DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

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February 25, 2009

Ms. Katherine Puana Kealoha, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Kealoha:

Subject: Final Environmental Assessment (FEA) and Findings of No Significant Impacts (FONSI) for Makakilo Drive Extension Project TMK: (1) 9-2-002: 01, 06, 07, 08 & 9-2-003: 74
Makakilo, Ewa District, Island of O'ahu

The approving agency, Department of Transportation Services, City and County of Honolulu, has reviewed the Final Environmental Assessment for the subject project and has determined that an environmental impact statement is not required. Further, the Department has reviewed the comments received during the 30-day public comment period for the Draft EA, which began November 23, 2008, and has determined that the proposed project will not have significant adverse environmental impacts to native flora and fauna, existing land use, historical or cultural resources, and public services and facilities. Impacts identified in the FEA will be mitigated by the applicant as stated in the FEA.

The Department further issues this Finding of No Significant Impact (FONSI) determination for the subject project.

Please publish notice of this FONSI for this project in the next OEQC Environmental Notice.

We have enclosed a completed OEQC Publication Form, and one (1) PDF copy and two (2) hard copies of the project FEA. A copy of the project summary is attached with the PDF copy of the FEA.

Should you have any questions, please contact Mr. Brian Suzuki at 768-8349.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

Attachment

FINAL ENVIRONMENTAL ASSESSMENT

Prepared in Accordance with Chapter 343, Hawai‘i Revised Statutes

MAKAKILO DRIVE EXTENSION
(Makakilo Drive to North-South Road Interchange)
‘Ewa District, O‘ahu, Hawai‘i

TMK (1) 9-2-002: 01, 06, 07, 08 & 9-2-003: 74

February 25, 2009

Department of Transportation Services
City and County of Honolulu

FINAL ENVIRONMENTAL ASSESSMENT

MAKAKILO DRIVE EXTENSION
(Makakilo Drive to North-South Road Interchange)
ʻEwa District, Oʻahu, Hawaiʻi

TMK (1) 9-2-002: 01, 06, 07, 08 & 9-2-003: 74

February 25, 2009

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Department of Transportation Services
City and County of Honolulu
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SECTION 1
PROJECT SUMMARY

Project:	Makakilo Drive Extension
Applicant:	Department of Transportation Services (DTS) 650 South King Street, 3rd Floor Honolulu, Hawai'i 96813
EA Accepting Agency:	Department of Transportation Services City and County of Honolulu Contact: Mr. Brian Suzuki, AICP Tel: 768-8349
EA Preparation	R.M. Towill Corporation Contact: Chester Koga, 842-1133; Email: chesterk@rmtowill.com
Location:	Makakilo, 'Ewa District, Island of O'ahu
Tax Map Keys:	(1) 9-2-002: 06 and 9-2-003: 74 & 79
Proposed Action:	Plan, design and construct an approximately 4,300 lineal feet, 4-lane median divided roadway from the terminus of the existing Makakilo Drive, connecting to the North-South Road Interchange. The proposed right-of-way is 78 feet wide with 4 travel lanes, a median, curbs and sidewalk, excluding land needed for embankments. The proposed action will be partially funded by the Federal Highway Administration and City and County of Honolulu.
Anticipated Impacts:	Negative: Loss of 6.7-14.5 acres of vacant agricultural lands; Acquisition of land; Change in land use – open areas to roadway; Visual change to the existing open landscape. Positive: Provision of a second access to the Makakilo community; Traffic congestion relief at Kapolei Interchange; No impacts to historic resources; No relocation or dislocation impacts; No endangered plant or animal species identified in the project area.
Land Area:	14.5 acres
Present Use:	Open and vacant agricultural land
State Land Use District:	Urban and Agricultural
'Ewa Development Plan Land Use Designation:	Agriculture
Present Zoning:	Agriculture, AG-2
Special Management Area SMA:	Not in SMA
Permits and Approvals Required:	NPDES permit for Construction Stormwater Discharge; Grading Permit; Land Acquisition; Connection to State Interchange
Chapter 343 Determination:	Finding of No Significant Impact (FONSI)

SECTION 2
INTRODUCTION

2.1 PROJECT OVERVIEW

The Department of Transportation Services (DTS), City and County of Honolulu, proposes the development of a 4-lane, median separated roadway that connects the termination of the existing Makakilo Drive to the proposed North-South Road Interchange currently under construction. The interchange construction is scheduled for completion by Fall 2009. The proposed roadway will provide a second access for Makakilo residents from and to Makakilo and the Interstate Route H-1.

2.2 PURPOSE AND NEED OF PROJECT

The purpose of the project is to provide greater accessibility and an alternative means for commuters to access the Makakilo community, its residents, facilities, and services. The project will benefit area commuters by decreasing the volume of traffic at the Kapolei-Makakilo Interchange and diverting some in-bound and out-bound traffic from the interchange. Diverting traffic from the Kapolei-Makakilo Interchange will improve the peak hour traffic congestion at the interchange. The development of the proposed roadway, however, will not affect the volume of traffic on Interstate Route H-1 beyond the Kapolei-Makakilo interchange.

The purpose of this project is to also implement the ʻEwa Development Plan and the Oʻahu Metropolitan Planning Organization's (OMPO) Oʻahu Regional Transportation Plan (ORTP). The project is currently included in both documents.

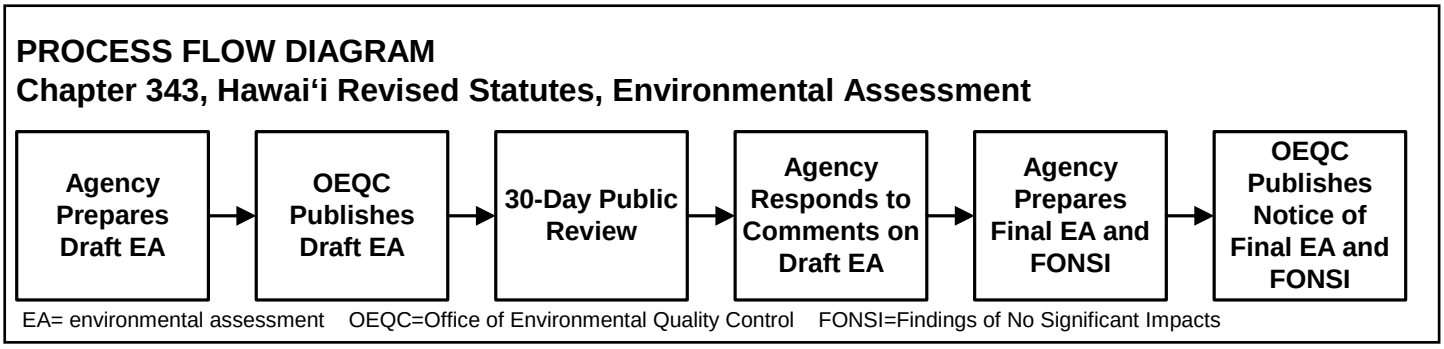
2.3 PURPOSE OF THE ENVIRONMENTAL ASSESSMENT

This Environmental Assessment (EA) is an informational and disclosure document prepared for the DTS and was used to evaluate the possible environmental effects of the proposed action. The EA describes the proposed project and evaluates the potential for direct, indirect and cumulative impacts. State of Hawaiʻi, City and County of Honolulu lands and federal funds will be used for the design and construction of the proposed project. This project, therefore, is subject to preparation of environmental documentation in accordance with Chapter 200, Title 11, Hawaiʻi Administrative Rules (HAR), and Chapter 343, Hawaiʻi Revised Statutes (HRS) and Federal Highway Administration's (FHWA) National Environmental Policy Act (NEPA) requirements.

This EA addressed the environmental impacts anticipated from the proposed project. This document considers the alternatives to the proposed project and describes measures proposed to minimize potential impacts.

The public had thirty (30) days from November 23, 2008 to review and comment on the DEA. After the DEA was finalized and public comments responded to, the DTS reviewed the final assessment and determined that "significant" environmental impacts were not anticipated. A flow diagram illustrating the process used is shown below.

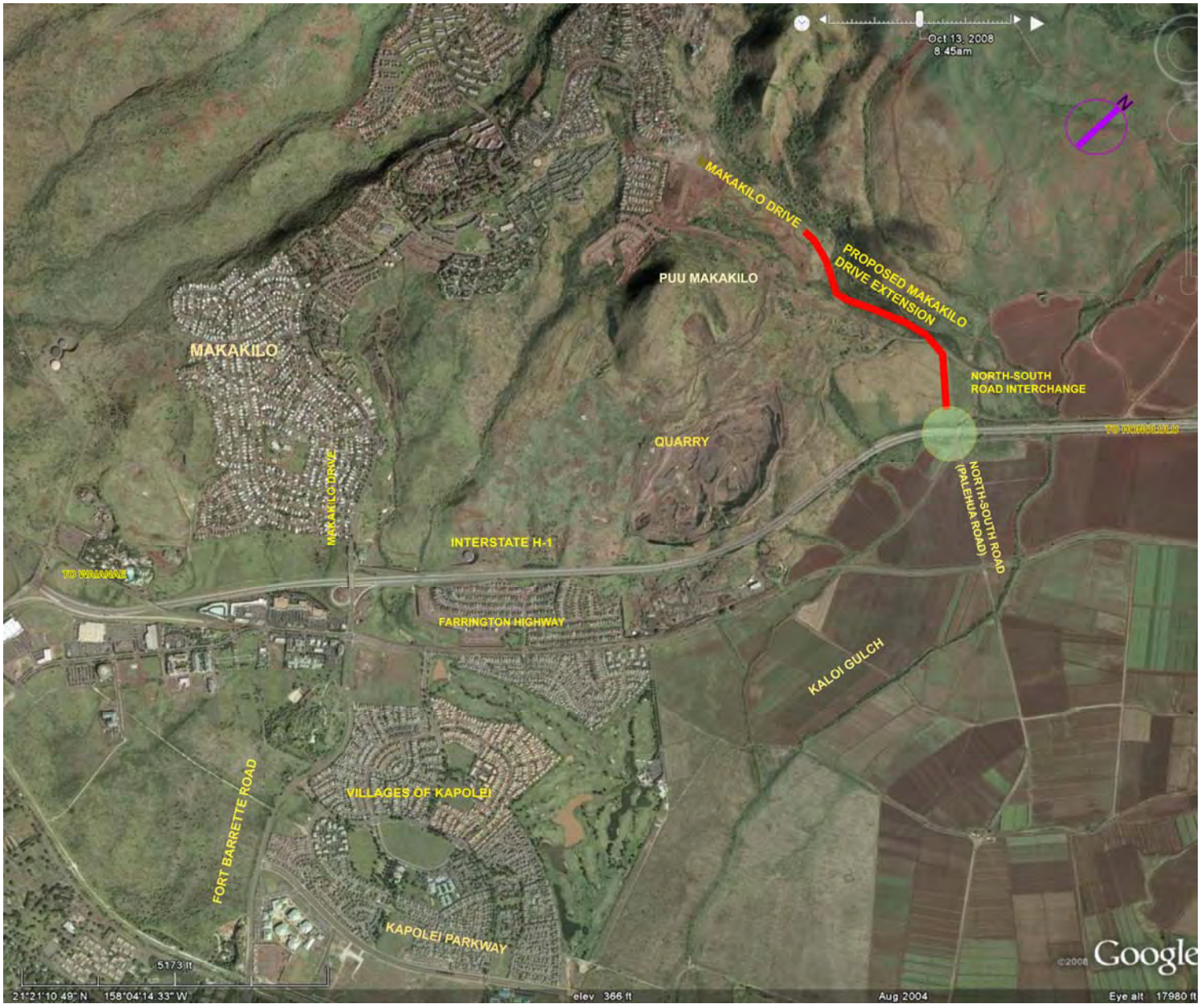
Since the DTS had determined that the project will not have a significant environmental impact, it has issued a Finding of No Significant Impact (FONSI) according to Chapter 343, HRS. The public has thirty (30) days, if it chooses, to challenge the findings of the Final EA in Circuit Court.



2.4 PROJECT LOCATION

The Makakilo Drive Extension Project area is located in the 'Ewa District of the Island of O'ahu. The roadway extension project proposes to connect the existing Makakilo Drive with the North-South Road Interchange at Interstate Route H-1 (see Figure 1, Project Location Map). The portion of the proposed roadway within the Makakilo Community starts at the recently completed subdivision where Makakilo Drive currently terminates. The Interstate Route H-1 connection is at the North-South Road Interchange which is currently under construction.

Figure 1. Project Location Map



SECTION 3
PREFERRED PLAN AND ALTERNATIVES CONSIDERED

3.1 EXISTING SITE CONDITION

The project area is currently undeveloped except for access roadways which currently extend between Palehua Road and the Makakilo Community and quarry owned by Grace Pacific Corporation. Flora in the area is characterized by introduced plant species. As shown in Figure 1, there are two principal landforms in the area are: a) Pu'u Makakilo, and b) Kalo'i Gulch. The proposed roadway will be within the Kalo'i Gulch drainage area, this generally dry, intermittent flowing Kalo'i Gulch which is oriented in a northwest-southeast direction (see Figure 1).

3.2 DESCRIPTION OF PREFERRED PLAN

The DTS, City and County of Honolulu, proposes the development of a 4-lane median divided roadway within a minimum 78-feet width right-of-way (ROW) that connects the terminus of the existing Makakilo Drive to the proposed North-South Road interchange currently under construction. The four-lane roadway will to be constructed according to City and County of Honolulu roadway standards. The roadway includes a median, curbs and gutters, sidewalks, streetlights, landscaping, fencing, and bike lanes. The proposed roadway will provide an alternative means for existing Makakilo residents to gain access from and to Makakilo from the Interstate Route H-1 in both the eastbound and westbound directions. See Figure 1, Project Location Map.

The project will benefit commuters by decreasing the volume of traffic at the Kapolei-Makakilo Interchange. Diverting traffic at the Kapolei-Makakilo Interchange will have the effect of improving the level of service at the interchange during peak hours. The development of this new roadway, however, will not change the volume of traffic on Interstate Route H-1 through the 'Ewa region.

The preferred alignment of the project is shown in Figure 2, Site Plan. The roadway is approximately 4,300 feet long and includes a 700-foot long elevated (bridge) section at the connection with Makakilo Drive. The roadway cross-section is a minimum 78-foot width and is shown in Figure 3, Typical Section. The roadway will feature a 4-lane median separated travelways with sidewalks, bike lanes, curbs, street lights, fencing, and landscaping strips. Because the North-South Road Interchange will be built in phases,

Figure 2. Proposed Roadway Alignment

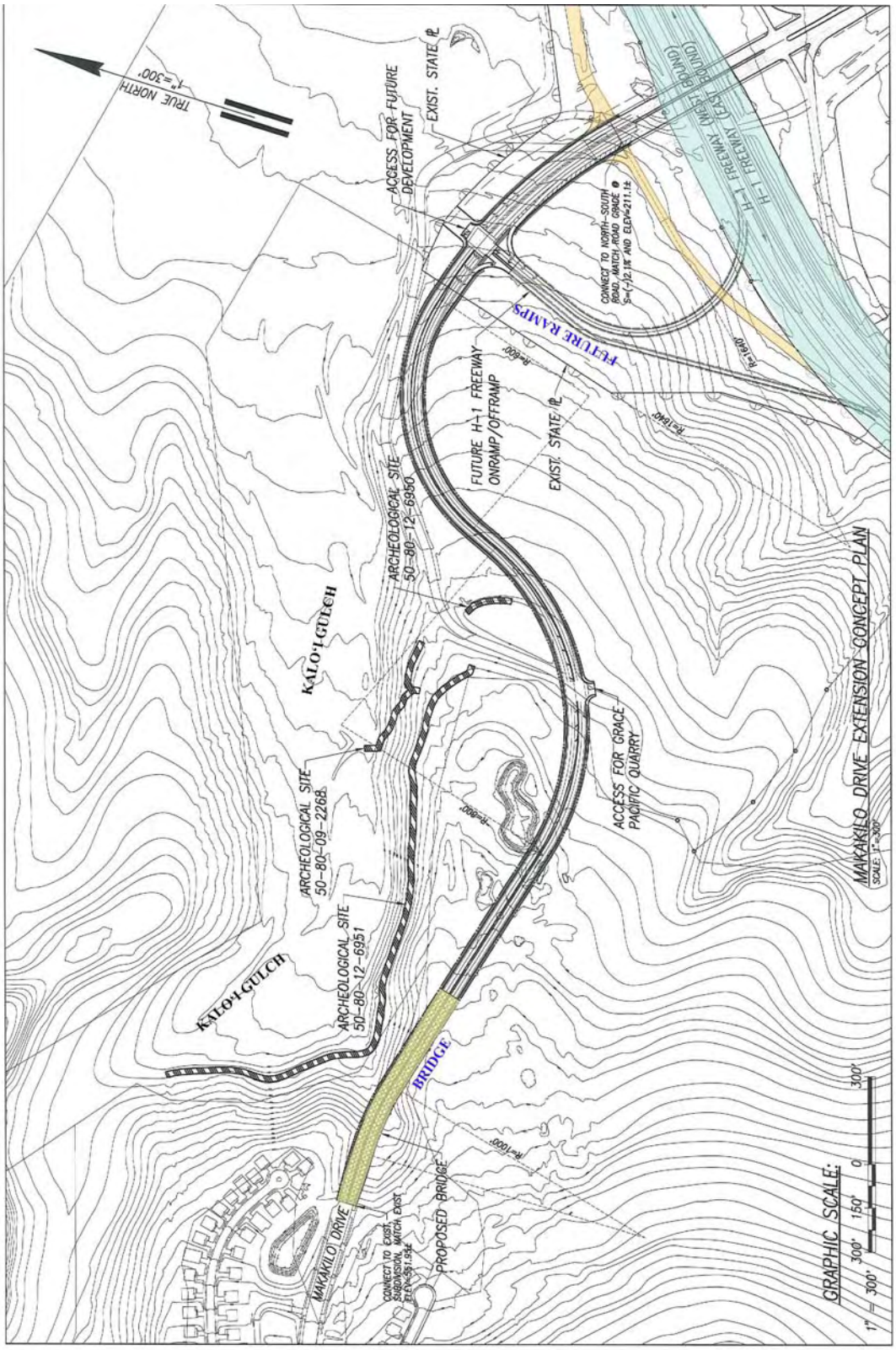
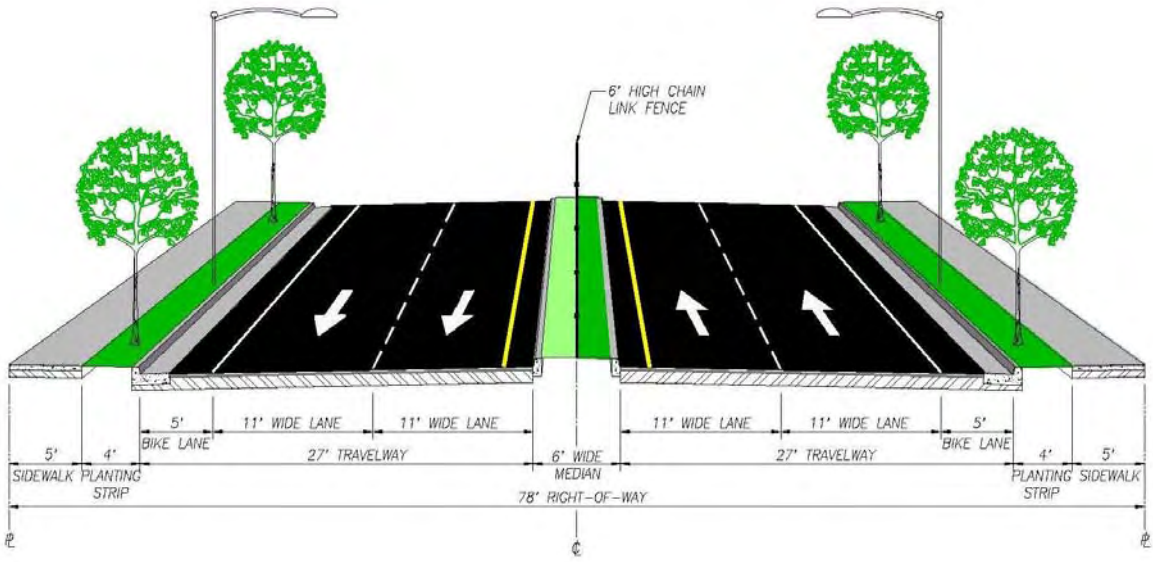


Figure 3. Proposed Roadway Cross-Section



access from adjoining properties will also be built in phases. Two access points to the extension, however, will be designated. In the future, any developer or landowner wishing to utilize these designated access points will be responsible for the intersection improvements.

3.3 DESIGN PARAMETERS

Design parameters for the proposed roadway are as follows:

a. Road standards are consistent with the American Association of State Highway and Transportation Officials (AASHTO).

b. The bridge structures for the roadway will meet all current Federal and State bridge and roadway standards. These include, but are not limited to, regulations for roadway sections (lane widths, pedestrian and bicycle facilities, and shoulders), seismic strength, guardrails, and the Americans with Disabilities Act.

c. The roadway will be a City and County of Honolulu standard 4-lane median separated facility built within a 78 feet right-of-way.

d. The roadway will, to every extent feasible, attempt to incorporate "green" concepts in the design and construction of the road. These measures include: use of recycled materials in asphalt or concrete, low energy (possibly solar

voltaic) street lighting, low maintenance and drought tolerant landscaping materials, and measures to minimize runoff to 'natural' areas.

