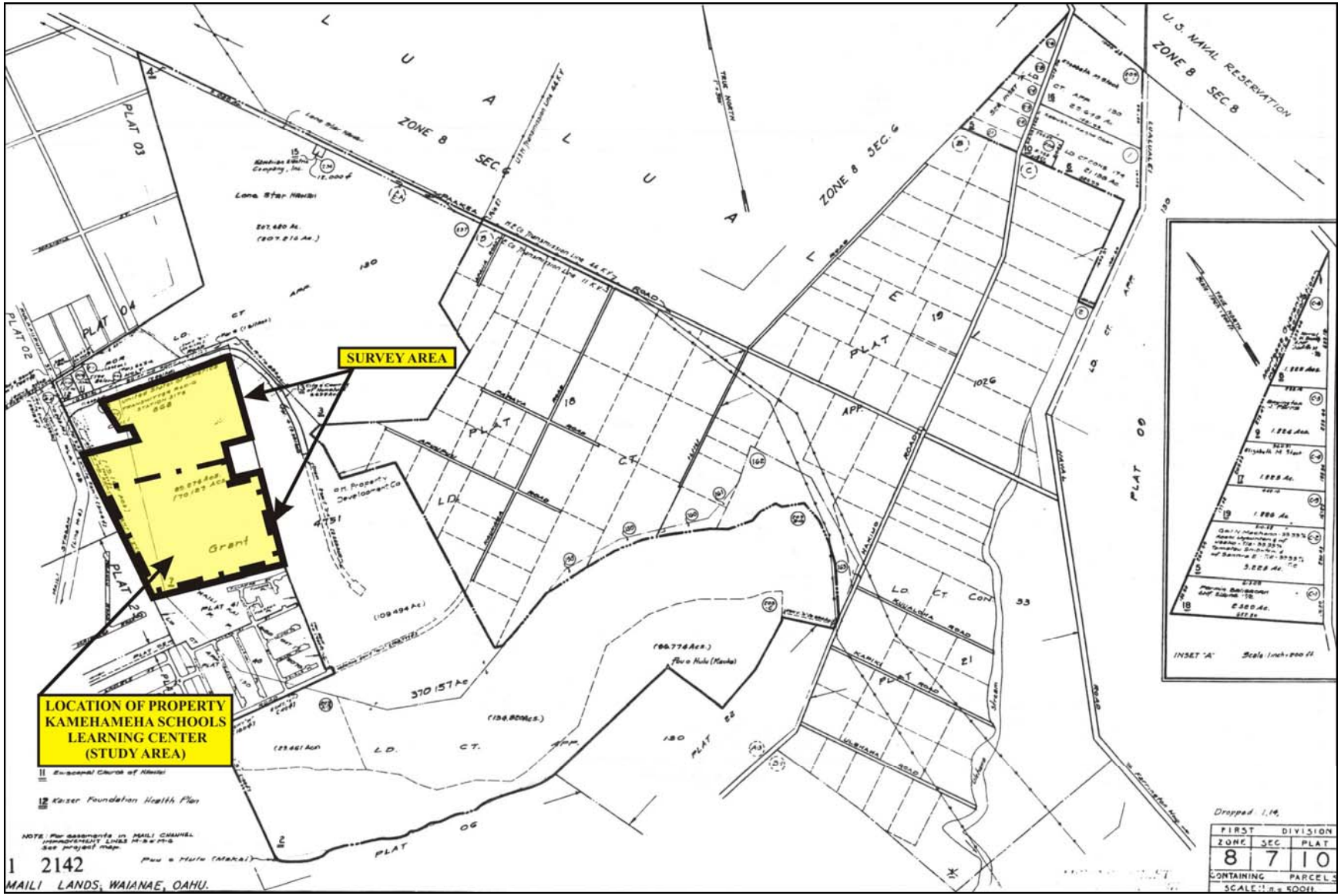

Figure 2: Tax Map Key [TMK: (1) 8-7-010:007] Showing Survey Area and Site of the Proposed Kamehameha Schools Community Learning Center.

Figure 3: Photographic Overview of the Northern Portion of the Survey Area. View to Northeast.

Figure 4: Photographic Overview of the Southern Portion of the Survey Area. View to Northwest.

The west and south sides of the study area are bounded by residences, vacant lands owned by the Department of Hawaiian Home Lands (DHHL) to the north, a transitional residential complex, a children's receiving home to the west, and a residential subdivision currently under construction. The eastern boundary is formed by a portion of the United States Coast Guard retained land and a residential subdivision currently under construction. The eastern boundary is formed by a portion of the United States Coast Guard retained land and a residential subdivision currently under construction. The survey area is currently vacant, but has undergone extensive previous disturbance. The prior ground disturbances to the entire survey area included: multiple dirt roads or trails used for mountain biking, motocross bikes, and hiking; limestone and basalt boulder bulldozer push piles; the unauthorized dumping of modern household debris, including plastic containers, automobile parts, etc.; and steel composite wire cables, which were also strewn across the northern portion of the survey area. The wire cables appear to have been associated with the Voice of America Transmission Towers that were located on the property during World War II. In addition, portions of the overall survey area have been subjected to wildfires, as evidenced by the presence of charred vegetation and remnant kiawe trees.

CLIMATE

In general, the climate of the survey area is exemplified by its leeward location: minimum annual precipitation. This dry area could receive up to 20 inches of rain per annum (Price 1983:62). However, higher elevations near the apex of the Wai`anae Range receive more than 40 inches per year. Thus, fresh water would be most frequently found at higher elevations, in the back of the valley, and along steep cliff faces where dikes are present to trap water (Haun *et al*. 1991:6; Stearns 1940). During the mornings of several days of the current fieldwork, squalls of rain from the rear of the Lualaulei Valley drifted over the survey area.

SOILS

According to Foote *et al*. (1972: Map Sheet 36) three soils classifications are present within the survey areas (Figure 5). The northern and southern portions of the survey area are comprised of soils classified as being of the Mokuleia Soils Series, specifically, Mokuleia clay (Mtb) (*ibid*). Soils of the Mokuleia Series are also well-drained soils occurring in the coastal region of O`ahu and Kaua`i. On O`ahu, the Mokuleia soils can be found at elevations ranging from near sea level to 100 feet amsl. in areas where the annual rainfall ranges from 15 to 40 inches annually. The Mtb soils exhibit slow permeability, very slow runoff, and a very slight erosion hazard. The Mtb soils are frequently utilized for the commercial cultivation of sugarcane and as ranchlands (*ibid*: 95).

The central portion of the survey area is comprised of soils of the Mamala Series, specifically, Mamala stony silty clay loam (MnC). Soils of the Mamala Series are shallow, well-drained soils occurring in the coastal regions of O`ahu and Kaua`i. Mamala Series soils can be found between sea level and 100 feet amsl on O`ahu in areas receiving 18 to 25 inches of rain annually. The MnC soils can exhibit slopes ranging from 0 to 12 percent. The MnC soils are known to exhibit moderate permeability, slow to medium runoff, and a moderate, at most, erosion hazard. These soils are frequently utilized for the commercial cultivation of sugarcane, truck crops, and as ranchlands (*ibid*: 93-94).

A two small portions of the project area, located near the upper west project area boundary, are comprised of soils of the Keaau Series, specifically Keaau clay, saline (Kmba). In general, the Keaau soils are poorly drained soils located in depressions or pockets along the coastal region of O`ahu. The Kmba soils occur on 0 to 2 percent slopes situated between 5 to 40 feet amsl and receiving 20 to 35 inches of rainfall annually. The Kmba soils exhibit platy or vesicular surface structure. Unmodified Kmba soils are usually left unused, but are often drained and filled and used for sugarcane cultivation, industrial or residential areas, and parks (Foote *et al*. 1972:65).

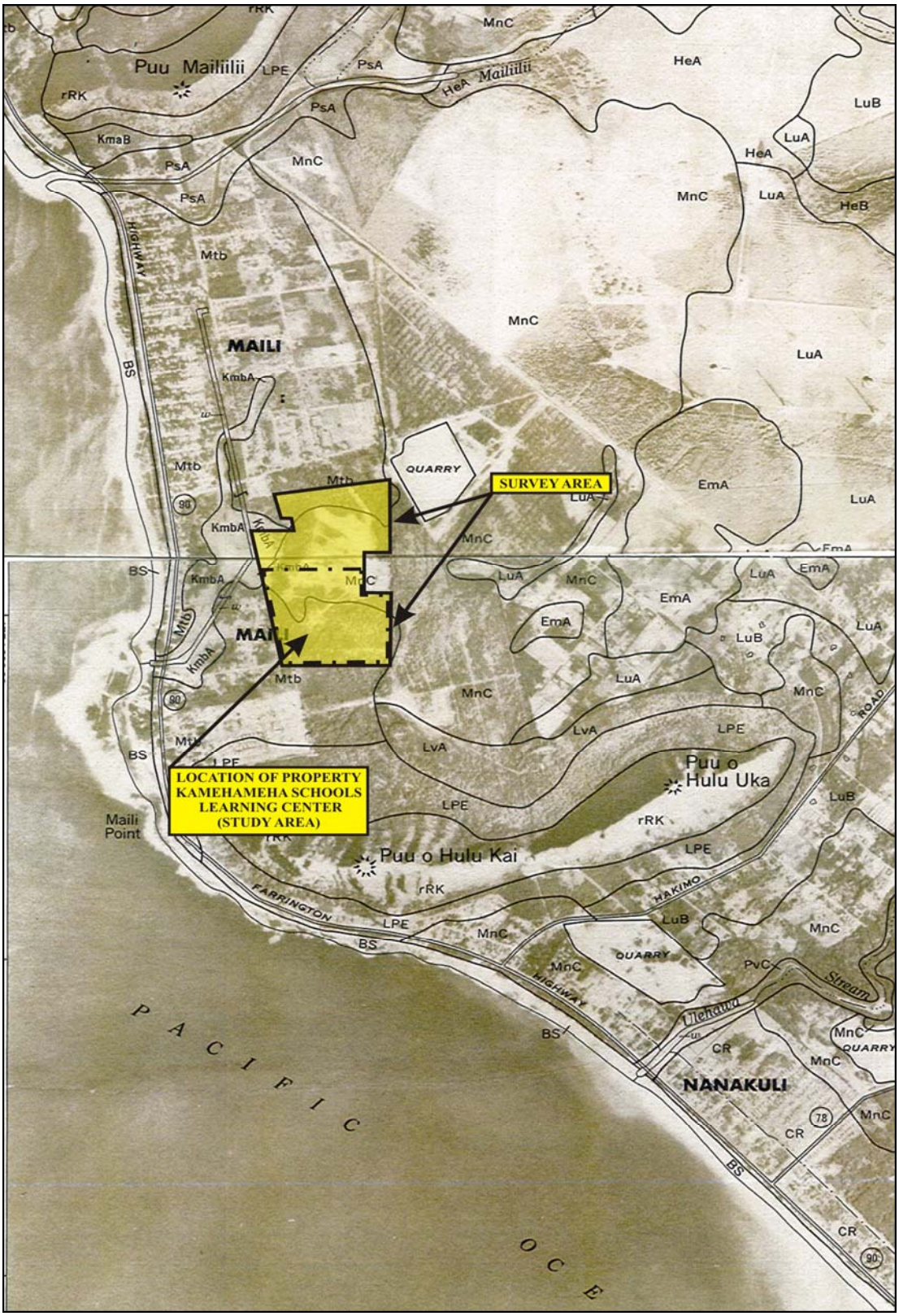

Figure 5: USDA Soil Survey Map (Foote *et al*. 1972: Sheet Map 36) Showing Survey Area and Site of the Proposed Kamehameha Schools Community Learning Center.

VEGETATION

Introduced vegetation observed within the study area during the Archaeological Inventory Survey included *koa haole* (*Leucaena glauca*), *kiawe* (*Prosopis pallida*), lion's ear (*Leonotis nepetifolia*), Indian fleabane (*Pluchea indica*), unidentified pluchea species (*Pluchea* sp.*),* amaranth (*Amaranthus* sp.), klu (*Acacia farnesiana*), Australian saltbush (*Atriplex semibaccata*); Golden crown-beard (*Verbesina encelioides*); Spanish Clover (*Desmodium* spp.); tobacco (*Nicotiana glauca*); and aloe (*Aloe vera*).

Native plants observed within the study area during the Archaeological Inventory Survey included *`uhaloa* (*Waltheria indica*); *`ahinahina*, *hinahina* or *Hinahina `Ewa* (*Achyranthes splendens*); *`ākulikuli* (*esuvium portulacastrum*); and *kīpūkai* (*Heliotropium curassavicum*).

Robert Hobdy (2012:3) conducted an earlier study of the flora within the current study area identified "...a mixture of mostly non-native grasses, shrubs and trees. One grass was abundant across the entire area: buffelgrass (*Cenchrus ciliaris*). Also common were: sourbush (*Pluchea carolinensis*), Indian fleabane (*Pluchea indica*), hybrid pluchea (*Pluchea x fosbergii*), klu (*Acacia farnesiana*), kiawe (*Prosopis pallida*) and 'uhaloa (*Waltheria indica*). A total of 42 plant species were recorded during the survey. Six of these were native species: the endemic *pā`ū o* Hi`iaka (*Jacquemontia ovalifolia* subsp. *sandwicensis*) that is found only in Hawai'i and five indigenous species *koali`ai* (*Ipomoea carica*), `ākulikuli (*Sesuvium portulacastrum*), *kīpūkai* (*Heliotropium curassavicum*), *`ilima* (*Sida fallax*) and *`uhaloa* which are native to Hawaii as well as to other Pacific islands. The remaining 36 plants were non-native species that are of no particular concern."

TABLE 1: PLANT SPECIES LIST (Hobdy 2012:5-6)

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
MONOCOTS			
ALOEACEAE (Aloe Family)			
Aloe vera (L.) N. L. Burman	aloe	non-native	rare
ARECACEAE (Palm Family)			
Cenchrus ciliaris L.	buffelgrass	non-native	abundant
Chloris barbata (L.) Sw.	swollen fingergrass	non-native	uncommon
Cynodon dactylon (L.) Pers.	Bermuda grass	non-native	rare
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	non-native	rare
Megathyrsus maximus (Jacq.) Simon & Jacobs	Guinea grass	non-native	uncommon
Sporobolus sp.	----------	non-native	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
DICOTS			
AIZOACEAE (Fig-marigold Family)			
Sesuvium portulacastrum (L.) L.	'ākulikuli	indigenous	uncommon
AMARANTHACEAE (Amaranth Family)			
Atriplex semibaccata R. Br.	Australian saltbush	non-native	rare
Atriplex suberecta Verd.	saltbush	non-native	uncommon
Chenopodium murale L.	'āheahea	non-native	rare
ANACARDIACEAE (Mango Family)			
Schinus terebinthifolius Raddi	Christmas berry	non-native	uncommon
ASTERACEAE (Sunflower Family)			
Flaveria trinervia (Spreng.) C. Mohr	clustered yellowtops	non-native	rare
Pluchea carolinensis (Jacq.) G. Don	sourbush	non-native	common
Pluchea indica L. Less.	Indian fleabane	non-native	common
Pluchea x fosbergii Cooperrider & Galang	hybrid pluchea	non-native	common
Tridax procumbens L.	coat buttons	non-native	uncommon
Verbesina encelioides (Cav.) Bentham & Hooker	golden crown-beard	non-native	rare
BATACEAE (Saltwort Family)			
Batis maritima L.	pickleweed	non-native	rare
BORAGINACEAE (Borage Family)			
Heliotropium curassavicum L.	kīpūkai	indigenous	rare
*Heliotropium procumbens*Mill.	four-spike heliotrope	non-native	rare
CONVOLVULACEAE (Morning Glory Family)			
Ipomoea cairica (L.) Sweet	koali 'ai	indigneous	uncommon
Ipomoea obscura (L.) Ker-Gawler	----------	non-native	rare
Jacquemontia ovalifolia (Choisy) H. Hallier subsp. *sandwicensis* (A.Gray)K.Robertson	pā'ū o Hi'iaka	endemic	uncommon
Merremia aegyptia (L.) Urb.	hairy merremia	non-native	rare
EUPHORBIACEAE (Spurge Family)			
Euphorbia hypericifolia L.	graceful spurge	non-native	rare
FABACEAE (Pea Family)			
Acacia farnesiana (L.) Willd.	klu	non-native	common
Desmanthus pernambucanus (L.)	slender mimosa	non-native	uncommon

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Thellung			
Leucaena leucocephala (Lam.) de Wit	koa haole	non-native	abundant
Prosopis pallida (Humb. & Bonpl.exWilld) Kunth	kiawe	non-native	common

CULTURAL HISTORICAL CONTEXT

The island of O`ahu ranks third in size of the eight main islands in the Hawaiian Archipelago. The Wai`anae and Ko`olau Mountain ranges were formed by two volcanoes. Through the millennia the constant force of water carved fertile amphitheater-headed valleys and rugged passes eroded at lower elevations providing access from one side of the island to another (Macdonald and Abbott 1970:360).

PAST POLITICAL BOUNDARIES

Traditionally, the division of Oahu's land into districts (*moku*) and sub-districts (*`ili*) was said to be performed by Mā`ilikukahi, a ruling chief of O`ahu, who was chosen by the chiefs to be the *mō`īho`oponopono o ke aupuni* (administrator of the government; Kamakau 1991). It was Mā`ilikukahi who had the Island of O`ahu thoroughly surveyed, and permanently defined the boundaries between the different divisions and lands (Fornander 1969:89). Cordy (2002: 25) places Mā`ilikukahi's reign over O`ahu at the beginning of the 16th Century. Mā`ilikukahi created six districts and six district chiefs (*ali`i `ai moku*). Land was considered the property of the king or *ali`i `ai moku* (chief who rules a *moku*) (Pukui and Elbert 1986: 20), which he held in trust for the gods. The title of *ali`i `ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him and, in turn, distributed smaller parcels to lesser chiefs. The *maka`āinana* (commoners) worked the individual plots of land. It is said that Mā`ilikukahi gave land to *maka`āinana* all over the island of O`ahu (*ibid*).

In general, several terms, such *as moku*, *ahupua`a*, *`ili* or *`ili`āina* were used to delineate various land sections. A district (*moku*) contained smaller land divisions (*ahupua`a*) that customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua`a* were, therefore, able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua`a* to be self-sufficient by supplying the needed resources from different environmental zones (Lyons 1875:111). The *`ili* or *`ili `āina* were smaller land divisions next in importance to the ahupua`a and were administered by the chief

who controlled the *ahupua`a* in which it was located (Lyons 1875:33; Lucas 1995:40). The *mo`o`āina* were narrow strips of land within an *`ili*. The land holding of a tenant or *hoa `āina* residing in an *ahupua`a* was called a *kuleana* (Lucas 1995:61).

TRADITIONAL SETTLEMENT PATTERN

Archaeological settlement pattern data suggests that initial colonization and occupation of the Hawaiian Islands first occurred on the windward shoreline areas of the main islands between A. D. 850 and 1100, with populations eventually settling in drier leeward areas during later periods (Kirch 2011:3). Although coastal settlement was dominant, Native Hawaiians began cultivating and living in the upland *kula* (plains) zones. Greater population expansion to inland areas began around the 14th Century and continued through the 16th Century. Large scale or intensive agriculture was implemented in association with habitation, religious, and ceremonial activities.

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During the pre-Contact Period (pre-1778), there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinaruma*) and *mai`a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were cultivated. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985:216).

The generally accepted paradigm of Hawaiian settlement is that the earliest settlements were located in the wet, windward regions. As population pressure increased or politics changed, populations began to branch out into leeward, less hospitable regions of Hawai`i, adapting their cultivation strategies as they moved into drier climates (Cordy 2002:17). According to Kirch's (1985) Hawaiian Settlement Model, the Wai`anae area was settled during the Expansion Period (A.D. 1100–1650) during which time O`ahu's population was growing faster than any other period of Hawaiian prehistory. Prior to the Expansion Period, Wai`anae District, including Lualualei, was likely visited by travelers and its rich offshore fisheries may have attracted seasonal fishermen (*ibid*).

Wai`anae likely gets its name from a large freshwater fishpond west of Wai`anae Stream. Mullet were grown in this pond, thus the name *wai* (water) *`anae* (mullet) (Handy and Handy 1972: 468). The region is renowned for its fruitful deep sea fisheries, especially in the waters off Ka`ena Point. Wai`anae's fisheries are noted in Hawaiian legend. Chief Kawelo distinguished himself as an able fisherman in these waters (Handy and Handy 1972:467). It is here, at Ka`ena Point, that the demigod Māui is said to have cast his line and attempted to pull Kaua`i toward O`ahu, creating a single island of the two. When he felt he had hooked Kaua`i firmly, he gave a mighty tug and pulled up an enormous boulder from the sea floor. This rock is known today as Pohaku o Kaua`i. The hook flew from its line and was lost in Pālolo Valley (Thrum in Sterling and Summers 1978:65-66).

The Wai`anae District's landscape is daunting, but its earliest coastal settlements were prosperous. In an early Historic description of the area, Vancouver (in Sterling and Summers 1978:67-68; Handy and Handy 1972:468) writes, "From the commencement of the high land to the westward of Opooroah (Puuloa) was...one barren rocky waste, nearly destitute of verdure, cultivation or inhabitants...". Vancouver's ship passed Wai`anae by, but if it had landed, these voyagers would have discovered that Wai`anae was not as desolate as it appeared from a distance. A variety of crops, including taro (*kalo)*, gourds (*ipu manalo)* and sweet potato (*`uala)* were grown in the uplands of Wai`anae Valley, Mākaha Valley, and Lualualei Valley (Handy and Handy 1972:468). Wet taro cultivation occurred extensively on the low valley slopes and the upper flatlands of these valleys, where water was plentiful (Handy 1940). Today, evidence of terracing can still be seen in the upper reaches of these valleys, but historic sugarcane cultivation obscured terrace remnants in the Waianae Valley bottom. Fishing villages, particularly around Pōka`ī Bay produced the necessary dietary protein; however, the landscape in the lower valley was adverse to plant cultivation. Therefore, trade between the upper and lower valley was essential in this inhospitable portion of western O`ahu.

The Wai`anae District society was punctuated by a distinct need to trade and share resources. This reliance on trade defined the culture in Wai`anae, perhaps to a greater extent than in other regions of O`ahu. The people of Nānākuli, for example, are said to have pretended to be deaf and dumb to passers-by, as they had no fresh water to offer travelers (McGrath *et al.* 1973:10). This, according to Pukui *et al.* (1974) is why this place is called Nānākuli, "looking at the knees." Resource availability, or lack thereof, undoubtedly had a great impact on Wai`anae society.

King Kamehameha I is said to have failed in his attempt to take over Kaua`i because he did not give homage to the Wai`anae gods. Kamakau states, "The fleet went (first) to Wai`anae and the war god (Kūkā`ilimoku) was carried ashore that evening" (Kamakau in McGrath *et al.* 1973*)*. McGrath continues, saying that Kamehameha rededicated two *heiau* to his war god, giving no homage to the war god of Wai`anae. As a result, the Wai`anae gods sent a storm to stop Kamehameha's war canoes from reaching Kaua`i, preventing Kamehameha from taking Kaua`i by force (*ibid*:14).

***WAHI PANA* (LEGENDARY PLACES)**

According to one legend, the origins of *niu* (coconut palm) in the Hawaiian Islands, as well as the naming of Pōka`ī Bay was described as:

> "In very ancient times, when the great Hawaiian chiefs and navigators sailed across the vast Pacific between Hawai`i and Kahiki, a legend arose about a voyaging chief named Pōka`ī. It said that he brought and planted at Wai`anae the first coconut tree in Hawai`i, from which grew in time a famous grove, Ka Ulu Niu o Pōka`ī. The grove stretched from the site of the present police station to that of the Sacred Hearts Church...the bay *makai* of the grove, formerly known as Mā`alaea, eventually took the name of the legendary planter" (Clark 1977:87).

Spirituality and cultural significance of the region is punctuated by the high number of *heiau* in Wai`anae District, both along the coast and inland. McAllister (1933:112-114) names nine *heiau* in Wai`anae Valley alone: Puupaheehee (McAllister Site 152), Kuilioloa (McAllister Site 153), Keopuni (McAllister Site 155) Kahoali`i (McAllister Site 156), Malaihakoa (McAllister Site 157), Kikahi McAllister (McAllister Site 158), Kalamaluna (McAllister Site 159), Kane (McAllister Site 160), Kamaile (McAllister Site 161), and Punanaula (McAllister Site 161). Some of these *heiau* have been destroyed, while some are partially or fully intact. Kuilioloa Heiau is particularly interesting, as this is the only known *heiau* on O`ahu to be surrounded by water on three sides. It rests on Kane`ilio Point at the eastern extremity of Pōka`ī Bay.

Lualualei Valley was important during the pre-Contact Period, as evidenced by the many named `*ili* across the valley landscape, these locales were especially prosperous for growing seasonal crops in the back of the valley where water resources were more plentiful (Kelly in Haun *et al*. 1991:343). In mid-valley reaches, pili grass was acquired and used for housing thatch, while lower valley areas were successfully utilized for salt mining and marine resource acquisition (*ibid*). As noted below, a diversity of site types were present in the valley, the sites reflecting soil and water resources available (or not) in each zone.

Lualualei has been interpreted to mean “beloved are spared”. The meaning is based on a story about a boy named Kalakua, whose life was spared by the king after he was falsely accused of wearing the king’s loin cloth or *malo* (I`i 1983: :23; Sterling and Summers 1978:64-65). Two trails known from prehistoric times cross through the valley and over the mountains. Particularly noted is the Kolekole Pass Trail which connects this Leeward valley with the present-day Schofield Plateau. These trails were lifelines for food, travel, and communication between those living or working on both sides of the Wai`anae Range (Kelly in Haun *et al.* 1991:313).

Numerous stories of Māui, the demigod, are associated with Lualualei Ahupua`a. These stories include a large rock (McAllister Site 148), located approximately 1.1 miles northwest of Nānākuli Station. which is said to be named after Māui (McAllister 1933:110). According to legend,

> "Maui...landed here when he first came to the Hawaiian Islands from the south. This stone at the time was surrounded by water, and it is here that Maui reposed and sunned himself. In the bluff to the northeast of the rock is the shelter in which he lived, and in the vicinity was a spring where he obtained water...".

Another legend tells how Māui was able to obtain fire from the "Mud-hen-of-Hina. According to this story, the gods had taken fire away from men and Māui-a-Kalani (Māui son of Kalani) wanted to find the source of fire. Māui was able to trace the fire to a *mapele* (temple, *heiau*) in Wai`anae District. A woman named `Alae-huapipi owned the fire, called "the fire of Pele", which she kept in the *mapele*. `Alae-huapipi and another woman, named `Alaenuahini, "had the fire in the mapele and from them fire was obtained. From that time men had fire. The source of the fire was in the possession of these two double-bodied women who could take bird form....". So, by observing these to women over a period of time, Māui was able to find out the source of fire" (Kamakau in Sterling and Silver 1978:64).

Another legend pertaining to Lualualei involves the legend of the goddess Pele and her younger sister, Hi`iaka. In this story, Hi`iaka and two traveling companions, Wahine-`ōma`o and Pā`ū-o-Pala`ā, traveled from the island of Hawai‘i to Kaua`i Island in order to bring the chief Lohi`au-ipo (Lohi`au) back to the Big Island from Hā`ena, Kaua`i. During their journey, Hi`iaka and her friend stopped and visited many locations on the islands of Hawai‘i, Maui, Moloka`i, and O`ahu. Once they reached Kaua`i, Hi`iaka found that Lohi`au had died. Once the funerary ceremonies were concluded, Hi`iaka revived Lohi`au and began the journey to return

with Lohi`au to Pele's domain at Kīlauea, Hawai`i. During their journey from Kaua`i back to Hawai`i Island, Hi`iaka and her companions stopped at Lualualei, on the island of O`ahu. During this segment of the trip (translated by Maly 1998):

> Hi`iaka and her companions then prepared to depart from Pōka`ī. She told Lohi`au and Wahine`ōma`o, that they would travel by canoe, while she would travel for a while over land, and that they would meet again at Kou [Honolulu]..Hi`iaka then continued her journey along the upland trail. Now the trail upon which Hi`iaka chose to travel, is the trail which passes above Pōhākea. Hi`iaka passed along the *kula* (plain) of Mā`ili, and then turned to look at the uplands. She saw the dazzling light of the sun on the uplands of Lualualei and Hi‘iaka chanted:

Wela ka lā e!	The sun is hot!
Wela ka lā e!	The sun is hot!
Ua wela i ka lā ke kula o Lualualei	The heat of the sun is on the plain of Lualualei
Ua nau ia e ka lā a ‘oka‘oka...	The sun chews it up entirely...

HISTORIC PERIOD (1778-EARLY 1900S)

By the time of Contact with Westerners (1778), Wai`anae Valley was the political and social center of the moku (district) of Wai`anae. However, Lualualei Valley was also occupied, as was Mākaha Valley to the north. Like Lualualei Valley, settlements were concentrated in the lower slopes of Wai`anae Valley, where some water was available for wet taro cultivation, and adjacent to Pōka`ī Bay, where access to the ocean and the rich marine resources was gained.

Slightly earlier, this region became the center for sweeping political changes in the late pre-Contact and early Historic Periods. Pu`u Kawiwi, at the rear of Wai`anae Valley, was the scene of the last stand of Maui Chief Kahekili against the O`ahu warriors. In this last battle of 1784, Kahekili overthrew the O`ahu chiefs, becoming ruling chief of the island. Ten years later, after Kahekili’s death, a power struggle ensued between his son (Kalanikupule) and his half-brother (Kaeo, the ruler of Kaua`i) (Kuykendall 1938, Day 1984:60). The Wai`anae warriors sided with Kaeo and they lost the deciding battle, to Kalanikupule, at `Aiea (Day1984:60). A Wai`anae *kahuna* (priest) prophesied the coming of a “big fish” who “would eat all the little fish.” The following year, Kamehameha invaded O`ahu.

Following Kamehameha’s succession as ruling chief, “the despoiled people in large numbers fled to Wai`anae District and settled there. This part of O`ahu being hot, arid, isolated,

with little water, was not coveted by the invaders" (Mouritz in Sterling and Summers 1978:68). The status Wai`anae once carried as a ruling center was now gone.

Kamehameha I monopolized the natural resources of his islands, often using them in great quantity for his own personal interests. According to Kamakau (in Kuykendall 1938), Kamehameha learned the value of conservation during a deal with a Boston ship in 1817. He purchased the *Columbia* in exchange for two ship-loads of sandalwood. In an effort to pay for the deal, Kamehameha ordered the chiefs of several *moku,* including Wai`anae, to cut sandalwood. Soon the island chain was starving because the people were neglecting their taro patches. Kamehameha, seeing his mistake, then ordered his people to farm. Thereafter, Kamehameha managed the island's resources more carefully.

Christian missionaries were quick to establish parishes throughout O`ahu following their arrival in 1820. However, it wasn't until the 1840s that these missionaries began licensing natives to preach, and even longer before native ministers were ordained. David Malo and Blind Bartemeous (Pua`aiki) were the first ordained Hawaiian ministers. Ordained in 1850, Stephen Waimalu became the first Hawaiian minister of Wai`anae District (Kuykendall 1938).

Sugar cultivation began in 1878 with a small operation owned by Hermann Widemann and Julius Richardson. Two years later, George and Albert Wilcox purchased and chartered the Waianae Sugar Company (Condè and Best 1973:356). Sugar in Wai`anae, like other operations throughout O`ahu, was limited by the lack of arable land and available water resources. This adversity was punctuated in the Wai`anae, Lualualei, and Mākaha Valleys, where water tunnels were eventually constructed to provide irrigation to the plantations. Despite this challenge, Waianae Sugar Company was among the most efficient sugar plantations in Hawai`i. At its peak, the plantation produced 13.79 tons of sugar per acre in 1935 (Dorrance and Morgan 2000:44). However, high yields did not make up for a lack of growing room and the plantation eventually was closed in 1946.

During the Māhele, traditional land tenure was abrogated in favor of western ownership principals (see below). The Hawaiian Monarchy gave portions of land to natives who could prove that they actively cultivated land segments. These land awards were given in the form of Land Commission Awards (LCAs). LCAs and Land Grants (lands that were made available for purchase) abound in Wai`anae District.

According to Kelly (in Haun *et al*. 1991:319-320), Kamehameha III claimed as his personal property the *ahupua`a* of Wai`anae, Lualualei, and Nānākuli. By 1850, a total of six LCA's were awarded for Lualualei Valley, all being in the *`ili* of Puhawai. Based on the 1998 USGS Waianae quadrangle map, the area of Puhawai appears to be located along the north side of Lualualei Ahupua`a within the Lualualei Homesteads. The LCA's represented land used for *lo`i*, dryland crops on the *kula*, *wauke*, and salt production (*ibid*). No Land Commission Awards exist within the current survey area.

By 1851 W. Jarrett was ranching on 17,000 acres of Lualualei lands, many of the walls built during this time having been recorded by archaeologists (see below). In the early 1900s, Lualualei was partially utilized as pasture lands for cattle, sheep, and horses. Kelly (in Haun *et al*. 1991:344) notes that at this time, Crown lands were open for homesteading but the modest local population still had difficulty obtaining water, particularly until the Waianae Sugar Plantation closed in 1946. While sugar cane was attempted to be grown in various portions of the valley, the water supply remained inadequate; as was the problem during prehistoric times, consistent high water flow was problematic. Multiple ditches, tunnels, flumes, and reservoirs were built through and in Lualualei Valley to obtain and hold water for sugar production. Given the low water resources even after these structures were built, the conflict for water between homesteaders and the sugar plantation remained.

According to Kelly (in Haun *et al*. 1991:339), "...[o]ne of the earliest references to military activity [Lualualei] had to do with Kolekole Pass Road (Military Road No. 280) which was mentioned in a Presidential Executive Order (No. 3885) dated July 1923". Apparently, a Governor's Executive Order (No. 3885) "...was issued on the lower road that led to the Kolokole Pass Road, dated 25 April 1923" (*ibid*). Kolekole Pass Road provided military access from Schofield Barracks across the Wai`anae Mountain Range into Lualualei Valley.

In 1929, Lualualei Depot was constructed and in 1934, ammunition was first stored in Lualualei Valley. This started a long use of the valley by the U.S. military, primarily the U.S. Navy, which continues today. Although the U.S. Navy is the largest land tenant within Lualualei Ahupua`a, there are multiple residential land parcels and various industrial business and farms *(i.e.,* agriculture and livestock).

THE MĀHELE

In the 1840s, traditional land tenure shifted drastically with the introduction of private land ownership based on Western law. While it is a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was

forced to establish laws changing the traditional Hawaiian economy to that of a market economy (Kuykendall 1938, Vol. I: 145; Daws 1968:111; Kelly 1983:45, 1998:4; Kame`eleihiwa 1992:169–70, 176). The Māhele of 1848 divided Hawaiian lands between the king, the chiefs, the government, and began the process of private ownership of lands. The subsequently awarded parcels were called Land Commission Awards (LCAs). Once lands were made available and private ownership was instituted, the *maka`āinana* were able to claim the plots on which they had been cultivating and living. These claims did not include any previously cultivated but presently fallow land, *`okipū* (on O`ahu), stream fisheries, or many other resources necessary for traditional survival (Kelly 1983; Kame`eleihiwa 1992:295; Kirch and Sahlins 1992). If occupation could be established through the testimony of two witnesses, the petitioners were awarded the claimed LCA and issued a Royal Patent after which they could take possession of the property (Chinen 1961:16).

According to the Waihona `Aina Database (2013), there were thirteen Land Court Award claims made in Lualualei Ahupua`a during the Māhele, none of which were within the current survey area. However, the REDI Realty Tax Map Key [TMK: (1) 8-7-010:007] indicated that the proposed undertaking is located within Land Grant 4751 (see Appendix E). Archival research indicated Land Grant 4751, comprised of 2,629 acres, was purchased by H. M von Holt for $1.00. The current survey area is situated in the western portion of Land Grant 4751, within the boundaries of Lot 8 (1,149 acres).

PREVIOUS ARCHAEOLOGY

The following excerpts are a sample of archaeological studies conducted in the Lualualei Ahupua`a that will aid in the creation of an archaeological site predictive model that can be utilized for settlement pattern analysis of the Lualualei Ahupua`a.

THE *MAUKA* (EASTERN) HALF OF LUALUALEI AHUPUA`A

During the early 1930s, Gilbert J. McAllister, under the auspices of the Bernie P. Bishop Museum, conducted one of the earliest and most extensive archaeological surveys on O`ahu and documented three sites in Lualualei Valley. The first was Nioula Heiau, a paved and walled heiau of the po`o kanaka class, denoted as Site 149 (subsequently designated State Site 50-80-08-1179) (McAllister 1933:110–111, Sterling and Summers 1978:66). At the time of McAllister's (1933) recording, the northern flank of the structure was almost completely destroyed, with the stones having been removed and used as a cattle pen. The structure was noted on Halona Ridge, just southwest of the Forest Reserve Line (near the end of current Forrestal Road). State Site 50-80-08-1179 was significant in that it was purported to be the heiau of Chief Kakuhihewa, on which the body of a boxer killed by Kewalo was placed and offered as sacrifice to the gods (McAllister 1933:110; in Sterling and Summers 1978:66).

The second site was a fairly large site complex (McAllister Site 150, subsequently designated State Site 50-80-08-1180) which were located in the middle of Lualualei at the foot of the cliffs (McAllister 1933:110-111, Sterling and Summers 1978:66). Haun *et al.* (1991:28) note that this site is referred to as the "Lualualei Complex" and was identified "...upslope from the west end of 59th Street to the base of steeper slopes and cliffs." When first observed by McAllister (1933:110), the site complex consisted of "... innumerable walls and small terraces that may have been house sites or possibly very old heiaus" (McAllister 1933:110). Haun *et al.* (1991:28) noted that McAllister (1933:110) initially stated that the structures were poorly preserved due to cattle damage. During the Haun *et al*. (1991) survey, only two features of the complex were recorded, presumably due to further deterioration to the site.

The third site noted in Lualualei Valley by McAllister (1933:110, Sterling and Summers 1978:66) was also a named heiau: Kakioe Heiau, also referred to as Site 151. According to Thrum (1909), the *heiau* was located at Puhawai, Lualualei, but nothing remained of the *heiau* "but its sacred spring, and the sound of its drums and conchs on the nights of Kane" (Sterling and Summers 1978:66). Haun et al. (1991:29) found no evidence of the *heiau* during their survey work.

In addition to these three notable sites/site areas described above, Haun *et al*. (1991:29) documented three additional, previously identified, sites. These consisted of Kolekole Rock, a bowl-shaped rock located at the intersection of Kolekole Road and 46th Street, another bowl-shaped rock, and a hoana stone, near the officer's mess in Lualualei. The latter rock and stone were in a secondary location, and later moved to a third location (north side of the administration building).

The Haun *et al*. (1991) archaeological study led to the documentation of 197 sites comprised of over 1,020 features. These sites included pre-Contact habitation and agricultural complexes, and historic period walls. Testing was conducted by Haun *et al.* (1991:150) at State Site 50-80-08-1760 and consisted of placing a shovel probe through the Feature A slab-lined hearth. The excavation revealed four strata from surface to just under a meter in depth. Layer II consisted of a thin cultural deposit consisting of charcoal and a kukui nut fragment. The charcoal was submitted for radiocarbon dating and returned a calibrated age of A. D. 1425-1655, firmly within pre-Contact times.

Dixon et al. (2002) reported on the findings of an archaeological survey that included areas previously documented by Haun *et al.* (1991) eleven years earlier. Only one feature assessment changed for State Site 50-80-07-1760. Dixon *et al*. (2002:4) interpreted the original "rectangular mound" of Feature B as more of a C-shaped structure. Assessments of the two other sites (State Site 50-80-07-1767 and State Site 50-80-07-1797) were not changed from their original recordation by Haun *et al*. (1991).

State Site 50-80-08-1761 was located at 387 ft. amsl. and consisted of five habitation and agricultural features. The site measured 73 m by 63 m (4,599 m²) and consisted of a U-shaped structure, three agricultural terraces, and an agricultural mound. The U-shaped feature yielded prehistoric artifacts inclusive of a basalt core, debitage, and a circular polished stone fragment. This site was also re-identified by Dixon *et al*. (2002). No interpretations were changed from the original survey, only several GPS points were added for site information.

State Site 50-80-08 -1797 was located at 230-276 ft. amsl. and measures 249 m by 117 m (2. 9 hectare). The site consists of two historic rock walls, both functioning as boundary markers. Both are in a poor-good preservation state and reflect historic ranching in the area. This site was again re-identified by Dixon *et al.* (2002). No interpretations were changed from the original survey.

THE *MAKAI* (WESTERN) HALF OF LUALUALEI AHUPUA`A

Barrera (1975) reported the findings of six archaeological sites (State Sites numbers 50-80-07-5309 through -5314) during a pedestrian survey of approximately 80-acres of land owned at the time by the Kaiser Pacific Properties Corporation. (Note: the project area perimeter of Barrera's 1975 survey cannot be pinpointed with regards to a Tax Map Key as his project area location map does not have a scale). State Sites numbers 50-80-07-5309 through -5314 included surface features such as enclosures, walls, platforms, C-shaped structures, mechanically damaged amorphous sites, and a surface midden scatter. Archaeological excavations were not conducted.

Cordy (1975) conducted archaeological excavations at State Site 50-80-07-5309, "a roughly rectangular stone structure," and produced various ferrous metal artifacts such as nails, banding fragments, can fragments, milled wood, a pig bones, and a bottle neck fragment. Excluding the bottle neck fragment that was found in the site's stone architecture, all of the other artifacts were found below the site's architecture. Thus, Cordy (1975) interpreted Site -5309 as "a recent structure—dating in this century" (20th century).

In 1990, while excavating for the placement of an 8-inch watermain, seven (7) human burials were inadvertently discovered within sandy matrices. Field analysis interpreted the burials as of Polynesian ancestry (Hammatt and Shideler 1990). Collectively, these burials were assigned as State Site 50-80-08-4244.

Ogden Environmental and Energy Services conducted an Archaeological Reconnaissance survey of 260-acres for the Lualualei Radio Transmission Facility (Robins and Anderson 1998). A total of three archaeological sites were identified. State Site 50-80-07-5591 consisted of a complex of ditches and modified drainages associated with the sugarcane industry that extended from the 1800s to the 1900s. State Site 50-80-07-5592 (a terraced stone enclosure constructed of limestone boulder-sized slabs and cobbles) was interpreted as a Traditional-type permanent habitation site. State Site 50-80-07-1886, a rock mound initially identified by Haun (1991), was re-located and interpreted as a traditional Hawaiian site of undetermined function. No archaeological excavation was conducted by Ogden Environmental and Energy Services Company to confirm the presence of subsurface archaeological cultural material at State Sites 50-80-08-1886 and -5592.

McDermott and Hammatt (2000) reported the findings of two buried Traditional-type cultural strata (State Sites 50-80-07-5672 and -5673) during an Archaeological Inventory Survey

of beach front properties [Tax Map Keys (1) 8-7-005:001, 003, and 005; 8-7-006:003; 8-7-008:001 and 026; and 8-7-008:026]. Based on the presence of Traditional-type food midden and associated shell and lithic artifacts recovered, the two sites were interpreted as occupied during the late pre-Contact or early post-Contact times.

In 2012, Scientific Consultant Services, Inc. conducted an Archaeological Inventory Survey of approximately 123. 6-acres of land in preparation for the placement of a solar panel farm located in Lualualei, Lualualei Ahupua`a, Wai`anae District, Island of O`ahu, Hawai`i [TMK: (1) 8-7-010:020 portion] (Dagher *et a*l. 2012). During the survey three previously documented sites (State Sites 50-80-07-3337, -3338, and -3750) were re-located and the remaining two sites (State Sites 50-80-07-7391 and -7392) were newly identified. One site, SCS Temporary Site T-2, was dropped from the archaeological list given archaeological testing revealed the site was mechanically created. Limited subsurface testing was conducted but did not produce archaeological cultural material. Archaeological work in this area follows Cordy (1976), Mayberry and Rosendahl (1994) and Jimenez (1994).

Jimenez (1994) returned to the location of five Mayberry and Rosendahl (1994) sites (State Sites 50-80-07-3335, -3339, -3344, -3750, and -3755) for the sole purpose of archaeological excavation. Unfortunately, State Site 50-80-07-3335, a sinkhole/well, was destroyed prior to excavation. Collectively, several excavations of the remaining four sites produced artifacts, midden, and charcoal. At State Site 50-80-07-3339, two excavations produced modern military ammunition cartridges and a burnt bone. At State Site 50-80-07-3344, two excavations produced flecks of charcoal. A radiocarbon sample from Test Unit 1 Stratum III-1 submitted from the excavation at Site -3344 returned one sigma calibrated calendric dates of 1670-1774 A. D. and 1793-1948 A. D. A second radiocarbon sample from Test Unit 6 Stratum II-1 at the same site returned one sigma calibrated calendric dates of 1671-1772 A. D. and 1794-1947 A. D. At State Site 50-80-07-3750 two excavations produced marine shell ecofacts, charcoal, and chert flakes. Test Unit 4 Stratum II-1 at Site -3750 returned several one sigma calibrated calendric dates of 1426-1639 A. D. , 1746-1799 A. D. , and 1941-1955 A. D. At State Site 50-80-07-3755 two subsurface excavations did not produce cultural material.

SUMMARY OF LUALUALEI VALLEY ARCHAEOLOGICAL RESOURCES

As a result of the multiple archaeological projects conducted in the valley over a span of c. 90 years, a wide range of sites have been identified in all parts of the valley, from near coastal reaches to the uplands, including Traditional-period sites as well as historic features. Haun *et al.* (1991: 307-308) and Robins and Anderson (1998:37-38) provide a summary of the settlement

pattern: permanent habitation loci near the coastline and in the back of the valley, much like the pattern for Mākaha Valley. Permanent habitation in the back of the valley was concomitant with the presence of freshwater resources, which allowed for irrigated agriculture. Mid-valley reaches of Lualualei Valley is reflected by a drier, kula landscape in which temporary habitation sites (i. e. , C-shapes) were built and dryland agriculture was practiced.

Site types in the valley were diverse, a majority including Traditional-type pre-Contact Hawaiian sites reflecting permanent and temporary habitation, religious and ceremonial use (*heiau*, burials), both irrigated and dryland agricultural loci, animal pens and walls, and lithic workshop areas, as evidenced by debitage clusters and partially finished tools. Historic sites were primarily represented by walls, ditches, and flumes indicative of ranching, sugar cane cultivation, and historic homesteading. Radiocarbon results from multiple sites around the valley indicate initial settlement, on a temporary basis, from the early to mid A. D. 1400s and late 1600s, primarily in upland locales (near water resources). Permanent occupation of the valley commenced around the start of the 1600s and into the 1800s.

Kelly (in Haun *et al*. 1991:345) pointedly sums up the history of Lualualei Valley use through time by stating that the outstanding issue for habitation and use of the land through history has been the story of water resources.

PREVIOUS ARCHAEOLOGY WITHIN TMK: (1) 8-7-010:007

In 2007, Cultural Surveys Hawai`i, Inc. conducted an Archaeological Inventory Survey-level study of 6-acres of land for what is currently the site of the Leeward Coast Emergency Homeless Shelter Project, Lualualei Ahupua`a, Wai`anae District, Island of O`ahu [TMK: (1) 8-7-010:007] (Tulchin and Hammatt 2007). The Tulchin and Hammatt (2007) study, located in the northwest corner of the current survey area, included archaeological monitoring of tree removal and subsurface geotechnical testing. No archaeological sites were identified.

Subsequent to the above-described inventory survey, Cultural Surveys Hawai`i, Inc,. conducted Archaeological Monitoring of 6.5-acres of land during ground altering activities associated with the construction of the Leeward Coast Emergency Homeless Shelter, Lualualei Ahupua`a, Wai`anae District, O`ahu Island [TMK: (1) 8-7-010:007 (Hunkin and Hammatt 2008). No archaeological sites were identified.

In 2008, Cultural Surveys Hawai`i, Inc,. conducted an Archaeological Inventory Survey-level study of approximately 0.5-acres of land for the Leeward Coast Emergency Homeless Shelter, Lualualei Ahupua`a, Wai`anae District, O`ahu Island [TMK: (1) 8-7-010:007 (Tulchin and Hammatt 2008). The Tulchin and Hammatt 2008 project area was located immediately adjacent to the southeast corner of the two above-described project areas. No archaeological sites were identified.

In 2009, International Archaeological Research Institute, Inc. conducted an Archaeological Inventory Survey of the current survey area (Rieth 2009). During the survey, a total of twenty-one surface features were identified. These features were incorporated into three archaeological sites: State Site 50-80-07-7081, the Voice of America Radio Transmission Site; State Site 50-80-07-7082, the Voice of America transmitter buildings and ancillary features; and State Site 50-80-7-7083, a raised railroad bed remnant from the Waianae Sugar Company (Rieth 2009). No subsurface testing was conducted.

EXPECTED FINDINGS WITHIN THE SURVEY AREA

Based on findings of Cordy (1976), Mayberry and Rosendahl (1994), and Jimenez (1994), it is possible that undocumented surface structures exist within the current survey area. Cultural materials on the ground surface and within subsurface contexts of archaeological sites would primarily reflect both limited and sustained occupation of this portion of Lualualei Valley. Artifacts might include stone implements, such as cores, flakes, and debitage that would represent various domestic activities and possible those related to agriculture (flakes). Marine invertebrate (*e. g. ,* marine shells, sea urchin, and crustacean) and vertebrate (*e. g. ,* primarily fish), terrestrial vertebrates (*e. g. ,* dog and pig), and avian (*i. e. ,* birds) remnants suggesting the consumption of possible food resources might also be found on the ground surface as well as within subsurface contexts. Military associated artifacts, such as those reported by Jimenez (1994), may also be found within the current survey area.

FIELD METHODS

FIELD METHODOLOGY

Multiple field tasks were completed during the current Archaeological Inventory Survey. First, a (100 percent coverage) pedestrian survey was conducted of the survey area in order to identify archaeological sites and assess the proposed survey area's geographical/physiographical features. Transect spacing of ten to fifteen meters (32. 8 to 49. 2 feet) intervals was employed as ground visibility was moderate. Once archaeological sites were located, they were marked with

two types of biodegradable flagging tape: florescent pink and white with blue dots. During the pedestrian survey, results were compiled on standard graphing paper as well as with digital photography. Each site was given an SCS temporary site designation (e. g., T-1) and plotted on a United States Geological Survey (USGS) map with a handheld Garmin GPS Map 60 CSx global positioning system (GPS) unit. The datum and coordinate system used for the GPS unit was NAD83 and UTM (Universal Transverse Mercator). True north compass orientation was also employed. All measurements were recorded in metric units. Individual sites were also documented in plan view. Site boundaries were primarily determined by feature architecture boundaries. With the exception of State Site 50-80-08-7081, Feature 23 (a surface Historic artifact scatter), visible exploration on the exterior of the features did not identify any Traditional- or Historic-type cultural materials. Thus, each feature recorded herein was defined by their exterior architecture. Vegetation within the proposed survey area was identified using Whistler (1995) and Neal (1965).

Limited excavation was conducted during the current Archaeological Inventory Survey, in the form of four manually excavated stratigraphic trenches, in order to identify human alteration, archaeological features, and associated artifacts in subsurface contexts. Equipment utilized to perform these excavations included shovel, trowel, pick ax, whisk broom, and metric tape measure. All excavated material was 100 percent screened utilizing nested 1/8- and 1/4-inch mesh screens. Soil matrices were recorded using United States Department of Agriculture (USDA) Munsell (2000) soil color descriptions.

LABORATORY METHODOLOGY

All field notes and digital photographs were curated at the SCS laboratory, Honolulu. Representative plan view sketches showing location and morphology of identified sites/features/deposits were illustrated. Significant artifacts were scanned or photographed and classified for qualitative analysis. All metric measurements and weights were also recorded for quantitative analysis. All data were clearly recorded on standard laboratory forms that included numbers and weights (as appropriate) of each constituent category. No definitive archaeological food midden samples were observed within the excavations, therefore were available for analysis. Artifact analysis data is presented in Appendix A and selected artifact photographs are presented in Appendix B.

CURRENT ARCHAEOLOGICAL INVENTORY SURVEY RESULTS

The current Archaeological Inventory Survey was conducted on approximately 90-acres of land of which 40-acres will be developed for the Kamehameha Schools Community Learning Center (KCLC) located in Mā`ili, Lualualei Ahupua`a, Wai`anae District, Island of O`ahu, Hawai`i [TMK: (1) 8-7-010:007 por.].

As stated elsewhere in this document, in 2009 Timothy Reith of International Archaeological Research Institute, Inc. conducted an Archaeological Inventory Survey of the subject property which identified a total of twenty-one surface features. Those features were incorporated into three archaeological sites: State Site 50-80-07-7081, the Voice of America Radio Transmission Site; State Site 50-80-07-7082, the Voice of America transmitter buildings and ancillary features; and State Site 50-80-7-7083, which was interpreted by Reith (2009) as a raised railroad bed remnant from the Waianae Sugar Company.

During the current survey, the sixteen surface features (1 through 6, 8, 9, 11 through 13, 15 through 18, and 21) comprising State Site 50-80-07-7081 were re-located. The buildings and the ancillary features of State Site 50-80-07-7082, were not re-located as this site was located in the exclusion zone (see Rieth 2009) (see Figures 1 and 2). However, State Site 50-80-07-7082, Feature 7, a series of fencelines which traverse the survey area, was re-located. The previously identified State Site 50-80-7-7083, was re-located. State Site 50-80-07-7083 was re-interpreted as a cart path, given the absence of evidence supporting the functional interpretation of a raised railroad bed. The relocated and newly identified sites and features are depicted in Figure 6.

Three surface features, two VOA antennae foundations and a Historic Period trash dump, were newly identified during the current inventory survey. Based on proximity, these features were incorporated into State Site 50-80-07-7081. In an attempt to retain consistency and to avoid confusion, the newly identified features were sequentially numbered following Rieth (2009). Thus, the VOA antennae foundations have been designated Feature 22 and 23. The Historic Period trash dump was designated Feature 24.

These findings and the results of the limited subsurface testing are discussed in detail below.

STATE SITE 50-80-07-7081 (VOICE OF AMERICA RADIO TRANSMISSION SITE)

State Site 50-80-08-7081 was previously identified by Reith (2009) during an Archaeological Inventory Survey. As described by Rieth (2009: 17-28), State Site 50-80-08-7081 consisted of:

[sixteen] features (Features 1-6, 8, 9, 11-13, 15-18, and 21) that were foundations for the VOA antenna system. The features are configured in three nearly linear and parallel arrangements oriented northeast-southwest and extending across the length of the parcel. The pedestals along each row average 85. 0 m apart, while the rows are separated on average by about 90. 0 m. Fifteen of the features are standardized pedestal foundations. measuring 1. 52 m in length and width with variable height. Each has a slightly convex upper surface and a central posthole that supported a creosoted pole. Some of the pedestals have additional components to stabilize the pole or associated wires in the forms of smaller concrete blocks and steel and concrete uprights. Remnants of creosoted poles, heavy-gauge guide wires, and ceramic insulators are present throughout the area surrounding these features.

Feature 1 is a concrete pedestal foundation measuring 1. 52 m in length, 1. 52 m in width, and 0. 82 m in height (Photo 4). The upper surface of the pedestal is convex and a central posthole is present measuring 0. 4 m in diameter. The posthole is filled with a mixture of tar/creosote and gravel. A long the east side of the upper surface is a rectangular impression measuring 0. 72 m in length and 0. 26 m in width. Bolt attachments along the edges of the impression would have secured a metal support structure presumably to stabilize the creosoted pole in the posthole. A small-diameter metal pipe that projects from the north side of the pedestal possibly functioned as conduit for electrical wire. The foundation is in good condition. Note, State Site 50-80-08-7081, Feature 1 was selected by SCS as a representative example of the concrete foundation feature type (Figures 7 through 12).

Feature 2 is a concrete pedestal foundation measuring 1. 52 m in length, 1. 52 m in width, and approximately 0. 1 m in height (Photo 5). The posthole measures approximately 0. 4 m in diameter and is filled with a mixture of tar/creosote and gravel. No additional components are present. The foundation is in good condition.

Feature 3 is a concrete pedestal foundation measuring 1. 52 m in length, 1. 52 m in width, and 0. 68 m in height (Photo 6). The posthole measures 0. 4 m in diameter and is filled with a mixture of tar/creosote and gravel. Along the east side of the upper surface is a rectangular impression identical to that at Feature 1. Bolt attachments along the edges of the impression would have secured a metal support structure presumably to stabilize the creosoted pole located in the posthole. A small-diameter metal pipe projecting from the north side of the pedestal possibly functioned as conduit for electrical wire. The foundation is in good condition.

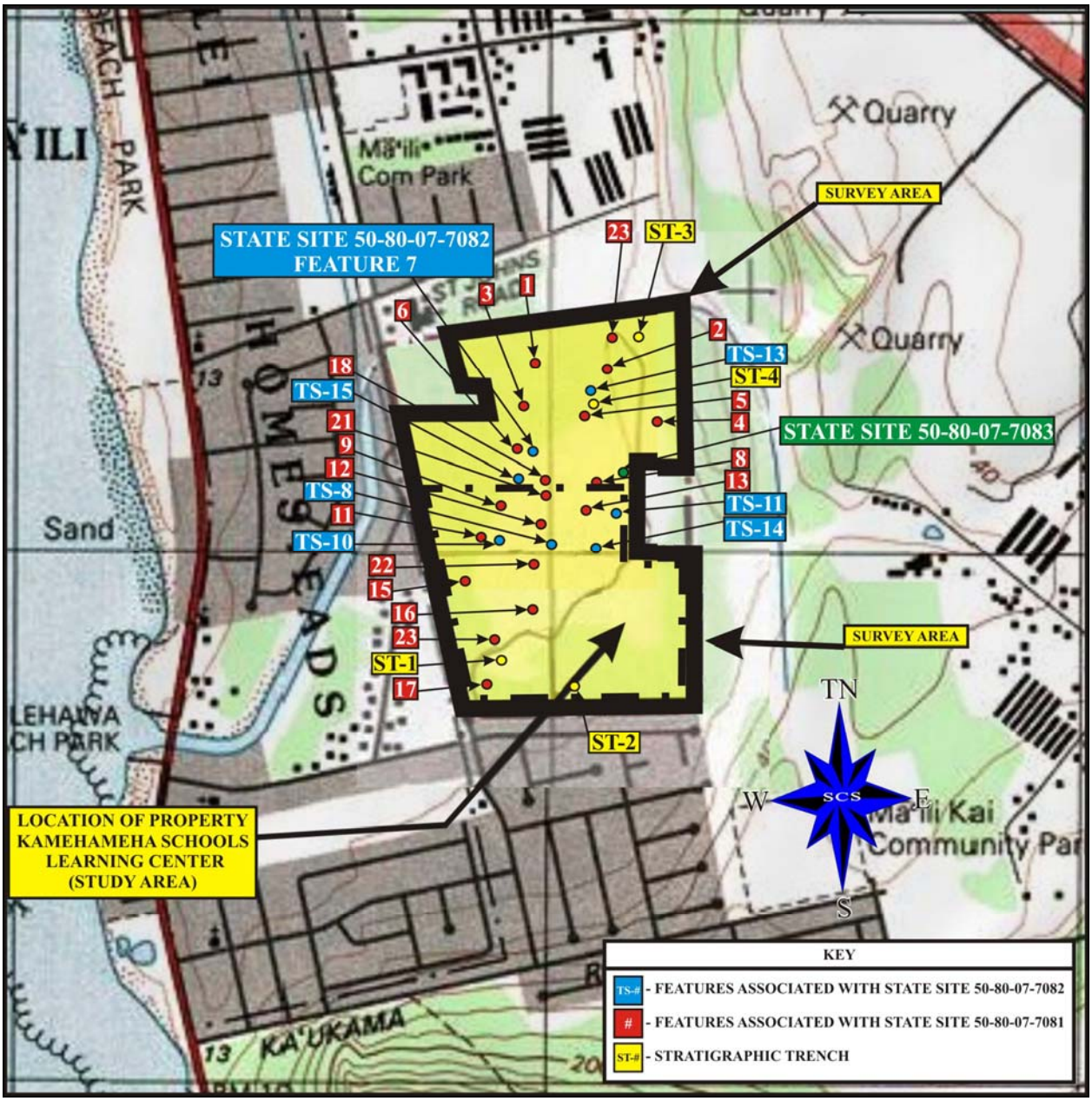

Figure 6: Plan View Drawing Showing Site and Feature Locations.

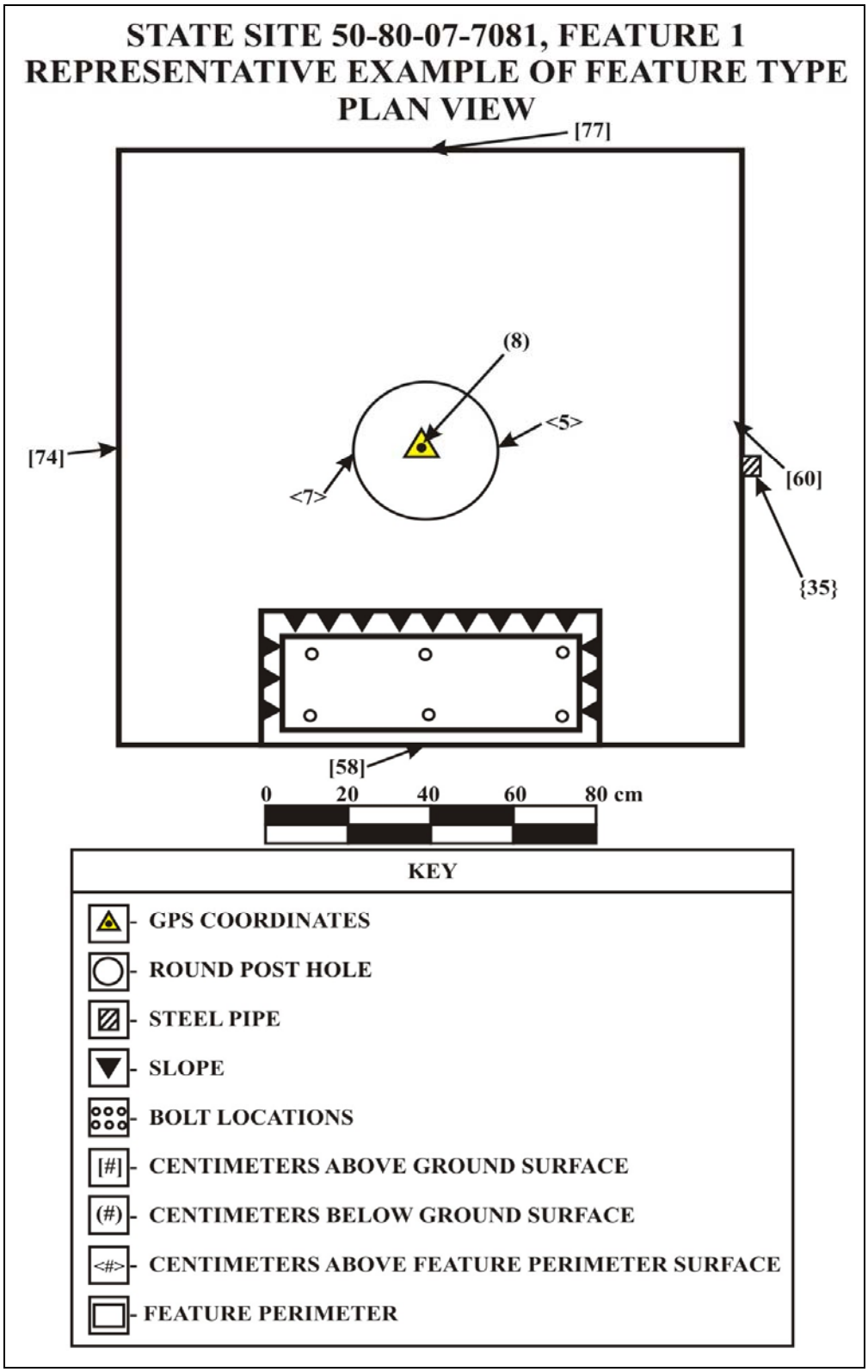

Figure 7: Plan View Drawing of State Site 50-80-07-7081, Feature 1. Representative Example of Feature Type.

Figure 8: Photographic View of State Site 50-80-07-7081, Feature 1. View to Southeast.

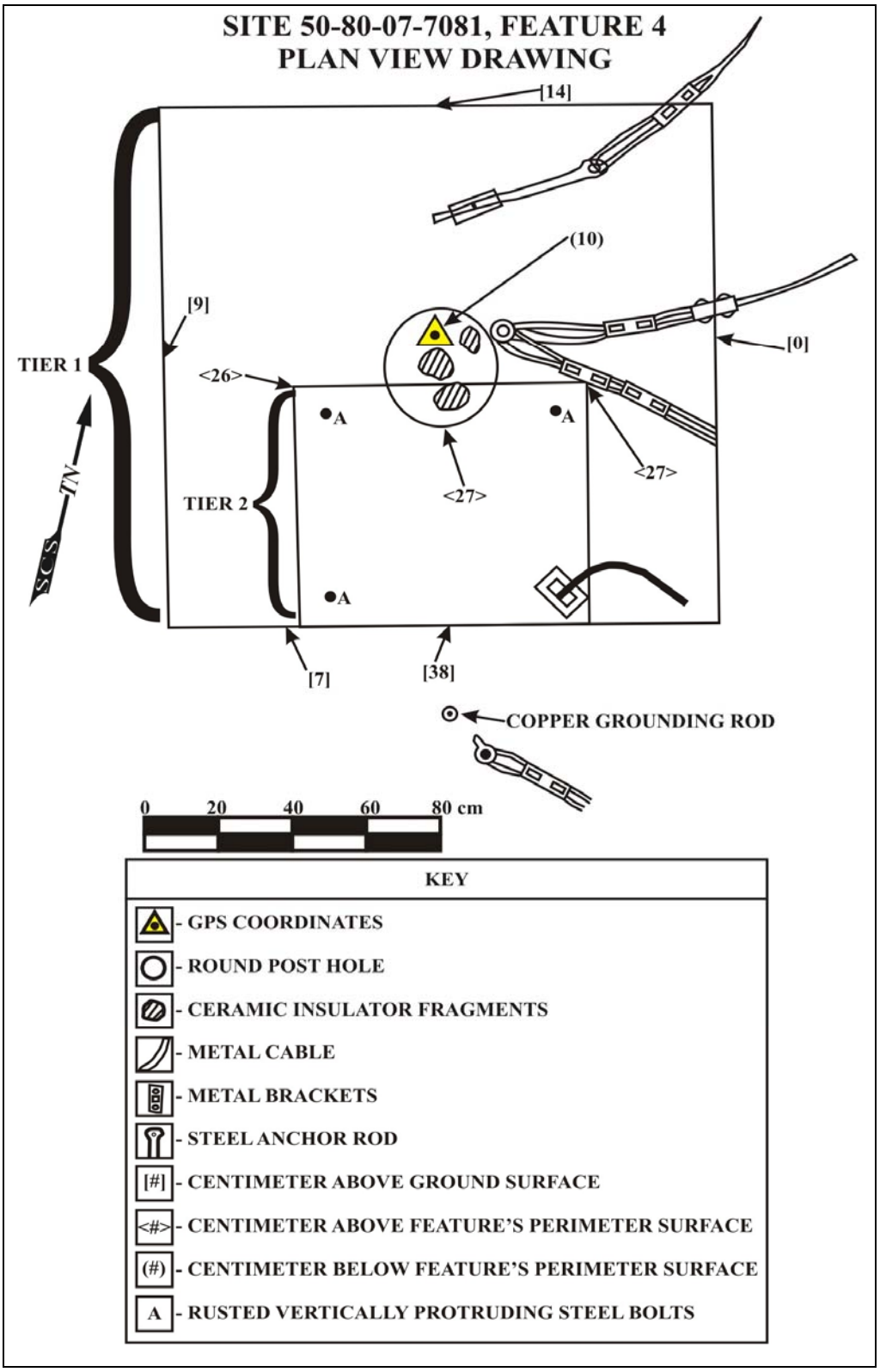

Figure 9: Plan View Drawing of State Site 50-80-07-7081, Feature 4. Representative Example of Feature Type.

Figure 10: Photographic View of State Site 50-80-07-7081, Feature 4. View to Northwest.

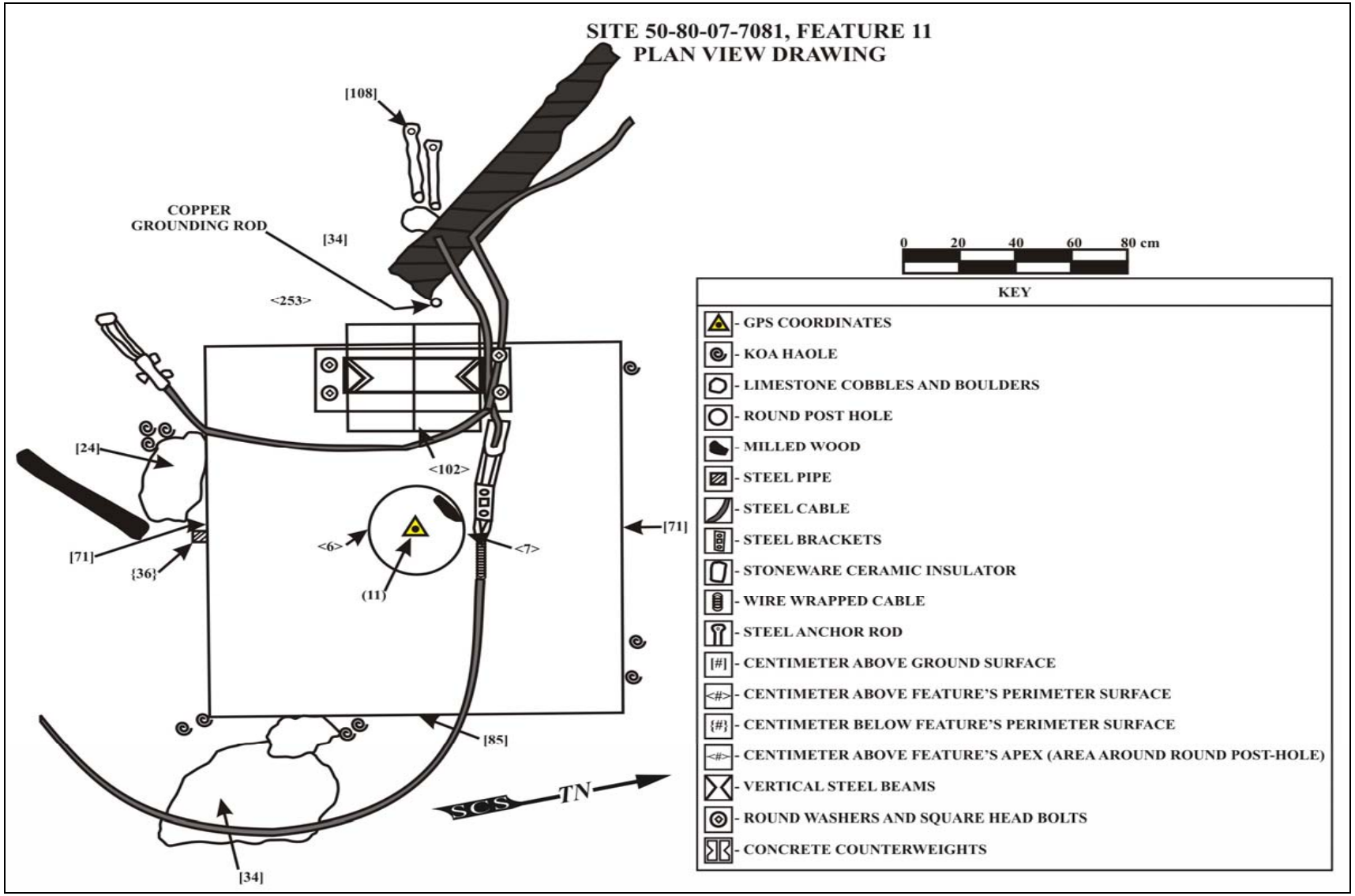

Figure 11: Plan View Drawing of State Site 50-80-07-7081, Feature 11. Representative Example of Feature Type.

Figure 12: Photographic View of State Site 50-80-07-7081, Feature 11. View to Southeast.

Feature 4 is a concrete pedestal foundation measuring 1. 52 m in length, 1. 52 m in width, and approximately 0. 1 m in height (Photo 7). The posthole measures approximately 0. 4 m in diameter and is filled with a mixture of tar/creosote and gravel. A second. smaller concrete block measuring 0. 8 m in length, 0. 7 m in width. and 0. 25 m in height is positioned adjacent to the posthole to provide additional support for the pole. A metal stanchion for the pole guide wires is cemented into the upper surface of the pedestal. The pole and associated cables are present east of the feature. No additional components are present. The foundation is in good condition.

Feature 5 is a concrete pedestal foundation measuring 1. 52 m in length, 1. 52 m in width, and 0. 84 m in height (Photo 8). The posthole, which retains the base of the creosoted pole, measures approximately 0. 4 m in diameter. A small diameter metal pipe projecting from the north side of the pedestal may have functioned as conduit for electrical wire. No additional components are present. The foundation is in good condition.

Feature 6 is a concrete pedestal foundation measuring 1. 52 m in length, 1. 52 m in width, and 0. 95 m in height (Photo 9). The posthole measures 0. 3 m in diameter and is filled with a mixture of tar/creosote and gravel. Along the east side of the upper surface is a rectangular impression measuring 0. 72 m in length and 0. 26 m in width. The metal support structure that was attached to the pedestal at this point has fallen along the east side of the feature. The support consists of a steel plate approximately 0. 7 m in length and 0. 3 m in width with two parallel steel bars projecting from either end, each approximately 2. 0 m in height. A concrete block measuring 0. 63 m in length, 0. 47 m in width, and 0. 46 m in thickness is constrained by the two rails towards the base of the support, acting as a counterweight to stabilize the support structure. The foundation is in good condition.

Feature 8 is a concrete pedestal foundation measuring J . 52 m in length, 1. 52 m in width, and approximately 0. 1 m in height (Photo 10). The posthole measures approximately 0. 4 m in diameter and is filled with a mixture of tar/creosote and gravel. A second, smaller concrete block measuring 0. 8 m in length. 0. 7 m in width, and 0. 25 m in height is adjacent to the posthole to provide additional support for the pole. The pole and associated cables are present to the east of the feature. No additional components are present. The foundation is in good condition. At least two welded steel jackets for creosoted poles were noted in the surrounding area.

Feature 9 is a concrete pedestal foundation measuring 1. 52 m in length, 1. 52 m in width, and 0. 9 m in height (Photo 11). The posthole measures 0. 28 m in diameter and is filled with a mixture of tar/creosote and gravel. Along the east side of the upper surface is a rectangular impression measuring 0. 72 m in length and 0. 26 m in width. Bolt attachments along the edges of the impression would have secured a metal support structure presumably to

stabilize the creosoted pole located in the central posthole. A small-diameter metal pipe projects from the north side of the pedestal that possibly functioned as conduit for electrical wire. The foundation is in good condition.

Feature 11 is a concrete pedestal foundation measuring 1. 52 m in length, 1. 52 m in width, and 0. 95 m in height (Photo 12). The posthole measures 0. 3 m in diameter and is filled with a mixture of tar/creosote and gravel. Along the east side of the upper surface is an intact, upright metal support structure, which is identical to the structure documented at Feature 6. The support consists of a steel plate measuring approximately 0. 7 m in length and 0. 3 m in width with two parallel steel bars projecting from either end approximately 2. 0 m in height. A concrete block measuring 0. 63 m in length, 0. 47 m in width, and 0. 46 m in thickness is secured between the two rails towards the base of the support, acting as a counterweight to stabilize the support structure. The foundation is in good condition.

Feature 12 is a concrete pedestal foundation measuring 1. 52 m in length, 1. 52 m in width, and approximately 0. 25 m in height (Photo 13). The posthole measures 0. 3 m in diameter and is filled with a mixture of tar/creosote and gravel. A remnant of the creosoted post and associated cables are present on the surrounding ground surface. The foundation is in good condition.

Feature 13 is a concrete pedestal foundation measuring 1. 52 m in length, 1. 52 m in width, and approximately 0. 1 m in height (Photo 14). The upper surface of the pedestal is convex and a central posthole is present measuring approximately 0. 4 m in diameter. The posthole is filled with a mixture of tar/creosote and gravel. A second. smaller concrete block measuring 0. 8 m in length, 0. 7 m in width, and 0. 25 m in height is adjacent to the posthole to provide additional support for the pole. No additional components are present. The foundation is in good condition.

Feature 15 is a concrete pedestal foundation measuring 1. 52 m in length, 1. 52 m in width, and 0. 95 m in height (Photo 15). The posthole measures 0. 3 m in diameter and is filled with a mixture of tar/creosote and gravel. Along the east side of the upper surface is a rectangular impression measuring 0. 72 m in length and 0. 26 m in width. The metal support structure that was formerly attached to the pedestal at this point is fallen along the east side of the feature. The support consists of a steel plate measuring approximately 0. 7 m in length and 0. 3 m in width with two parallel steel bars projecting from either end approximately 2. 0 m in height. A concrete block measuring 0. 63 m in length, 0. 47 m in width, and 0. 46 m in thickness is secured between the two rails towards the base of the support. acting as a counterweight to stabilize the support structure. The remnant of the creosoted pole and steel jacket is located approximately 10. 0 m to the east of the pedestal. The foundation is in good condition.

Feature 16 is a concrete pedestal foundation measuring 1. 52 m in length. 1. 52 m in width. and approximately 0. 1 m in height (Photo 16). The posthole measures 0. 3 m in diameter and is filled with a mixture of tar/creosote and gravel. The foundation is in good condition.

Feature 17 is a concrete pad and upright metal support structure. The concrete pad measures 1. 2 m in length, 1. 2 m in width, and is set at the surrounding grade (Photo 17). The metal support structure is identical to the components recorded at Features 6, 11, and 15. The support consists of a steel plate measuring 0. 66 m in length and 0. 25 m in width with two parallel steel bars projecting from either end 2. 57 m in height. A concrete block measuring approximately 0. 6 m in length, 0. 5 m in width, and 0. 5 m in thickness is secured between the two rails towards the base of the support, acting as a counterweight to stabilize the support structure. The feature is in good condition.

Feature 18 is a concrete pedestal foundation measuring 1. 52 m in length. 1. 52 m in width, and approximately 0. 45 m in height (Photo 18). The posthole measures 0. 32 m in diameter and is filled with a mixture of tar/creosote and gravel. No additional components are present. The remnant of the creosoted pole and its steel jacket lie on the ground several meters 10 the east. The foundation is in good condition.

Feature 21 is a concrete pedestal foundation measuring 1. 52 m in length. 1. 52 m in width, and 0. 2 m in height. The posthole measures 0. 3 m in diameter and is filled with a mixture of tar/creosote and gravel. No additional components are present. The foundation is in good condition.

NEWLY IDENTIFIED FEATURES ABSORBED INTO STATE SITE 50-80-07-7081

During the current Archaeological Inventory Survey, Feature 22, a pedestalled concrete foundation measuring 1. 52 x 1. 52 x 0. 64 m high, was newly identified. The long axis extends along north/south axis (0/180°, Magnetic) (Figures 13 and 14). The foundation is square-shaped in plan view, but appears to be trapezoidal on the surface. A hole, measuring 0. 38 m in diameter x 0. 12 m deep, is located in the center of the trapezoidal surface and contained a mixture of tar/creosote and a few pieces of basalt gravel. The south profile of the feature displays five horizontal wooden form lines and a steel pipe, measuring 4. 0 cm in diameter, protruding towards the south. The top of the pipe is approximately 0. 33 m below the top of the feature, on the south side. The foundation is in good condition and appears to be unaltered. Based on feature type and proximity, Feature 22 was incorporated into State Site 50-80-07-7081.

Feature 23 was newly identified during the current Archaeological Inventory Survey. Feature 23 consisted of a pedestalled concrete foundation measuring 1. 22 x 1. 22 x 0. 07 m high.

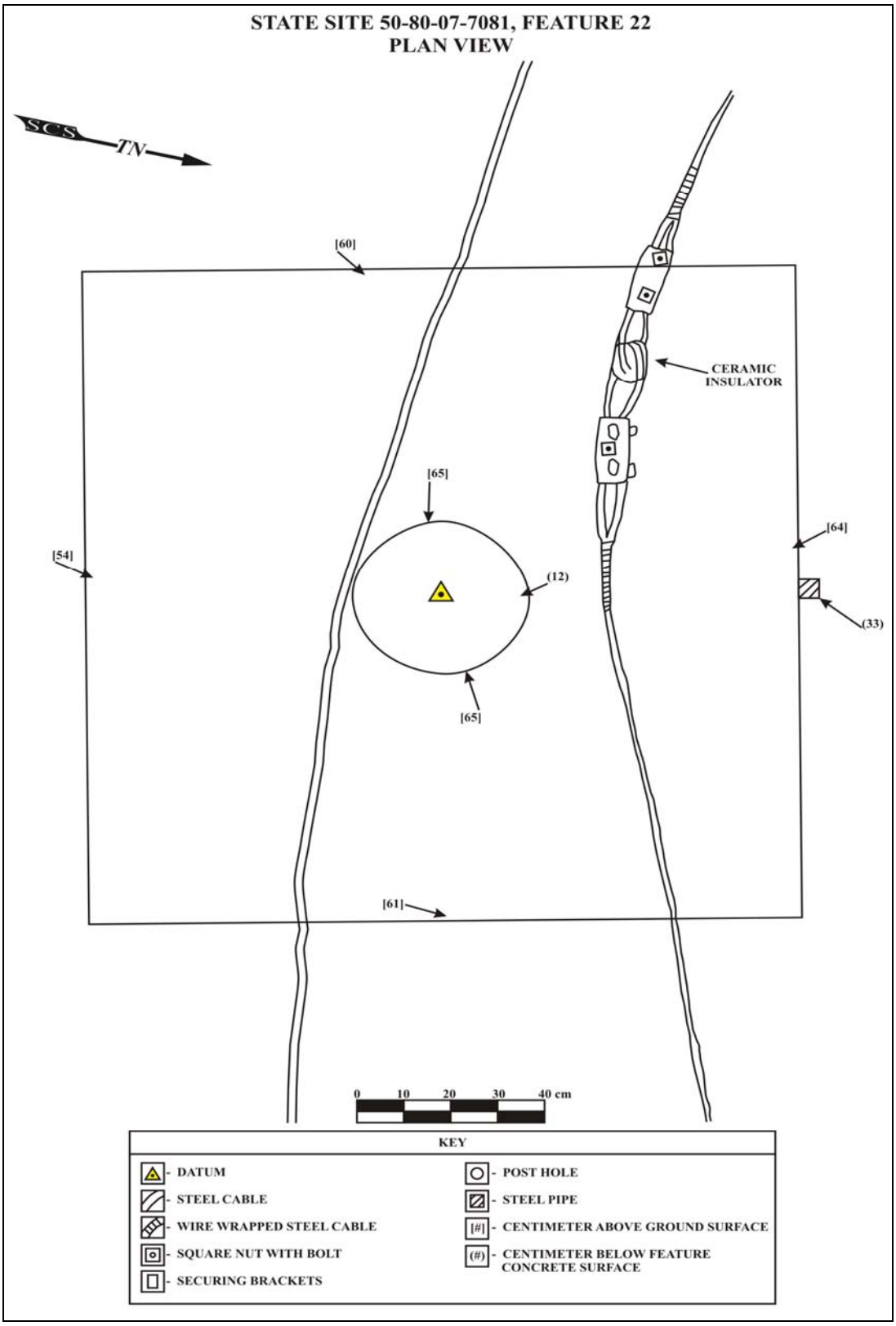

Figure 13: Plan View Drawing of State Site 50-80-07-7081, Feature 22. Representative Example of Feature Type.

Figure 14: Photographic View of State Site 50-80-07-7081, Feature 22. View To Northwest.

The long axis extends along a north/south axis (027/207°, Magnetic). The foundation is square-shaped in plan view and is comprised of two tiers(Figures 15 and 16). Tier 1 is the concrete foundation. Tier 2 is the four metal braces belted in the center of tier 1 and is interpreted as being a support for an approximately 25 cm squared square post. The foundation is in good condition and appears to be unaltered. Based on feature type and proximity, Feature 23 was incorporated into State Site 50-80-07-7081.

Feature 24 was newly identified during the current Archaeological Inventory Survey. Feature 24 consisted of a surface artifact scatter comprised of historic material (Figures 17 and 18). The surface scatter measured 11. 5 m long by 7. 5 m wide and was oriented along a north/south axis (25/205°). Surface artifacts noted, but not collected, included; glass bottle sherds; copper wire; glass light bulb sherds; various dinnerware ceramic sherds; one metal thermometer; one 4-prong electrical plug; flat window glass sherds; one aluminum pull-tab; one severely rusted steel can. Historic surface artifacts collected included: porcelain bowl base and body sherds; porcelain rim/base and rim sherds; amber glass bottle sherd; glass jar base sherds; whiteware cup rim/base sherds; whiteware bowl rim/base sherd; whiteware base sherds; milk glass jar base sherd; porcelain bowl rim/base sherd; porcelain plate rim/base sherd; glass jar; stainless steel tablespoon; porcelain bowl; glass bottle; and a silver spoon (see Appendices A and B). Manufacture dates for the collected Historic artifacts range from 1907-1933; 1920-1964; 1929-1954; 1939-1957; and 1954 (see Appendices A and B). Feature 24 is in poor condition. Based on proximity, Feature 24 was incorporated into State Site 50-80-07-7081.

All of the features comprising State Site 50-80-07-7081a, including the three newly identified features, were evaluated for significance under HAR §13-275-6 and found to be significant under Criteria A, associated with historic events or activities, and Criteria D, for information content.

The GPS coordinates obtained during the current survey for State Site 50-80-07-7081, Features 1-6, 8, 9, 11-13, 15-18, and 21-23 are presented in Table 1, below.

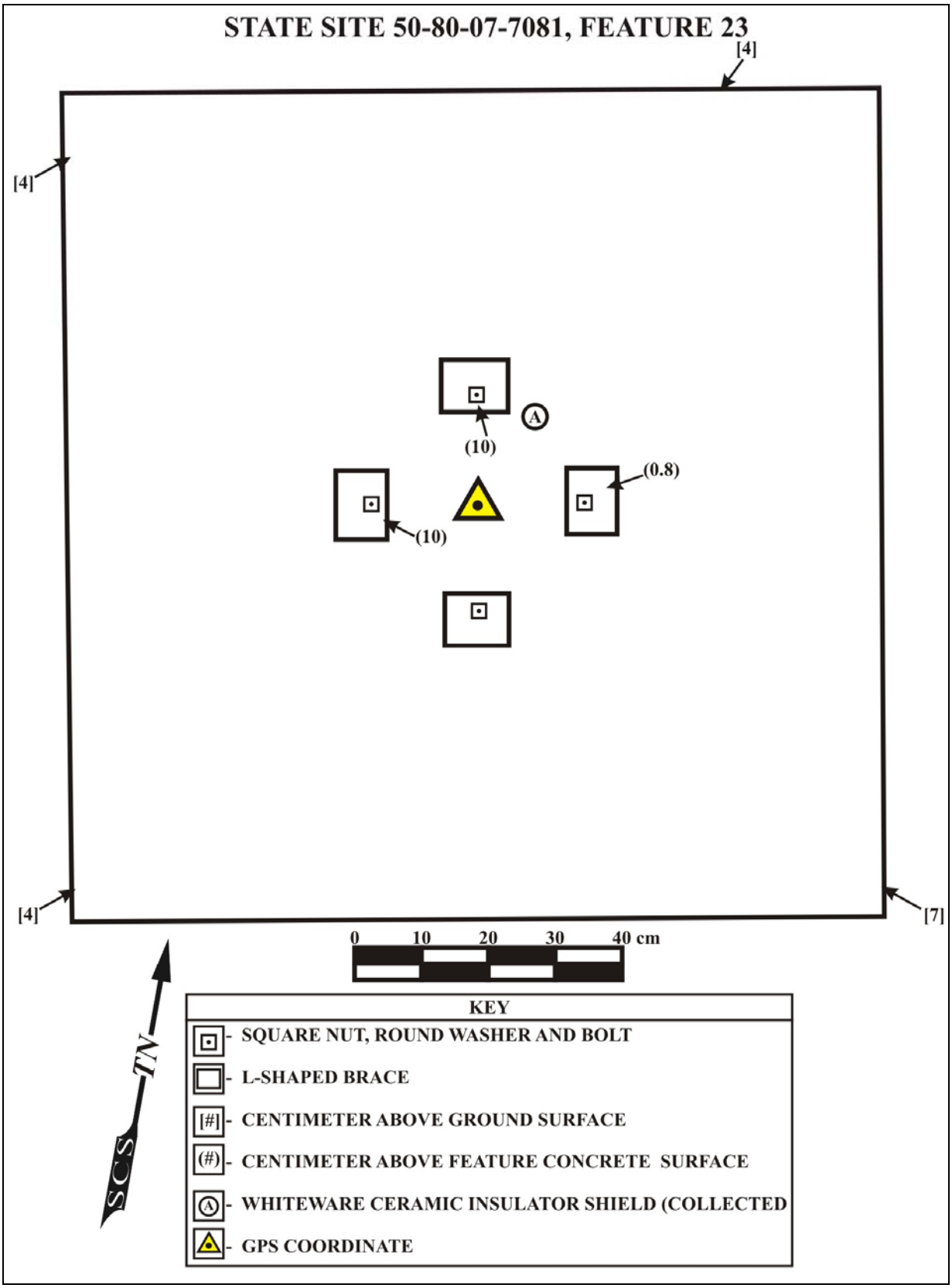

Figure 15: Plan View Drawing of State Site 50-80-07-7081, Feature 23.

Figure 16: Photographic View of State Site 50-80-07-7081, Feature 23. View to Northeast.

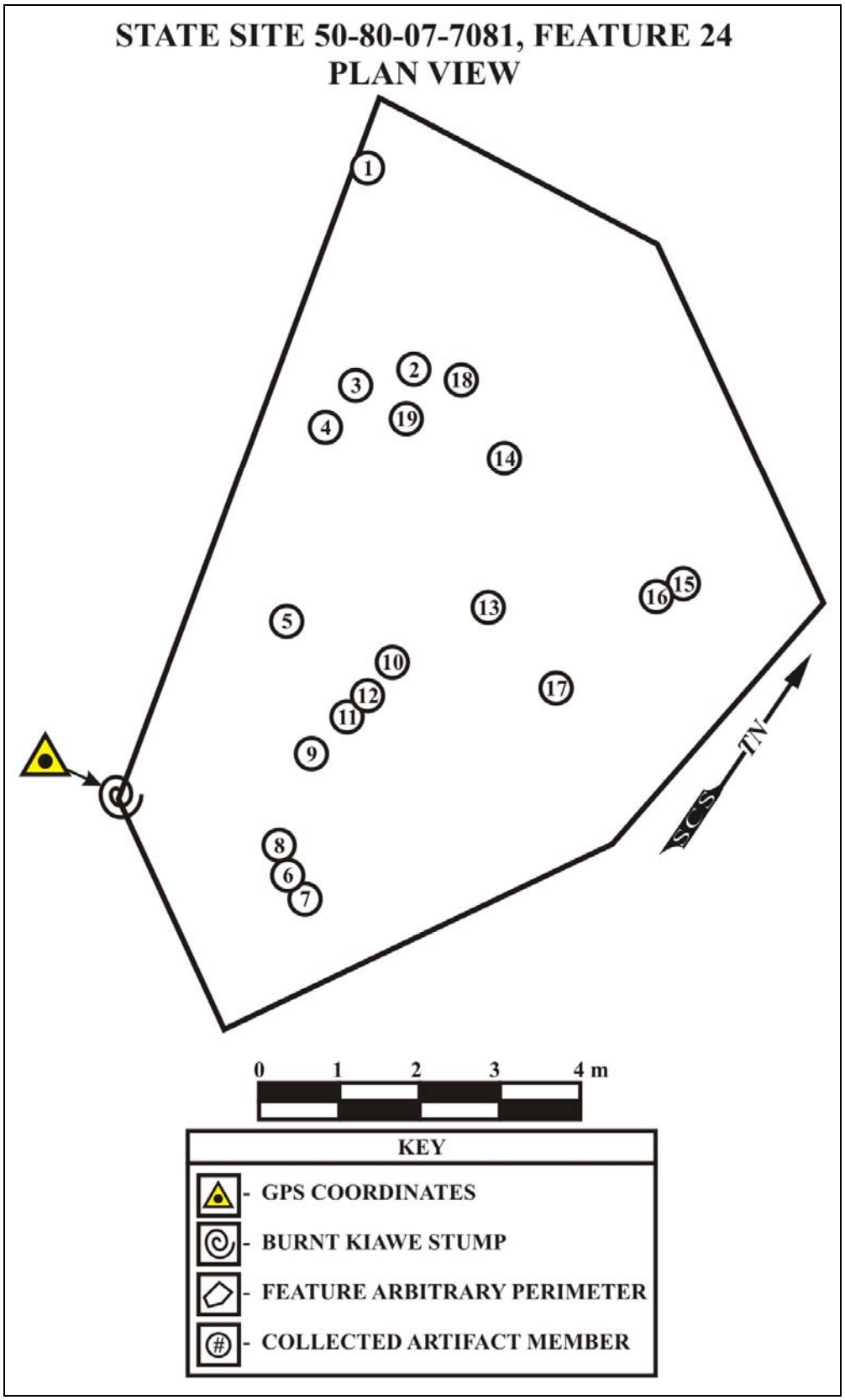

Figure 17: Plan View Drawing of State Site 50-80-07-7081, Feature 24.

Figure 18: Photographic View of State Site 50-80-07-7081, Feature 24. View to Southwest.

Table 1: State Site 50-80-07-7081 GPS Coordinates

Feature No.	Easting	Northing	Accuracy
1	585974	2368345	±2 m
2	586103	2368329	±2 m
3	585954	2368263	±2 m
4	586190	2368226	±2 m
5	586059	2368244	±2 m
6	585937	2368184	±2 m
8	586075	2368116	±2 m
9	585904	2368079	±2 m
11	585869	2368019	±2 m
12	585973	2368041	±2 m
13	586055	2368062	±2 m
15	585836	2367938	±2 m
16	585954	2367880	±2 m
17	585866	2367745	±2 m
18	585987	2368125	±2 m
21	585983	2368097	±2 m
22	585961	2367968	±2 m
23	585884	2367826	±2 m
24	586112	2368389	±2 m

STATE SITE 50-80-07-7082 (VOICE OF AMERICA RADIO TRANSMITTER BUILDING AND ANCILLARY FEATURE)

State Site 50-80-08-7082 was previously identified by Reith (2009) during an Archaeological Inventory Survey. State Site 50-80-08-7082 is comprised of an unspecified number features associated with the VOA transmitter buildings and ancillary features which are discussed below. As described by Rieth (2009: 28-32), State Site 50-80-08-7082 consisted of:

> Site 50-80-08-7082 includes four features (Features 7, 14, 19, and 20) relating to the VOA transmitter buildings and ancillary features. Three of the features (Features 14, 19, and 20) including the remnants of the transmitter buildings are located along the center point of the eastern boundary of the parcel. The remaining feature (Feature 7) consists of the concrete postholes for a series of fence lines that traversed the property.
>
> Feature 7 includes multiple square concrete posthole structures that are distributed across the project area (Photo 19). One of these postholes retains the base or a wooden 7-inch by 7-inch (0. 18 m by 0. 18 m) post. Heavy vegetation in most of the parcel1ikely obscures numerous additional postholes. As the remnant of a fence line(s) support system the feature is in poor

condition. [Note: Feature was relocated during the current (SCS) survey and recorded as SCS TS-7].

Feature 14 is a concrete pad measuring 3. 1 m in length, 1. 2 m in width, and 0. 2 m in height (Photo 20). Three metal posts project from the center of the pad, spaced approximately 0. 6 m apart. The posts are secured with a coarse concrete that postdates construction of the underlying slab. Feature 14 is located along the west side or the transmitter building complex and appears to relate to these structures (Features 19 and 20). The feature is in good condition.

Feature 19 is the remnant of a cement block structure measuring 6. 7 m in length, 3. 05 m in width, and at least 1. 78 m in height (Photo 21). The structure has a poured concrete slab foundation with cement block exterior and interior walls. Most of these walls have been demolished to their base course of blocks. The structure is partitioned into two rooms. with the south room measuring 3. 48 m in length and 2. 85 m in width and the north room measuring 2. 85 m in length and 2. 6 m in width. The feature is located approximately 10. 0 m northeast of Feature 20. the remnant of the main transmitter building. The feature is in poor condition.

Feature 20. the remnant of the main transmitter building. is approximately 32. 0 m in length and 10. 0–15. 0 m in width (Photo 22). The superstructure has been demolished, but the concrete slab foundation is mostly intact. A large channel or conduit is in the slab presumably to hold electrical wires for the antenna array. The building's walls were constructed with reinforced cement blocks capped with reinforced concrete bondbeams. An asphalt road and a concrete curb separate Features 19 and 20 and provided access to these structures. The feature is in poor condition.

As stated elsewhere in this report, Features 14, 19, and 20, of State Site 50-80-07-7082, were located in the exclusion area; outside of the current project area boundary. Thus, State Site 50-80-07-7082, Features 14, 19, and 20 were not re-located during the current survey. Feature 7, consisted of ". . . multiple square concrete posthole structures that are distributed across the project area" (Rieth 2009:29). During the current survey, SCS re-located seven, only one of which (State Site 50-80-07-7082, Feature 7) can be confirmed as previously identified by Rieth (2009:29) (see above feature description). Rieth (2009) did not assign individual feature numbers to the fencepost structures or document each feature. Rather, Rieth (2009: 29) grouped all of the fencepost features into State Site 50-80-07-7082, Feature 7. Thus, it cannot be stated with certainty that the features recorded by SCS were re-located, as some may be newly identified. Accordingly, the features are referred to by SCS field designations (TS-8, TS-10, TS-11, TS-13 through TS-15). The re-located fencepost features are discussed below.

Feature SCS TS-8 consisted of a square concrete posthole structure 1. 25 m by 1. 25 m in diameter by 4 cm high. A square posthole (20 x 20 x 75 cm deep) was located in the center of the concrete structure. A charred wooden post, measuring 2. 16 m long by 0. 19m thick, was located immediately adjacent to the concrete structure. In addition, a steel cable was wrapped around the wooden post (Figures 19 and 20). This feature was in poor condition.

Feature SCS TS-10 consisted of a square concrete posthole structure 1. 23 m by 1. 23 m in diameter by 2 cm high. A square posthole (20 x 20 x 80 cm deep) was located in the center of the concrete structure (Figures 21 and 22). This feature was in poor condition.

Feature SCS TS-11 consisted of a square concrete posthole structure 1. 2 m by 1. 2 m in diameter by 3 cm high. A square posthole (20 x 20 x 48 cm deep) was located in the center of the concrete structure (Figures 23 and 24). This feature was in poor condition.

Feature SCS TS-13 consisted of a square concrete posthole structure 1. 2 m by 1. 1 m in diameter by 3 cm high. A square posthole (20 x 20 x 45 cm deep) was located in the center of the concrete structure. In addition, one piece of metal wire was located on top of the concrete foundation (Figures 25 and 26). This feature was in poor condition.

Feature SCS TS-14 consisted of a square concrete posthole structure 1. 3 m by 1. 24 m in diameter by 2 cm high. A square posthole (20 x 20 x 74 cm deep) was located in the center of the concrete structure. In addition, one piece of charred milled wood was located on top of the concrete foundation (Figures 27 and 28). This feature was in poor condition.

Feature SCS TS-15 consisted of a square concrete posthole structure 0. 88 m by 0. 84 m in diameter by 1 cm high. A square posthole (20 x 20 x 86 cm deep) was located in the center of the concrete structure (Figures 29 and 30). This feature was in poor condition.

State Site 50-80-07-7082, Feature 7, was re-evaluated for significance under HAR §13-275-6 and found to be significant under Criteria A, associated with historic events or activities, and Criteria D, for information content.

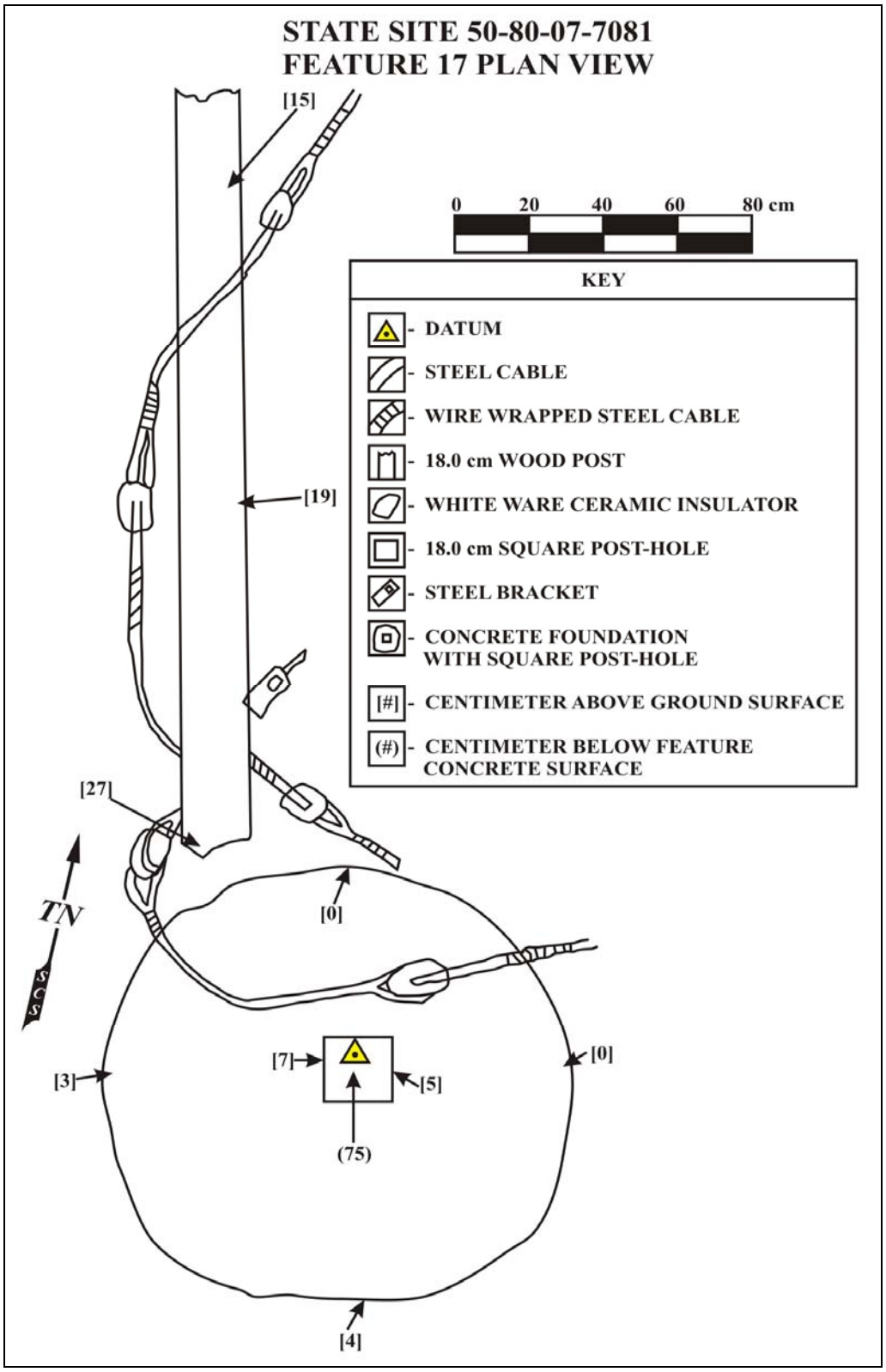

Figure 19: Plan View Drawing of State Site 50-80-07-7082 (TS-8). Representative Example of Feature Type.

Figure 20: Photographic View of State Site 50-80-07-7082 (TS-8). View to North.

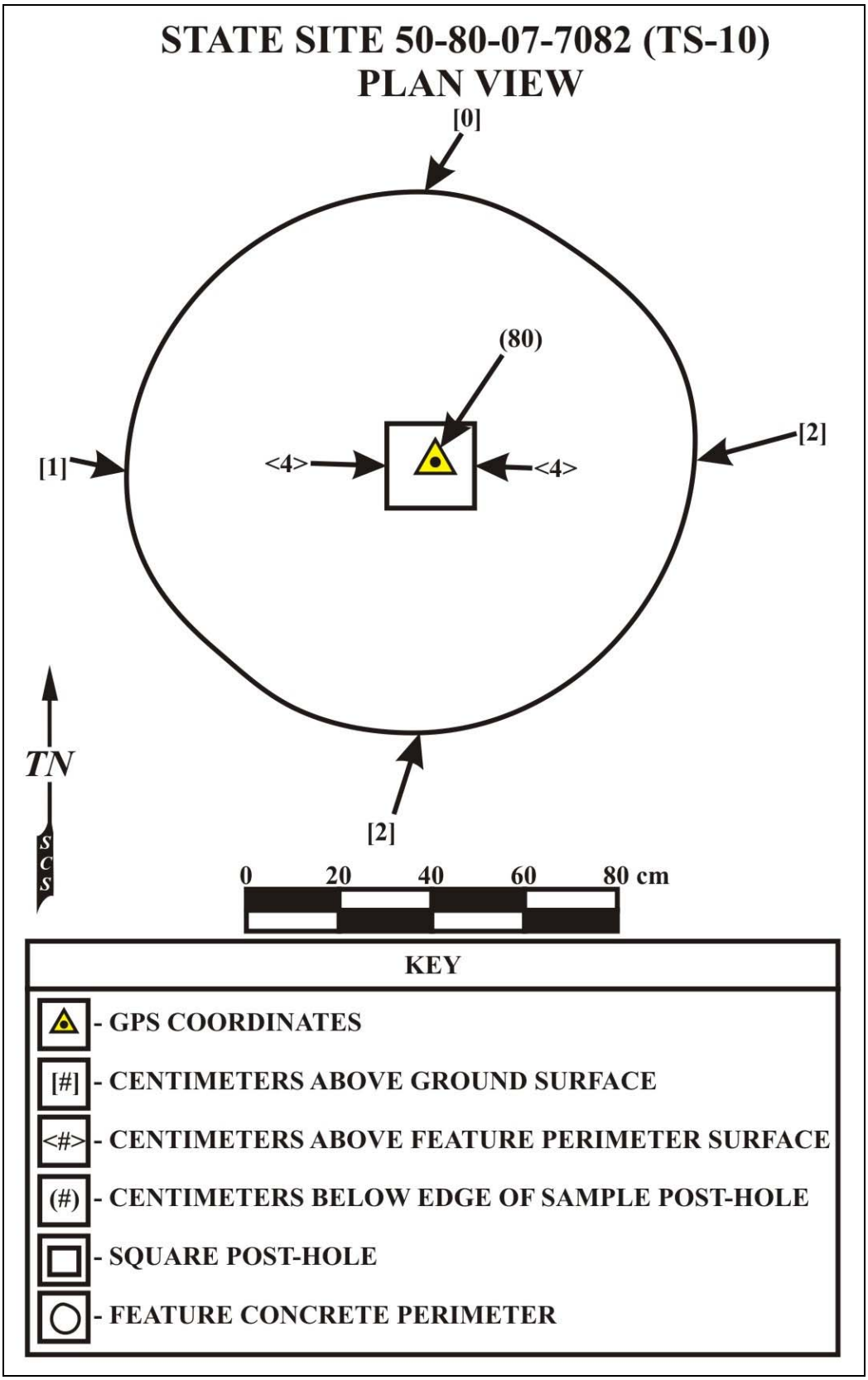

Figure 21: Plan View Drawing of State Site 50-80-07-7082 (TS-10).

Figure 22: Photographic View of State Site 50-80-07-7082 (TS-10). View to Northwest.

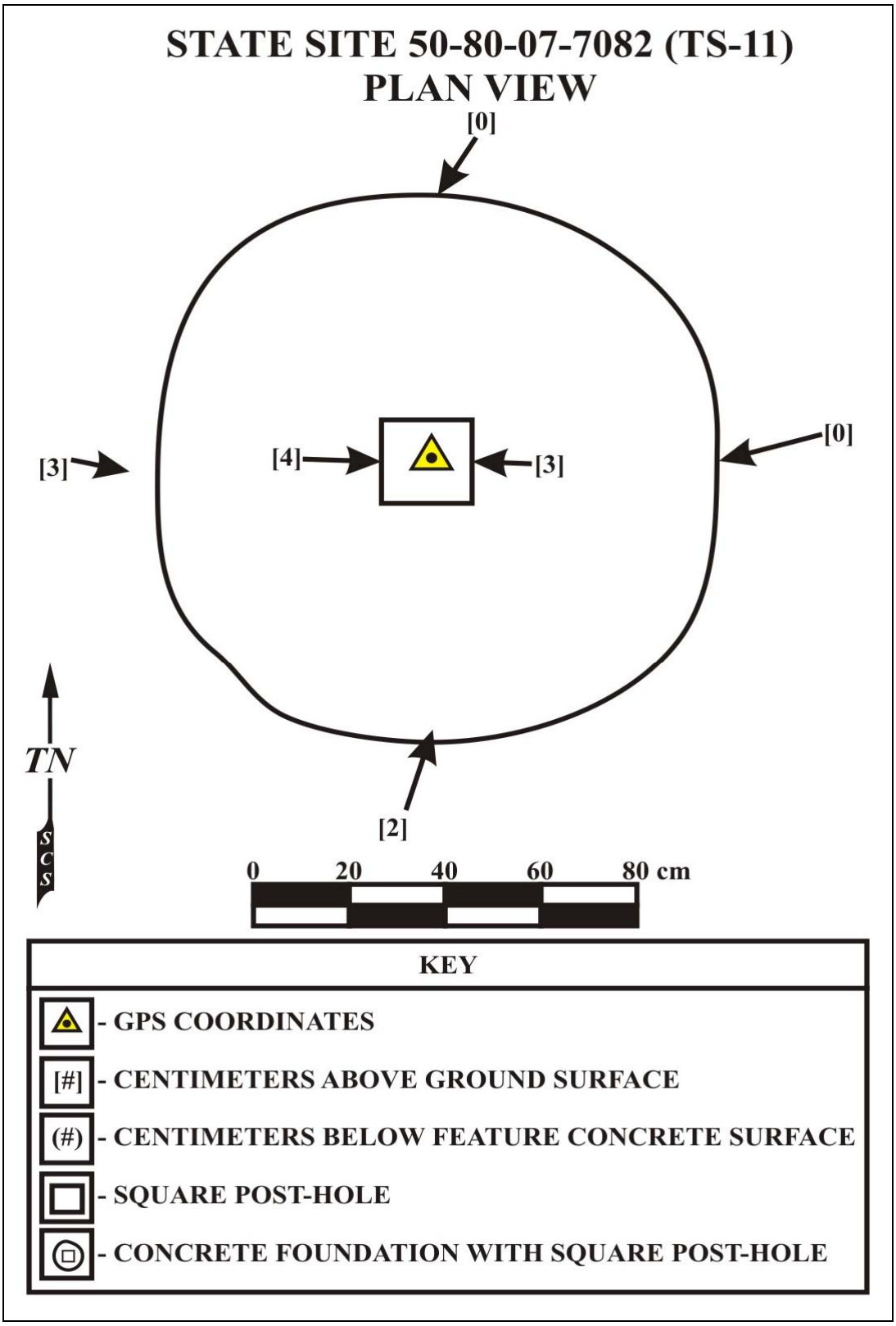

Figure 23: Plan View Drawing of State Site 50-80-07-7082 (TS-11).

Figure 24: Photographic View of State Site 50-80-07-7082 (TS-11). View to Southeast.

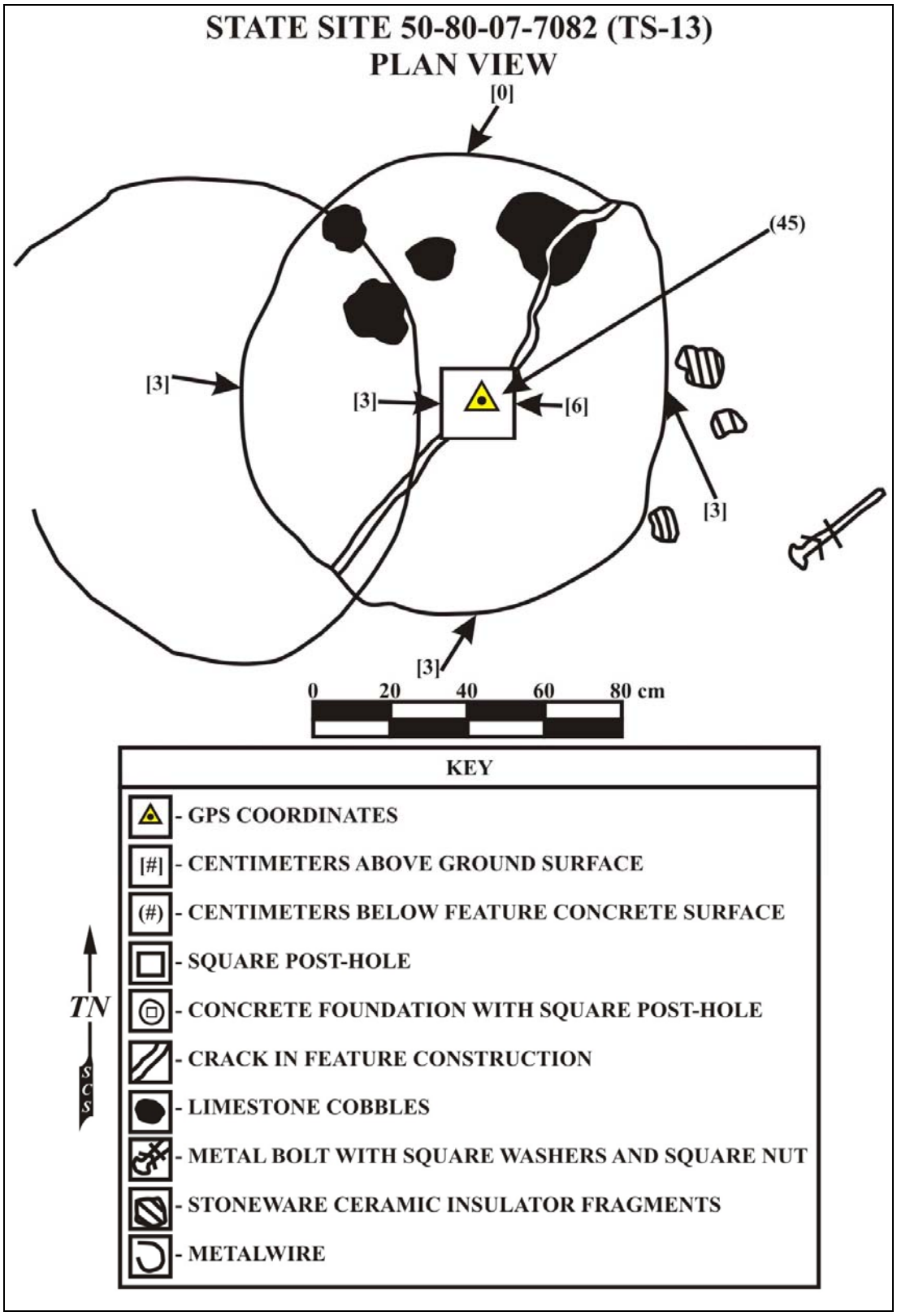

Figure 25: Plan View Drawing of State Site 50-80-07-7082 (TS-13).

Figure 26: Photographic View of State Site 50-80-07-7082 (TS-13). View to Southwest.

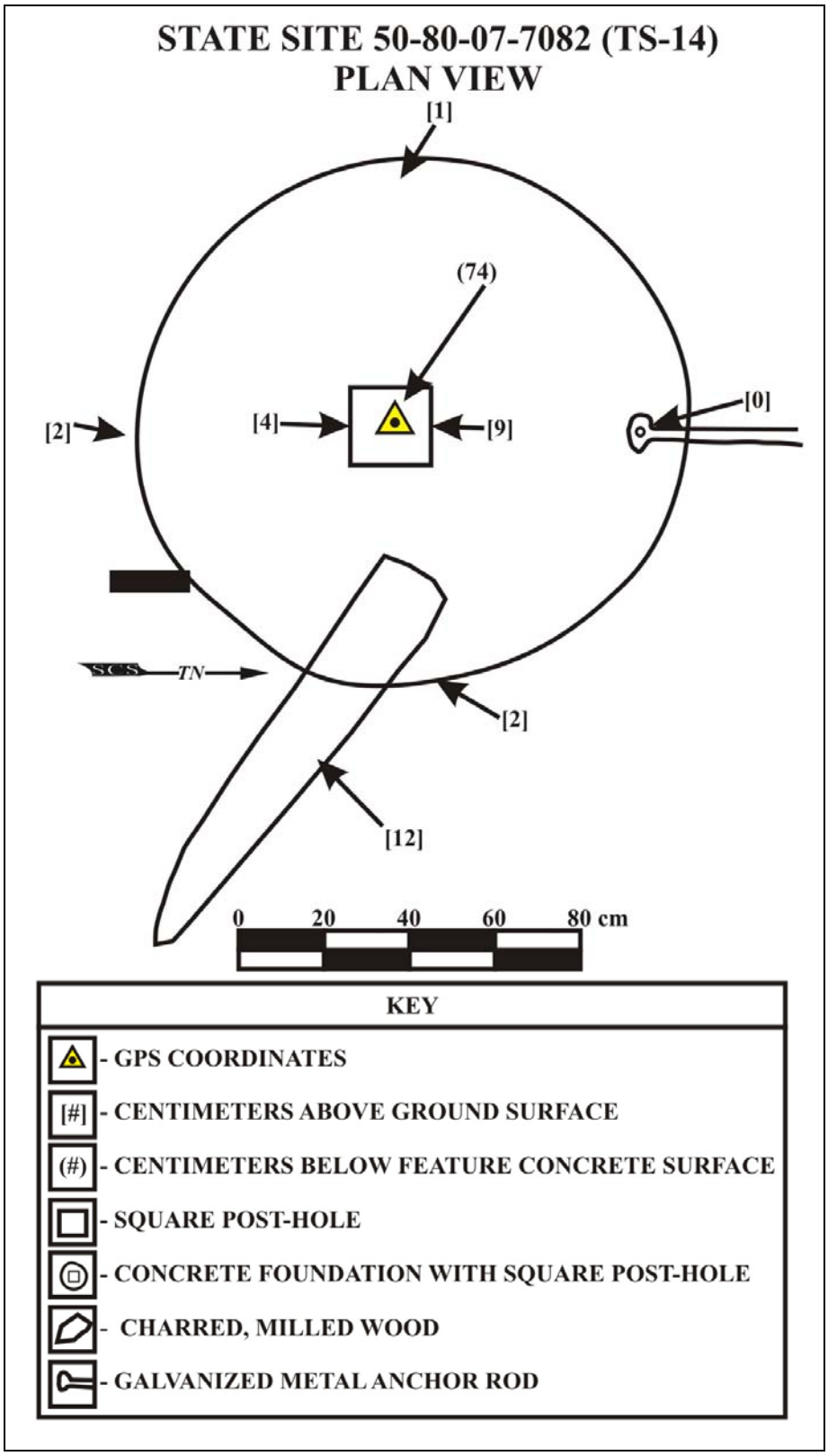

Figure 27: Plan View Drawing of State Site 50-80-07-7082 (TS-14).

Figure 28: Photographic View of State Site 50-80-07-7082 (TS-14). View to Northwest.

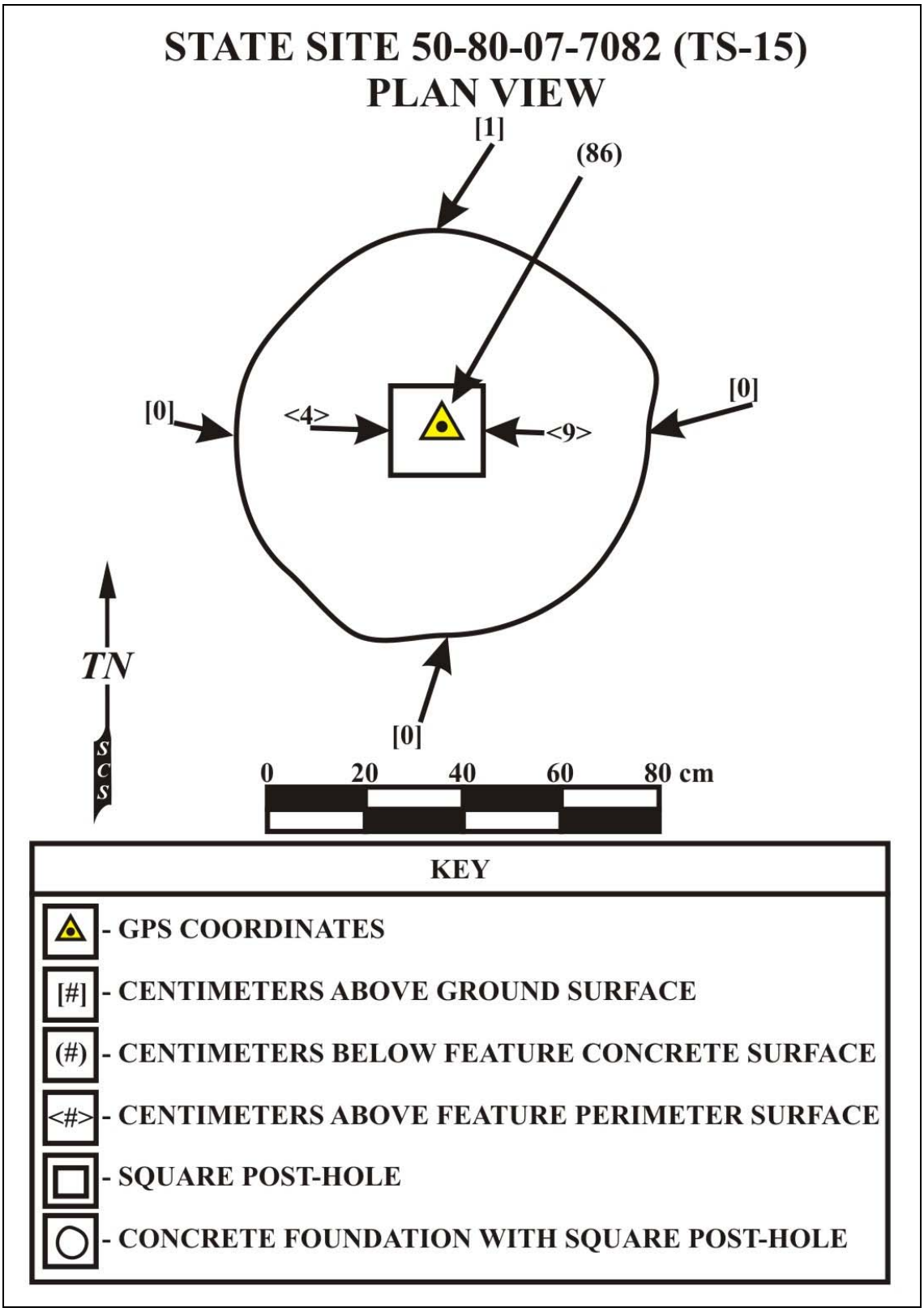

Figure 29: Plan View Drawing of State Site 50-80-07-7082 (TS-15).

Figure 30: Photographic View of State Site 50-80-07-7082 (TS-15). View to Northwest.

The GPS coordinates obtained during the current survey for the seven fencepost features incorporated into State Site 50-80-07-7082 are presented in Table 2, below.

Table 2: State Site 50-80-07-7082 GPS Coordinates

Feature Designation	Easting	Northing	Accuracy
State Site 50-80-07-7082, Feature 7 (Reith 2009)	585963	2368174	±3
SCS TS-8	585992	2368003	±2
SCS TS-10	585901	2368016	±2
SCS TS-11	586108	2368056	±2
SCS TS-13	586075	2368280	±2
SCS TS-14	586071	2367994	±2
SCS TS-15	585937	2368130	±2

STATE SITE 50-80-07-7083 (WAIANAE SUGAR COMPANY RAILROAD BED)

State Site 50-80-07-7083 was previously identified by Reith (2009) during an Archaeological Inventory Survey. As described by Rieth (2009: 32-37), State Site 50-80-07-7083:

> consists of a single feature (Feature 10) which is a remnant raised railroad bed from the Waianae Sugar Company. The sugar company began planting sugarcane in Lualualei in 1892 and continued production in the valley until 1946. An Army Corp of Engineers map dated 1909-1913 shows the current project area planted in sugarcane (Fig. 4). Interestingly, three features approximately correspond with the recorded railroad bed, although all of the features are more than 100 m northeast of Feature 10 when georeferenced. One of the features is labeled as a railroad segment, yet this feature is furthest from the location of Feature 10. The second linear feature is unlabeled on the map and appears to be either a transportation feature or boundary wall. The feature that most closely approximates the location of Feature 10 appears to be an unimproved road. Admittedly these are ambiguous results, yet considering the vast degree of difference between the accuracy and precision of early 20th century maps and recordation using a GPS it is likely that Feature 10 is the railroad segment denoted on the Corps of Engineers map.
>
> Feature 10 includes three segments of an originally continuous railroad bed (Photos 23-25; Fig. 5). The railroad had been destroyed in places during construction of the VOA station, producing 40. 0-85. 0 m wide gaps between the three remaining segments of the railroad bed. The feature segments are constructed with dry laid angular and tabular basalt and coral boulders and cobbles. The exterior edges have a slight batter angle. Basalt boulders are often present as the lower courses. with the majority of the railroad bed constructed

with limestone boulders and slabs. Intact edges retain up to nine courses of stone. The interior fill of the feature is primarily limestone boulders and cobbles. The upper surfaces vary between the segments: the western segment is paved with limestone slabs and exhibits a slightly concave surface; the central segment lacks the formal paving but exhibits a concave surface: and the eastern segment has a relatively even surface partially paved with small cobbles and pebbles. The western segment measures 48. 0 m in length, 4. 9 m in width, and 0. 7 - 5 m in height. The central segment measures 17. 0 m in length, 4. 7 m in width, and 0. 9-1. 2 m in height. The eastern segment measures 52. 0 m in length, 5. 4 m in width, and 1. 4-2. 0 m in height.

State Site 50-80-08-7083 was re-located during the current survey and found to be in the same condition as described by Rieth (2009) (Figure 31). However, the current survey found State Site 50-80-08-7083 extended beyond the boundaries of the current survey and into the exclusion zone. Thus, the portion of the feature extends into the exclusion zone was not evaluated. Global Positioning System coordinates were obtained during the current survey from the southeast end of the railroad bed just before it enters into the Coast Guard 4. 8 acre perimeter (E586128/N2368136).

The current survey found no evidence to support Reith's (2009) interpretation of State Site 50-80-07-7083 as a raised rail roadbed. Supporting evidence of the functional interpretation of this feature as a raised railroad would include metal rails (whole or remnant), wooden slats (whole or remnant), and metal stakes. In addition, the current study did not find the raised railroad bed structurally able to support locomotives. Thus, of State Site 50-80-07-7083 was re-interpreted as a possible cart path associated with the Waianae Sugar Company.

State Site 50-80-07-7083 was re-evaluated for significance under HAR §13-275-6 and found to be significant under Criteria A, associated with historic events or activities, Criteria C, an excellent example of a feature type, and Criteria D, for information content. Thus, preservation is recommended for this site, either in its entirety or segment(s).

TESTING RESULTS

Limited subsurface testing was conducted during the current Archaeological Inventory Survey in order to identify human alteration, archaeological features, and associated artifacts in subsurface contexts. For the purpose of addressing these issues, four stratigraphic trenches (ST-1 through ST-4) were manually excavated during the current survey. All excavations produced negative results. A description of each Stratigraphic Trench is presented below.

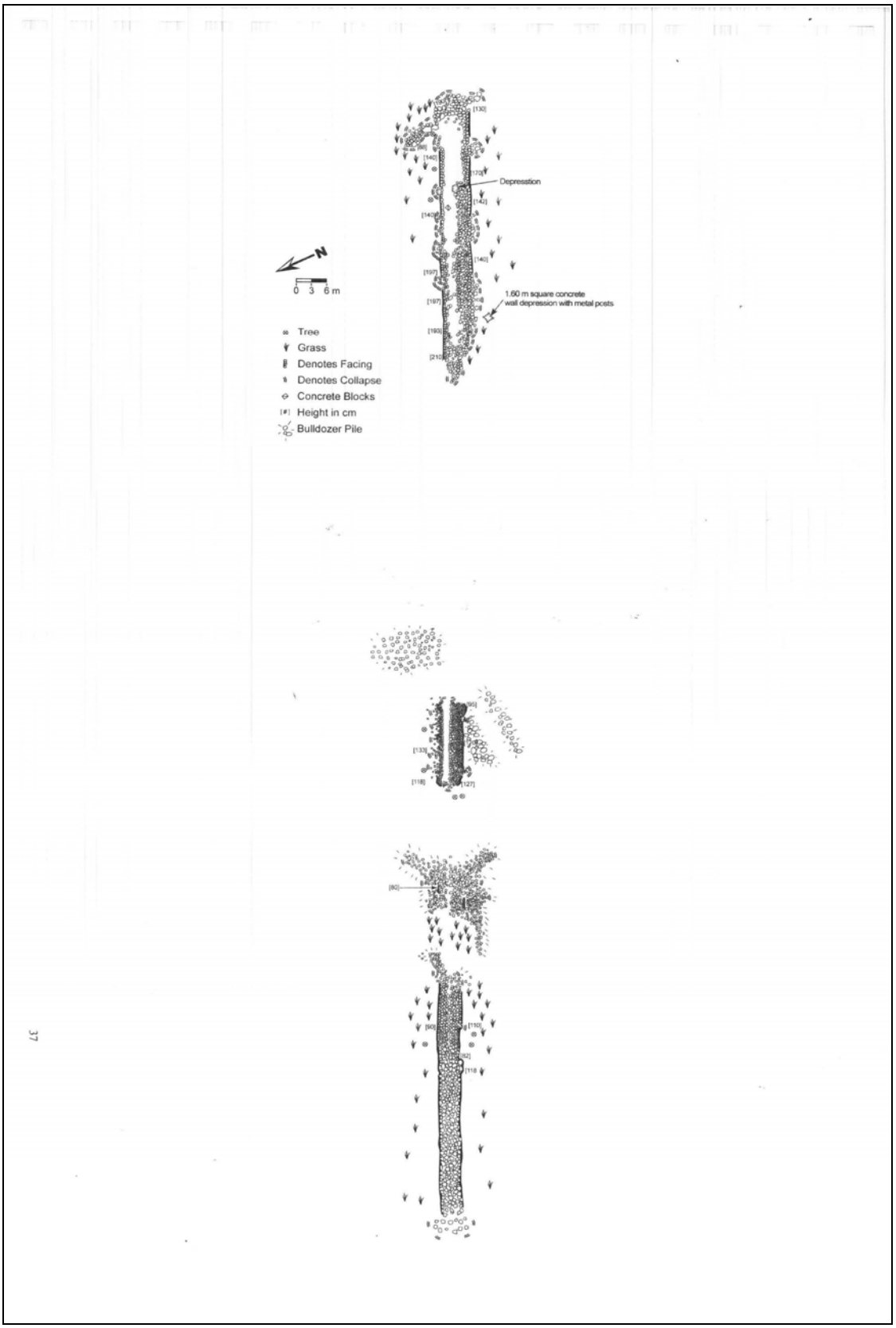

Figure 31: Plan View Drawing of State Site 50-80-07-7083 (Reith 2009:37, Figure 5).

STRATIGRAPHIC TRENCH 1 (ST-1)

Stratigraphic Trench 1 (ST-1) measured 1. 5 by 0. 5 by 0. 67 m deep and was oriented along a north/south axis (87/267°, Magnetic). Stratigraphic Trench 1 was placed in a grassy area located approximately 4. 0 m north of an informal dirt road which was extended in a northwest/southeast direction. The GPS coordinates of ST-1 are E585895/N2367787 with an accuracy of ± 3. 0 m (see Figure 6). Prior to excavation, the surface of ST-1 was relatively level and exhibited evidence of a recent wildfire in the form of dead grass and charcoal. A few pieces of limestone pebbles were observed on the ground surface of ST-1. Stratigraphic Trench 1 contained three stratigraphic culturally sterile layers which are described below (Figures 32 and 33).

> Layer I (0-18 cmbs) consisted of semi-compact, very dark grayish brown (10YR 3/2, dry) loamy silt with grass roots (some charred due to the recent wildfire), a few limestone pebbles and cobbles, and a few basalt cobbles. A few charcoal flecks associated with a recent wildfire were observed. A modern, melted aluminum can and a pulltab were the only cultural materials encountered. Based on the presence of angular basalt cobbles, Layer I was interpreted as an imported fill layer which had been added over Layer II for stabilization purposes.
>
> Layer II (18-50 cmbs) consisted of compact, mottled pink (7. 5YR 8/3, moist) calcareous sand and dark brown (7. 5YR 3/2, moist) silty clay with a few kiawe tree roots and a few limestone cobbles. A few charcoal flecks, which are likely to be associated with a recent wildfire and percolated into Layer II from Layer I, were observed. Because of the mottling of the calcareous sand and silty clay matrices, Layer II was interpreted as an imported fill deposit which had been added over Layer III for stabilization purposes. Layer II was culturally sterile.
>
> Layer III (50-63 cmbs) consisted of semi-compact greenish gray (Gley 1 6/5GY, moist) sandy gley with a few, very small diameter tree roots. No cultural materials were observed in Layer III. Thus, Layer III was interpreted as a natural stratum.

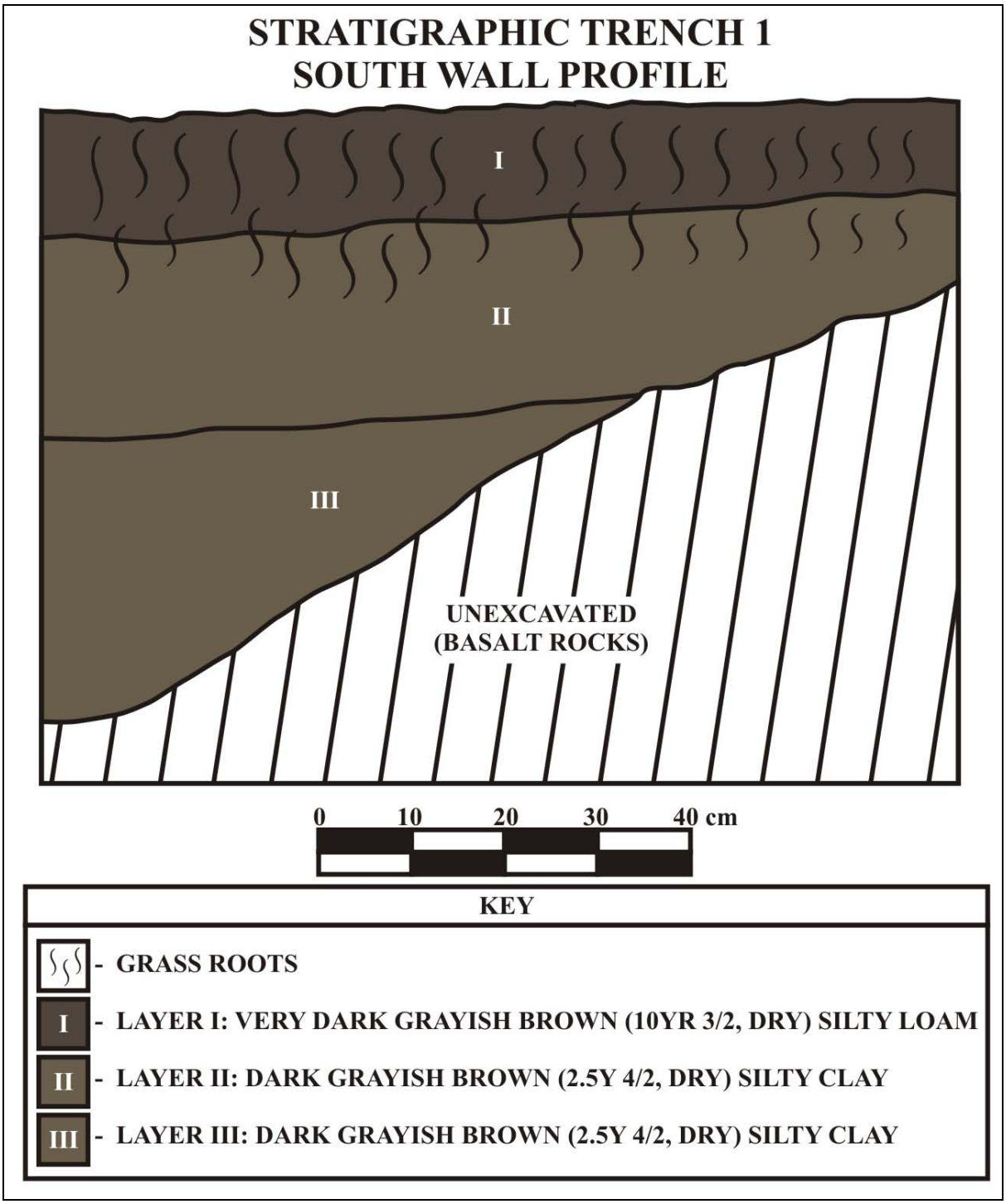

Figure 32: Stratigraphic Trench 1 South Wall Profile Drawing.