Specific features of the roadway as illustrated in the proposed roadway cross-section (Figure 3) are as follows:

a. Each travel lane is 11 feet wide
b. Five (5) foot wide bike lanes are provided in each direction of the road
c. Four (4) foot wide planting strips on both sides
d. Five (5) foot wide sidewalks on both sides
e. Street lights on both sides
f. Six (6) feet wide median is divided with a chainlink fence

3.4 PROJECT ALTERNATIVES

The alternatives analysis for this project included the following:

- No Action
- Alternative Alignments
- Alternative Road Cross-Sections

3.4.1 NO ACTION

The no-action alternative would result in no further effort to develop a new roadway connecting the existing Makakilo Drive with the North-South Road Interchange. Under this option, environmental impacts, such as changes to the landscape from the current open space to roadway would be averted. In addition, natural resources, human resources and road development costs would be spared. This alternative was not selected because it does not meet the objectives of this project, which are to relieve traffic congestion at the Kapolei Interchange and to provide a second means of accessing the Makakilo community.

3.4.2 ALTERNATIVE ALIGNMENTS

Two primary alternative alignments for the proposed action were considered:

1. Alignment South of Kaloʻi Gulch. Three alignments were considered, Alternatives 1-3.

2. Alignment North of Kaloʻi Gulch. One alignment was considered, Alternative 4.

The features of the four alternative alignments are summarized in the Table 1 below:

Table 1. Summary of Alternative Alignments Features

Evaluation Factors	Alternative 1*	Alternative 2	Alternative 3	Alternative 4
Roadway ROW	78 FT.	78 FT.	78 FT.	78 FT.
Total Length	4,300 LF	4,107 LF	3,950 LF	4,375 LF
Land Acquisition (acres) (estimate)	7.70	7.35	7.07	7.83
Bridge Length	800 LF	750 LF	700 LF	3,600 LF
Maximum Slope	12%	12%	12%	12%
Parcels Affected	4 EA	4 EA	4 EA	3 EA
Potential Relocations	NONE	NONE	NONE	NONE
Archaeological Sites Affected	NONE	2 EA	3 EA	1 EA
Kaloi Gulch Affected	YES	YES	YES	YES
Total Grading	375,000 CY	443,332 CY	491,952 CY	45,000 CY
Total Construction Cost Estimate**	$61,759,000	$63,229,000	$63,497,000	$122,338,000

*Note: Alternative 1 is the preferred plan.

** Land acquisition costs are not included.

Alternative 1. Alignment Southwest of Kaloʻi Gulch (Preferred Alternative)

Alternative 1 sites the roadway along the south western edge of Kaloʻi Gulch (see Figure 4). The roadway ROW is 78 feet. Features of the proposed roadway are summarized in Table 1. Transition from Makakilo Drive and to the North-South road will be required because of variations between the sizes of the travelway, sidewalk width, lack of median and landscape strip. This alternative was selected as the preferred alignment because of lower cost and no impacts to historic resources.

Alternative 2. Alignment Southwest of Kaloʻi Gulch

Alternative 2 sites the roadway along the south western edge of Kaloʻi Gulch (see Figure 5). The roadway ROW is 78 feet. Transition from Makakilo Drive and to the North-South road will be required because of variations between the sizes of the travelway, sidewalk width, lack of median and landscape strip. Features of the roadway are summarized in Table 1. This alternative was rejected because of costs and impacts to historic resources.

Alternative 3. Alignment Southwest of Kaloʻi Gulch

Alternative 3 sites the roadway along the north western edge of Kaloʻi Gulch (see Figure 6). The roadway ROW is 78 feet. Transition from Makakilo Drive and to the North-South road will be required because of variations between the sizes of the travelway, sidewalk width, lack of median and landscape strip. Features of the roadway are summarized in Table 1. This alternative forms the basis of the preferred alignment.

Alternative 4. Alignment Northeast of Kaloʻi Gulch

Alternative 4 places the roadway on the north eastern side of Kaloʻi Gulch (see Figure 7). The roadway will be mostly a viaduct structure except for the last 700-800 feet before it reached the interchange. Transition from Makakilo Drive and to the North-South road will be required because of variations between the sizes of the travelway, sidewalk width, lack of median and landscape strip. This roadway features are summarized in Table 1. This alternative was rejected because of costs and aesthetics.

Figure 4. Alternative 1 – Preferred Alternative Plan (Southwest of Kalo‘i Gulch)

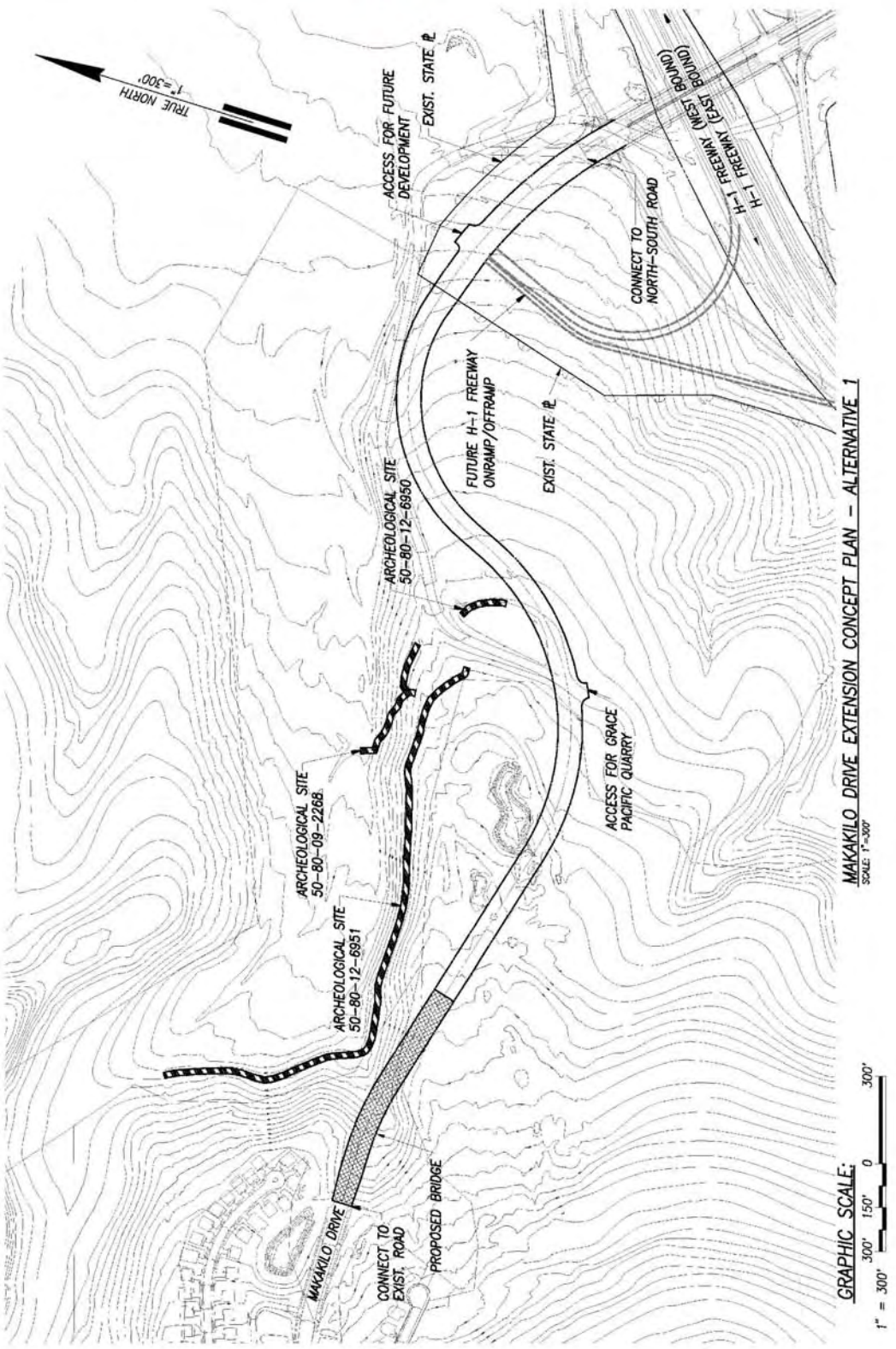


Figure 5. Alternative 2 – Concept Plan (Southwest of Kalo‘i Gulch)

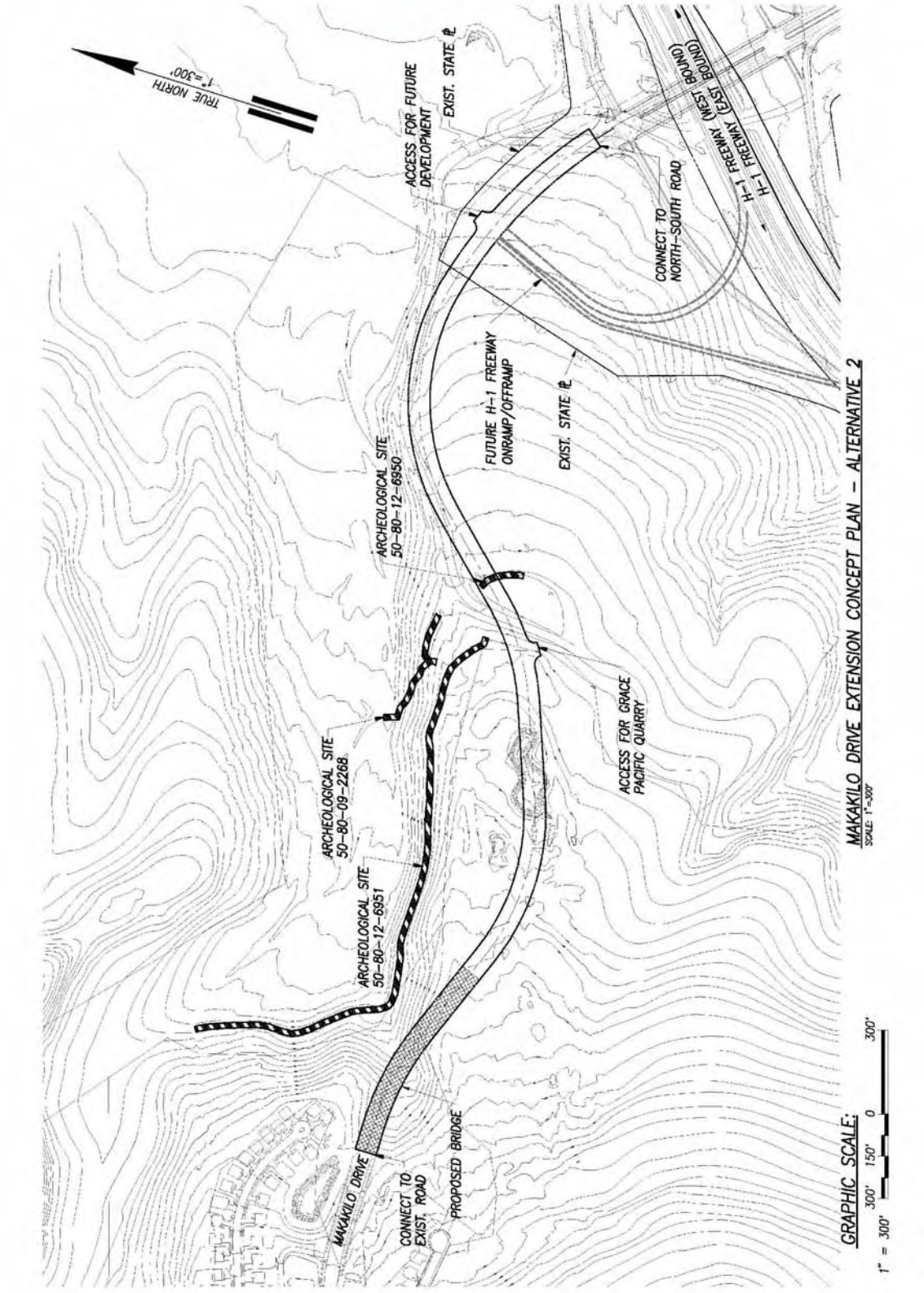


Figure 6. Alternative 3 – Concept Plan (Southwest of Kalo‘i Gulch)

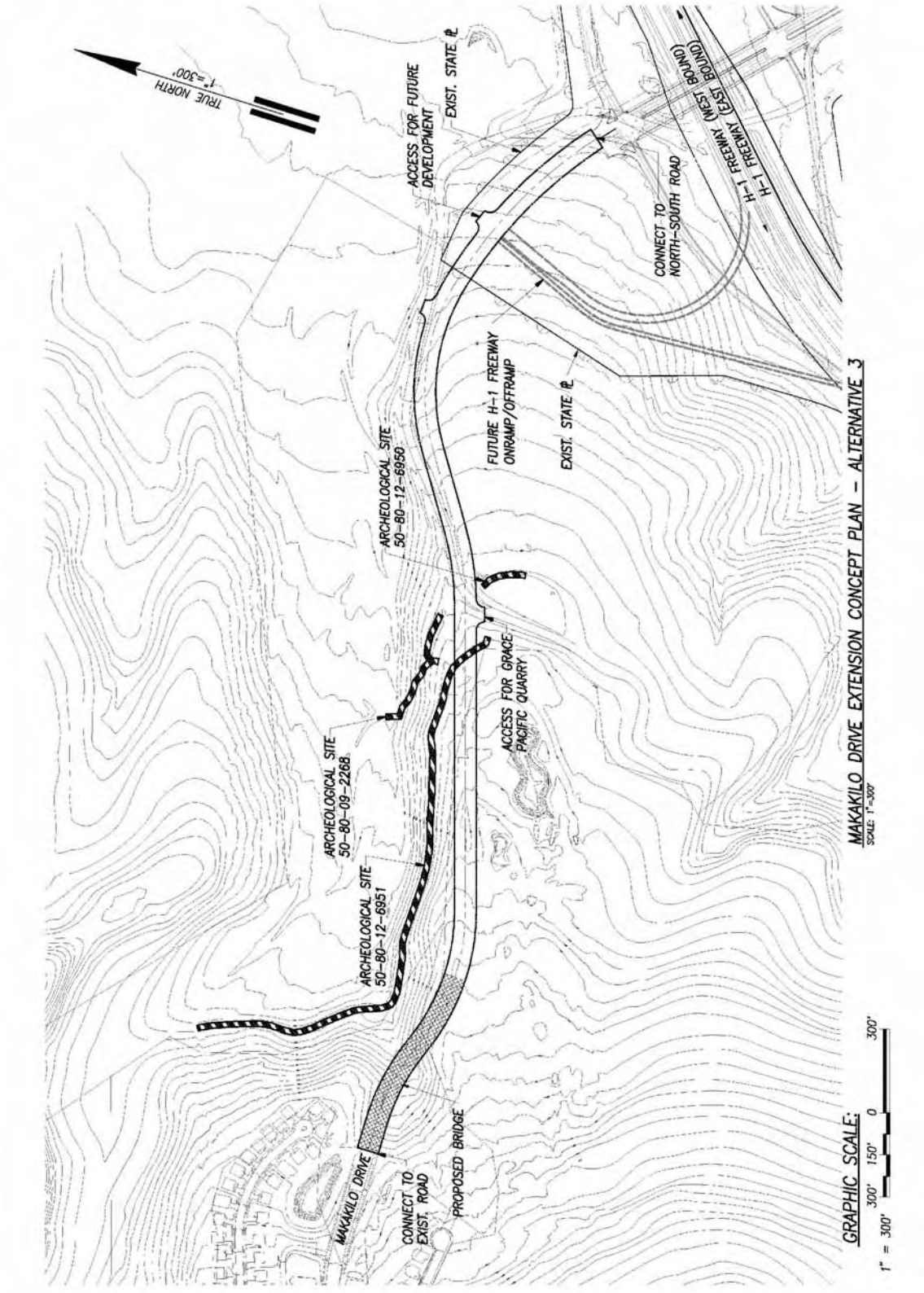
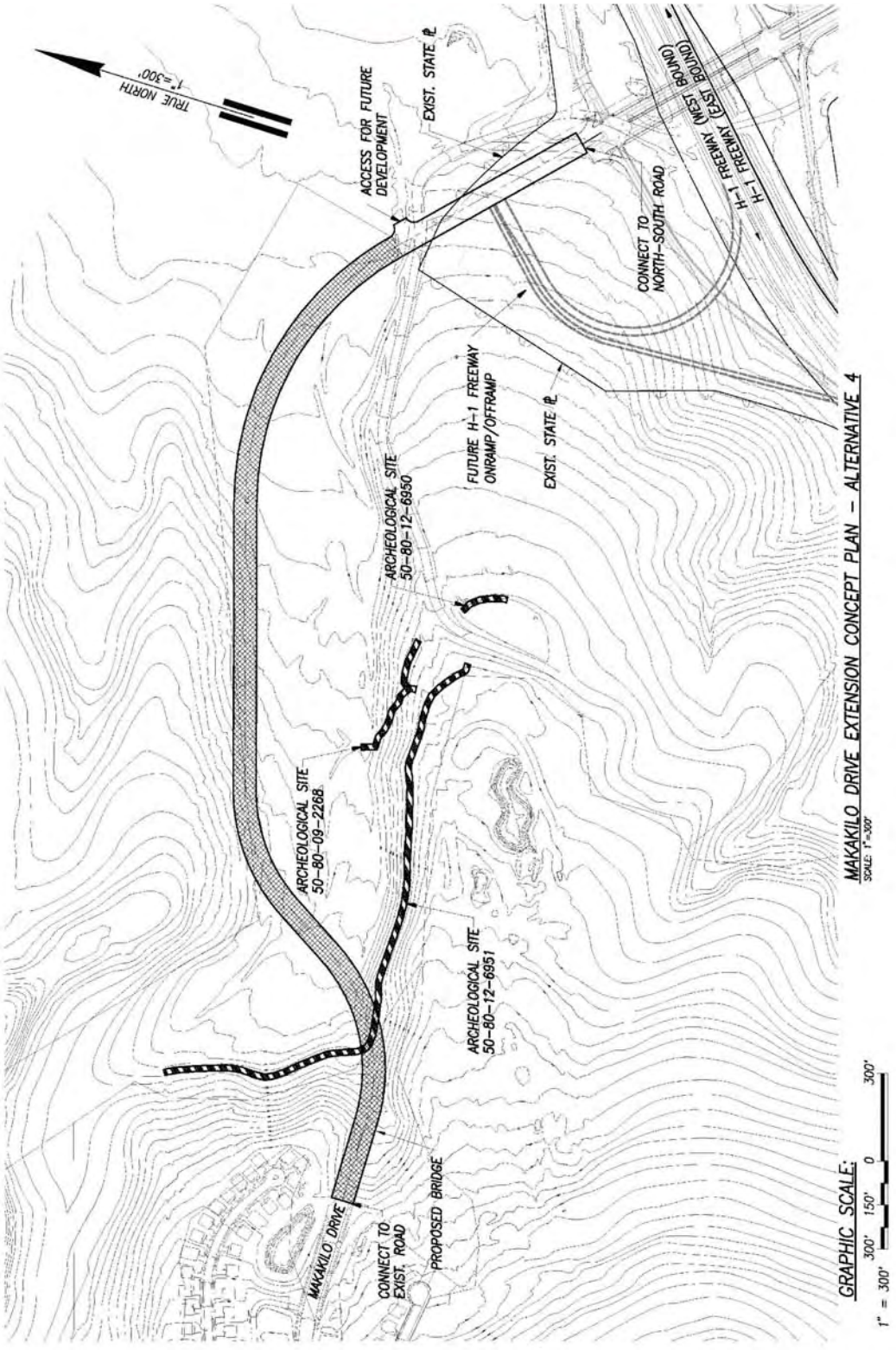


Figure 7. Alternative 4 – Concept Plan (Northeast of Kalo‘i Gulch)



3.4.3 ALTERNATIVE CROSS-SECTIONS

Alternative roadway cross-sections considered for the roadway are as follows and are summarized in Table 2:

- Alternative 1: Basic 78-Feet ROW, 4-travel lanes with 8 ft. planted median, no bike lanes (see Figure 8)
- Alternative 2: 78-Feet ROW, 4-travel lanes with median, and median street lights, and no bike lanes (see Figure 9)
- Alternative 3: 78-Feet ROW, 4-travel lanes with no median with bike lanes (see Figure 10)
- Alternative 4: 78-Feet ROW, 4-travel lanes with no median and no bike lane (see Figure 11)
- Alternative 5: 78-Feet ROW, 4-travel lanes with Jersey barrier in median and no bike lanes (see Figure 12)
- Alternative 6: 78 Feet ROW, 4-travel lanes with median with 6 chainlink fencing, bike lanes, street lights, curbs and gutter, sidewalk, and landscaping (see Figure 3)

Table 2. Summary of Alternative Roadway Features

Road Feature	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 6*
ROW Width	78 ft.	78 ft.	78 ft.	78 ft.	78 ft.	78 ft.
Travel Lane Width	4-12 ft. lanes	4-12 ft. lanes	4-11 ft. lanes	4-12 ft. lanes	4-11 ft. lanes	4-11 ft. lanes
Median Width	8 ft. planted	8 ft. with fence barrier	None	None	6 ft. with Jersey barrier	6 ft. median with center fence
Bike Lane Width	None	None	4 ft.	None	None	5 ft.
Sidewalk	5 ft.	5 ft.	5 ft.	5 ft.	5 ft.	5 ft.
Landscaping Strip	4 ft.	4 ft.	8 ft.	8 ft.	7 ft.	4 ft.
Street Lights	Along curb	Within median	Along curb	Along curb	Along curb	Along curb

*Alternative 6 was selected as the preferred roadway cross-section (see Figure 3). The travelway width along the North-South Road is 12 feet and no median is provided.