Figure 33: Photographic View of Stratigraphic Trench 1 South Wall Profile. View to Southwest.

STRATIGRAPHIC TRENCH 2 (ST-2)

Stratigraphic Trench 2 (ST-2) measured 1. 5 by 0. 5 by 0. 67 m deep and was oriented along an east/west axis (000/180°, Magnetic). Stratigraphic Trench 2 was placed in an area located approximately 5. 0 m south of an informal dirt road which was extended in a northwest/southeast direction. The GPS coordinates of ST-2 are E586027/N2367733 with an accuracy of ± 2. 0 m (see Figure 6). Prior to excavation, the surface of ST-2 was relatively level and partially covered with live and decomposing vegetation. Modern cultural material encountered in ST-2 included: angular basalt gravel, asphalt chunks, and non-diagnostic clear bottle glass sherds. Stratigraphic Trench 2 contained three stratigraphic culturally sterile layers which are described below (Figures 34 and 35).

> Layer I (0-10 cmbs) consisted of compact, dark yellowish brown (10YR 3/3, dry) loamy silt with crushed limestone and grass roots. Modern cultural materials observed in Layer I included: asphalt, non-diagnostic clear bottle glass body sherds, and angular basalt. Based on the presence of modern cultural materials, Layer I was interpreted as an imported stratum.
>
> Layer II (10-45 cmbs) consisted of compact, yellowish red (5YR 4/6, dry) clayey silt with kiawe roots and limestone pebbles. No cultural materials were identified in Layer II. The boundary between Layer II and Layer III was diffuse which suggested that Layer II was a naturally occurring stratum; possibly an alluvial deposit.
>
> Layer III (24-46 cmbs) consisted of compacted white (7. 5YR 8/1, dry) silt. Based on texture and the diffuse boundary between Layer II and Layer III, Layer III was interpreted as a naturally occurring stratum comprised of volcanic ash deposit. No cultural materials were observed in Layer III.

STRATIGRAPHIC TRENCH 3 (ST-3)

Stratigraphic Trench 3 (ST-3) measured 1. 5 by 0. 5 by 0. 67 m deep and was oriented along a north/south axis (90/270°, Magnetic). Stratigraphic Trench 3 was placed in an area that was recently burned in a wildfire. The GPS coordinates of ST-3 are E586163/N2368387 with an accuracy of ± 2. 0 m (see Figure 6). Stratigraphic Trench 3 was placed approximately 2. 0 m north of an informal dirt road extending in a southwest/northeast direction. Multiple push piles of soil containing limestone chunks are located approximately 4. 0 m northwest of ST-3. Stratigraphic Trench 3 contained two stratigraphic culturally sterile layers which are described below (Figures 36 and 37).

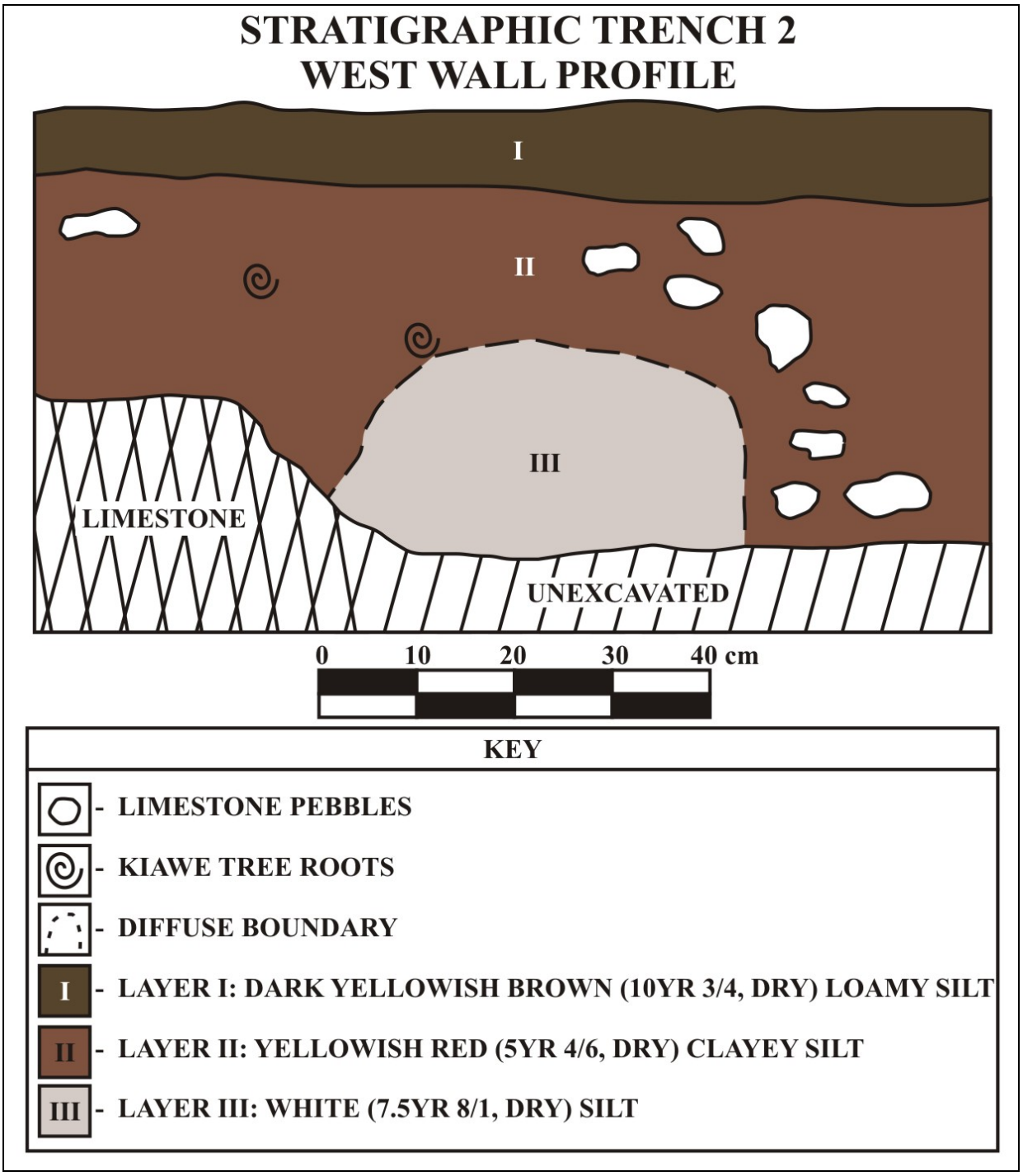

Figure 34: Stratigraphic Trench 2 West Wall Profile Drawing.

Figure 35: Photographic View of Stratigraphic Trench 2 West Wall Profile Drawing.

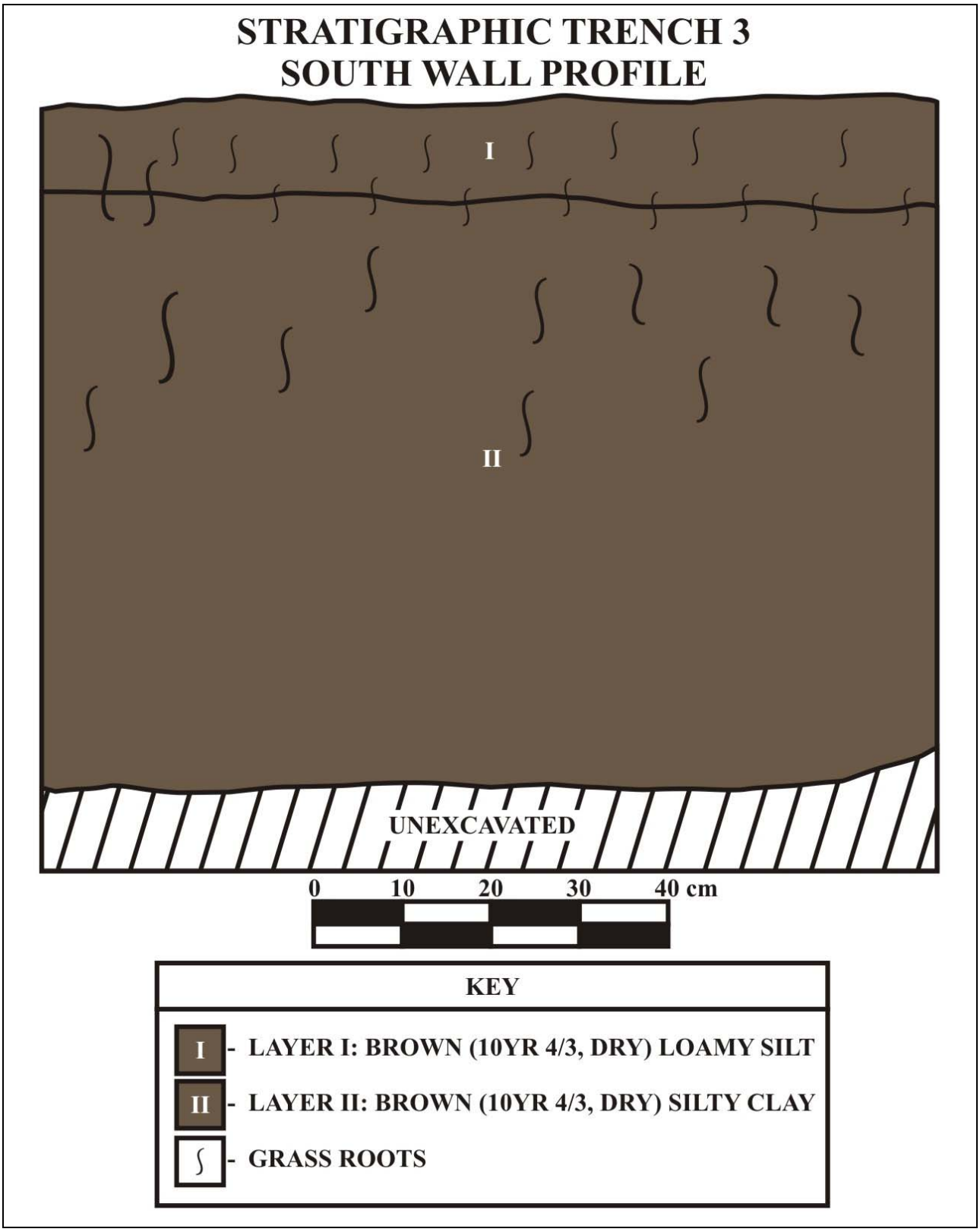

Figure 36: Stratigraphic Trench 3 South Wall Profile Drawing.

Figure 37: Photographic View of Stratigraphic Trench 3 South Wall Profile. View to South.

Layer I (0-12 cmbs) consisted of semi-compact brown (10YR 4/3 dry) loamy silt with grass roots (some charred due to the recent wildfire), a few limestone pebbles and cobbles. The only cultural material observed within Layer I consisted of non-diagnostic clear bottle glass sherds and one smashed . 22 caliber lead bullet. A few charcoal flecks attributed to a recent area wildfires were observed. Layer I also contained vertical cracks which suggested the arid quality of the area. The vertical cracks extended into the upper portion of Layer II. Layer I may have been mechanically affected, as suggested by neighboring push-piles located to the northwest of ST-3. Layer I is interpreted as a natural stratum possibly affected by mechanical means.

Layer II (12-77 cmbs) consisted of compact brown (10YR 4/3, dry) silty clay contained grass roots in the upper stratum and with limestone pebbles and cobbles scattered throughout the entire stratum. No cultural materials were observed. Thus, Layer II was interpreted as a natural stratum. However, Layer II did contain a few charcoal flecks in the upper stratum which was interpreted as associated with recent area wildfires and as having percolated downward through the vertical cracks in Layer I.

STRATIGRAPHIC TRENCH 4 (ST-4)

Stratigraphic Trench 4 (ST-4) measured 1. 5 by 0. 5 by 0. 67 m deep and was oriented along an east/west axis (000/180°, Magnetic). Stratigraphic Trench 4 was placed in an area with grass 60 cm high and situated approximately 2. 0 me southwest of an area affected by recent wildfires. The GPS coordinates of ST-4 are E586075/N2368261with an accuracy of ± 2. 0 m (see Figure 6). Stratigraphic Trench 4 contained three stratigraphic culturally sterile layers which are described below (Figures 38 and 39).

Layer I (0-14 cmbs) consisted of semi-compact brown (10YR 3/2, dry) silty loam with chunks of limestone, grassroots, and charcoal (which is a direct result of the wildfires in the area). Due to the arid nature of the area, the soil surface exhibited vertical cracks, which extend downward into Layer I and terminate in Layer III. Due to the presence of these vertical cracks, the charcoal has percolated into the upper portion of Layer III. It is also possible that the limestone chunks, present in Layer I, also percolated into the upper portion of Layer III. Given the condition of the deposit, it was difficult to discern whether Layer I was a naturally occurring stratum which had been mechanically affected. However, as the majority of the project area was subjected to previous mechanical disturbance, as evidenced by the many soil and limestone push piles present throughout the project area, and due to the distinct boundary between Layer I and Layer II, Layer I was interpreted as a mechanically altered stratum. Charred and melted aluminum can and pull tab were observed within Layer I. However, no Traditional- or Historic-type cultural materials were observed within Layer I.

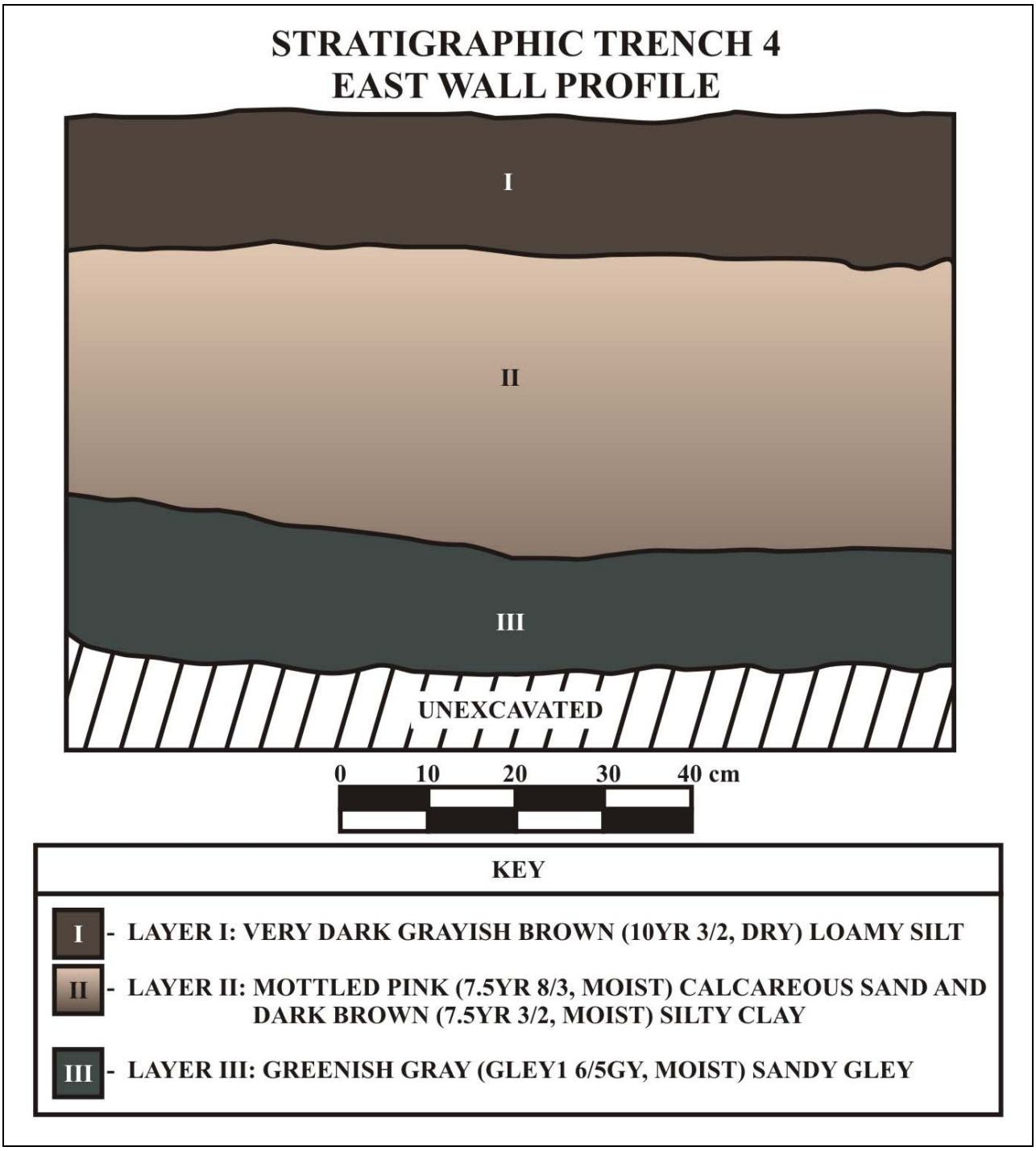

Figure 38: Stratigraphic Trench 4 East Wall Profile Drawing.

Figure 39: Photographic View of Stratigraphic Trench 4 East Wall Profile. View to East.

Layer II (14-36 cmbs) consisted of dark, grayish brown (2. 5YR 4/2, dry) silty clay with grass roots, limestone chunks, and charcoal (due to the recent wildfires). As stated in the Layer I soil description, the presence of limestone and charcoal within Layer II is due to these materials percolating downward through the vertical cracks in the ground surface. No Traditional- or Historic-type cultural materials were observed within Layer II. Based on the diffuse boundary between Layer II and Layer III, Layer II was interpreted as a natural stratum.

Layer III (36-67 cmbs) consisted of compact, dark grayish brown (2. 5YR 4/2, dry) silty clay with few vertical cracks (which extend downward from Layer I) in the upper portion of the stratum. In the upper portion of Layer III there are smaller pieces of charcoal and limestone that percolated down, through vertical cracks, from Layer I. Excavation of Layer III was terminated due to the presence of a sinkhole or horizontal excavation area. Due to the limited amount of charcoal and limestone, Layer III was interpreted as a natural stratum. No Traditional- or Historic-type cultural materials were observed within Layer III.

DISCUSSION AND CONCLUSION

Scientific Consultant Services, Inc. (SCS) conducted an Archaeological Inventory Survey of approximately 90-acres of land of which 40-acres will be developed for the Kamehameha Schools Community Learning Center (KCLC) located in Mā`ili, Lualualei Ahupua`a, Wai`anae District, Island of O`ahu, Hawai`i [TMK: (1) 8-7-010:007 por.]. The current survey followed an earlier survey (Rieth 2009), which identified three archaeological sites State Site 50-80-07-7081, the Voice of America antennae system; State Site 50-80-07-7082,Voice of America transmitter buildings and ancillary features; and State Site 50-80-7-7083, a raised railroad bed remnant from the Waianae Sugar Company. The current survey also included the relocation of these three previously identified archaeological sites.

The current survey re-located the sixteen surface features (1 through 6, 8, 9, 11 through 13, 15 through 18, and 21) comprising State Site 50-80-07-7081. Three surface features, two VOA antennae foundations (Features 22 and 23) and a Historic trash dump (Feature 24), were newly identified during the current survey. Based on proximity, these features were incorporated into State Site 50-80-07-7081.

The buildings and the ancillary features of State Site 50-80-07-7082, were not re-located, as this site was located in the exclusion zone (see Rieth 2009). However, State Site 50-80-07-7082, Feature 7, a series of fencelines which traverse the survey area, was re-located.

The previously identified State Site 50-80-7-7083, initially interpreted by Reith (2009) as a raised railroad bed, was re-located. Given the absence of evidence supporting this functional interpretation, State Site 50-80-07-7083 was re-interpreted as a cart path associated with the Plantation Era. Limited subsurface testing was conducted, but did not produce Traditional- or Historic-type cultural material.

The current survey included limited subsurface testing. However, no Traditional- or Historic-type cultural materials were encountered.

The current Archaeological Inventory Survey also found intensive mechanical ground disturbance on more than 90 percent of the survey area's surface as suggested by the multiple push piles of basalt and limestone, multiple dirt roads or trails used for mountain biking, motocross bikes, and hiking; the unauthorized dumping of modern household debris, including plastic containers, automobile parts, etc. ; and steel composite wire cables. The wire cables appear to have been associated with the Voice of America Transmission Towers that were located on the property during World War II. In addition, portions of the overall survey area have been subjected to wildfires, as evidenced by the presence of charred vegetation and remnant kiawe trees.

In addition, SCS conducted limited subsurface testing, in the form of four manually excavated stratigraphic trenches, which yielded negative results. The synthesis of previous archaeological work [(Cordy 1976; Mayberry and Rosendahl (1994), and Jimenez (1994)] suggests that the type of landscape on which the current survey area is situated may have contained a few scattered temporary or seasonal habitations sites. However, given the extent of the previous land alterations, no evidence of pre-Contact utilization of the survey area remained on the ground surface or within subsurface contexts.

SIGNIFICANCE ASSESSMENTS AND RECOMMENDATIONS

All of the previously identified features associated with State Sites 50-80-07-7081 (and the three newly identified surface features which have been incorporated into State Site 50-80-07-7081), State Site 50-80-07-7082, and 50-80-07-7083 were assessed for their significance as outlined in Hawai‘i Administrative Rules §13-275-6 (HAR §13-275-6).

To be assessed as significant a site must be characterized by one or more of the following five criteria:

(A) It must be associated with events that have made a significant contribution to the broad patterns of our history, or be considered a traditional cultural property.

(B) It must be associated with the lives of persons significant in the past.

(C) It must embody distinctive characteristics of a type, period, or method of construction, or represent a significant and distinguishable entity whose components may lack individual distinction.

(D) It must have yielded or may be likely to yield, information important in prehistory or history.

(E) Have important value to native Hawaiian people or other ethnicities in the state, due to associations with cultural practices and traditional beliefs that were, or still are, carried out.

The previously identified State Site 50-80-07-7081 and State Site 50-80-07-7082, Feature 7, were re-evaluated for significance and found to be significant under Criteria A, associated with historic events or activities, and Criterion D, for information content. The three newly identified surfaced features (Features 22, 23, and 24) which have been incorporated into State Site 50-80-07-7081, were and found to be significant under Criteria A and Criteria D. However, as these sites are not structurally unique, they are not recommended for preservation. State Site 50-80-07-7083 was re-evaluated and found to be significant under Criterion A, D, and C, as an excellent example of a feature type. Thus, State Site 50-80-07-7083, in its entirety or in segment(s), is recommended for preservation. No further archaeological work is recommended for this project.

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APPENDIX A: ARTIFACT ANALYSIS

SCS PROJECT 1355 CULTURAL MATERIAL INVENTORY						
Site	**Artifact Locus**	**Layer/ Level**	**Collected Item**	**Measurements**	**Count**	**Remarks**
-7081	1	Surface	Porcelain Bowl Rim/ Base Sherd	Rim diameter: 14. 4 cm Vessel height: 3. 2 cm Ringfoot base diameter: 7. 1 cm	1	See below.
Flared rim, ringfoot base present, exterior and interior glazed, exterior center of base displays portion of manufacturer's mark in orange (**Kutani** in cursive) color over glaze, interior decorated over glaze with brown, gray and red colors depicting masted ships, landscape, a wooden house, a waterwheel, and vegetation. Lithophane black applied. Artifact fits with Artifact #14.						
-7081	2	Surface	Porcelain Shallow Bowl	Rim diameter: 19. 5 cm Vessel height: 3. 3 cm Ringfoot base diameter: 11. 1 cm	1	See below.
Portion of rim/base missing, ringfoot base present, exterior and interior glazed, exterior center of base displays manufacturer's mark over glaze, interior decorated with silver strip on rim and silver bamboo leaves over glaze. Manufacturer's mark description: 1st line (arched): **IMPERIAL HOUSE**; 2nd line: a jeweled crown with a cross pattee on top of the crown; 3rd line (horizontal): **FINE CHINA**; 4th line (horizontal): **JAPAN**; 5th line (horizontal): **SILVER BEAUTY**; 6th line (horizontal): **HAND PAINTED**.						
-7081	2	Surface	Porcelain Saucer Rim/ Base Sherd	Saucer height: 1. 6 cm Ringfoot base diameter: 8. 5 cm	1	Ringfoot base present, decorations same as previous artifact, manufacturer is suspected as same as previous artifact due to same decoration type.
-7081	2	Surface	Porcelain Saucer Rim Sherds	-	2	Decorations same as previous artifact.
-7081	2	Surface	Porcelain Body Sherd	-	1	Vessel type unknown.
-7081	3	Surface	Glass Bottle Base Sherd	Base diameter: 6. 2 cm	1	See below.
Amber color, at least three piece mold (base and two sides), embossed base textured with multiple dots. Base embossment: 1st line (horizontal): **14** manufacturer's stamp **0**; 2nd line (horizontal): **8**. The manufacturer's stamp is a vertical oval encompassing a capital **I** (in use 1954). The manufacturer's stamp is Owens Illinois Glass Company of Toledo, Ohio.						
-7081	4	Surface	Glass Jar Base Sherd	-	1	See below.
Clear, at least three piece mold (base and two sides), rim of base displays multiple joined diamonds, base embossed. Base embossment: 1st line (horizontal): **3019**; 2nd line (horizontal): **15** manufacturer's stamp; 3rd line (horizontal): **2**. The manufacturer's stamp is a circle encompassing a capital **B**. Based on manufacturing methods, the manufacturer is identified as either Brockway Machine Bottle Company (1907–1933) or Brockway Glass Company (since 1933); both are of Brockwayville, PA. The manufacturer's stamp was first used in 1925.						
-7081	5	Surface	Glass Bottle Base Sherd	Base width: 2. 4 cm	1	See below.
Green colored, oval shaped and embossed. Base embossment: 1st line (horizontal): **4** manufacturer's stamp **4**; 2nd line (horizontal): **7**. The manufacturer' stamp is a vertical oval intersected by a horizontal diamond and within the intersection is a capital **I**. The manufacturer is identified as Owens Illinois Glass Company of Toledo, Ohio. The manufacturer's stamp was utilized between 1929 and 1954.						

SCS PROJECT 1355 CULTURAL MATERIAL INVENTORY						
Site	**Artifact Locus**	**Layer/ Level**	**Collected Item**	**Measurements**	**Count**	**Remarks**
-7081	6	Surface	Glass Jar or Bottle Base Sherd	-	1	See below.
Clear, embossed. Base embossment: 1st line (horizontal): **M 810**; 2nd line (horizontal): manufacturer's stamp; 3rd line (horizontal): **8**. The manufacturer's stamp is the horizontal portion of a capital **L** intersecting the left vertical side of a capital **M**; the two letters are encompassed by a single circle. The manufacturer is identified as Latchford-Marble Glass Company of Los Angeles, CA. The manufacturer's stamp was utilized between 1939 and 1957.						
-7081	7	Surface	Whiteware Cup Rim/ Base Sherd	Cup height: 6. 1 cm Ringfoot base diameter: 4. 5 cm	1	See below.
Ring handle missing, exterior and interior glazed, notched ringfoot base present, arched relief pattern just below rim exterior, exterior and interior crackled.						
-7081	8	Surface	Whiteware Bowl Rim/ Base Sherd	Bowl height: 3. 5 cm	1	See below.
Exterior and interior glazed, rim scalloped and flared, shallow ringfoot, manufacturer's stamp (in black) under glaze on center of base exterior; the manufacturer's stamp is partial.						
-7081	8	Surface	Whiteware Base Sherd	-	1	Vessel type unknown.
-7081	9	Surface	Glass Bottle	Overall height: 24. 2 cm Body height: 13. 8 cm Mouth diameter (inner): 1. 7 cm Base diameter: 5. 3 cm	1	See below.
Clear, automatic machine made, crown top finish, horizontal ring located mid-neck, multiple textured lines on the shoulder and below the waist, body mid-section displays painted red and white bottle label, heel and base embossed. Mid-section front label: 1st line (horizontal): **NEHI**; 2nd line (horizontal): **REG. U. S. PAT. OFF.** ; 3rd line (horizontal): **BEVERAGES**; 4th line (horizontal): **CONTENTS 12 FLU. OZS.** Mid-section reverse label: 1st line (horizontal): **BOTTLE STERILIZED**; 2nd line (horizontal): **BEFORE FILLING**; 3rd line (horizontal): **PROPERTY OF**; 4th line (horizontal): **BEVERAGE CO. , OF HAWAII**; 5th line (horizontal): **HONOLULU, T. H.** Heel embossment (horizontal): **4455-G 2**. Base embossment: 1st line (horizontal): **20** manufacturer's stamp **44**; 2nd line (horizontal): **DESIGN**; 3rd line (horizontal): **PAT D**; 4th line (horizontal): **MAR. 3. 2**. The manufacturer's stamp is a vertical oval intersected by a horizontal diamond and within the intersection is a capital **I**. The manufacturer is identified as Owens Illinois Glass Company of Toledo, Ohio. The manufacturer's stamp was utilized between 1929 and 1954. Based on the 44 located to the right of the manufacturer's stamp, it is likely that the bottle was manufactured in 1944.						
-7081	10	Surface	Milk Glass Jar Base Sherd	-	1	See below.
Ring present around heel, base embossed. Base embossment: a capital **H** hovering over a capital **A**. The manufacturer's stamp is identified as Hazel-Atlas Glass Company of Wheeling, West Virginia. The manufacturer's stamp was utilized between 1920 and 1964.						
-7081	11	Surface	Glass Bottle Base Sherd	Base diameter: 5. 9 cm	1	See below.

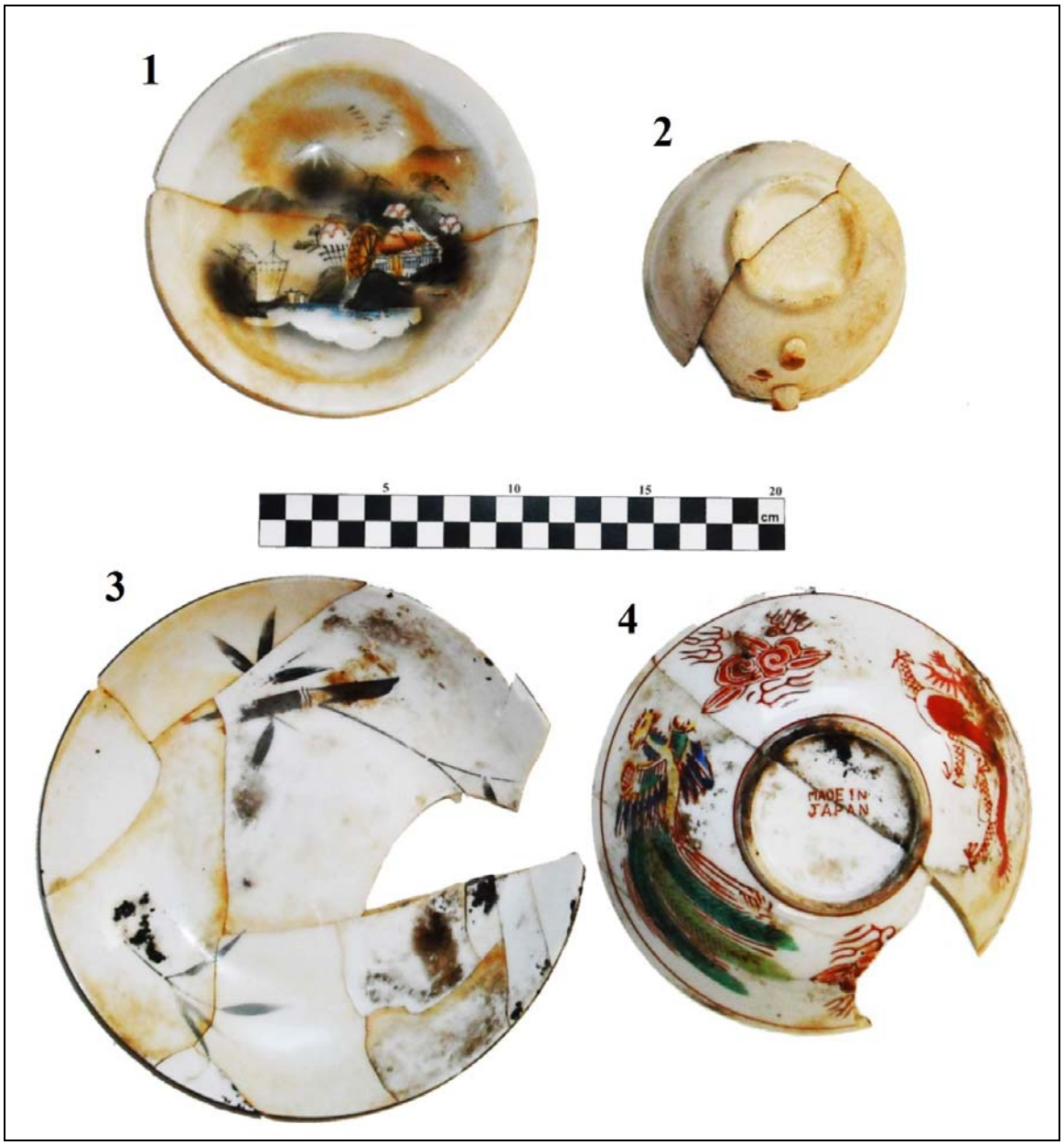
SCS PROJECT 1355 CULTURAL MATERIAL INVENTORY						
Site	**Artifact Locus**	**Layer/ Level**	**Collected Item**	**Measurements**	**Count**	**Remarks**
Greenish-aqua-marine colored, at least three piece mold (base and two sides), body textured, base textured and embossed. Base embossment: 1st line (horizontal; cursive): Duraglas; 2nd line (horizontal): 9 manufacturer's stamp; 3rd line (horizontal): 15.						
-7081	12	Surface	Whiteware Cup Rim/ Base Sherd	Cup height: 6. 1 cm Ringfoot base diameter: 4. 5 cm	1	Fits with Artifact #7.
-7081	13	Surface	Porcelain Plate Rim/ Base Sherd	-	1	See below.
Exterior and interior glazed, exterior center of shallow ringfoot displays manufacturer's stamp (in blue) under glaze, interior decorated with a blue line near the rim and an inch away from the rim. Manufacturer's stamp: 1st line (horizontal): **TE**…; 2nd line (horizontal): **VITRI**. . . ; 3rd line (horizontal): **MADE**						
-7081	14	Surface	Porcelain Bowl Rim/ Base Sherd	Rim diameter: 14. 4 cm Vessel height: 3. 2 cm Ringfoot base diameter: 7. 1 cm	1	See below.
Flared rim, ringfoot base present, exterior and interior glazed, exterior center of base displays portion of manufacturer's mark in orange (**Kutani** in cursive) color over glaze, interior decorated over glaze with brown, gray and red colors depicting masted ships, landscape, a wooden house, a waterwheel, and vegetation. Lithophane black applied. Artifact fits with Artifact #1.						
-7081	15	Surface	Porcelain Plate Rim/ Base Sherd	-	1	See below.
Exterior and interior glazed, exterior center of shallow ringfoot displays manufacturer's stamp (in blue) under glaze, interior decorated with a blue line near the rim and an inch away from the rim. Manufacturer's stamp: 1st line (horizontal): **TE**…; 2nd line (horizontal): **VITRI**. . . ; 3rd line (horizontal): **MADE**						
-7081	16	Surface	Glass Jar	Overall height: 8. 6 cm Body height: 5. 5 cm Mouth diameter (inner): 4. 1 cm Base diameter: 4. 0 cm	1	See below.
Clear, automatic machine made, screw top finish, short neck, steep shoulders, cylindrical body, embossed tapered heel, base textured and embossed. Base embossment: 1st line (horizontal): **3783-C**; 2nd line (horizontal): **20** manufacturer's stamp **5**; 3rd line (horizontal): **6A**. The manufacturer's stamp is a vertical oval intersected by a horizontal diamond and within the intersection is a capital **I**. The manufacturer is identified as Owens Illinois Glass Company of Toledo, Ohio. The manufacturer's stamp was utilized between 1929 and 1954.						
-7081	17	Surface	Whiteware Bowl Rim/ Base Sherd	Ringfoot diameter: 10. 1 cm	1	See below.
Exterior and interior glazed, exterior near center of base displays part of the manufacturer's information in faded black.						

SCS PROJECT 1355 CULTURAL MATERIAL INVENTORY						
Site	**Artifact Locus**	**Layer/ Level**	**Collected Item**	**Measurements**	**Count**	**Remarks**
-7081	18	Surface	Stainless Steel Tablespoon	Length: 17. 8 cm Width: 4. 0 cm Weight: 31. 9 g	1	Underside of spoon handle displays …**Co SOLID STAINLESS U. S. A. ® Heather** (in cursive)
-7081	19	Surface	Porcelain Bowl	Vessel height: 5. 5 cm Rim diameter: 16. 5 cm Ringfoot base diameter: 6. 4 cm	1	See below.
Rim portion missing, ringfoot base present, exterior and interior glazed, exterior decorated with orange, green, aqua, yellow, and blue transfer prints over glaze. These transfer prints comprise of orange flowers, a dragon, and a multi-colored bird with long tail feathers. The center of the base displays **MADE IN JAPAN** in two horizontal lines. The rim interior is decorated with linear shapes. The interior center is decorated with a single orange flower.						
General Project Area Collection	A	Surface	Glass Bottle	Overall height: 12. 2 cm Body height: 7. 1 cm Mouth diameter (inner): 1. 3 cm Base dimensions: 4. 7 cm long by 3. 0 cm wide	1	See below. Artifact found at GPS coordinates East 586123/ North 2368369.
Amber color, automatic machine made, screw top finish, ring collar, short neck, reverse of golden gate body embossed, golden gate base embossed and textured with two rows of dots circumnavigating base. Reverse body has two measurement scales along with an embossment of the words **SANI-GLAS** located near bottle heel between the two measurement scales. Base embossment: 1st line (horizontal, in cursive): **Brockway**; 2nd line (horizontal): either a **31** or **51**. The bottle manufacturer is either Brockway Machine Bottle Company (1907–1933) or Brockway Glass Company (since 1933); both are of Brockwayville, PA.						
General Project Area Collection	B	Surface	Silver Spoon	Length: 15. 7 cm Width: 2. 9 cm Weight: 28. 7 g	1	Underside of spoon handle displays **NOBILITY PLATE** with four repeating, non-recognizable symbols. Artifact found at GPS coordinates East 586119/ North 2368417.

APPENDIX B: SELECTED ARTIFACT PHOTOGRAPHS

Selected Glass Artifacts

1. State Site 50-80-08-7081 Feature 23 Historic Artifact Scatter Artifact Locus #9: glass Nehi Beverages bottle.
2. State Site 50-80-08-7081 Feature 23 Historic Artifact Scatter Artifact Locus #16: glass jar.
3. General Project Area Surface Collection Artifact Locus #A: glass bottle.



Selected Ceramic Artifacts

1. State Site 50-80-08-7081 Feature 23 Historic Artifact Scatter Artifact Artifact Loci #1 and #14 fitted: porcelain bowl.
2. State Site 50-80-08-7081 Feature 23 Historic Artifact Scatter Artifact Artifact Loci #7 and #12 fitted: whiteware cup.
3. State Site 50-80-08-7081 Feature 23 Historic Artifact Scatter Artifact Artifact Locus #2: shallow porcelain bowl.
4: State Site 50-80-08-7081 Feature 23 Historic Artifact Scatter Artifact Artifact Locus #19: porcelain bowl.

APPENDIX C: LAND GRANT 4751

Land Patent No. 4751

(Grant.)

On —— Land Exchange ——

By this Patent the Governor of the Territory of Hawaii, in conformity with the laws of the United States of America and of the Territory of Hawaii, makes known to all men that he has this day granted and confirmed unto

—— H. M. Von Holt ——

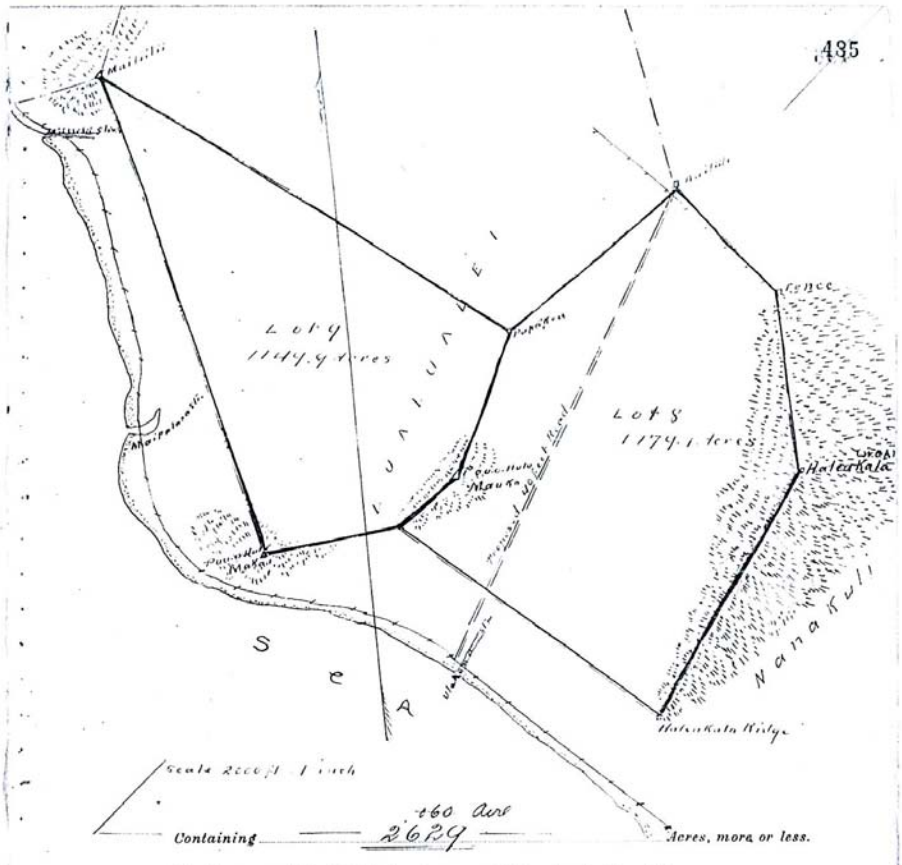
for the consideration of — One — Dollars, $ 1.00 paid into the Treasury.

And for the further consideration of a deed to the Government of the Territory of Hawaii of lands situate in the City of Honolulu, Island of Oahu, required of road purposes from H. M. Von Holt, the receipt of which is hereby acknowledged.

all of the land situate at —— Lualualei ——
in the District of Waianae Island of Oahu bounded and described as follows: —— Lot 8. ——

Beginning at Puu-o-Hulu mauka Trig. Station marked by an iron oo, or native digger, driven into soft rock and ahu on top of hill of same, as shown on Government Survey Registered Map No. 2040 and running as follows by true bearings:—

1. N. 26° 20' 30" E. 3654 feet along Lot 9 to + on coral stone and ahu;
2. N. 56° 5' E. 5160 " " Public Lands General Lease No. 535 to + on stone and ahu;
3. S. 38° 17' E. 3345 " " Government remainder to + on solid rock 5 feet mauka of fence on slope near base of pali;
4. S. 2° 3' E. 4214 " " the same up the Halaakula hill to a point on its summit as located by Prof. W. D. Alexander;
5. S. 87° 40' 30" W. 6666 " down the hill along Government



Containing 2629.60 Acres, more or less.

To Have and to Hold *the above granted Land unto the said*

H. M. Von Holt

and his *heirs and assigns forever.*

In Witness Whereof, *The Governor of the Territory of Hawaii, has hereto set his hand and caused the Great Seal of the Territory to be hereunto affixed, this* 23rd *day of* June *A. D.* 1903.

(Great Seal)

/s/ Sanford B. Dole

BY THE GOVERNOR:

/s/ Edward S. Boyd
Commissioner of Public Lands.

remainder to + on rock and ahu on the Southwest portion of the ridge;

6. N. 47° 16' W. 7486 feet along Government remainder to an unmarked point on Puu-o-Hulu ridge;

7. N. 39° 20' E. 1700 " " the ridge, the same being boundary of Lot 9, to the initial point and containing an area of

1479 7/10 Acres, exclusive of a Government reservation, 40 feet wide for a road.

Lot 9.

Beginning at Puu-o-Hulu mauka Trig. Station marked by an iron a. or native digger, driven into soft rock, and ahu on top of hill of same name, as shown on Government Survey Registered map No. 2040 and running as follows by true bearings:

1. S. 39° 20' W. 1700 feet along ridge, the same being boundary of Lot 8, to an unmarked point,

2. S. 85° 29' W. 3240 " still along the ridge to Puu-o-Hulu makai Trig. Station marked by an iron bar set in ground and ahu, near highest point of hill of same name;

3. N. 12° 27' W. 1756 " along Government remainder to maiŭlii Trig. Station marked by + on stone and ahu on highest point of hill of same name

4. S. 51° 19' E. 1334 " " Public Lands General Lease No. 535 to + on coral stone and ahu.

5. S. 26° 20' 30" W. 3654 " " Lot 8 to the initial point and containing an area of

1149 7/10 Acres.

Appendix C

CULTURAL IMPACT ASSESSMENT

SCS Project Number 1356-CIA-1

A CULTURAL IMPACT ASSESSMENT FOR THE KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER LUALUALEI AHUPUA`A, WAI`ANAE DISTRICT, ISLAND OF O`AHU, HAWAI`I [TMK: (1) 8-7-010:007 (por.)]

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February 2013
DRAFT

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INTRODUCTION

At the request of PBR Hawaii & Associates, Inc., Scientific Consultant Services, Inc. (SCS), has prepared a Cultural Impact Assessment (CIA) for the proposed Kamehameha Schools Community Learning Center to be located on approximately 40 acres of land located in Mā`ili, Lualualei Ahupua`a, Wai`anae District, Island of O`ahu, [TMK: (1) 8-7-010:007 (por.)] (Figures 1 through 4).

The Constitution of the State of Hawai`i clearly states the duty of the State and its agencies is to preserve, protect, and prevent interference with the traditional and customary rights of Native Hawaiians. Article XII, Section 7 (2000) requires the State to "protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by *ahupua`a* tenants who are descendants of Native Hawaiians who inhabited the Hawaiian Islands prior to 1778." In spite of the establishment of the foreign concept of private ownership and western-style government, Kamehameha III (Kauikeaouli) preserved the peoples traditional right to subsistence. As a result in 1850, the Hawaiian Government confirmed the traditional access rights to Native Hawaiian *ahupua`*a tenants to gather specific natural resources for customary uses from undeveloped private property and waterways under the Hawaiian Revised Statutes (HRS) 7-1. In 1992, the State of Hawai`i Supreme Court, reaffirmed HRS 7-1 and expanded it to include, "native Hawaiian rights…may extend beyond the *ahupua`a* in which a Native Hawaiian resides where such rights have been customarily and traditionally exercised in this manner" (Pele Defense Fund v. Paty, 73 Haw.578, 1992).

Act 50, enacted by the Legislature of the State of Hawai`i (2000) with House Bill (HB) 2895, relating to Environmental Impact Statements, proposes that:

> …there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawaii's culture, and traditional and customary rights… [H.B. NO. 2895].

Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on government agencies a duty to promote and protect cultural beliefs and practices, and resources of Native Hawaiians as well as other ethnic groups. Act 50 also requires state agencies and other developers to assess the effects of proposed land use or shoreline developments on the

Figure 1: USGS Quadrangle (Wai`anae, 1998) Map Showing the Location of the Study Area.

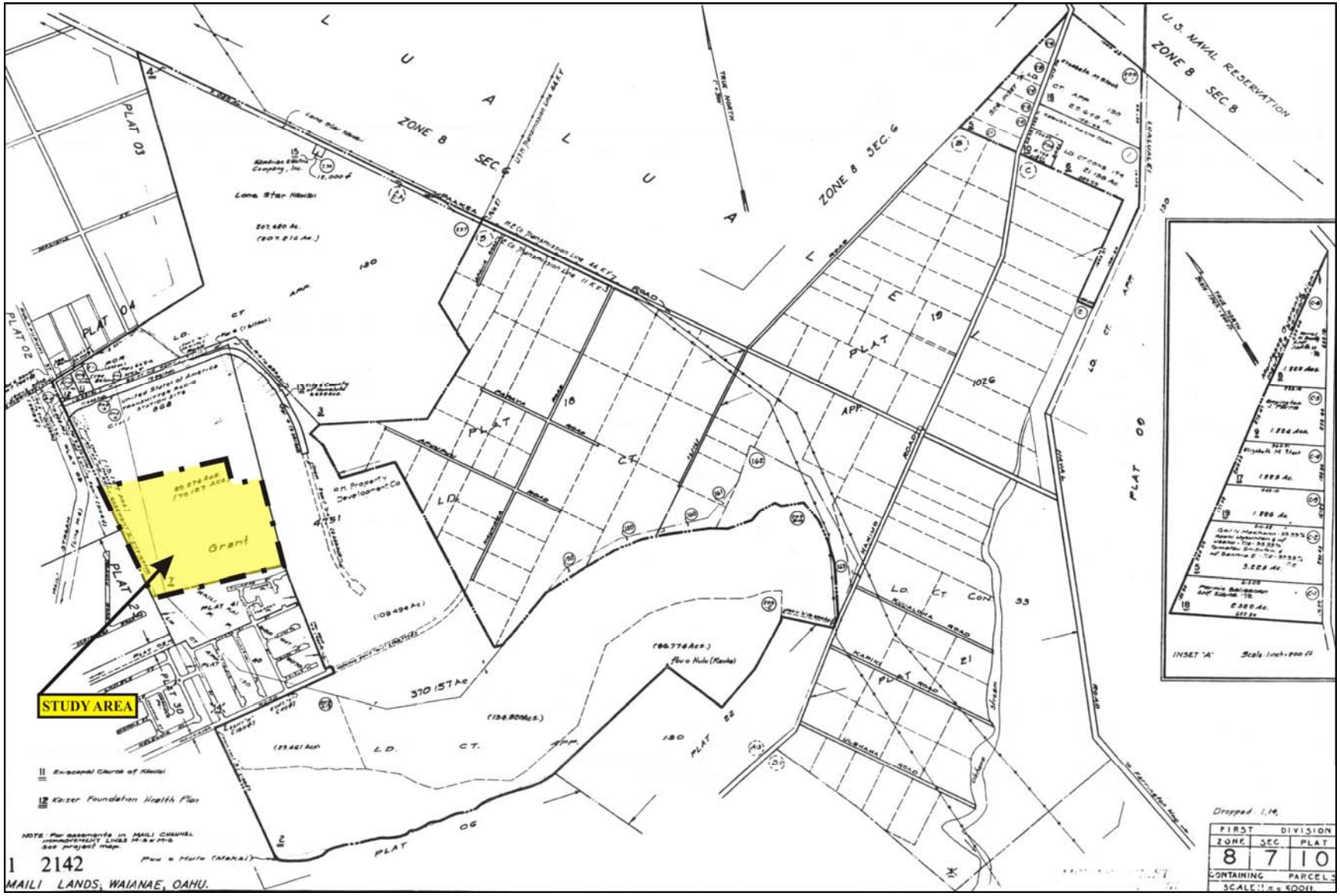

Figure 2: Tax Map Key [TMK: (1) 8-7-010] Showing the Location of the Study Area.

Figure 3: Photographic Overview of the Proposed Site of the Kamehameha Schools Community Learning Center. View to Northeast.

Figure 4: Photographic Overview of the Proposed Site of the Kamehameha Schools Community Learning Center. View to Northwest.

"cultural practices of the community and State" as part of the HRS Chapter 343 (2001) environmental review process.

It also re-defined the definition of "significant effect" to include "the sum of effects on the quality of the environment including actions impact a natural resource, limit the range of beneficial uses of the environment, that are contrary to the State's environmental policies . . . or adversely affect the economic welfare, social welfare or cultural practices of the community and State" (H.B. 2895, Act 50, 2000). Cultural resources can include a broad range of often overlapping categories, including places, behaviors, values, beliefs, objects, records, stories, etc. (H.B. 2895, Act 50, 2000).

Thus, Act 50 requires that an assessment of cultural practices and the possible impacts of a proposed action be included in Environmental Assessments and Environmental Impact Statements, and to be taken into consideration during the planning process. As defined by the Hawaii State Office of Environmental Quality Control (OEQC), the concept of geographical expansion is recognized by using, as an example, "the broad geographical area, e.g. district or *ahupua`a*" (OEQC 1997). It was decided that the process should identify 'anthropological' cultural practices, rather than 'social' cultural practices. For example, *limu* (edible seaweed) gathering would be considered an anthropological cultural practice, while a modern-day marathon would be considered a social cultural practice.

Therefore, the purpose of a Cultural Impact Assessment is to identify the possibility of on-going cultural activities and resources within a project area, or its vicinity, and then assessing the potential for impacts on these cultural resources. The CIA is not intended to be a document of in depth archival-historical land research, or a record of oral family histories, unless these records contain information about specific cultural resources that might be impacted by a proposed project.

According to the Guidelines for Assessing Cultural Impacts established by the Hawaii State Office of Environmental Quality Control (OEQC 1997):

> The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religions and spiritual customs. The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both manmade and natural, which support such cultural beliefs.

The meaning of "traditional" was explained in *National Register Bulletin*:

> Traditional" in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations', usually orally or through practice. The traditional cultural significance of a historic property then is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices. . . . [Parker and King 1990:1]

METHODOLOGY

This Cultural Impact Assessment was prepared as much as possible in accordance with the suggested methodology and content protocol in the Guidelines for Assessing Cultural Impacts (OEQC 1997). In outlining the "Cultural Impact Assessment Methodology", the OEQC states that:

> "…information may be obtained through scoping, community meetings, ethnographic interviews and oral histories…"

This report contains archival and documentary research, as well as communication with organizations having knowledge of the project area, its cultural resources, and its practices and beliefs. An example Letter of Inquiry is presented in Appendix A; copies of the posted Legal Notice and the Affidavit of Publication, dated January 7, 2013, are presented in Appendix B; an example follow-up Letter of Inquiry is presented below in Appendix C; responses to the letters of Inquiry are presented in Appendix D; a completed Information Release Form is presented in Appendix E; Land Grant 4751 which was awarded in the proposed project area is presented in Appendix F. This Cultural Impact Assessment was prepared in accordance with the suggested methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 1997), whenever possible. The assessment concerning cultural impacts may include, but not be limited to, the following matters:

(1) if consultation is available, a discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints of limitations which might have affected the quality of the information obtained;

(2) a description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken;

(3) if conducted, interview procedures, including the circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained;

(4) biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or being interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area;

(5) a discussion concerning historical and cultural source materials consulted, the institutions and repositories searched, and the level of effort undertaken, as well as the particular perspective of the authors, if appropriate, any opposing views, and any other relevant constraints, limitations or biases;

(6) a discussion concerning the cultural resources, practices and beliefs identified, and for the resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site;

(7) a discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area, affected directly or indirectly by the proposed project;

(8) an explanation of confidential information that has been withheld from public disclosure in the assessment;

(9) a discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs;

(10) an analysis of the potential effect of any proposed physical alteration on cultural resources, practices, or beliefs; the potential of the proposed action to isolate cultural resources, practices, or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place, and;

(11) the inclusion of bibliography of references, and attached records of interviews which were allowed to be disclosed.

If on-going cultural activities and/or resources are identified within the project area, assessments of the potential effects on the cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

ARCHIVAL RESEARCH

Archival research focuses on a historical documentary study involving both published and unpublished sources. These include legendary accounts of native and early foreign writers; early historical journals and narratives; historic maps, land records, such as Land Commission Awards, Royal Patent Grants, and Boundary Commission records; historic accounts, and previous archaeological reports.

INTERVIEW METHODOLOGY

Interviews are conducted in accordance with Federal and State laws, and guidelines, when knowledgeable individuals are able to identify cultural practices in, or in close proximity to, the project area. If they have knowledge of traditional stories, practices and beliefs associated with a project area or if they know of historical properties within the project area, they are sought out for additional consultation and interviews. Individuals who have particular knowledge of traditions passed down from preceding generations and a personal familiarity with the project area are invited to share their relevant information concerning particular cultural resources. Often people are recommended for their expertise, and indeed, organizations, such as Hawaiian Civic Clubs, the Island Branch of Office of Hawaiian Affairs (OHA), historical societies, Island Trail clubs, and Planning Commissions are depended upon for their recommendations of suitable informants. These groups are invited to contribute their input, and suggest further avenues of inquiry, as well as specific individuals to interview. It should be stressed again that this process does not include formal or in-depth ethnographic interviews or oral histories and is conducted as described in the OEQC's *Guidelines for Assessing Cultural Impacts* (1997). The assessments are intended to identify potential impacts to on-going cultural practices, or resources, within a project area or in its close vicinity.

If knowledgeable individuals are identified, personal interviews are sometimes taped and then transcribed. These draft transcripts are returned to each of the participants for their review and comments. After corrections are made, each individual signs a release form, making the interview available for this study. When telephone interviews occur, a summary of the information is usually sent for correction and approval, or dictated by the informant and then incorporated into the document. If no cultural resource information is forthcoming and no knowledgeable informants are suggested for further inquiry, interviews are not conducted.

ENVIRONMENTAL SETTING

The study area is located in the coastal region on the leeward (west) side of the island of O`ahu. At its closest point, the study area is located approximately 805 meters (m) from the leeward coast of O`ahu and situated between 5 and 25 feet [1.5 - 7.62 meters (m)] above mean sea level (amsl) approximately 0.5 miles north of on the northern flank of the Pu`u O Hulu Kai Summit and approximately 1.0 miles northwest of the Pu`u O Hulu Uka Summit.

The west and south sides of the study area are bounded by residences, vacant lands owned by the Department of Hawaiian Home Lands (DHHL) to the north, a transitional residential complex, a children's receiving home to the west, and a residential subdivision currently under construction. The eastern boundary is formed by a portion of the United States Coast Guard retained land and a residential subdivision currently under construction. The study area is currently vacant, but has undergone extensive previous disturbance, including multiple dirt roads or trails used for mountain biking, motocross bikes, and hiking; limestone and basalt boulder bulldozer push piles; the unauthorized dumping of modern household debris, including plastic containers, automobile parts, etc.; and steel composite wire cables, which were also strewn across the northern portion of the study area. The wire cables appear to have been associated with the Voice of America Transmission (VOA) Towers that were located on the property during World War II. In addition, portions of the study area have been subjected to wildfires, as evidenced by the presence of charred vegetation and remnant kiawe trees.

CLIMATE

In general, the climate of the study area is exemplified by its leeward location: minimum annual precipitation. This dry area could receive up to 20 inches of rain per annum (Price 1983:62). However, higher elevations near the apex of the Wai`anae Range receive more than 40 inches per year. Thus, fresh water would be most frequently found at higher elevations, in the back of the valley, and along steep cliff faces where dikes are present to trap water (Haun *et al*. 1991:6; Stearns 1940). During the mornings of several days of the current fieldwork, squalls of rain from the rear of the Lualaulei Valley drifted over the study area.

SOILS

According to Foote *et al*. (1972: Map Sheet 36) two soils classifications are present within the study areas (Figure 5). The northern and southern portions of the study area are comprised of soils classified as being of the Mokuleia Soils Series, specifically, Mokuleia clay (Mtb) (Foote *et al.*1972, Sheet Map 36). Soils of the Mokuleia Series are also well-drained soils occurring in the coastal region of O`ahu and Kaua`i. On O`ahu, the Mokuleia soils can be found

at elevations ranging from near sea level to 100 feet amsl. in areas where the annual rainfall ranges from 15 to 40 inches annually. The Mtb soils exhibit slow permeability, very slow runoff, and a very slight erosion hazard. The Mtb soils are frequently utilized for the commercial cultivation of sugarcane and as ranchlands (*ibid*: 95).

The central portion of the study area is comprised of soils of the Mamala Series, specifically, Mamala stony silty clay loam (MnC). Soils of the Mamala Series are shallow, well-drained soils occurring in the coastal regions of O`ahu and Kaua`i. Mamala Series soils can be found between sea level and 100 feet amsl on O`ahu in areas receiving 18 to 25 inches of rain annually. The MnC soils can exhibit slopes ranging from 0 to 12 percent. The MnC soils are known to exhibit moderate permeability, slow to medium runoff, and a moderate, at most, erosion hazard. These soils are frequently utilized for the commercial cultivation of sugarcane, truck crops, and as ranchlands (*ibid*: 93-94).

VEGETATION

Introduced vegetation observed within the study area during the Archaeological Inventory Survey (Dagher and Spear 2013, in prep.) included *koa haole* (*Leucaena glauca*), *kiawe* (*Prosopis pallida*), lion's ear (*Leonotis nepetifolia*), Indian fleabane (*Pluchea indica*), unidentified pluchea species (*Pluchea* sp.*),* amaranth (*Amaranthus* sp.), klu (*Acacia farnesiana*), Australian saltbush (*Atriplex semibaccata*); Golden crown-beard (*Verbesina encelioides*); Spanish Clover (*Desmodium* spp.); tobacco (*Nicotiana glauca*); and aloe (*Aloe vera*).

Native plants observed within the study area during the Archaeological Inventory Survey included *`uhaloa* (*Waltheria indica*); *`ahinahina*, *hinahina* or *Hinahina `Ewa* (*Achyranthes splendens*); *`ākulikuli* (*esuvium portulacastrum*); and *kīpūkai* (*Heliotropium curassavicum*).

Robert Hobdy (2012:3) conducted an earlier study of the flora within the current study area identified "...a mixture of mostly non-native grasses, shrubs and trees. One grass was abundant across the entire area: buffelgrass (*Cenchrus ciliaris*). Also common were: sourbush (*Pluchea carolinensis*), Indian fleabane (*Pluchea indica*), hybrid pluchea (*Pluchea x fosbergii*), klu (*Acacia farnesiana*), kiawe (*Prosopis pallida*) and 'uhaloa (*Waltheria indica*). A total of 42 plant species were recorded during the survey. Six of these were native species: the endemic *pā`ū o* Hi`iaka (*Jacquemontia ovalifolia* subsp. *sandwicensis*) that is found only in Hawai'i and five indigenous species *koali`ai* (*Ipomoea carica*), `ākulikuli (*Sesuvium portulacastrum*), *kīpūkai* (*Heliotropium*

curassavicum), *`ilima* (*Sida fallax*) and *`uhaloa* which are native to Hawaii as well as to other Pacific islands. The remaining 36 plants were non-native species that are of no particular concern."

TABLE 1: PLANT SPECIES LIST (Hobdy 2012:5-6)

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
MONOCOTS			
ALOEACEAE (Aloe Family)			
Aloe vera (L.) N. L. Burman	aloe	non-native	rare
ARECACEAE (Palm Family)			
Cenchrus ciliaris L.	buffelgrass	non-native	abundant
Chloris barbata (L.) Sw.	swollen fingergrass	non-native	uncommon
Cynodon dactylon (L.) Pers.	Bermuda grass	non-native	rare
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	non-native	rare
Megathyrsus maximus (Jacq.) Simon & Jacobs	Guinea grass	non-native	uncommon
Sporobolus sp.	----------	non-native	rare
DICOTS			
AIZOACEAE (Fig-marigold Family)			
Sesuvium portulacastrum (L.) L.	'ākulikuli	indigenous	uncommon
AMARANTHACEAE (Amaranth Family)			
Atriplex semibaccata R. Br.	Australian saltbush	non-native	rare
Atriplex suberecta Verd.	saltbush	non-native	uncommon
Chenopodium murale L.	'āheahea	non-native	rare
ANACARDIACEAE (Mango Family)			
Schinus terebinthifolius Raddi	Christmas berry	non-native	uncommon
ASTERACEAE (Sunflower Family)			
Flaveria trinervia (Spreng.) C. Mohr	clustered yellowtops	non-native	rare
Pluchea carolinensis (Jacq.) G. Don	sourbush	non-native	common
Pluchea indica L. Less.	Indian fleabane	non-native	common
Pluchea x fosbergii Cooperrider & Galang	hybrid pluchea	non-native	common
Tridax procumbens L.	coat buttons	non-native	uncommon
Verbesina encelioides (Cav.) Bentham & Hooker	golden crown-beard	non-native	rare
BATACEAE (Saltwort Family)			
Batis maritima L.	pickleweed	non-native	rare
BORAGINACEAE (Borage Family)			
Heliotropium curassavicum L.	kīpūkai	indigenous	rare

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
*Heliotropium procumbens*Mill.	four-spike heliotrope	non-native	rare
CONVOLVULACEAE (Morning Glory Family)			
Ipomoea cairica (L.) Sweet	koali 'ai	indigneous	uncommon
Ipomoea obscura (L.) Ker-Gawler	----------	non-native	rare
Jacquemontia ovalifolia (Choisy) H. Hallier subsp. *sandwicensis* (A.Gray)K.Robertson	pā'ū o Hi'iaka	endemic	uncommon
Merremia aegyptia (L.) Urb.	hairy merremia	non-native	rare
EUPHORBIACEAE (Spurge Family)			
Euphorbia hypericifolia L.	graceful spurge	non-native	rare
FABACEAE (Pea Family)			
Acacia farnesiana (L.) Willd.	klu	non-native	common
Desmanthus pernambucanus (L.) Thellung	slender mimosa	non-native	uncommon
Leucaena leucocephala (Lam.) de Wit	koa haole	non-native	abundant
Prosopis pallida (Humb. & Bonpl.exWilld) Kunth	kiawe	non-native	common

Figure 5: USDA Soil Survey Map USDA Soil Survey Map (Foote *et al*. 1972: Sheet Map 36) Showing Soils Within Study Area.

CULTURAL HISTORICAL CONTEXT

The island of O`ahu ranks third in size of the eight main islands in the Hawaiian Archipelago. The Wai`anae and Ko`olau Mountain ranges were formed by two volcanoes. Through the millennia the constant force of water carved fertile amphitheater-headed valleys and rugged passes eroded at lower elevations providing access from one side of the island to another (Macdonald and Abbott 1970).

PAST POLITICAL BOUNDARIES

Traditionally, the division of Oahu's land into districts (*moku*) and sub-districts (*`ili*) was said to be performed by Mā`ilikukahi, a ruling chief of O`ahu, who was chosen by the chiefs to be the *mō`īho`oponopono o ke aupuni* (administrator of the government; Kamakau 1991). It was Mā`ilikukahi who had the Island of O`ahu thoroughly surveyed, and permanently defined the boundaries between the different divisions and lands (Fornander 1969:89). Cordy (2002: 25) places Mā`ilikukahi's reign over O`ahu at the beginning of the 16th Century. Mā`ilikukahi created six districts and six district chiefs (*ali`i `ai moku*). Land was considered the property of the king or *ali`i `ai moku* (chief who rules a *moku*) (Pukui and Elbert 1986: 20), which he held in trust for the gods. The title of *ali`i `ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him and, in turn, distributed smaller parcels to lesser chiefs. The *maka`āinana* (commoners) worked the individual plots of land. It is said that Mā`ilikukahi gave land to *maka`āinana* all over the island of O`ahu (*ibid*).

In general, several terms, such as *moku, ahupua`a, `ili or `ili`āina* were used to delineate various land sections. A district (*moku*) contained smaller land divisions (*ahupua`a*) that customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua`a* were, therefore, able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua`a* to be self-sufficient by supplying the needed resources from different environmental zones (Lyons 1875:111). The *`ili* or *`ili `āina* were smaller land divisions next in importance to the *ahupua`a* and were administered by the chief who controlled the *ahupua`a* in which it was located (Lyons 1875:33; Lucas 1995:40). The *mo`o`āina* were narrow strips of land within an *`ili*. The land holding of a tenant or *hoa `āina* residing in an *ahupua`a* was called a *kuleana* (Lucas 1995:61).

TRADITIONAL SETTLEMENT PATTERN

Archaeological settlement pattern data suggests that initial colonization and occupation of the Hawaiian Islands first occurred on the windward shoreline areas of the main islands between

A. D. 850 and 1100, with populations eventually settling in drier leeward areas during later periods (Kirch 2011:3). Although coastal settlement was dominant, Native Hawaiians began cultivating and living in the upland *kula* (plains) zones. Greater population expansion to inland areas began around the 14th Century and continued through the 16th Century. Large scale or intensive agriculture was implemented in association with habitation, religious, and ceremonial activities.

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During the pre-Contact Period (pre-1778), there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinaruma*) and *mai`a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were cultivated. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985).

The generally accepted paradigm of Hawaiian settlement is that the earliest settlements were located in the wet, windward regions. As population pressure increased or politics changed, populations began to branch out into leeward, less hospitable regions of Hawai`i, adapting their cultivation strategies as they moved into drier climates (Cordy 2002). According to Kirch's (1985) Hawaiian Settlement Model, the Wai`anae area was settled during the Expansion Period (A.D. 1100–1650) during which time O`ahu's population was growing faster than any other period of Hawaiian prehistory. Prior to the Expansion Period, Wai`anae District, including Lualualei, was likely visited by travelers and its rich offshore fisheries may have attracted seasonal fishermen (*ibid*).

Wai`anae Ahupua`a may have been named after a large freshwater fishpond situated west of Wai`anae Stream. Mullet were grown in this pond, thus the name *wai* (water) *`anae* (mullet) (Handy and Handy 1972: 468). The region is renowned for its fruitful deep sea fisheries, especially in the waters off Ka`ena Point. Wai`anae's fisheries are noted in Hawaiian legend. Chief Kawelo distinguished himself as an able fisherman in these waters (Handy and Handy 1972:467). It is here, at Ka`ena Point, that the demigod Māui is said to have cast his line and attempted to pull Kaua`i toward O`ahu, creating a single island of the two. When he felt he had hooked Kaua`i firmly, he gave a mighty tug and pulled up an enormous boulder from the sea

floor. This rock is known today as Pohaku o Kaua`i. The hook flew from its line and was lost in Pālolo Valley (Thrum in Sterling and Summers 1978:65-66).

The Wai`anae District's landscape is daunting, but its earliest coastal settlements were prosperous. In an early Historic description of the area, Vancouver (in Sterling and Summers 1978:67-68; Handy and Handy 1972:468) writes, "From the commencement of the high land to the westward of Opooroah (Puuloa) was...one barren rocky waste, nearly destitute of verdure, cultivation or inhabitants...". Vancouver's ship passed Wai`anae by, but if it had landed, these voyagers would have discovered that Wai`anae was not as desolate as it appeared from a distance. Upland crops, including taro (*kalo)*, gourds (*ipu manalo)* and sweet potato (*`uala)* were grown in the uplands of Wai`anae Valley, Mākaha Valley, and Lualualei Valley (Handy and Handy 1972:468). Wet taro cultivation occurred extensively on the low valley slopes and the upper flatlands of these valleys, where water was plentiful (Handy 1940). Today, evidence of terracing can still be seen in the upper reaches of these valleys, but historic sugarcane cultivation obscured terrace remnants in the Waianae Valley bottom. Fishing villages, particularly around Pōka`ī Bay produced the necessary dietary protein; however, the landscape in the lower valley was adverse to plant cultivation. Therefore, trade between the upper and lower valley was essential in this inhospitable portion of western O`ahu.

The Wai`anae District society was punctuated by a distinct need to trade and share resources. This reliance on trade defined the culture in Wai`anae, perhaps to a greater extent than in other regions of O`ahu. The people of Nānākuli, for example, are said to have pretended to be deaf and dumb to passers-by, as they had no fresh water to offer travelers (McGrath *et al.* 1973:10). This, according to Pukui *et al.* (1974) is why this place is called Nānākuli, "looking at the knees." Resource availability, or lack thereof, undoubtedly had a great impact on Wai`anae society.

King Kamehameha I is said to have failed in his attempt to take over Kaua`i because he did not give homage to the Wai`anae gods. Kamakau states, "The fleet went (first) to Wai`anae and the war god (Kūkā`ilimoku) was carried ashore that evening" (Kamakau in McGrath *et al.* 1973*)*. McGrath continues, saying that Kamehameha rededicated two *heiau* to his war god, giving no homage to the war god of Wai`anae. As a result, the Wai`anae gods sent a storm to stop Kamehameha's war canoes from reaching Kaua`i, preventing Kamehameha from taking Kaua`i by force (*ibid*:14).

***WAHI PANA* (LEGENDARY PLACES)**

According to one legend, the origins of *niu* (coconut palm) in the Hawaiian Islands, as well as the naming of Pōka`ī Bay was described as:

> "In very ancient times, when the great Hawaiian chiefs and navigators sailed across the vast Pacific between Hawai`i and Kahiki, a legend arose about a voyaging chief named Pōka`ī. It said that he brought and planted at Wai`anae the first coconut tree in Hawai`i, from which grew in time a famous grove, Ka Ulu Niu o Pōka`ī. The grove stretched from the site of the present police station to that of the Sacred Hearts Church...the bay *makai* of the grove, formerly known as Mā`alaea, eventually took the name of the legendary planter" (Clark 1977:87).

Spirituality and cultural significance of the region is punctuated by the high number of *heiau* in Wai`anae District, both along the coast and inland. McAllister (1933:112-114) names nine *heiau* in Wai`anae Valley alone: Puupaheehee (McAllister Site 152), Kuilioloa (McAllister Site 153), Keopuni (McAllister Site 155) Kahoali`i (McAllister Site 156), Malaihakoa (McAllister Site 157), Kikahi McAllister (McAllister Site 158), Kalamaluna (McAllister Site 159), Kane (McAllister Site 160), Kamaile (McAllister Site 161), and Punanaula (McAllister Site 161). Some of these *heiau* have been destroyed, while some are partially or fully intact. Kuilioloa Heiau is particularly interesting, as this is the only known *heiau* on O`ahu to be surrounded by water on three sides. It rests on Kane`ilio Point at the eastern extremity of Pōka`ī Bay.

Lualualei Valley was important during the pre-Contact Period, as evidenced by the many named *`ili* across the valley landscape, these locales were especially prosperous for growing seasonal crops in the back of the valley where water resources were more plentiful (Kelly in Haun *et al*. 1991:343). In mid-valley reaches, pili grass was acquired and used for housing thatch, while lower valley areas were successfully utilized for salt mining and marine resource acquisition (*ibid*). As noted below, a diversity of site types were present in the valley, the sites reflecting soil and water resources available (or not) in each zone.

Lualualei has been interpreted to mean "beloved are spared". The meaning is based on a story about a boy named Kalakua, whose life was spared by the king after he was falsely accused of wearing the king's loin cloth or *malo* (I`i 1983: :23; Sterling and Summers 1978:64-65). Two trails known from prehistoric times cross through the valley and over the mountains. Particularly noted is the Kolekole Pass Trail which connects this Leeward valley with the present-day Schofield Plateau. These trails were lifelines for food, travel, and communication between those living or working on both sides of the Wai`anae Range (Kelly in Haun *et al.* 1991:313).

Numerous stories of Māui, the demigod, are associated with Lualualei Ahupua`a. These stories include a large rock (McAllister Site 148), located approximately 1.1 miles northwest of Nānākuli Station. which is said to be named after Māui (McAllister 1933:110). According to legend,

> "Maui...landed here when he first came to the Hawaiian Islands from the south. This stone at the time was surrounded by water, and it is here that Maui reposed and sunned himself. In the bluff to the northeast of the rock is the shelter in which he lived, and in the vicinity was a spring where he obtained water...".

Another legend tells how Māui was able to obtain fire from the "Mud-hen-of-Hina. According to this story, the gods had taken fire away from men and Māui-a-Kalani (Māui son of Kalani) wanted to find the source of fire. Māui was able to trace the fire to a *mapele* (temple, *heiau*) in Wai`anae District. A woman named `Alae-huapipi owned the fire, called "the fire of Pele", which she kept in the *mapele*. `Alae-huapipi and another woman, named `Alaenuahini, "had the fire in the mapele and from them fire was obtained. From that time men had fire. The source of the fire was in the possession of these two double-bodied women who could take bird form....". So, by observing these to women over a period of time, Māui was able to find out the source of fire" (Kamakau in Sterling and Silver 1978:64).

Another legend pertaining to Lualualei involves the legend of the goddess Pele and her younger sister, Hi`iaka. In this story, Hi`iaka and two traveling companions, Wahine-`ōma`o and Pā`ū-o-Pala`ā, traveled from the island of Hawai‘i to Kaua`i Island in order to bring the chief Lohi`au-ipo (Lohi`au) back to the Big Island from Hā`ena, Kaua`i. During their journey, Hi`iaka and her friend stopped and visited many locations on the islands of Hawai‘i, Maui, Moloka`i, and O`ahu. Once they reached Kaua`i, Hi`iaka found that Lohi`au had died. Once the funerary ceremonies were concluded, Hi`iaka revived Lohi`au and began the journey to return with Lohi`au to Pele's domain at Kīlauea, Hawai`i. During their journey from Kaua`i back to Hawai`i Island, Hi`iaka and her companions stopped at Lualualei, on the island of O`ahu. During this segment of the trip (translated by Maly 1998):

> Hi`iaka and her companions then prepared to depart from Pōka`ī. She told Lohi`au and Wahine`ōma`o, that they would travel by canoe, while she would travel for a while over land, and that they would meet again at Kou [Honolulu]..Hi`iaka then continued her journey along the upland trail. Now the

trail upon which Hi`iaka chose to travel, is the trail which passes above Pōhākea. Hi`iaka passed along the *kula* (plain) of Mā`ili, and then turned to look at the uplands. She saw the dazzling light of the sun on the uplands of Lualualei and Hi‘iaka chanted:

Wela ka lā e!	The sun is hot!
Wela ka lā e!	The sun is hot!
Ua wela i ka lā ke kula o Lualualei	The heat of the sun is on the plain of Lualualei
Ua nau ia e ka lā a ‘oka‘oka...	The sun chews it up entirely...

HISTORIC PERIOD (1778-EARLY 1900S)

By the time of Contact with Westerners (1778), Wai`anae Valley was the political and social center of the *moku* (district) of Wai`anae. However, Lualualei Valley was also occupied, as was Mākaha Valley to the north. Like Lualualei Valley, settlements were concentrated in the lower slopes of Wai`anae Valley, where some water was available for wet taro cultivation, and adjacent to Pōka`ī Bay, where access to the ocean and the rich marine resources was gained.

Slightly earlier, this region became the center for sweeping political changes in the late pre-Contact and early Historic Periods. Pu`u Kawiwi, at the rear of Wai`anae Valley, was the scene of the last stand of Maui Chief Kahekili against the O`ahu warriors. In this last battle of 1784, Kahekili overthrew the O`ahu chiefs, becoming ruling chief of the island. Ten years later, after Kahekili’s death, a power struggle ensued between his son (Kalanikupule) and his half-brother (Kaeo, the ruler of Kaua`i) (Kuykendall 1938, Day1984:60). The Wai`anae warriors sided with Kaeo and they lost the deciding battle, to Kalanikupule, at `Aiea (Day1984:60). A Wai`anae *kahuna* (priest) prophesied the coming of a “big fish” who “would eat all the little fish.” The following year, Kamehameha invaded O`ahu.

Following Kamehameha’s succession as ruling chief, “the despoiled people in large numbers fled to Wai`anae District and settled there. This part of O`ahu being hot, arid, isolated, with little water, was not coveted by the invaders” (Mouritz in Sterling and Summers 1978). The status Wai`anae once carried as a ruling center was now gone.

Kamehameha I monopolized the natural resources of his islands, often using them in great quantity for his own personal interests. According to Kamakau (in Kuykendall 1938), Kamehameha learned the value of conservation during a deal with a Boston ship in 1817. He

purchased the *Columbia* in exchange for two ship-loads of sandalwood. In an effort to pay for the deal, Kamehameha ordered the chiefs of several *moku,* including Wai`anae, to cut sandalwood. Soon the island chain was starving because the people were neglecting their taro patches. Kamehameha, seeing his mistake, then ordered his people to farm. Thereafter, Kamehameha managed the island's resources more carefully.

Christian missionaries were quick to establish parishes throughout O`ahu following their arrival in 1820. However, it wasn't until the 1840s that these missionaries began licensing natives to preach, and even longer before native ministers were ordained. David Malo and Blind Bartemeous (Pua`aiki) were the first ordained Hawaiian ministers. Ordained in 1850, Stephen Waimalu became the first Hawaiian minister of Wai`anae District (Kuykendall 1938).

Sugar cultivation began in 1878 with a small operation owned by Hermann Widemann and Julius Richardson. Two years later, George and Albert Wilcox purchased and chartered the Waianae Sugar Company (Condè and Best 1973). Sugar in Wai`anae, like other operations throughout O`ahu, was limited by the lack of arable land and available water resources. This adversity was punctuated in the Wai`anae, Lualualei, and Mākaha Valleys, where water tunnels were eventually constructed to provide irrigation to the plantations. Despite this challenge, Waianae Sugar Company was among the most efficient sugar plantations in Hawai`i. At its peak, the plantation produced 13.79 tons of sugar per acre in 1935 (Dorrance and Morgan 2000). However, high yields did not make up for a lack of growing room and the plantation eventually was closed in 1946.

During the Māhele, traditional land tenure was abrogated in favor of western ownership principles (see below). The Hawaiian Monarchy gave portions of land to natives who could prove that they actively cultivated land segments. These land awards were given in the form of Land Commission Awards (LCAs). LCAs and Land Grants (lands that were made available for purchase) abound in Wai`anae District.

According to Kelly (in Haun *et al*. 1991:319-320), Kamehameha III claimed as his personal property the *ahupua`a* of Wai`anae, Lualualei, and Nānākuli. By 1850, a total of six LCA's were awarded for Lualualei Valley, all being in the *`ili* of Puhawai. Based on the 1998 USGS Waianae quadrangle map, the area of Puhawai appears to be located along the north side of Lualualei Ahupua`a within the Lualualei Homesteads. The LCA's represented land used for *lo`i*, dryland crops on the *kula*, *wauke*, and salt production (*ibid*). No Land Commission Awards exist within the current study area.

By 1851 W. Jarrett was ranching on 17,000 acres of Lualualei lands, many of the walls built during this time having been recorded by archaeologists (see below). In the early 1900s, Lualualei was partially utilized as pasture lands for cattle, sheep, and horses. Kelly (in Haun *et al*. 1991:344) notes that at this time, Crown lands were open for homesteading but the modest local population still had difficulty obtaining water, particularly until the Waianae Sugar Plantation closed in 1946. While sugar cane was attempted to be grown in various portions of the valley, the water supply remained inadequate; as was the problem during prehistoric times, consistent high water flow was problematic. Multiple ditches, tunnels, flumes, and reservoirs were built through and in Lualualei Valley to obtain and hold water for sugar production. Given the low water resources even after these structures were built, the conflict for water between homesteaders and the sugar plantation remained.

According to Kelly (in Haun *et al*. 1991:339), "...[o]ne of the earliest references to military activity [Lualualei] had to do with Kolekole Pass Road (Military Road No. 280) which was mentioned in a Presidential Executive Order (No. 3885) dated July 1923". Apparently, a Governor's Executive Order (No. 3885) "...was issued on the lower road that led to the Kolokole Pass Road, dated 25 April 1923" (*ibid*). Kolekole Pass Road provided military access from Schofield Barracks across the Wai`anae Mountain Range into Lualualei Valley. In 1929, Lualualei Depot was constructed and in 1934, ammunition was first stored in Lualualei Valley. This started a long use of the valley by the U.S. military, primarily the U.S. Navy, which continues today. Although the U.S. Navy is the largest land tenant within Lualualei Ahupua`a, there are multiple residential land parcels and various industrial business and farms *(i.e.,* agriculture and livestock).

THE MĀHELE

In the 1840s, traditional land tenure shifted drastically with the introduction of private land ownership based on Western law. While it is a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was forced to establish laws changing the traditional Hawaiian economy to that of a market economy (Kuykendall 1938, Vol. I: 145; Daws 1968:111; Kelly 1983:45, 1998:4; Kame`eleihiwa 1992:169–70, 176). The Māhele of 1848 divided Hawaiian lands between the king, the chiefs, the government, and began the process of private ownership of lands. The subsequently awarded parcels were called Land Commission Awards (LCAs). Once lands were made available and private ownership was instituted, the *maka`āinana* were able to claim the plots on which they had been cultivating and living. These claims did not include any previously cultivated but

presently fallow land, *`okipū* (on O`ahu), stream fisheries, or many other resources necessary for traditional survival (Kelly 1983; Kame`eleihiwa 1992:295; Kirch and Sahlins 1992). If occupation could be established through the testimony of two witnesses, the petitioners were awarded the claimed LCA and issued a Royal Patent after which they could take possession of the property (Chinen 1961:16).

According to the Waihona `Aina Database (2013), there were thirteen Land Court Award claims made in Lualualei Ahupua`a during the Māhele, none of which were within the current study area. However, the REDI Realty Tax Map Key [TMK: (1) 8-7-010:007] indicated that the proposed undertaking is located within Land Grant 4751 (see Appendix E). Archival research indicated Land Grant 4751, comprised of 2,629 acres, was purchased by H.M von Holt for $1.00. The current study area is situated in the western portion of Land Grant 4751, within the boundaries of Lot 8 (1,149 acres).

ARCHAEOLOGY

The following excerpts are a sample of archaeological studies conducted in the Lualualei Ahupua`a that will aid in the creation of an archaeological site predictive model that can be utilized for settlement pattern analysis of the Lualualei Ahupua`a.

THE *MAUKA* (EASTERN) HALF OF LUALUALEI AHUPUA`A

During the early 1930s, Gilbert J. McAllister, under the auspices of the Bernie P. Bishop Museum, conducted one of the earliest and most extensive archaeological surveys on O`ahu and documented three sites in Lualualei Valley. The first was Nioula Heiau, denoted as Site 149 (State Site 50-80-08-1179) (McAllister 1933:110–111, Sterling and Summers 1978:66) and consisting of a paved and walled *heiau* of the *po`o kanaka* class. At the time of McAllister's (1933) recording, the northern flank of the structure was almost completely destroyed, with the stones having been removed and used as a cattle pen. The structure was noted on Halona Ridge, just southwest of the Forest Reserve Line (near the end of current Forrestal Road). State Site 50-80-08-1179 was significant in that it was purported to be the *heiau* of Chief Kakuhihewa, on which the body of a boxer killed by Kewalo was placed and offered as sacrifice to the gods (McAllister 1933:110; in Sterling and Summers 1978:66).

The second site was a fairly large site complex (McAllister Site 150, subsequently designated State Site 50-80-08-1180) which were located in the middle of Lualualei at the foot of the cliffs (McAllister 1933:110–111, Sterling and Summers 1978:66). Haun *et al*. (1991:28) note that this site is referred to as the "Lualualei Complex" and was identified "upslope from the

west end of 59th Street to the base of steeper slopes and cliffs." When first observed by McAllister (1933:110), the site complex consisted of "...innumerable walls and small terraces that may have been house sites or possibly very old *heiaus* (McAllister 1933:110). Haun *et al.* (1991:28) noted that McAllister (1933:110) initially stated that the structures were poorly preserved due to cattle damage. During the Haun *et al.* (1991) survey, only two features of the complex were recorded, presumably due to further deterioration to the site.

The third site noted in Lualualei Valley by McAllister (1933:110, Sterling and Summers 1978:66) was also a named *heiau*: Kakioe Heiau, also referred to as Site 151. According to Thrum (1909), the *heiau* was located at Puhawai, Lualualei, but nothing remained of the *heiau* "but its sacred spring, and the sound of its drums and conchs on the nights of Kane" (Sterling and Summers 1978:66). Haun *et al*. (1991:29) found no evidence of the *heiau* during their survey work.

In addition to these three notable sites/site areas described above, Haun *et al*. (1991:29) documented three additional, previously identified, sites. These consist of Kolekole Rock, a bowl-shaped rock located at the intersection of Kolekole Road and 46th Street, another bowl-shaped rock, and a *hoana* stone, near the officer's mess in Lualualei. The latter rock and stone were in a secondary location, and later moved to a third location (north side of the administration building).

The Haun *et al*. (1991) archaeological project led to the documentation of 197 sites comprised of over 1,020 features. These sites included pre-Contact habitation and agricultural complexes, and historic period walls. Testing was conducted by Haun *et al*. (1991:150) at State Site 50-80-08-1760 and consisted of placing a shovel probe through the Feature A slab-lined hearth. The excavation revealed four strata from surface to just under a meter in depth. Layer II consisted of a thin cultural deposit consisting of charcoal and a *kukui* nut fragment. The charcoal was submitted for radiocarbon dating and returned a calibrated age of A.D. 1425-1655, firmly within pre-Contact times.

Dixon *et al*. (2002) reported on the findings of an archaeological survey that included areas previously documented by Haun *et al.* (1991) eleven years earlier. Only one feature assessment changed for State Site 50-80-07-1760. Dixon *et al*. (2002:4) interpreted the original "rectangular mound" of Feature B as more of a C-shaped structure. Assessments of the two other sites (State Site 50-80-07-1767 and State Site 50-80-07-1797) were not changed from their original recordation by Haun *et al*. (1991).

State Site 50-80-08-1761 was located at 387 ft. amsl. and consisted of five habitation and agricultural features. The site measured 73 m by 63 m (4,599 m²) and consisted of a U-shaped structure, three agricultural terraces, and an agricultural mound. The U-shaped feature yielded prehistoric artifacts inclusive of a basalt core, debitage, and a circular polished stone fragment. This site was also re-identified by Dixon *et al*. (2002). No interpretations were changed from the original survey, only several GPS points were added for site information.

State Site 50-80-08 -1797 was located at 230-276 ft. amsl. and measures 249 m by 117 m (2.9 hectare). The site consists of two historic rock walls, both functioning as boundary markers. Both are in a poor-good preservation state and reflect historic ranching in the area. This site was again re-identified by Dixon *et al*. (2002). No interpretations were changed from the original survey.

THE *MAKAI* (WESTERN) HALF OF LUALUALEI AHUPUA`A

Barrera (1975) reported the findings of six archaeological sites (State Sites numbers 50-80-07-5309 through -5314) during a pedestrian survey of approximately 80-acres of land owned at the time by the Kaiser Pacific Properties Corporation. (Note: The project area perimeter of Barrera's 1975 survey cannot be pinpointed with regards to a Tax Map Key as his project area location map does not have a scale). State Sites numbers 50-80-07-5309 through -5314 included surface features such as enclosures, walls, platforms, C-shaped structures, mechanically damaged amorphous sites, and a surface midden scatter. Archaeological excavations were not conducted.

Cordy (1975) conducted archaeological excavations at State Site 50-80-07-5309, "a roughly rectangular stone structure," and produced various ferrous metal artifacts such as nails, banding fragments, can fragments, milled wood, a pig bones, and a bottle neck fragment. Excluding the bottle neck fragment that was found in the site's stone architecture, all of the other artifacts were found below the site's architecture. Thus, Cordy (1975) interpreted Site -5309 as "a recent structure—dating in this century" (20th century).

In 1990, while excavating for the placement of an 8-inch watermain, seven (7) human burials were inadvertently discovered within sandy matrices. Field analysis interpreted the burials as of Polynesian ancestry (Hammatt and Shideler 1990). Collectively, these burials were assigned as State Site 50-80-08-4244.

Ogden Environmental and Energy Services conducted an Archaeological Reconnaissance survey of 260-acres for the Lualualei Radio Transmission Facility (Robins and Anderson 1998). A total of three archaeological sites were identified. State Site 50-80-07-5591 consisted of a complex of ditches and modified drainages associated with the sugarcane industry that extended from the 1800s to the 1900s. State Site 50-80-07-5592 (a terraced stone enclosure constructed of limestone boulder-sized slabs and cobbles) was interpreted as a Traditional-type permanent habitation site. State Site 50-80-07-1886, a rock mound initially identified by Haun (1991), was re-located and interpreted as a traditional Hawaiian site of undetermined function. No archaeological excavation was conducted by Ogden Environmental and Energy Services Company to confirm the presence of subsurface archaeological cultural material at State Sites 50-80-08-1886 and -5592.

McDermott and Hammatt (2000) reported the findings of two buried Traditional-type cultural strata (State Sites 50-80-07-5672 and -5673) during an Archaeological Inventory Survey of beach front properties [Tax Map Keys (1) 8-7-005:001, 003, and 005; 8-7-006:003; 8-7-008:001 and 026; and 8-7-008:026]. Based on the presence of Traditional-type food midden and associated shell and lithic artifacts recovered, the two sites were interpreted as occupied during the late pre-Contact or early post-Contact times.

In 2012, Scientific Consultant Services, Inc. conducted an Archaeological Inventory Survey of approximately 123.6-acres of land in preparation for the placement of a solar panel farm located in Lualualei, Lualualei Ahupua`a, Wai`anae District, Island of O`ahu, Hawai`i [TMK: (1) 8-7-010:020 portion] (Dagher *et al.* 2012). During the survey three previously documented sites (State Sites 50-80-07-3337, -3338, and -3750) were re-located and the remaining two sites (State Sites 50-80-07-7391 and -7392) were newly identified. One site, SCS Temporary Site T-2, was dropped from the archaeological list given archaeological testing revealed the site was mechanically created. Limited subsurface testing was conducted but did not produce archaeological cultural material. Archaeological work in this area follows Cordy (1976), Mayberry and Rosendahl (1994) and Jimenez (1994).

Jimenez (1994) returned to the location of five Mayberry and Rosendahl (1994) sites (State Sites 50-80-07-3335, -3339, -3344, -3750, and -3755) for the sole purpose of archaeological excavation. Unfortunately, State Site 50-80-07-3335, a sinkhole/well, was destroyed prior to excavation. Collectively, several excavations of the remaining four sites produced artifacts, midden, and charcoal. At State Site 50-80-07-3339, two excavations produced modern military ammunition cartridges and a burnt bone. At State Site 50-80-07-3344,

two excavations produced flecks of charcoal. A radiocarbon sample from Test Unit 1 Stratum III-1 submitted from the excavation at Site -3344 returned one sigma calibrated calendric dates of 1670-1774 A.D. and 1793-1948 A.D. A second radiocarbon sample from TU-6 Stratum II-1 at the same site returned one sigma calibrated calendric dates of 1671-1772 A.D. and 1794-1947 A.D. At State Site 50-80-07-3750 two excavations produced marine shell ecofacts, charcoal, and chert flakes. Test Unit 4 Stratum II-1 at Site -3750 returned several one sigma calibrated calendric dates of 1426-1639 A.D., 1746-1799 A.D., and 1941-1955 A.D. At State Site 50-80-07-3755 two subsurface excavations did not produce cultural material.

PREVIOUS ARCHAEOLOGY WITHIN TMK: (1) 8-7-010:007

In 2007, Cultural Surveys Hawai`i, Inc. conducted an Archaeological Inventory Survey-level investigation of 6-acres of land for what is currently the site of the Leeward Coast Emergency Homeless Shelter Project, Lualualei Ahupua`a, Wai`anae District, Island of O`ahu [TMK: (1) 8-7-010:007] (Tulchin and Hammatt 2007). The Tulchin and Hammatt (2007) project area, located in the northwest corner of the current study area, included archaeological monitoring of tree removal and subsurface geotechnical testing. No archaeological sites were identified.

Subsequent to the above-described inventory survey, Cultural Surveys Hawai`i, Inc,. conducted Archaeological Monitoring of 6.5-acres of land during ground altering activities associated with the construction of the Leeward Coast Emergency Homeless Shelter, Lualualei Ahupua`a, Wai`anae District, O`ahu Island [TMK: (1) 8-7-010:007 (Hunkin and Hammatt 2008). No archaeological sites were identified.

In 2008, Cultural Surveys Hawai`i, Inc,. conducted an Archaeological Inventory Survey-level study of approximately 0.5-acres of land for the Leeward Coast Emergency Homeless Shelter, Lualualei Ahupua`a, Wai`anae District, O`ahu Island [TMK: (1) 8-7-010:007 (Tulchin and Hammatt 2008). The Tulchin and Hammatt 2008 project area was located immediately adjacent to the southeast corner of the two above-described project areas. No archaeological sites were identified.

In 2009, International Archaeological Research Institute, Inc. conducted an Archaeological Inventory Survey of the subject property which identified a total of twenty-one surface features (Rieth 2009). These features were incorporated into three archaeological sites: State Site 50-80-07-7081, the VOA Radio Transmission Site; State Site 50-80-07-7082, the

VOA transmitter buildings and ancillary features; and State Site 50-80-7-7083, which was interpreted by Reith (2009) as raised railroad bed remnant from the Waianae Sugar Company. No subsurface testing was conducted.

Scientific Consultant Services, Inc. recently completed an Archaeological Inventory Survey of the current study area located in Mā`ili, Lualualei Ahupua`a, Wai`anae District, Island of O`ahu, Hawai`i [TMK: (1) 8-7-010:007] (Dagher and Spear 2013, in prep.). The Archaeological Inventory Survey was conducted on approximately 90-acres of land of which 40-acres located in the southern portion of the project area will be developed for the proposed Kamehameha Schools Community Learning Center (KCLC). During the survey, the sixteen surface features (1 through 6, 8, 9, 11 through 13, 15 through 18, and 21) comprising State Site 50-80-07-7081 were re-located (Dagher and Spear 2013, in prep.). The buildings and the ancillary features of State Site 50-80-07-7082, were not re-located as this site was located in the exclusion zone (see Rieth 2009) (see Figures 1 and 2). However, State Site 50-80-07-7082, Feature 7, a series of fencelines which traverse the study area, was re-located. The previously identified State Site 50-80-7-7083 was re-located. State Site 50-80-07-7083 was re-interpreted as a cart path, given the absence of evidence supporting the functional interpretation of a raised railroad bed.

Three surface features, two VOA antennae foundations and a Historic Period trash dump, were newly identified during the inventory survey (Dagher and Spear 2103,in prep.). Based on proximity, these features were incorporated into State Site 50-80-07-7081. In an attempt to retain consistency and to avoid confusion, the newly identified features were sequentially numbered following Rieth (2009). Thus, the VOA antennae foundations have been designated Feature 22 and 23. The Historic Period trash dump was designated Feature 24. The previously identified State Site 50-80-07-7081 and State Site 50-80-07-7082, Feature 7, were re-evaluated for significance, as outlined in Hawai‘i Administrative Rules §13-275-6, and found to be significant under Criteria A, associated with historic events or activities, and Criterion D, for information content. The three newly identified surfaced features incorporated into State Site 50-80-07-7081, were also found to be significant under Criteria A and Criteria D. However, as these sites are not structurally unique, they are not recommended for preservation. State Site 50-80-07-7083 was found to be significant under Criterion A, D, and C, as an excellent example of a feature type. Thus, State Site 50-80-07-7083, in its entirety or segment(s), is recommended for preservation (Dagher and Spear 2013, in prep.).

SUMMARY OF LUALUALEI VALLEY ARCHAEOLOGICAL RESOURCES

Of the multiple archaeological projects conducted in the valley over a span of c. 90 years, a wide range of sites were identified, including Traditional-period sites and historic features having been documented in all parts of the valley, from near coastal reaches to the uplands. Haun *et al*. (1991: 307-308) and Robins and Anderson (1998:37-38) provide a summary of the settlement pattern: permanent habitation loci near the coastline and in the back of the valley, much like the pattern for Mākaha Valley. Permanent habitation in the back of the valley was concomitant with the presence of freshwater resources, which allowed for irrigated agriculture. Mid-valley reaches of Lualualei Valley is reflected by a drier, *kula* landscape in which temporary habitation sites (*i.e.,* C-shapes) were built and dryland agriculture was practiced.

Located in the valley were diverse, a majority including traditional-type pre-Contact Hawaiian sites reflecting permanent and temporary habitation, religious and ceremonial use (heiau, burials), both irrigated and dryland agricultural loci, animal pens and walls, and lithic workshop areas, as evidenced by debitage clusters and partially finished tools. Historic sites were primarily represented by walls, ditches, and flumes indicative of ranching, sugar cane cultivation, and historic homesteading. Radiocarbon results from multiple sites around the valley indicate initial settlement, on a temporary basis, from the early to mid A.D. 1400s and late 1600s, primarily in upland locales (near water resources). Permanent occupation of the valley commenced around the start of the 1600s and into the 1800s.

Kelly (in Haun *et al*. 1991:345) pointedly sums up the history of Lualualei Valley use through time by stating that the outstanding issues for habitation and use of the land through history has been the story of water resources.

CONSULTATION

Consultation was conducted via telephone, e-mail, and the U.S. Postal Service. Consultation was sought from Walterbea Aldeguer, community member, Wai`anae; Eric Enos, Ka`ala Farm; Lucy Gay, community coordinator and *kupuna* learning group coordinator, Wai`anae; Glen Kila, community member; Keala Kwan, community member; Richard Landford, Lualualei Hawaiian Civic Club; Christopher Oliveira, community member; Cynthia Rezentes, community member; Albert Silva, community member; Maryknoll Spotkaef, community member; Bob Hogue, *kupuna* learning group and community member, Wai`anae; Bruce Gustafson, *kupuna* learning group and community member, Wai`anae; Lily Campbell, *kupuna* learning group and community member, Wai`anae; Helen Nakasone, *kupuna* learning group and community member, Wai`anae; Lani Dano, *kupuna* learning group and community member,

Wai`anae; Lio Neill, *kupuna* learning group and community member, Wai`anae; Linda Aipa, Kupuna Learning Group, Leeward Community College, Wai`anae; Arleen Balecha, *kupuna* learning group and community member, Wai`anae; Harris K. C. Hopfzsr, *kupuna* learning group and community member, Wai`anae; Pat Patterson, *kupuna* learning group and community member, Wai`anae; Emerson Kahoano, Jr., *kupuna* learning group and community member, Wai`anae; Richard Tripp, *kupuna* learning group and community member, Wai`anae; Sierra C. Kuroda, *kupuna* learning group and community member, Wai`anae; Alice Greenwood, *kupuna* learning group and community member, Wai`anae; Grace Sabrina, *kupuna* learning group and community member ,Wai`anae; William Aila, Jr., Chairperson Department of Land and Natural Resources and community member; William Aila, Sr., community member; Nettie Armitage-Lapilio, community member; Joseph Lapilio, community member; Kepa Maly, Historian; William Ho`ohuli, community member; Phyllis "Coochie" Cayan, State Historic Preservation Division; Shad Kane, `Ewa O`ahu Island Burial Council Representative; Michael K. Lee, community member, and Victoria Holt-Takamine, Kumu Hula and community member, Alika Silva, community member; Poka Laenui Burgess, community member; Puanani Burgess, community member; and Henry Ahlo, community member.

A Cultural Impact Assessment Notice was published in *The Honolulu Star-Advertise*r, January 1, 2, and 6, 3 issuethe February 2013 issue of the OHA newspaper, *Ka Wai Ola* (Lisa Asato, Office of Hawaiian Affairs, personal communication) (see Appendix C). These notices requested information of cultural resources or activities in the area of the proposed project, stated the Tax Map Key (TMK) number, and where to respond with pertinent information.

Based on the responses of the individuals consulted, an assessment of the potential effects on cultural resources in the study area and recommendations for mitigation of these effects can be proposed.

CULTURAL IMPACT ASSESSMENT INQUIRY RESPONSE SUMMARIES

Analysis of the potential effect of the project on cultural resources, practices or beliefs, the potential to isolate cultural resources, maintain practices or beliefs in their original setting, and the potential of the project to introduce elements that may alter the setting in which cultural practices take place is a requirement of the OEQC (No. 10, 1997). As stated earlier, this includes the cultural resources of the different groups comprising the multi-ethnic community of Hawai`i.

As stated above, consultation was sought from local community organizations; a *kupuna* learning group that meets at Leeward Community College; State of Hawai`i agencies; and

knowledgeable community members and local residents. In addition, legal notices were placed in *The Honolulu Star-Advertise*r and the OHA newspaper, *Ka Wai Ola*. Follow-up Letters of Inquiry were mailed to be the above-mentioned individuals, as necessary (see Appendix C). In addition, please note that no written responses, to letters of inquiry, were received. None of the individuals interviewed indicated in their responses that any traditional cultural practices would be affected by the proposed Kamehameha Schools Community Learning Center.

Consultation efforts for the CIA for the proposed Kamehameha Schools Learning Center in Mā`ili resulted in four responses. Two of these responses were received by telephone, one response was received via e-mail, and one response was received via the U. S. Postal Service. These responses are summarized below and the written responses are reproduced in their entirety in Appendix D. As one of the responses included information pertaining to Traditional Cultural Practices in Lualualei, an Information Release Form is presented in Appendix E.

On January 2, 2013, Albert Silva, community member, stated, via telephone, that he did not know of any traditional cultural practices associated with the study area or Lualualei, but recommended contacting Charles Holt; Milton Holt, son of Charles; or Victoria Holt-Takamine, daughter of Charles, as they are long-time residents of the area (personal communication January 21, 2013. Attempts to confirm street and e-mail addresses for Charles Holt and Milton Holt were unsuccessful. However, a Letter of Inquiry was sent to Mrs. Holt-Takamine, via e-mail, on January 14, 2013.

The Office of Hawaiian Affairs responded, via the U.S. Postal Service (letter dated January 7, 2013, from Dr. Kamana`opono M. Crabbe, OHA to Cathleen Dagher, SCS Senior Archaeologist. In this letter OHA applauded Kamehameha Schools for "moving forward with this project" and indicated OHA was looking forward to the completion of the Learning Center, as the "new facilities, events, classes, and services" will be beneficial to the "Wai`anae Coast and the larger community." The Office of Hawaiian Affairs did not indicate in this transmittal that the proposed undertaking would impact any traditional cultural places or impact access rights.

On January 9, 2013, Eric Enos, community member and resident, stated, via e-mail, the cultural significance of Lualualei Ahupua`a "is still being revealed." Mr. Enos indicated that the Lualualei Ahupua`a has been impacted by a variety of human activities from the pre-Contact Period to the present, with the most significant alterations to Lualualei during the "American occupation leading up to and after the 'war years." As long time residents of the area, Mr. Enos and his family experienced "massive flooding" during periods of heavy rains, prior to the

construction of the flood drainage channels. Mr. Enos explained that the stories of Māui, the demi-god, and the mud hens are pertinent mythologies specific to this area because the area was in marshlands during the pre-Contact Period. In summary, Mr. Enos states that the area has been heavily compromised by previous grading activities and the construction of military structures. Mr. Enos did not indicate in his transmittal that the proposed undertaking would impact any traditional cultural places or impact access rights.

During a January 8, 2013 telephone interview, William Aila, Jr. (community member, resident, and Department of Land and Natural Resources Chairperson) provided a wealth of information pertaining to Lualualei. This information is paraphrased below.

The Aila family has lived in Lualualei for three generations. Mr. Aila, Jr., has lived in Lualualei for fifty-four years. When asked if he knew of any Traditional Cultural Practices conducted in Lualualei, Mr. Aila, Jr., responded that fishing for specific types of fish in specific areas was conducted in Lualualei and along the entire Wai`anae Coast to provide fish for specific ceremonies. Limu was gathered from the coastal area for religious and burial ceremonies. The ocean was utilized for gathering marine resources and for subsistence fishing. The environment provided other resources, such as rocks, which were gathered in Lualualei for constructing *ahu* (shrines), and traditional plants, including *olena* (*Curcuma domestica*, tumeric), *ti* (*kī*, *Cordyline fruticosa*), *mai`a* (banana, *Musa*), *`awa* (*Piper methysticum*), *`uala* (sweet potato, *Ipomoea batatas*), *kalo* (*taro, Colocasia esculenta*), and *luahala* (*Pandanus tectorius*) were grown and gathered for food and ceremonies.

Numerous legends are associated with Lualualei. According to Mr. Aila, Jr., Nioi`ula Heiau is associated with the *ali`i* Kawelo (see Sterling and Summers 1978:66; Handy and Handy 1972:467); Pāhe`ehe`e Ridge, which separates Wai`anae Ahupua`a and Lualualei Ahupua`a, was the site of a *holua* slide. In another story related by Mr. Aila, Jr., three mountains (Pu`u Huluhulu, Pu`u Mā`ili`ili, and Pu`u Pāhe`ehe`e) are associated with an amorous chief who was in love with twin sisters and could not choose between them. So, either the father of the chief or a *kahuna* (priest) turned the three of them into mountains so that they could be together forever. In addition, Mr. Aila, Jr. mentioned that Māui, the demigod, was associated with several legends from Lualualei. On January 9, 2013, Mr. Aila, Jr., affirmed, via telephone, that the proposed undertaking would not impact any traditional cultural places or impact access rights.

SUMMARY

The "level of effort undertaken" to identify potential effect by a project to cultural resources, places or beliefs (OEQC 1997) has not been officially defined and is left up to the investigator. A good faith effort can mean contacting agencies by letter, interviewing people who may be affected by the project or who know its history, research identifying sensitive areas and previous land use, holding meetings in which the public is invited to testify, notifying the community through the media, and other appropriate strategies based on the type of project being proposed and its impact potential. Sending inquiring letters to organizations concerning development of a piece of property that has already been totally impacted by previous activity and is located in an area previously impacted by commercial agriculture may be a "good faith effort". However, when many factors need to be considered, such as in coastal or mountain development, a good faith effort might mean an entirely different level of research activity.

Historical and cultural source materials were extensively used and can be found listed in the References Cited portion of the report. Such scholars as Samuel Kamakau, Martha Beckwith, Jon J. Chinen, Lilikalā Kame`eleihiwa, R. S. Kuykendall, Marion Kelly, E. S. C. Handy and E.G. Handy, Elspeth P. Sterling, and Mary Kawena Puku`i and Samuel H. Elbert and continue to contribute to our knowledge and understanding of Hawai`i, past and present. The works of these and other authors were consulted and incorporated in the report where appropriate. Land use document research was supplied by the Waihona `Aina 2013 Database, the REDI Realty Tax Map Key, and the State of Hawai`i Archives.

In the case of the current undertaking, letters of inquiry were sent to individuals and organizations that may have knowledge or information pertaining to the collection of cultural resources and/or practices currently, or previously conducted in the *ahupua`a* of Lualualei, and the District of Wai`anae. As stated elsewhere in this document, consultation was sought from a *kupuna* learning group, Wai`anae; Lualualei Hawaiian Civic Club; the O`ahu Island Burial Council (`Ewa District Representative); Office of Hawaiian Affairs, O`ahu; State Historic Preservation Division, Kapolei, and individuals recognized by the community In addition, a Cultural Impact Assessment Legal Notices were published in *The Honolulu Star-Advertise*r and the OHA newspaper, *Ka Wai Ola* (see Appendix C).

CULTURAL ASSESSMENT AND RECOMMENDATIONS

Analysis of the potential effect of the project on cultural resources, practices or beliefs, its potential to isolate cultural resources, practices or beliefs from their setting, and the potential of the project to introduce elements which may alter the setting in which cultural practices take

place is also a suggested guideline of the OEQC (No. 10, 1997). To our knowledge, the project area has not been used for traditional cultural purposes within recent times.

Based on the above research, it is reasonable to conclude that, pursuant to Act 50, the exercise of Native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities will not be affected by proposed Kamehameha Schools Learning Center to be located on approximately 40 acres of land located in Mā`ili, Lualualei Ahupua`a, Wai`anae District, Island of O`ahu, [TMK: (1) 8-7-010:007 (por.)].

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APPENDIX A: EXAMPLE LETTER OF INQUIRY

Date

Dear :

In compliance with the State of Hawai‘i Revised Statutes (HRS) Chapter 343 Environmental Impact Statement Law and in accordance with the State of Hawai`i Department of Health’s Office of Environmental Quality Control (OEQC) Guidelines for Assessing Cultural Impacts as adopted by the Environmental Council, State of Hawai`i on November 19, 1997, Scientific Consultant Services, Inc. (SCS) is in the process of preparing a Cultural Impact Assessment (CIA) pertaining to a proposed Kamehameha Schools Community Learning Center (KCLC) and necessary infrastructure and roadway improvements, located on approximately 40 acres of land within the Lualualei Ahupua`a, Wai`anae District, O`ahu Island [TMK: (1) 8-7-010: 007 (portion)] (Figures 1 and 2).

Scientific Consultant Services is in the process of conducting an Archaeological Inventory of the TMK: (1) 8-7-010: 007, in its entirety (c. 90 acres) in order to determine the presence of archaeological cultural materials.

According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

> The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs…The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man made and natural which support such cultural beliefs…

We are asking you for any information that you or other individuals have which might contribute to the knowledge of traditional cultural activities that were, or are currently, conducted in the vicinity of the proposed undertaking. We are also asking for any information pertaining to traditional cultural activities or traditional rights which may be impacted by the proposed undertaking. The results of the cultural impact assessment are dependent on the response and contributions made by individuals, such as yourself.

Enclosed are maps showing the proposed project area. Please contact me at the Scientific Consultant Services, Honolulu, office at (808) 597-1182 or via e-mail cathy@scshawaii.com) with any information or recommendations concerning this Cultural Impact Assessment.

Sincerely yours,

Cathleen Dagher
Senior Archaeologist
Enclosures (2)

Cc: Walterbea Aldeguer, community member; Eric Enos, Ka`ala Farm; Glen Kila, community member; Keala Kwan, community member; Richard Landford, Lualualei Hawaiian Civic Club; Christopher Oliveira, community member; Cynthia Rezentes, community member; Albert Silva, community member; Maryknoll Spotkaef, community member; Bob Hogue, Kupuna Learning Group, Leeward Community College, Wai`anae; Bruce Gustafson, Kupuna Learning Group, Leeward Community College, Wai`anae; Lily Campbell, Kupuna Learning Group, Leeward Community College, Wai`anae; Helen Nakasone, Kupuna Learning Group, Leeward Community College, Wai`anae; Lani Dano, Kupuna Learning Group, Leeward Community College, Wai`anae; Lio Neill, Kupuna Learning Group, Leeward Community College, Wai`anae; Linda Aipa, Kupuna Learning Group, Leeward Community College, Wai`anae; Arleen Balecha, Kupuna Learning Group, Leeward Community College, Wai`anae; Harris K. C. Hopfzsr, Kupuna Learning Group, Leeward Community College, Wai`anae; Pat Patterson, Kupuna Learning Group, Leeward Community College, Wai`anae; Emerson W. Kahoano, Jr., Kupuna Learning Group, Leeward Community College, Wai`anae; Richard Tripp, Kupuna Learning Group, Leeward Community College, Wai`anae; Sierra C. Kuroda, Kupuna Learning Group, Leeward Community College, Wai`anae; Grace Sabrina, Kupuna Learning Group, Leeward Community College; William Aila, Sr., Chairperson Department of Land and Natural Resources and community member; William Aila, Jr., community member; Nettie Armitage-Lapilio, community member; Joseph Lapilio, community member; Kepa Maly, Historian; William Ho`ohuli, community member; Michael K. Lee, community member; Phyllis "Coochie" Cayan, State Historic Preservation Division; Poka Laenui Burgess, community member; Puanani Burgess, community member; Dr. Kamana`opono M. Crabbe, Chief Executive Officer, State of Hawai‘i Office of Hawaiian Affairs; Alika Silva, community member; Alice Greenwood,. community member

APPENDIX B: LEGAL NOTICES AND AFFIDAVIT OF PUBLICATION

Information requested by Scientific Consultant Services, Inc. (SCS) on cultural resources or on-going cultural activities on or near the proposed Kamehameha Schools Community Learning Center to be located on approximately 40 acres of land located in Lualualei Ahupua`a, Wai`anae District, Island of O`ahu, [TMK: (1) 8-7-010:007 (por.)]. Please respond within 30 days to Cathleen Dagher at (808) 597-1182.

1356

AFFIDAVIT OF PUBLICATION

IN THE MATTER OF
SCS Proj 1356

STATE OF HAWAII }
} SS.
City and County of Honolulu }

Doc. Date: JAN - 7 2013 **# Pages:** 1
Notary Name: Patricia K. Reese **First Judicial Circuit**
Doc. Description: Affidavit of Publication
Notary Signature — JAN - 7 2013 Date

PATRICIA K. REESE NOTARY PUBLIC State of Hawaii Comm. No. 86-467 STATE OF HAWAII

Information requested by Scientific Consultant Services, Inc. (SCS) on cultural resources or on-going cultural activities on or near the proposed Kamehameha Schools Community Learning Center to be located on approximately 40 acres of land located in Lualualei Ahupua'a, Wai'anae District, Island of O'ahu, [TMK: (1) 8-7-010:007 (por.)]. Please respond within 30 days to Cathleen Dagher at (808) 597-1182.
(SA481342 1/1, 1/2, 1/6/13)

Rose Rosales being duly sworn, deposes and says that she is a clerk, duly authorized to execute this affidavit of Oahu Publications, Inc. publisher of The Honolulu Star-Advertiser and MidWeek, that said newspapers are newspapers of general circulation in the State of Hawaii, and that the attached notice is true notice as was published in the aforementioned newspapers as follows:

Honolulu Star-Advertiser 3 times on:
01/01, 01/02, 01/06/2013

Midweek Wed. 0 times on:

_____ times on:

And that affiant is not a party to or in any way interested in the above entitled matter.

Rose Rosales

Subscribed to and sworn before me this 7th day
of January A.D. 20 13

Patricia K. Reese, Notary Public of the First Judicial Circuit, State of Hawaii
My commission expires: Oct 07 2014

PATRICIA K. REESE NOTARY PUBLIC Comm. No. 86-467 STATE OF HAWAII

Ad # 0000481342

LN: _____

APPENDIX C: EXAMPLE FOLLOW-UP LETTER OF INQUIRY

Date

Dear :

This is our follow-up letter to our December 21, 2012 letter which was in compliance with the statutory requirements of the State of Hawai‘i Revised Statute (HRS) Chapter 343 Environmental Impact Statements Law, and in accordance with the State of Hawai`i Department of Health's Office of Environmental Quality Control (OEQC) Guidelines for Assessing Cultural Impacts as adopted by the Environmental Council, State of Hawai`i, on November 19, 1997.

Scientific Consultant Services, Inc. (SCS) is in the process of preparing a Cultural Impact Assessment (CIA) pertaining to a proposed Kamehameha Schools Community Learning Center (KCLC) and necessary infrastructure and roadway improvements, located on approximately 40 acres of land within the Lualualei Ahupua`a, Wai`anae District, O`ahu Island [TMK: (1) 8-7-010: 007 (portion)].

Scientific Consultant Services has recently completed an Archaeological Inventory of the TMK: (1) 8-7-010: 007, in its entirety (c. 90 acres) in order to determine the presence of archaeological cultural materials. A report documenting the findings is currently being prepared (Dagher and Spear 2013 in prep.). In 2009, International Archaeological Research Institute conducted an Archaeological Inventory Survey of the current project area (Rieth 2009). Thus, a portion of the current survey work was dedicated to the relocation of previously identified archaeological sites within the project area: State Site 50-80-07-7081, the Voice of America antennae system; State Site 50-80-07-7082,Voice of America transmitter buildings and ancillary features; and State Site 50-80-7-7083, raised railroad bed remnant from the Waianae Sugar Company.

During the current survey, State Sites 50-80-07-7081 were 50-80-7-7083 re-located. The buildings and the ancillary features of State Site 50-80-07-7082, were not relocated, as this site was located in the exclusion zone (see Rieth 2009. However, State Site 50-80-07-7082, Feature 7, a series of fencelines which traverse the project area, was re-located. Two surface features, a VOA antennae foundation and an Historic trash dump, were newly identified during the current inventory survey. Based on proximity, these features were incorporated into State Site 50-80-07-7081. Limited subsurface testing was conducted, but did not produce archaeological cultural material.

We are asking you for any information that you or other individuals have which might contribute to the knowledge of traditional cultural activities that were, or are currently, conducted in the vicinity of the proposed undertaking. We are also asking for any information pertaining to traditional cultural activities or traditional rights which may be impacted by the proposed undertaking. The results of the cultural impact assessment are dependent on the response and contributions made by individuals, such as yourself.

Enclosed are maps showing the proposed project area. Please contact me at the Scientific Consultant Services, Honolulu, office at (808) 597-1182 or via e-mail (cathy@scshawaii.com) with any information or recommendations concerning this Cultural Impact Assessment.

Sincerely yours,

Cathleen Dagher
Senior Archaeologist
Enclosures (2)

Cc: Walterbea Aldeguer, Clerk, Leeward Community College, Wai`anae; Lucy Gay, Leeward Community College, Wai`anae; Glen Kila, community member; Keala Kwan, community member; Richard Landford, Lualualei Hawaiian Civic Club; Christopher Oliveira, community member; Cynthia Rezentes, community member; Maryknoll Spotkaef, community member; Bob Hogue, Kupuna Learning Group, Leeward Community College, Wai`anae; Bruce Gustafson, Kupuna Learning Group, Leeward Community College, Wai`anae; Lily Campbell, Kupuna Learning Group, Leeward Community College, Wai`anae; Helen Nakasone, Kupuna Learning Group, Leeward Community College, Wai`anae; Lani Dano, Kupuna Learning Group, Leeward Community College, Wai`anae; Lio Neill, Kupuna Learning Group, Leeward Community College, Wai`anae; Linda Aipa, Kupuna Learning Group, Leeward Community College, Wai`anae; Arleen Balecha, Kupuna Learning Group, Leeward Community College, Wai`anae; Harris K. C. Hopfzsr, Kupuna Learning Group, Leeward Community College, Wai`anae; Pat Patterson, Kupuna Learning Group, Leeward Community College, Wai`anae; Emerson Kahoano, Jr., Kupuna Learning Group, Leeward Community College, Wai`anae; Richard Tripp, Kupuna Learning Group, Leeward Community College, Wai`anae; Sierra C. Kuroda, Kupuna Learning Group, Leeward Community College, Wai`anae; Alice Greenwood, Kupuna Learning Group, Leeward Community College, Wai`anae; Grace Sabrina, Kupuna Learning Group, Leeward Community College, Wai`anae; William Aila, Sr., community member; Nettie Armitage-Lapilio, community member; Joseph Lapilio, community member; Kepa Maly, Historian; Michael K. Lee, community member; Phyllis "Coochie" Cayan, State Historic Preservation Division; William Ho`ohuli, community member

APPENDIX D: RESPONSES TO THE LETTER OF INQUIRY

on Jan 09, 2013, Eric Enos <eric@kaala.org> wrote:

Thank you for your information for review

The cultural significance of the ahupua'a related to Lualualei is still being revealed. This specific parcel of land aka "the voice of America" site has transitioned and impacted from pre- contact, to a variety of post contact uses to its most signigicant alteration in "American occupation" activities leading up to and after the "war years". My family lived on St. Johns road prior to the construction of the extensive flood drainage canals and we experienced massive flooding in heavy rains. All of this area was geologically a marsh wetland in pre-historic venues. This is why the Maui stories and marsh hens are prominent mythology specific to this area and related habitats.

Much has changed, I cannot speak to the specific parcel in question and its transformation to government facilities. It was always off limits during my youth and then abandonded after the "cold war". As in all large development activities its impact has to be looked at in its entirety.

In summary, this site specific has been heavily compromised with past grading and military type structures. Its future use is this process we are going through. My comments are limited to the information we are presented with. In terms of specific cultural sites still existing in this area I have no knowledge. I will reserve future comments when the larger plan unfolds for public review. Thank you for keepin us informed and we look forward to having the "big picture", the 10,000 ft. view.

Everything is in context.

Thank you.

Eric Enos - community resident

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD12_4748F

January 7, 2012

Cathleen Dagher, Senior Archaeologist
Scientific Consultant Services, Inc.
711 Kapi'olani Boulevard, Suite 975
Honolulu, Hawai'i 96813

Re: Pre-Cultural Impact Assessment consultation
Kamehameha Schools Community Learning Center Project
Lualualei Ahupua'a, Wai'anae, Island of O'ahu

Dear Cathleen Dagher:

The Office of Hawaiian Affairs (OHA) is in receipt of your December 21, 2012 letter with enclosures seeking comments ahead of a cultural impact assessment (CIA) that will be prepared to support the construction of a community learning center and associated infrastructure and roadway improvements (project) that are proposed by the Kamehameha Schools on forty (40) acres of land in Lualualei Ahupua'a, Wai'anae on the Island of O'ahu.

OHA applauds the Kamehameha Schools for moving forward with this project and look forward to seeing it completed as the new facilities, events, classes and services will certainly benefit the Wai'anae Coast and larger community.

Your letter mentions that you are in the process of conducting an archaeological inventory survey (AIS) of the project area. We look forward to the opportunity to reviewing the draft AIS report, including significance assessments for any identified historic properties and providing additional comments that you should consider in preparation of the CIA.

The list of people who you will be contacting (included with your letter) represent a broad range of knowledgeable individuals with connections to the project area and the Wai'anae Coast. We have no additional recommendations to offer to you at this time. We look forward to seeing the comments and concerns of those you consult with incorporated and addressed in the CIA analysis.

We look forward to receiving the AIS report and continuing CIA consultation with you. Should you have any questions, please contact Keola Lindsey at 594-0244 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Kamana'opono M. Crabbe, Ph.D.
Ka Pouhana, Chief Executive Officer

KM:kl

C: Jason Jeremiah, Kamehameha Schools- Senior Manager, Cultural Resources (via email)

APPENDIX E: INFORMATION RELEASE FORM

INFORMATION RELEASE FORM

I, the undersigned participated in an interview with Scientific Consultant Services, Inc. on 1/9 of the year 2013. Scientific Consultant Services, Inc., Senior Archaeologist, Cathleen Dagher conducted the interview on the Island of O`ahu, State of Hawai`i.

I understand that the information I have provided to Scientific Consultant Services, Inc., shall be submitted as part of a Cultural Impact Assessment report on a proposed Kamehameha Schools Learning Center, Lualualei Ahupua`a, Wai`anae District, O`ahu Island [TMK: (1) 8-7-010: 007 (portion)].

I have read the transcript of the interview and the information is true and accurate to the best of my knowledge. By signing this release form, I am providing my approval for the release of the information to Scientific Consultant Services, Inc., for the purpose outlined above.

Date of recorded interview: January 8, 2013

Print Name: William J. Aila, Jr.

Signature: [signature]

Release Dated: 1/28/13

APPENDIX F: LAND GRANT 4751

Land Patent No. 4751

(Grant.)

On — Land Exchange —

By this Patent the Governor of the Territory of Hawaii, in conformity with the laws of the United States of America and of the Territory of Hawaii, makes known to all men that he has this day granted and confirmed unto

— H. M. Von Holt —

for the consideration of — One — Dollars, $ 1.00 paid into the Treasury.

And for the further consideration of a deed to the Government of the Territory of Hawaii of lands situate in the City of Honolulu, Island of Oahu, required of road purposes from H. M. Von Holt, the receipt of which is hereby acknowledged.

all of the land situate at — Lualualei — in the District of Waianae Island of Oahu bounded and described as follows: — Lot 8. —

Beginning at Puu-o-Kulu mauka Trig. Station marked by an iron oo, or native digger, driven into soft rock and ahu on top of hill of same, as shown on Government Survey Registered Map No. 2040 and running as follows by true bearings:—

1. N. 26° 20' 30" E. 3654 feet along Lot 9 to + on coral stone and ahu;
2. N. 56° 5' E. 5160 " " Public Lands General Lease No. 535 to + on stone and ahu;
3. S. 38° 17' E. 3345 " " Government remainder to + on solid rock 5 feet mauka of fence on slope near base of trail;
4. S. 2° 3' E. 4214 " " the same up the Kalaeakalo hill to a point on its summit as located by Prof. W. D. Alexander;
5. S. 87° 50' 30" W. 6666 " down the hill along Government

Appendix D

Transportation Impact Analysis Report

FEHR PEERS

MEMORANDUM

Date: February 25, 2013

To: Grant Murakami, PBR Hawaii
Michael Shibata, PBR Hawaii

From: Anjuli Bakhru and Sohrab Rashid

Subject: ***Kamehameha Schools Community Learning Center in Maili, Hawaii – Transportation Impact Analysis Report (TIAR)***

SD12-0075

Fehr & Peers has completed a transportation impact analysis for the proposed Kamehameha Schools Community Learning Center (KCLC) in Maili on the Leeward Coast of the island of Oahu. This report includes an assessment of existing conditions and near-term future conditions, with Phase I, Phase II, and Phase III of the project in place, and is based on the latest conceptual program dated December 20, 2012 and the conceptual site plan dated February 4, 2013. A summary of potential transportation issues and recommended improvements is presented below, followed by details of our analysis.

SUMMARY OF FINDINGS

The following findings resulted from the TIAR:

- Typical traffic patterns within the study area include heavy southbound vehicle traffic during the AM peak hour and heavy northbound vehicle traffic during the PM peak hour on Farrington Highway.
- The proposed three-phase project educational facility providing academic, recreation and community resources, is expected to generate approximately 780 net new vehicle trips during the morning peak hour and approximately 450 net new vehicle trips during the evening peak hour based on typical uses. While the KCLC will produce approximately 2,200 daily trips.
- The St. John's Road/Kulaaupuni Street intersection operates at an unacceptable level (Level of Service (LOS) E) during the existing AM peak hour. This is due to traffic generated by Ma`ili Elementary School located north of the intersection, and congestion generally only occurs for less than 30 minutes within the AM peak hour. Under Existing Conditions, the intersection does not warrant signalization.
- In 2014, Phase I of KCLC would not result in a significant traffic impact, and no roadway improvements are required. The study assumed that Kulauku Road would be extended from north of Kulawae Street to directly serve the site but would <u>not</u> connect to the southern terminus of Kulaaupuni Street under this scenario.

- In 2017, development of KCLC Phases I and II would not result in a significant impact, and no roadway improvements are required. This scenario did not assume the planned Kulaaupuni-Kulauku connection but did assume development of some residential uses on the adjacent Department of Hawaiian Homelands (DHHL) parcel per its construction schedule.

- In 2019, buildout of KCLC would result in impacts to the Kaukama Road/Kulauku Street and Kaukama Road/Farrington Highway intersections. Two sets of roadway improvements were identified as potential mitigation options to address projected capacity deficiencies. These include:

    - Option A (without the planned extension of Kulaaupuni to Kulauku)

        - Signalize the Kaukama Road/Kulauku Street intersection

        - Modify the Kaukama Road approach to Farrington Highway to add a third westbound turn lane (minor striping and median modifications required)

    - Option B (with the planned extension of Kulaaupuni to Kulauku)

        - Modify the Kaukama Road approach to Farrington Highway to add a third westbound turn lane

        - Signalize the St. John's Road/Kulaaupuni Street intersection and widen the St. John's approach to provide an additional eastbound right-turn lane

        - Widen the St. John's Road approach at Farrington Highway to provide westbound two-turn lanes (right-of-way acquisition required)

        - Extend the existing southbound left-turn pocket on Farrington Highway at St. John's Road by 275 feet

  Option B addresses a projected queuing deficiency on Farrington Highway at Kaukama Road (where left-turning vehicles would extend into the adjacent through lane) that Option A does not address. Given the features of the surrounding land, and the fact that there is no parallel roadway to divert traffic from Farrington Highway, no other feasible mitigation is available for this projected deficiency.

- Based on the results of this analysis, the following improvements are associated with specific land developments or roadway network changes:

    - KCLC - Signalization of Kaukama Road/Kulauku Street and modifying the Kaukama Road approach at Farrington Highway

    - DHHL - Signalization of St. John's Road/Kulaaupuni Street

- Connection of Kulaaupuni Street and Kulauku Street (expected to be proposed by the City & County of Honolulu) - Widening of St. John's Road approach at Farrington Highway

- Overall, the proposed project will provide adequate mobility for all travel modes on site, including transit and para-transit. Recommendations have been made to provide appropriate access for pedestrians and bicyclists including a shared-use path connection to the site from Kulaaupuni Street, and connections to existing sidewalks south of the site.

DETAILED TECHNICAL ANALYSIS

Project Description

East of Farrington Highway (Highway 93), in Ma`ili, is an approximately 80-acre area that is owned by DHHL. Kamehameha Schools (KS) has a lease agreement with DHHL for use of a portion of the property. The project site consists of approximately 40 acres, within the approximately 80 acres, for a Kamehameha Schools Community Learning Center (KCLC) to be located on the southern portion of the property. Ultimately, the development of the entire site is expected to include the extension of Kulaaupuni Street south to the existing terminus of Kulauku Street.

The proposed KCLC is planned in three phases, with complete build out anticipated by 2019. While Phase I focuses primarily on the Early Childhood Education Complex, Phase II includes two charter schools and an educational center that will provide workshops and activities focused on improving health and fitness. Phase III will include a Student Support Complex and Community Learning Complex serving the multi-purpose needs of the KCLC. At full build out, the project is anticipated to serve a total of 1,440 students and 395 faculty/staff.

Transportation Evaluation

The project site is located in Ma`ili and will incorporate use of existing roads for vehicle access. Access to the KCLC will initially be provided via Kaukama Road and Kulauku Street. Both of these roadways have a substantial amount of available capacity during peak periods, and throughout the day, based on traffic counts and observations. Accordingly, the transportation evaluation of the proposed project presents a full analysis of four study intersections. Existing conditions are described below, followed by a description of the proposed project. Operations of the transportation system with the project in place are then described, and recommended improvements to minimize potential impacts are detailed in the last section.

Table 1 below summarizes the project facilities, by phase.

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TABLE 1
SUMMARY OF PROJECT FACILITIES

Phase (Year)	Facility	No. of Students	No. of Staff	Hours of Operation
Phase I (2014)	Infant Toddler Program	32	9	8am-2pm
	Preschool			
	Class A (Aug-May, 8am- 2pm)	120	16	8am-2pm
	Class B (Year Round, 6am-5pm)	96	13	6am-5pm
	Class C (Year Round, 8am-2pm)	29	10	8am-2pm
	Sub-Total	*245*	*39*	
	P-3 Kauhale[1]	50	60	7:30am-5pm
	CEI Kauhale[2]	0	44	7:30am-5pm
	Transportation Hub	0	15	7:30am-7:30pm
	Sub-Total	*327*	*167*	-
Phase II (2017)	Hale Ola Clinic	8[3]	4	7:30am-7:30pm
	Physical Fitness and Well Being	50[4]	25	7:30am-7:30pm
	Aquatics Center	40[4]	19	7:30am-7:30pm
	Charter School (9-12)	400[5]	60	7:30am-4pm
	Charter School (K-12)	195[5]	25	7:30am-4pm
	Youth Enrichment Center	120[6]	35	8am-6pm
	Sub-Total	*1,140*	*335*	-
Phase III (2019)	Student Support Complex	60	20	8am-7:30pm
	Community Learning Complex	240	30	7:30am-7:30pm
	Facility Support Services	0	10	7:30am-7:30pm
	Sub-Total	*300*	*110*	-
Grand Total		**1,440**	**395**	**-**

Notes:

1. P-3 Kauhale facility provides special needs screening and support for children up to third grade, and educational programs for parents of children ages 0-5 years old. Trip generation calculations assumed 90% capacity.
2. CEI Kauhale includes office and meeting space for Kamehameha Schools Staff.
3. Trip generation calculation assumes these students are already on-site and do not produce new trips.
4. Trip generation calculation uses reduced number of students based on KS assumption that 3% of students are bussed.
5. Assumed split between 9-12 and K-12 classes. KS plans for 595 total Charter School students. Trip generation uses reduced number of students based on KS assumption that 20% of students are bussed.
6. Trip generation uses reduced number of students based on KS assumption that 5% of students are bussed.

Source: Kamehameha Schools Summary Program and Phasing Plan, Dec. 2012.

Existing Conditions

The location of the project site and immediate study area are shown on Figure 1.

Study Roadways

The primary corridors for vehicle access are Farrington Highway, Kaukama Road, and St. John's Road. Kulaaupuni Street and Kulauku Street are smaller residential streets which also provide access to the proposed project site. Each of these facilities is briefly described below.

Farrington Highway is owned by the State of Hawaii, and is a four-lane, generally north-south, divided highway in the vicinity of Ma`ili that extends along the western coast of the island, from Waianae at the north end to Nanakuli at the south end of the coast. Farrington Highway has a posted speed limit of 35 mph in the vicinity of the site. Separate left and right turn lanes are provided at intersections.