Figure 8. Alternative 1, Basic 78-Feet ROW, 4-Travel Lanes, Planted Median, No Bike Lane

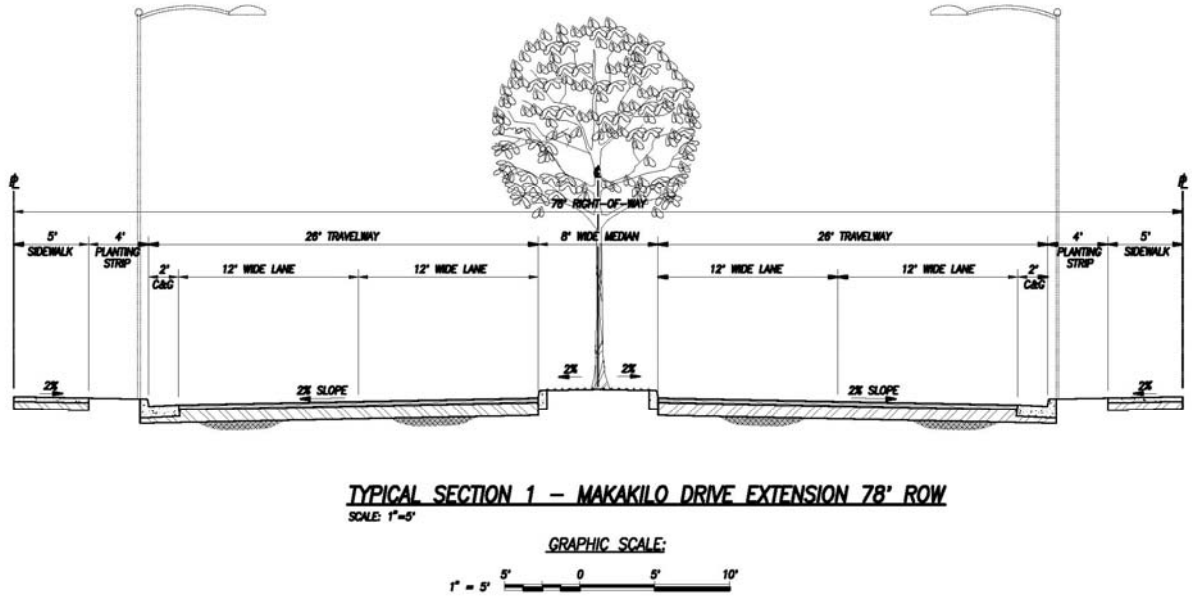


Figure 9. Alternative 2, 78-Feet ROW, 4-Travel Lanes with Median and Street Lights

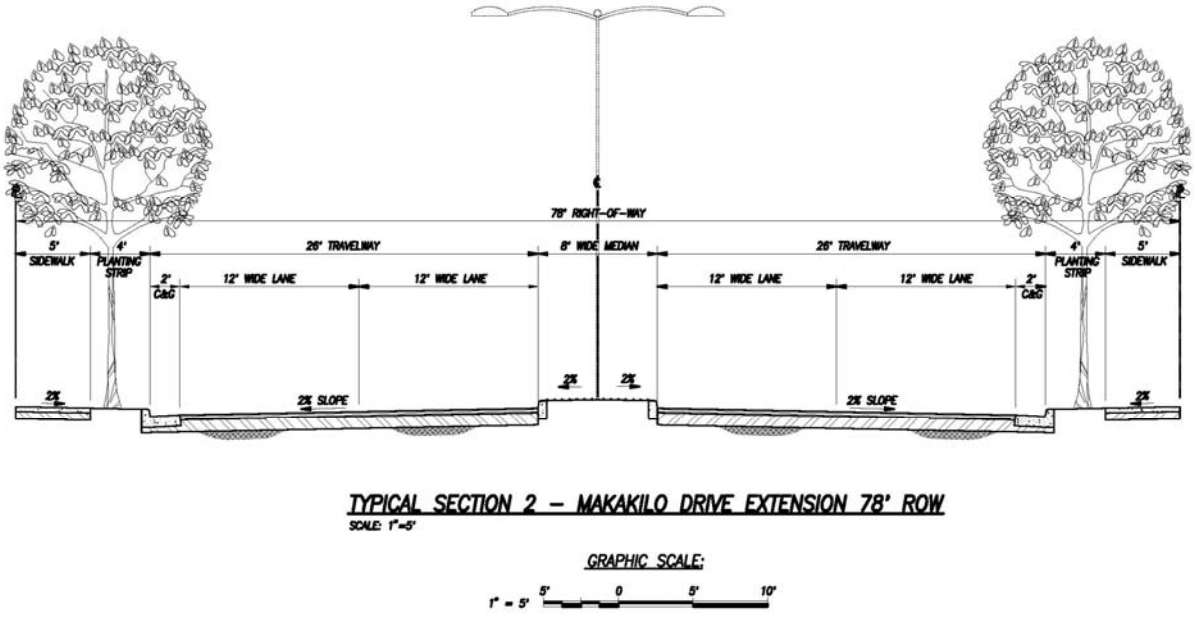


Figure 10. Alternative 3, 78-Feet ROW, 4-Travel Lanes, No Median, with Bike Lanes

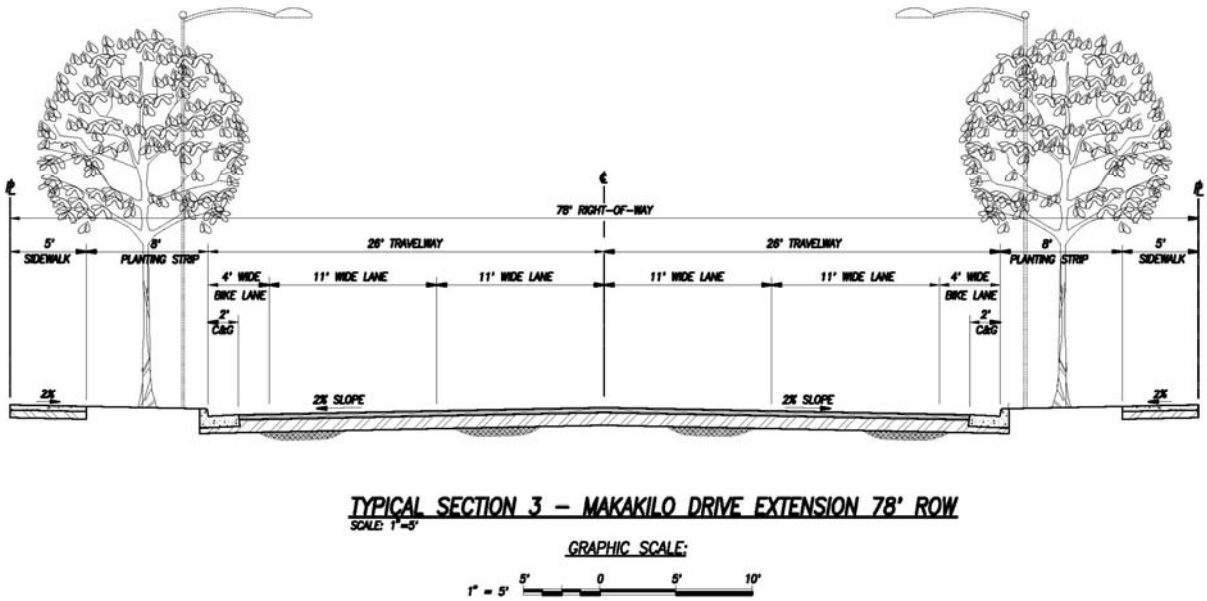


Figure 11. Alternative 4, 78-Feet ROW, 4-Travel Lanes, No Median, No Bike Lane

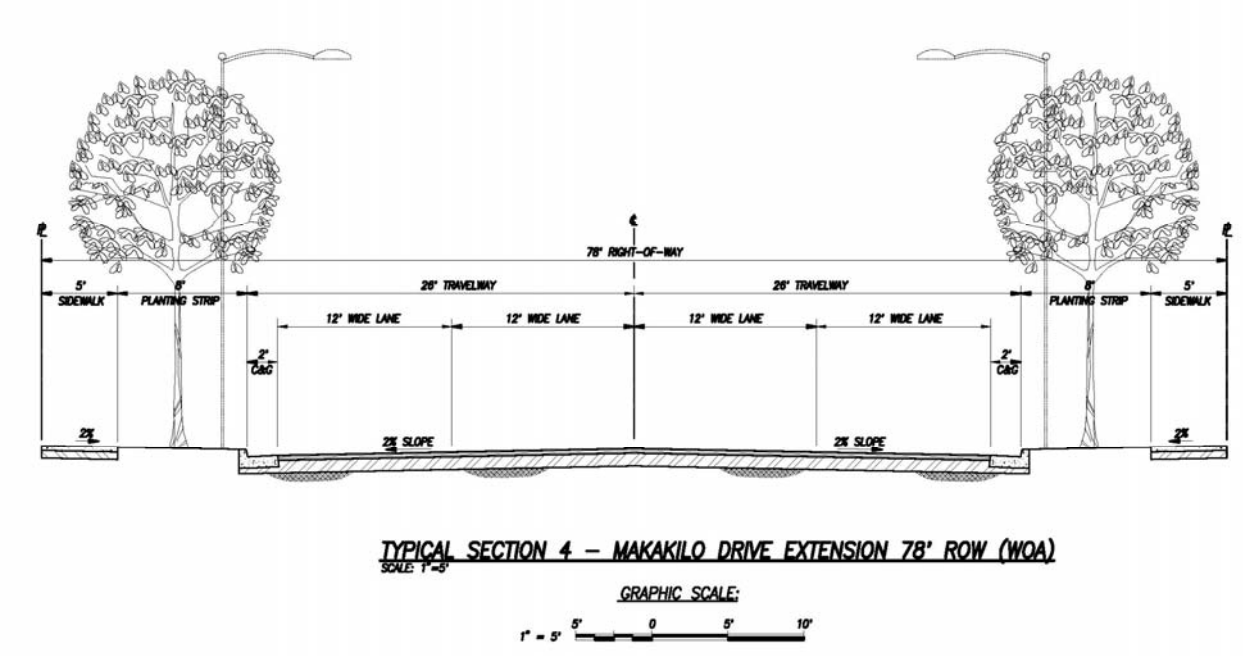
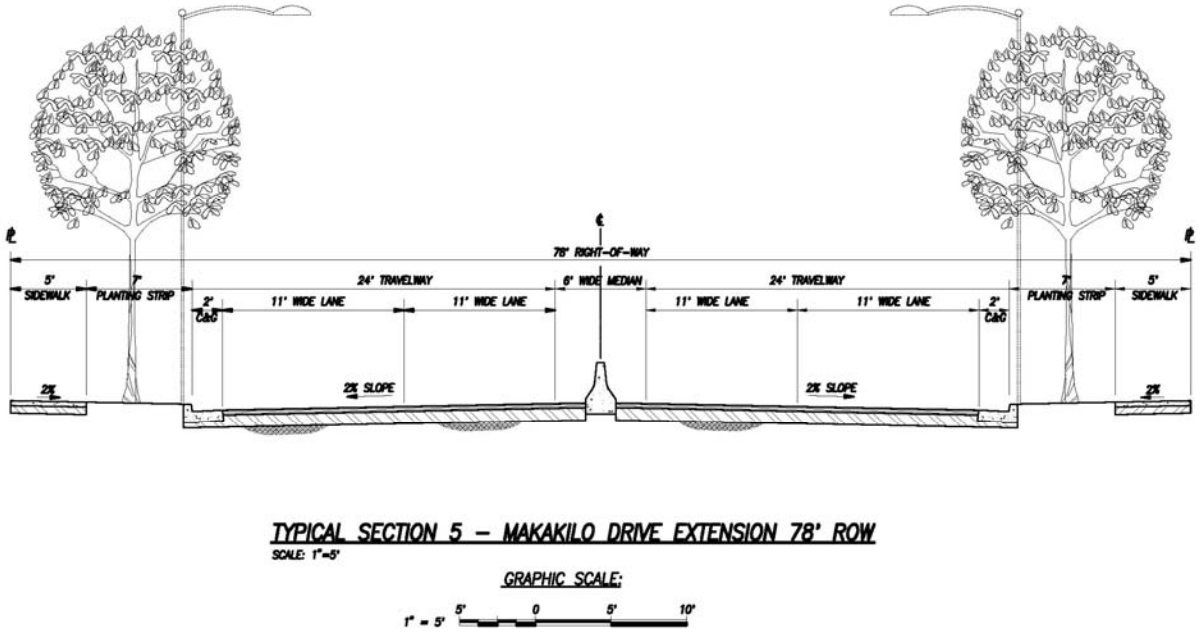


Figure 12. Alternative 5, 78-Feet ROW, 4-Travel Lanes, Jersey Barrier in Median, No Bike Lane



3.5 SELECTION PROCESS OF THE PREFERRED ALTERNATIVE

The DTS formed an Advisory Committee to obtain feedback on the proposed roadway alternatives and to assist in the selection of a preferred plan. The Committee was composed of individuals from neighborhood groups, organizations, government agencies and landowners. A list of participants is shown in Section 8. Additional comments from the community included two public informational meetings. Two general public informational meetings were held to obtain input from the broader community. The meetings were held in December 11, 2007 and October 27, 2008. The December 2007 meeting was used to introduce the project to the community and to obtain initial thoughts on the project. At the October 2008 meeting the preferred alternative was shared with the community and comments solicited. In addition, a presentation was made before to the Makakilo-Kapolei Neighborhood Board to present the preferred plan and to obtain comments on the plan.

The principal task of the Advisory Committee was to assist in finalizing a preferred alternative. The membership of the Committee consisted of 11 residents, representatives from 5 City agencies, the State Department of Transportation (SDOT), the Federal Highway Administration (FHWA), 4 landowners, the University of Hawai'i-West O'ahu, Hawaiian Electric Company, and the project consultant. The Advisory Committee met three times -- January 11, March 17, and June 10, 2008. The first meeting centered on the need for the proposed project. Members were asked to describe features of the roadway

that they believed the community would desire. During the second meeting, alternative plans (described above) were presented to the Committee for their comments. Members of the Committee described their likes and dislikes about each alternative. This meeting created a composite plan that is the basis for the preferred plan. This plan was refined by the consultant and presented at the group's third meeting. The Committee selected Alternative 1 as their preferred plan based on criteria identified in Table 1 and 2 cited above. Input from the SDOT and landowners also influenced how and where connections to the proposed roadway were to be located. Land acquisition requirements were also identified during this phase of work. The areas to be acquired are shown in Figure 13.

3.6 DEVELOPMENT COSTS

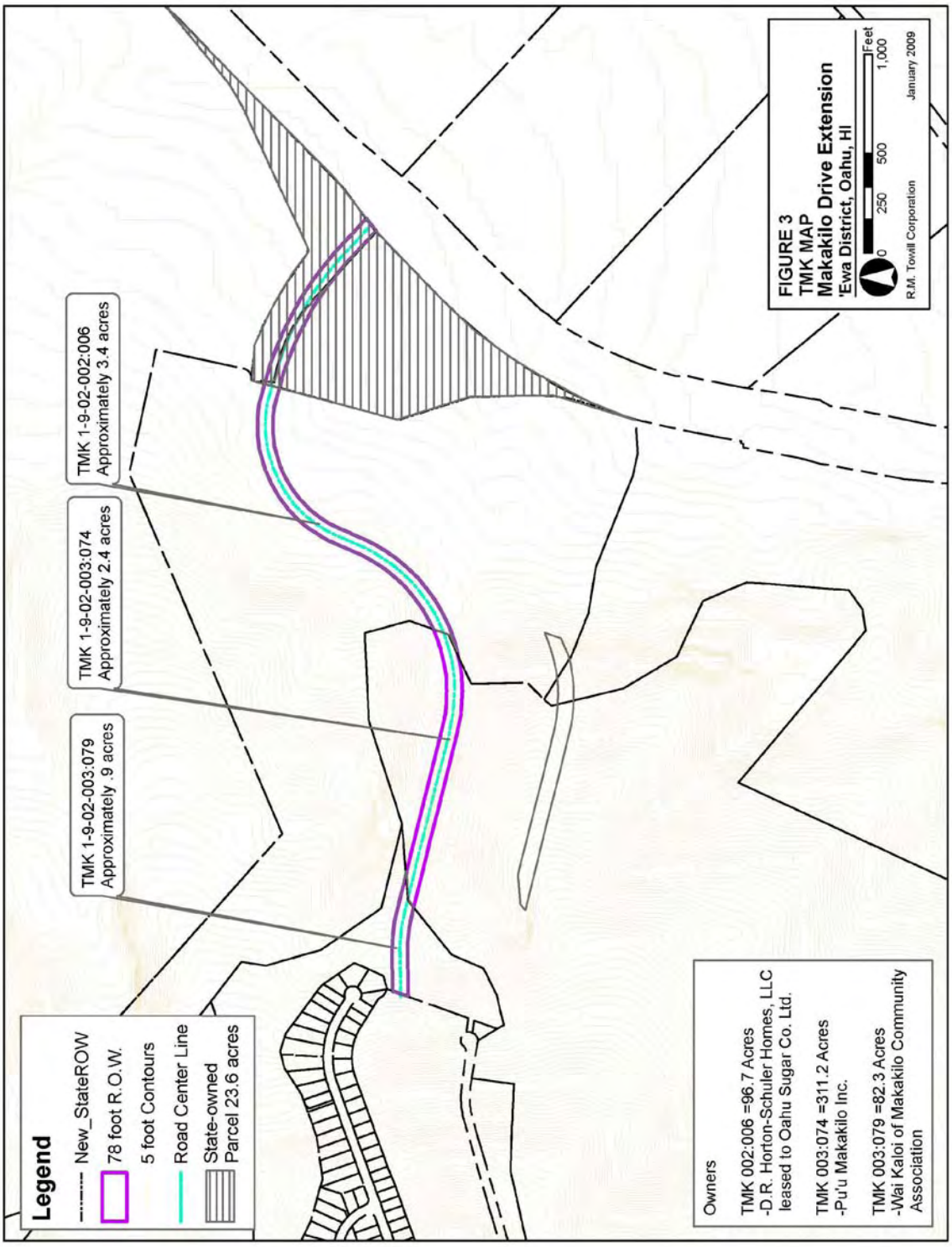
The preliminary construction cost estimate for the preferred alignment is $62 million. Funding for this project will be provided by a local funding source that may include private sources and the City and County of Honolulu (City). The City will seek Federal Highway Administration (FHWA) participation in the funding of the construction of the project. Land acquisition will also be funded through a combination of private, City, and federal sources.

3.7 SCHEDULE

The current project schedule is as follows:

- Design Phase 2009 - 2011
- Advertisement, Bid Opening and Contract Award Phase: 2011
- Construction Phase: To be determined

Figure 13. Land Areas To Be Acquired



SECTION 4
DESCRIPTION OF THE ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATIVE MEASURES

4.1 EXISTING TRANSPORTATION NETWORK

The major existing roadways that service the 'Ewa-Kapolei-Makakilo area consists of three types of roadway facilities: (see Figure 14)

- Regional Facilities – Major State or County facilities that move traffic between communities and destination nodes. These facilities include:
    - Interstate Route H-1
    - Farrington Highway
- Major Collectors – Major collectors are facilities that are used to move vehicles from the local neighborhoods and commercial areas to the regional transportation network. These facilities include:
    - Makakilo Drive
    - Kamokila Boulevard
    - Fort Barrette Road
- Local Streets – Local streets are facilities that are used to move vehicles within a small community or neighborhood area. These facilities generally move vehicular traffic to the collector streets.

A review of traffic studies conducted in the area was done by Julian Ng in October 2008 to evaluate the findings of the North-South Road and development projects in the area and to prepare projections of anticipated traffic (see Appendix B). Based on the findings of the prior studies, the following projections of traffic volumes on the Makakilo Drive Extension, north of the North-South Road Interchange with Interstate Route H-1, are recommended: (see Table 3).

Figure 14. Existing Road Network

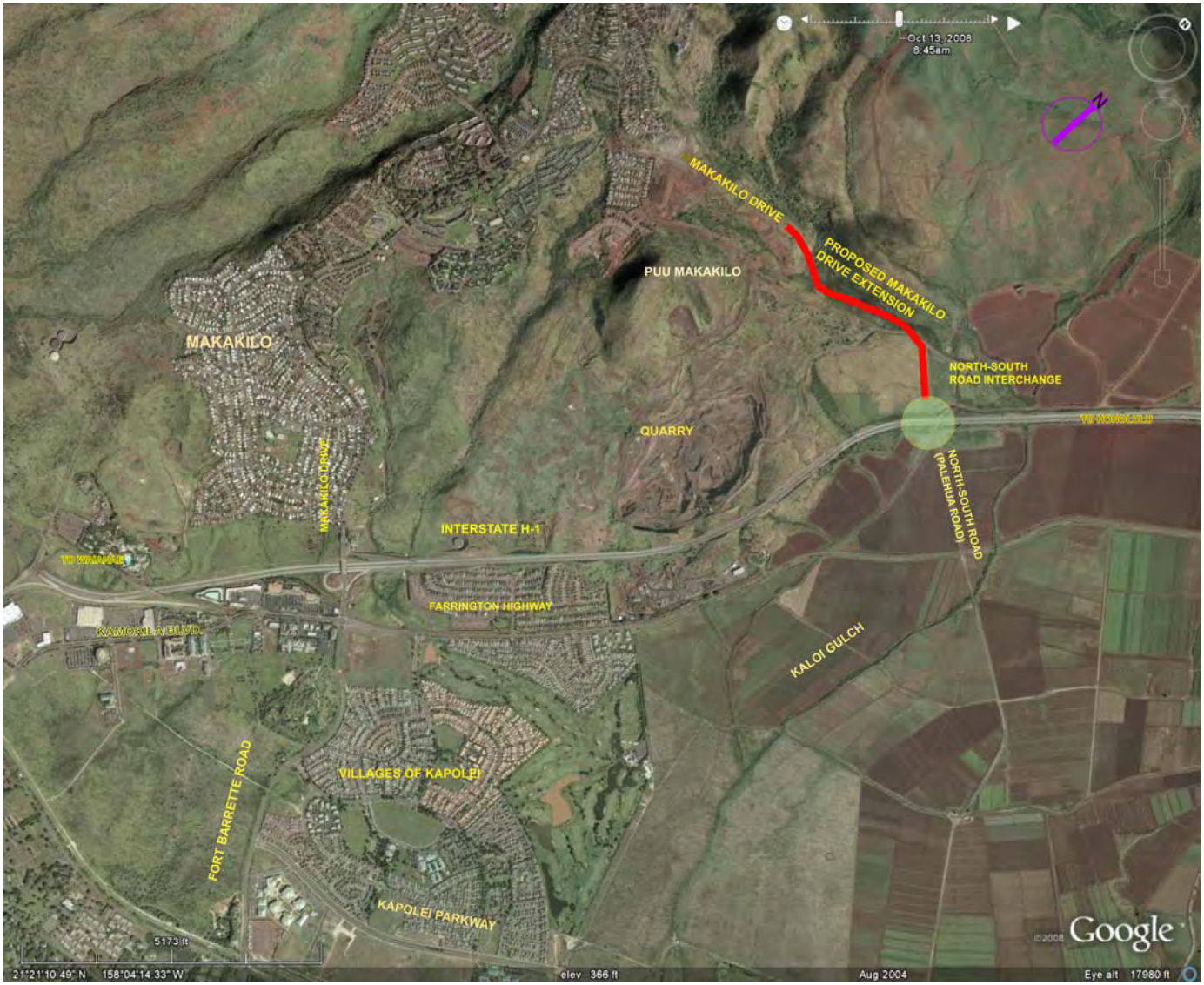


Table 3. Recommended 2025 Traffic Projections

	2025		Ultimate	
Average Daily Traffic (two-way, vehicles per day)	17,700		19,500	
	SB	NB	SB	NB
AM Peak Hour (vehicles per hour)	940	335	1,030	370
PM Peak Hour (vehicles per hour)	525	850	580	940

SB = southbound NB = northbound

The SDOT noted that the North South Road Interchange will be developed in phases in response to traffic volumes resulting from development in the area. During the initial phases the interchange is designed as a "diamond." When warranted, the interchange design will change to include loop ramps (as shown in Figure 2). The access from the adjoining parcels will be developed by the adjoining landowners.