Kaukama Road is owned by the City & County of Honolulu, and is an east-west, two-lane roadway that terminates at Farrington Highway to the west and Pakeke Street to the east. It is an improved road, with a 40-foot roadway and 56-foot right-of-way. This facility serves two-way traffic and includes shoulders along most of its length between Farrington Highway and Pakeke Street. The posted speed limit for this roadway is 25 mph. The intersection of Kaukama Road and Farrington Highway is signalized.

St. John's Road is owned by the City & County of Honolulu from Farrington Highway to the corner of Kulaaupuni Street and has an approximately 20 foot paved roadway within a 40 foot right-of-way. It is an unimproved, two-lane, roadway with no curb, gutter, or sidewalks. This narrower street is fronted by single-family residential uses. The unpaved shoulder areas are often used for parking. Vehicles use St. John's Road to access Ma`ili Elementary School to the north, via Kulaaupuni Street. The intersection of St. John's Road and Farrington Highway is signalized. The posted speed limit for this roadway is 15 mph.

Kulaaupuni Street is owned by the City & County of Honolulu and has a 20 to 24 foot paved roadway within a 40 foot easement, and is a two-lane roadway which runs north-south. It is an unimproved road with no curb, gutter, or sidewalk in parts. The roadway is offset at the intersection with St. John's Road and terminates at Mamoali'i Place, just south of Holt Road. The unpaved shoulder areas are often used for parking. The posted speed limit is 25 mph, north of St. John's Road. There is no posted speed limit on the southern leg of the roadway.

Kulauku Street is owned by the City & County of Honolulu and is access from Farrington Highway via Kaukama Road. It is an improved road with 40 foot roadway and 56 foot right-of-way, and is a two-lane roadway which terminates at Kaukama Road to the south, and dead ends just north of Kulawae Street. The roadway runs through a residential neighborhood and on-street parking is permitted. The posted speed limit is 25 miles per hour.

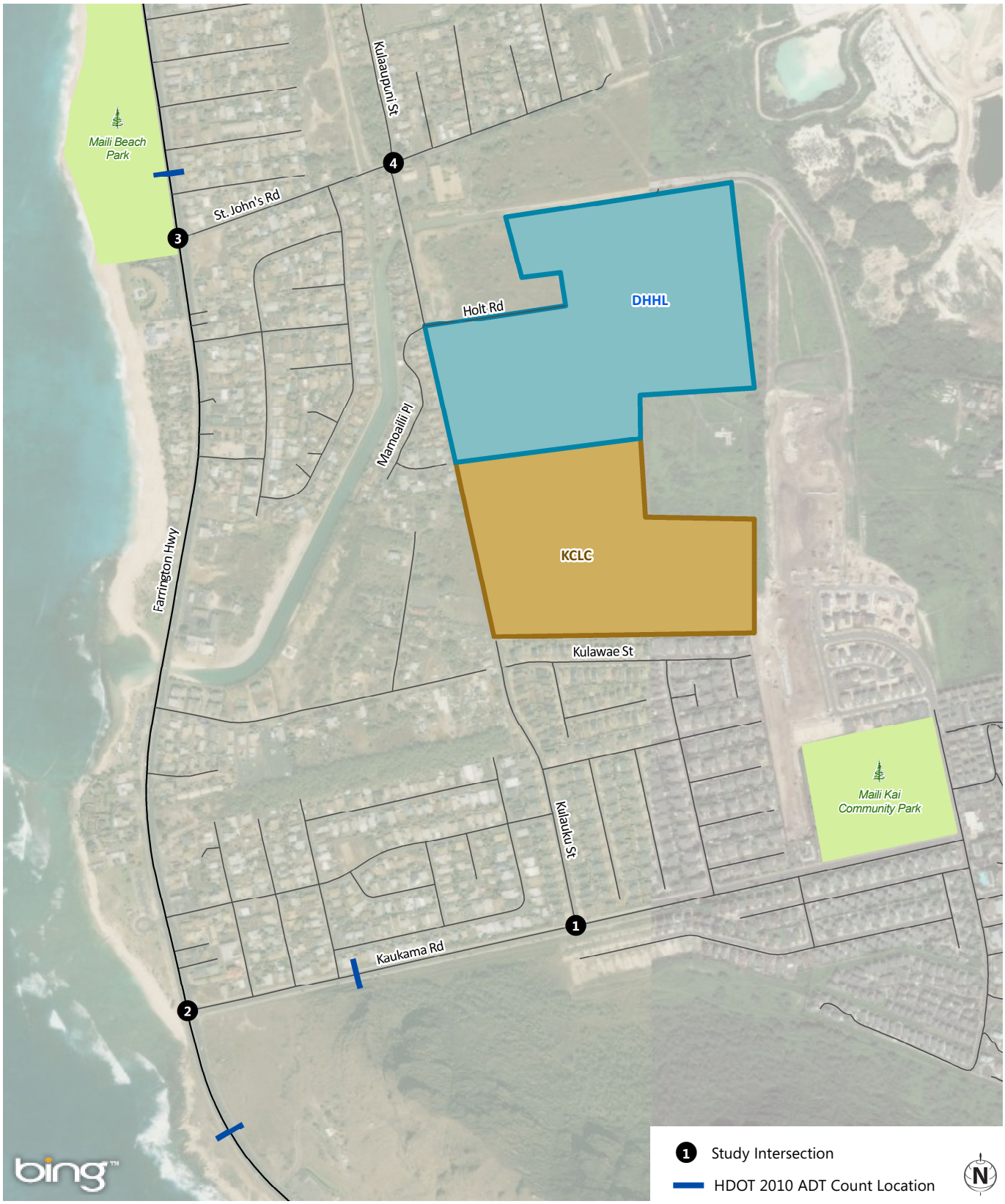

Figure 1.

Study Area

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Pedestrian, Bicycle, and Transit Access

Sidewalks are intermittent in the vicinity of the proposed project site. Kaukama Road and Kulauku Street feature sidewalks on both sides of the street along their entire length. On Kulaaupuni Street features either sidewalks or paved walking paths on both sides of the street south of St. Johns Road; north of St. Johns Road a walking path exists on the west side of the street. St. John's Road does not have any formal pedestrian or separate bicycle facilities. Pedestrians typically walk on the unpaved shoulders and must maneuver around parked vehicles. This is not ideal given that transit users accessing the stop locations on Farrington Highway do not have a formal path to travel into the neighborhoods. However, signage and striped crosswalks are provided at both the St. John's Road and Kaukama Road intersections on Farrington Highway to guide pedestrians and enhance pedestrian access.

As is the case with most other local streets in Ma`ili, no separate bicycle facilities are provided in the vicinity of the site. Farrington Highway is well served by both sidewalks and bus service, operated by the City & County of Honolulu, with ten bus stops between St. John's Road and Kaukama Road.

Bus transit service is provided on Farrington Highway and includes local routes (Route C and Route PH1) and standard routes (Route 40 and Route 90). Service frequency on local routes varies from 4:00 AM to 10:30 PM with 30 minute headways. Route 40 operates 24 hours per day with 30 minute headways during the peak hours. The Handi-Van Service is an all hour service operated by the City & County of Honolulu's public transit service for persons with disabilities who are unable to use the public bus service. It is available within ¾ mile of Route 40, 24 hours per day, and provides transportation between designated pick-up and drop-off points. Route 90 is an express route which operates in the eastbound direction during the morning peak hour at 20 minute headways, and operates during the evening peak hour with an average of 15 minute headways. The closest City and County bus stops require a walk of between ½-mile to ¾-mile to access the project site. Figure 2 details the existing pedestrian, bicycle, and transit facilities within the study area.

Existing Traffic Volumes

Farrington Highway is the highest vehicle volume roadway on the Leeward Coast and includes distinct directional traffic as residents travel to jobs in Kapolei and the primary urban center of Honolulu in the morning (AM) peak period and return in the evening (PM) peak period. Kaukama Road does experience some moderate vehicle traffic volumes as it serves as a collector for a substantial portion of Ma`ili residences.

The State of Hawai'i Department of Transportation (HDOT) data indicates that the daily volume on Farrington Highway between St. John's Road and Kaukama Road in 2010 was less than 24,000 vehicles per day. The maximum two-way peak hour volume is slightly more than 2,600 vehicles per day occurring between 3:00PM and 4:00PM. HDOT data also indicates that the daily volume on Kaukama Road, between Farrington Highway and Kulauku Street, in 2010 was less than 3,200 vehicles per day, and the maximum two-way peak hour volume was slightly more than 370 vehicles occurring between 4:30PM and 5:30PM.

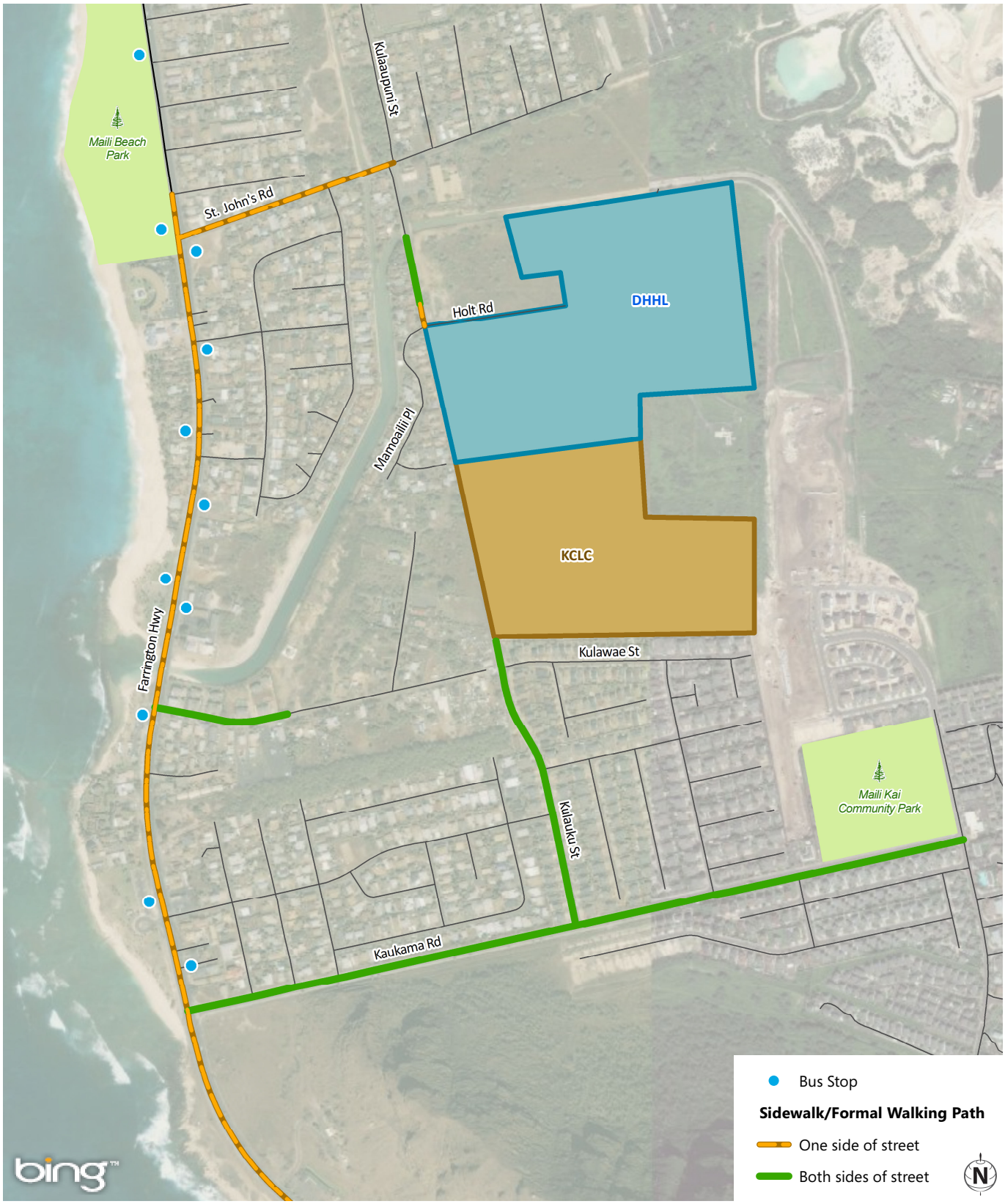

Figure 2.

Existing Pedestrian, Bicycle and Transit Facilities

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Traffic counts were conducted in November 2012 at four study intersection: (1) Kaukama Road and Kulauku Street; (2) Kaukama Road and Farrington Highway; (3) St. John's Road and Farrington Highway; and (4) St. John's Road and Kulaaupuni Street. This count data confirmed the AM peak hour to be between 7:00 AM and 9:00 AM, and the evening peak hour to be between 4:00 PM and 6:00 PM. A comparison between the 2010 vehicle traffic volumes and the recent traffic count data concluded that there has not been substantial growth in the project area since 2010.

Peak Hour Intersection LOS Standards and Thresholds

Two study intersections are signalized and two study intersections are unsignalized under existing conditions. All intersections were assumed to remain the same under future conditions, with the exception of the Phase II 2017 With Project Mitigated and Phase III 2019 With Project Mitigated conditions. This change is explained later in the report. This section presents the methodologies used to perform peak hour intersection capacity analyses of the signalized and unsignalized intersections within the study area.

Signalized intersections were analyzed using the method described in Chapter 16 of the 2000 *Highway Capacity Manual* (HCM) (Special Report 209, Transportation Research Board) which was used to prepare the level of service calculations for the study intersections. This level of service method, which is approved by the State DOT and the City & County of Honolulu, analyzes a signalized intersection's operation based on average control delay per vehicle. Control delay includes the initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The average control delay for signalized intersections is calculated using Synchro analysis software and is correlated to a LOS designation as shown in Table 2.

TABLE 2
LOS CRITERIA FOR SIGNALIZED INTERSECTIONS

Level of Service	Description	Average Control Delay Per Vehicle (Seconds)
A	Operations with very low delay occurring with favorable progression and/or short cycle lengths.	≤ 10.0
B	Operations with low delay occurring with good progression and/or short cycle lengths.	10.1 to 20.0
C	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.1 to 35.0
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, and high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35.1 to 55.0
E	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	55.1 to 80.0
F	Operations with delays unacceptable to most drivers occurring due to over-saturation, poor progression, or very long cycle lengths.	> 80.0

Source: 2000 Highway Capacity Manual, TRB Special Report 2009

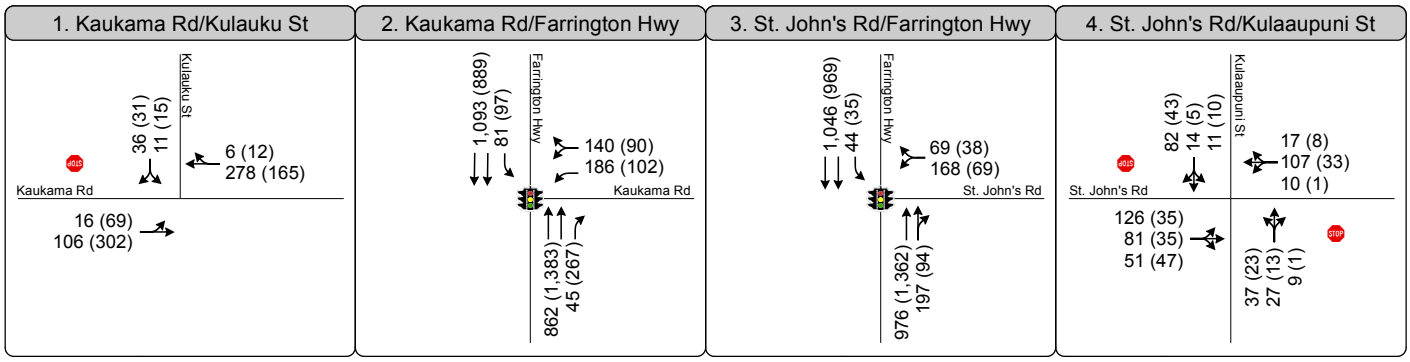
Unsignalized intersections, including two-way and all-way stop controlled intersections were analyzed using the Chapter 17 methodology of the 2000 Highway Capacity Manual. The LOS for a two-way stop controlled (TWSC) intersection is determined by the computed or measured control delay and is defined for each minor movement. Table 3 summarizes the LOS criteria for unsignalized intersections. The SYNCHRO 7.0 software supports this methodology and was utilized to produce LOS results.

TABLE 3
LOS CRITERIA FOR UNSIGNALIZED INTERSECTIONS

Level of Service	Description	Average Control Delay Per Vehicle (Seconds)
A	Little or no delay.	≤ 10.0
B	Short traffic delay.	10.1 to 15.0
C	Average traffic delays.	15.1 to 25.0
D	Long traffic delays.	25.1 to 35.0
E	Very long traffic delays.	35.1 to 50.0
F	Extreme traffic delays with intersection capacity exceeded.	> 50.0

Source: 2000 Highway Capacity Manual, TRB Special Report 2009

Figure 3 shows the lane geometries and vehicle traffic volumes under Existing Conditions. Table 4 below shows the results of the analysis for Existing Conditions. Detailed LOS Worksheets can be found in Appendix A.



→	Turn Lane
AM (PM)	Peak Hour Traffic Volume
1	Study Intersection
	Traffic Signal
STOP	Stop Sign

Figure 3.

Peak Hour Traffic Volumes and Lane Configurations - Existing Conditions

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TABLE 4
EXISTING INTERSECTION LEVELS OF SERVICE

Intersection	Peak Hour	Intersection Control	Delay[1]	V/C[2]	LOS[3]
1. Kaukama Road and Kulauku Street	AM	Side-Street Stop	11.4	0.10	B
	PM		11.5	0.08	B
2. Kaukama Road and Farrington Highway	AM	Signal	12.1	0.50	B
	PM		9.8	0.58	A
3. St. John's Road and Farrington Highway	AM	Signal	15.0	0.69	B
	PM		9.6	0.66	A
4. St. John's Road and Kulaaupuni Street	AM	Side-Street Stop	38.2[4]	0.52[4]	E[4]
	PM		11.4	0.08	B

Notes:
1 Delay is whole intersection weighted average control delay expressed in seconds per vehicle for signalized and all-way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop-controlled intersections
2 V/C = maximum volume-to-capacity ratio
3 LOS = Level of Service. LOS calculations conducted using the Synchro level of service analysis software package, which applies the methodology described in the *2000 HCM*.
4 For side-street stop control intersections, the worst-case movement data is reported.
Source: Fehr & Peers, January 2013.

Table 4 shows that the intersection of St. John's Road at Kulaaupuni Street operates at Level of Service (LOS) E during the existing AM peak hour. This is due to traffic generated by Ma`ili Elementary School located north of the intersection, and congestion generally only occurs for less than 30 minutes within the AM peak hour.

At unsignalized intersections with LOS E or F operations, the need for installation of a traffic signal is evaluated based on standard warrants published in the 2009 edition of the *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD). A variety of warrants are typically evaluated and include data such as hourly vehicle volume, delay, collision history, etc. For the impact analysis of a development project such as the proposed KCLC, the peak hour signal warrant is used to make this determination. Based on the AM peak hour volumes, the St. John's Road/Kulaaupuni Street intersection does not warrant signalization under Existing Conditions.

Significant Impact Criteria

The analysis of future conditions compares baseline years with the three phases of the KCLC to determine whether the project traffic results in a significant impact on the surrounding roadways. Based on previous studies conducted for both the City & County of Honolulu and HDOT, the minimum acceptable operating standard for a signalized intersection is LOS D. Therefore, if the LOS for any roadway is LOS E or F without the project, and the project adds traffic to this location, then this would be characterized as a cumulative impact. If the addition of project traffic is expected to degrade acceptable service levels (LOS D or better) to unacceptable service levels (LOS E or F) then the project is considered to have a project-specific impact. When evaluating intersection approach LOS at any location, other factors should be considered in the analysis, such as traffic volumes, volume-to-capacity (V/C) ratios (should ideally be less than 1.00), and secondary impacts to pedestrian, bicycle, and transit travel.

For unsignalized intersections, the project is determined to have a significant cumulative impact when it adds traffic to a study location that: 1) includes a controlled approach that operates at an unacceptable level (i.e., LOS E or F), <u>and</u> 2) satisfies the peak hour signal warrant criteria published in the 2009 edition of the *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD). If the addition of project traffic causes an unsignalized intersection to degrade from LOS D or better to LOS E or F and causes the peak hour warrant to be met, then the impact is considered project-specific.

Future Conditions

The proposed KCLC was analyzed for three future scenarios corresponding with its three phases of development scheduled for 2014, 2017, and 2019. In each case a baseline scenario was identified assuming no KCLC development, followed by the addition of traffic from each development phase (e.g., the 2017 with project scenario includes Phase I and II of KCLC). This section of the report describes the conditions associated with each project scenario and the analysis results. Each phase of development includes an assumed annual growth factor, as well as approved and other projects within a relevant distance to the KCLC site.

The existing roadway network was initially used for the analysis of all future scenarios to identify the appropriate mitigation required for each phase of development. While the extension of Kulaaupuni Street to Kulauku Street is a planned improvement, it was not initially assumed to be in place in any of the future scenarios, except as a potential mitigation option. The following discussion of future conditions presents each of these scenarios and their analysis results.

<u>Overall Trip Generation Methodology</u>

The vehicle trip generation methodology is based upon two sources. For specific uses within the KCLC and for other anticipated developments in the area (i.e., housing), extensive traffic survey data is available and is the standard practice for transportation impact analyses. For these uses, vehicle trip rates were obtained from the Institute of Transportation Engineers (ITE) published in *Trip Generation* (9th Edition). ITE trip rates are developed by correlating total vehicle trip generation data at sites with various activity/land use characteristics, such as the vehicle trips per hour (vph) per single-family dwelling unit (DU) or per student at an elementary school. The ITE trip rates used in this analysis were derived from regression equations where applicable. For those

uses where standard survey information is not available (e.g., the preschool with varied program times), the number of vehicle trips was estimated based on assumed vehicle occupancies and the number of students and staff expected to be traveling during the day and during the peak periods.

Phase I 2014 Baseline Conditions

Annual average growth rates in traffic were calculated based on 2006 and 2010 historic HDOT roadway volumes. These rates were calculated separately for Farrington Highway and for those local streets intersections and range from a total of 3.4 to 5.7% in the AM and 3.8 to 4.2% in the PM. The rates were applied to the existing traffic volumes to estimate future 2014 Baseline traffic volumes, and accounts for general growth in traffic along the Leeward Coast.

In addition to general growth, traffic from two residential developments planned or under construction in the immediate vicinity of the project site was included in the 2014 Baseline conditions analysis. One development (Development 1) with 25 single-family residential units is located south and east of the project site near the Kulawae Street/Mokila Street intersection. A second area of development (Developments 2 and 3) totaling 55 single-family residential is expected to be constructed north of St. John's Road on both sides of the drainage channel makai of Kulaaupuni Street. ITE trip generation rates were used to estimate volumes for these developments, and a trip distribution based on existing commute patterns was used to assign traffic to the study intersections. These cumulative project volumes were added to the growth factored existing volumes described above and the total represents the 2014 Baseline traffic volumes without the proposed project.

Figure 4 depicts the lane geometries and vehicle traffic volumes analyzed under 2014 Baseline conditions, and Table 5 below shows the results of the operations analysis under 2014 Baseline conditions. The corresponding detailed LOS Worksheets are included in Appendix A.

TABLE 5
2014 BASELINE INTERSECTION LEVELS OF SERVICE

Intersection	Peak Hour	Intersection Control	Delay[1]	V/C[2]	LOS[3]
1. Kaukama Road and Kulauku Street	AM	Side-Street Stop[4]	11.2	0.10	B
	PM		12.0	0.09	B
2. Kaukama Road and Farrington Highway	AM	Signal	18.7	0.50	B
	PM		11.6	0.67	B
3. St. John's Road and Farrington Highway	AM	Signal	17.6	0.74	B
	PM		12.5	0.75	B
4. St. John's Road and Kulaaupuni Street	AM	Side-Street Stop[4]	83.3	0.79	F
	PM		14.0	0.12	B

Notes:
1 Delay is whole intersection weighted average control delay expressed in seconds per vehicle for signalized and all-way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop-controlled intersections
2 V/C = maximum volume-to-capacity ratio
3 LOS = Level of Service. LOS calculations conducted using the Synchro level of service analysis software package, which applies the methodology described in the *2000 HCM*.
4 For side-street stop control intersections, the worst-case movement data is reported.
Source: Fehr & Peers, February 2013.

The table shows that the intersection of St. John's Road and Kulaaupuni Street is projected to operate at LOS F during the AM peak hour with excessive delay and congested conditions. The combination of Maili Elementary School traffic and traffic from new residential developments, including the DHHL development, contribute to these operations. However under these conditions, the vehicle traffic volumes do not warrant signalization of the intersection as they are just under the threshold.

Estimated KCLC Project Trip Generation

The proposed project represents a unique shared-use school/community facility for which there are few comparable developments. As such, the estimated vehicle trip generation requires development of a series of assumptions regarding the attendance level and operating hours for some facility components, while standard ITE rates can be used for other on-site uses.

Typical use of the KCLC facilities will include school activities from the morning through the early afternoon. During the course of the day, various student populations will occupy different areas of the KCLC such that no new trips will be generated. Between 2:00 PM and 6:00 PM, some of the after-school programs will generate new trips to the site. A portion of these students will result in external trips from the community, while the remainder will be students already on site. After-school bussing of students will be provided for a portion of the students coming from the

community. In addition, some facilities will operate until 6:00 PM which will result in new evening peak hour vehicle trips to and from the site.

The number of trips estimated for the proposed project is based on assumed vehicle occupancies and hours of operation for each facility component. Operations are expected to vary from day to day, and the impact of actual operations will likely be less than described here. For example, some preschool programs only operate between the months of August and May, yet this program was included in the analysis to provide a conservative estimate of traffic volumes. The table below shows the trip generation for the project, by phase. A detailed explanation of the trip generation estimate is presented in Appendix B.

TABLE 6
KCLC PROJECT TRIP GENERATION

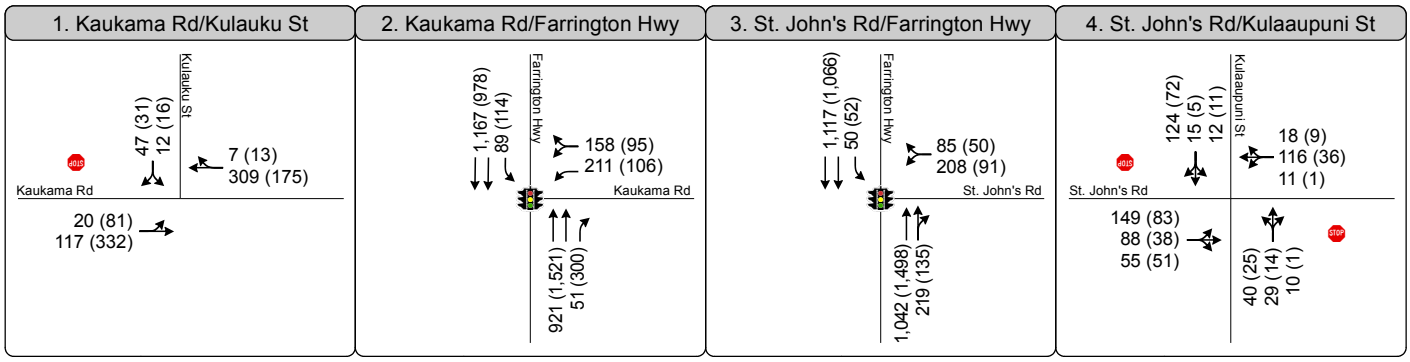
Phase (Year)	Daily Trips	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Phase I (2014)	1,060	294	204	498	91	161	252
Phase II (2017)	974	153	66	219	20	111	131
Phase III (2019)	214	68	0	68	0	68	68
Total (I+II+III)	**2,248**	**515**	**270**	**785**	**111**	**340**	**451**

Notes:
Source: ITE Trip Generation 9th Edition and Fehr & Peers, February 2013.

As shown in Table 6 above, the project buildout is expected to generate 2,248 daily trips, 785 AM peak hour trips, and 451 PM peak hour trips. Approximately, 60% of the peak hour trips will occur during Phase I of the project, and the need for near-term transportation improvements focuses on the 2014 scenario. As noted above, trip generation estimates are considered conservative for each scenario in that these levels are not expected to occur every day.

Project Trip Distribution

The KCLC is intended to serve the residents of the Leeward Coast. Thus, the vast majority of the trips will be confined to the communities along Farrington Highway, with the exception of some staff that may live in other areas and commute in. Based on the distribution of residences along the coast, the project trips were generally distributed as follows: 60% to and from the north, and 40% to and from the south. For all three project phases, the operations analysis was initially conducted assuming that all KCLC traffic would use Kulauku Street and Kaukama Road to access Farrington Highway (i.e., the Kulaaupuni Street extension to Kulauku Street was not assumed to be in place). The trip distribution and assignment of project trips to each turning movement were applied accordingly.



→	Turn Lane
AM (PM)	Peak Hour Traffic Volume
1	Study Intersection
	Traffic Signal
	Stop Sign

Figure 4.

Peak Hour Traffic Volumes and Lane Configurations - Phase I - 2014 Baseline Conditions

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Phase I 2014 with Project

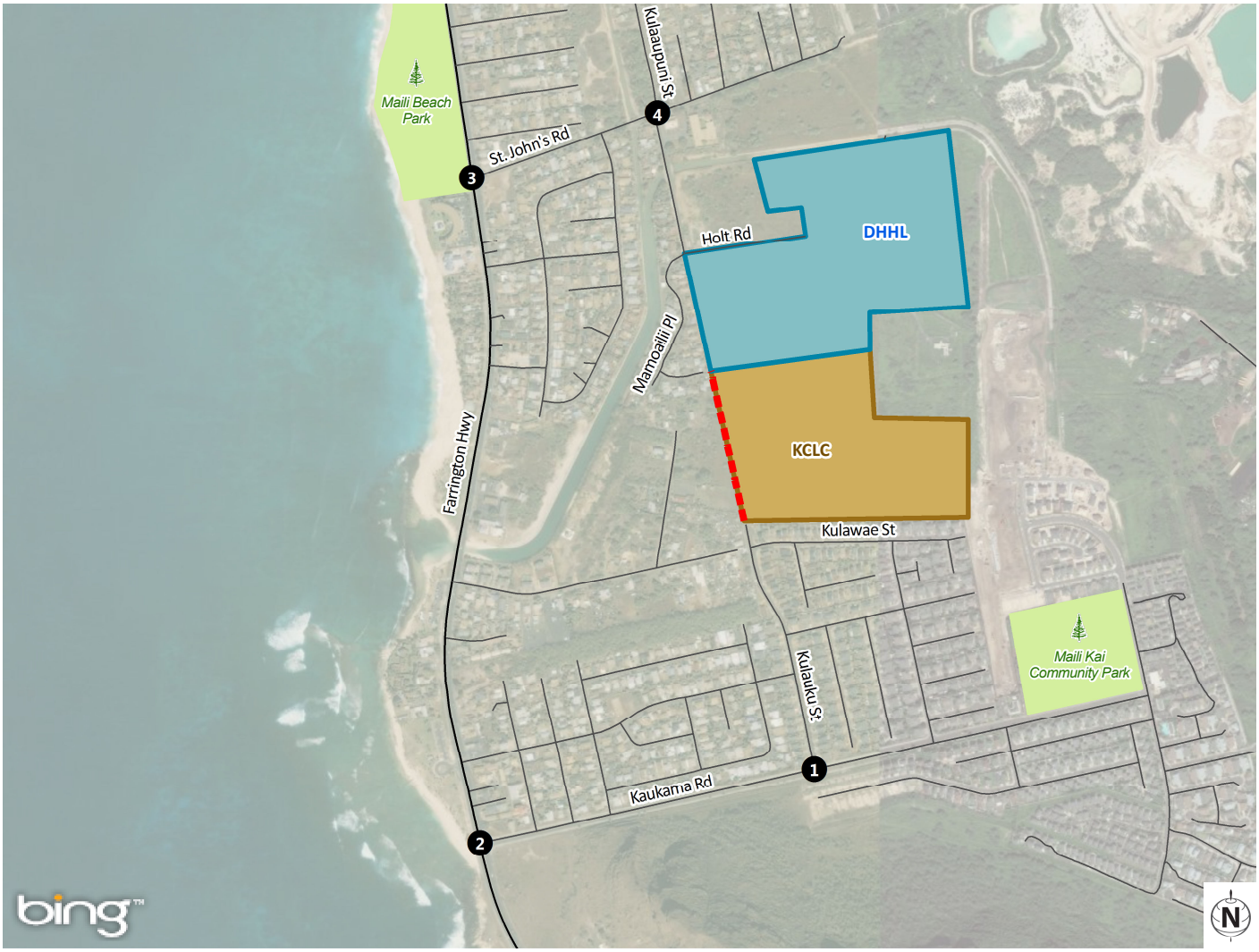
This scenario includes the trips generated by Phase I of the proposed project, which were added to the 2014 Baseline volumes. Figure 5 depicts the lane geometries and vehicle traffic volumes under Phase I 2014 With Project conditions. The table below shows the results of the Phase I 2014 With Project analysis, and the detailed LOS Worksheets are available in Appendix A.

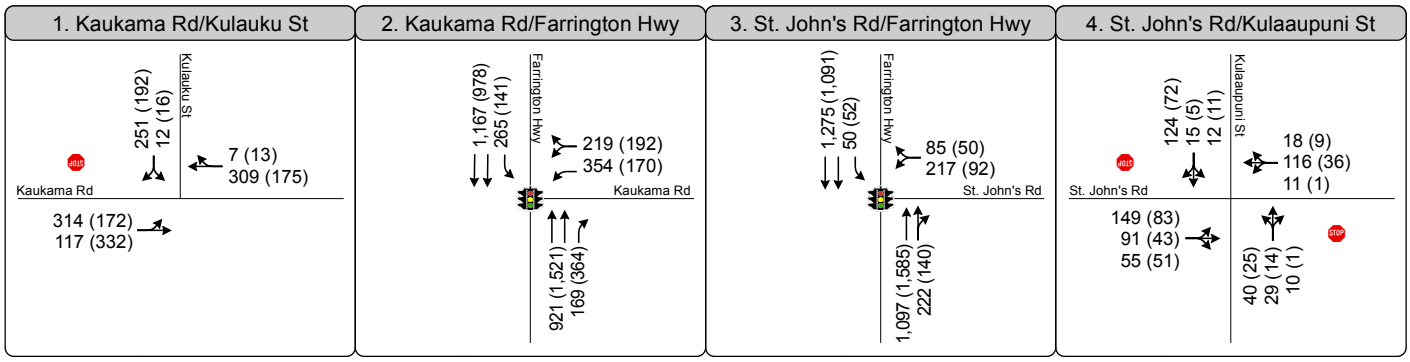
TABLE 7
2014 WITH PROJECT INTERSECTION LEVELS OF SERVICE

Intersection	Peak Hour	Intersection Control	2014 Baseline			2014 With Project		
			Delay[1]	V/C[2]	LOS[3]	Delay[1]	V/C[2]	LOS[3]
1. Kaukama Road and Kulauku Street	AM	Side-Street Stop[4]	11.2	0.10	B	16.4	0.48	C
	PM		12.0	0.09	B	12.6	0.32	B
2. Kaukama Road and Farrington Highway	AM	Signal	18.7	0.50	B	23.6	0.74	C
	PM		11.6	0.67	B	15.4	0.72	B
3. St. John's Road and Farrington Highway	AM	Signal	17.6	0.74	B	18.4	0.77	B
	PM		12.5	0.75	B	13.4	0.78	B
4. St. John's Road and Kulaaupuni Street	AM	Side-Street Stop[4]	83.3	0.79	F	84.9	0.80	F
	PM		14.0	0.12	B	14.1	0.12	B

Notes:
1 Delay is whole intersection weighted average control delay expressed in seconds per vehicle for signalized and all-way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop-controlled intersections
2 V/C = maximum volume-to-capacity ratio
3 LOS = Level of Service. LOS calculations conducted using the Synchro level of service analysis software package, which applies the methodology described in the *2000 HCM*.
4 For side-street stop control intersections, the worst-case movement data is reported.
Source: Fehr & Peers, February 2013.

The table shows that the intersection of St. John's Road and Kulaaupuni Street is projected to operate at LOS F during the AM peak hour with excessive delay and congested conditions. The combination of Maili Elementary School traffic and traffic from new residential developments, including the DHHL development, contribute to these operations. However under these conditions, the vehicle traffic volumes do not warrant signalization of the intersection as they are just under the threshold. Therefore, the project does not result in any significant traffic impacts in 2014.





→	Turn Lane
AM (PM)	Peak Hour Traffic Volume
1	Study Intersection
	Traffic Signal
	Stop Sign
	Site Access

Figure 5.

Peak Hour Traffic Volumes and Lane Configurations - Phase I - 2014 Plus Project Conditions

FEHR PEERS

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Phase II 2017 Baseline Conditions

Traffic volumes under this scenario are comprised of three components:

- Existing volumes plus five (5) years of regional growth (based on historic counts)
- Traffic from three approved residential developments within the study area, and
- Traffic from a portion of the proposed DHHL development (see description below)

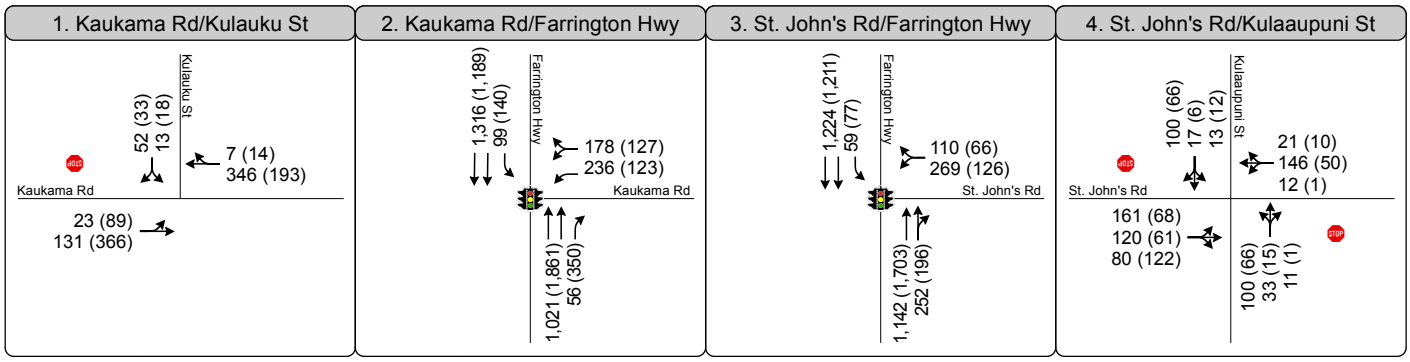
While no formal action has been taken, approximately 33.5 acres north of the project site are anticipated to be developed by the State of Hawaii Department of Hawaiian Homelands (DHHL) and are intended for residential development to be completed in three phases. The first phase contemplates 100 single-family dwelling units to be constructed in 2016, and was therefore, for the purposes of this TIAR, assumed to be constructed and occupied under Phase II 2017 Baseline conditions. All DHHL-generated trips were assumed to use Kulaaupuni Street and St. John's Road to access Farrington Highway, and they were distributed and assigned to the study intersections based on existing travel patterns.

Figure 6 shows the lane geometries and vehicle traffic volumes under Phase II 2017 Baseline conditions. Table 8 below shows the results of the Phase II 2017 Baseline operations analysis. Detailed LOS worksheets can be found in Appendix A.

TABLE 8
PHASE II 2017 BASELINE INTERSECTION LEVELS OF SERVICE

Intersection	Peak Hour	Intersection Control	Delay[1]	V/C[2]	LOS[3]
1. Kaukama Road and Kulauku Street	AM	Side-Street Stop[4]	11.7	0.12	B
	PM		12.8	0.11	B
2. Kaukama Road and Farrington Highway	AM	Signal	13.7	0.56	B
	PM		17.1	0.82	B
3. St. John's Road and Farrington Highway	AM	Signal	23.8	0.85	C
	PM		19.4	0.88	B
4. St. John's Road and Kulaaupuni Street	AM	Side-Street Stop[4]	>150	>2.0	F
	PM		17.0	0.27	C

Notes:
1 Delay is whole intersection weighted average control delay expressed in seconds per vehicle for signalized and all-way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop-controlled intersections
2 V/C = maximum volume-to-capacity ratio
3 LOS = Level of Service. LOS calculations conducted using the Synchro level of service analysis software package, which applies the methodology described in the *2000 HCM*.
4 For side-street stop control intersections, the worst-case movement data is reported.
Source: Fehr & Peers, February 2013.



→	Turn Lane
AM (PM)	Peak Hour Traffic Volume
1	Study Intersection
	Traffic Signal
	Stop Sign

Figure 6.

Peak Hour Traffic Volumes and Lane Configurations - Phase II - 2017 Baseline Conditions

FEHR PEERS

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The table shows that the intersection of St. John's Road and Kulaaupuni Street is projected to operate at LOS F during the AM peak hour with excessive delay and congested conditions. The combination of Maili Elementary School traffic and traffic from new residential developments, including the DHHL development, contribute to these operations. However under these conditions, the vehicle traffic volumes do not warrant signalization of the intersection as they are just under the threshold.

Phase II 2017 with Project

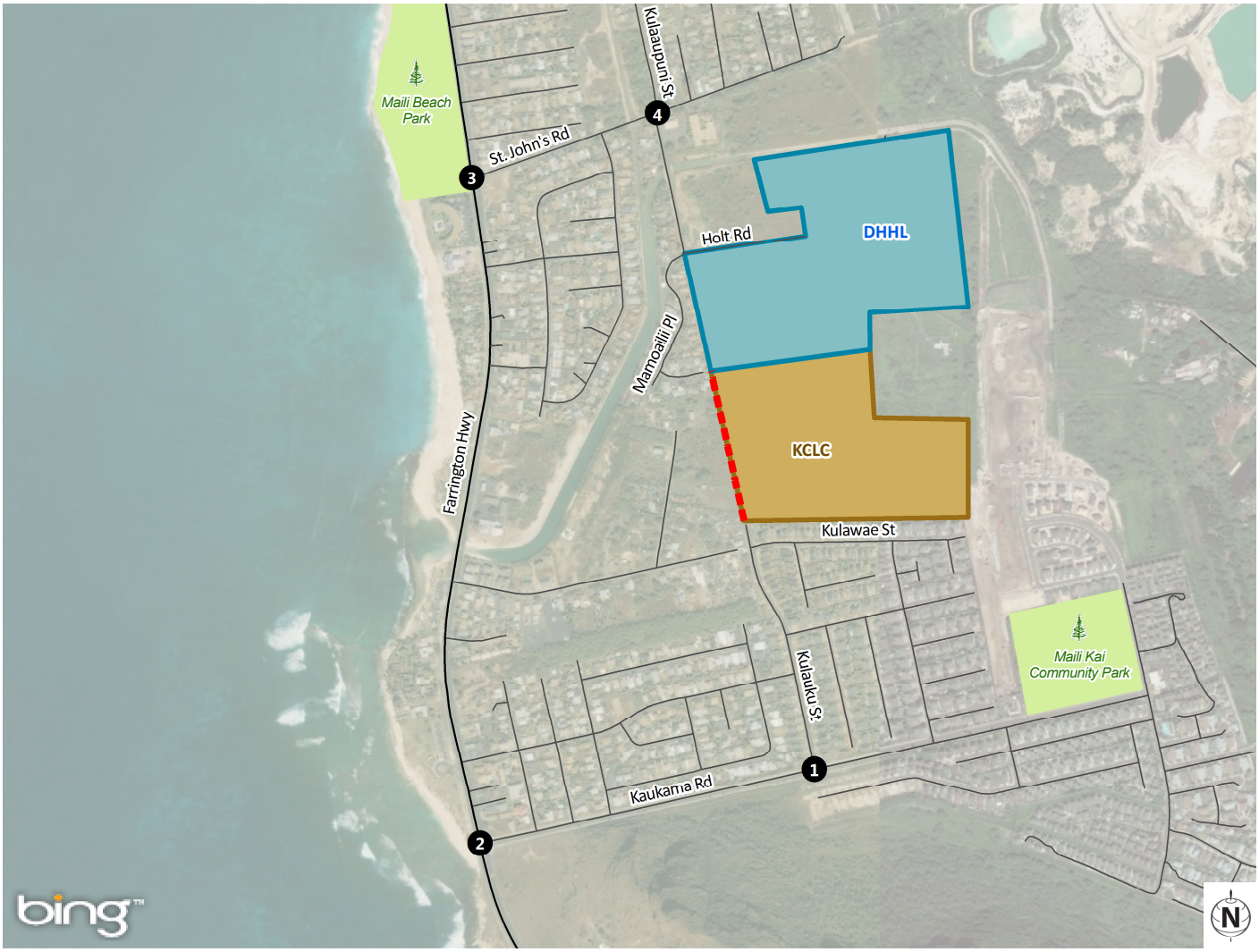
Traffic volumes under this scenario include the Phase II 2017 Baseline volumes from the previous section plus traffic from Phases I and II of KCLC.

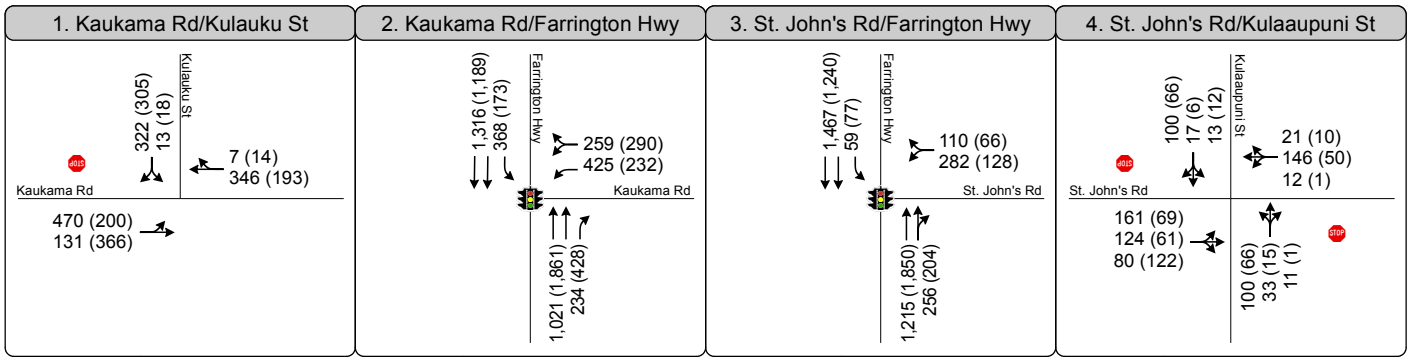
Figure 7 shows the lane geometries and vehicle traffic volumes under Phase II 2017 With Project Conditions. Table 9 below shows the results of the Phase II 2017 with Project operations analysis. Detailed LOS worksheets can be found in Appendix A.

TABLE 9
PHASE II 2017 WITH PROJECT INTERSECTION LEVELS OF SERVICE

Intersection	Peak Hour	Intersection Control	2017 Baseline			2017 With Project		
			Delay[1]	V/C[2]	LOS[3]	Delay[1]	V/C[2]	LOS[3]
1. Kaukama Road and Kulauku Street	AM	Side-Street Stop[4]	11.7	0.12	B	29.8	0.73	D
	PM		12.8	0.11	B	15.5	0.51	C
2. Kaukama Road and Farrington Highway	AM	Signal	13.7	0.56	B	29.8	0.93	C
	PM		17.1	0.82	B	30.8	0.91	C
3. St. John's Road and Farrington Highway	AM	Signal	23.8	0.85	C	26.2	0.89	C
	PM		19.4	0.88	B	26.8	0.94	C
4. St. John's Road and Kulaaupuni street	AM	Side-Street Stop[4]	>150	>2.0	F	>150	>2.0	F
	PM		17.0	0.27	C	17.1	0.27	C

Notes:
1 Delay is whole intersection weighted average control delay expressed in seconds per vehicle for signalized and all-way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop-controlled intersections
2 V/C = maximum volume-to-capacity ratio
3 LOS = Level of Service. LOS calculations conducted using the Synchro level of service analysis software package, which applies the methodology described in the *2000 HCM*.
4 For side-street stop control intersections, the worst-case movement data is reported.
Source: Fehr & Peers, February 2013.





→	Turn Lane
AM (PM)	Peak Hour Traffic Volume
1	Study Intersection
	Traffic Signal
	Stop Sign
	Site Access

Figure 7.

Peak Hour Traffic Volumes and Lane Configurations - Phase II - 2017 Plus Project Conditions

FEHR PEERS

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The table shows that the intersection of St. John's Road and Kulaaupuni Street is projected to operate at LOS F during the AM peak hour with excessive delay and congested conditions. The combination of Maili Elementary School traffic and traffic from new residential developments including the DHHL project contribute to these operations, while the amount of KCLC traffic contributing to this intersection is negligible. However, under these conditions, the vehicle traffic volumes do not warrant signalization of the intersection as they are just under the threshold. Thus, no impact is identified at this location in 2017.

All other intersections operate at an acceptable level of service in both the AM and PM peak hours.

Phase III 2019 Baseline Conditions

Traffic volumes under this scenario are comprised of three components:

- Existing volumes plus seven (7) years of regional growth (based on historic counts)
- Traffic from three approved residential developments within the study area, and
- Traffic from the first and second phases of the proposed DHHL development

The second phase of the DHHL development is currently anticipated to include 80 units of multi-family housing to be constructed in 2018, and was therefore assumed to be constructed and occupied under Phase III 2019 conditions. Similar to the first phase, these DHHL trips are assumed to access Farrington Highway via St. John's Road and Kulaaupuni Street, and they were distributed and assigned to the study intersections based on existing travel patterns. Lastly, an additional two years of regional growth was added to the Phase II 2017 baseline volumes to account for other development in the area. Thus, the combination of traffic anticipated from the first two phases of DHHL (180 residential units), a total of seven (7) years of background growth (2012 to 2019), and existing conditions comprise the Phase III 2019 baseline traffic volumes.

Vehicle trips for the two DHHL project phases were estimated using ITE rates and the resulting trips are presented in Appendix B. This table is referenced under the Phase II 2017 and Phase III 2019 future conditions sections. The DHHL project also contemplates a third development phase which was not included in this TIAR analysis since the KCLC is intended to be built out before DHHL's remaining 80 units are constructed in 2020.

Table 10 below shows the results of the Phase III 2019 Baseline intersection operations analysis. Detailed LOS worksheets can be found in Appendix A.

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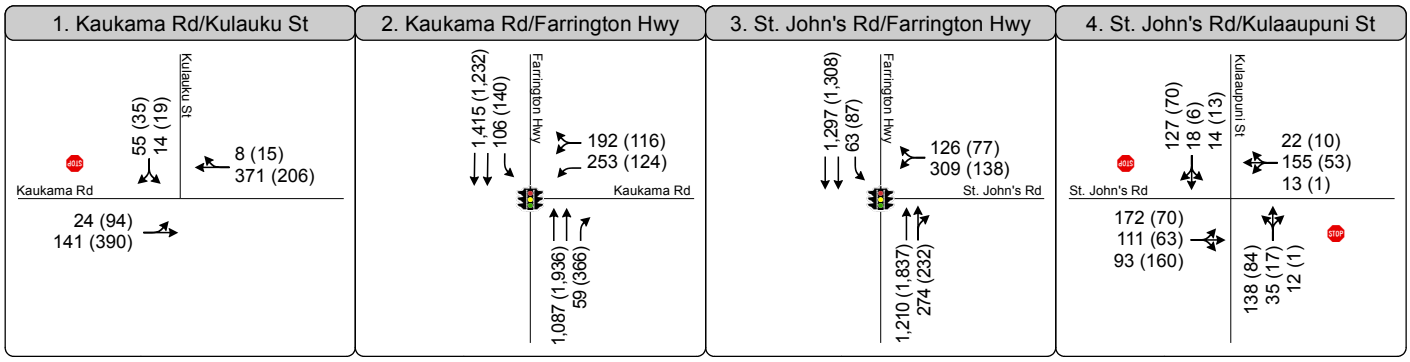
TABLE 10
PHASE III 2019 BASELINE INTERSECTION LEVELS OF SERVICE

Intersection	Peak Hour	Intersection Control	Delay[1]	V/C[2]	LOS[3]
1. Kaukama Road and Kulauku Street	AM PM	Side-Street Stop[4]	12.1 13.3	0.13 0.12	B B
2. Kaukama Road and Farrington Highway	AM PM	Signal	21.8 18.8	0.62 0.85	C B
3. St. John's Road and Farrington Highway	AM PM	Signal	29.6 32.7	0.92 0.97	C C
4. St. John's Road and Kulaaupuni Street	AM PM	Side-Street Stop[4]	>150 19.7	>2.0 0.36	F C

Notes:
1 Delay is whole intersection weighted average control delay expressed in seconds per vehicle for signalized and all-way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop-controlled intersections
2 V/C = maximum volume-to-capacity ratio
3 LOS = Level of Service. LOS calculations conducted using the Synchro level of service analysis software package, which applies the methodology described in the *2000 HCM*.
4 For side-street stop control intersections, the worst-case movement data is reported.
Source: Fehr & Peers, February 2013.

The table shows that the intersection of St. John's Road and Kulaaupuni Street is projected to operate at an unacceptable LOS during the AM peak hour with excessive delay and congested conditions. The combination of Maili Elementary School traffic and traffic from new residential developments including the DHHL development contribute to these operations. However under these conditions, the vehicle traffic volumes do not warrant signalization of the intersection as they are just under the threshold.

Figure 8 shows the lane geometries and vehicle traffic volumes under Phase III 2019 Baseline conditions.



→	Turn Lane
AM (PM)	Peak Hour Traffic Volume
1	Study Intersection
	Traffic Signal
	Stop Sign

Figure 8.

Peak Hour Traffic Volumes and Lane Configurations - Phase III - 2019 Baseline Conditions

FEHR PEERS

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Phase III 2019 with Project

For this scenario, traffic from buildout of KCLC (Phases I through III) was added to the 2019 Phase III Baseline volumes described above.

Figure 9 shows the lane geometries and vehicle traffic volumes under Phase III 2019 with Project conditions. Table 11 below shows the results of the Phase III 2019 with Project operations analysis. Detailed LOS worksheets can be found in Appendix A.

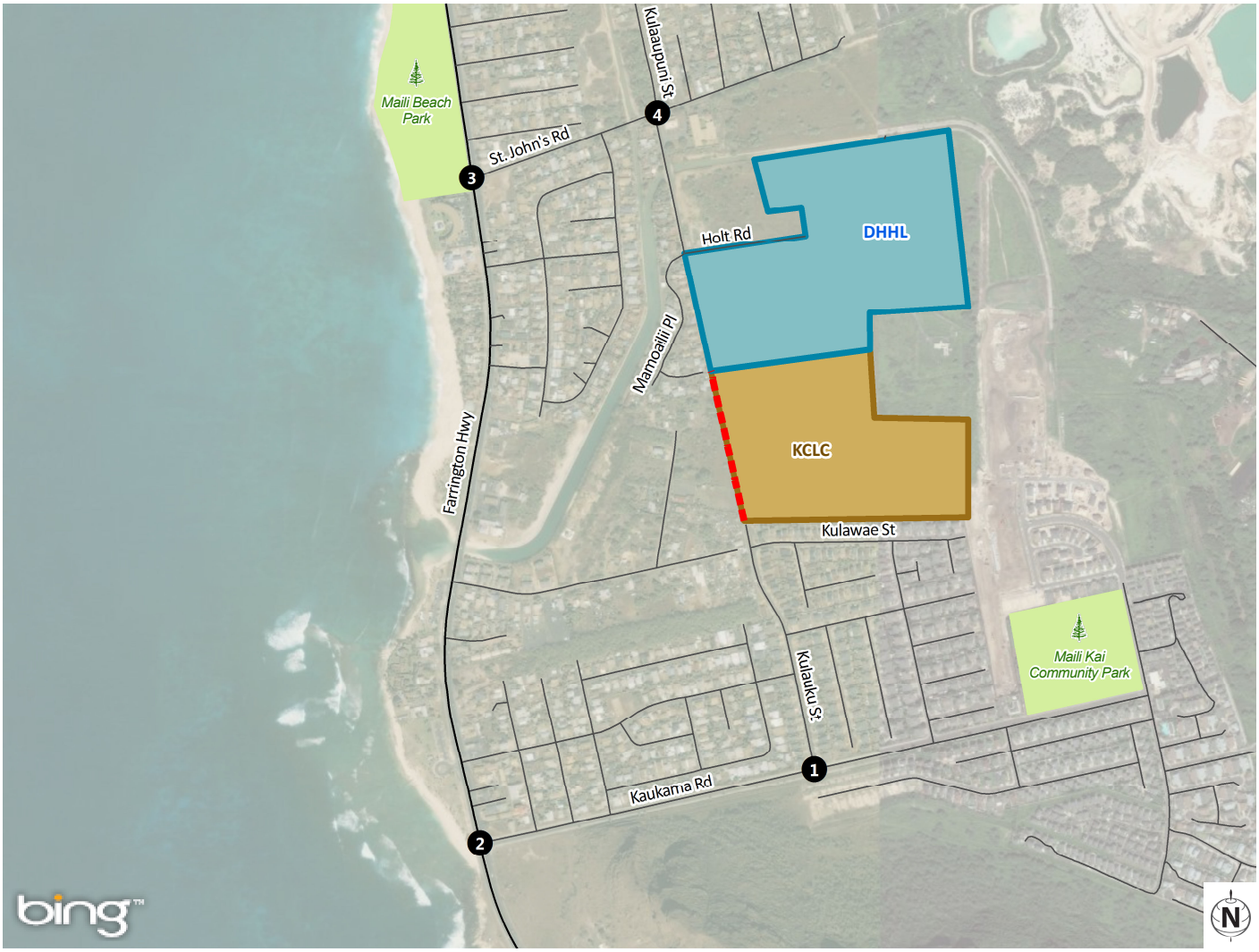
TABLE 11
PHASE III 2019 WITH PROJECT INTERSECTION LEVELS OF SERVICE

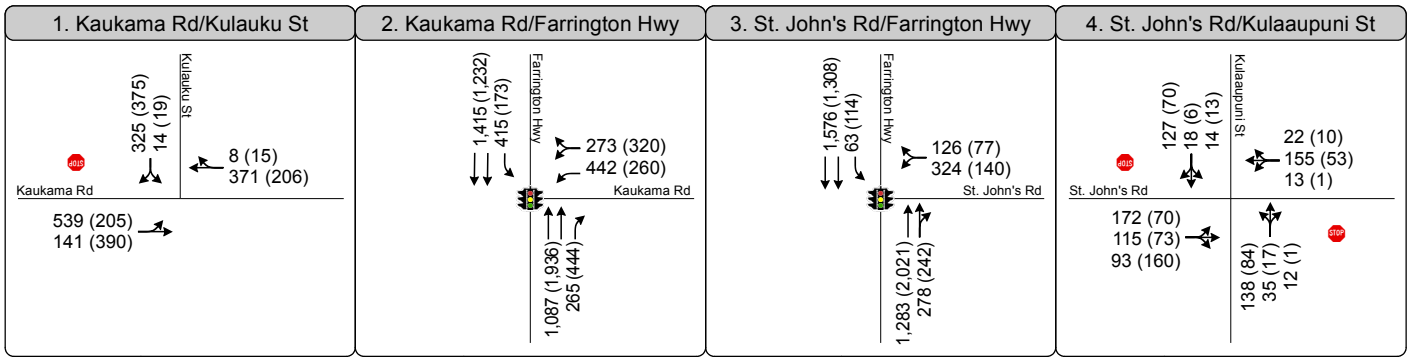
Intersection	Peak Hour	Intersection Control	2019 Baseline			2019 With Project		
			Delay[1]	V/C[2]	LOS[3]	Delay[1]	V/C[2]	LOS[3]
1. Kaukama Road and Kulauku Street	AM	Side-Street Stop[4]	12.1	0.13	B	52.3	0.89	F
	PM		13.3	0.12	B	18.8	0.63	C
2. Kaukama Road and Farrington Highway	AM	Signal	21.8	0.62	C	48.3	1.16	D
	PM		18.8	0.85	B	66.7	0.98	E
3. St. John's Road and Farrington Highway	AM	Signal	29.6	0.92	C	33.9	0.97	C
	PM		32.7	0.97	C	54.8	1.04	D
4. St. John's Road and Kulaaupuni Street	AM	Side-Street Stop[4]	>150	>2.0	F	>150	>2.0	F
	PM		19.7	0.36	C	20.2	0.37	C

Notes:
1 Delay is whole intersection weighted average control delay expressed in seconds per vehicle for signalized and all-way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop-controlled intersections
2 V/C = maximum volume-to-capacity ratio
3 LOS = Level of Service. LOS calculations conducted using the Synchro level of service analysis software package, which applies the methodology described in the *2000 HCM*.
4 For side-street stop control intersections, the worst-case movement data is reported.
Source: Fehr & Peers, February 2013.

During the AM peak period, the addition of project traffic will degrade operations at the Kaukama Road/Kulauku Street intersection from LOS B to LOS F in 2019. According to the impact criteria, this results in a significant project-specific impact, as the traffic volumes do warrant signalization.

In addition, the addition of project traffic will degrade PM peak hour operations from LOS B to LOS E at the Kaukama Road/Farrington Highway intersection in 2019. This constitutes a project-specific impact.





→	Turn Lane
AM (PM)	Peak Hour Traffic Volume
1	Study Intersection
	Traffic Signal
	Stop Sign
	Site Access

Figure 9.

Peak Hour Traffic Volumes and Lane Configurations - Phase III - 2019 Plus Project Conditions

FEHR PEERS

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The table shows that the intersection of St. John's Road and Kulaaupuni Street is projected to operate at LOS F during the AM peak hour with excessive delay and congested conditions. The combination of Maili Elementary School traffic and traffic from new residential developments including the DHHL project contribute to these operations, while the amount of KCLC traffic contributing to this intersection is negligible. However, under these conditions, the vehicle traffic volumes do not warrant signalization of the intersection as they are just under the threshold. Thus, no project impact is identified at this location in 2019.

Potential Vehicle Capacity Mitigation Measures

Several improvements were identified to mitigate the project intersection impact under 2019 conditions. First, improvements were identified that would only affect the existing roadway network (i.e., without the connection of Kulaaupuni Street to Kulauku Street). These improvements were identified as Option A and include:

- Signalization of the Kaukama Road and Kulauku Street intersection
- Modify the Kaukama Road approach at Farrington Highway to provide additional westbound capacity

Second, mitigation measures were identified assuming that the extension of Kulaaupuni Street to Kulauku Street was in place. This is a planned extension that would improve connectivity within the Maili community, would better distribute traffic from the project and other existing and proposed developments, and provide an additional option for accessing Farrington Highway. With the new connection, the following mitigation measures were identified as Option B and include:

- Widening the St. John's Road approach at Farrington Highway to provide additional westbound capacity
- Signalizing the St. John's Road/Kulaaupuni Street intersection (volume warrants would be met with the new Kulaaupuni-Kulauku connection)

Under Option B, the Kaukama Road/Kulauku Street intersection would not need to be signalized.

The detailed operations analysis for each mitigation option is presented below.

Phase III 2019 Operations with Mitigation

Option A

Under this scenario, the intersection of Kaukama Road and Kulauku Street would be signalized but no modifications to the lane striping or roadway section would be required. Also, the Kaukama Road/Farrington Highway intersection would need to be widened at the Kaukama approach, and restriped to allow for two exclusive left-turn lanes, and one right-turn lane. As noted above, this scenario does not assume any roadway connection between Kulaaupuni Street and Kulauku Street.

Figure 10 shows the lane geometries and vehicle traffic volumes under Phase III 2019 with Project Mitigated Option A conditions. Table 12 below shows the results of the Phase III 2019 with Project Mitigated Option A analysis.

TABLE 12
PHASE III 2019 WITH PROJECT INTERSECTION LEVELS OF SERVICE (MITIGATED - OPTION A)

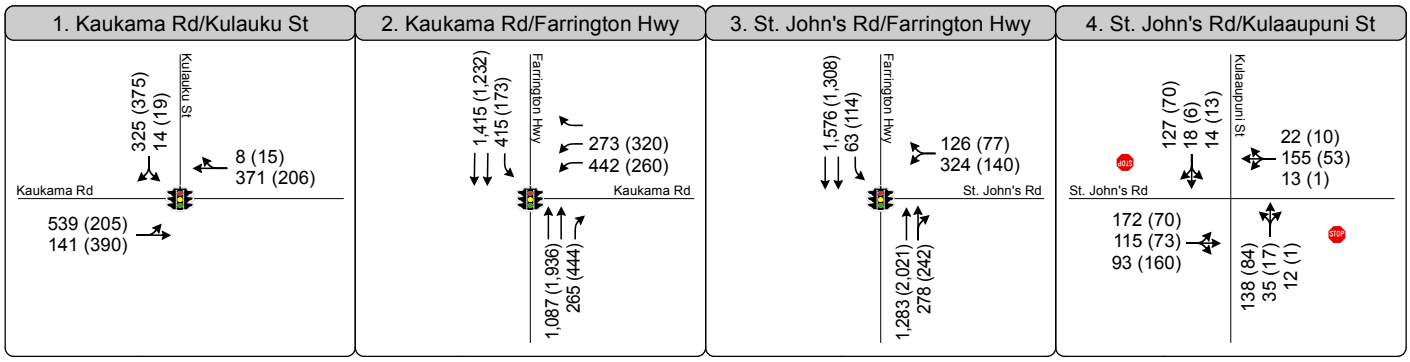
Intersection	Peak Hour	Intersection Control	Delay[1]	V/C[2]	LOS[3]
1. Kaukama Road and Kulauku Street	AM	Signal	29.2	0.91	C
	PM		12.7	0.67	B
2. Kaukama Road and Farrington Highway	AM	Signal	48.6	1.07	D
	PM		28.8	0.92	C
3. St. John's Road and Farrington Highway	AM	Signal	33.9	0.97	C
	PM		54.8	1.04	D
4. St. John's Road and Kulaaupuni Street	AM	Side-Street Stop[4]	>150	>2.0	F
	PM		20.2	0.37	C

Notes:
1 Delay is whole intersection weighted average control delay expressed in seconds per vehicle for signalized and all-way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop-controlled intersections
2 V/C = maximum volume-to-capacity ratio
3 LOS = Level of Service. LOS calculations conducted using the Synchro level of service analysis software package, which applies the methodology described in the *2000 HCM*.
4 For side-street stop control intersections, the worst-case movement data is reported.
Source: Fehr & Peers, February 2013.

The table above shows that, with the recommended mitigation measures under Option A, the Kaukama Road/Kulauku Street and Kaukama Road/Farrington Highway intersections will operate at an acceptable LOS in both the AM and PM peak hours. The St. John's Road and Kulaaupuni Street intersection continues to operate unacceptably during the AM peak hour, however it does not warrant signalization.

Option B

Under this scenario, the connection between Kulaaupuni Street and Kulauku Street is assumed. The additional demand caused by the new connection and re-distribution of traffic will require signalization of the St. John's Road/Kulaaupuni Street intersection. This improvement would also require a separate right-turn lane to accommodate the increase in project trips using this intersection to access KCLC. Without signalization, and or the additional separate right-turn lane, the intersection would operate with excessive delay and the peak hour signal warrant criteria would be satisfied.



→	Turn Lane
AM (PM)	Peak Hour Traffic Volume
1	Study Intersection
	Traffic Signal
STOP	Stop Sign
- -	Continuous Sidewalk / Multi-use Path

Figure 10.

Peak Hour Traffic Volumes and Lane Configurations - Phase III - 2019 Plus Project Mitigated Option A

FEHR PEERS

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In addition, St. John's Road at Farrington Highway would have to be widened for approximately 190 feet mauka of the intersection to accommodate two outbound lanes (one left-turn lane and one shared left/right-turn lane) and one inbound (i.e., eastbound) lane. Given the existing right-of-way of 40 feet, a narrow width of additional right-of-way will likely need to be acquired from the parcel at the southeast corner of the intersection to accommodate the widening and an ADA-compliant pedestrian path on at least one side of the street.

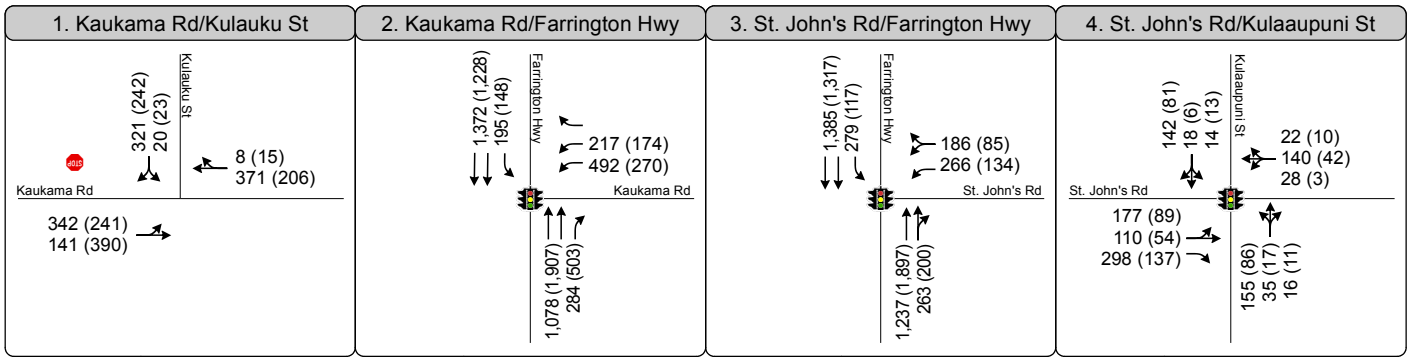
Table 13 below shows the results of the Phase III 2019 with Project Mitigated Option B analysis. As noted above, a new traffic signal would not be required at the Kaukama Road/Kulauku Street intersection under this scenario.

TABLE 13
PHASE III 2019 WITH PROJECT INTERSECTION LEVELS OF SERVICE (MITIGATED - OPTION B)

Intersection	Peak Hour	Intersection Control	Delay[1]	V/C[2]	LOS[3]
1. Kaukama Road and Kulauku Street	AM	Side-Street Stop	28.3	0.72	D
	PM		16.2	0.47	C
2. Kaukama Road and Farrington Highway	AM	Signal	25.6	0.80	C
	PM		31.7	0.93	C
3. St. John's Road and Farrington Highway	AM	Signal	26.7	0.88	C
	PM		23.3	0.90	C
4. St. John's Road and Kulaaupuni Street	AM	Signal	48.9	0.87	D
	PM		14.8	0.32	B

Notes:
1 Delay is whole intersection weighted average control delay expressed in seconds per vehicle for signalized and all-way stop controlled intersections. Total control delay for the worst movement is presented for side-street stop-controlled intersections
2 V/C = maximum volume-to-capacity ratio
3 LOS = Level of Service. LOS calculations conducted using the Synchro level of service analysis software package, which applies the methodology described in the *2000 HCM*.
4 For side-street stop control intersections, the worst-case movement data is reported.
Source: Fehr & Peers, February 2013.

The table above shows that with the recommended Option B mitigation measures, all intersections have an acceptable LOS in both the AM and PM peak hours. Detailed LOS Worksheets can be found in Appendix A. Figure 11 shows the lane geometries and vehicle traffic volumes under Phase III 2019 with Project Mitigated Option B conditions.



→	Turn Lane
AM (PM)	Peak Hour Traffic Volume
1	Study Intersection
	Traffic Signal
STOP	Stop Sign
- -	Continuous Sidewalk / Multi-use Path

Figure 11.

Peak Hour Traffic Volumes and Lane Configurations - Phase III - 2019 Plus Project Mitigated Option B

FEHR PEERS

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Queuing Analysis

As part of the intersection operations analysis, the vehicle queues in the southbound left-turn lanes on Farrington Highway at the Kaukama Road and St. John's Road intersections were reviewed. The purpose of this evaluation is to determine the probability of left-turn queues extending into the adjacent through lane during the peak hours. This evaluation was conducted for Phase III 2019 with Project conditions with mitigation.

At the Kaukama Road intersection, the vehicle queues in the southbound left-turn lane on Farrington Highway can be accommodated in the existing 225-foot pocket under Option B (with the Kulaaupuni-Kulauku connection) during both peak hours. Under Option A, however, the average (50th percentile) and maximum (95th percentile) queues would extend out of the turn pocket during the AM peak hour. With the addition of the second westbound left-turn lane under Option A, widening of the highway south of Kaukama Road would be required but would likely result in unmitigable environmental impacts due to proximity of the widened highway to the ocean. An alternative mitigation was considered which involves re-striping the back-to-back left turn pockets at Kaukama and Hookele as a continuous two-way left-turn lane. This would allow flexible use of the available storage area between the intersections. However the projected queues far exceed the total available storage between the intersections and this improvement is considered infeasible. Based on these findings, Option B provides the best overall mitigation for traffic operations from a capacity and queuing perspective.

At the St. John's Road and Farrington Highway intersection, the projected maximum queues in the southbound left-turn pocket would exceed the available 85-foot pocket during one or both peak hours under both Option A and Option B. Based on the longest maximum queue length, which occurs under Option B during the AM peak hour, the southbound left-turn pocket would need to be extended by 275 feet. This improvement is considered feasible given the available shoulder area on the makai side of the highway.

Construction Traffic Management

The proposed KCLC is planned for construction in three separate phases over a seven-year span. Each construction phase will involve the use of trucks for hauling of materials, as well as trips generated from construction workers. The recommendation is for a construction traffic management plan to be developed for each phase to designate truck routes and manage the temporary increase in vehicle trips to the site. In all three phases, the construction traffic impact is not anticipated to exceed the projected traffic impacts from each phase of KCLC once it is operational.

Pedestrian, Bicyclist and Transit Facilities

The Phase I conceptual plan (December 20, 2012) prepared by PBR Hawaii designates pedestrian paths throughout the KCLC, allowing for walk access between all facilities. No paths cross any internal vehicle roadways and this practice should be employed throughout buildout of the site to the maximum extent possible. Where pedestrian paths or sidewalks require roadway crossings, measures such as raised crosswalks, speed humps, or channelization should be implemented to slow vehicle traffic and enhance driver awareness of pedestrians. The layout of facilities within the

site should be developed such that adults are required to cross roadways in lieu of school-age children.

As noted under the Trip Distribution section, the project will serve the greater Leeward Coast area, and those students that do not travel on buses are expected to access the site via private vehicle. To minimize the number of vehicles traveling to and from the site and to encourage those students from the local Ma`ili area to walk, streets directly serving the property should include formal paths or sidewalks that are separated from vehicle travel lanes. Accordingly, the extension of Kulauku Street from north of Kulawae Street along the project frontage should include sidewalks on both sides of the street consistent with other streets in the neighborhood.

For students walking from the north, a separate pedestrian path should be provided from the southern terminus of Kulaaupuni Street to the site regardless of the timing of the planned street extension. In addition, the existing path on the east side of Kulaaupuni Street (south of the drainage channel bridge) currently terminates just north of Holt Drive. At a minimum, this path should be formalized with at least an AC berm separating it from the travel lanes, and extended to the site (adjacent to the DHHL site frontage). In addition, a graded path should be constructed north of the bridge to St. John's Road and parking should be prohibited on this side of the street as needed to keep the path clear of obstructions.

Once the street is fully extended between Kulaaupuni Street and Kulauku Street, the path could become a raised sidewalk. Ideally, a full multi-use path which could be used by both pedestrians and bicyclists would be constructed from St. John's Road to Kulawae Street if right-of-way is available. The multi-use path would be a community amenity in addition to enhancing active transportation access to the project site.

Given the relatively low speeds and existing vehicle traffic volumes, bicyclists are able to share the road with vehicles, and no separate bicycle lanes or paths are needed near the project site in the near term. The construction of the multi-use path with Phase I of the KCLC would serve bicycle demand. If a multi-use path is provided, no bicycle lane is necessary. Without the multi-use path, a bicycle lane is recommended, which would include the restriction of on-street parking on the makai side of Kulauku Street. In addition, bicycle racks should be provided near building entrances on the site to encourage cycling and to provide a safe location for bike parking and storage.

The proposed KCLC will not significantly impact transit service within the study area. This is due to the fact that limited students are anticipated to use transit to access the KCLC, and some students will be bused to and from the site. Some staff are expected to use public transit operated by the City & County of Honolulu, including the Handi-Van Service for disabled persons, however the number is not significant enough to result in an impact on the transit service. Designated parking spaces should be provided on-site for Handi-Van vehicles, as well as for vehicles with disabled permits per City & County of Honolulu ordinance.

APPENDIX A

LOS WORKSHEETS

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/23/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	16	106	278	6	11	36
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	20	134	352	8	14	46
Pedestrians		2	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	364				537	363
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	364				537	363
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	93
cM capacity (veh/h)	1189				493	678

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	154	359	59
Volume Left	20	0	14
Volume Right	0	8	46
cSH	1189	1700	623
Volume to Capacity	0.02	0.21	0.10
Queue Length 95th (ft)	1	0	8
Control Delay (s)	1.2	0.0	11.4
Lane LOS	A		B
Approach Delay (s)	1.2	0.0	11.4
Approach LOS			B

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	29.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	186	140	862	45	81	1093
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.94		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3248		3539	1548	1769	3539
Flt Permitted	0.97		1.00	1.00	0.24	1.00
Satd. Flow (perm)	3248		3539	1548	453	3539
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	219	165	1014	53	95	1286
RTOR Reduction (vph)	145	0	0	19	0	0
Lane Group Flow (vph)	239	0	1014	34	95	1286
Confl. Peds. (#/hr)		4		1	1	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	12.4		64.4	64.4	69.6	75.6
Effective Green, g (s)	12.4		64.4	64.4	69.6	75.6
Actuated g/C Ratio	0.12		0.64	0.64	0.70	0.76
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	403		2279	997	384	2675
v/s Ratio Prot	c0.07		0.29		0.01	c0.36
v/s Ratio Perm				0.02	0.16	
v/c Ratio	0.59		0.44	0.03	0.25	0.48
Uniform Delay, d1	41.4		8.9	6.5	5.4	4.7
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	2.4		0.6	0.1	0.1	0.6
Delay (s)	43.8		9.5	6.5	5.5	5.3
Level of Service	D		A	A	A	A
Approach Delay (s)	43.8		9.4			5.3
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	12.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	168	69	976	197	44	1046
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.99		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.96		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1709		3426		1770	3539
Flt Permitted	0.97		1.00		0.13	1.00
Satd. Flow (perm)	1709		3426		249	3539
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	187	77	1084	219	49	1162
RTOR Reduction (vph)	13	0	14	0	0	0
Lane Group Flow (vph)	251	0	1289	0	49	1162
Confl. Peds. (#/hr)		23		8	8	
Turn Type					D.P+P	
Protected Phases			6		5	2
Permitted Phases	4				6	
Actuated Green, G (s)	20.0		53.3		57.0	63.0
Effective Green, g (s)	20.0		53.3		57.0	63.0
Actuated g/C Ratio	0.21		0.56		0.60	0.66
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	360		1922		209	2347
v/s Ratio Prot			c0.38		0.01	c0.33
v/s Ratio Perm	c0.15				0.13	
v/c Ratio	0.70		0.67		0.23	0.50
Uniform Delay, d1	34.7		14.7		10.1	8.0
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	5.8		1.2		0.2	0.3
Delay (s)	40.4		15.9		10.4	8.4
Level of Service	D		B		B	A
Approach Delay (s)	40.4		15.9			8.4
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	15.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	95.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	126	81	51	10	107	17	37	27	9	11	14	82
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Hourly flow rate (vph)	197	127	80	16	167	27	58	42	14	17	22	128
Pedestrians		16			14			8			6	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	200			214			935	799	188	827	826	202
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	200			214			935	799	188	827	826	202
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	86			99			65	84	98	92	91	84
cM capacity (veh/h)	1366			1347			166	266	838	217	257	823

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	403	209	114	167
Volume Left	197	16	58	17
Volume Right	80	27	14	128
cSH	1366	1347	218	522
Volume to Capacity	0.14	0.01	0.52	0.32
Queue Length 95th (ft)	13	1	68	34
Control Delay (s)	4.6	0.7	38.2	15.1
Lane LOS	A	A	E	C
Approach Delay (s)	4.6	0.7	38.2	15.1
Approach LOS			E	C

Intersection Summary			
Average Delay	9.9		
Intersection Capacity Utilization	44.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/23/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	69	302	165	12	15	31
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Hourly flow rate (vph)	76	332	181	13	16	34
Pedestrians		2	1		11	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	206				683	201
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	206				683	201
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	94				96	96
cM capacity (veh/h)	1353				388	831

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	408	195	51
Volume Left	76	0	16
Volume Right	0	13	34
cSH	1353	1700	605
Volume to Capacity	0.06	0.11	0.08
Queue Length 95th (ft)	4	0	7
Control Delay (s)	1.9	0.0	11.5
Lane LOS	A		B
Approach Delay (s)	1.9	0.0	11.5
Approach LOS			B

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	102	90	1383	267	97	889
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.93		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3238		3539	1540	1770	3539
Flt Permitted	0.97		1.00	1.00	0.13	1.00
Satd. Flow (perm)	3238		3539	1540	247	3539
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	107	95	1456	281	102	936
RTOR Reduction (vph)	87	0	0	78	0	0
Lane Group Flow (vph)	115	0	1456	203	102	936
Confl. Peds. (#/hr)		1		3	3	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	8.8		67.4	67.4	73.2	79.2
Effective Green, g (s)	8.8		67.4	67.4	73.2	79.2
Actuated g/C Ratio	0.09		0.67	0.67	0.73	0.79
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	285		2385	1038	269	2803
v/s Ratio Prot	c0.04		c0.41		0.02	c0.26
v/s Ratio Perm				0.13	0.26	
v/c Ratio	0.40		0.61	0.20	0.38	0.33
Uniform Delay, d1	43.1		9.0	6.1	6.2	2.9
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9		1.2	0.4	0.3	0.3
Delay (s)	44.1		10.2	6.5	6.5	3.3
Level of Service	D		B	A	A	A
Approach Delay (s)	44.1		9.6			3.6
Approach LOS	D		A			A

Intersection Summary			
HCM Average Control Delay	9.8	HCM Level of Service	A
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	64.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	69	38	1362	94	35	969
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.98		1.00		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.95		0.99		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1692		3495		1770	3539
Flt Permitted	0.97		1.00		0.11	1.00
Satd. Flow (perm)	1692		3495		202	3539
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	73	40	1434	99	37	1020
RTOR Reduction (vph)	18	0	3	0	0	0
Lane Group Flow (vph)	95	0	1530	0	37	1020
Confl. Peds. (#/hr)		30		11	11	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	10.3		54.4		57.2	63.2
Effective Green, g (s)	10.3		54.4		57.2	63.2
Actuated g/C Ratio	0.12		0.64		0.67	0.74
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	204		2224		186	2616
v/s Ratio Prot	c0.06		c0.44		0.01	c0.29
v/s Ratio Perm					0.13	
v/c Ratio	0.46		0.69		0.20	0.39
Uniform Delay, d1	35.0		10.1		7.2	4.1
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	1.7		1.2		0.2	0.2
Delay (s)	36.7		11.2		7.4	4.3
Level of Service	D		B		A	A
Approach Delay (s)	36.7		11.2			4.4
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	85.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	66.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	35	35	47	1	33	8	23	13	1	10	5	43
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	47	47	63	1	44	11	31	17	1	13	7	57
Pedestrians		2			4			7			4	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	59			116			293	240	89	241	266	55
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	59			116			293	240	89	241	266	55
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			100			95	97	100	98	99	94
cM capacity (veh/h)	1540			1464			593	635	960	671	614	1006

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	156	56	49	77
Volume Left	47	1	31	13
Volume Right	63	11	1	57
cSH	1540	1464	614	882
Volume to Capacity	0.03	0.00	0.08	0.09
Queue Length 95th (ft)	2	0	7	7
Control Delay (s)	2.4	0.2	11.4	9.5
Lane LOS	A	A	B	A
Approach Delay (s)	2.4	0.2	11.4	9.5
Approach LOS			B	A

Intersection Summary			
Average Delay	4.9		
Intersection Capacity Utilization	26.9%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	20	117	309	7	12	47
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	127	336	8	13	51
Pedestrians		2	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	348				517	347
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	348				517	347
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	93
cM capacity (veh/h)	1205				506	692

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	149	343	64
Volume Left	22	0	13
Volume Right	0	8	51
cSH	1205	1700	644
Volume to Capacity	0.02	0.20	0.10
Queue Length 95th (ft)	1	0	8
Control Delay (s)	1.3	0.0	11.2
Lane LOS	A		B
Approach Delay (s)	1.3	0.0	11.2
Approach LOS			B

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	34.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	211	158	921	51	89	1167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.94		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3249		3539	1548	1770	3539
Flt Permitted	0.97		1.00	1.00	0.19	1.00
Satd. Flow (perm)	3249		3539	1548	353	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	229	172	1001	55	97	1268
RTOR Reduction (vph)	122	0	0	29	0	0
Lane Group Flow (vph)	279	0	1001	26	97	1268
Confl. Peds. (#/hr)		4		1	1	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	29.0		47.1	47.1	53.0	59.0
Effective Green, g (s)	29.0		47.1	47.1	53.0	59.0
Actuated g/C Ratio	0.29		0.47	0.47	0.53	0.59
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	942		1667	729	271	2088
v/s Ratio Prot	c0.09		0.28		0.02	c0.36
v/s Ratio Perm				0.02	0.17	
v/c Ratio	0.30		0.60	0.04	0.36	0.61
Uniform Delay, d1	27.6		19.5	14.2	13.2	13.1
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8		1.6	0.1	0.3	1.3
Delay (s)	28.4		21.1	14.3	13.5	14.4
Level of Service	C		C	B	B	B
Approach Delay (s)	28.4		20.8			14.4
Approach LOS	C		C			B

Intersection Summary			
HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	208	85	1042	219	50	1117
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.99		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.96		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1708		3422		1770	3539
Flt Permitted	0.97		1.00		0.12	1.00
Satd. Flow (perm)	1708		3422		216	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	226	92	1133	238	54	1214
RTOR Reduction (vph)	12	0	15	0	0	0
Lane Group Flow (vph)	306	0	1356	0	54	1214
Confl. Peds. (#/hr)		23		8	8	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	23.2		58.1		61.8	67.8
Effective Green, g (s)	23.2		58.1		61.8	67.8
Actuated g/C Ratio	0.23		0.56		0.60	0.66
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	385		1930		185	2330
v/s Ratio Prot	c0.18		c0.40		0.01	c0.34
v/s Ratio Perm					0.16	
v/c Ratio	0.79		0.70		0.29	0.52
Uniform Delay, d1	37.6		16.2		11.8	9.2
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	10.7		1.5		0.3	0.4
Delay (s)	48.4		17.7		12.1	9.6
Level of Service	D		B		B	A
Approach Delay (s)	48.4		17.7			9.7
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	17.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	103.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	70.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
4: St John's Rd & Kulaaupuni St

2/25/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	149	88	55	11	116	18	40	29	10	12	15	124
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Hourly flow rate (vph)	233	138	86	17	181	28	62	45	16	19	23	194
Pedestrians		16			14			8			6	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	215			231			1105	904	202	934	933	217
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	215			231			1105	904	202	934	933	217
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	83			99			43	80	98	89	89	76
cM capacity (veh/h)	1348			1327			110	223	823	172	215	807

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	456	227	123	236
Volume Left	233	17	62	19
Volume Right	86	28	16	194
cSH	1348	1327	156	515
Volume to Capacity	0.17	0.01	0.79	0.46
Queue Length 95th (ft)	16	1	127	59
Control Delay (s)	5.0	0.7	83.3	17.8
Lane LOS	A	A	F	C
Approach Delay (s)	5.0	0.7	83.3	17.8
Approach LOS			F	C

Intersection Summary			
Average Delay	16.2		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	81	332	175	13	16	31
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	88	361	190	14	17	34
Pedestrians		2	1		11	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	215				746	210
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	215				746	210
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				95	96
cM capacity (veh/h)	1342				352	821

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	449	204	51
Volume Left	88	0	17
Volume Right	0	14	34
cSH	1342	1700	565
Volume to Capacity	0.07	0.12	0.09
Queue Length 95th (ft)	5	0	7
Control Delay (s)	2.1	0.0	12.0
Lane LOS	A		B
Approach Delay (s)	2.1	0.0	12.0
Approach LOS			B

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	47.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	106	95	1521	300	114	978
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.93		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3237		3539	1540	1770	3539
Flt Permitted	0.97		1.00	1.00	0.09	1.00
Satd. Flow (perm)	3237		3539	1540	164	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	115	103	1653	326	124	1063
RTOR Reduction (vph)	94	0	0	84	0	0
Lane Group Flow (vph)	124	0	1653	242	124	1063
Confl. Peds. (#/hr)		1		3	3	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	9.0		65.3	65.3	73.0	79.0
Effective Green, g (s)	9.0		65.3	65.3	73.0	79.0
Actuated g/C Ratio	0.09		0.65	0.65	0.73	0.79
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	291		2311	1006	243	2796
v/s Ratio Prot	c0.04		c0.47		0.04	c0.30
v/s Ratio Perm				0.16	0.33	
v/c Ratio	0.43		0.72	0.24	0.51	0.38
Uniform Delay, d1	43.1		11.3	7.1	10.3	3.2
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0		1.9	0.6	0.8	0.4
Delay (s)	44.1		13.2	7.7	11.0	3.5
Level of Service	D		B	A	B	A
Approach Delay (s)	44.1		12.3			4.3
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	11.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	91	50	1498	135	52	1066
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.98		1.00		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.95		0.99		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1688		3480		1770	3539
Flt Permitted	0.97		1.00		0.07	1.00
Satd. Flow (perm)	1688		3480		129	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	99	54	1628	147	57	1159
RTOR Reduction (vph)	17	0	5	0	0	0
Lane Group Flow (vph)	136	0	1770	0	57	1159
Confl. Peds. (#/hr)		30		11	11	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	13.8		69.2		73.3	79.3
Effective Green, g (s)	13.8		69.2		73.3	79.3
Actuated g/C Ratio	0.13		0.66		0.70	0.75
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	222		2291		154	2670
v/s Ratio Prot	c0.08		c0.51		0.01	c0.33
v/s Ratio Perm					0.24	
v/c Ratio	0.61		0.77		0.37	0.43
Uniform Delay, d1	43.1		12.5		11.6	4.7
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	4.9		2.0		0.5	0.2
Delay (s)	48.0		14.4		12.2	4.9
Level of Service	D		B		B	A
Approach Delay (s)	48.0		14.4			5.3
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	12.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	105.1	Sum of lost time (s)	18.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	83	38	51	1	36	9	25	14	1	11	5	72
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	111	51	68	1	48	12	33	19	1	15	7	96
Pedestrians		2			4			7			4	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	64			126			471	380	96	381	408	60
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	64			126			471	380	96	381	408	60
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			100			92	96	100	97	99	90
cM capacity (veh/h)	1533			1452			419	508	952	521	490	1000

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	229	61	53	117
Volume Left	111	1	33	15
Volume Right	68	12	1	96
cSH	1533	1452	453	852
Volume to Capacity	0.07	0.00	0.12	0.14
Queue Length 95th (ft)	6	0	10	12
Control Delay (s)	3.9	0.2	14.0	9.9
Lane LOS	A	A	B	A
Approach Delay (s)	3.9	0.2	14.0	9.9
Approach LOS			B	A

Intersection Summary			
Average Delay	6.1		
Intersection Capacity Utilization	31.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	314	117	309	7	12	251
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	341	127	336	8	13	273
Pedestrians		2	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	348				1156	347
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	348				1156	347
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	72				92	61
cM capacity (veh/h)	1205				155	692

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	468	343	286
Volume Left	341	0	13
Volume Right	0	8	273
cSH	1205	1700	598
Volume to Capacity	0.28	0.20	0.48
Queue Length 95th (ft)	29	0	65
Control Delay (s)	7.4	0.0	16.4
Lane LOS	A		C
Approach Delay (s)	7.4	0.0	16.4
Approach LOS			C

Intersection Summary			
Average Delay	7.4		
Intersection Capacity Utilization	66.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	354	219	921	169	265	1167
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.94		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3270		3539	1548	1770	3539
Flt Permitted	0.97		1.00	1.00	0.15	1.00
Satd. Flow (perm)	3270		3539	1548	285	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	385	238	1001	184	288	1268
RTOR Reduction (vph)	103	0	0	110	0	0
Lane Group Flow (vph)	520	0	1001	74	288	1268
Confl. Peds. (#/hr)		4		1	1	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	29.0		40.2	40.2	53.0	59.0
Effective Green, g (s)	29.0		40.2	40.2	53.0	59.0
Actuated g/C Ratio	0.29		0.40	0.40	0.53	0.59
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	948		1423	622	341	2088
v/s Ratio Prot	c0.16		0.28		c0.11	0.36
v/s Ratio Perm				0.05	c0.34	
v/c Ratio	0.55		0.70	0.12	0.84	0.61
Uniform Delay, d1	30.0		24.9	18.8	17.3	13.1
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	2.3		2.9	0.4	16.5	1.3
Delay (s)	32.3		27.9	19.2	33.8	14.4
Level of Service	C		C	B	C	B
Approach Delay (s)	32.3		26.5			18.0
Approach LOS	C		C			B

Intersection Summary			
HCM Average Control Delay	23.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	76.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	217	85	1097	222	50	1275
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.99		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.96		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1710		3425		1770	3539
Flt Permitted	0.97		1.00		0.10	1.00
Satd. Flow (perm)	1710		3425		191	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	236	92	1192	241	54	1386
RTOR Reduction (vph)	12	0	14	0	0	0
Lane Group Flow (vph)	316	0	1419	0	54	1386
Confl. Peds. (#/hr)		23		8	8	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	24.1		60.6		64.3	70.3
Effective Green, g (s)	24.1		60.6		64.3	70.3
Actuated g/C Ratio	0.23		0.57		0.60	0.66
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	387		1951		170	2338
v/s Ratio Prot	c0.19		c0.41		0.01	c0.39
v/s Ratio Perm					0.18	
v/c Ratio	0.82		0.73		0.32	0.59
Uniform Delay, d1	39.1		16.8		12.7	10.1
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	12.6		1.7		0.4	0.6
Delay (s)	51.6		18.5		13.1	10.7
Level of Service	D		B		B	B
Approach Delay (s)	51.6		18.5			10.8
Approach LOS	D		B			B

Intersection Summary			
HCM Average Control Delay	18.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	106.4	Sum of lost time (s)	18.0
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
4: St John's Rd & Kulaaupuni St

2/25/2013

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	149	91	55	11	116	18	40	29	10	12	15	124
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Hourly flow rate (vph)	233	142	86	17	181	28	62	45	16	19	23	194
Pedestrians		16			14			8			6	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	215			236			1110	909	207	939	937	217
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	215			236			1110	909	207	939	937	217
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	83			99			43	80	98	89	89	76
cM capacity (veh/h)	1348			1322			109	222	818	170	213	807

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	461	227	123	236
Volume Left	233	17	62	19
Volume Right	86	28	16	194
cSH	1348	1322	155	513
Volume to Capacity	0.17	0.01	0.80	0.46
Queue Length 95th (ft)	16	1	128	60
Control Delay (s)	5.0	0.7	84.9	17.9
Lane LOS	A	A	F	C
Approach Delay (s)	5.0	0.7	84.9	17.9
Approach LOS			F	C

Intersection Summary			
Average Delay	16.4		
Intersection Capacity Utilization	51.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	172	332	175	13	16	192
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	187	361	190	14	17	209
Pedestrians		2	1		11	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	215				944	210
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	215				944	210
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	86				93	75
cM capacity (veh/h)	1342				248	821

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	548	204	226
Volume Left	187	0	17
Volume Right	0	14	209
cSH	1342	1700	697
Volume to Capacity	0.14	0.12	0.32
Queue Length 95th (ft)	12	0	35
Control Delay (s)	3.7	0.0	12.6
Lane LOS	A		B
Approach Delay (s)	3.7	0.0	12.6
Approach LOS			B

Intersection Summary			
Average Delay	5.0		
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	170	192	1521	364	141	978
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.92		1.00	0.85	1.00	1.00
Flt Protected	0.98		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3212		3539	1540	1770	3539
Flt Permitted	0.98		1.00	1.00	0.08	1.00
Satd. Flow (perm)	3212		3539	1540	141	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	185	209	1653	396	153	1063
RTOR Reduction (vph)	185	0	0	114	0	0
Lane Group Flow (vph)	209	0	1653	282	153	1063
Confl. Peds. (#/hr)		1		3	3	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	11.5		61.4	61.4	70.5	76.5
Effective Green, g (s)	11.5		61.4	61.4	70.5	76.5
Actuated g/C Ratio	0.12		0.61	0.61	0.70	0.76
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	369		2173	946	248	2707
v/s Ratio Prot	c0.07		c0.47		c0.06	0.30
v/s Ratio Perm				0.18	0.38	
v/c Ratio	0.57		0.76	0.30	0.62	0.39
Uniform Delay, d1	41.9		14.0	9.1	16.4	3.9
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	2.0		2.6	0.8	3.2	0.4
Delay (s)	43.9		16.6	9.9	19.5	4.4
Level of Service	D		B	A	B	A
Approach Delay (s)	43.9		15.3			6.3
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	15.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	76.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	92	50	1585	140	52	1091
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.98		1.00		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.95		0.99		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1688		3481		1770	3539
Flt Permitted	0.97		1.00		0.06	1.00
Satd. Flow (perm)	1688		3481		105	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	100	54	1723	152	57	1186
RTOR Reduction (vph)	17	0	5	0	0	0
Lane Group Flow (vph)	137	0	1870	0	57	1186
Confl. Peds. (#/hr)		30		11	11	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	13.9		71.0		75.2	81.2
Effective Green, g (s)	13.9		71.0		75.2	81.2
Actuated g/C Ratio	0.13		0.66		0.70	0.76
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	219		2308		139	2683
v/s Ratio Prot	c0.08		c0.54		0.02	c0.34
v/s Ratio Perm					0.27	
v/c Ratio	0.62		0.81		0.41	0.44
Uniform Delay, d1	44.1		13.1		13.9	4.7
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	5.4		2.6		0.7	0.2
Delay (s)	49.6		15.7		14.6	5.0
Level of Service	D		B		B	A
Approach Delay (s)	49.6		15.7			5.4
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	13.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	107.1	Sum of lost time (s)	18.0
Intersection Capacity Utilization	74.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	83	43	51	1	36	9	25	14	1	11	5	72
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	111	57	68	1	48	12	33	19	1	15	7	96
Pedestrians		2			4			7			4	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	64			132			478	386	102	388	414	60
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	64			132			478	386	102	388	414	60
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			100			92	96	100	97	99	90
cM capacity (veh/h)	1533			1444			415	503	944	516	485	1000

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	236	61	53	117
Volume Left	111	1	33	15
Volume Right	68	12	1	96
cSH	1533	1444	449	850
Volume to Capacity	0.07	0.00	0.12	0.14
Queue Length 95th (ft)	6	0	10	12
Control Delay (s)	3.8	0.2	14.1	9.9
Lane LOS	A	A	B	A
Approach Delay (s)	3.8	0.2	14.1	9.9
Approach LOS			B	A

Intersection Summary			
Average Delay	6.1		
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	23	131	346	7	13	52
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	25	142	376	8	14	57
Pedestrians		2	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	389				579	387
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	389				579	387
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	91
cM capacity (veh/h)	1165				464	657

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	167	384	71
Volume Left	25	0	14
Volume Right	0	8	57
cSH	1165	1700	607
Volume to Capacity	0.02	0.23	0.12
Queue Length 95th (ft)	2	0	10
Control Delay (s)	1.4	0.0	11.7
Lane LOS	A		B
Approach Delay (s)	1.4	0.0	11.7
Approach LOS			B

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	37.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	236	178	1021	56	99	1316
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.94		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3248		3539	1548	1770	3539
Flt Permitted	0.97		1.00	1.00	0.20	1.00
Satd. Flow (perm)	3248		3539	1548	379	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	257	193	1110	61	108	1430
RTOR Reduction (vph)	166	0	0	24	0	0
Lane Group Flow (vph)	284	0	1110	37	108	1430
Confl. Peds. (#/hr)		4		1	1	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	13.8		61.1	61.1	68.2	74.2
Effective Green, g (s)	13.8		61.1	61.1	68.2	74.2
Actuated g/C Ratio	0.14		0.61	0.61	0.68	0.74
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	448		2162	946	357	2626
v/s Ratio Prot	c0.09		0.31		0.02	c0.40
v/s Ratio Perm				0.02	0.18	
v/c Ratio	0.64		0.51	0.04	0.30	0.54
Uniform Delay, d1	40.7		11.0	7.8	6.4	5.6
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	2.9		0.9	0.1	0.2	0.8
Delay (s)	43.7		11.9	7.8	6.6	6.4
Level of Service	D		B	A	A	A
Approach Delay (s)	43.7		11.7			6.4
Approach LOS	D		B			A

Intersection Summary			
HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	269	110	1142	252	59	1224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.99		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.96		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1707		3416		1770	3539
Flt Permitted	0.97		1.00		0.07	1.00
Satd. Flow (perm)	1707		3416		130	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	292	120	1241	274	64	1330
RTOR Reduction (vph)	12	0	15	0	0	0
Lane Group Flow (vph)	400	0	1500	0	64	1330
Confl. Peds. (#/hr)		23		8	8	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	29.9		59.2		62.9	68.9
Effective Green, g (s)	29.9		59.2		62.9	68.9
Actuated g/C Ratio	0.27		0.53		0.57	0.62
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	461		1825		129	2201
v/s Ratio Prot	c0.23		c0.44		0.02	c0.38
v/s Ratio Perm					0.27	
v/c Ratio	0.87		0.82		0.50	0.60
Uniform Delay, d1	38.6		21.4		17.7	12.7
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	15.6		3.5		1.1	0.7
Delay (s)	54.2		24.9		18.8	13.4
Level of Service	D		C		B	B
Approach Delay (s)	54.2		24.9			13.6
Approach LOS	D		C			B

Intersection Summary			
HCM Average Control Delay	23.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	110.8	Sum of lost time (s)	18.0
Intersection Capacity Utilization	81.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	161	120	80	12	146	21	100	33	11	13	17	100
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Hourly flow rate (vph)	252	188	125	19	228	33	156	52	17	20	27	156
Pedestrians		16			14			8			6	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	267			320			1229	1066	272	1098	1112	267
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	267			320			1229	1066	272	1098	1112	267
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	81			98			0	70	98	83	84	79
cM capacity (veh/h)	1290			1231			88	174	753	119	164	758

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	564	280	225	203
Volume Left	252	19	156	20
Volume Right	125	33	17	156
cSH	1290	1231	108	376
Volume to Capacity	0.19	0.02	2.09	0.54
Queue Length 95th (ft)	18	1	477	77
Control Delay (s)	4.9	0.7	585.8	25.2
Lane LOS	A	A	F	D
Approach Delay (s)	4.9	0.7	585.8	25.2
Approach LOS			F	D

Intersection Summary			
Average Delay	110.0		
Intersection Capacity Utilization	55.4%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	89	366	193	14	18	33
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	97	398	210	15	20	36
Pedestrians		2	1		11	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	236				821	230
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	236				821	230
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				94	96
cM capacity (veh/h)	1319				316	800

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	495	225	55
Volume Left	97	0	20
Volume Right	0	15	36
cSH	1319	1700	519
Volume to Capacity	0.07	0.13	0.11
Queue Length 95th (ft)	6	0	9
Control Delay (s)	2.2	0.0	12.8
Lane LOS	A		B
Approach Delay (s)	2.2	0.0	12.8
Approach LOS			B

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	123	127	1861	350	140	1189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.92		1.00	0.85	1.00	1.00
Flt Protected	0.98		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3222		3539	1540	1770	3539
Flt Permitted	0.98		1.00	1.00	0.06	1.00
Satd. Flow (perm)	3222		3539	1540	118	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	134	138	2023	380	152	1292
RTOR Reduction (vph)	125	0	0	85	0	0
Lane Group Flow (vph)	147	0	2023	295	152	1292
Confl. Peds. (#/hr)		1		3	3	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	9.7		63.3	63.3	72.3	78.3
Effective Green, g (s)	9.7		63.3	63.3	72.3	78.3
Actuated g/C Ratio	0.10		0.63	0.63	0.72	0.78
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	313		2240	975	234	2771
v/s Ratio Prot	c0.05		c0.57		c0.06	0.37
v/s Ratio Perm				0.19	0.41	
v/c Ratio	0.47		0.90	0.30	0.65	0.47
Uniform Delay, d1	42.7		15.7	8.3	24.7	3.7
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1		6.5	0.8	4.6	0.6
Delay (s)	43.8		22.2	9.1	29.3	4.3
Level of Service	D		C	A	C	A
Approach Delay (s)	43.8		20.2			6.9
Approach LOS	D		C			A

Intersection Summary			
HCM Average Control Delay	17.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	126	66	1703	196	77	1211
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.98		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.95		0.98		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1688		3465		1770	3539
Flt Permitted	0.97		1.00		0.05	1.00
Satd. Flow (perm)	1688		3465		101	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	137	72	1851	213	84	1316
RTOR Reduction (vph)	17	0	7	0	0	0
Lane Group Flow (vph)	192	0	2057	0	84	1316
Confl. Peds. (#/hr)		30		11	11	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	17.6		73.5		77.4	83.4
Effective Green, g (s)	17.6		73.5		77.4	83.4
Actuated g/C Ratio	0.16		0.65		0.68	0.74
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	263		2254		127	2612
v/s Ratio Prot	c0.11		c0.59		0.02	c0.37
v/s Ratio Perm					0.43	
v/c Ratio	0.73		0.91		0.66	0.50
Uniform Delay, d1	45.4		17.0		22.5	6.2
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	10.0		6.5		9.6	0.3
Delay (s)	55.4		23.5		32.1	6.5
Level of Service	E		C		C	A
Approach Delay (s)	55.4		23.5			8.0
Approach LOS	E		C			A

Intersection Summary			
HCM Average Control Delay	19.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	113.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	68	61	122	1	50	10	66	15	1	12	6	66
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	91	81	163	1	67	13	88	20	1	16	8	88
Pedestrians		2			4			7			4	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	84			251			521	438	174	439	512	79
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	84			251			521	438	174	439	512	79
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			100			78	96	100	97	98	91
cM capacity (veh/h)	1508			1307			393	477	862	480	433	976

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	335	81	109	112
Volume Left	91	1	88	16
Volume Right	163	13	1	88
cSH	1508	1307	409	789
Volume to Capacity	0.06	0.00	0.27	0.14
Queue Length 95th (ft)	5	0	27	12
Control Delay (s)	2.4	0.1	17.0	10.3
Lane LOS	A	A	C	B
Approach Delay (s)	2.4	0.1	17.0	10.3
Approach LOS			C	B

Intersection Summary			
Average Delay	6.0		
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	470	131	346	7	13	322
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	511	142	376	8	14	350
Pedestrians		2	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	389				1551	387
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	389				1551	387
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	56				80	47
cM capacity (veh/h)	1165				70	657

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	653	384	364
Volume Left	511	0	14
Volume Right	0	8	350
cSH	1165	1700	495
Volume to Capacity	0.44	0.23	0.73
Queue Length 95th (ft)	57	0	152
Control Delay (s)	9.3	0.0	29.8
Lane LOS	A		D
Approach Delay (s)	9.3	0.0	29.8
Approach LOS			D

Intersection Summary			
Average Delay	12.1		
Intersection Capacity Utilization	82.4%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	425	259	1021	234	368	1316
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.94		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3271		3539	1548	1770	3539
Flt Permitted	0.97		1.00	1.00	0.10	1.00
Satd. Flow (perm)	3271		3539	1548	192	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	462	282	1110	254	400	1430
RTOR Reduction (vph)	106	0	0	155	0	0
Lane Group Flow (vph)	638	0	1110	99	400	1430
Confl. Peds. (#/hr)		4		1	1	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	24.3		39.0	39.0	57.7	63.7
Effective Green, g (s)	24.3		39.0	39.0	57.7	63.7
Actuated g/C Ratio	0.24		0.39	0.39	0.58	0.64
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	795		1380	604	406	2254
v/s Ratio Prot	c0.20		0.31		c0.18	0.40
v/s Ratio Perm				0.06	c0.38	
v/c Ratio	0.80		0.80	0.16	0.99	0.63
Uniform Delay, d1	35.6		27.1	19.9	29.4	11.1
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	5.9		5.1	0.6	40.3	1.4
Delay (s)	41.5		32.2	20.5	69.7	12.4
Level of Service	D		C	C	E	B
Approach Delay (s)	41.5		30.0			24.9
Approach LOS	D		C			C

Intersection Summary			
HCM Average Control Delay	29.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	282	110	1215	256	59	1467
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.99		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.96		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1708		3420		1770	3539
Flt Permitted	0.97		1.00		0.07	1.00
Satd. Flow (perm)	1708		3420		122	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	307	120	1321	278	64	1595
RTOR Reduction (vph)	12	0	14	0	0	0
Lane Group Flow (vph)	415	0	1585	0	64	1595
Confl. Peds. (#/hr)		23		8	8	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	30.9		60.9		64.7	70.7
Effective Green, g (s)	30.9		60.9		64.7	70.7
Actuated g/C Ratio	0.27		0.54		0.57	0.62
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	465		1833		125	2203
v/s Ratio Prot	c0.24		c0.46		0.02	c0.45
v/s Ratio Perm					0.27	
v/c Ratio	0.89		0.86		0.51	0.72
Uniform Delay, d1	39.7		22.8		19.6	14.7
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	18.9		4.9		1.5	1.5
Delay (s)	58.7		27.7		21.1	16.2
Level of Service	E		C		C	B
Approach Delay (s)	58.7		27.7			16.4
Approach LOS	E		C			B

Intersection Summary			
HCM Average Control Delay	26.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	113.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	82.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	161	124	80	12	146	21	100	33	11	13	17	100
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Hourly flow rate (vph)	252	194	125	19	228	33	156	52	17	20	27	156
Pedestrians		16			14			8			6	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	267			327			1235	1072	278	1104	1118	267
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	267			327			1235	1072	278	1104	1118	267
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	81			98			0	70	98	83	84	79
cM capacity (veh/h)	1290			1225			87	173	747	117	162	758

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	570	280	225	203
Volume Left	252	19	156	20
Volume Right	125	33	17	156
cSH	1290	1225	107	374
Volume to Capacity	0.19	0.02	2.11	0.54
Queue Length 95th (ft)	18	1	480	78
Control Delay (s)	4.9	0.7	596.4	25.5
Lane LOS	A	A	F	D
Approach Delay (s)	4.9	0.7	596.4	25.5
Approach LOS			F	D

Intersection Summary			
Average Delay	111.4		
Intersection Capacity Utilization	55.6%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	200	366	193	14	18	305
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	217	398	210	15	20	332
Pedestrians		2	1		11	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	236				1062	230
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	236				1062	230
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	84				90	59
cM capacity (veh/h)	1319				205	800

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	615	225	351
Volume Left	217	0	20
Volume Right	0	15	332
cSH	1319	1700	688
Volume to Capacity	0.16	0.13	0.51
Queue Length 95th (ft)	15	0	73
Control Delay (s)	4.1	0.0	15.5
Lane LOS	A		C
Approach Delay (s)	4.1	0.0	15.5
Approach LOS			C

Intersection Summary			
Average Delay	6.7		
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	232	290	1861	428	173	1189
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.92		1.00	0.85	1.00	1.00
Flt Protected	0.98		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3201		3539	1540	1770	3539
Flt Permitted	0.98		1.00	1.00	0.07	1.00
Satd. Flow (perm)	3201		3539	1540	133	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	252	315	2023	465	188	1292
RTOR Reduction (vph)	246	0	0	124	0	0
Lane Group Flow (vph)	321	0	2023	341	188	1292
Confl. Peds. (#/hr)		1		3	3	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	15.0		56.2	56.2	67.0	73.0
Effective Green, g (s)	15.0		56.2	56.2	67.0	73.0
Actuated g/C Ratio	0.15		0.56	0.56	0.67	0.73
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	480		1989	865	266	2583
v/s Ratio Prot	c0.10		c0.57		c0.08	0.37
v/s Ratio Perm				0.22	0.40	
v/c Ratio	0.67		1.02	0.39	0.71	0.50
Uniform Delay, d1	40.2		21.9	12.3	27.4	5.7
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	3.5		24.6	1.3	6.8	0.7
Delay (s)	43.7		46.5	13.7	34.2	6.4
Level of Service	D		D	B	C	A
Approach Delay (s)	43.7		40.3			10.0
Approach LOS	D		D			A

Intersection Summary			
HCM Average Control Delay	30.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	92.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	128	66	1850	204	77	1240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.98		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.95		0.99		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1689		3468		1770	3539
Flt Permitted	0.97		1.00		0.05	1.00
Satd. Flow (perm)	1689		3468		101	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	139	72	2011	222	84	1348
RTOR Reduction (vph)	16	0	6	0	0	0
Lane Group Flow (vph)	195	0	2227	0	84	1348
Confl. Peds. (#/hr)		30		11	11	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	17.8		73.5		77.4	83.4
Effective Green, g (s)	17.8		73.5		77.4	83.4
Actuated g/C Ratio	0.16		0.65		0.68	0.74
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	266		2252		127	2607
v/s Ratio Prot	c0.12		c0.64		0.02	c0.38
v/s Ratio Perm					0.43	
v/c Ratio	0.73		0.99		0.66	0.52
Uniform Delay, d1	45.4		19.4		28.0	6.3
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	10.0		16.3		9.6	0.3
Delay (s)	55.4		35.8		37.6	6.7
Level of Service	E		D		D	A
Approach Delay (s)	55.4		35.8			8.5
Approach LOS	E		D			A

Intersection Summary			
HCM Average Control Delay	26.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	113.2	Sum of lost time (s)	18.0
Intersection Capacity Utilization	91.1%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	69	61	122	1	50	10	66	15	1	12	6	66
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	92	81	163	1	67	13	88	20	1	16	8	88
Pedestrians		2			4			7			4	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	84			251			524	440	174	442	515	79
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	84			251			524	440	174	442	515	79
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			100			77	96	100	97	98	91
cM capacity (veh/h)	1508			1307			391	475	862	478	431	976

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	336	81	109	112
Volume Left	92	1	88	16
Volume Right	163	13	1	88
cSH	1508	1307	407	788
Volume to Capacity	0.06	0.00	0.27	0.14
Queue Length 95th (ft)	5	0	27	12
Control Delay (s)	2.5	0.1	17.1	10.3
Lane LOS	A	A	C	B
Approach Delay (s)	2.5	0.1	17.1	10.3
Approach LOS			C	B

Intersection Summary			
Average Delay	6.0		
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	24	141	371	8	14	55
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	153	403	9	15	60
Pedestrians		2	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	417				620	415
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	417				620	415
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				97	91
cM capacity (veh/h)	1137				439	634

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	179	412	75
Volume Left	26	0	15
Volume Right	0	9	60
cSH	1137	1700	581
Volume to Capacity	0.02	0.24	0.13
Queue Length 95th (ft)	2	0	11
Control Delay (s)	1.4	0.0	12.1
Lane LOS	A		B
Approach Delay (s)	1.4	0.0	12.1
Approach LOS			B

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	39.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	253	192	1087	59	106	1415
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.94		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3247		3539	1548	1770	3539
Flt Permitted	0.97		1.00	1.00	0.12	1.00
Satd. Flow (perm)	3247		3539	1548	220	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	275	209	1182	64	115	1538
RTOR Reduction (vph)	137	0	0	35	0	0
Lane Group Flow (vph)	347	0	1182	29	115	1538
Confl. Peds. (#/hr)		4		1	1	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	29.0		45.3	45.3	53.0	59.0
Effective Green, g (s)	29.0		45.3	45.3	53.0	59.0
Actuated g/C Ratio	0.29		0.45	0.45	0.53	0.59
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	942		1603	701	236	2088
v/s Ratio Prot	c0.11		0.33		0.04	c0.43
v/s Ratio Perm				0.02	0.22	
v/c Ratio	0.37		0.74	0.04	0.49	0.74
Uniform Delay, d1	28.2		22.5	15.2	15.3	14.9
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1		3.1	0.1	0.6	2.4
Delay (s)	29.3		25.5	15.4	15.9	17.2
Level of Service	C		C	B	B	B
Approach Delay (s)	29.3		25.0			17.1
Approach LOS	C		C			B

Intersection Summary			
HCM Average Control Delay	21.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	309	126	1210	274	63	1297
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.99		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.96		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1706		3412		1770	3539
Flt Permitted	0.97		1.00		0.07	1.00
Satd. Flow (perm)	1706		3412		123	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	336	137	1315	298	68	1410
RTOR Reduction (vph)	12	0	16	0	0	0
Lane Group Flow (vph)	461	0	1597	0	68	1410
Confl. Peds. (#/hr)		23		8	8	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	33.5		60.8		64.6	70.6
Effective Green, g (s)	33.5		60.8		64.6	70.6
Actuated g/C Ratio	0.29		0.52		0.56	0.61
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	492		1787		122	2152
v/s Ratio Prot	c0.27		c0.47		0.02	c0.40
v/s Ratio Perm					0.29	
v/c Ratio	0.94		0.89		0.56	0.66
Uniform Delay, d1	40.3		24.8		21.5	14.8
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	25.4		6.6		3.1	1.0
Delay (s)	65.7		31.4		24.6	15.8
Level of Service	E		C		C	B
Approach Delay (s)	65.7		31.4			16.2
Approach LOS	E		C			B

Intersection Summary			
HCM Average Control Delay	29.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	116.1	Sum of lost time (s)	18.0
Intersection Capacity Utilization	87.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	172	111	93	13	155	22	138	35	12	14	18	127
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Hourly flow rate (vph)	269	173	145	20	242	34	216	55	19	22	28	198
Pedestrians		16			14			8			6	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	283			327			1320	1115	268	1150	1170	281
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	283			327			1320	1115	268	1150	1170	281
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	79			98			0	66	98	79	81	73
cM capacity (veh/h)	1273			1225			68	159	756	103	148	744

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	588	297	289	248
Volume Left	269	20	216	22
Volume Right	145	34	19	198
cSH	1273	1225	81	371
Volume to Capacity	0.21	0.02	3.55	0.67
Queue Length 95th (ft)	20	1	Err	117
Control Delay (s)	5.1	0.7	Err	32.4
Lane LOS	A	A	F	D
Approach Delay (s)	5.1	0.7	Err	32.4
Approach LOS			F	D

Intersection Summary			
Average Delay	2040.7		
Intersection Capacity Utilization	68.7%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	94	390	206	15	19	35
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	102	424	224	16	21	38
Pedestrians		2	1		11	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	251				872	245
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	251				872	245
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				93	95
cM capacity (veh/h)	1302				293	785

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	526	240	59
Volume Left	102	0	21
Volume Right	0	16	38
cSH	1302	1700	493
Volume to Capacity	0.08	0.14	0.12
Queue Length 95th (ft)	6	0	10
Control Delay (s)	2.2	0.0	13.3
Lane LOS	A		B
Approach Delay (s)	2.2	0.0	13.3
Approach LOS			B

Intersection Summary			
Average Delay	2.4		
Intersection Capacity Utilization	52.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	124	116	1936	366	140	1232
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.93		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3233		3539	1540	1770	3539
Flt Permitted	0.97		1.00	1.00	0.06	1.00
Satd. Flow (perm)	3233		3539	1540	118	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	135	126	2104	398	152	1339
RTOR Reduction (vph)	114	0	0	86	0	0
Lane Group Flow (vph)	147	0	2104	312	152	1339
Confl. Peds. (#/hr)		1		3	3	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	9.7		63.3	63.3	72.3	78.3
Effective Green, g (s)	9.7		63.3	63.3	72.3	78.3
Actuated g/C Ratio	0.10		0.63	0.63	0.72	0.78
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	314		2240	975	234	2771
v/s Ratio Prot	c0.05		c0.59		0.06	c0.38
v/s Ratio Perm				0.20	0.41	
v/c Ratio	0.47		0.94	0.32	0.65	0.48
Uniform Delay, d1	42.7		16.6	8.4	26.1	3.8
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1		9.3	0.9	4.6	0.6
Delay (s)	43.8		25.9	9.3	30.7	4.4
Level of Service	D		C	A	C	A
Approach Delay (s)	43.8		23.3			7.1
Approach LOS	D		C			A

Intersection Summary			
HCM Average Control Delay	18.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	84.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	138	77	1837	232	85	1308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.98		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.95		0.98		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1684		3458		1770	3539
Flt Permitted	0.97		1.00		0.05	1.00
Satd. Flow (perm)	1684		3458		102	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	150	84	1997	252	92	1422
RTOR Reduction (vph)	18	0	8	0	0	0
Lane Group Flow (vph)	216	0	2241	0	92	1422
Confl. Peds. (#/hr)		30		11	11	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	19.1		73.1		78.1	84.1
Effective Green, g (s)	19.1		73.1		78.1	84.1
Actuated g/C Ratio	0.17		0.63		0.68	0.73
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	279		2194		142	2584
v/s Ratio Prot	c0.13		c0.65		0.03	c0.40
v/s Ratio Perm					0.41	
v/c Ratio	0.78		1.02		0.65	0.55
Uniform Delay, d1	46.0		21.1		28.1	7.0
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	12.7		24.9		7.4	0.4
Delay (s)	58.7		45.9		35.5	7.5
Level of Service	E		D		D	A
Approach Delay (s)	58.7		45.9			9.2
Approach LOS	E		D			A

Intersection Summary			
HCM Average Control Delay	32.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	115.2	Sum of lost time (s)	18.0
Intersection Capacity Utilization	95.6%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	70	63	160	1	53	10	84	17	1	13	6	70
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	93	84	213	1	71	13	112	23	1	17	8	93
Pedestrians		2			4			7			4	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	88			304			564	475	202	478	575	83
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	88			304			564	475	202	478	575	83
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			100			69	95	100	96	98	90
cM capacity (veh/h)	1503			1249			365	453	831	449	398	971

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	391	85	136	119
Volume Left	93	1	112	17
Volume Right	213	13	1	93
cSH	1503	1249	379	766
Volume to Capacity	0.06	0.00	0.36	0.15
Queue Length 95th (ft)	5	0	40	14
Control Delay (s)	2.2	0.1	19.7	10.6
Lane LOS	A	A	C	B
Approach Delay (s)	2.2	0.1	19.7	10.6
Approach LOS			C	B

Intersection Summary			
Average Delay	6.6		
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	539	141	371	8	14	325
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	586	153	403	9	15	353
Pedestrians		2	2		5	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	417				1740	415
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	417				1740	415
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	48				67	44
cM capacity (veh/h)	1137				46	634

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	739	412	368
Volume Left	586	0	15
Volume Right	0	9	353
cSH	1137	1700	415
Volume to Capacity	0.52	0.24	0.89
Queue Length 95th (ft)	76	0	230
Control Delay (s)	10.4	0.0	52.3
Lane LOS	B		F
Approach Delay (s)	10.4	0.0	52.3
Approach LOS			F

Intersection Summary			
Average Delay	17.8		
Intersection Capacity Utilization	88.4%	ICU Level of Service	E
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	205	390	206	15	19	375
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	223	424	224	16	21	408
Pedestrians		2	1		11	
Lane Width (ft)		12.0	12.0		12.0	
Walking Speed (ft/s)		4.0	4.0		4.0	
Percent Blockage		0	0		1	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	251				1114	245
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	251				1114	245
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	83				89	48
cM capacity (veh/h)	1302				189	785

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	647	240	428
Volume Left	223	0	21
Volume Right	0	16	408
cSH	1302	1700	682
Volume to Capacity	0.17	0.14	0.63
Queue Length 95th (ft)	15	0	111
Control Delay (s)	4.1	0.0	18.8
Lane LOS	A		C
Approach Delay (s)	4.1	0.0	18.8
Approach LOS			C

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	260	320	1936	444	173	1232
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.92		1.00	0.85	1.00	1.00
Flt Protected	0.98		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3203		3539	1540	1770	3539
Flt Permitted	0.98		1.00	1.00	0.07	1.00
Satd. Flow (perm)	3203		3539	1540	138	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	283	348	2104	483	188	1339
RTOR Reduction (vph)	239	0	0	131	0	0
Lane Group Flow (vph)	392	0	2104	352	188	1339
Confl. Peds. (#/hr)		1		3	3	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	17.4		53.8	53.8	64.6	70.6
Effective Green, g (s)	17.4		53.8	53.8	64.6	70.6
Actuated g/C Ratio	0.17		0.54	0.54	0.65	0.71
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	557		1904	829	265	2499
v/s Ratio Prot	c0.12		c0.59		0.08	c0.38
v/s Ratio Perm				0.23	0.38	
v/c Ratio	0.70		1.11	0.42	0.71	0.54
Uniform Delay, d1	38.9		23.1	13.8	26.4	7.0
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.0		55.7	1.6	6.9	0.8
Delay (s)	42.9		78.8	15.4	33.4	7.8
Level of Service	D		E	B	C	A
Approach Delay (s)	42.9		67.0			10.9
Approach LOS	D		E			B

Intersection Summary			
HCM Average Control Delay	45.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	95.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	140	77	2021	242	114	1308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.98		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.95		0.98		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1685		3462		1770	3539
Flt Permitted	0.97		1.00		0.05	1.00
Satd. Flow (perm)	1685		3462		102	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	84	2197	263	124	1422
RTOR Reduction (vph)	18	0	7	0	0	0
Lane Group Flow (vph)	218	0	2453	0	124	1422
Confl. Peds. (#/hr)		30		11	11	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	19.2		73.1		78.1	84.1
Effective Green, g (s)	19.2		73.1		78.1	84.1
Actuated g/C Ratio	0.17		0.63		0.68	0.73
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	281		2195		141	2581
v/s Ratio Prot	c0.13		c0.71		0.04	c0.40
v/s Ratio Perm					0.56	
v/c Ratio	0.78		1.12		0.88	0.55
Uniform Delay, d1	46.0		21.1		33.2	7.1
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	12.7		59.7		40.7	0.4
Delay (s)	58.7		80.8		73.9	7.5
Level of Service	E		F		E	A
Approach Delay (s)	58.7		80.8			12.8
Approach LOS	E		F			B

Intersection Summary			
HCM Average Control Delay	54.8	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	115.3	Sum of lost time (s)	18.0
Intersection Capacity Utilization	102.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	70	73	160	1	53	10	84	17	1	13	6	70
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	93	97	213	1	71	13	112	23	1	17	8	93
Pedestrians		2			4			7			4	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	88			318			577	488	215	491	588	83
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	88			318			577	488	215	491	588	83
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			100			69	95	100	96	98	90
cM capacity (veh/h)	1503			1235			357	446	817	440	391	971

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	404	85	136	119
Volume Left	93	1	112	17
Volume Right	213	13	1	93
cSH	1503	1235	371	761
Volume to Capacity	0.06	0.00	0.37	0.16
Queue Length 95th (ft)	5	0	41	14
Control Delay (s)	2.2	0.1	20.2	10.6
Lane LOS	A	A	C	B
Approach Delay (s)	2.2	0.1	20.2	10.6
Approach LOS			C	B

Intersection Summary			
Average Delay	6.6		
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	442	273	1087	265	415	1415
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.94		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3269		3539	1548	1770	3539
Flt Permitted	0.97		1.00	1.00	0.10	1.00
Satd. Flow (perm)	3269		3539	1548	191	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	480	297	1182	288	451	1538
RTOR Reduction (vph)	103	0	0	176	0	0
Lane Group Flow (vph)	674	0	1182	112	451	1538
Confl. Peds. (#/hr)		4		1	1	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	29.0		39.0	39.0	53.0	59.0
Effective Green, g (s)	29.0		39.0	39.0	53.0	59.0
Actuated g/C Ratio	0.29		0.39	0.39	0.53	0.59
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	948		1380	604	322	2088
v/s Ratio Prot	c0.21		0.33		c0.20	0.43
v/s Ratio Perm				0.07	c0.55	
v/c Ratio	0.71		0.86	0.19	1.40	0.74
Uniform Delay, d1	31.8		27.9	20.1	29.0	14.9
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	4.5		7.0	0.7	198.1	2.4
Delay (s)	36.3		35.0	20.7	227.1	17.2
Level of Service	D		C	C	F	B
Approach Delay (s)	36.3		32.2			64.8
Approach LOS	D		C			E

Intersection Summary			
HCM Average Control Delay	48.3	HCM Level of Service	D
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	89.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	324	126	1283	278	63	1576
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.99		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.96		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1708		3417		1770	3539
Flt Permitted	0.97		1.00		0.06	1.00
Satd. Flow (perm)	1708		3417		120	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	352	137	1395	302	68	1713
RTOR Reduction (vph)	12	0	15	0	0	0
Lane Group Flow (vph)	477	0	1682	0	68	1713
Confl. Peds. (#/hr)		23		8	8	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	34.7		61.9		65.8	71.8
Effective Green, g (s)	34.7		61.9		65.8	71.8
Actuated g/C Ratio	0.29		0.52		0.56	0.61
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	500		1785		121	2144
v/s Ratio Prot	c0.28		c0.49		0.02	c0.48
v/s Ratio Perm					0.29	
v/c Ratio	0.95		0.94		0.56	0.80
Uniform Delay, d1	41.1		26.6		23.9	17.8
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	28.7		10.9		3.5	2.5
Delay (s)	69.9		37.5		27.5	20.3
Level of Service	E		D		C	C
Approach Delay (s)	69.9		37.5			20.6
Approach LOS	E		D			C

Intersection Summary			
HCM Average Control Delay	33.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	118.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	88.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	172	115	93	13	155	22	138	35	12	14	18	127
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Hourly flow rate (vph)	269	180	145	20	242	34	216	55	19	22	28	198
Pedestrians		16			14			8			6	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	283			333			1326	1121	274	1156	1176	281
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	283			333			1326	1121	274	1156	1176	281
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	79			98			0	65	98	78	81	73
cM capacity (veh/h)	1273			1218			67	158	750	101	147	744

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	594	297	289	248
Volume Left	269	20	216	22
Volume Right	145	34	19	198
cSH	1273	1218	81	368
Volume to Capacity	0.21	0.02	3.59	0.68
Queue Length 95th (ft)	20	1	Err	118
Control Delay (s)	5.1	0.7	Err	32.9
Lane LOS	A	A	F	D
Approach Delay (s)	5.1	0.7	Err	32.9
Approach LOS			F	D

Intersection Summary			
Average Delay	2031.9		
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	539	141	371	8	14	325
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	
Lane Util. Factor		1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00		0.99	
Flpb, ped/bikes		0.99	1.00		1.00	
Frt		1.00	1.00		0.87	
Flt Protected		0.96	1.00		1.00	
Satd. Flow (prot)		1781	1856		1595	
Flt Permitted		0.53	1.00		1.00	
Satd. Flow (perm)		983	1856		1595	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	586	153	403	9	15	353
RTOR Reduction (vph)	0	0	0	0	317	0
Lane Group Flow (vph)	0	739	412	0	51	0
Confl. Peds. (#/hr)	5			5	2	2
Turn Type	Perm					
Protected Phases		4	8		6	
Permitted Phases	4					
Actuated Green, G (s)		67.2	67.2		9.0	
Effective Green, g (s)		67.2	67.2		9.0	
Actuated g/C Ratio		0.76	0.76		0.10	
Clearance Time (s)		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	
Lane Grp Cap (vph)		749	1414		163	
v/s Ratio Prot			0.22		c0.03	
v/s Ratio Perm		c0.75				
v/c Ratio		0.99	0.29		0.31	
Uniform Delay, d1		10.1	3.2		36.7	
Progression Factor		1.00	1.00		1.00	
Incremental Delay, d2		29.3	0.1		1.1	
Delay (s)		39.3	3.3		37.8	
Level of Service		D	A		D	
Approach Delay (s)		39.3	3.3		37.8	
Approach LOS		D	A		D	

Intersection Summary			
HCM Average Control Delay	29.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	88.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	93.4%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	442	273	1087	265	415	1415
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Frpb, ped/bikes	1.00	1.00	1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1583	3539	1548	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.10	1.00
Satd. Flow (perm)	3433	1583	3539	1548	191	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	480	297	1182	288	451	1538
RTOR Reduction (vph)	0	297	0	176	0	0
Lane Group Flow (vph)	480	0	1182	112	451	1538
Confl. Peds. (#/hr)		4		1	1	
Turn Type		NA		Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	29.0	0.0	39.0	39.0	53.0	59.0
Effective Green, g (s)	29.0	0.0	39.0	39.0	53.0	59.0
Actuated g/C Ratio	0.29	0.00	0.39	0.39	0.53	0.59
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	996	0	1380	604	322	2088
v/s Ratio Prot	c0.14		0.33		c0.20	0.43
v/s Ratio Perm				0.07	c0.55	
v/c Ratio	0.48	0.00	0.86	0.19	1.40	0.74
Uniform Delay, d1	29.3	50.0	27.9	20.1	29.0	14.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	0.0	7.0	0.7	198.1	2.4
Delay (s)	31.0	50.0	35.0	20.7	227.1	17.2
Level of Service	C	D	C	C	F	B
Approach Delay (s)	38.2		32.2			64.8
Approach LOS	D		C			E

Intersection Summary			
HCM Average Control Delay	48.6	HCM Level of Service	D
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	88.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	324	126	1283	278	63	1576
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.99		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.96		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1708		3417		1770	3539
Flt Permitted	0.97		1.00		0.06	1.00
Satd. Flow (perm)	1708		3417		120	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	352	137	1395	302	68	1713
RTOR Reduction (vph)	12	0	15	0	0	0
Lane Group Flow (vph)	477	0	1682	0	68	1713
Confl. Peds. (#/hr)		23		8	8	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	34.7		61.9		65.8	71.8
Effective Green, g (s)	34.7		61.9		65.8	71.8
Actuated g/C Ratio	0.29		0.52		0.56	0.61
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	500		1785		121	2144
v/s Ratio Prot	c0.28		c0.49		0.02	c0.48
v/s Ratio Perm					0.29	
v/c Ratio	0.95		0.94		0.56	0.80
Uniform Delay, d1	41.1		26.6		23.9	17.8
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	28.7		10.9		3.5	2.5
Delay (s)	69.9		37.5		27.5	20.3
Level of Service	E		D		C	C
Approach Delay (s)	69.9		37.5			20.6
Approach LOS	E		D			C

Intersection Summary			
HCM Average Control Delay	33.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	118.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	88.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	172	115	93	13	155	22	138	35	12	14	18	127
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Hourly flow rate (vph)	269	180	145	20	242	34	216	55	19	22	28	198
Pedestrians		16			14			8			6	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		1			1			1			1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	283			333			1326	1121	274	1156	1176	281
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	283			333			1326	1121	274	1156	1176	281
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	79			98			0	65	98	78	81	73
cM capacity (veh/h)	1273			1218			67	158	750	101	147	744

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	594	297	289	248
Volume Left	269	20	216	22
Volume Right	145	34	19	198
cSH	1273	1218	81	368
Volume to Capacity	0.21	0.02	3.59	0.68
Queue Length 95th (ft)	20	1	Err	118
Control Delay (s)	5.1	0.7	Err	32.9
Lane LOS	A	A	F	D
Approach Delay (s)	5.1	0.7	Err	32.9
Approach LOS			F	D

Intersection Summary			
Average Delay	2031.9		
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	205	390	206	15	19	375
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0	
Lane Util. Factor		1.00	1.00		1.00	
Frpb, ped/bikes		1.00	1.00		0.99	
Flpb, ped/bikes		1.00	1.00		1.00	
Frt		1.00	0.99		0.87	
Flt Protected		0.98	1.00		1.00	
Satd. Flow (prot)		1824	1842		1598	
Flt Permitted		0.79	1.00		1.00	
Satd. Flow (perm)		1466	1842		1598	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	223	424	224	16	21	408
RTOR Reduction (vph)	0	0	3	0	337	0
Lane Group Flow (vph)	0	647	237	0	92	0
Confl. Peds. (#/hr)	11			11	1	2
Turn Type	Perm					
Protected Phases		4	8		6	
Permitted Phases	4					
Actuated Green, G (s)		27.1	27.1		8.3	
Effective Green, g (s)		27.1	27.1		8.3	
Actuated g/C Ratio		0.57	0.57		0.18	
Clearance Time (s)		6.0	6.0		6.0	
Vehicle Extension (s)		3.0	3.0		3.0	
Lane Grp Cap (vph)		838	1053		280	
v/s Ratio Prot			0.13		c0.06	
v/s Ratio Perm		c0.44				
v/c Ratio		0.77	0.22		0.33	
Uniform Delay, d1		7.8	5.0		17.1	
Progression Factor		1.00	1.00		1.00	
Incremental Delay, d2		4.4	0.1		0.7	
Delay (s)		12.2	5.1		17.8	
Level of Service		B	A		B	
Approach Delay (s)		12.2	5.1		17.8	
Approach LOS		B	A		B	