Traffic volume analysis conducted for the North-South Road and Interchange are shown in Table 4 and Figures 15 and 16. The analysis describes the projected 2025 volumes with and without the North-South Road Interchange.

Table 4. Peak Hour Traffic Volumes for Makakilo Drive

	Traffic Volumes With Project				Traffic Volumes Without project			
	Northbound		Southbound		Northbound		Southbound	
Location	AM	PM	AM	PM	AM	PM	AM	PM
Makakilo Dr. Extension-N-S Road	335	850	940	528				
Makakilo Drive	725	1130	1965	700	1195	1965	2730	981
Source: North-South Road Corridor Study, December 2004								

Work on the proposed roadway will result in a temporary increase in construction related traffic, particularly during mobilization and demobilization of the construction area. The movement of heavy construction equipment will also result in additional temporary impacts to traffic on Makakilo Drive. Construction activity will also include movement of heavy equipment between staging areas and the active construction site, transportation of work crews, and truck traffic during removal of excavation spoils and construction of road surfaces. These activities are expected to impact regular traffic on the Makakilo Drive and North-South Road with temporary delays and the presence of large, slow-moving vehicles on the main roadway.

Figure 15. Projected 2025 Regional Peak Hour Traffic Volumes with North-South Road Interchange

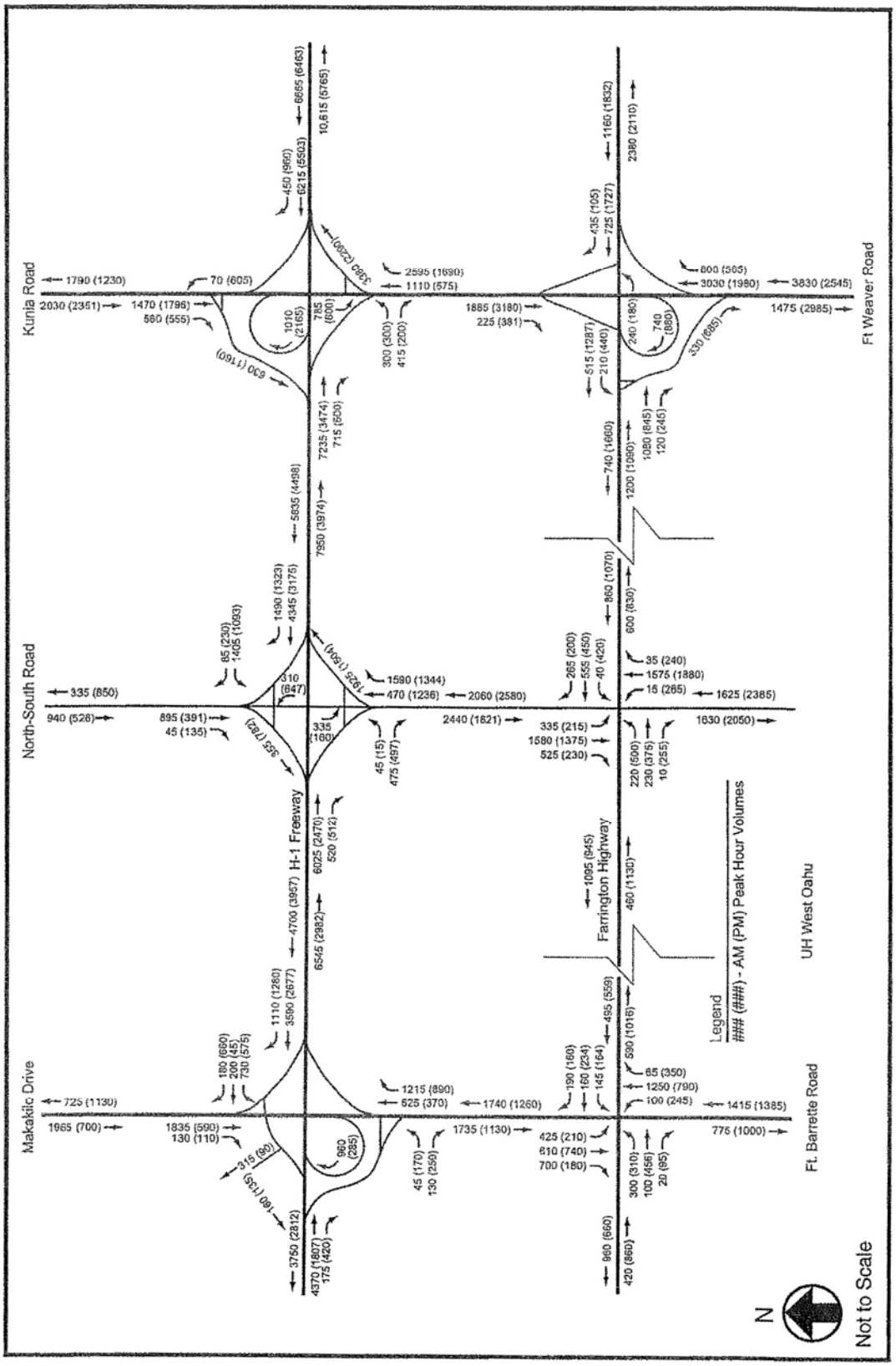
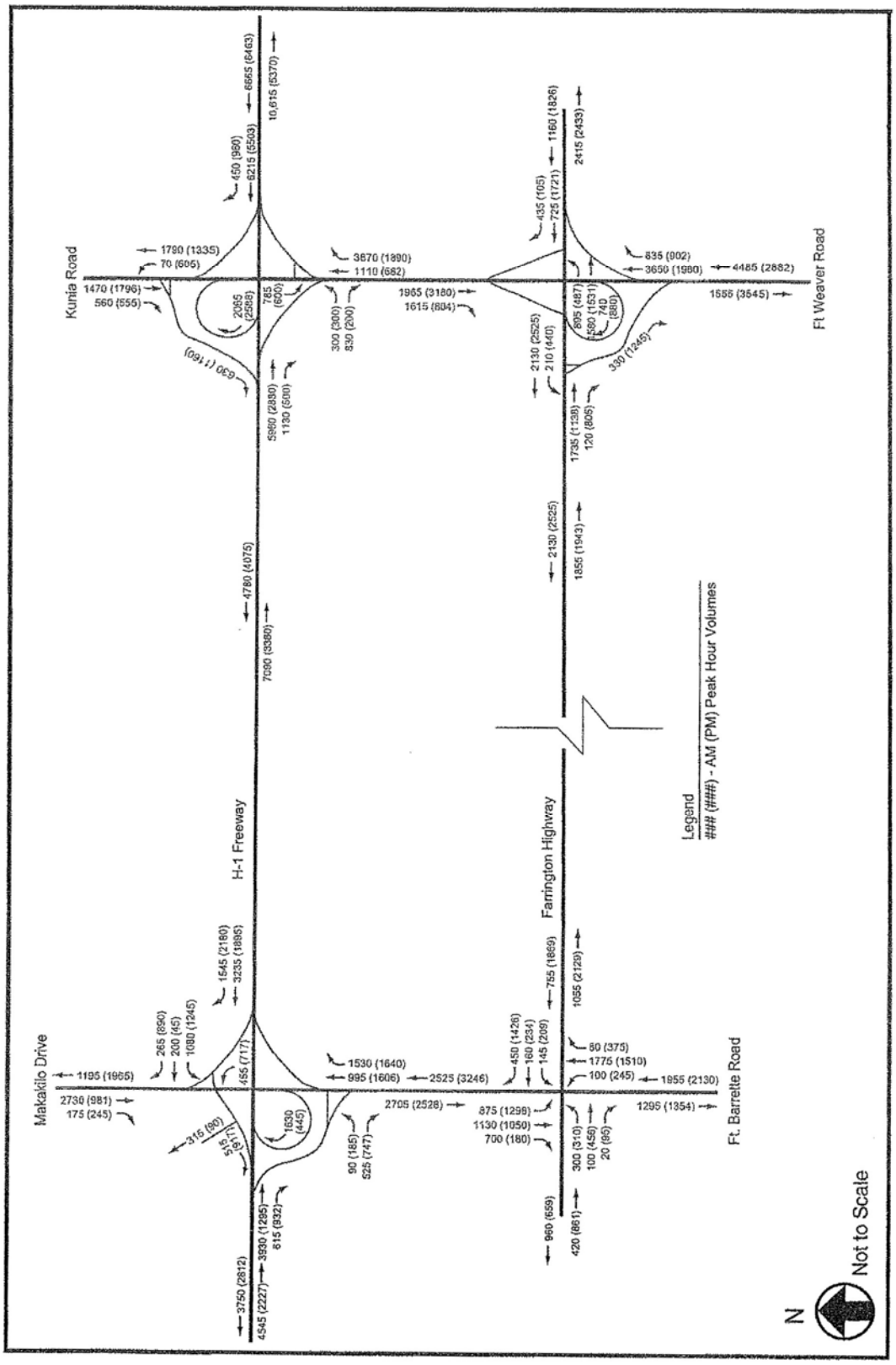


Figure 16. Projected 2025 Regional Peak Hour Traffic Volumes without North-South Road Interchange



Potential Impacts and Mitigation

To minimize traffic disruption, traffic control barricades, cones, signage and lighting will be used as necessary to alert drivers and delineate construction boundaries. Approach signs and a flag person will be positioned to direct traffic through temporary traffic control zones as necessary.

To minimize traffic impacts to nearby residents, the contractor will schedule heavy truck activity as much as possible between the hours of 9:00 a.m. and 3:00 p.m. on weekdays. The Honolulu Police Department (HPD) will be notified prior to periods of heavy truck activity or during transport and operation of heavy equipment.

Short-term impacts include traffic slow-downs as previously described. The project will also result in a temporary increase in vehicle trips attributable to workers traveling to and from the work site, and the use of construction vehicles during the course of work. All construction-related traffic impacts are temporary, however, and will cease upon project completion.

Short-term construction-related impacts will be mitigated by restricting the hours of construction vehicle activity to non-peak traffic periods, and by use of traffic control measures as previously described. All traffic control measures will be designed to minimize impacts on continuous traffic flow. With the proposed mitigation measures in place, significant short-term adverse impacts to traffic are not anticipated.

4.2 BUS SERVICE

Bus service is provided through the DTS, which currently contracts with O'ahu Transit Services (OTS) for operation of TheBus. OTS also operates the Handi-Van system. In 2008, bus ridership is estimated to approach 71 million passengers (source: www.thebus.org). Approximately 35 buses are assigned to TheBus's 'Ewa Service Area, which is identical to the 'Ewa Development Plan area.

In 2008, the bus routes serving Makakilo throughout the day included:

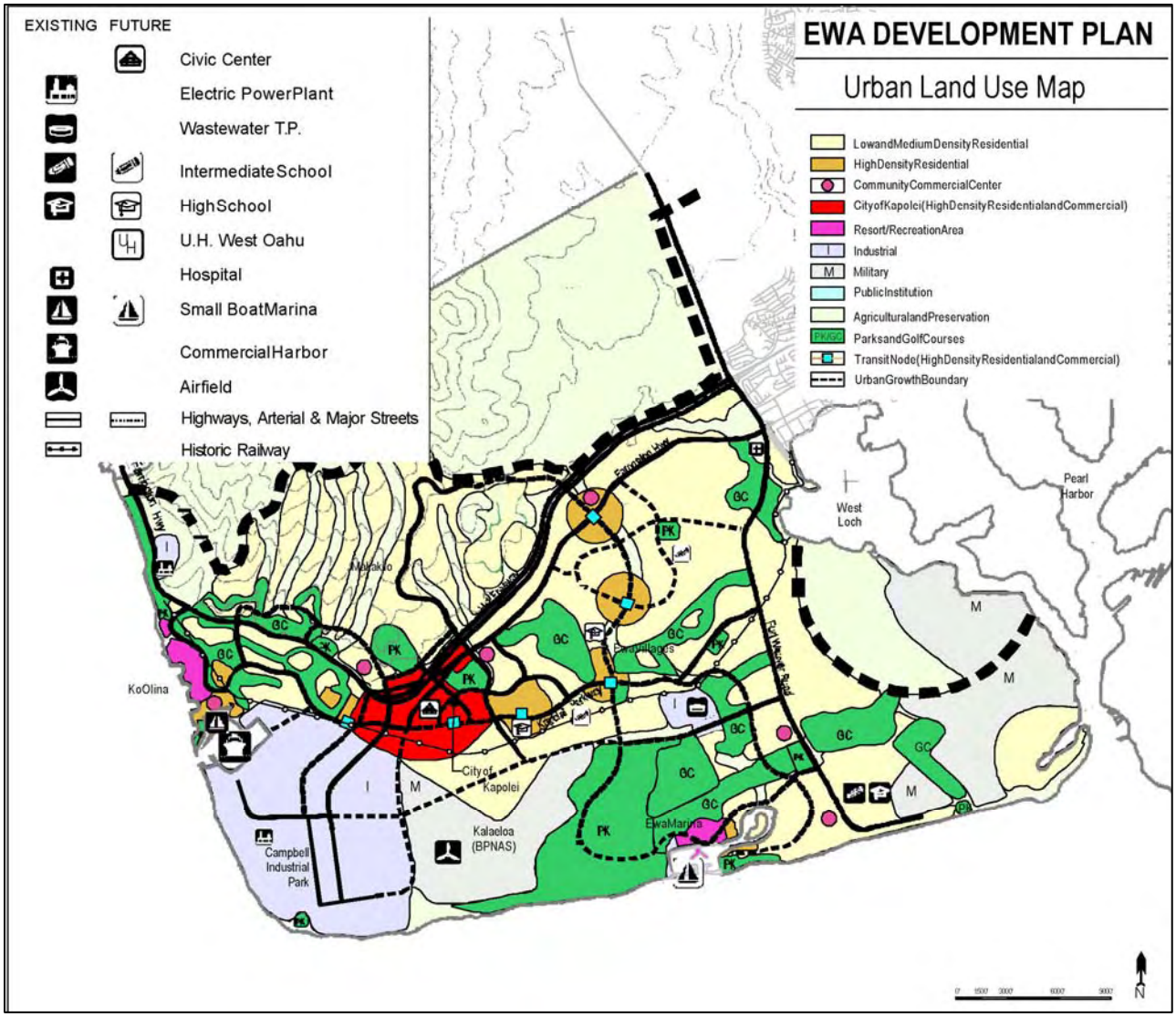
- Makakilo No. 411
- Makakilo No. 412
- Makakilo No. 414
- Route C – Kapolei Transit Center - Honolulu

OTS currently operates three "divisions" from bus maintenance facilities located in Kalihi-Palama, Hālawa and Manana in the Pearl City area.

4.3 LAND USE

Existing and planned land uses are shown in Figure 17, ʻEwa Development Plan Land Use Map. (Editor's Note: The ʻEwa Development Plan is currently in revision by the Department of Planning and Permitting. A draft of the Plan was published in October 2008). The area adjoining the proposed roadway to the northwest is predominantly low density residential. To the east of the proposed roadway alignment, the land use is current vacant agricultural lands. The urban growth limit, as defined by the ʻEwa Development Plan is just east of the proposed roadway alignment. Major planned development is proposed south of Interchange H-1 and include the City of Kapolei and the University of Hawaiʻi West Oʻahu Campus. Additionally, the land to the west is planned for low and medium density residential developments.

Figure 17. ‘Ewa Development Plan Land Use Map



4.4 CLIMATE

Makakilo is located on the leeward coast on the southwestern portion of the Island of O'ahu. The climate of the Makakilo area is generally uniform. The area is characterized by abundant sunshine, persistent northeast tradewinds, relatively constant temperatures, moderate humidity, and the infrequency of severe storms. Average wind velocity in the area varies from 10 to 20 mph. Monthly temperatures in the project area are within the range of 76 degrees Fahrenheit mean temperature in August and 70 degrees Fahrenheit mean temperature in December. Temperatures of 80 degrees and higher are not uncommon throughout the year.

Average annual rainfall recorded at Makakilo was 59.2 inches (4.9 inches/month) for the period from 1968 to 1991. The dryer months of June through September average 3-4 inches per month. The wetter months of October through April average 5-6.5 inches per month (World Climate, 2003).

Potential Impacts and Mitigation

The proposed project is not expected to have an impact on overall climatic conditions in the region or islandwide. It is acknowledged that additional paved surfaces will be added to the area and may increase local average temperatures, however, not to the extent that regional or global temperatures will be impacted. Due to the aforementioned tradewinds, the temperature in the region should continue to remain moderate with seasonal variations. The mitigation measures proposed includes the landscaping of the roadway with street trees, shrubs, and ground cover to minimize heat gain. The use of drought tolerant plants will be encouraged to minimize the use of potable water for irrigation.

4.5 TOPOGRAPHY

The proposed Makakilo Drive extension project is located along the south western (leeward) slopes of the Waianae Mountain Range. The change in elevation from the start of the project to the end is 200 feet. At Makakilo Drive, the elevation is 550 feet above sea level (asl). At the connection at Interstate Route H-1 the elevation is 350 feet. The average slope is approximately 5-8 percent with steeper area along Kalo'i Gulch. There are some sections of the proposed roadway that have slopes nearing 12 percent.

Potential Impacts and Mitigation

The proposed project will have an impact on the topography of the area by changing the existing landscape through the introduction of the roadway. The

visual impact of the new roadway will be minimized and mitigated through landscaping.

4.6 WATER RESOURCES AND HYDROLOGY

Kaloʻi Gulch, an intermittent water course, parallels the proposed roadway alignment to the southeast. Kaloʻi Gulch stream flows in the project area is intermittent and only flows during periods of high rainfall. The gulch is part of the drainage network that emanates from the Waianae Mountain Range and also drains a portion of the Makakilo community. Water collected in the gulch is conveyed under Interstate Route H-1 and continues to the ocean in Kalaeloa. The roadway will impact Kaloʻi Gulch by the support piles placed in the gulch for the bridge portion of the roadway. Stormwater generated from the project after completion of the roadway will be directed into a stormwater drainage system located within the roadway and will be directed into the storm drains located in the North-South Road interchange. The stormwater will eventually be discharged into Kaloʻi Gulch makai (south) of the interchange through the regional stormwater drainage system.

There are no wetlands in the immediate vicinity of the project area. The area also does not have any wells.

Remnants of the Waiʻahole Ditch are still found in portions of Kaloʻi Gulch. With the cessation of sugarcane, however, the ditch system has fallen into disrepair and has not conveyed water for decades.

The development of the Makakilo Drive Extension is being coordinated with the development of the North-South Road in that stormwater generated by the project will be accommodated by the drainage system developed for the North-South Road. Because the project is within the limits of the South Oʻahu Basal Aquifer (SOBA), stormwater needed to be conveyed to a point outside of the SOBA as prescribed by the regional drainage plan and the Environmental Protection Agency.

Potential Impacts and Mitigation

The project is not expected to have any significant impacts to water resources in the area, therefore no mitigation measures are proposed. Potential for adverse impacts to water quality from construction activities associated with this project will be addressed through the following proposed measures and practices below.

Runoff from construction areas will be regulated through adherence to the National Pollutant Discharge Elimination System (NPDES) permit conditions.

Best management practices (BMP) will be employed to prevent soil loss and sediment discharges from work sites. Project activities and operation of the system following project completion will comply with Department of Health (DOH) regulations as set forth in Hawai'i Administrative Rules, Title 11 Chapter 54 - Water Quality Standards, and Chapter 55 - Water Pollution Controls.

Pursuant to Section 401 of the Clean Water Act of 1977, DTS will obtain Water Quality Certification from DOH, if required. Further, a Water Quality Monitoring Plan will be prepared to monitor water quality, as required, during construction.

Discharge pollution prevention measures will be employed in all phases of the project. Control measures will be in place and functional before construction activities begin, and will be maintained throughout the construction period. A site-specific plan to prevent runoff and the discharges of other pollutants into State waters, including removal procedures for the construction site BMPs, will be prepared by the construction contractor as part of the project construction plan. The construction plan will be submitted to the DOH-Clean Water Branch for review.

The BMPs will include guidelines and mitigation measures to prevent runoff, discharge pollution, and other detrimental impacts related to construction activities. In addition, BMPs will include contingency plans to respond to heavy rainfall conditions.

Mitigation measures, in addition to the discharge pollution controls described above, shall include, but not be limited to the following:

- Clearing and excavation shall be held to a minimum necessary to meet project design and construction plan requirements.
- Construction shall be phased to minimize the exposure time of cleared or excavated areas. Existing ground cover shall not be destroyed, removed or disturbed more than 20 calendar days prior to the start of construction.
- Stabilization shall be accomplished by temporarily or permanently protecting the disturbed surface from rainfall impacts and runoff.
- Storm water flowing toward active project areas shall be diverted as much as practicable using the appropriate controls, including berms and silt fences, as determined by the contractor according to site conditions.
- Areas that remain unfinished for more than 30 calendar days shall be hydro-mulched or seeded to provide temporary soil stabilization.

- The project contractor will select locations for stockpiling construction material. Stockpile sites will be identified in the site-specific BMPs and construction plans. A sediment retention berm or silt fence will be installed around the down-slope side of stockpile sites to retain sediment discharges during heavy rainfall.
- Fueling of construction equipment will only be performed off-site or within an area designated by the contractor. Any site designated for refueling shall be located away from the stream, enclosed by a containment berm, constructed to contain spills and seepage, and prevent storm water runoff from carrying pollutants into state coastal waters.
- In the event of a severe storm event that may result in flooding of the work site within the streambed, all construction equipment and materials, including discharge pollution prevention will be removed from the project site to a secure staging area above the potential flood level.

The contractor, based on professional experience and expertise, may modify the proposed BMP mitigation measures as necessary to account for unanticipated or site specific conditions.

4.7 SOILS

The following soil types are found in the project area: (See Figure 18, Soil Map).

- rRK – Rock land. Area made up of exposed rock covering 25-90 percent of the surface. This type of soil is confined to Kaloʻi Gulch.
- MuB, MuC, MuD – Molokaʻi Series. Areas made up of well-drained soils on uplands. The MuB soil series in the project area is a silty clay loam with slow to medium runoff potential. The MuC and MuD soil series, however, do pose medium potential for erosion.
- KlA and KlB – Kawaihapai Series. This soil series consist of well-drained soils in drainageways and alluvial fans. The soil is further characterized as a clay loam with slow to medium erodability.
- KaB – Kaena Series. This soil series consist of very deep, poorly drained clay soils on alluvial fans and talus slopes. Runoff is slow to medium.
- McD2 – Mahana Series. This soil is characterized as a silty loam found on lands with slopes between 6 and 12 percent. These soils are exposed due to erosion and runoff from these areas is high.

The prevention of soil erosion will be included in the specifications for construction. The BMPs outlined above will be utilized to minimize stormwater runoff. Besides structural controls, such as the use of detention basins and silt-screening, vegetative means to control runoff will be utilized. Also, minimizing the area that is exposed at any one time will further reduce soil erosion, especially the exposed areas currently existing on the site.

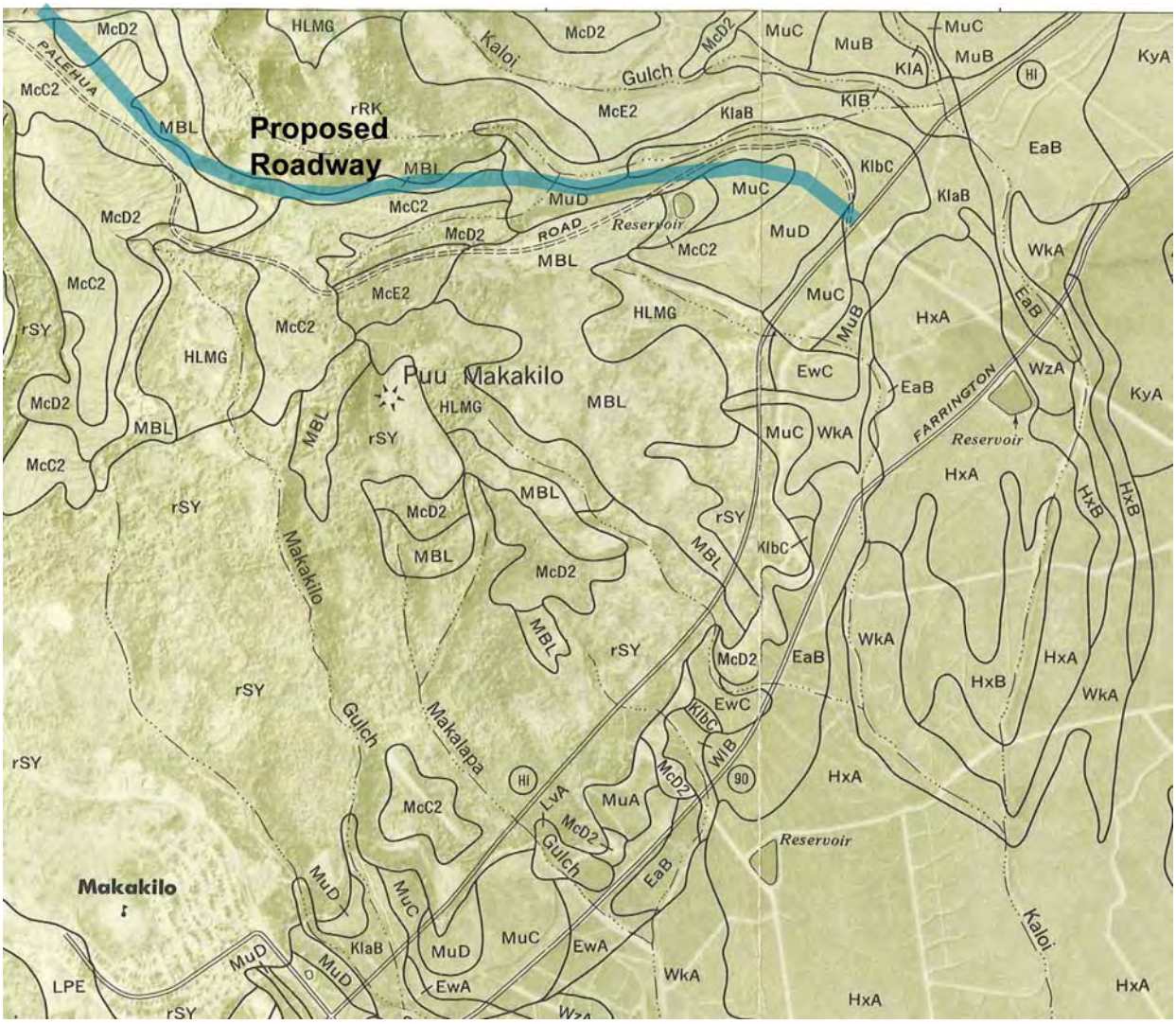


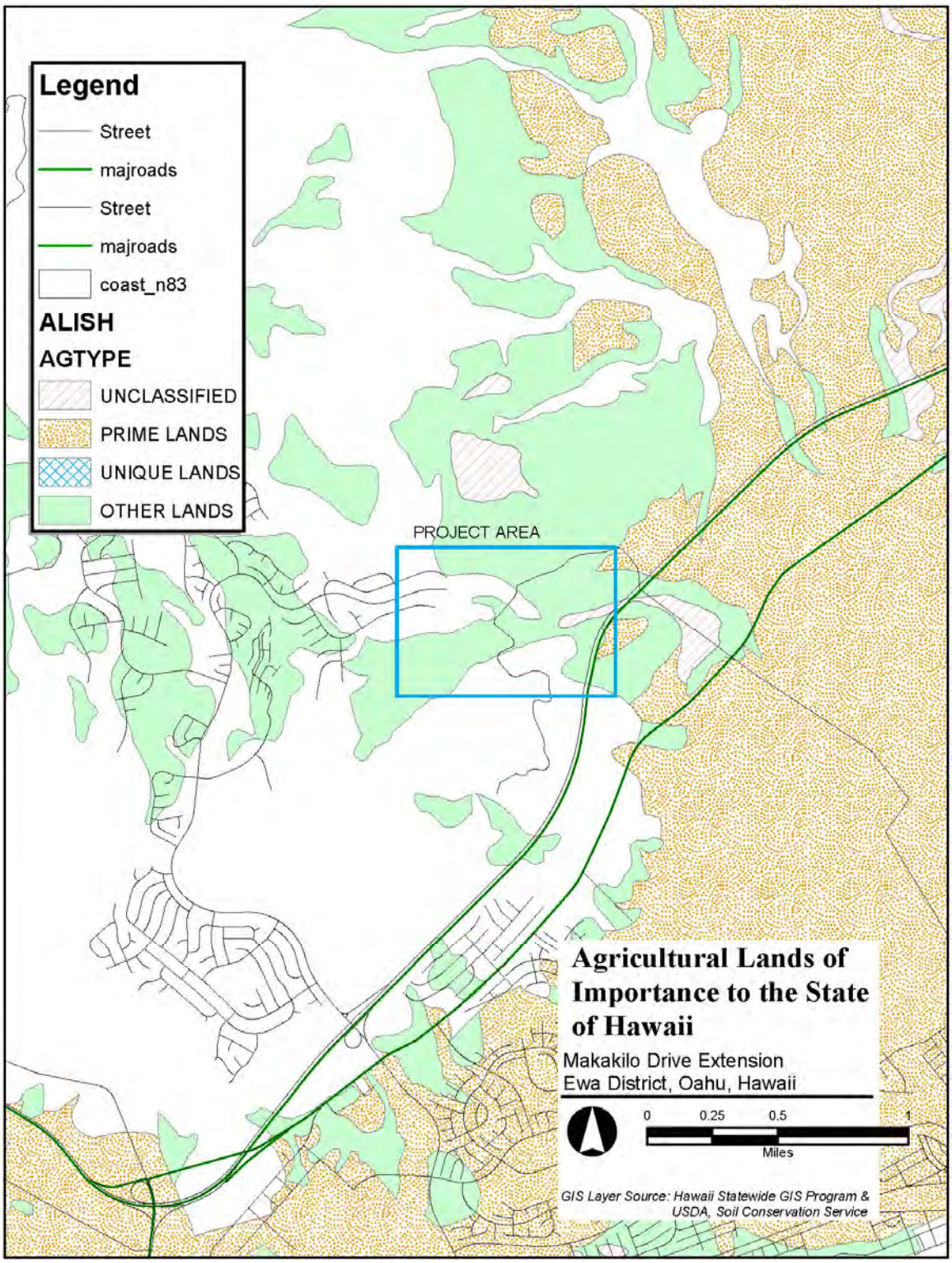
Figure 18. Soil Map

4.8 FARMLAND

The areas on both sides of the roadway corridor were once used for agriculture that included cattle grazing and sugarcane cultivation. The land was arable because of the

irrigation water that was made available via the Wai'ahole Ditch System. Remnants of the ditch system are still visible in the area of the project. With the cessation of sugar

Figure 19. Map Showing Agricultural Lands of Importance to the State of Hawai'i



cultivation in the 1980's the land mauka (northwest) of the H-1 Freeway has been left fallow. Land makai (southeast) of the H-1 Freeway has been continuously cultivated with truck crops since the closing of sugar operations. Within the preferred alignment of the project, there is currently no farming activity. Further, the land where the roadway will traverse is not within an area designated as "Prime" agricultural land (see Figure 19).

4.9 NATURAL HAZARDS

4.9.1 EARTHQUAKES

The Uniform Building Code (UBC) provides minimum design criteria to address potential for damage due to seismic disturbances. The range of seismic risk varies from Zone 0, indicating no damage, to Zone 4, indicating major damage. The island of O'ahu is in Seismic Zone 2, as established by the UBC, indicating a moderate risk of damage from earthquake.

Potential Impacts and Mitigation

A seismic event could affect bridge integrity; and therefore, DTS will ensure that the bridge design is compliant with current seismic parameters for bridge designs. All structures proposed for this project will be built, at a minimum, according to standards for UBC Seismic Zone 2, and in accordance with SDOT and ASSHTO Local and Resistance Factor Design (LRFD) specifications.

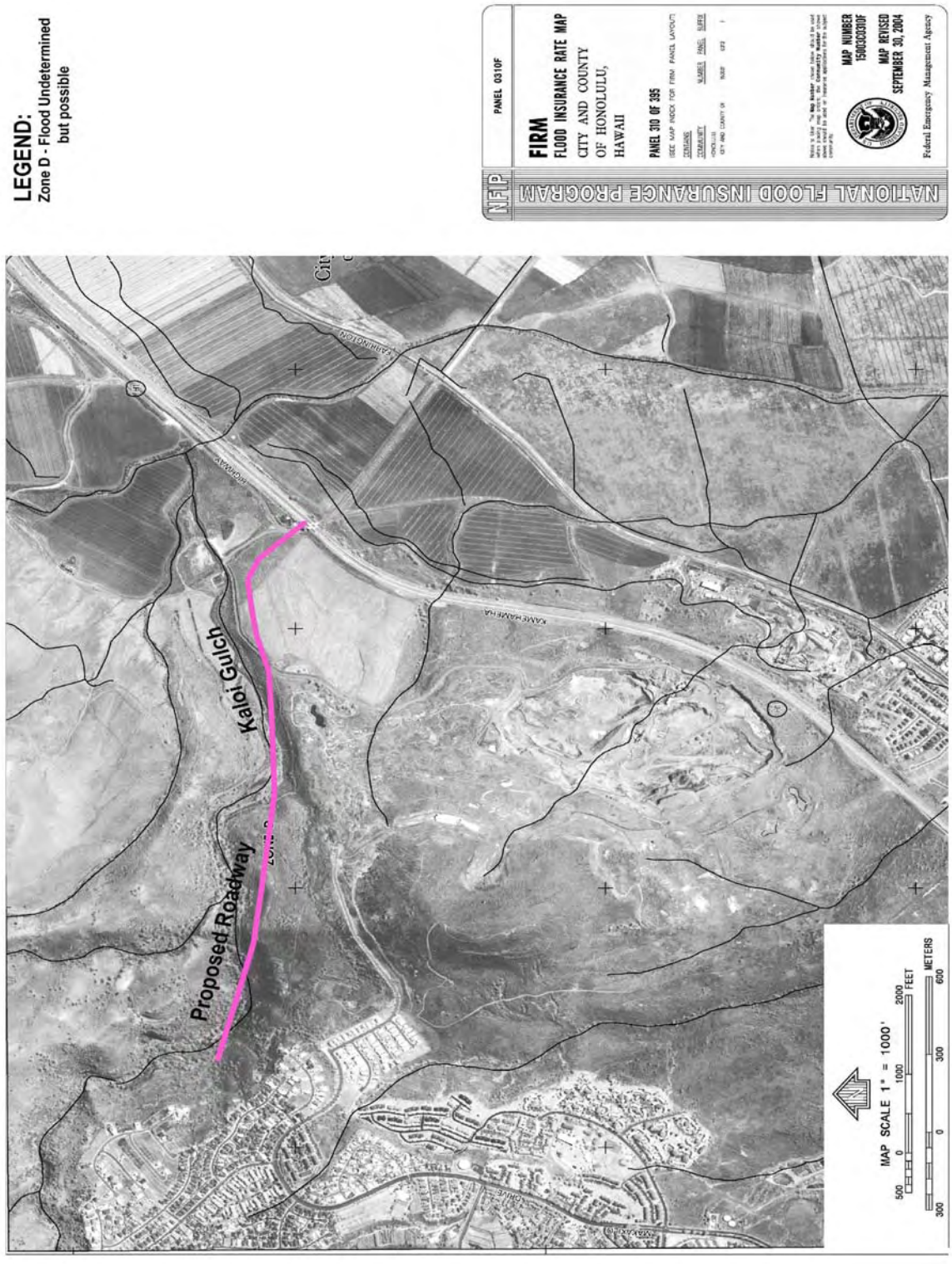
4.9.2 FLOOD ZONES

The Makakilo Drive Extension project area is not within a Federal Emergency Management Agency (FEMA) designated floodway (see Figure 20). The area is designated Zone D, "areas where flood determination was not determined, but it is possible."

Potential Impacts and Mitigation

No mitigation is required.

Figure 20. Flood Insurance Rate Map



4.9.3 HURRICANES

In Hawai'i, northeast trade winds predominate throughout most of the year and generally range in velocity between 10 and 20 mph. Trade winds of 40-60 mph periodically occur. When wind speeds exceed 70 mph, the storms are characterized as hurricanes. The hurricanes are classified according to "Category," where Category 1 hurricanes have wind speeds between 75-95 mph and Category 5 hurricanes have wind speeds exceeding 155 mph. Damaging wind events on O'ahu are most commonly associated with passing tropical storms or hurricanes.

Potential Impacts and Mitigation

To mitigate for the potential effects of hurricanes the bridge structure of the new roadway will be designed to meet or exceed the minimum requirements of latest AASHTO LRFD specifications.

4.9.4 TSUNAMIS

The Makakilo Drive Extension project is not located adjacent to a coastal area, and therefore will not be subject to tsunamis.

Potential Impacts and Mitigation

No mitigation is required or proposed.

4.10 FLORA AND FAUNA SURVEYS

4.10.1 BOTANICAL SURVEY

A botanical survey of the area proposed for the new roadway, the realigned approach roadways, and the area adjacent to and underneath the existing bridge was conducted by LeGrande Biological Services, Inc., in November 2007. See Appendix D, Botanical Resources Assessment for the Makakilo Drive Extension, 'Ewa District, O'ahu.

The site proposed for the road extension is dominated by a non-native guinea grass (Panicum maximum)/Koa haole (Leucaena leucocephala) matrix with a small pocket of native 'A'ali'i Lowland Shrubland. There are a total of 60 plant species observed within the survey site. 55 are alien (introduced), four are indigenous (native to the Hawaiian Islands and elsewhere), and one endemic (native only to the Hawaiian Islands). Over 91% of the plant species observed in the project area are alien. An inventory of all the plants observed within the survey area is presented in the species list at the end of the report in the Appendix.

The lower section of the survey area is dominated by monotypic stands of guinea grass with scattered koa haole shrubs, large sections of land have been cleared or graded as roadway and quarry work is presently active in the area. As the survey area gains elevation short weedy species dominate the roadside such as buffelgrass, coat buttons (*Tridax procumbens*), spiny amaranth (*Amaranthus spinosa*), false mallow (*Malvastrum coromandelianum*), boerhavia (*Boerhavia coccinea*), manienie grass (*Cynodon dactylon*), and slender mimosa (*Desmanthus pernambucans*); with a taller shrubby plant matrix characterizing the upper slopes of Kaloʻi Gulch. Some of the larger shrubs include sourbush (*pluchea carolinensis*), tree tobacco (*Nicotiana glauca*), klu (*Acacia farnesiana*), Formosa koa (*Acacia confusa*) and koa haole. Vines such as ivy-leaved morning glory (*Ipomoea cairica*) and hairy merremia (*Merremia aegyptia*) were locally abundant growing along the gravel roadway near the upper elevations of the survey area.

There were several large trees observed during the survey including, pepper tree (*Schinus molle*), kiawe (*Prosopis pallida*), monkeypod (*Samanea saman*), and yellow elder (*Tecoma stans*).

A small degraded `A`ali`i shrubland is located at the upper elevations of the survey area. A pocket on the upper slope of Kaloʻi Gulch, to the north of the existing gravel roadway, from an elevation of 184 meters down to about 155 meters harbors several hundred ʻaʻaliʻi plants as well as an estimated 40 to 50 ʻiliahialoʻe or coastal sandalwood (*Santalum ellipticum*) trees. A Bishop Museum plant survey was conducted in 2004 for 155 acres in the Makakilo area, including sections of the Kalo'i gulch and portions of the present survey area. Over 90 *Santalum ellipticum* plants were located and tagged during the 2004 survey. A large section of the *Santalum* population has since been cleared for housing development along the present Pueonani Street.

Other native plant species observed were mainly scattered along the edges of the existing gravel roadway at the upper elevations of the survey area. They include `ilima (*Sida fallax*), `uhaloa (*Waltheria indica*), and popolo (*Solanum americanum*).

Potential Impacts and Mitigation

None of the plants observed on the project site is a State or Federally listed threatened or endangered species or a species of concern (U.S. Fish and Wildlife Service, 1999a, 1999b, 2004; Wagner et. al., 1999). The majority of the plants observed during the survey are non-native, dominated by a non-native guinea grass (*Panicum maximum*)/Koa haole (*Leucaena leucocephala*) matrix with a small pocket of native ʻAʻaliʻi Lowland Shrubland. The ʻiliahialoʻe (*Santalum ellipticum*) population found at the upper elevations of the survey area is

significant, the species as a whole is declining due to urbanization throughout its home range.

The proposed project is not expected to have any impact to important vegetation within the proposed roadway alignment. Project activities which include clearing vegetation from construction and staging areas will not impact any rare, threatened or endangered plant species. Although not anticipated, should a listed plant be identified during construction, the City will work with State and Federal officials to establish a Habitat Conservation Plan for the listed specie.

Upon completion of construction, all disturbed soils within the project area will be stabilized with ground vegetation or landscaping. As much as possible, disturbed soils will be replanted with native plants.