Intersection Summary			
HCM Average Control Delay	12.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	47.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	88.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	260	320	1936	444	173	1232
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Frpb, ped/bikes	1.00	1.00	1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1583	3539	1540	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.07	1.00
Satd. Flow (perm)	3433	1583	3539	1540	129	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	283	348	2104	483	188	1339
RTOR Reduction (vph)	0	348	0	120	0	0
Lane Group Flow (vph)	283	0	2104	363	188	1339
Confl. Peds. (#/hr)		1		3	3	
Turn Type		NA		Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	13.6	0.0	57.6	57.6	68.4	74.4
Effective Green, g (s)	13.6	0.0	57.6	57.6	68.4	74.4
Actuated g/C Ratio	0.14	0.00	0.58	0.58	0.68	0.74
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	467	0	2038	887	265	2633
v/s Ratio Prot	c0.08		c0.59		c0.08	0.38
v/s Ratio Perm				0.24	0.41	
v/c Ratio	0.61	0.00	1.03	0.41	0.71	0.51
Uniform Delay, d1	40.7	50.0	21.2	11.8	27.9	5.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.2	0.0	28.8	1.4	6.9	0.7
Delay (s)	42.9	50.0	50.0	13.2	34.9	6.0
Level of Service	D	D	D	B	C	A
Approach Delay (s)	46.8		43.1			9.5
Approach LOS	D		D			A

Intersection Summary			
HCM Average Control Delay	32.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	140	77	2021	242	114	1308
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		0.95		1.00	0.95
Frpb, ped/bikes	0.98		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.95		0.98		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	1685		3462		1770	3539
Flt Permitted	0.97		1.00		0.05	1.00
Satd. Flow (perm)	1685		3462		102	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	84	2197	263	124	1422
RTOR Reduction (vph)	18	0	7	0	0	0
Lane Group Flow (vph)	218	0	2453	0	124	1422
Confl. Peds. (#/hr)		30		11	11	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	19.2		73.1		78.1	84.1
Effective Green, g (s)	19.2		73.1		78.1	84.1
Actuated g/C Ratio	0.17		0.63		0.68	0.73
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	281		2195		141	2581
v/s Ratio Prot	c0.13		c0.71		0.04	c0.40
v/s Ratio Perm					0.56	
v/c Ratio	0.78		1.12		0.88	0.55
Uniform Delay, d1	46.0		21.1		33.2	7.1
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	12.7		59.7		40.7	0.4
Delay (s)	58.7		80.8		73.9	7.5
Level of Service	E		F		E	A
Approach Delay (s)	58.7		80.8			12.8
Approach LOS	E		F			B

Intersection Summary			
HCM Average Control Delay	54.8	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	115.3	Sum of lost time (s)	18.0
Intersection Capacity Utilization	102.6%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	70	73	160	1	53	10	84	17	1	13	6	70
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Hourly flow rate (vph)	93	97	213	1	71	13	112	23	1	17	8	93
Pedestrians		2			4			7			4	
Lane Width (ft)		12.0			12.0			12.0			12.0	
Walking Speed (ft/s)		4.0			4.0			4.0			4.0	
Percent Blockage		0			0			1			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	88			318			577	488	215	491	588	83
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	88			318			577	488	215	491	588	83
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			100			69	95	100	96	98	90
cM capacity (veh/h)	1503			1235			357	446	817	440	391	971

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	404	85	136	119
Volume Left	93	1	112	17
Volume Right	213	13	1	93
cSH	1503	1235	371	761
Volume to Capacity	0.06	0.00	0.37	0.16
Queue Length 95th (ft)	5	0	41	14
Control Delay (s)	2.2	0.1	20.2	10.6
Lane LOS	A	A	C	B
Approach Delay (s)	2.2	0.1	20.2	10.6
Approach LOS			C	B

Intersection Summary			
Average Delay	6.6		
Intersection Capacity Utilization	43.7%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	342	141	371	8	20	321
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	372	153	403	9	22	349
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	412				1304	408
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	412				1304	408
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	68				82	46
cM capacity (veh/h)	1147				120	644

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	525	412	371
Volume Left	372	0	22
Volume Right	0	9	349
cSH	1147	1700	512
Volume to Capacity	0.32	0.24	0.72
Queue Length 95th (ft)	35	0	147
Control Delay (s)	7.8	0.0	28.3
Lane LOS	A		D
Approach Delay (s)	7.8	0.0	28.3
Approach LOS			D

Intersection Summary			
Average Delay	11.2		
Intersection Capacity Utilization	77.3%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	492	217	1078	284	195	1372
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.98	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.95		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3304		3539	1548	1770	3539
Flt Permitted	0.97		1.00	1.00	0.10	1.00
Satd. Flow (perm)	3304		3539	1548	187	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	535	236	1172	309	212	1491
RTOR Reduction (vph)	53	0	0	180	0	0
Lane Group Flow (vph)	718	0	1172	129	212	1491
Confl. Peds. (#/hr)		4		1	1	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	29.0		41.7	41.7	53.0	59.0
Effective Green, g (s)	29.0		41.7	41.7	53.0	59.0
Actuated g/C Ratio	0.29		0.42	0.42	0.53	0.59
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	958		1476	646	278	2088
v/s Ratio Prot	c0.22		c0.33		0.09	c0.42
v/s Ratio Perm				0.08	0.32	
v/c Ratio	0.75		0.79	0.20	0.76	0.71
Uniform Delay, d1	32.2		25.4	18.5	20.8	14.5
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	5.4		4.5	0.7	10.6	2.1
Delay (s)	37.6		29.9	19.2	31.3	16.6
Level of Service	D		C	B	C	B
Approach Delay (s)	37.6		27.7			18.5
Approach LOS	D		C			B

Intersection Summary			
HCM Average Control Delay	25.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	266	186	1237	263	279	1385
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	0.97		0.95		1.00	0.95
Frpb, ped/bikes	0.97		1.00		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.94		0.97		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	3194		3430		1770	3539
Flt Permitted	0.97		1.00		0.07	1.00
Satd. Flow (perm)	3194		3430		124	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	289	202	1345	286	303	1505
RTOR Reduction (vph)	112	0	14	0	0	0
Lane Group Flow (vph)	379	0	1617	0	303	1505
Confl. Peds. (#/hr)		23		8	8	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	18.2		60.1		77.3	83.3
Effective Green, g (s)	18.2		60.1		77.3	83.3
Actuated g/C Ratio	0.16		0.53		0.68	0.73
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	512		1816		334	2597
v/s Ratio Prot	c0.12		0.47		c0.14	0.43
v/s Ratio Perm					c0.48	
v/c Ratio	0.74		0.89		0.91	0.58
Uniform Delay, d1	45.4		23.8		35.8	7.0
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	5.7		6.3		26.4	0.5
Delay (s)	51.1		30.1		62.3	7.5
Level of Service	D		C		E	A
Approach Delay (s)	51.1		30.1			16.7
Approach LOS	D		C			B

Intersection Summary			
HCM Average Control Delay	26.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	113.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	90.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	177	110	298	28	140	22	155	35	16	14	18	142
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		6.0			6.0			6.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes		1.00	0.96		1.00			0.99			0.98	
Flpb, ped/bikes		1.00	1.00		1.00			0.99			1.00	
Frt		1.00	0.85		0.98			0.99			0.89	
Flt Protected		0.97	1.00		0.99			0.96			1.00	
Satd. Flow (prot)		1807	1521		1813			1747			1615	
Flt Permitted		0.97	1.00		0.99			0.54			0.96	
Satd. Flow (perm)		1807	1521		1813			984			1550	
Peak-hour factor, PHF	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64
Adj. Flow (vph)	277	172	466	44	219	34	242	55	25	22	28	222
RTOR Reduction (vph)	0	0	306	0	4	0	0	3	0	0	116	0
Lane Group Flow (vph)	0	449	160	0	293	0	0	319	0	0	156	0
Confl. Peds. (#/hr)	6		8	8		6	16		14	14		16
Turn Type	Split		Perm	Split			Perm			Perm		
Protected Phases	4	4		3	3			2			6	
Permitted Phases			4				2			6		
Actuated Green, G (s)		31.1	31.1		24.8			44.1			44.1	
Effective Green, g (s)		31.1	31.1		24.8			44.1			44.1	
Actuated g/C Ratio		0.26	0.26		0.21			0.37			0.37	
Clearance Time (s)		6.0	6.0		6.0			6.0			6.0	
Vehicle Extension (s)		3.0	3.0		3.0			3.0			3.0	
Lane Grp Cap (vph)		476	401		381			368			579	
v/s Ratio Prot		c0.25			c0.16							
v/s Ratio Perm			0.11					c0.32			0.10	
v/c Ratio		0.94	0.40		0.77			0.87			0.27	
Uniform Delay, d1		42.6	35.8		43.9			34.3			25.7	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		27.4	0.7		9.0			18.9			0.3	
Delay (s)		70.0	36.4		52.9			53.2			26.0	
Level of Service		E	D		D			D			C	
Approach Delay (s)		52.9			52.9			53.2			26.0	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM Average Control Delay	48.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	118.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	87.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis
1: Kaukama Rd & Kulauku St

2/25/2013

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	241	390	206	15	23	242
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	262	424	224	16	25	263
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	240				1180	232
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	240				1180	232
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	80				85	67
cM capacity (veh/h)	1326				169	807

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	686	240	288
Volume Left	262	0	25
Volume Right	0	16	263
cSH	1326	1700	608
Volume to Capacity	0.20	0.14	0.47
Queue Length 95th (ft)	18	0	64
Control Delay (s)	4.6	0.0	16.2
Lane LOS	A		C
Approach Delay (s)	4.6	0.0	16.2
Approach LOS			C

Intersection Summary			
Average Delay	6.4		
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	270	174	1907	503	148	1228
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0	6.0	6.0	6.0
Lane Util. Factor	0.97		0.95	1.00	1.00	0.95
Frpb, ped/bikes	0.99		1.00	0.97	1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00	1.00	1.00
Frt	0.94		1.00	0.85	1.00	1.00
Flt Protected	0.97		1.00	1.00	0.95	1.00
Satd. Flow (prot)	3272		3539	1540	1770	3539
Flt Permitted	0.97		1.00	1.00	0.07	1.00
Satd. Flow (perm)	3272		3539	1540	131	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	293	189	2073	547	161	1335
RTOR Reduction (vph)	137	0	0	140	0	0
Lane Group Flow (vph)	345	0	2073	407	161	1335
Confl. Peds. (#/hr)		1		3	3	
Turn Type				Perm	D.P+P	
Protected Phases	4		6		5	2
Permitted Phases				6	6	
Actuated Green, G (s)	15.6		56.9	56.9	66.4	72.4
Effective Green, g (s)	15.6		56.9	56.9	66.4	72.4
Actuated g/C Ratio	0.16		0.57	0.57	0.66	0.72
Clearance Time (s)	6.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		5.0	5.0	2.0	5.0
Lane Grp Cap (vph)	510		2014	876	243	2562
v/s Ratio Prot	c0.11		c0.59		0.06	c0.38
v/s Ratio Perm				0.26	0.38	
v/c Ratio	0.68		1.03	0.46	0.66	0.52
Uniform Delay, d1	39.8		21.6	12.6	25.5	6.1
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	3.6		28.0	1.8	5.2	0.8
Delay (s)	43.4		49.5	14.4	30.6	6.9
Level of Service	D		D	B	C	A
Approach Delay (s)	43.4		42.2			9.4
Approach LOS	D		D			A

Intersection Summary			
HCM Average Control Delay	31.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	100.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	89.4%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	134	85	1897	200	117	1317
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	0.97		0.95		1.00	0.95
Frpb, ped/bikes	0.97		1.00		1.00	1.00
Flpb, ped/bikes	1.00		1.00		1.00	1.00
Frt	0.94		0.99		1.00	1.00
Flt Protected	0.97		1.00		0.95	1.00
Satd. Flow (prot)	3194		3478		1770	3539
Flt Permitted	0.97		1.00		0.05	1.00
Satd. Flow (perm)	3194		3478		102	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	92	2062	217	127	1432
RTOR Reduction (vph)	71	0	5	0	0	0
Lane Group Flow (vph)	167	0	2274	0	127	1432
Confl. Peds. (#/hr)		30		11	11	
Turn Type					D.P+P	
Protected Phases	4		6		5	2
Permitted Phases					6	
Actuated Green, G (s)	10.8		73.0		78.0	84.0
Effective Green, g (s)	10.8		73.0		78.0	84.0
Actuated g/C Ratio	0.10		0.68		0.73	0.79
Clearance Time (s)	6.0		6.0		6.0	6.0
Vehicle Extension (s)	3.0		5.0		2.0	5.0
Lane Grp Cap (vph)	323		2377		153	2783
v/s Ratio Prot	c0.05		c0.65		0.04	c0.40
v/s Ratio Perm					0.57	
v/c Ratio	0.52		0.96		0.83	0.51
Uniform Delay, d1	45.5		15.4		30.2	4.1
Progression Factor	1.00		1.00		1.00	1.00
Incremental Delay, d2	1.4		10.3		28.9	0.3
Delay (s)	46.9		25.8		59.1	4.4
Level of Service	D		C		E	A
Approach Delay (s)	46.9		25.8			8.9
Approach LOS	D		C			A

Intersection Summary			
HCM Average Control Delay	20.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	106.8	Sum of lost time (s)	18.0
Intersection Capacity Utilization	95.8%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	89	54	137	3	42	10	86	17	11	13	6	81
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	4.0		6.0			6.0			6.0	
Lane Util. Factor		1.00	1.00		1.00			1.00			1.00	
Frpb, ped/bikes		1.00	1.00		1.00			1.00			0.99	
Flpb, ped/bikes		1.00	1.00		1.00			1.00			1.00	
Frt		1.00	0.85		0.98			0.99			0.89	
Flt Protected		0.97	1.00		1.00			0.96			0.99	
Satd. Flow (prot)		1800	1583		1804			1765			1628	
Flt Permitted		0.77	1.00		0.98			0.71			0.96	
Satd. Flow (perm)		1424	1583		1774			1305			1573	
Peak-hour factor, PHF	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Adj. Flow (vph)	119	72	183	4	56	13	115	23	15	17	8	108
RTOR Reduction (vph)	0	0	183	0	9	0	0	6	0	0	58	0
Lane Group Flow (vph)	0	191	0	0	64	0	0	147	0	0	75	0
Confl. Peds. (#/hr)	4		7	7		4	2		4	4		2
Turn Type	Perm		NA	Perm			Perm			Perm		
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		15.3	0.0		15.3			23.8			23.8	
Effective Green, g (s)		15.3	0.0		15.3			23.8			23.8	
Actuated g/C Ratio		0.30	0.00		0.30			0.47			0.47	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		426	0		531			608			733	
v/s Ratio Prot												
v/s Ratio Perm		c0.13			0.04			c0.11			0.05	
v/c Ratio		0.45	0.00		0.12			0.24			0.10	
Uniform Delay, d1		14.5	25.6		13.0			8.2			7.7	
Progression Factor		1.00	1.00		1.00			1.00			1.00	
Incremental Delay, d2		0.8	0.0		0.1			0.2			0.1	
Delay (s)		15.2	25.6		13.1			8.4			7.7	
Level of Service		B	C		B			A			A	
Approach Delay (s)		20.3			13.1			8.4			7.7	
Approach LOS		C			B			A			A	

Intersection Summary			
HCM Average Control Delay	14.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	51.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	56.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX B

TRIP GENERATION

KCLC Phase I Project Trip Generation																			
KCLC Phase I Facility	STUDENTS									STAFF									
	No.	Avg. Vehicle Occupancy	AM Peak			PM Peak			Total Daily Trips	No.	Avg. Vehicle Occupancy	AM Peak			PM Peak			Total Daily Trips	
			In	Out	Trip Gen	In	Out	Trip Gen				In	Out	Trip Gen	In	Out	Trip Gen		
Infant Toddler Program (a)	32	n/a	15	13	28	n/a	n/a	n/a	120	9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Preschool																			
Aug-May	120	1.5	80	80	160	n/a	n/a	n/a	320	16	1.4	11	0	11	n/a	n/a	n/a	23	
6 AM - 5 PM	96	1.5	64	64	128	64	64	128	256	13	1.4	9	0	9	0	9	9	19	
8 AM - 2 PM	29	1.5	19	19	39	n/a	n/a	n/a	77	10	1.4	7	0	7	n/a	n/a	n/a	14	
Total (b)	245	n/a	163	163	327	64	64	128	653	39	n/a	28	0	28	0	9	9	56	
P-3 Kauhale (c)	41	1.5	27	27	55	27	27	55	109	49	1.4	35	0	35	0	35	35	70	
CEI Kauhale (d)	0	1.5	0	0		0	0		0	36	1.4	26	0	26	0	26	26	51	
Total (a+b+c+d)	**318**		**206**	**204**	**409**	**91**	**91**	**183**	**883**	**133**		**89**	**0**	**89**	**0**	**70**	**70**	**177**	**1,060**

NOTE: P-3 and CEI student and employee count based on KS response that between 70-90 % of P-3 (110) occurs during peak (82%), and applied 90/110 ratio to CEI.

KCLC Phase II Project Trip Generation

KCLC Phase II Facility	STUDENTS									STAFF								
	No.	Avg. Vehicle	AM Peak			PM Peak			Total Daily	No.	Avg. Vehicle	AM Peak			PM Peak			Total Daily
			In	Out	Trip Gen	In	Out	Trip Gen				In	Out	Trip Gen	In	Out	Trip Gen	
Hale Ole Clinic (a)	0	0	0	0	0	0	0	0	0	4	1.4	3	0	3	0	0	0	6
Physical Fitness and Well Being[1] (b)	26	1.5	0	0	0	0	17	17	35	25	1.4	18	0	18	0	0	0	36
Aquatics Center[1] (c)	21	1.5	0	0	0	0	14	14	28	19	1.4	14	0	14	0	0	0	27
Youth Academic Learning (9-12)[2] (d)	206	n/a	59	28	87	13	14	27	481	57	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Youth Academic Learning (K-12)[2] (e)	101	n/a	60	38	98	7	10	17	250	23	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Youth Enrichment Center[3] (f)	48	1.5	0	0	0	0	32	32	64	35	1.4	0	0	0	0	25	25	50
Totals (a+b+c+d+e+f)	**402**		**119**	**66**	**185**	**20**	**87**	**107**	**858**	**163**	**6**	**34**	**0**	**34**	**0**	**25**	**25**	**119**

Notes: Reduced number of students based on assumptions for bussing (per KS program summary) and expected capacity.

[1] 3% bussing reduction for Physical Fitness and Aquatics center combined, and then assume 50% arrive/depart during the AM/PM hours. Subtract results from the each facility's capacity to get 26/21 distribution between Physical Fitness and Aquatics Center

[2] Assumed reduction of 288 students for bussing. Proportioned students between 9-12 (206 students) and K-12 (101 students).

[3] Assumed 72 students being bussed. PM in and out only

KCLC Phase III Project Trip Generation																		
KCLC Phase III Facility	STUDENTS									STAFF								
	No.	Avg. Vehicle	AM Peak			PM Peak			Total Daily	No.	Avg. Vehicle	AM Peak			PM Peak			Total Daily
			In	Out	Trip Gen	In	Out	Trip Gen				In	Out	Trip Gen	In	Out	Trip Gen	
Student Support Complex (a)	60	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0	0	0
Community Learning Complex (b)	59	1.5	39	0	39	0	39	39	157	30	1.4	21	0	21	0	21	21	43
Facility Support Services (c)	0	0	0	0	0	0	0	0	0	10	1.4	7	0	7	0	7	7	14
																		0
Totals (a+b+c)			**39**	**0**	**39**	**0**	**39**	**39**	**157**	**60**	**3**	**29**	**0**	**29**	**0**	**29**	**29**	**57**

Note: Community Learning Complex student and staff accounts for 70% from the outside community, 70% occupancy, and also 50% arriving/departing during peak hours, per KS direction

Approved Projects Trip Generation									
Facility	Type	Units	Daily Trips	AM Peak			PM Peak		
				In	Out	Trip Gen	In	Out	Trip Gen
Development 1	SFR	25	1050	5	15	20	19	11	30
Development 2	SFR	25	293	5	15	20	19	11	30
Development 3	SFR	35	400	7	20	27	26	15	41
Total	**SFR**	**85**	**1743**	**17**	**50**	**67**	**64**	**37**	**101**

**Assumed under 2014 w/ project scenario.

Other Projects Trip Generation									
DHHL Development	Type	Units	Daily Trips	AM Peak			PM Peak		
				In	Out	Trip Gen	In	Out	Trip Gen
Phase II (2016)	SFR	100	1050	18	55	73	66	39	105
Phase III (2018)	MFR	80	530	7	36	43	34	17	50
Total			**1,580**	**26**	**90**	**116**	**100**	**55**	**155**

KCLC Project Trip Generation Summary							
Phase	Daily Trips	AM			PM		
		In	Out	Trip Gen	In	Out	Trip Gen
I	1060	294	204	498	91	161	253
II	974	153	66	219	20	111	131
III	214	68	0	68	0	68	68
Total	**2248**	**515**	**270**	**785**	**111**	**340**	**452**

Appendix E

PRELIMINARY ENGINEERING REPORT

KAMEHAMEHA SCHOOLS
COMMUNITY LEARNING CENTER at MA‘ILI
Preliminary Engineering Report

MA‘ILI, O‘AHU, HAWAI‘I
Tax Map Key: 8-7-010:007

Prepared by:

MITSUNAGA &
ASSOCIATES, INC.
February 2013

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I. GENERAL INFORMATION

Project Name:	Kamehameha Schools Community Learning Center
Land Owner:	State of Hawai‘i, Department of Hawaiian Home Lands
Tax Map Key:	8-7-010:007
Land Area:	89.274 Acres
Project Area:	40.5Acres (approximate)

II. PROJECT INFORMATION

A. SITE DESCRIPTION

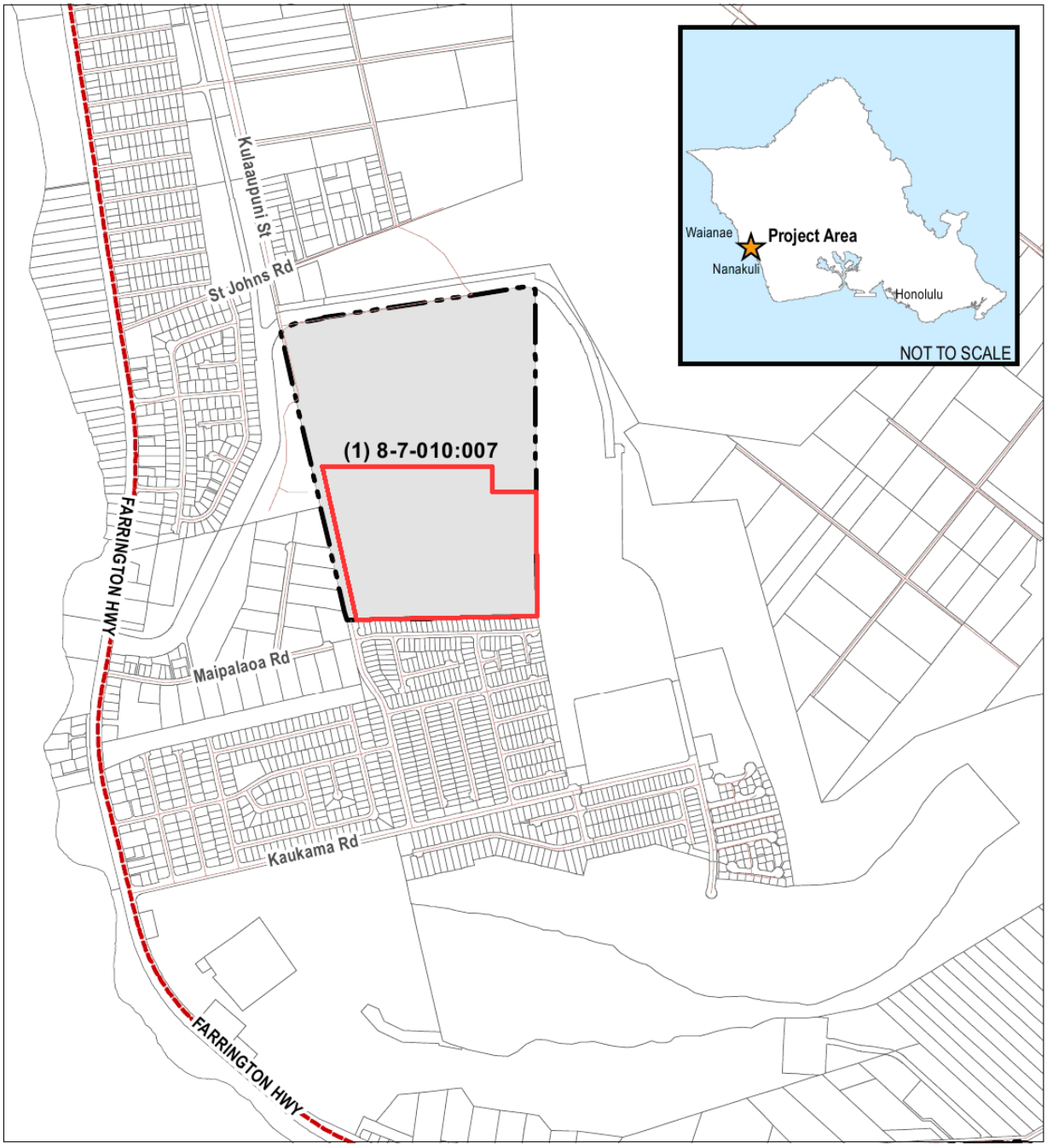
The project site is located in Maʻili Valley, on the island of Oʻahu, shown in Figure 1. The elevation of the site ranges from 6 feet to 30 feet above mean sea level. The project consists of gently sloping terrain with localized mounds and a sloped bank located along the eastern edge of the site. The majority of stormwater runoff flows towards the Maʻili Channel to the southwest of the property.

The project site is estimated to encompass approximately 40.5acres within an approximately 89-acre parcel owned by the State of Hawaiʻi, Department of Hawaiian Home Lands (DHHL). The parcel is designated as Tax Map Key (TMK) 8-7-010:007 and falls under the zoning designation AG-2. The project is part of a larger 89-acre parcel owned by DHHL. The majority of the parcel is currently vacant, with the exception of ʻUlu Ke Kukui, which includes transitional housing and community support facilities and the Hoʻomalu o Nā Kamaliʻi receiving home. Together these facilities occupy approximately 8 acres at the northwest corner of the 89-acre parcel and are accessible from HoltRoad.

DHHL may develop residential units of the remainder of the parcel. While DHHL's plans are not part of the KCLC, for the purposes of this report, we have assumed that DHHL will develop approximately 100 single-family and 160 multi-family units by 2020.

To the north and west of the DHHL parcel is the Maʻili Channel; Residential developments are located to the southwest to the southeast; and a quarry to the northeast. A 4.857-acre portion has been fenced off by the U.S. Government along the east border of the parcel. This portion may be contaminated and is to be mitigated by the U.S. Government.

The site includes two easements. The first is a 40-foot wide roadway easement, which runs along the entire west property boundary (2.160 acres) in favor of the City & County of Honolulu. The second is an access easement in favor of the U.S. Government for ingress, egress, construction, operation, maintenance, and repair of utilities in order to perform environmental investigation, remediation or other corrective action for the benefit of the 4.857-acres retained by the U.S. Government. Currently the site is only subject to a 40' easement; the second easement has not been created.



LEGEND

- Tax Map Key
- Major Roads
- Streets
- Kamehameha Schools Community Learning Center

Source: City and County of Honolulu
Disclaimer: This graphic has been prepared for general planning purposes only.

Tax Map Key
Kamehameha Schools
Community Learning Center

Kamehameha Schools — ISLAND OF OAHU

NORTH

LINEAR SCALE (FEET)
0 250 500 1,000 2,000

Figure 1 - Location Map (Ma‘ili, Lualualie Valley)

B. PROJECT DESCRIPTION

The proposed Kamehameha Schools Community Learning Center (KCLC) is planned to include Hawai‘i P-20 programs; preschool; educational learning labs; multi-learning halls; cafeteria and possibly a multi-media library; recreational spaces; a community gathering area and community facilities. “Hawai‘i P-20: Partnerships for Education” is a statewide partnership that is working to strengthen the education pipeline from early childhood (preschool) through higher education (level 20). The project will incorporate sustainable design features as applicable.

The project may require on-site and off-site improvements to roads, water system, wastewater system, electrical, telephone and cable television. The KCLC will provide a venue to model innovative and collaboration in support of keiki and ‘ohana and will establish educational spaces that recognize the importance of ‘āina based learning; spans across the P-20 continuum; and is specific to the aspirations and goals of the people of the Wai‘anae Coast. Programming will include early learning opportunities, public charter school options, community learning spaces, and a health and wellness complex.

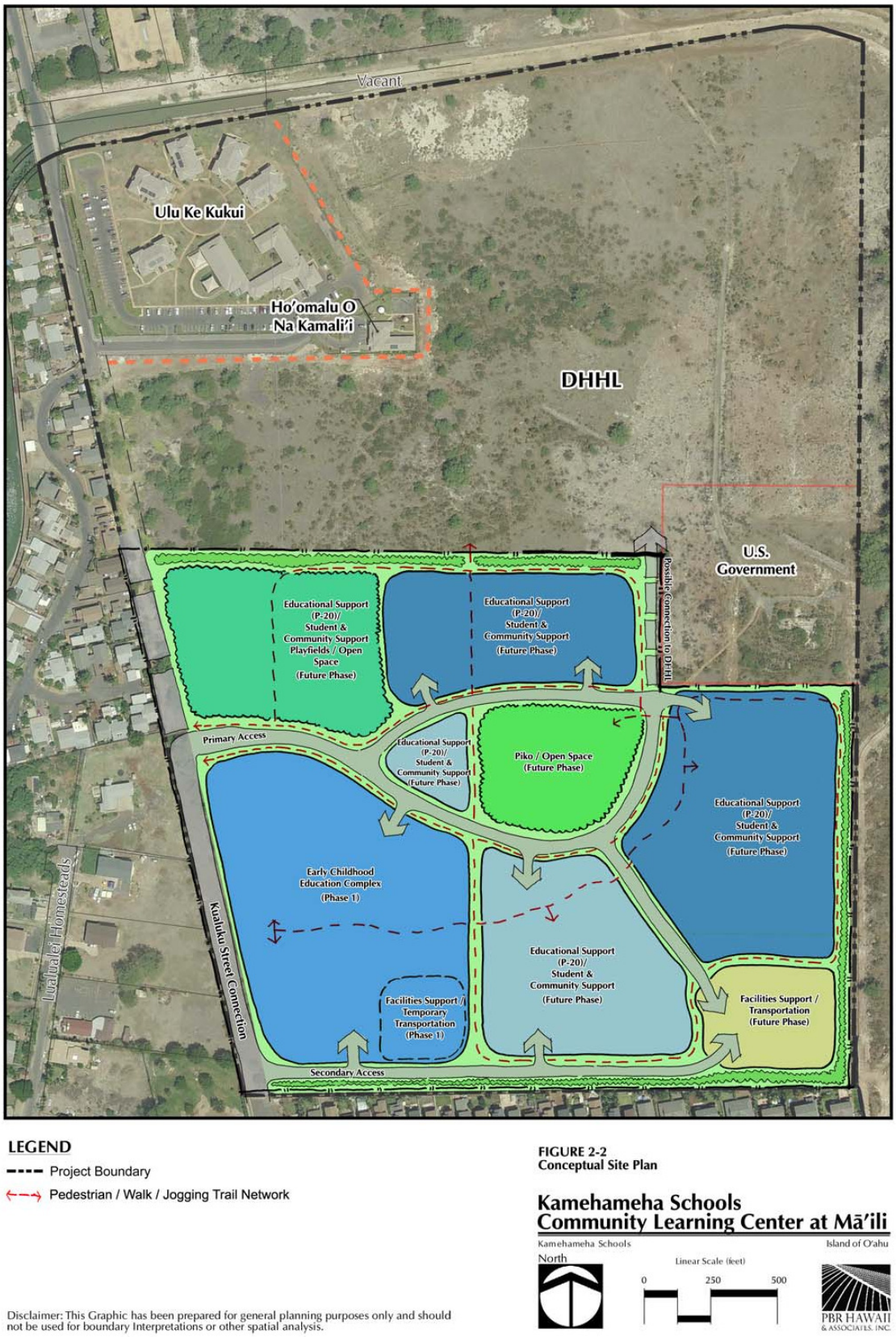


Figure 2 - Conceptual Development Plan

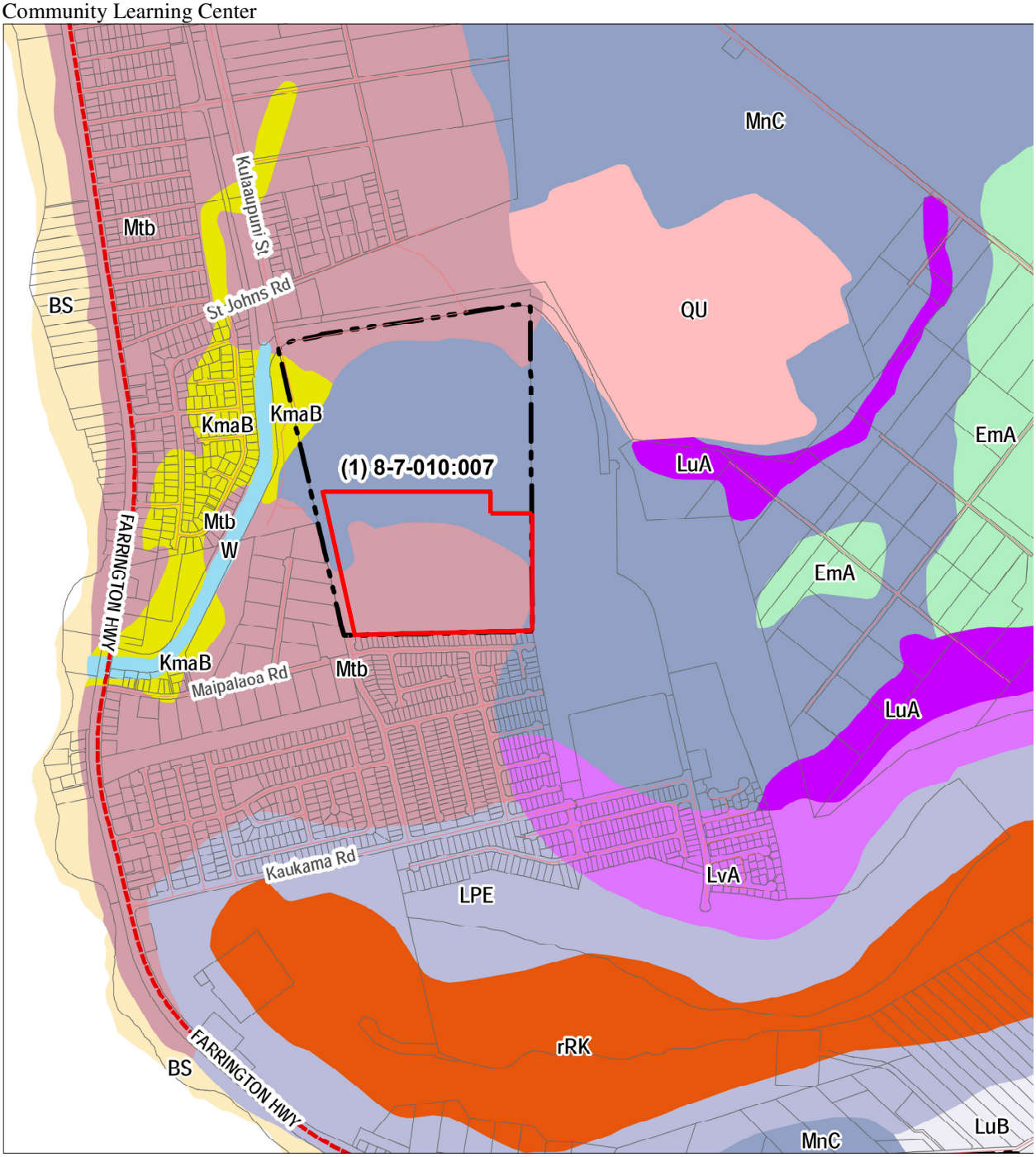
C. SOILS

Based on the 1972 USDA Soils Classification Survey, the soils within the project site includes:

- **Mamala Stony Silty Clay Loam 0-12% Slopes (MnC)** – This soil is known to have favorable properties as foundation materials for low buildings and general fill, have moderate shrink and swell potential, except that the soils are stony and cobbly.
- **Mokuleia Clay (Mtb)** – This soil is characterized as poor construction material, very sticky and very plastic, has low shear strength, poor work ability, slow permeability, and has a very high shrink swell potential.

The underlying soils for the majority of the proposed project site appear to be mostly favorable for the proposed KCLC. Within the middle portion of the project site, the soils are very workable. However, the soils to the northern and southern portions of the project site are anticipated to contain expansive clays near the surface.

The site is capable of supporting the development of the KCLC. For those areas of expansive soil, it is recommended to over-excavate and replaced with non-expansive material to prevent swelling and shrinking of the subsurface soil on which structures are located. Over-excavation and fill shall be done within and three feet around the perimeter of the proposed structures. The existing site should be cleared and grubbed of all materials including boulders prior to grading activities. A subsurface geotechnical investigation is recommended during the design phase of the project. Refer to Figure 3 soil classification types and locations.



Tax Map Key
Kamehameha Schools Community Learning Center

Figure 3 - USDA Soils Classification Survey

III. DRAINAGE SYSTEM

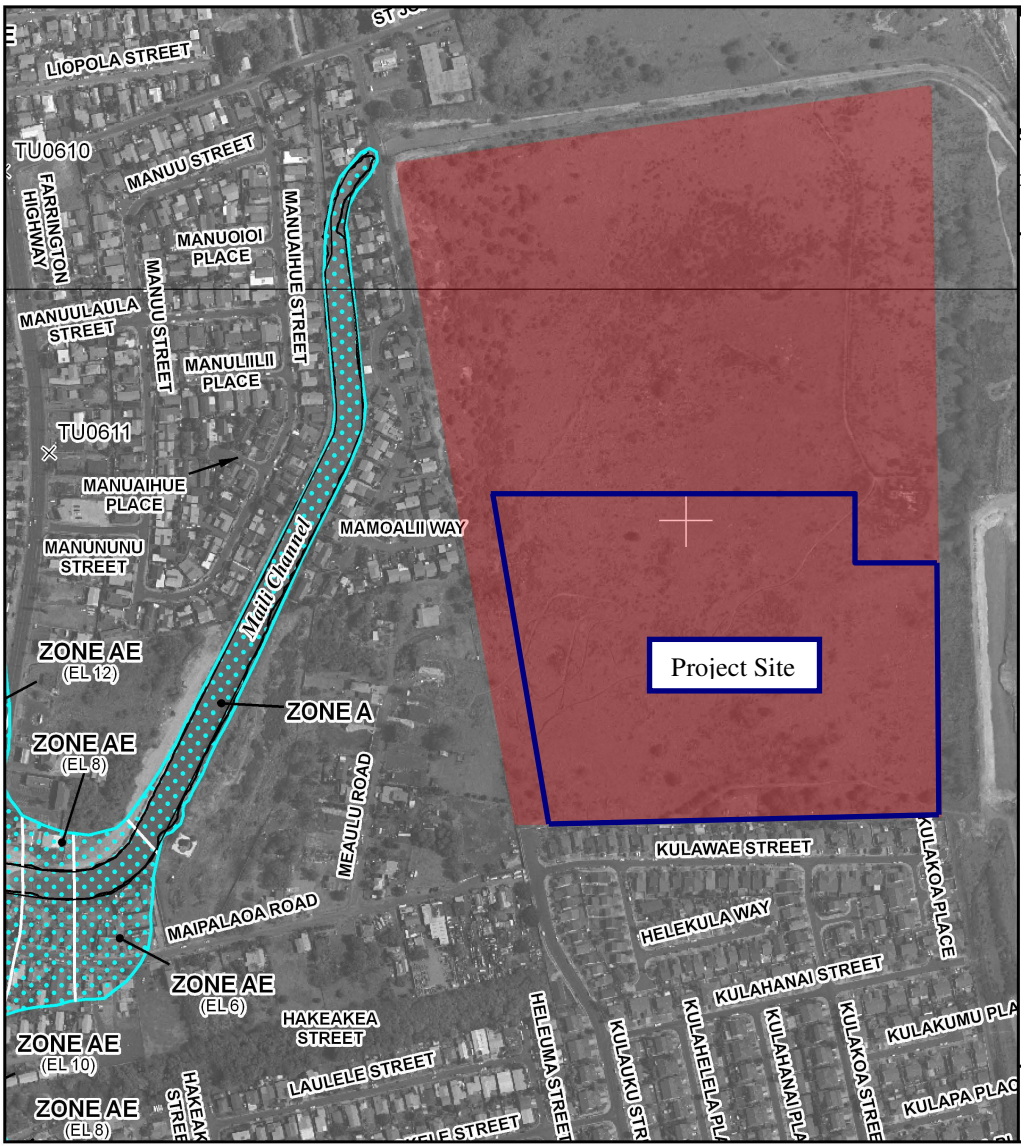
Existing System

The storm runoff from the project site sheet flows towards the western edge of the property near Mamoali‘i Place. An existing catch basin is located on the project site (near Mamoali‘i Place) with a 48” drainline which connects to Ma‘ili Channel. Figure 4 identifies the existing drainage map of the project site. Ma‘ili Channel runs in a southwesterly direction towards Farrington Highway and conveys the runoff to the Pacific Ocean. Ma‘ili Channel circumnavigates the property on the north and west sides.

Existing Drainage Area
Kamehameha Schools Community Learning Center

Figure 4 - Existing Drainage Map

According to the Flood Insurance Rate Map (15003C0192H) by the Federal Emergency Management Agency (FEMA), the project site is in Flood Zone D, which are areas where flood hazards are undetermined (See Figure 5).



Tax Map Key
Kamehameha Schools Community Learning Center

Figure 5 - FEMA Flood Insurance Rate Map

Proposed System

As required by the City & County of Honolulu, the proposed project will maintain existing drainage patterns and detain additional runoff generated by the increase in impervious area due to the development of the project site. The project will use sustainable design practices and post construction best management practices (BMPs) to limit the increase in runoff volume from the

project site and address stormwater quality prior to discharge. Detention ponds, water quality swales, structural BMPs, and pervious pavements may be utilized as part of the on-site development. Furthermore, the project will comply with the City & County of Honolulu's Rules Relating to Storm Drainage Standards. A 48-inch drainline will connect all subsurface stormwater from the site to Mai'ili Channel as shown in Figure 6.

Figure 6 - Proposed Drainage Map

The development of the KCLC increases the impervious area to 14.98 acres. The peak storm water runoff from the proposed drainage system (101.45 cfs) is greater than the existing system (86.96 cfs). The additional 14.49 cfs of runoff due to the increase in impervious surface area will be detained on-site. Therefore, the proposed project will have no adverse drainage impact on the surrounding areas. See Appendix C for drainage calculations.

IV. SITE GRADING

The proposed project will limit grading largely by maintaining existing drainage patterns on-site. In addition, excavation and embankment quantities will be balanced to the maximum extent practical to limit the import and export of fill and waste material from the project site. Grading and erosion control measures will be designed and implemented in accordance with City & County guidelines and the recommendations of the project's geotechnical engineer.

V. ROADWAYS

Existing System

The proposed project is approximately 0.25-miles northeast of Farrington Highway (See Figure 7). The project's primary access will be an extension of Kulauku Street. Kulauku Street is owned by the City & County of Honolulu and is accessed from Farrington Highway via Kaukama Road. The intersection of Kaukama Road and Farrington Highway is currently signalized and channelized. KCLC's primary access will be through Kulauku Street.

Figure 7 - Access to Project

Secondary access can be provided by Kulaaupuni Street at the northern portion of the project site. Kulaaupuni Street connects to St. John's Road to the north. St. John's Road has a signalized and channelized connection to Farrington Highway. Both Kaukama Road and Kulauku Street are improved roads, each with 40-ft roadways and 56-ft right-of-ways, and are owned by the City & County of Honolulu. St. John's Road, Kulaaupuni Street and Holt Road are unimproved (no curb, gutter and sidewalk). St John's Road is a City & County of Honolulu Road from Farrington Highway to the corner of Kulaaupuni Street and has an approximately 20-ft. wide paved roadway within a 40-ft. right-of-way. Kulaaupuni Road is a City & County of Honolulu two-lane, 20 to 24-ft wide paved road within a 40-ft. wide easement adjacent to the project site northwestern portion of the 89-acre parcel. The 40-foot wide roadway easement along the west property line is in favor of City & County of Honolulu. Holt Road is a City & County of Honolulu maintained 24-ft paved road within parcel 8-7-010: 007. For recommended roadway improvements, see the Transportation Impact Analysis Report for the project.

VI. WATER SYSTEM

Existing System

The project is within the Wai‘anae Service Area of the Board of Water Supply’s (BWS) Development Plan for the island of O‘ahu. The Wai‘anae Service Area (potable supply) is estimated to have a water demand of 9.3 million gallons a day (MGD). The wells in the Wai‘anae Service Area contribute approximately 4.8 MGD (See Figure 8). The Lualualei booster pump provides approximately 4.5 MGD to the Wai‘anae Area from Central O‘ahu (See Figure 9).

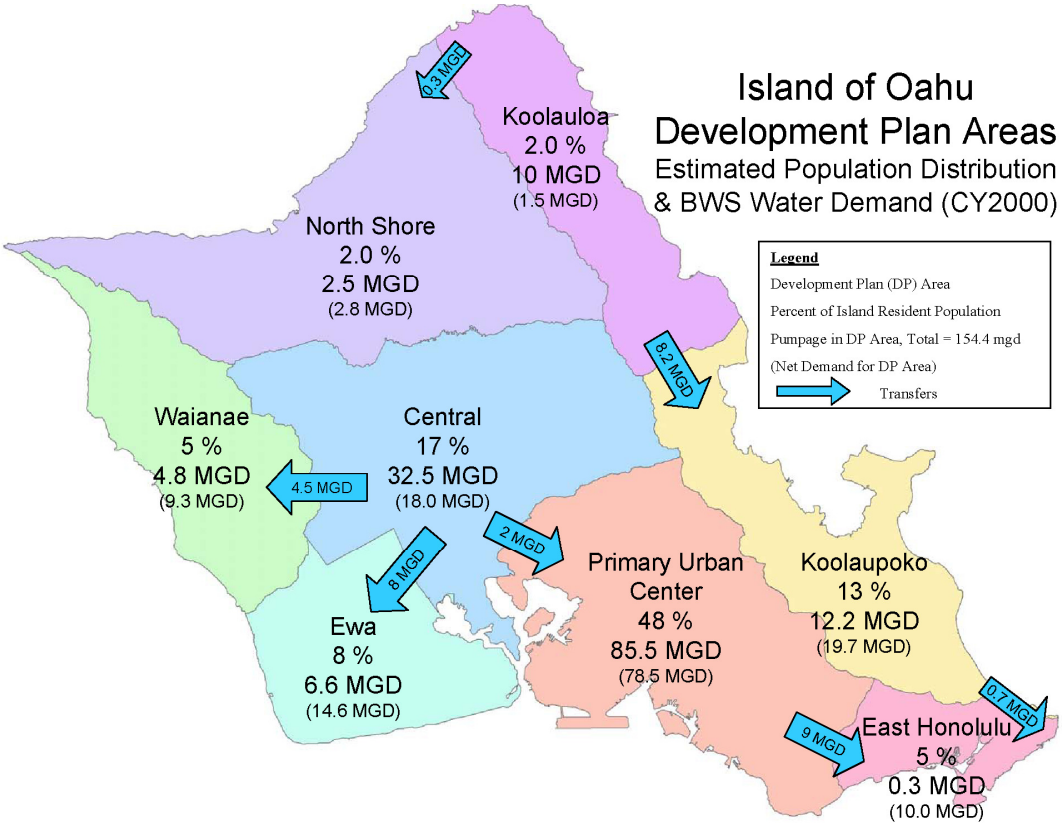


Figure 8 - Island of O‘ahu Development Plan Areas

The existing services within the project area consist of:

- 242 Service Zone: 2.0 million gallon (MG) reservoir and 1.5 MG reservoir

Currently BWS has a 50 single-family home or 25,000 GPD limit per project west of the Lualualei Pumping Station. An upgrade to the Lualualei booster pump is scheduled to be funded in 2013, and expected to come on line in 2015. The booster pump will be upgraded from a 5 MGD capacity to 8 MGD. BWS has indicated that the upgraded booster pump will lift the 50 single-family home equivalent restriction. Discussions with BWS have indicated that the Ulu Ke Kukui project has encumbered the 25,000 GPD limit for the parcel (TMK 8-7-010:007). Further discussions with BWS need to be conducted to examine the options the project has to secure water allocation for Phase 1 (Early Childhood Education Complex).

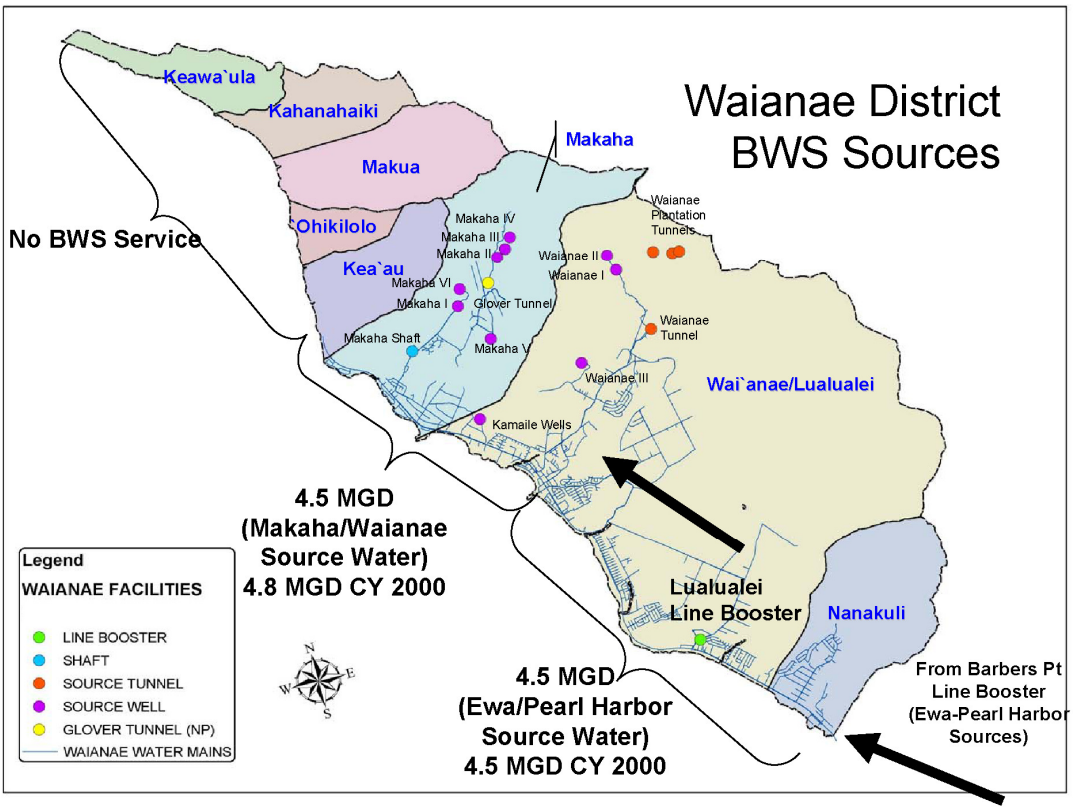
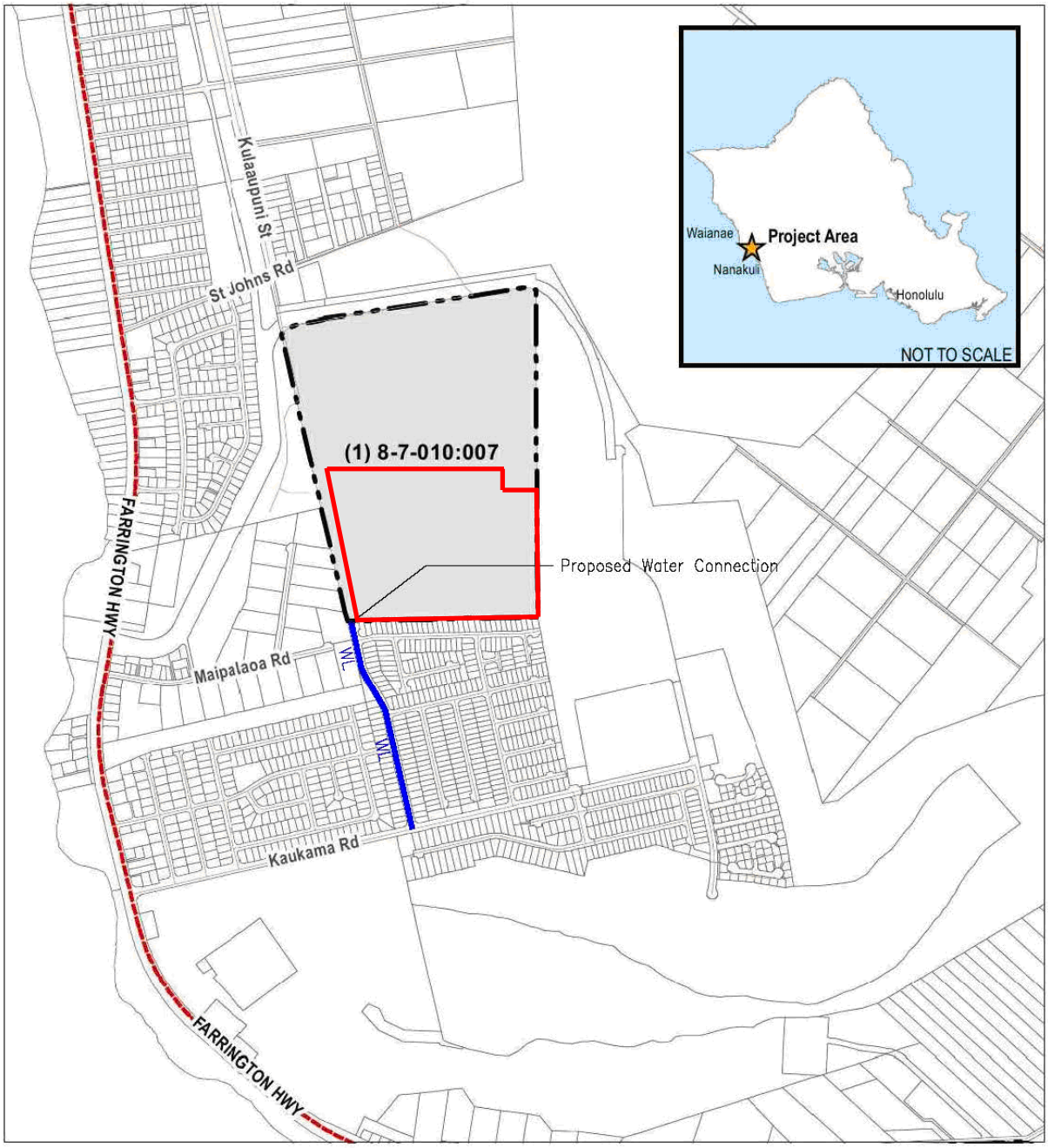


Figure 9 - Wai‘anae District BWS Sources

Proposed System

A new water system will provide water service to the proposed KCLC. The water system shall be designed in conformance with the Board of Water Supply Water System Standards and Standard Details. Connection to the proposed system is expected be serviced by the 242 Service Zone. Connection to the BWS system is anticipated near the intersection of Kulawae Street and Kulauku Street.

The estimated average daily demand (gallons per day) for the KCLC is 164,000 gpd. The estimated total fire flow requirement for the project = 240,000 gallons. See Appendix A for Water System Calculations. Figure 10 shows the point of connection of the new water system.



LEGEND

- Tax Map Key
- Major Roads
- Streets
- Water Line
- Kamehameha Schools Community Learning Center

Figure 10 - Water Connection Map

VII. WASTEWATER SYSTEM

Existing System

An existing 18-inch sewer line meets at the intersection of Kulawae Street and Kulauku Street. Figure 11 identifies the route of the sewer system.

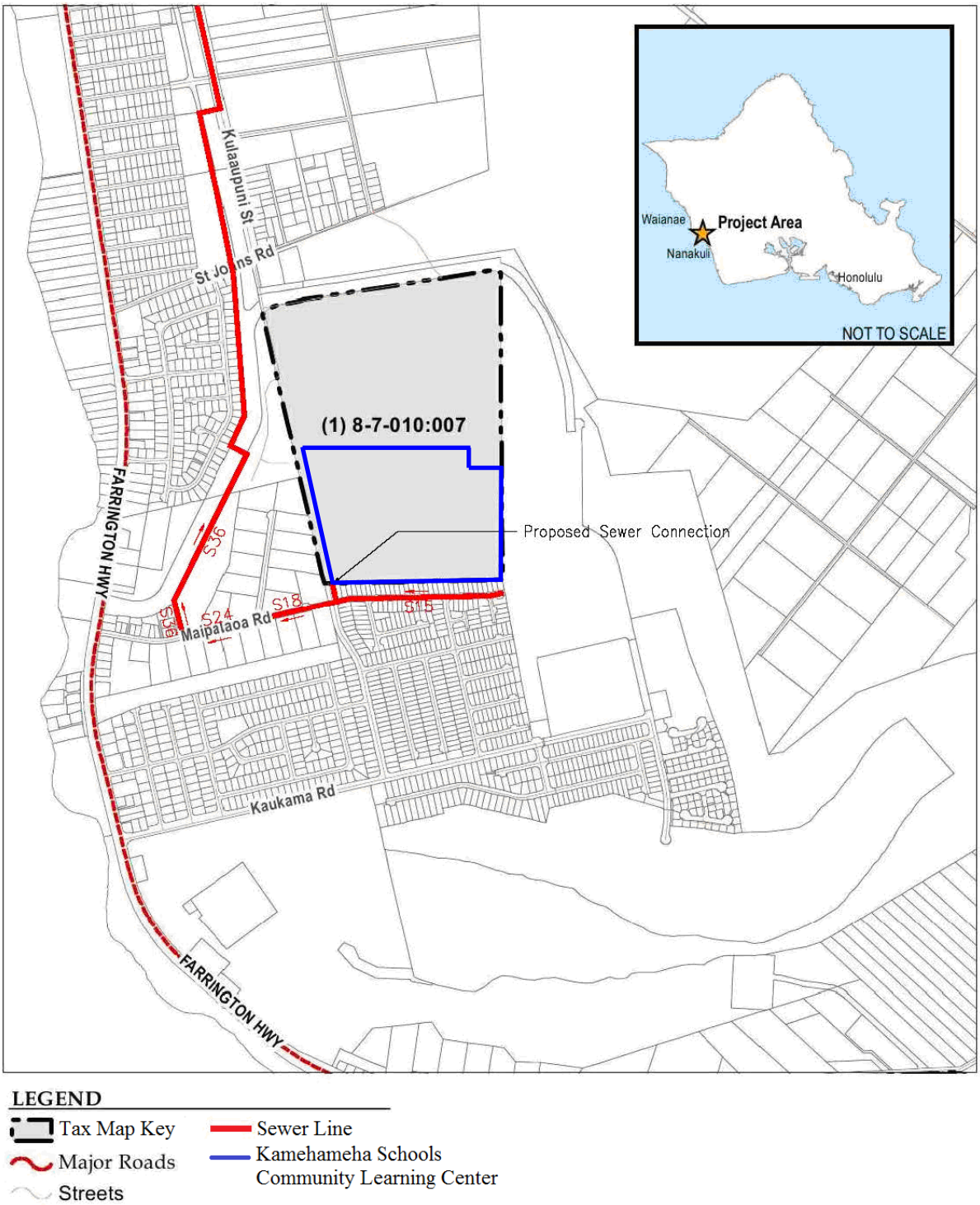


Figure 11 - City & County of Honolulu Sewer System

The sewer line increases to a 24-inch along Maipaloa Road. The 24-inch Maipaloa Road sewer connects to the 36 inch Ma‘ili interceptor sewer at Ma‘ili Channel. The 36-inch sewer line continues north parallel to Kulaaupuni Street (175ft west) to Makone Street where it jogs east onto Kulaaupuni Street and continues north toward Mā‘ili‘ilii Stream. The sewer crosses Mā‘ili‘ili Stream and then heads west towards Farrington Highway. The 36-inch continues north along Farrington Highway until it reaches the Wai‘anae Wastewater Treatment Plant. The City & County of Honolulu has indicated that the Wai‘anae Wastewater Treatment Plant has enough capacity for the project. The Wai‘anae Wastewater Treatment Plant provides secondary treatment of the wastewater.

Proposed System

The wastewater system shall be designed in conformance with the City & County of Honolulu Wastewater Standards and Standard Details. The anticipated connection for the project is to an existing 18-inch sewer at the intersection of Kulawae Street and Kulauku Street. Preliminary telephone communication with the City & County of Honolulu Department of Planning and Permitting Wastewater Branch indicates that there is capacity in the 18” sewer and down stream system to accommodate the proposed project. A sewer connection application has been submitted.

VIII. SOLID WASTE

The proposed project will generate solid waste during construction and after development. Construction waste will include vegetation, rocks and debris from the grading and grubbing of the project site. The typical range of per capita solid waste from a residential source is 2.0 to 5.0 pounds per capita per day. It is estimated the learning center will generate 2.4 tons/day (1600 students & faculty x 3.0 lbs/person/day / 2000lbs/ton). The composition of the solid waste is expected to be typical for a municipal source. (US EPA 2009)

Any KCLC refuse that is not recycled is anticipated to be collected by a private refuse company.

The KCLC strives to incorporate sustainability as one of its foremost project goals. Low impact development and construction practices are likely to be implemented including recycling and limiting waste generation.

IX. ELECTRICAL SYSTEM

Existing System

Hawaiian Electric Company, Inc.’s (HECO) has three circuits that serve properties adjacent to this project. Each circuit consists of overhead lines energized at 12.47KV. The first two circuits are on the Nanakuli side of the property consisting of a single phase primary overhead system along Maipalaoa Road and a single phase underground system in the D.R. Horton subdivision. Both of these primary power sources would require alterations to adequately serve the project. As such, these optional power sources would not be considered in this study.

However, if a second power circuit is desired for reliability, then re-framing the poles along Maipalaoa Road would be the more economical alternative. HECO would re-frame the poles and a cost would be incurred by KCLC. This cost is not included in our current cost estimate.

The third overhead circuit is a three phase primary line installed from St Johns Road to Kulaaupuni Street. The primary line terminates at a riser pole (pole 4/9Y) on Kulaaupuni Street that feeds Ulu Ke Kukui housing project.

Riser pole 4/9Y on Kulaaupuni Street

Proposed System (Off-site)

A total electrical load of approximately 3MW has been estimated for the DHHL and Kamehameha Schools projects. See Appendix D. HECO has been contacted and has determined that the existing three phase circuit along Kulaaupuni Street has adequate capacity to accommodate the DHHL and KCLC projects.

Proposed System (KCLC)

The proposed improvements will include underground electric system of ductlines, handholes, and concrete pads along the interior development roadways to provide for HECO's underground cables, pad mounted switching equipment, and transformers. Stub out ducts will be provided for service extension to accommodate project phasing.

X. TELEPHONE SYSTEM and CABLE TELEVISION SYSTEM

Existing System

The existing Hawaiian Telcom and Oceanic Time Warner Cable infrastructure consists of an overhead system along St Johns Road, which risers down to an underground system along Kulaaupuni Street. The underground system, 2x4 pullboxes, serve the residential subdivision on Kulaaupuni Street and Ulu Ke Kukui Development.

Last telephone and cable TV pullboxes on Kulaaupuni Street

Proposed System (Off-site)

The existing underground telephone and cable TV system seem antiquated and may not be adequate to accommodate the new KCLC project. Therefore, two options could be evaluated. The first option would route a new underground system from St Johns Road and extend the system down Kulaaupuni Street to the KCLC project. The other option would extend a new overhead line from St Johns road, down Kulaaupuni Street. The current HECO power poles on Kulaaupuni Street would be used with new intermediate poles to meet Hawaiian Telcom and Oceanic Time Warner Cable span standards. Both systems would enter the new KCLC project underground.

Proposed System (KCLC)

An underground telephone and cable TV system with ductlines and pullboxes will be constructed along the interior development roadway for Hawaiian Telcom's and Oceanic Time Warner Cable's underground cables and equipment. Stub out ducts will be provided for service extension to accommodate project phasing.

XI. STREET LIGHTING SYSTEM

Existing System

There are City and County of Honolulu street lights installed along Kulaaupuni Street and Kulauku Street.

Proposed System

New street light bases, poles, and luminaries will be installed on concrete bases with underground wiring along the extended Kulaaupuni Street and within the KCLC project. Street lighting will be similar to City and State Roadway Lighting Standards.

References:

1. *Rules Relating to Storm Drainage Standards*. Department of Planning and Permitting, City & County of Honolulu, January 2000.

2. *Rules Relating to Soil Erosion Standards and Guidelines*. Department of Planning and Permitting, City & County of Honolulu, April 1999.

3. *Water System Standards, Volume I*. Board of Water Supply, City & County of Honolulu, 1985.

4. *Water System Distribution Maps*, Board of Water Supply.

5. *Wai'anae Watershed Management Plan, July 23, 2005,* Board of Water Supply.

6. *Municipal Solid Waste Generation, Recycling & Disposal in the United States, able 29.* US EPA, November 2009

7. *Soils Survey of Islands of Kauai, O'ahu, Maui, Molokai and Lanai, State of Hawai'i.* US Department of Agriculture, Soils Conservation Service, August 1972

APPENDIX A

WATER SYSTEM CALCULATIONS

Water System Calculations

Community Learning Center:
4000 gals/acre or 60 gals/student (Table 100-18)
Schools Area: 41 acres (estimated)

Average Daily Demand: 4000 gpd/ac. x 41 ac. = 164,000 gallons per day (gpd)

Maximum Daily Demand: 1.5 x 164,000 gpd = 246,000 gpd (Table 100-20)

Peak Hour Demand: 3.0 x 164,000 gpd = 492,000 gpd (Table 100-20)

Residential:
2500 gallons/acre or 500 gallons/unit (Table 100-18)
Residential Development Area = 33.5 acres
Residential Units = 260

Average Daily Demand: 2500 gpd/ac. x 33.5 ac. = 83,750 gpd
Or 260 units x 500 gallons/unit = 130,000 gpd

Maximum Daily Demand: 1.5 x 130,000 gpd = 195,000 gpd (Table 100-20)

Peak Hour Demand: 3.0 x 130,000 gpd = 390,000 gpd (Table 100-20)

Total Domestic Water Demand
Average Daily Demand: 160,000 gpd + 130,000 gpd = 290,000 gpd

Maximum Daily Demand: 1.5 x 290,000 gpd = 435,000 gpd (Table 100-20)

Peak Hour Demand: 3.0 x 290,000 gpd = 870,000 gpd (Table 100-20)

Fire Flow Requirement: 1000 gallons per minute (gpm) for residential units
2000 gpm for learning center

Duration: 1 hour for residential units
2 hour for learning center

Total Fire Flow = 300,000 gallons
1000 gpm x 60min/hour =60,000 gallons for residential homes
2000 gpm x 2 hours x 60 min./hour = 240,000 gallons for learning center

Pipeline Sizing (Fire line): Provide required fire flow at a minimum of 20 psi residual pressure at fire hydrants.

Fire Hydrant Spacing: 350 feet maximum for residential units
250 feet maximum for learning center

BOARD OF WATER SUPPLY

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

December 11, 2012

PETER B. CARLISLE, MAYOR

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MAHEALANI CYPHER, Vice Chair
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GLENN M. OKIMOTO, Ex-Officio

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

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

Mr. Vincent Shigekuni, Vice President
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Mr. Shigekuni:

Subject: Your Letter Dated November 28, 2012, Regarding the Draft Environmental Assessment Pre-Assessment Consultation for the Proposed Kamehameha Schools Community Learning Center on Kulauku Street, Maili – Tax Map Key: 8-7-010: 007

Thank you for the opportunity to comment on the proposed Kamehameha Community Learning Center.