4.10.2 Avifaunal and Terrestrial Fauna Survey

Terrestrial fauna resources were assessed during a site visit by Phillip L. Bruner in February 2008 (see Appendix E). During the visit, no terrestrial animals were observed. Mr. Bruner observed that the array of introduced birds and mammals recorded was typical for this area. No native land birds were found but the endangered Hawaiian Duck was recorded on the site. The endangered (State of Hawai'i, O'ahu only) Hawaiian Owl or Pueo, does forage in the undeveloped areas of West O'ahu. Mr. Bruner has seen this species as recently as 2005 on Barbers Point property. The Pacific Golden-Plover (the most abundant migratory shorebird) was observed on the property. They typically establish foraging territories on lawns and other open lands during their winter (August - April) stay in Hawai'i. They are not listed as endangered or threatened. This property does not contain any unusual or unique habitat for birds and mammals. The drainage catchment is likely an ephemeral water resource for waterbirds and shorebirds. The development of this site should have no measurable effect on the populations of alien birds and mammals in West O'ahu.

Potential Impacts and Mitigation

Noise from heavy equipment and other construction activities might disturb domestic animals. Project activities also might alter the local distribution of birds presently visiting the site, but will not impact the overall abundance of these species on O'ahu.

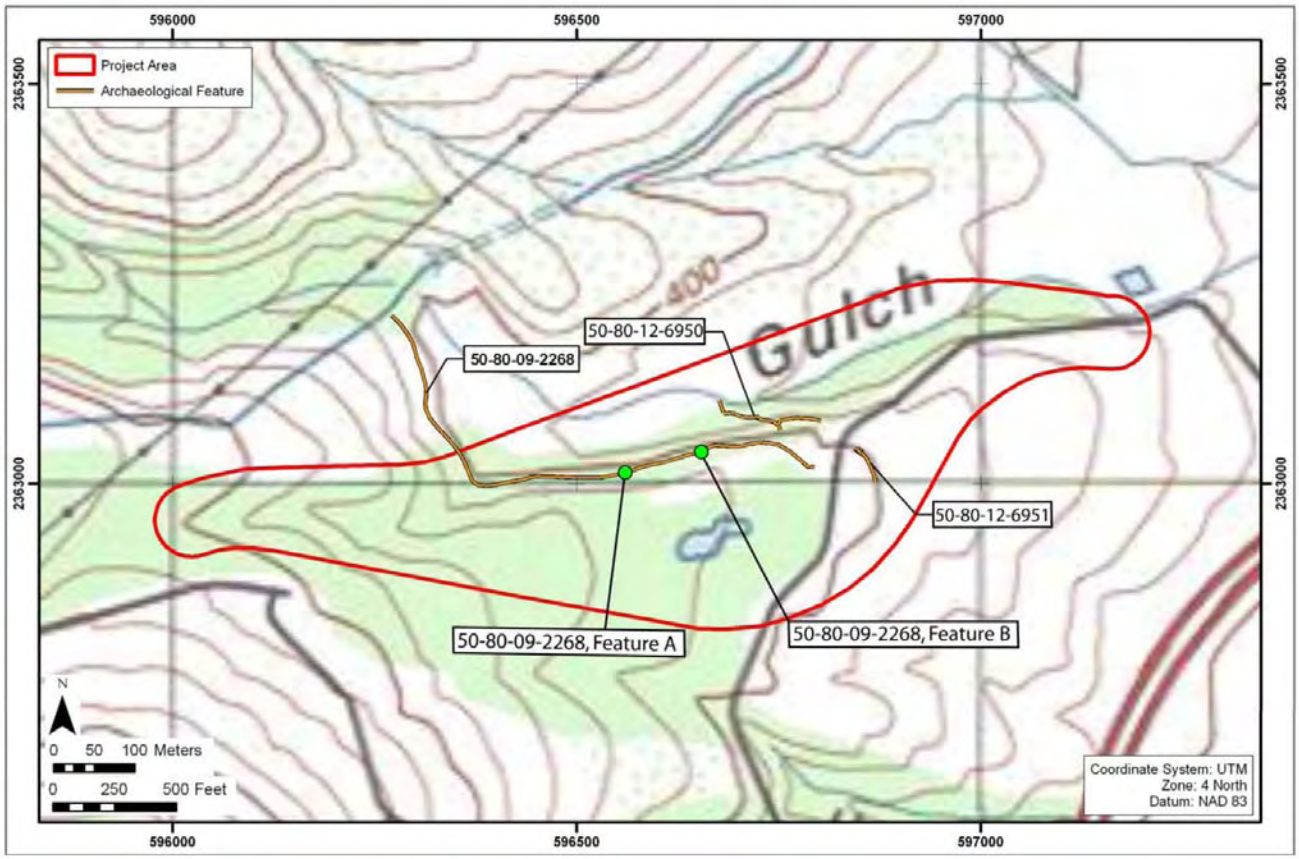
To minimize the possibility that birds may become disoriented and harmed by the lighting, the proposed project will incorporate shielded lighting. This lighting shall be specified on the building permit plans.

Given the above findings, the proposed project is not anticipated to have a significant negative impact on faunal resources.

4.11 ARCHAEOLOGICAL SITE ASSESSMENT

An Archaeological Inventory Survey of the area was conducted by Cultural Surveys Hawai'i and several sites of historic value were identified (see Appendix C). The sites are shown in Figure. 21.

Figure 21. Archaeological Sites Map (CSH, 2008)



The approximately 62-acre proposed Makakilo Drive Extension Project study area is located in the western-side of the Honouliuli Ahupua'a at approximately the 400-600 ft. elevation along the southern foothills of the Wai'anae Range. Background research indicates that pre-Contact settlement within the Honouliuli Ahupua'a would have been centered on the rich cultivated lands of Honouliuli 'ili. In the intermediate area between the limestone plain and the upland forests, which is in the vicinity of the current project

area, traditional Hawaiian activities would have been limited to dryland agriculture within gulches or near springs, and mauka to makai transportation routes (i.e. trails) and associated temporary shelters. Historic land use within the project area has included ranching, modifications related to commercial sugar plantation irrigation, and industrial rock quarry operations.

Findings by previous archaeological investigations in the immediate vicinity of the project area (i.e. Kaloʻi Gulch, Makakilo Golf Course, Makakilo D and D-1, and U.H. West Oʻahu) were generally limited to historic ranching and commercial sugar plantation infrastructure, including irrigation ditches, aqueducts, and flumes, and stone walls. The project area is in dry, leeward Oʻahu, with no seasonal or perennial streams in the vicinity. At present, Kaloʻi Stream is an intermittent stream, limited to the channeling of flood waters during periods of heavy precipitation. However, historical documentation indicated abundant spring water was once present in the area. Kaloʻi spring was described in the 1890s as having standing water even in dry weather (Von Holt 1985). Additional springs were located in the vicinity by Von Holt, including a paved well, known to Hawaiians as the "Hidden Spring." It was also noted that the Kaloʻi Gulch area was populated in pre-Contact times, though the population was wiped out by the smallpox epidemic of the mid-1800s (Von Holt 1985). No evidence of traditional Hawaiian agriculture or habitation was located within the project area.

Two new sites have been given SIHP numbers for their archaeological significance: SIHP No. 50-80-12-6950 is a reinforced drainage ditch utilized to divert water flowing downslope; and SIHP No. 50-80-12-6951 is an irrigation reservoir that fed water into the sugar cane fields on its east and south sides, into Oʻahu Sugar Company's lot #29 (see Figure 20). All plantation-era archaeological sites observed in the region are probably interrelated in function: excessive water that flowed from cane fields fed from Site -6951 was likely diverted by the structures of Site 50-80-12-6950 to minimize the effects of erosion on the landscape, then proceeded to the base of the gulch.

Previously identified historic sites located during the inventory survey include two newly documented features associated with SIHP No. 50-80-09-2268, a metal flume bridge, a wooden flume bridge, and stone and mortar walls (see Figure 20).

The limited nature of findings by the current study, despite the historic accounts of a substantial population of Hawaiians in the vicinity of Kaloʻi Gulch and Spring, may be due to the extensive land modification within the project area by historic ranching, commercial sugar plantation endeavors, and industrial rock quarrying operations. It is plausible that the settlement in the area was generally restricted to areas near the mouth

of Kaloʻi Gulch, with only limited use of the surrounding areas, including the current project area.

Summary of Findings

During the survey of the 62-acre Makakilo Drive Extension Project study area, two (2) new sites related to the Oʻahu Sugar Company's sugar cane cultivation and irrigation were recorded. 50-80-12-6950 consists of three (3) features that cooperatively functioned to divert water through engineered channeling to lower ground; 50-80-12-6951 is a remnant reservoir of irrigation infrastructure that fed into cane fields upslope from Site -6950. Both sites are associated with water control and plantation irrigation. In addition, two (2) new features associated with SIHP No. 50-80-09-2268 (Waiʻahole Ditch System) were discovered on the survey and documented. No surface remains were found in the vicinity of the sites and the only surface remains found within the project area was modern refuse and evidence of bulldozing and rock quarrying industry.

Significance Assessments

Sites are evaluated for significance according to the broad criteria established for the National and State Registers. The five criteria are:

A. Site reflects major trends or events in the history of the state or nation.

B. Site is associated with the lives of persons significant in our past.

C. Site is an excellent example of a site type.

D. Site may be likely to yield information important in prehistory or history.

E. Site has cultural significance; probable religious structures and/or burials present.

Sites 50-80-12-6950 and 50-80-12-6951 are significant under the Criterion D for the information that has or can be obtained from them. The Waiʻahole Ditch, SIHP No. 50-80-09-2268 continues to be significant under criteria A, C, and D.

Table 5 summarizes the findings and includes the site number, function of the site, the significance assessment, type of work performed, and recommended action.

Table 5. Significance Assessments and Recommendations for All Identified Archaeological Sites Located within the Project Area.

SIHP No.	Type	Function	Significance	Work Accomplished	Recommendations
50-80-12-6950	Water Drainage	Water Control	D	L, M, P, D	No Further Work
50-80-12-6951	Irrigation Reservoir	Water Control	D	L, M, P, D	No Further Work
50-80-09-2268,	Flume Bridge	Water Control, Drainage	A,C,D	L, M, P, D	No Further Work
50-80-09-2268, Feature B	Flume Bridge	Water Control, Drainage	A, C,D	L, M, P, D	No Further Work
L=Located with a GPS, M. = Mapped, P = Photographed, D=Described, T=Tested					

Potential Impacts and Mitigation

The proposed roadway alignment proposed to avoid the sites identified and therefore should have no impact on the sites identified. However, should historical or cultural materials be discovered during ground disturbing activities, work in the area will cease immediately and the SHPD will be notified of the discovery and consulted as to the appropriate course of action. Burial finds will be treated in accordance with HAR Section 12-300 and HRS Chapter 6E-43.6. The SHPD will determine the appropriate treatment of the remains and any associated historical or cultural material in consultation with recognized descendants, if any, and the O'ahu Island Burial Council.

4.12 NOISE CONDITIONS

Ambient noise levels in the area are currently dominated by traffic on Interstate Route H-1, with an occasional overflight by aircraft from Kalaeloa Airport. A noise study to

assess noise impacts was conducted by D.L. Adams and Associates (October 2008). Their findings are summarized below and re-printed in Appendix G.

Potential Impacts and Mitigation

Construction of the proposed bridge will involve excavating, grading, concrete casting, the placement of pre-cast structural components, and paving. The various construction phases will likely generate noise which could impact nearby areas. The actual noise levels produced are dependent on the construction methods employed during each phase of the construction process. Earth moving equipment, such as diesel engine powered bulldozers, trucks, backhoes, front-end loaders, graders, etc., will probably be the noisiest equipment used during construction. However, as the noise will be temporary, no lasting impact from the proposed project is expected.

Long-term noise impacts from vehicles traversing the proposed roadway will not be measurably lesser or greater than those generated from the continued use of the existing roadways.

Ambient noise conditions in the proposed project area are generally low due to the rural location. The dominant noise is from vehicular traffic along Makakilo Drive, Interstate Route H-1, the local roadways, and from wind. Local residences are generally exposed to sound levels ranging from 70 dB to 60 dB or lower (Day-Night average sound levels). Other normal daytime sources of noise include lawn mowers, barking dogs, and power tools.

Short-term noise impacts are related primarily to construction activities. A majority of the noise will be generated during mobilization and operation of heavy construction equipment. Construction equipment noise is expected to be in the range of 55 and 90 dBA in close proximity to the site. To mitigate short-term construction related impacts, the contractor will ensure that project activities are in compliance with the provisions of HAR, Chapter 11-46, "Community Noise Control".

No long-term negative noise impacts are expected to result from the proposed roadway. Use of the completed roadway will result in vehicular noise comparable to the traffic level at the present time within existing portions of the Makakilo community.

In order to mitigate noise impacts, contractors will muffle all construction vehicles and machinery and maintain all noise attenuation equipment in good operating condition. Faulty equipment will be repaired or replaced. Additionally,

construction activities and use of heavy equipment will be scheduled as much as possible during daylight hours to avoid disturbing area residents during the evening.

4.13 AIR QUALITY

Presently, air quality in the vicinity of the project is good because of the normal north-easterly trades. The primary sources of air pollution are from auto emissions. Agricultural sources of air pollution include dust, spraying of insecticides and herbicides, and equipment emissions generally occur when the normal wind regime reverses itself and blows from the south, generally referred to as 'Kona' winds. To a lesser and occasional extent, air quality is impacted by natural pollution sources, such as airborne salt from the ocean, plants, wind-blown dust and volcanic vog.

Potential Impacts and Mitigation

Short-term impacts from fugitive dust will likely occur during the project construction phase. To a lesser extent, exhaust emissions from stationary and mobile construction equipment, and from workers' vehicles may also affect air quality during the period of construction. During tradewind periods, dust and vehicle emissions are not expected to affect the residential areas as the tradewinds will direct dust in a southerly direction away from the residential communities. Periodic watering for dust control will further minimize the dust traveling towards the Interstate Route H-1.

Long-term air quality impacts will result from the continued use of the roadway by vehicular traffic. It is not anticipated that the roadway will increase the overall emission of carbon dioxide (CO2) as the roadway will transfer vehicles from one area to another (from south to north). Air quality impacts from vehicles traversing along Makakilo Drive will not be measurably lesser or greater than that currently exists. The new roadway will not, in and of itself, result in increased long-term air quality impacts such as increased 'greenhouse' gases that result in increase in global temperature rise.

The present ambient air quality in the project area is considered good due to the prevailing northeasterly tradewinds and the absence of "heavy" industries. The air quality is mostly affected by air pollutants from natural and/or vehicular sources. Natural sources include ocean spray, wind-blown dust, possible distant volcanic emissions from the Island of Hawai'i, vehicular emissions from motorists

traveling on Makakilo Drive, and industrial discharges from Campbell Industrial Park during 'Kona' winds.

The proposed project is not expected to have a significant impact on air quality. Construction activities may result in short-term air quality impacts from fugitive dust and equipment emissions. However, construction related impacts to air quality will be temporary and will cease when construction is completed.

Both federal and state standards have been established to maintain ambient air quality at healthy levels. At present, seven parameters are regulated including: particulate matter, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, ozone, and lead. In most cases, the State of Hawai'i's air quality standards are more stringent than the comparable federal limits.

State air pollution control regulations require that there be no visible fugitive dust emissions at the project boundary. Therefore, an effective dust control plan will be implemented by the project contractor to ensure compliance with state regulations. Fugitive dust emissions will be controlled to a large extent by watering of active work areas, using dust screens, keeping adjacent paved roads clean, and by covering open-bodied trucks. Exhaust emissions will be mitigated by ensuring that project contractors properly maintain their internal combustion engines and comply with DOH Rules Title 11, Chapter 59 and 60, regarding Air Pollution Control.

Due to the predicted minimal impact of the project, further mitigation of any potential long-term impacts is not anticipated to be required.

4.14 VISUAL RESOURCES

The proposed roadway is located on the southern slopes of the Wai'anae Mountain Range. The area is lightly vegetated with mostly introduced species. There are no tall trees. The predominant tree is the koa haole (*Leucaena leucocephala).* Views from the end of Makakilo Drive are panoramic and include views towards Interstate Route H-1, Pearl City, Aiea, Downtown and in the distance Diamond Head (see Figure 22).

Public views of the area where the roadway is proposed includes Kalo'i Gulch and Pu'u Makakilo.

Figure 23 and Figure 24 illustrates the view of the proposed roadway against the existing landscape. As previously stated, the roadway will be landscaped but not to the extent that the roadway will be obscured.

Potential Impacts and Mitigation

Short-term view impacts will include graded surfaces during initial earthwork. To mitigate this impact the land will be grassed as soon as practicable. In the long-term, the roadway will be a new visual element introduced into the landscape. To soften the view of the roadway, street trees will be planted. Because of the distance of the roadway from H-1, the panoramic views of the Wai'anae Mountain Range will not be significantly impacted. Further, the view of Pu'u Makakilo will similarly not be impacted.



Figure 22. Photo of Project Site from end of Makakilo Drive (View Southeast)

Figure 23. Aerial View, Northeast to Southwest Along the Proposed Roadway Alignment





Figure 24. Concept Illustration of Roadway (View Towards the Southwest)

4.15 SOCIO-ECONOMIC ENVIRONMENT AND DEMOGRAPHICS

In 2000, the Makakilo community represented approximately 1.5 percent (13,322 persons) of the entire population of Oʻahu; and 52.9 percent (25,158 persons) of the area represented by the Makakilo-Kapolei-Honokai Hale Neighborhood Board No. 34 in 2000 (see Appendix H).

The Neighborhood Board No. 34 area is represented as having the following demographic characteristics: (Dept. of Planning and Permitting)

- 3,946 households
- 3.37 persons per household
- 66.6 percent of the homes are owner occupied

- Ethnic Distribution
  - White 21.8%
  - Black 2.5%
  - American Indian 0.2%
  - Asian 39.1%
  - Native Hawaiian 8.8%
  - Other 1.4%

Additional characteristics of the Neighborhood Board No. 34 area include:

- 3.4 % of the population is unemployed (2000)
- 89% of workers in the area commute (drive) to work
- 5.8% use public transport to commute to work
- $64,560 median household income (1999)

Potential Impacts and Mitigation

The proposed roadway will not have a direct impact on the demographics of the area in the near term. The roadway may have the secondary impact of making the area much more desirable to live because of increased access into the community. No mitigation measures are planned for proposed.

4.16 ENVIRONMENTAL JUSTICE

In 1994, President Clinton signed Executive Order 12898 to demonstrate "fair treatment" as defined as meaning that "no groups of people, including racial, ethnic or socioeconomic groups, should bear a disproportionate share of negative environmental consequences from industrial, municipal, and commercial operations, or the execution of federal, state, local, and tribal programs and policies."

The Executive Order further directed efforts to prevent environmental racism under Title VI of the 1964 Civil Rights Act. Title VI prohibits discrimination on the basis of race, color or national origin. It also prohibits recipients of federal funds, including federal and state agencies, from discriminatory actions.

FHWA defined Environmental Justice (EJ) persons as anyone belonging to any of the following groups:

- **Black** - a person having origins in any of the black racial groups of Africa.
- **Hispanic** - a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.

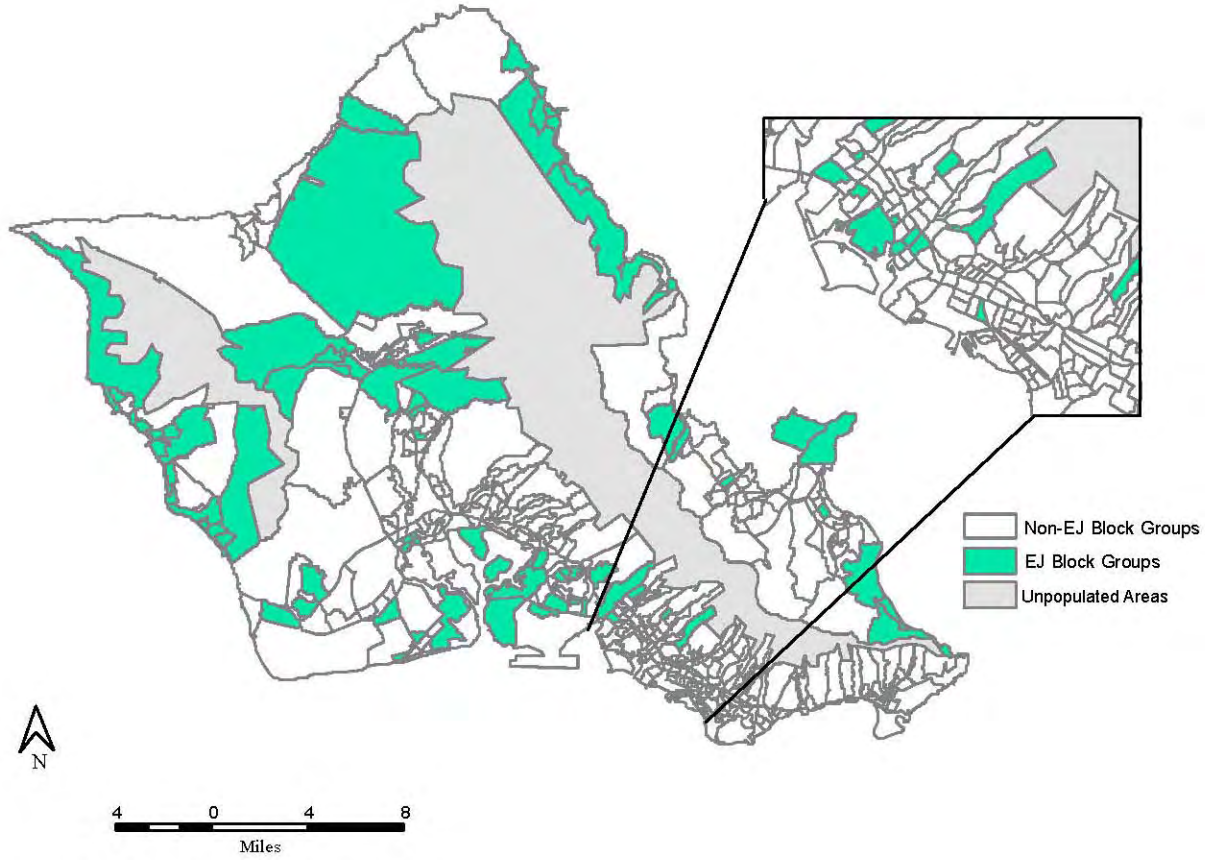
- **Asian** - a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent.
- **American Indian and Alaskan Native** - a person having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or community recognition.
- **Native Hawaiian or Other Pacific Islander** - a person having origins in any of the original peoples of Hawai'i, Guam, Samoa, or other Pacific Islands.
- **Low-Income** - a person whose household income (or in the case of a community or group, whose median household income) is at or below the U.S. Department of Health and Human Services poverty guidelines.

The following is a summary of findings from the 2004 O'ahu Metropolitan Planning Organization (OMPO) report titled "Environmental Justice in the OMPO Planning Process: Defining Environmental Justice Populations, March 2004."

"Between 2000 and 2004, the Hawai'i DOT Title VI Plan has also evolved, providing more direction for its sub-recipients to follow. The 2004 Hawai'i DOT Title VI Plan required that its sub-recipients collect, maintain, analyze, and use data for an expanded list of racial categories. Recognizing that about 75% of its population is comprised of the federally-defined minority populations, the Hawai'i DOT expanded two of the five racial categories to include Hawaiian/Part Hawaiian, Samoan, Japanese, Chinese, Filipino, Korean, Vietnamese, Other. The remaining three racial categories (African American, Hispanic, American Indian/Alaska Native) were kept as is, as part of the Hawai'i DOT policy for which data must be sought."

Figure 25 illustrates the locations of the EJ populations on O'ahu (OMPO, 2004).

Figure 25. Location of Environmental Justice Populations on O‘ahu (OMPO 2004)



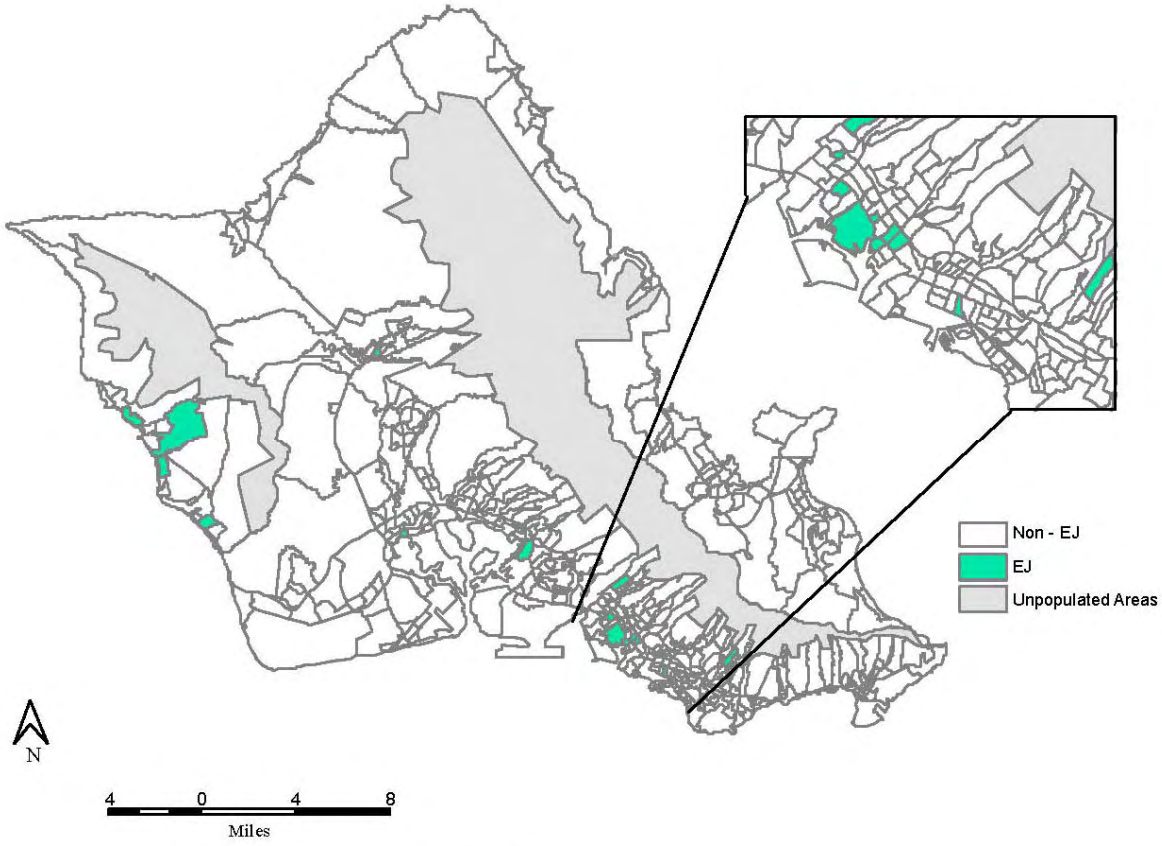
FHWA further defines “low-income” populations as persons who live in a household whose “income is at or below the Department of Health and Human Services (DHHS) poverty guidelines.” DHHS provides annual updates of the poverty guidelines that are used by the Census Bureau to calculate poverty. Table 6 provides the DHHS poverty guidelines for 1999. Note that during the 2000 Census, respondents were asked questions based on their income in the previous year, 1999. The location of the low income neighborhoods are shown in Figure 26 and further information on the nature of population in Table 7.

Table 6. DHHS 1999 Poverty Guidelines

Source: http://aspe.hhs.gov/poverty/99poverty.htm

Size of Family Unit	48 Contiguous States and D.C.	Alaska	Hawai'i
1	$ 8,240	$10,320	$ 9,490
2	11,060	13,840	12,730
3	13,880	17,360	15,970
4	16,700	20,880	19,210
5	19,520	24,400	22,450
6	22,340	27,920	25,690
7	25,160	31,440	28,930
8	27,980	34,960	32,170
For each additional person, add:	2,820	3,520	3,240

Figure 26. Low Income Neighborhoods on O'ahu (OMPO, 2004)



Source: 2000 US Census, City and County of Honolulu DPP

Potential Impacts and Mitigation

The proposed roadway is considered an improvement to regional transportation facilities and will benefit a large segment of the population. The decision to make this roadway improvement was not biased by race or income, rather, the decision was made based on the fact that the roadway will serve a mixed and diverse community. As part of the environmental review process, the DTS consulted with neighborhood groups, organizations and individuals prior to finalizing plans. Potential for adverse effect relating to EJ or Title VI populations are not anticipated or expected. No mitigative measures are proposed.

Table 7. EJ and Low Income Neighborhoods on O'ahu (OMPO 2006)

DP Area	Location	Block Group	Military	Poverty	POP	FHWA Minority	Selection Basis							Max Minority Pop	Max Minority Basis	FHWA Minority as % of POP	Selection Basis as % of	
							All	BLACK	AIAN	ASIAN	NHOPI	OTHER	HISP+				POP	Total
2	Ewa Gentry	84041			8669	6817	1207	462	0	0	0	0.0	745	745	6	78.6	13.9	1.8
2	Lanikai Hale	86091			1703	1059	281	0	0	0	0	0.0	281	281	6	62.2	16.5	0.4
2	Makakilo	86032			3565	2343	477	0	0	0	0	0.0	477	477	6	65.7	13.4	0.7
2	Makakilo	86042			1641	1243	284	0	0	0	0	0.0	284	284	6	75.7	17.3	0.4
3	Schofield Barracks	90009	1		2829	1207	989	616	0	0	0	0.0	373	616	1	42.7	35.0	1.5
3	Schofield Barracks	95019	1		3450	1664	1561	929	0	0	0	0.0	632	929	1	48.2	45.2	2.3
3	Schofield Barracks	95029	1		4035	1755	1556	875	0	0	0	0.0	681	875	1	43.5	38.6	2.3
3	Schofield Barracks	95039	1		2528	940	764	423	0	0	0	0.0	341	423	1	37.2	30.2	1.1
3	Schofield Barracks	95059	1		3429	1822	1694	1003	0	0	0	0.0	691	1003	1	53.1	49.4	2.5
3	Mililani - Nob Hill	89181			2017	1462	307	0	0	0	0	0.0	307	307	6	72.5	15.2	0.5
3	Mililani Mauka	89169			11181	8907	7175	0	0	7175	0	0.0	0	7175	3	79.7	64.2	10.7
3	Mililani-Kipapa	89079			2057	1569	320	0	0	0	0	0.0	320	320	6	76.3	15.6	0.5
3	Wahiawa - Makai	94001		1	2926	2500	1305	0	0	0	837	0.0	468	837	4	85.4	44.6	1.9
3	Wahiawa - Mauka	92001			2256	1774	355	0	0	0	0	0.0	355	355	6	78.6	15.7	0.5
3	Waipahu	87031			1010	894	573	0	0	0	573	0.0	0	573	4	88.5	56.7	0.9
3	Waipahu	87033			788	693	476	0	0	0	476	0.0	0	476	4	87.9	60.4	0.7
3	Waipahu	89141			2706	2360	740	0	0	0	740	0.0	0	740	4	87.2	27.3	1.1
3	Waipahu - Pupupuhi	87032		1	1627	1450	873	0	0	0	873	0.0	0	873	4	89.1	53.7	1.3
3	Waipio Acres	89151			2754	2328	354	0	0	0	0	0.0	354	354	6	84.5	12.9	0.5
5	Bellows Air Station	113011	1		3102	2383	1191	0	0	0	1191	0.0	0	1191	4	76.8	38.4	1.8
5	Kaneohe Marine Corps Base	108019	1		3906	1334	1139	485	42	0	0	0.0	612	612	6	34.2	29.2	1.7
5	Kaneohe Marine Corps Base	108029	1		7921	2848	2244	962	106	0	0	0.0	1176	1176	6	36.0	28.3	3.3
5	Ahuimanu	103051			3048	2406	402	0	0	0	0	0.0	402	402	6	78.9	13.2	0.6
5	Kahuhipa Apt/Industrial Area	105062			2981	2111	1202	0	0	0	810	0.0	392	810	4	70.8	40.3	1.8
5	Kailua (Ulupaina St.)	109051			2512	1565	38	0	38	0	0	0.0	0	38	2	62.3	1.5	0.1

Source: 2000 US Census, City and County of Honolulu DPP

4.17 SECTION 4(F) LANDS

The purpose of Section 4(f) of the Department of Transportation Act (49 U.S.C. 303 and 23 U.S.C. 138) is to preserve park land, recreation areas, wildlife refuges, and historic sites by limiting the circumstances under which such lands can be used for transportation programs or projects. Section 4(f) permits the use of land for a transportation project from a significant publicly owned park, recreation lands, wildlife or waterfowl refuge, or any significant historic site only when FHWA and the Federal Transit Administration (FTA) has determined that (1) there is no feasible and prudent

alternative to such use, and (2) the project includes all possible planning to minimize harm to the property resulting from such use.

Existing Conditions

Existing and planned land uses are shown in Figure 28 ʻEwa Development Plan Land Use Map. The area adjoining the proposed roadway to the northeast is predominantly single family residential. The land immediately east of the proposed roadway alignment is part of Kaloʻi Gulch. East of Kaloʻi Gulch is fallow agricultural land, formerly used for sugarcane production. Immediately to the west of the proposed roadway alignment is fallow agriculturally designated land. Further to the northwest is Puʻu Makakilo. To the southwest is the quarry operations of Grace Pacific.

Botanical and avi-faunal surveys were conducted along the proposed roadway alignment (Figure 2) and no listed threatened or endangered species were identified. The findings are discussed in detail in the Appendix.

An archaeological inventory survey was conducted and four sites associated with the Waiʻahole Ditch (irrigation system) and sugarcane operations were identified that were determined to be significant because of (a) the site reflects major trends or events in the history of the state or nation; (b) site is associated with the lives of persons significant in our past; (c) the site is an excellent example of a site type; and (d) the site may be likely to yield information important in prehistory or history.

During the preparation and evaluation of alternatives, alignments that directly impacted the ditch system were avoided. The selected alignment therefore does not impact the sites identified.

Consultation

The following agencies were consulted to ascertain if there were potential impacts to parks, recreation lands, wildlife or waterfowl refuge, or any significant historic site:

- State Department of Land and Natural Resources
    - Division of State Parks
    - Historic Preservation Division
- Office of Hawaiian Affairs
- National Park Service
- Department of Parks and Recreation, City and County of Honolulu

Based on the analysis of the preferred plan, it was concluded that no impacts to parks, recreation lands, wildlife or waterfowl refuges, or any significant historic sites are anticipated.

Potential Impacts and Mitigation

The proposed project does not impact parks, recreation lands, wildlife or waterfowl refuges, or any significant historic sites, and therefore, no mitigation is proposed.

4.18 PUBLIC FACILITIES AND SERVICES

4.18.1 FIRE, POLICE AND MEDICAL SERVICES

Fire protection service is provided through the Honolulu Fire Department's (HFD) Makakilo and Kapolei Fire Stations. Each fire station has one fire truck and is able to provide fire fighting, first response and medical services. Police protection services are provided by the Honolulu Police Department's (HPD) Kapolei Substation. The St. Francis Hospital-West is located approximately ten to fifteen minutes drive by car from Makakilo along Farrington Highway and provides health care services. Private health clinics are also located in Kapolei.

Potential Impacts and Mitigation

The proposed project is not expected to have an adverse impact on fire, police and medical services. The proposed roadway will have the additional benefit of providing an alternative transportation route for emergency vehicles and equipment requiring access to the Makakilo community.

4.18.2 POTABLE WATER

The Honolulu Board of Water Supply (BWS) does not have waterlines crossing or parallel to the proposed roadway. Water service is provided to the subdivision at the current terminus of Makakilo Drive. A waterline will be installed for irrigation purposes within the proposed roadway right-of-way. The University of Hawai'i has proposed the installation of a distribution main within the roadway ROW for its development. Coordination with the UH will be initiated during the design phase of this project to facilitate the inclusion of a water distribution main in the roadway ROW.

Potential Impacts and Mitigation

The proposed project is not expected to have an adverse impact on water service in the area. An increase in water consumption will result from the project due to dust control measure during construction and from irrigation water used for the landscaping. To the extent feasible, drought tolerant plants will be used for landscaping to minimize water use.

4.18.3 ELECTRICITY, CABLE AND TELEPHONE UTILITIES

A preliminary inventory of power and telecommunications facilities within the project sites did not reveal any facilities. Existing services are confined to the Makakilo community.

Potential Impacts and Mitigation

The proposed roadway will have provision for street lights. Power is anticipated to be acquired from the terminus of the existing Makakilo Drive. It is proposed that power lines be placed underground.

4.18.4 PEDESTRIAN AND BICYCLE ACCESS

Makakilo Drive provides the primary transportation corridor in the area and is the only direct route used daily by local residents, commuters, and visitors. Though traffic on Makakilo Drive consists primarily of automobiles and buses, area residents also transit the route on foot, and bicycle. To safely accommodate pedestrian and bicycle traffic, the proposed roadway will provide two five-foot wide sidewalks, and bike lanes.

Potential Impacts and Mitigation

Because there is currently no pedestrian access in the project area, no impacts are anticipated to pedestrian and bicycle traffic. Barriers and signs will be erected at the end of Makakilo Drive to warn pedestrians and bicyclists from entering the project area during construction. Through the provision of sidewalks and bike lanes, the new roadway will provide a safe means for pedestrian movement.

4.19 HAZARDOUS WASTES AND MATERIALS

Kauai Environmental Inc. performed a Phase I Environmental Site Assessment (ESA) for the properties along the proposed route of the Makakilo Drive Roadway Extension, a new section of Makakilo Drive which will connect the existing Makakilo Drive to the

North-South Road Interchange (see Appendix A). The proposed alignment will traverse portions of one or more of the following properties TMK Nos. (1) 9-2- 002: Parcel 006 and (1) 9-2-003: Parcels 074 and 079.

The ESA report covers those sections of these properties that are affected by the proposed alignment. While the roadway extension will only be constructed on a small portion of the referenced parcels, the entire area defined as the proposed roadway extension corridor, was evaluated in order to assess the impact of the different possible routes for the project.

The ESA was conducted in conformance with the 2000 ASTM Standard for Phase 1 Environmental Site Assessments to determine whether conditions or situations on the properties in question might result in real or potential hazards, or environmental liabilities that might impact or complicate construction of the roadway extension (see Appendix A). Specific items investigated included: present and historical uses of the subject properties and adjacent properties; signs of gross surface contamination; the presence of hazardous materials and wastes; above ground and underground storage tanks (ASTs and USTs), and other indications of the presence of chemical contamination.

A review of State and Federal environmental regulatory databases indicated the following:

- No sites listed by the U.S. EPA on the National Priorities List (NPL) (Superfund) or delisted NPL databases were identified within the recommended search distances from the proposed roadway extension corridor.
- No Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) sites were identified within the recommended search distance from the proposed roadway extension corridor.
- No Resource Conservation and Recovery Act (RCRA) corrective action sites or treatment, storage, and disposal facilities were identified within the recommended search distances from the proposed roadway extension corridor.
- No RCRA hazardous waste generators were identified within the recommended search distance from the proposed roadway extension corridor.
- No state-recognized hazardous waste sites were identified within one mile of the proposed roadway extension corridor.
- No registered underground storage tank (UST) sites were identified within the recommended search distance from the proposed roadway extension corridor.
- One leaking underground storage tank (LUST) site was identified within the recommended search distance from the proposed roadway extension corridor,

No impact to the subject properties is anticipated due to the distance to this site of over a quarter mile, and the fact that a site clean-up has been completed. No active landfills were identified within the recommended search distance from the proposed roadway extension corridor,

There have been no spill incidents connected with the subject properties that were reported to the Hazard Evaluation and Emergency Response (HEER) office or entered on the Emergency Response and Notification System (ERNS) database.

- No Brown fields sites, or sites with institutional or engineering controls, were identified within the recommended search distances from the proposed roadway extension corridor.

A review of relevant State and Federal databases did not identify any institutional controls, engineering controls, or activity and use limitations associated with the subject properties or adjacent properties. A site reconnaissance at the subject properties was performed on April 7, 2008. The environmental issues identified during this inspection are listed below.

- Extensive erosion was evident in areas that were landscaped and graded as part of the former golf course on the site. It appears that much of the eroding material was imported fill. While this material may have been brought in from the nearby quarries, the source of the material is unknown.

A review of historical land use information including aerial photographs, historical topographic maps, and interviews with persons familiar with the history of the property has indicated the following:

- The subject property has been largely undeveloped.
- Possible historical uses of the property included cattle ranching and limited agricultural production.
- Palehua Road, which runs through the property, was originally an unpaved road dating back to at least the 1960s. The roadway was paved to facilitate the delivery of raw materials to the Makakilo subdivision from the quarries nearby.
- A portion of the subject property was previously developed as a golf course, which has since been abandoned and has fallen into neglect. Potential environmental concerns related to this abandoned golf course include the use of imported fill materials and the possibility of residual contamination associated with chemicals or petroleum products that may have been stored and used at the golf course for maintenance purposes. Whether or not the golf course had a

functional maintenance facility is unknown, as is the location of any such facility. Neither of these issues are considered to be recognized environmental conditions.

In summary, no recognized environmental conditions or historical recognized environmental conditions have been identified in association with the subject properties during the process of completing the Phase 1 Environmental Site Assessment.

4.20 RECREATIONAL FACILITIES

There are no recreation facilities within the project study corridor. Because the majority of the land in the area is privately owned, public access is limited. On occasion it has been observed that residents in the adjoining subdivisions cross over the road barriers to walk. The prominent destination is Pu'u Makakilo. Once the roadway is built, public access will be provided along the roadway via sidewalks and a bike route that will connect the Makakilo community and Kapolei.

Formal recreation space is provided at the Makakilo Community Park in the community which has hard courts, play fields, and classroom-meeting rooms. Additional recreation spaces are provided at the Makakilo Elementary School.

Potential Impacts and Mitigation

No impacts to existing recreation facilities are anticipated. The roadway will provide pedestrian and bicycle access to lands that are currently privately held.

4.21 SOLID WASTE

Construction debris from the project site will disposed of by the construction contractor or via a private company. The collected waste will be disposed at the City and County of Honolulu's garbage-to-energy plant or at the Waimanalo Gulch Sanitary Landfill or at a private facility depending on the composition of the waste. Based on a study of past uses of the site it is not anticipated that any hazardous material will need to be disposed. Construction debris (unused material), rocks and aggregate will be re-used on-site to the extent feasible. Items that cannot be re-used will be disposed at a private landfill.

Potential Impacts and Mitigation

No impacts are anticipated. Construction debris, to the extent feasible, will be re-used on the project site rather than transporting it to a landfill. All other construction debris will be disposed off at an approved landfill.

4.22 RELOCATION-DISPLACEMENT IMPACTS

The proposed roadway right-of-way will require the acquisition from the current landowners. Compensation to the landowners for the land will be determined by appraisal. The roadway, however, is away from any developed areas and therefore no displacement or relocation is required.

Potential Impacts and Mitigation

No relocation or dislocation impacts are anticipated resulting from the roadway project, and no mitigation is proposed. In order to provide for further development adjacent to the roadway, access points have been identified based on discussions with the landowners. The access points identified have been considered in the geometric planning of the roadway and includes consideration for safety and topography. The intersections, however, will need to be developed by the landowners.