The existing water system is presently not adequate to accommodate the proposed community learning center. The Lualualei Line Booster is operating at maximum capacity. We are currently in the design phase of the Lualualei Line Booster upgrade and anticipate going out for construction in 2013. We suggest you resubmit your request around the end of calendar year 2014.

If you have any questions, please contact Robert Chun at 748-5443.

Very truly yours,

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

Water for Life . . . Ka Wai Ola

APPENDIX B

WASTEWATER FLOW CALCULATIONS

Wastewater Flow Calculations

Community Learning Center:

Population = 1,600 persons

Average Daily Flow = 1,600 capita x 25 gpcd	=	40,000 gpd
Dry Weather I/I = 1,600 capita x 5 gpcd	=	8,000 gpd
DESIGN AVERAGE FLOW	=	48,000 gpd

Maximum Rate of Flow = $5/1.60^{0.2} = 4.55$

Maximum Flow = 40,000 gpd x 4.55	=	182,000 gpd
Dry Weather I/I	=	8,000 gpd
DESIGN MAXIMUM FLOW	=	190,000 gpd

Wet Weather I/I = 41.27 acres x 1250 gpad	=	51,588 gpd
Design Maximum Flow	=	190,000 gpd
PEAK FLOW	=	241,588 gpd

Housing Units:

Population = 310 units x 4 persons/unit = 1,240 persons

Average Daily Flow = 1,240 capita x 80 gpcd	=	99,200 gpd
Dry Weather I/I = 1,240 capita x 5 gpcd	=	6,200 gpd
DESIGN AVERAGE FLOW	=	105,400 gpd

Maximum Rate of Flow = $5/1.24^{0.2} = 4.79$

Maximum Flow = 99,200 gpd x 4.79	=	475,168 gpd
Dry Weather I/I	=	6,200 gpd
DESIGN MAXIMUM FLOW	=	481,368 gpd

Wet Weather I/I = 38.79 acres x 1250 gpad	=	48,488 gpd
Design Maximum Flow	=	481,368 gpd
PEAK FLOW	=	529,856 gpd

Peak flow of the Learning Center = 167.77 gpm
Peak flow of the Housing Units = 367.96 gpm
Total Peak flow of the entire site = 535.73 gpm

Minimum slope for an 6" PVC sewer pipe to carry the peak flow of 238,488 gpd = 0.37 cfs.

$Q= (1.486/n)(\pi/4)(D^2)(D/4)^{2/3}(s^{1/2})$

$0.37 \text{ cfs} = (1.486/0.015)(\pi/4)(8/12)^2(8/48)^{2/3}(s^{1/2})$

s = 0.0058 ft/ft

Minimum slope for an 10" PVC sewer pipe to carry the peak flow of 771,444 gpd = 1.19 cfs.

$Q= (1.486/n)(\pi/4)(D^2)(D/4)^{2/3}(s^{1/2})$

$1.19 \text{ cfs} = (1.486/0.015)(\pi/4)(10/12)^2(10/48)^{2/3}(s^{1/2})$

s = 0.0039 ft/ft

DEPARTMENT OF PLANNING AND PERMITTING

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET * HONOLULU, HAWAII 96813
Phone: (808) 768-8209 * Fax: (808) 768-4210

SEWER CONNECTION APPLICATION

APPLICATION NO.: **2011/SCA-0590** STATUS: **Approved with conditions**

DATE RECEIVED: **09/21/2011** IWDP APP. NO.:

PROJECT NAME: **2011/SCA-0590 Ka Pua Learning Community, Voice of America Site.**

$325,299.00
Estimated Wastewater System Facility Charge*

LOCATION:

Zone	Section	Plat	Parcel
8	7	010	007

87-578 KULAAUPUNI ST **3,888,775** Sq. Ft.

SPECIFIC LOCATION: **87-587 Kulaaupuni St**

APPLICANT: **MITSUNAGA & ASSOCIATES INC.**
747 AMANA 216
HONOLULU, HAWAII 96814

DEVELOPMENT TYPE: **Schools (other)** SEWER CONNECTION WORK DESIRED: **New**

OTHER USES: **1300 students, 300 admin & faculty**

NON-RESIDENTIAL AREA: s.f. APPROXIMATE DATE OF CONNECTION: **12/01/2011**

PROPOSED UNITS	EXISTING UNITS	UNITS TO BE DEMOLISHED
No. of New Units:	No. of Existing Units:	No. of Units to be Demolished:
Studios:	Studios:	Studios:
1-Bedroom:	1-Bedroom:	1-Bedroom:
2-Bedroom:	2-Bedroom:	2-Bedroom:
3-Bedroom:	3-Bedroom:	3-Bedroom:
4-Bedroom:	4-Bedroom:	4-Bedroom:
5-Bedroom:	5-Bedroom:	5-Bedroom:
6-Bedroom:	6-Bedroom:	6-Bedroom:

REMARKS **Connect to existing SMH with an 18-inch sewer line at the intersection of Kulawai Street and Kualuku Street. IWDP may be required.**

APPROVAL DATE: **11/01/2011**

EXPIRATION DATE: **10/31/2013**

Valid 2-years after approval date. Construction plans shall be completed and approved within this 2-year period. Construction shall commence within 1-year after approval of plans.
** Applicable WSFC shall be collected at the prevailing rate in accordance with ROH 1990, Chapter 14, Sections 14-10.3, 14-10.4, 14-10.5 and Appendix 14-D.*

REVIEWED BY: ***Tessa Ching***

Site Development Division, Wastewater Branch

ExternalID: **043683685-001** JobId: **43683685**

Initial Print Date: Tuesday November 1, 2011 2:14 pm

Page 1 of 1

APPENDIX C

DRAINAGE CALCULATIONS

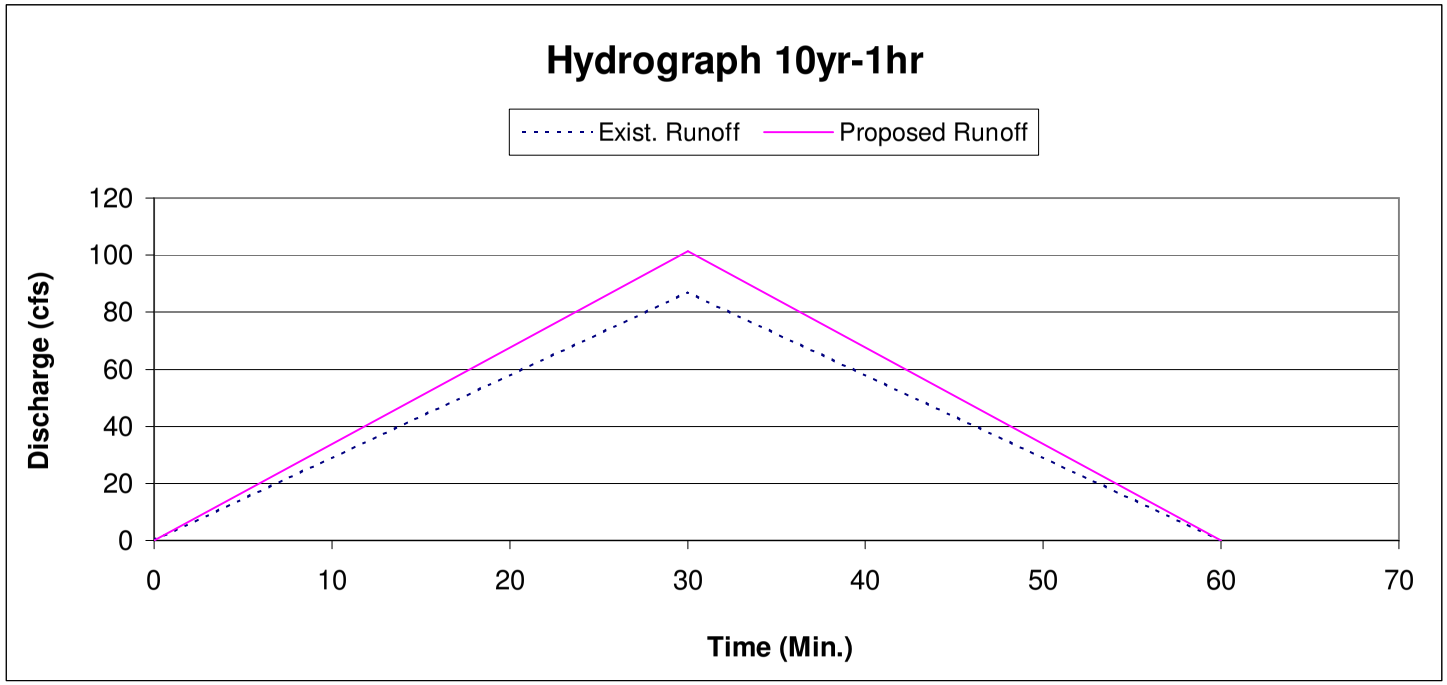
Kamehameha Schools Community Learning Center - FLOW CALCULATION FOR EACH DRAINAGE AREA 10YR

Existing Condition

AREA	LANDSCAPED AREA (ACRE)	C1	PAVED AREA (ACRE)	C2	AREA WEIGHTED C	1-HR RAIN-FALL (INCH/HR)	LENGTH	SLOPE	INTENSITY (INCH/HR)	FLOW(CFS)
E1	46.010	0.60	0.000	0.90	0.60	2.25	2094	0.50%	3.15	86.96
TOTAL	46.010									**86.96**

Proposed Condition

AREA	LANDSCAPED AREA (ACRE)	C1	PAVED AREA (ACRE)	C2	AREA WEIGHTED C	1-HR RAIN-FALL (INCH/HR)	LENGTH	SLOPE	INTENSITY (INCH/HR)	FLOW(CFS)
P1	31.030	0.60	14.980	0.90	0.70	2.25	2071	0.40%	3.15	101.45
TOTAL	46.010									**101.45**



Existing		**Proposed**	
Time (min)	Flow (cfs)	Time (min)	Flow (cfs)
0	0	0	0
30	86.96	30	101.45
60	0	60	0

Exist. Runoff Volume	156526.0 ft^3
Proposed Runoff Volume	182613.7 ft^3
Detention Voume Required	26087.7 ft^3

APPENDIX D

LOAD CALCULATIONS

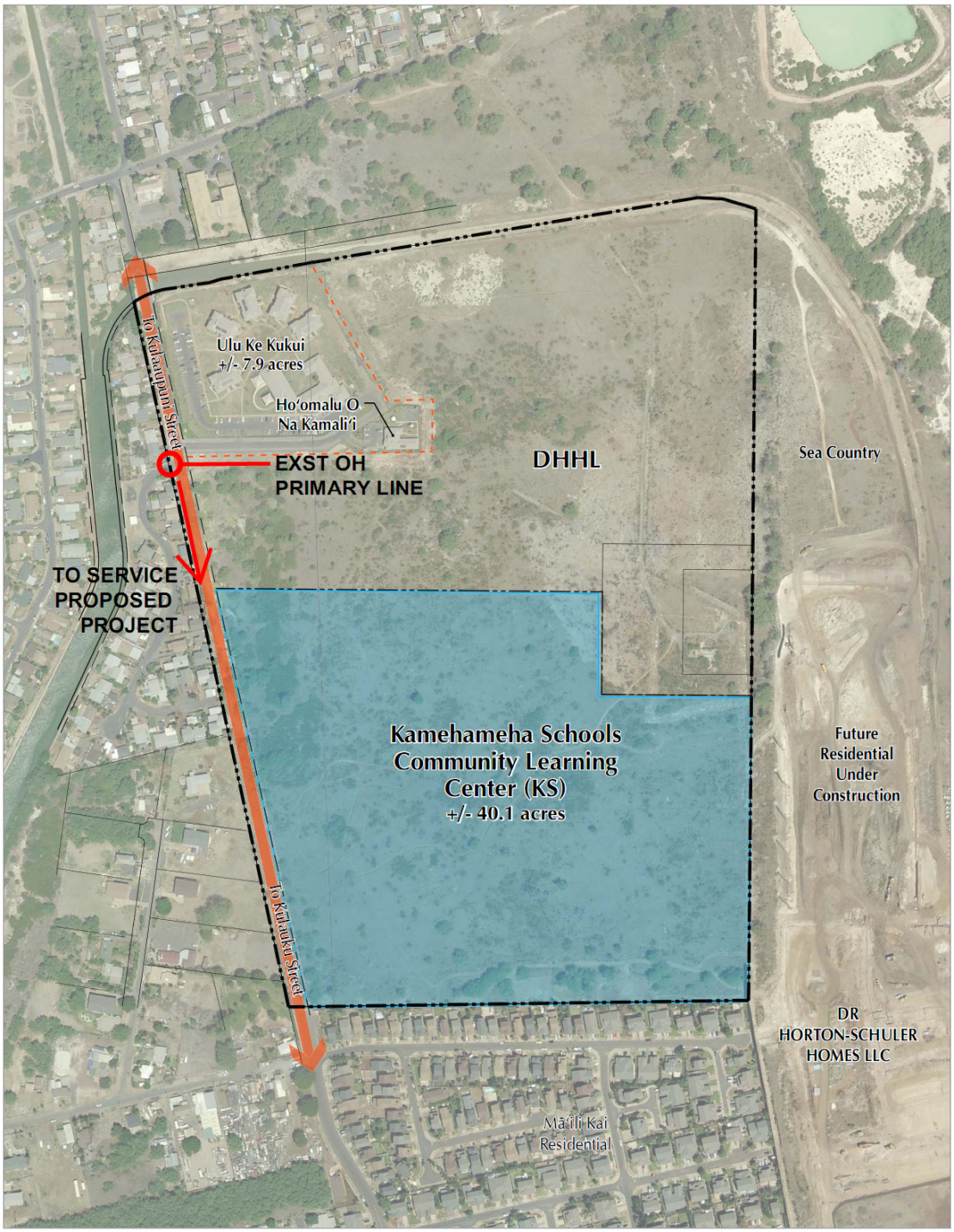
Kamehameha Schools - Ka Pua EP Site

		Gross SF	Watts/SF	kW Demand
Bldg A - Toddler Infand Center				
	Total	4143.2	10	41.4
Bldgs B, C, & D		16906	10	169.1
	Covered Outdoor Area	900	2.3	2.1
Bldg E		23687.1	10	236.9
Bldg F		610	10	6.1
Bus/Van Parking Lot		5800	0.15	0.9
Piko Outdoor Area				
	Gathering Area	6248	2.6	16.2
	Staging Area	2000	2.6	5.2
Bldg G				
	Fitness/Locker Rooms	9720	8	77.8
	Offices/Additional	10810.8	10	108.1
	Storage	1350	0.25	0.3
	Pool			2.6
	Outdoor Fields	106000	0.5	53.0
	Outdoor Walking Path	63360	0.2	12.7
	Covered Courts	9500	2.3	21.9
Bldg H,I,J,K		29349	10	293.5
Bldg L, M		17482.5	10	174.8
Bldg N				
	Computer Lab	1215	10	12.2
	Music, Art, Dance Rms	9355.5	5	46.8
	Additional Space	2667.6	10	26.7
	Outdoor Science	900	5	4.5
Bldg O		11743.2	10	117.4
Indoor and Outdoor Learning		1200		
Bldg P		10033.2	10	100.3
Bldg Q		4028.4	10	40.3
Bldg R				
	Serving Kitchen	1215	12	14.6
	Dinning Hall/Take Out	3510	10	35.1
Bldg S		10486.8	10	104.9
			Subtotal	1725.2 kW
Parking (Based on KS Historical Demand Analysis)				
		255150	0.15	38.3 kW
			Ka Pua Total	**1763.5 kW**

DHHL Site	kW/Unit	No. Units	Linear Ft	kW/ft	kW Demand
	Proposed Buildings				
Single Family	3	100			300.0
Duplex (DY FY 2017)	2.5	80			200.0
Duplex (DY FY 2019)	2.5	80			200.0
Roads/Open Space			15150	0.3	45.5
			DHHL New Build Total		**745.5 kW**
				Total Site	**2.509 MVA**

APPENDIX E

ELECTRICAL SUBSTATION



LEGEND

- Tax Map Key
- KS Community Learning Center

Kamehameha Schools
Community Learning Center

Kamehameha Schools — Island of Oʻahu

North — Linear Scale (feet) 0 150 300 600

PBR HAWAII & ASSOCIATES, INC.

Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.

APPENDIX F

COST ESTIMATE

Kamehameha Community Learning Center
On-Site & Offsite Civil Estimate

PROJECT: Kamehameha Schools Community Learning Center
Maili, Oahu

PREPARED BY: MITSUNAGA & ASSOCIATES
DATE:February 2013

PROJECT NO. 1363-01-C

SUBMITTAL: PRELININARY ENGINEERING ASSESSMENT

Off-Site Infrastructure Cost

		SUBTOTAL	CONTINGENCY(25%)	PLAN/DESIGN(10%)	TOTAL	KS COST	DHHL COST
1)	Roadway Improvements	$2,111,481	$527,870.28	$211,148.11	$2,850,499.50	$1,567,774.73	$1,282,724.78
2)	Water System (Including Booster Pump Upgrade $3M)	$3,197,500	$799,375.00	$319,750.00	$4,316,625.00	$4,316,625.00	$0.00
3)	Wastewater System	$181,000	$45,250.00	$18,100.00	$244,350.00	$244,350.00	$0.00
4)	Drainage Improvements	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
5)	Electrical System	$325,000	$81,250.00	$32,500.00	$438,750.00	$438,750.00	$0.00
	Total	$5,814,981.11		$581,498.11	**$7,850,225**	$6,567,499.73	$1,282,724.78

On-Site Infrastructure Costs

	PER ACRE	ACRES	TOTAL
6) Kamehameha Community Learning Center	$450,000	41.27	$18,571,500
7) *Planning & Design (10%)*			*$1,857,150*
Total			**$20,428,650**

Facilities Charges

8) Water System Facilities Charges	$406,700
9) Wastewater Facilities Charge	$330,600
Total	**$737,300**

KAMEHAMEHA PROJECT TOTAL	**$27,733,450**
PROJECT TOTAL	**$29,016,175**

KS & DHHL shared costs are estimated based on the percent of the area of the project site being develooped by each entity.

Kamehameha Community Learning Center

PROJECT: Kamehameha Schools Community Learning Center
Maili, Oahu, Hawaii

PREPARED BY: MITSUNAGA AND ASSOCIATES
DATE:February 2013

PROJECT NO.: 1363-01-C

SUBMITTA|PRELIMINARY

ITEM NO.	ITEM	APPROX. QUANTITY	UNIT	UNIT PRICE	AMOUNT
	KCLC OFF-SITE IMPROVEMENTS				
	1) Roadway improvements				
	Roadway Extension (Kulaaupuni St. to Kulauku St.)				
1	3" A.C. Pavement	5860	LS	$55.00	$322,300.00
2	6" Aggregate Base Course	1036	CU YD	$50.00	$51,817.59
3	6" Subbase Course	1112	CU YD	$48.00	$53,391.11
4	Curb & Gutter	2930	LF	$37.00	$108,410.00
5	Concrete Sidewalk	239	CU YD	$550.00	$131,307.41
6	Drainage improvements	1	LS	$154,700.00	$154,700.00
7	Landscaping	13185	SQ FT	$3.00	$39,555.00
	Roadway Extension Subtotal				**$861,481.11**
	Signalization of St. Johns & Kulaaupuni Streets				
8	Intersection Signalization	1	LS	$275,000.00	$275,000.00
	Farrington Hwy Intersection Subtotal				**$275,000.00**
	St. Johns @ Farrington Hwy Improvements				
9	Rehabilitate the interstection	1	LS	$500,000.00	$500,000.00
	Farrington Hwy Intersection Subtotal				**$500,000.00**
	St. Johns Road Improvements				
10	Add 6 foot wide AC Shoulder to Westside of Roadway	1	LS	$150,000.00	$150,000.00
11	Add 6 foot wide AC Shoulder to Eastside of Roadway	1	LS	$150,000.00	$150,000.00
	St Johns Road Improvements				**$300,000.00**
	Kuakama @ Farrington Hwy Improvements				
12	Rehabilitate the interstection	1	LS	$175,000.00	$175,000.00
	Farrington Hwy Intersection Subtotal				**$175,000.00**
	Roadway Improvements Subtotal				**$2,111,481.11**

Kamehameha Community Learning Center

PROJECT: Kamehameha Schools Community Learning Center
Maili, Oahu, Hawaii

PREPARED BY: MITSUNAGA AND ASSOCIATES
DATE:February 2013

PROJECT NO.: 1363-01-C

SUBMITTAl PRELIMINARY

ITEM NO.	ITEM	APPROX. QUANTITY	UNIT	UNIT PRICE	AMOUNT
	2) Water System				
	Connection to BWS System				
13	Connect to Exist. Waterline	1	LS	$12,500.00	$12,500.00
14	Waterlines	500	LIN FT	$350.00	$175,000.00
15	Chlorination and Flushing for Waterline	1	LS	$10,000.00	$10,000.00
	Connecton to BWS System Subtotal				**$197,500.00**
	BWS Booster pump project 2015				
16	BWS Booster pump project 2015	1	LS	$3,000,000.00	$3,000,000.00
	BWS Booster Pump Project Subtotal				**$3,000,000.00**
	Water System Subtotal				**$3,197,500.00**
	3) Wastewater System				
	Connect to Kulaku Street Sewer Line				
17	Connect to Exist. Sewer line	1	LS	$1,500.00	$1,500.00
18	Sewer Line	500	LN FT	$275.00	$137,500.00
19	Sewer Manhole	6	EA	$7,000.00	$42,000.00
	Kulaku Street Sewer Connection Subtotal				**$181,000.00**
	4) Drainage Improvements				
20	Detention Basin's	1	LS	Onsite Cost	Onsite Cost
	5) Electrical				
21	Electric Overhead Distribution System	5	Poles	$40,000.00	$200,000.00
22	Telephone Overhead Distribution System (Same Pole as Elec)	5	Poles	$10,000.00	$50,000.00
23	Cable TV	5	Poles	$10,000.00	$50,000.00
24	Street Lighting with Underground Wiring	500	LIN FT	$50.00	$25,000.00
	Electrical Subtotal				**$325,000.00**
	KCLC Total				**$5,814,981.11**

Kamehameha Community Learning Center

PROJECT: Kamehameha Schools Community Learning Center
Maili, Oahu, Hawaii

PREPARED BY: MITSUNAGA AND ASSOCIATES
DATE:February 2013

PROJECT NO. 1363-01-C

SUBMITTAL: Preliminary

ITEM NO.	ITEM	APPROX. QUANTITY	UNIT	UNIT PRICE	AMOUNT
	Facilities Charges				
2)	Kamehameha Community Learning Center				
	Water System Facilities Charges				
	Kamehameha Schools Learning Complex 50 FU	50	FU	$739	$36,950
	Kamehameha Schools Learning Complex 1450 FU	1450	FU	$255	$369,750
	Wastewater Facilities Charge	57	ESDU	$5,800	$330,600
	Total				**$737,300**

Appendix F

PRE-CONSULTATION LETTERS AND RESPONSES

NEIL ABERCROMBIE
GOVERNOR

KAREN SEDDON
EXECUTIVE DIRECTOR

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT AND TOURISM
HAWAII HOUSING FINANCE AND DEVELOPMENT CORPORATION
677 QUEEN STREET, SUITE 300
Honolulu, Hawaii 96813
FAX: (808) 587-0600

IN REPLY REFER TO:

12:PEO/84

December 10, 2012

Mr. Vincent Shigekuni, Vice President
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Mr. Shigekuni:

Re: Pre-Assessment Consultation for the Proposed Kamehameha Schools Community Learning Center, Ma'ili, Oahu, TMK: (1)8-7-010:007 (por)

Thank you for the opportunity to provide comments on the proposed Kamehameha Schools Community Learning Center (KCLC).

There are a number of transitional and affordable rental housing projects along the Waianae Coast. The proposed KCLC could benefit families with children that reside in these rental housing facilities by expanding access to educational and other supportive services.

Sincerely,

Karen Seddon
Executive Director

PBR HAWAII
& ASSOCIATES, INC.

PRINCIPALS

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President

R. STAN DUNCAN, ASLA
Executive Vice-President

RUSSELL Y. J. CHUNG, FASLA, LEED®AP BD+C
Executive Vice-President

VINCENT SHIGEKUNI
Vice-President

GRANT T. MURAKAMI, AICP, LEED®AP BD+C
Vice-President

W. FRANK BRANDT, FASLA
Chairman Emeritus

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Senior Associate

RAYMOND T. HIGA, ASLA
Senior Associate

KIMI MIKAMI YUEN, LEED®AP BD+C
Senior Associate

SCOTT ALIKA ABRIGO, LEED®AP BD+C
Managing Director - Kapolei

ROY TAKEMOTO
Managing Director - Hilo

SCOTT MURAKAMI, ASLA, LEED®AP
Associate

DACHENG DONG, LEED®AP
Associate

MARC SHIMATSU, ASLA
Associate

MICHAEL SHIBATA, AICP
Associate

CATIE CULLISON, AICP
Associate

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E-mail: sysadmin@pbrhawaii.com

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Kapolei Building, Suite 313
Kapolei, Hawai'i 96707-2005
Tel: (808) 521-5631
Fax: (808) 535-3163

HILO OFFICE
1719 Haleloke Street
Hilo, Hawai'i 96720-1553
Tel/Cel: (808) 315-6878

printed on recycled paper

February 25, 2013

Ms. Karen Seddon, Executive Director
State of Hawai'i
Department of Business, Economic Development, and Tourism
Hawaii Housing Finance and Development Corporation
677 Queen Street, Suite 300
Honolulu, HI 96813

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER, MĀ'ILI, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Ms. Seddon:

Thank you for your letter dated December 10, 2012 (your reference number: 12:PEO/84).

We acknowledge that there are a number of transitional and affordable rental housing projects along the Wai'anae Coast, and agree that the proposed Kamehameha Schools Community Learning Center at Mā'ili will help benefit families with children that reside in these rental housing facilities by increasing access to educational and other services.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

Vincent R. Shigekuni

Vincent Shigekuni
Vice President

cc: Ms. Samantha Hudson, Kamehameha Schools

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NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

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

In reply, please refer to:
File:

12-223
DEA Kamehameha

December 12 2012

Mr. Vincent Shigekuni, Vice President
PBR Hawaii & Associates
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Mr. Shigekuni:

SUBJECT: Pre-Assessment Consultation for the Proposed Kamehameha Schools Community Learning Center, Ma`ili, Island of O`ahu Draft Environmental Assessment

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your letter, dated November 28, 2012. Thank you for allowing us to review and comment on the subject document. The document was routed to the various branches of the Environmental Health Administration. We have no comments at this time, but reserve the right to future comments. We strongly recommend that you review all of the Standard Comments on our website: www.hawaii.gov/health/environmental/env-planning/landuse/landuse.html. Any comments specifically applicable to this application should be adhered to.

The United States Environmental Protection Agency (EPA) provides a wealth of information on their website including strategies to help protect our natural environment and build sustainable communities at: http://water.epa.gov/infrastructure/sustain/ . The DOH encourages State and county planning departments, developers, planners, engineers and other interested parties to apply these strategies and environment principles whenever they plan or review new developments or redevelopments projects. We also ask you to share this information with others to increase community awareness on healthy, sustainable community design. If there are any questions about these comments please contact me.

Sincerely,

Laura Leialoha Phillips McIntyre, AICP
Environmental Planning Office Manager
Environmental Health Administration
Department of Heath
919 Ala Moana Blvd., Ste. 312
Honolulu, Hawaii 96814
Phone: 586-4337
laura.mcintyre@doh.hawaii.gov

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& ASSOCIATES, INC.

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Tel/Cel: (808) 315-6878

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February 25, 2013

Ms. Laura Leialoha Phillips McIntyre, ACIP
Environmental Health Administration
Department of Health
919 Ala Moana Boulevard, Suite 312
Honolulu, Hawai'i 96814

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER, MĀ'ILI, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Ms. McIntyre:

Thank you for your letter dated December 12, 2012 (your reference number: 12-223 DEA Kamehameha). We acknowledge that the Department of Health has no comments at this time, but reserves the right to future comments. As recommended, the Standard Comments on the Department of Health's website and United State Environmental Protection Agency website were reviewed for applicability to the project.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

Vincent Shigekuni
Vice President

cc: Ms. Samantha Hudson, Kamehameha Schools

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NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 27, 2012

PBR Hawaii & Associates, Inc.
Attn: Vincent Shigekuni
1001 Bishop Street, Suite 650
Honolulu, HI 96813-3484

via email: vshigekuni@pbrhawaii.com

Dear Mr. Shigekuni,

SUBJECT: Pre-Assessment Consultation for the Proposed Kamehameha Schools Community Learning Center, Ma`ili, Island of O`ahu, 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; and (2) Engineering Division, on the subject matter. No other comments were received as of our suspense date. Should you have any questions, please feel free to call Supervising Land Agent Steve Molmen at 587-0439. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 7, 2012

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

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Pre-Assessment Consultation for the Proposed Kamehameha Schools Community Learning Center, Ma`ili, Island of O`ahu, Draft Environmental Assessment
LOCATION: Ma`ile, Island of O`ahu, TMK (1) 8-7-010: 007 (portion)
APPLICANT: PBR Hawaii & Associates, Inc. for Kamehameha Schools

Transmitted for your review and comment on the above-referenced document. We would appreciate your comments on this document. Please submit any comments by December 26, 2012.

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: T Chee
Print Name: Tracy Chee
Date: 12/4/12

cc: Central Files

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

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LAND DIVISION
2012 DEC 24 AM 9:45
DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

December 7, 2012

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: Pre-Assessment Consultation for the Proposed Kamehameha Schools Community Learning Center, Ma`ili, Island of O`ahu, Draft Environmental Assessment
LOCATION: Ma`ile, Island of O`ahu, TMK (1) 8-7-010: 007 (portion)
APPLICANT: PBR Hawaii & Associates, Inc. for Kamehameha Schools

Transmitted for your review and comment on the above-referenced document. We would appreciate your comments on this document. Please submit any comments by December 26, 2012.

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 t (808) 587-0439. Thank you.

Attachments

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

Signed: _____
Print Name: Carty S. Chang, Chief Engineer
Date: 12/21/12

cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/SteveMolmen
RE:PreAsessConsultDEAKamSchoolComLearningCenter
Oahu.914

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 Flood Zone D. The Flood Insurance Program does not have any regulations for developments within Flood Zone D.

( ) 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 or Ms. Ardis Shaw-Kim at (808) 768-8296 of t he 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. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.

( ) Mr. Wynne Ushigome at (808) 241-4890 of the County of Kauai, Department of Public Works.

( ) The applicant should include water demands and infrastructure required to meet project needs. Please note that projects within State lands requiring water service from the Honolulu Board of Water Supply system will be required to pay a resource development charge, in addition to Water Facilities Charges for transmission and daily storage.

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

( ) Additional Comments: _____

( ) Other: _____

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

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: 12/24/12

PBR HAWAII
& ASSOCIATES, INC.

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Tel/Cel: (808) 315-6878

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February 25, 2013

Mr. Russell Y. Tsuji, Land Administrator
State of Hawaii
Department of Land and Natural Resources
Post Office Box 621
Honolulu, Hawai'i 96809

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER, MĀ'ILI, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Tsuji:

Thank you for your letter dated December 27, 2012. We understand that the pre-assessment consultation letter was distributed to the following divisions:

1. Commission on Water Resource Management (no comments provided);
2. Engineering Division (comments provided);
3. Historic Preservation (no comments provided);
4. Land Division – Oahu District (comments provided); and
5. Office of Conservation & Coastal Lands (no comments provided).

We offer the following responses to comments provided by the respective divisions of the Department of Land and Natural Resources.

Engineering Division

1. Thank you for confirming that the Proposed Project is located in Flood Zone D according to the Flood Insurance Rate Map, and that the Flood Insurance Program does not have any regulations for developments within Flood Zone D.

Land Division – Oahu District

1. We acknowledge that the Land Division – Oahu District has no comments to offer at this time.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

Vincent Shigekuni
Vice President

cc: Ms. Samantha Hudson, Kamehameha Schools

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NEIL ABERCROMBIE
GOVERNOR

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

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

IN REPLY REFER TO:

STP 8.1059

December 13, 2012

Mr. Vincent Shigekuni
Vice President
PBR Hawaii
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Mr. Shigekuni:

Subject: Kamehameha Schools Community Learning Center (KCLC), Maili
Pre-Assessment Consultation for Draft Environmental Assessment (DEA)
TMK: (1) 8-7-010:007 (por.)

Thank you for requesting the State Department of Transportation's (DOT) review of the subject project. DOT understands Kamehameha Schools proposes to develop a community learning center on 40 acres of land owned by the State of Hawaii Department of Hawaiian Home Lands (DHHL). The project will include on-site infrastructure, grading, and site preparation and construction of roads, buildings and facilities for the KCLC.

While the project will not have any direct access to the State highway facilities (Farrington Highway) in the area, DOT is concern with the potential impact the subject project will have on our transportation facilities. The DEA should include a review and discussion of any traffic and intersection impacts that may affect Farrington Highway.

DOT appreciates the opportunity to provide comments. If there are any other questions, including the need to meet with DOT staff, please contact Mr. Garrett Smith of the DOT Statewide Transportation Planning Office at telephone number (808) 831-7976.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

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& ASSOCIATES, INC.

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Managing Director - Hilo

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CATIE CULLISON, AICP
Associate

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February 25, 2013

Dr. Glenn M. Okimoto, Ph.D.
State of Hawai'i
Department of Transportation
869 Punchbowl Street
Honolulu, Hawai'i 96813-5097

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER, MĀ'ILI, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Dr. Okimoto:

Thank you for your letter dated December 13, 2012 (your reference number: STP 8.1059). We acknowledge your concern that the proposed Kamehameha Schools Community Learning Center at Mā'ili may have a potential impact on the State's transportation facilities. A Transportation Impact Analysis Report will be prepared and included in the Draft Environmental Assessment, and will include a discussion of traffic and intersection impacts that may affect Farrington Highway.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

Vincent Shigekuni
Vice President

cc: Ms. Samantha Hudson, Kamehameha Schools

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BOARD OF WATER SUPPLY

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

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GLENN M. OKIMOTO, Ex-Officio

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

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

December 11, 2012

Mr. Vincent Shigekuni, Vice President
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Mr. Shigekuni:

Subject: Your Letter Dated November 28, 2012, Regarding the Draft Environmental Assessment Pre-Assessment Consultation for the Proposed Kamehameha Schools Community Learning Center on Kulauku Street, Maili – Tax Map Key: 8-7-010: 007

Thank you for the opportunity to comment on the proposed Kamehameha Community Learning Center.

The existing water system is presently not adequate to accommodate the proposed community learning center. The Lualualei Line Booster is operating at maximum capacity. We are currently in the design phase of the Lualualei Line Booster upgrade and anticipate going out for construction in 2013. We suggest you resubmit your request around the end of calendar year 2014.

If you have any questions, please contact Robert Chun at 748-5443.

Very truly yours,

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

PBR HAWAII
& ASSOCIATES, INC.

PRINCIPALS

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President

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Managing Director - Hilo

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Associate

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1719 Haleloke Street
Hilo, Hawai'i 96720-1553
Tel/Cel: (808) 315-6878

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February 25, 2013

Mr. Ernest Y. W. Lau, P.E., Manager and Chief Engineer
Board of Water Supply
City and County of Honolulu
630 South Beretania Street
Honolulu, Hawai'i 96843

Attn: Mr. Robert Chun

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER, MĀ'ILI, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Lau:

Thank you for your letter dated December 11, 2012. We acknowledge your assessment that the existing water system is not presently adequate. Currently, Kamehameha Schools is in discussions with the Board of Water Supply on mitigation measures that can help reduce the need for potable water requirements and are investigating potential solutions to address this water capacity issue.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

Vincent Shigekuni
Vice President

cc: Ms. Samantha Hudson, Kamehameha Schools

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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

PETER B. CARLISLE
MAYOR

LORI M.K. KAHIKINA, P.E.
DIRECTOR

CHRIS TAKASHIGE, P.E.
DEPUTY DIRECTOR

December 12, 2012

Mr. Vincent Shigekuni, Vice President
PBR Hawaii & Associates, INC.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Mr. Shigekuni:

Pre- Assessment Consultation For The Proposed
Kamehameha Schools Community Learning Center
Maili, Island Of Oahu
Draft Environmental Assessment

Thank you for the opportunity to review and comment. The Department of Design and Construction has no comments on this project.

Should you have any questions, please contact me at 768-8480.

Sincerely,

Lori M.K. Kahikina, P. E.
Director

LMKK:pg(493237)

PBR HAWAII
& ASSOCIATES, INC.

PRINCIPALS

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February 25, 2013

Ms. Chris T. Takashige, P.E., Director
Department of Design and Construction
City and County of Honolulu
650 South King Street, 11th Floor
Honolulu, Hawai'i 96813

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER, MĀ'ILI, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Takashige:

Thank you for the letter dated December 12, 2012 [your reference number: LMKK:pg(493237)]. We acknowledge that your department has no comments on this project.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

Vincent Shigekuni
Vice President

cc: Ms. Samantha Hudson, Kamehameha Schools

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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

PETER B. CARLISLE
MAYOR

JIRO A. SUMADA
ACTING DIRECTOR

2012/ELOG-2376 (BLB)

December 24, 2012

Mr. Vincent Shigekuni
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Mr. Shigekuni:

Subject: Kamehameha Schools Community Learning Center
Pre-Assessment Consultation
Maili, Lualualei, Waianae, Oahu
Tax Map Key 8-7-10: 7

This responds to your request, received November 30, 2012, for pre-consultation comments concerning the preparation of a Draft Environmental Assessment (EA) for the subject proposed learning center in Maili. We understand that this project is on an approximately 40-acre portion of a parcel owned by the State of Hawaii, Department of Hawaiian Home Lands (DHHL), and will consist of the development of a Kamehameha Schools Community Learning Center which will include a pre-school facility, infant toddler care center, early childhood educational and administrative support facilities, integrative educational systems and resources, educational and community support facilities, a health and wellness (recreation) component and gathering areas. Our preliminary comments are as follows:

A. Planning Division (Development Plans Zone Change Branch)

1. The EA should include a discussion on how the proposed project is consistent with City Ordinance 12-03, Revised Waianae Sustainable Communities Plan (SCP) and the Public Review Draft of the Revised Waianae SCP. The revised plans are available online at the following website:

http://honoluludpp.org/Planning/Waianae/Waianae5yr/WaianaePRD10.1.08.pdf.

2. Records identify that the Villages at Maili Transitional Housing Project is located on the same parcel. The DEA should include a discussion on the status of the housing project and how the proposed project will impact the housing project.

For any questions concerning DPZCB comments, please contact Eugene Takahashi of our staff at 768-8035.

B. Land Use Permits Division (Land Use Approvals Branch)

1. The Attorney General opinion of August 6, 1992, clearly states that lands under the jurisdiction of the DHHL may be exempt from county zoning and Special Management Area (SMA) permits and processes, at the discretion of the DHHL. Upon receipt of a letter from the DHHL exempting the subject site from Land Use Ordinance (LUO) and SMA requirements, the DPP will relinquish authority concerning all matters pertaining to zoning and/or SMA issues for the subject properties.

2. If the DHHL does not exempt the subject site, the project will be subject to all LUO regulations and development standards. Based on our current understanding of the information provided so far, the proposed KS learning center will require a Conditional Use Permit (CUP) (Minor) to allow both "meeting facility" and "day-care facility" uses. However, additional information and detailed descriptions of these particular uses (especially with regard to the proposed "P-20" educational system) are needed before a definitive determination can be rendered regarding the specific type(s) of conditional use involved. We have enclosed a copy of our filing instructions for a CUP (Minor), as well as a Land Use Permits Division Master Application Form, for your reference.

For any questions concerning LUAB comments, please contact Blake La Benz of our staff at 768-8016.

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

Very truly yours,

Nelson B. Sumida

Nelson Jiro A. Sumada, Acting Director
Department of Planning and Permitting

JAS:nw
Encls.

CITY AND COUNTY OF HONOLULU
DEPARTMENT OF PLANNING & PERMITTING
650 South King Street
Honolulu, Hawaii 96813

LAND USE PERMITS DIVISION MASTER APPLICATION FORM

Additional data, drawings/plans, and fee requirements are listed on a separate sheet titled "Instructions for Filing". *PLEASE ASK FOR THESE INSTRUCTIONS.*

All specified materials described in the "Instructions for Filing" and required fees must accompany this form; incomplete applications will delay processing. You are encouraged to consult with Zoning Division staff in completing the application. Please call the appropriate phone number given in the "Instructions for Filing."

Please print legibly or type the required information.

SUBMITTED FEE: $_____

PERMIT/APPROVAL REQUESTED (Check one or more as appropriate):

Cluster:
- ☐ Agricultural
- ☐ Country
- ☐ Housing

Conditional Use Permit:
☐ Minor ☐ Major

☐ Existing Use: _____
(Indicate Type of Use)

☐ Minor Shoreline Structures Permit

☐ Modify Approved Permit: _____
(Indicate Reference File No.)

☐ Plan Review Use

Planned Development:
- ☐ Housing
- ☐ Commercial (WSD Only)
- ☐ Resort (WSD Only)

☐ Shoreline Setback Variance

Special District Permit:
☐ Minor ☐ Major
_____
(Indicate District)

☐ Downtown Height >350 Feet

Special Management Area Use Permit:
☐ Minor ☐ Major

☐ Variance from LUO Sec.(s): _____

☐ Waiver from LUO Sec.(s): _____

☐ Zoning Adjustment, LUO Sec.(s): _____

☐ 201G Project

TAX MAP KEY(S): _____
LOT AREA: _____
ZONING DISTRICT(S): _____ STATE LAND USE DISTRICT: _____
STREET ADDRESS/LOCATION OF PROPERTY: _____

RECORDED FEE OWNER:
Name (& title, if any) _____
Mailing Address _____
Phone Number _____
Signature _____

PRESENT USE(S) OF PROPERTY/BUILDING:
_____

PROJECT NAME (if any): _____

APPLICANT:
Name _____
Mailing Address _____
Phone Number _____
Signature _____

AUTHORIZED AGENT/CONTACT PERSON:
Name _____
Mailing Address _____
Phone Number _____
Signature _____

REQUEST/PROPOSAL (Briefly describe the nature of the request, proposed activity or project): _____

POSSE JOB NO. _____

CITY AND COUNTY OF HONOLULU
DEPARTMENT OF PLANNING AND PERMITTING (DPP)

Conditional Use Permit (Minor)
Day-care Facility
Meeting Facility
School: Elementary, Intermediate and High

Application Instructions

This document is intended to assist you in preparing a complete application and should be read in conjunction with the Land Use Ordinance (LUO).

I. Overview.

A. Potential Public Hearing. A Conditional Use Permit (CUP) for any of the above uses MAY require a public hearing, to be determined by the Director of DPP. In the event that a public hearing is deemed necessary, the notification requirements on page 6 must be met.

B. Time Frame. The time frame for processing this permit is 45 calendar days from acceptance of a completed application, unless the Director determines that a public hearing is required for the proposed project; in such cases, the processing time shall be 90 calendar days from the date of application acceptance. If the DPP fails to process the permit within the required time frame, the permit shall be deemed approved.

II. Pre-application Procedures.

A. Pre-application Meeting. Prior to submitting the application, the applicant is encouraged to meet with DPP staff to review the project. Please call 768-8014 to schedule a meeting.

B. Presentation to Neighborhood Board. Prior to submitting the application, the applicant **must present** the project to the neighborhood board of the district where the site is located, or if no such neighborhood board exists, then to an appropriate community association. The applicant must provide written notice of the presentation to all adjoining property owners.

This requirement will be deemed to have been satisfied if either:

1. The neighborhood board (or community association if applicable) fails to provide an opportunity to present the proposed project at a meeting held within 60 days of the date of the written request to make a presentation; **or**

2. The neighborhood board (or community association if applicable) submits a letter confirming that a presentation was made and describing the position of the Board, or stating that such a presentation is not necessary.

   In the event that the neighborhood board does not submit a letter, the applicant may submit a copy of the Board's minutes which documents that the presentation was made.

Please contact the Neighborhood Commission at 768-3710 for information concerning the appropriate neighborhood board and contact person for the project.

III. Application Requirements.

A. DPP Master Application. Complete and submit the DPP Land Use Permits Division Master Application Form. Provide all requested information.

B. Fees. Submit a non-refundable fee of $300 payable to the City and County of Honolulu.

Note: When an applicant applies for a CUP after being cited for taking action without having obtained necessary approvals, the application fee set forth above ***shall be doubled****. The payment of the fee required by this section shall not relieve the applicant from compliance with the LUO or from penalties imposed there under.*

C. Affidavit. Submit a signed, notarized affidavit confirming that adjoining property owners were sent written notification of the required neighborhood board presentation.

D. Written Statement. Your application package must include two copies of the following material. If you are submitting a multi-permit application, please submit two copies for each permit.

Upon completion of the initial review of your submittal by the DPP, you will be notified of the number of ADDITIONAL copies required for agency and community review and comment.

The written statement must address the following issues:

1. Site Description. Describe the project site, including topography, abutting uses, and a brief history of the uses of the site, up to the present.

2. Project Description. Describe the proposed project, including the following if applicable:

   a. Details on existing and proposed uses and activities, such as hours of operation, number of clients and staff and use and number of structures.

   b. Details on existing and proposed structures, building and site alterations, including parking areas, grading and landscaping. Provide information on building heights, setbacks and buffering from adjoining parcels.

3. Infrastructure. Describe infrastructure requirements for the project, including the following if applicable (preliminary checks with the appropriate agency are encouraged):

   a. Wastewater disposal;

      Note: Contact the DPP Wastewater Branch at 768-8197 or State Department of Health at 586-4294.

   b. Water facilities; and

      Note: Contact the Board of Water Supply, Project Review Section at 748-5440.

   c. Traffic, and off-street parking and loading.

      Note: A traffic impact analysis and/or traffic management plan may be required as part of your application, particularly when the surrounding neighborhood is characterized by existing congestion or the proposed use may adversely impact roadways in the vicinity of the project. Contact the DPP Traffic Review Branch at 768-8077 and/or State Department of Transportation for details and requirements.

      Furthermore, if access to the site is from a private roadway or easement, then the Applicant ***must*** *provide documentation that they have access rights to the roadway or easement at the time of application. And, if off-site access improvements involving a private roadway are likely or even possible, then the Applicant* ***must*** *include with the application written permission from* ***all*** *of the roadway owners stating that the Applicant is authorized to make any roadway improvements that are determined to be necessary and appropriate.*

Day-care facilities, meeting facilities, and schools must have access to a street or right-of-way of minimum access width; and, for meeting facilities, sufficient street frontage, as well. The application **must** include the written determination from the appropriate traffic agency (see above) regarding the adequacy of the site with respect to these requirements.

4. Neighborhood Board. Describe all issues or concerns relating to the project raised at the presentation to the neighborhood board or community association. Describe the measures, if any, taken to mitigate such issues or concerns.

5. Other Impacts. Describe any other expected project impacts and proposed mitigative measures to address such impacts including the following, if applicable:

   a. Public services, including, but not necessarily limited to:

      i. Refuse collection;

      ii. Fire protection, and related occupancy requirements;

      iii. Police services; and

      iv. Schools.

   b. Physical environment, including, but not necessarily limited to:

      i. Natural landforms;

      ii. Public views;

      iii. Natural habitats;

      iv. Historic sites; and

      v. Flood hazards.

   c. Housing and population;

   d. Employment;

   e. Parks and recreation;

f. Community concerns; and

g. Potential nuisances, such as noise, lights, dust, and odors.

6. Justification.

a. Explain how the proposed project will comply with the following general requirements for conditional uses:

i. The proposed use is permitted as a conditional use in the underlying zoning district and conforms to the requirements of the LUO;

ii. The site is suitable for the proposed use considering size, shape, location, topography, infrastructure and natural features;

iii. The proposed use will not alter the character of the surrounding area in a manner substantially limiting, impairing or precluding the use of surrounding properties for the principal uses permitted in the underlying zoning district; and

iv. The use at its proposed location will provide a service or facility which will contribute to the general welfare of the community-at-large or surrounding neighborhood.

b. Explain how the project will comply with the specific development standards for the applicable conditional use category (refer to LUO Article 5), the district development standards for the applicable zoning district (refer to LUO Article 3), general development standards (refer to LUO Article 4), and off-street parking and loading requirements (refer to LUO Article 6).

E. Drawings/Plans. Submit the following fully dimensioned drawings and/or plans applicable to the project. All drawings/plans must be black line prints, drawn to scale and prepared by a draftsman, architect, engineer, or similar professional. For document imaging purposes, one (1) set of drawings shall be a maximum size of 11" x 17" and the second should not exceed 24" x 36". DPP staff may request additional copies after acceptance of the application.

1. Site Plan. Two (2) copies of a site plan drawn to scale, showing existing and proposed structures, including fences and walls. In addition, the site plan should also show the following:

   a. Existing structures to be removed and/or modified;

   b. On-site traffic circulation patterns and access;

   c. Details of parking areas, including dimensions of parking and loading stalls and maneuvering areas; and

   d. Details for each existing and proposed structure, including building heights, setbacks from property lines, floor area and building area.

2. Building Plans. Detailed plans for all new structures, including the following:

   a. Building elevations and section drawings which show finish and existing grades, and setbacks from property lines; and

   b. Floor plans, including the dimensions of rooms/habitable areas and activity areas.

3. Landscape Plans. Landscape plans indicating the following:

   a. Sizes, locations and quantifies of existing and proposed landscaping, including plantings to be removed;

   b. Type or kind of plant material by typical name; and

   c. Details of a permanent irrigation system.

*Note: All scaled plans and drawings **must** include a graphic ("bar") scale in addition to or in lieu of a numerical scale.*

F. Photos. Submit photos of the project site showing the following:

1. Street access (ingress and egress) to the project site;

2. Uses on adjoining properties; and

3. Building setbacks from property lines, distances to neighboring buildings, parking areas, and other uses, on the site.

Note: all photos should be labeled and keyed to a general site map.

G. Supplemental Information. Additional information which may be required to successfully process the application by the DPP.

H. Environmental Assessment. If the project is subject to the requirements of Chapter 343, Hawaii Revised Statutes (HRS), the Environmental Impact Statement (EIS) law, then provide documentation of compliance.

1. If the project involves an exempt class of action, pursuant to Section 11-200-8, Hawaii Administrative Rules (HAR), then provide written documentation of such exemption from the appropriate proposing and/or approving agency (for projects subject to HRS Chapter 343, only); or

2. Submit two (2) copies of the Finding of No Significant Impact (FONSI) or EIS for the project.

   Note: If the project requires an Environmental Assessment (EA) or EIS, then this must be processed before the CUP application will normally be accepted for processing.

3. If the project is not an exempt class of action, but is associated with a prior FONSI or EIS, then a determination must be made that a Supplemental EA or EIS is not necessary before the CUP application will be accepted for processing. Therefore, provide detailed written justifications why the proposal does not require the preparation of a Supplemental EA or EIS.

Note: If the project has substantially changed in size, scope, intensity, use, location, timing, or other means since the time the FONSI was issued or the EIS was accepted, and the project will involve significant effects, then the applicant must prepare a supplemental assessment prior to submitting the application for the CUP. The supplemental assessment will be processed in the same manner as the EA or EIS (see Subchapter 10 of Chapter 200, Title 11, HAR, for details).

*Note Regarding Public Notification. In the event that the Director determines that a public hearing is justified, then the Applicant **must** comply with the public hearing notification requirements of LUO Section 21-2.40-2(c)(3), which requires the notification of owners of property within 300 feet of the site.*

IV. Electronic Document Submittals. The submittal of electronic documents, either in whole or in part of this application, is encouraged; and, shall be at the sole discretion of the Applicant. Electronic document submittals shall adhere to the following specified formats: PDF (Adobe Reader 9 or earlier), JPEG, or Word (2003 or earlier). Electronic documents **must** be submitted on either CD or DVD.

No individual electronic document shall exceed 15 megabytes in size; any electronic document involving a larger size **must** be broken down into smaller size files. ALL maps, drawings and /or plans **must** be drawn to an appropriate scale, and **must** include a graphic ("bar") scale accurately representing the applicable scale of the document.

For further assistance or information on how to complete the application, please call the DPP at 768-8014.

CONDITIONAL USE PERMIT (MINOR)
MEETING FACILITY
DAY-CARE FACILITY
SCHOOL: ELEMENTARY, INTERMEDIATE AND HIGH

APPLICATION CHECK LIST

1.	Pre-Application meeting with DPP (optional)	
2.	Neighborhood Board (NB) Presentation (letter or meeting minutes attached; or copy of applicant's request to NB if no presentation opportunity provided)	
3.	Master Application Form	
4.	Fees	
5.	Affidavit (confirming Notification of Adjoining Property Owners of NB Presentation, and list of those notified)	
6.	Written Statement (2 copies)	
7.	Drawings/Plans - 2 sets drawn to scale, 1 set max. 11" x 17" and 2nd set max. 24" x 36"	
	Site Plans	
	Building/Floor Plans	
	Landscape Plans	
8.	Photos (labeled and keyed to a general site map)	

*Note: This list is intended as a general reference for applicants. Please refer to the attached permit instruction sheets for **complete** application requirements.

The adequacy/completeness of application submittals for acceptance will be determined by the DPP within 10 working days of application submittal.

PBR HAWAII
& ASSOCIATES, INC.

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President

R. STAN DUNCAN, ASLA
Executive Vice-President

RUSSELL Y. J. CHUNG, FASLA, LEED®AP BD+C
Executive Vice-President

VINCENT SHIGEKUNI
Vice-President

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W. FRANK BRANDT, FASLA
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February 25, 2013

Mr. George I. Atta, FACIP, LEED AP, CEI, Director Designate
Department of Planning and Permitting
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, Hawai'i 96813

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER, MĀ'ILI, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Atta:

Thank you for the letter dated December 24, 2012 [your reference number: 2012/ELOG-2376 (BLB)]. We offer the following responses to your comments:

Planning Division (Development Plans Zone Change Branch)

1. The Draft EA includes a discussion on how the Proposed Project is consistent with City Ordinance 12-03, Revised Waianae Sustainable Communities Plan (WSCP) and the Public Review Draft of the Revised WSCP.

2. The Villages at Mā'ili Transitional Housing Project (also known as Ulu Ke Kukui) is also located on the same parcel as the Proposed Project. The Draft EA includes a discussion on Ulu Ke Kukui.

Land Use Permits Division (Land Use Approvals Branch)

1. The Proposed Project is located on lands that are zoned AG-2 by the City and County of Honolulu and is an allowable use with a Conditional Use Permit-Minor. However, as mentioned in your letter, lands under the jurisdiction of the DHHL may be exempt from county zoning and Special Management Area (SMA) permits and processes. DHHL intends to exercise its right to exempt the Proposed Project from the City and County of Honolulu Land Use Ordinance (LUO) and SMA requirements. A letter will be provided by DHHL.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

Vincent Shigekuni
Vice President

cc: Ms. Samantha Hudson, Kamehameha Schools

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 DESIGNATE

TP9/12-493288R

January 7, 2013

Mr. Vincent Shigekuni
Vice President
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Mr. Shigekuni

Subject: Pre-Consultation for Draft Environmental Assessment (DEA) for the Proposed Kamehameha Schools Community Learning Center, Ma`ili, Island of Oahu, Hawaii Tax Map Key (TMK): 8-7-010:007

This responds to your letter of November 28, 2012, concerning this proposed project are, as follows:

- The DEA should prepare and discuss in a traffic management plan methods to minimize short-term traffic impacts during construction. In addition, a street usage permit may be required should construction of the project require the temporary usage of any public street in the area.

- The DEA should address improvements necessary to provide vehicular, pedestrian, and bicycle access between the project location and neighborhoods north and south therefrom.

- The DEA should include a traffic impact assessment report (TIAR) to evaluate existing traffic conditions of the surrounding City roadways and viable mitigative measures, if necessary. The TIAR should include a discussion of pedestrian traffic in the area and ways to safely manage pedestrian routes for children walking to school.

- Your DEA should include a description of Public Transit in the project area, and the possible impact of your project on Public Transit bus and paratransit operations during construction. Basic information is available on our websites: www.thebus.org and www.honolulu.gov/dts. For more details, you may contact our staff at 768-8370.

We reserve further comment pending submission of the DEA.

Thank you for the opportunity to review this matter. Should you have any further questions, please contact Virginia Bisho of my staff at 768-5461.

Very truly yours,

MICHAEL D. FORMBY
Director Designate

PBR HAWAII
& ASSOCIATES, INC.

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February 25, 2013

Mr. Michael D. Formby, Director
Department of Transportation Services
City and County of Honolulu
650 South King Street, 3rd Floor
Honolulu, Hawai'i 96813

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER, MĀ'ILI, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Formby:

Thank you for your letter dated January 7, 2013 (your reference number: TP9/12-493288R). We offer the following responses to your comments:

1. The Draft Environmental Assessment (EA) will include a discussion on traffic management plan methods to minimize short-term traffic impacts during construction of the Proposed Project. We acknowledge that a Street Usage Permit may be required should construction of the Proposed Project require temporary usage of a public street.

2. A discussion on improvements necessary to provide vehicular, pedestrian, and bicycle access to the Proposed Project will be included in the Draft EA.

3. A transportation impact analysis report (TIAR) has been prepared for the Proposed Project and will be included in the Draft EA.

4. The Draft EA includes a description of public transportation in the vicinity of the Proposed Project, as well as possible impacts on public transportation and paratransit operations during construction of the Proposed Project.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

Vincent R. Shigekuni

Vincent Shigekuni
Vice President

cc: Ms. Samantha Hudson, Kamehameha Schools

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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

PETER B. CARLISLE
MAYOR

KENNETH G. SILVA
FIRE CHIEF

EMMIT A. KANE
DEPUTY FIRE CHIEF

December 13, 2012

Mr. Vincent Shigekuni
Vice President
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813-3484

Dear Mr. Shigekuni:

Subject: Preassessment Consultation
Proposed Kamehameha Schools Community Learning Center
Draft Environmental Assessment
Tax Map Key: 8-7-010: 007 Portion

In response to your letter of November 28, 2012, regarding the above-mentioned subject, 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 (46 m) 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 ft (15 m) 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 (45 720 mm) from a water supply on a fire apparatus access road, as measured by an approved route around 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. Submit civil drawings to the HFD for review and approval.

Should you have questions, please contact Battalion Chief Socrates Bratakos of our Fire Prevention Bureau at 723-7151 or sbratakos@honolulu.gov.

Sincerely,

KENNETH G. SILVA
Fire Chief

KGS/SY:bh

PBR HAWAII
& ASSOCIATES, INC.

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Executive Vice-President

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February 25, 2013

Chief Manuel P. Neves
Honolulu Fire Department
City and County of Honolulu
636 South Street
Honolulu, Hawai'i 96813-5007

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER, MĀ'ILI, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Chief Neves:

Thank you for the letter dated December 13, 2012. We offer the following responses to your comments:

1. Fire apparatus access roads shall be designed and constructed in accordance with the Uniform Fire Code, 2006 Edition, Section 18.2.3.2.1 and 18.2.3.2.2.

2. Water infrastructure shall be designed and installed in accordance with the Uniform Fire Code, 2006 Edition, Section 18.3.1, as amended.

3. Civil drawings will be submitted to your department for your review and approval.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

Vincent Shigekuni
Vice President

cc: Ms. Samantha Hudson, Kamehameha Schools

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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

PETER B. CARLISLE
MAYOR

LOUIS M. KEALOHA
CHIEF

DAVE M. KAJIHIRO
MARIE A. McCAULEY
DEPUTY CHIEFS

OUR REFERENCE EO-WS

December 10, 2012

Mr. Vincent Shigekuni
Vice President
PBR Hawaii & Associates, Inc.
1001 Bishop Street, Suite 650
Honolulu, Hawaii 96813

Dear Mr. Shigekuni:

This is in response to your letter dated November 28, 2012, requesting comments on the Pre-Assessment Consultation for the proposed Kamehameha Schools Community Learning Center located in Ma'ili, Oahu.

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

If there are any questions, please call Major Kerry Inouye of District 8 (Kapolei) at 723-8403.

Sincerely,

LOUIS M. KEALOHA
Chief of Police

By
BART HUBER
Assistant Chief
Support Services Bureau

PBR HAWAII
& ASSOCIATES, INC.

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printed on recycled paper

February 25, 2013

Chief Louis M. Kealoha
Police Department
City and County of Honolulu
801 South Beretania Street
Honolulu, Hawai'i 96813

Attn: Major Kerry Inouye

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER, MĀ'ILI, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Chief Kealoha:

Thank you for your letter dated December 10, 2012 (your reference number: EO-WS). We acknowledge your assessment that the proposed Kamehameha Schools Community Learning Center at Mā'ili should have no significant impact on the facilities or operations of the Honolulu Police Department.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

Vincent Shigekuni
Vice President

cc: Ms. Samantha Hudson, Kamehameha Schools

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

REPLY TO
ATTENTION OF:

January 10, 2013

Regulatory Branch

POH-2013-00015

PBR HAWAII & ASSOCIATE, INC
Attn: Vincent Shigekuni, Vice President
1001 Bishop St, Suite 650
Honolulu, HI 96813

Dear Mr. Shigekuni:

This is in response to your November 28, 2012 letter requesting the Department of the Army review and comment on the proposed Kamehameha Schools Community Learning Center located in the southern portion of TMK (1) 8-7-010:007 near Maili, City and County of Honolulu, Island of O'ahu, Hawai'i. We have completed our review of the submitted document and have the following comments:

Your proposed project was reviewed pursuant to Section 10 of the Rivers and Harbors Act of 1899 (Section 10) and Section 404 of the Clean Water Act (Section 404). Section 10 requires that a DA permit be obtained for certain structures or work in or affecting navigable waters of the United States (U.S.), prior to conducting the work (33 U.S.C. 403). Navigable waters of the U.S. are those waters subject to the ebb and flow of the tide shoreward to the mean high water mark, and/or other waters identified as navigable by the Honolulu District. In addition, a Section 10 permit is required for structures or work outside this limit if they affect the course, capacity, or condition of the waterbody. Some typical examples of structures or work requiring Section 10 permits within this jurisdictional area include beach nourishment, boat ramps, breakwaters, bulkheads, and dredging.

Section 404 requires that a DA permit be obtained for the placement or discharge of dredged and/or fill material into waters of the U.S., including wetlands, prior to conducting the work (33 U.S.C. 1344). For regulatory purposes, the U.S. Army Corps of Engineers (Corps) defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The area of Corps jurisdiction under Section 404 extends to the Mean Higher High Tide Line (MHHTL) or to the Ordinary High Water Mark (OHWM) for navigable waters other than the Pacific Ocean, and to the upland boundary of any adjacent wetlands Fill material is any material that replaces a jurisdictional aquatic area with dry land or changes the bottom elevation of a waterbody. Fill may be temporary or permanent and often includes, but is not limited to, rock, sand, concrete, and sandbags. Projects involving discharges typically include placement of fill material for homes and landscaping, impoundments , road fills, dams and dikes, culverts, riprap, and beach nourishment.

Section 404 also regulates discharges of dredged material incidental to certain activities such as grading, mechanized landclearing, ditching or other excavation activity, and the installation of certain pile-supported structures.

The Corps of Engineers has sole authority to determine if an aquatic feature is/is not a water of the U.S., potentially subject to regulation under Section 10 and/or Section 404. Based on the submitted documents, Maili Drainage Canal surrounds the northern and western boundaries of the property. Maili Drainage Canal is intermittent and subject to ebb and flow of the tides, with terminal discharge into the Pacific Ocean, and therefore is subject to Section 10 and Section 404. Please submit further documentation you may have in regards to proposed work in or adjacent to Maili Drainage Canal, along with any additional aquatic features that may be present on the property. Please submit drawings as outlined on our website (www.poh.usace.army.mil). Specifically, drawing recommendations must be on 8.5"x11" sheets of paper, show existing and proposed conditions, and show the Mean High Water Mark/Ordinary High Water Mark. Please also indicate in writing the proposed construction in relation to any aquatic features, including Maili Drainage Canal.

Thank you for giving us the opportunity to review this proposal and for your cooperation with our regulatory program. Please be advised you can provide comments on your experience with the Honolulu District Regulatory Branch by accessing our web-based customer survey form at http://per2.nwp.usace.army.mil/survey.html.

Should you have any questions, please contact Kaitlyn Seberger of this office at the above address or telephone 808-835-4303 (FAX: 808-835-4301) or by E-Mail at Kaitlyn.R.Seberger@usace.army.mil. Please refer to File Number **POH-2013-00015** in all future communications with this office regarding this or other projects at this location.

Sincerely,

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

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& ASSOCIATES, INC.

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February 25, 2013

Mr. George P. Young. P.E., Chief, Regulatory Branch
Department of the Army
U.S. Army Corps of Engineers, Honolulu District
Fort Shafter, Hawai'i 96858-5440

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER, MĀ'ILI, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Mr. Young:

Thank you for your letter dated January 10, 2013 (your reference number: POH-2013-00015). As the planning consultant for the applicant, Kamehameha Schools, we are confirming that the Mā'ili Drainage Canal is not located within the Proposed Project. The Proposed Project is located in Flood Zone D according to the Flood Insurance Rate Map. The Flood Insurance Program does not have any regulations for developments within Flood Zone D. We acknowledge that the Mā'ili Drainage Canal is subject Section 10 of the Rivers and Harbors Act of 1889 and Section 404 of the Clean Water Act. Should future plans include the possible discharge of fill into the Mā'ili Drainage Canal, a Department of the Army permit will be submitted to the Corps.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

Vincent Shigekuni
Vice President

cc: Ms. Samantha Hudson, Kamehameha Schools

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Michael Shibata

-----Original Message-----
From: Maile Shimabukuro [mailto:maileshimabukuro@yahoo.com]
Sent: Monday, December 24, 2012 3:37 PM
To: sysadmin
Cc: chkailih@ksbe.edu
Subject: Comments Re: Proposed KS Community Learning Center in Maili

Dear PBR HI:

I apologize for the delay in responding to the attached proposal. I think this is a fantastic project, and the Waianae Coast is very fortunate that KS is planning the Ka Pua Project to benefit its residents.

One comment I have is to increase the amount of full day KS preschool slots available to parents if possible. Although my son was accepted into KS's preschool on Ala Hema St., we had to decline since there were no full day slots available.

Another comment is to urge KS to incorporate and support on-going efforts to return the E Ala voyaging canoe to the Waianae Coast. The desire is to bring the canoe home to educate residents about canoe-building, Hawaiian culture, navigation, etc. Currently there is $500k in the State budget to support this project, and we need help submitting a proposal to DLNR to lease land for a canoe halau and education program. I would be glad to provide further information, and here is some background:
http://21maile.com/2010/12/17/e-ala-voyaging-canoe-closer-to-coming-home/

Mahalo again for the opportunity to comment, and Happy Holidays, ~Maile 349-3075

Aloha ,

Sen. Maile Shimabukuro
District 21 (Kalaeloa, Honokai Hale, Ko Olina, Nanakuli, Ma`ili, Wai`anae, Makaha, Makua) Hawaii State Senate State Capitol, Room 222
415 South Beretania Street
Honolulu, HI 96813
808-586-7793 phone
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Blog: http://21maile.com

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February 25, 2013

Senator. Maile Shimabukuro
District 21 Hawaii State Senate
Capital, Room 222
415 South Beretania Street
Honolulu, HI 96813

SUBJECT: PRE-CONSULTATION FOR THE PROPOSED KAMEHAMEHA SCHOOLS COMMUNITY LEARNING CENTER, MĀ'ILI, ISLAND OF O'AHU DRAFT ENVIRONMENTAL ASSESSMENT

Dear Sen. Shimabukuro:

Thank you for your email received on December 24, 2012. As the planning consultant for the applicant, Kamehameha Schools, we agree that the Proposed Project will benefit the residents of the Wai'anae Coast and offer the following responses to your comments:

1. Phase 1 of the Proposed Project will include an Early Childhood Education Complex which will increase the amount of full day preschool slots available.

2. Thank you for sharing the information on the E Ala voyaging canoe and the initiatives to bring E Ala home to the Wai'anae Coast. We have forwarded your comments to Kamehameha Schools.

Thank you again for your participation in the preparation of the upcoming Environmental Assessment. If you need any additional information or have any questions regarding this project, please do not hesitate to contact me at (808) 521-5631.

Sincerely,

Vincent Shigekuni
Vice President

cc: Ms. Samantha Hudson, Kamehameha Schools

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