SECTION 5
CULTURAL ASSESSMENT, POTENTIAL IMPACTS AND MITIGATIVE MEASURES

5.1 AREA OVERVIEW

Cultural Surveys Hawai'i, Inc. (CSH) prepared a Cultural Impact Assessment (CIA) for the approximately 23-acre Makakilo Drive Extension Project, Honouliuli Ahupua'a, 'Ewa District, O'ahu (TMK [1] 9-2-002: 006 & 9-2-003:079) (see Appendix F). The project area studied by CSH is approximately 3,300 feet long by 300 feet wide (i.e., approximately 23 acres), extending from the end of the existing Makakilo Drive to the proposed North-South Road interchange with Interstate Route H-1. The study area consists of the south-southeastern portion of the Kalo'i Gulch floodplain. Kalo'i Stream channel runs from the central portion of the project area to the northeast. The southern face of Kalo'i Gulch is at the central portion of the project area, and the base of the northeastern slope of Pu'u Makakilo is at the southwestern portion of the study area. Old Palehua Road enters the study area from its eastern side, splits into Quarry Road heading south, and continues to the southwest section of the study area. Old Palehua Road is poorly maintained and in substandard condition compared with the Quarry Road section. As the well-maintained part of Old Palehua Road runs from the easternmost section of the study area, it continues south-southwest, where it becomes Quarry Road. There were four alignment alternatives proposed for the new roadway within the study area, one of which will be constructed upon determination by planners and developers.

The study area is privately owned by D.R. Horton – Schuler Homes LLC, Castle & Cooke Homes Hawai'i, Inc., Grace Pacific, and the State of Hawai'i. Minimally, land-disturbing activities will include grubbing, grading and excavation for subsurface utilities and associated infrastructure improvements.

The scope of work for the CIA included:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. A review of previous archaeological work at and near the study parcel that may be relevant to reconstructions of traditional land use activities; and to the

identification and description of cultural resources, practices, and beliefs associated with the parcel.

3. Consultation and interviews with knowledgeable parties regarding traditional cultural practices at or near the study area; present uses of the study area; and / or other (non-Hawaiian) practices, uses, or traditions associated with the study area.
4. Preparation of a report summarizing the results of these research activities.

Historical documents, maps and existing archaeological information pertaining to the sites in the vicinity of this project were researched at the CSH library. Information on Land Commission Awards was accessed through Waihona ʻAina Corporation's Mahele Data Base (www.waihona.com). The SHPD, Office of Hawaiian Affairs (OHA), Oʻahu Island Burial Council (OIBC), and other community and cultural organizations in the Kapolei/Makakilo area were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the study area and the surrounding vicinity. The names of potential community contacts were also provided by colleagues at CSH and from the authors' familiarity with people who live in or around the project area. The cultural specialist conducting research on this assessment employed snowball and judgment sampling methods, an informed consent process and semi-structured interviews according to standard ethnographic methods (as suggested by Bernard 2005). Some of the prospective community contacts were not available to be interviewed as part of this project.

Hawaiian organizations, agencies and community members were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the study area and the vicinity. The organizations consulted included the SHPD, OHA, OIBC, Hui Malama I Nā Kupuna o Hawaiʻi Nei, ʻAhahui Siwila Hawaiʻi o Kapolei Hawaiian Civic Club and the Makakilo/Kapolei Neighborhood Board.

Background research yielded the following relevant information:

(1) The study area is located in the Kaloʻi Gulch floodplain, which includes the Kaloʻi Stream channel. Kaloʻi, which translates as "the taro patch," was a well-known place of Native Hawaiian activity from before the historic era. Given the physiographic location and characteristics of the study area, it is unlikely to have ever been a place of permanent Hawaiian settlement; however, the presence of several small fresh-water springs in the general gulch system, as described in historic accounts, suggests Hawaiians used at least portions of the study area as gardening sites.

(2) The study area also contains remnants of one or more old Hawaiian trails.

(3) Given its location within Honouliuli Ahupua'a, the study area is generally associated with a wide variety and extensive number of *mo'olelo* (oral histories), including legends, mythological accounts, stories, parables and sayings; these include, for example, the exploits of gods and demi-gods such as Kane, Kanaloa, Maui, Kamapua'a (the pig god), Maunauna (the shark deity), Ka'ahupahau, and the hero Palila. There are several references associated with Honouliuli to chiefly lineages and to the ruling chiefs Hilo-a-Lakapu and Kuali'i.

(4) The study area is also closely associated with commercial sugar cane agriculture on O'ahu; in particular, the study area retains archaeological features related to water-management and transport facilities, including the famous Waiahole Ditch.

A total of 23 individuals were contacted for the CIA; 14 did not respond; four provided referrals to other individuals; and five participated in formal "talk story" interviews. Community consultation yielded the following cultural concerns:

(1) Several participants are very concerned about one or more trails crossing through the subject project area; at least one of the trails is perceived to be an old Hawaiian trail dating from early historic or perhaps even pre-Contact times. Mr. Shad Kane, in particular, stressed that this trail should not be sacrificed or physically compromised to make way for the proposed project.

(2) Several participants talked about a wide variety of "ghost stories" and unexplained phenomena either experienced personally or related by others in old stories dealing with the general vicinity of the study area, and extending to much of the entire *ahupua'a* of Honouliuli.

(3) Some participants stressed the importance of not losing any additional Hawaiian features of the landscape, such as trails, to development in and around the project area, which has experienced substantial losses in historic and more recent times.

(4) One participant talked about the cultural significance of *wiliwili* trees (*Erythrina sandwicensis*), which are closely associated with "*ao kuewa*," a kind of Hawaiian purgatory.

5.2 POTENTIAL IMPACTS AND MITIGATION

Based on all available information, including background research and community consultation, CSH recommends the following measures, which, if addressed in a good faith manner, will help mitigate the potentially adverse effects of the proposed project:

(1) The old Hawaiian trail depicted in the CIA Report, and described by several participants in this CIA, should be preserved and protected from potential harm during project construction. Preservation and protection of this trail may require a formal preservation plan with additional fieldwork directed towards obtaining accurate GPS data to adequately mark and flag the feature during construction. (Editor's Note: The trail in question is located to the east of the proposed roadway alignment and within Kaloʻi Gulch and therefore will not be impacted by the roadway.)

(2) All Native Hawaiian trees, including *wiliwili* and *ʻiliahi* (sandalwood, *Santalum ellipticum*) should be preserved within the project area in perpetuity, and protected from harm during construction. (Editor's Note: During the botanical survey conducted, no wiliwili or ʻiliahi trees identified by the informants were observed.)

(3) Cultural monitoring of the two aforementioned items (i.e., trail and native tree protection) should be conducted by qualified and interested individuals or organizations such as the participants in the "talk story" interviews included above.

(4) Consultation with the organizations, agencies and individuals listed in the CIA should continue throughout the project, including any future alterations or updated proposals.

(5) DTS will continue to make efforts to follow and implement the mitigation measures suggested in the CIA report.

SECTION 6
POLICIES AND PLANS

6.1 STATE OF HAWAI'I

6.1.1 STATE LAND USE COMMISSION (CHAPTER 205-2, HRS)

Chapter 205, Hawai'i Revised Statutes (HRS), relating to the Land Use Commission, establishes the four (4) major land use districts in which all lands in the State are placed: Urban, Rural, Agricultural, and Conservation. Criteria for these land use designations are cited below. The proposed roadway will traverse land that is designated Agriculture (see Figure 27).

Chapter 205, HRS, Districting and classification of lands.

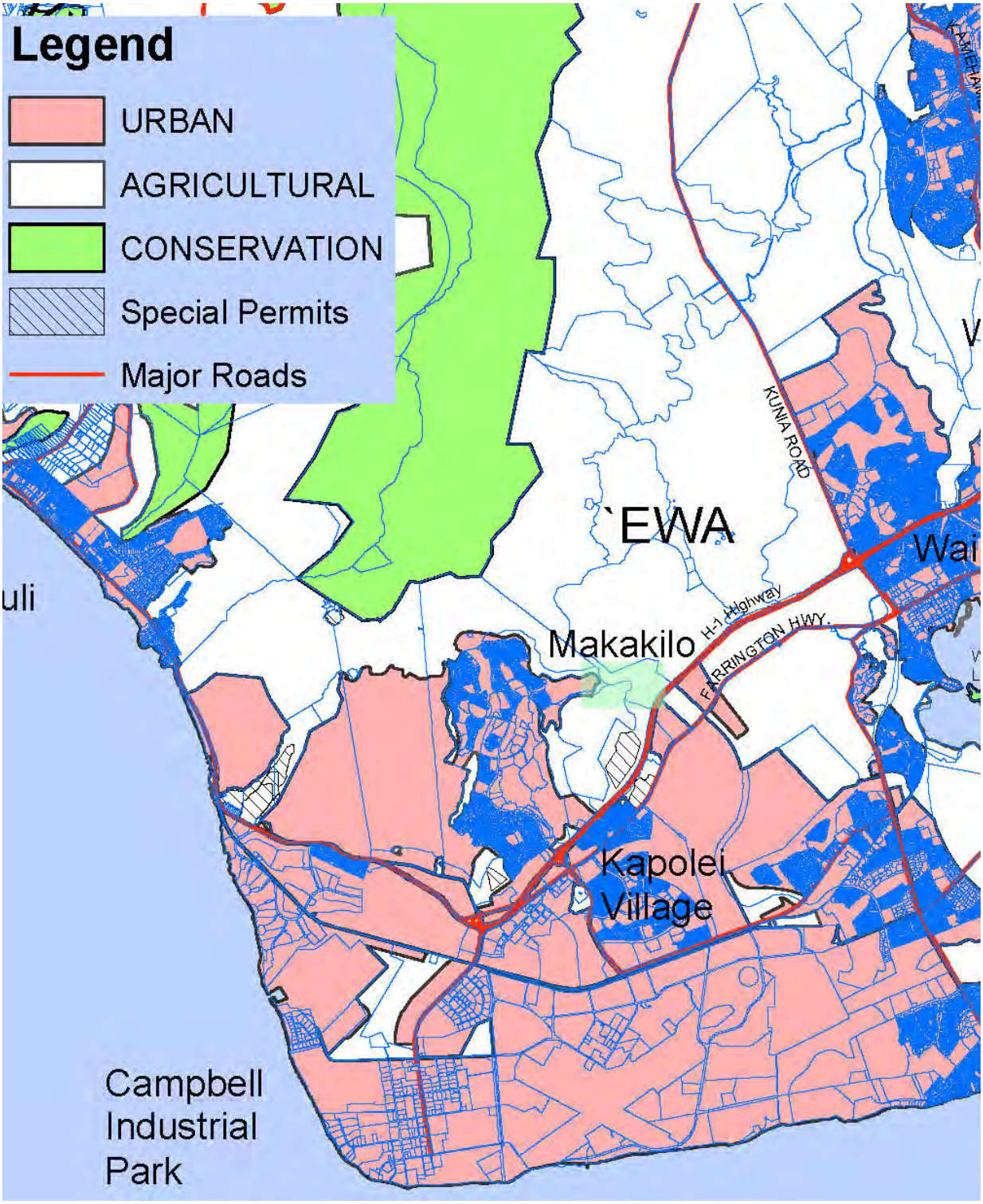
(a) There shall be four major land use districts in which all lands in the State shall be placed: urban, rural, agricultural, and conservation. The land use commission shall group contiguous land areas suitable for inclusion in one of these four major districts. The commission shall set standards for determining the boundaries of each district, provided that:

(1) In the establishment of boundaries of urban districts those lands that are now in urban use and a sufficient reserve area for foreseeable urban growth shall be included;

(2) In the establishment of boundaries for rural districts, areas of land composed primarily of small farms mixed with very low density residential lots, which may be shown by a minimum density of not more than one house per one-half acre and a minimum lot size of not less than one-half acre shall be included, except as herein provided;

(3) In the establishment of the boundaries of agricultural districts the greatest possible protection shall be given to those lands with a high capacity for intensive cultivation; and

Figure 27. State Land Use Map



(4) In the establishment of the boundaries of conservation districts, the "forest and water reserve zones" provided in Act 234, section 2, Session Laws of Hawai'i 1957, are renamed "conservation districts" and, effective as of July 11, 1961, the boundaries of the forest and water reserve zones theretofore established pursuant to Act 234, section 2, Session Laws of Hawai'i 1957, shall constitute the boundaries of the conservation districts; provided that thereafter the power to determine the boundaries of the conservation districts shall be in the commission.

In establishing the boundaries of the districts in each county, the commission shall give consideration to the master plan or general plan of the county.

(b) Urban districts shall include activities or uses as provided by ordinances or regulations of the county within which the urban district is situated.

(c) Rural districts shall include activities or uses as characterized by low density residential lots of not more than one dwelling house per one-half acre, except as provided by county ordinance pursuant to section 46-4(c), in areas where "city-like" concentration of people, structures, streets, and urban level of services are absent, and where small farms are intermixed with low density residential lots except that within a subdivision, as defined in section 484-1, the commission for good cause may allow one lot of less than one-half acre, but not less than 18,500 square feet, or an equivalent residential density, within a rural subdivision and permit the construction of one dwelling on such lot, provided that all other dwellings in the subdivision shall have a minimum lot size of one-half acre or 21,780 square feet. Such petition for variance may be processed under the special permit procedure. These districts may include contiguous areas which are not suited to low density residential lots or small farms by reason of topography, soils, and other related characteristics.

(d) Agricultural districts shall include activities or uses as characterized by the cultivation of crops, orchards, forage, and forestry; farming activities or uses related to animal husbandry, aquaculture, and game and fish propagation; aquaculture, which means the production of aquatic plant and animal life for food and fiber within ponds and other bodies of water; wind generated energy production for public, private, and commercial use; bona fide agricultural services and uses which support the agricultural activities of the fee or leasehold owner of the property and accessory to any of the above

activities, whether or not conducted on the same premises as the agricultural activities to which they are accessory, including but not limited to farm dwellings as defined in section 205-4.5(a)(4), employee housing, farm buildings, mills, storage facilities, processing facilities, vehicle and equipment storage areas, and roadside stands for the sale of products grown on the premises; wind machines and wind farms; small-scale meteorological, air quality, noise, and other scientific and environmental data collection and monitoring facilities occupying less than one-half acre of land, provided that such facilities shall not be used as or equipped for use as living quarters or dwellings; agricultural parks; and open area recreational facilities, including golf courses and golf driving ranges; provided that they are not located within agricultural district lands with soil classified by the land study bureau's detailed land classification as overall (master) productivity rating class A or B.

These districts may include areas which are not used for, or which are not suited to, agricultural and ancillary activities by reason of topography, soils, and other related characteristics.

Discussion:

The proposed roadway alignment does not require changing the existing State Land Use designations as the current Agricultural designation is compatible with the proposed roadway.

6.1.2 HAWAIʻI STATEWIDE TRANSPORTATION PLAN (SEPTEMBER 2002)

The Hawai'i Statewide Transportation Plan (HSTP) provides transportation professionals and decision makers with a framework to be used in the planning of Hawai'i's transportation system. Integral to the plan's development was an extensive public involvement and outreach effort that included a broad and diverse range of participants. The plan was a product of collaboration with the modal divisions of the SDOT and its County partners. A detailed research effort was also conducted to ensure that all technical issues associated with the plan were fully analyzed and considered, and that applicable federal and state regulations were satisfied.

The primary purposes and utility of the HSTP are:

- To establish a framework for the development, integrated management, and operation of Hawai'i's multi-modal transportation systems, programs, and facilities.
- To provide a foundation and identify the parameters within which the search for solutions can begin.

The stated mission of the HSTP is "To provide for the safe, economic, efficient, and convenient movement of people and goods."

The goals of the HSTP are:

GOAL I: Achieve an integrated multi-modal transportation system that provides mobility and accessibility for people and goods.

GOAL II: Ensure the safety and security of the air, land, and water transportation systems.

GOAL III: Protect and enhance Hawai'i's unique environment and improve the quality of life.

GOAL IV: Support Hawai'i's economic vitality.

GOAL V: Implement a statewide planning process that is comprehensive, cooperative, and continuing.

Discussion:

The proposed roadway plan does not require changing or amending the existing Statewide Transportation Plan as the proposed roadway project is compatible with and supported by the current goals and objectives of the Plan.

6.2 FEDERAL

6.2.1 CLEAN WATER ACT (CWA) SECTIONS 401, 402, AND 404

Kalo'i Gulch, an intermittent drainage course, currently receives stormwater from the Makakilo Community and passes it under Interstate Route H-1. Section 401 (CWA) affirms that "States can review and approve, condition, or deny all Federal permits or licenses that might result in a discharge to State waters, including wetlands. States and Tribes make their decisions to deny, certify, or condition permits or licenses primarily by ensuring the activity will comply with State water quality standards." Activities regulated by Section 401 (CWA) are currently administered by the Clean Water Branch (CWB) of the State Department of Health (DOH).

Section 402 (CWA) regulates discharges as part of the National Pollutant Discharge Elimination System (NPDES) permits. The CWB-DOH administers the provision of the Section 402. Section 11-55, Hawai'i Administrative Rules (HAR) will be used to guide the preparation of stormwater discharges from the project site.

Section 404 (CWA) requires a permit before dredge or fill material may be discharged into waters of the United States including wetlands. The U.S. Army Corps of Engineers will be consulted to determine if the proposed project within the Kalo'i Gulch is regulated according to Section 404, CWA.

Discussion:

The proposed roadway project is not anticipated to trigger the jurisdictional regulations of a Section 401 and 404 of the CWA based on prior project within the Kalo'i Gulch drainageway including the Kapolei Parkway and North-South Road. The area of the project will exceed the use of an area of land greater than 1-acre. This will require the filing of a NPDES construction Stormwater Permit application with the DOH-CWB prior to the start of construction.

6.2.2 DEPARTMENT OF TRANSPORTATION SECTION 4(F)

Section 4(f) of the U.S. Department of Transportation Act of 1966, codified in Federal law at 49 USC §303, declares that "it is the policy of the United States Government that special effort should be made to preserve the natural beauty of the countryside and public parks and recreation lands, wildlife and waterfowl refuges, and historic sites." Section 4(f) specifies that "[t]he Secretary [of Transportation] may approve a transportation program or project requiring the use of publicly owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State, or local significance, or land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, refuge, or site) only if:

"(1) There is no prudent and feasible alternative to using that land; and

(2) The program or project includes all possible planning to minimize harm to the park, recreation area, wildlife and waterfowl refuge, or historic site resulting from the use."

Section 4(f) further requires consultation with the U.S. Department of the Interior and, as appropriate, the involved offices of the U.S. Departments of Agriculture and Housing and Urban Development in developing transportation projects and programs, which use land protected by section 4(f).

In general, a section 4(f) "use" occurs with a DOT-approved project or program when:

> "1) section 4(f) land is permanently incorporated into a transportation facility;
> 2) when there is a temporary occupancy of section 4(f) land that is adverse in term of the section 4(f) preservationist purposes as determined by specified criteria (23 CFR §771.135[p][7]); and
> 3) when section 4(f) land is not incorporated into the transportation project, but the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under section 4(f) are substantially impaired (constructive use) (23 CFR § 771.135(p)(1) and (2))."

Discussion:

In order to ascertain if land that fall within the objectives of Section 4f are impacted, the following agencies were consulted: Fish and Wildlife Service, State Historic Preservation Division, State Division of State Parks, Office of Hawaiian Affairs, National Park Services, Hawaiian Railway Society, and the Makakilo-Kapolei Neighborhood Board. Each agency was provided with a project summary, a location map, a map of the proposed roadway alignment, and the typical roadway section. Each agency was asked to respond within 30 days from October 7, 2008. The Fish and Wildlife Service responded as follows: "To the best of our knowledge, no federal listed or proposed threatened or endangered species, or proposed of designated critical habitats occur within the proposed project footprint."

Based on the analysis conducted for this project, the proposed roadway plan does not impact any uses identified in Section 4(f), and therefore no mitigation is required.

6.2.3 ENDANGERED SPECIES ACT

The purpose of the Endangered Species Act (ESA) of 1973, is to protect and conserve ecosystems upon which endangered and threatened species are dependant, and to provide for the conservation of endangered and threatened species. The ESA is

administered by the U.S. Department of Interior through the Fish and Wildlife Service and the U.S. Department of Commerce through the National Marine Fisheries Service, National Oceanic and Atmospheric Administration.

Discussion:

In order to ascertain if land that fall within the objectives of Section 7 of the Endangered Species Act are impacted, the following agencies were consulted: Fish and Wildlife Service, State Division of Forestry and Wildlife, Outdoor Circle, James Campbell Company, and National Marine Fisheries Service. Each agency was provided with a project summary, a location map, a map of the proposed roadway alignment, the typical roadway section, and a copy of the botanical (Appendix D) and avifaunal (Appendix E) studies conducted for this document. Each agency was asked to respond within 30 days from October 6, 2008. The Fish and Wildlife Service responded as follows: "To the best of our knowledge, no federal listed or proposed threatened or endangered species, or proposed of designated critical habitats occur within the proposed project footprint." Comments were also received from the Office of Hawaiian Affairs were they noted: "In addition, OHA recommends that the applicant use native vegetation in its landscaping plans' for the project site, particularly the native plants that are currently found in the area, such as 'a'ali'i, 'ilima, popolo and 'uhaloa. We ask that, where possible, the populations of 'iliahialo'e, or coastal sandalwood trees (*Santalum ellipticum*), be protected. OHA would also like to see the replanting of 'iliahialo'e, either in the landscaping plans or in the general project site, as a large number of them were removed from a nearby area to accommodate a housing development. Landscaping with native plants furthers the traditional Hawaiian concept of malama 'aina and creates a more Hawaiian sense of place. Moreover, the native plants of this area are best suited for the climate of the region, and as such would not require much additional care."

Based on the analysis conducted for this project, the proposed roadway plan does not impact any uses identified in Section 7, and therefore no mitigation is required.

6.2.4 NATIONAL HISTORIC PRESERVATION ACT SECTION 106

The National Historic Preservation Act (NHPA) became law in 1966, and was last amended in 2000. The NHPA requires government agencies to evaluate the impact of government funded construction projects through a process known as the Section 106

Review. The goal of the process is to identify historic properties potentially affected by the proposed project, assess its impacts and seek ways to minimize or mitigate adverse effects. The NHPA is administered by the U.S. Department of Interior, National Park Service and the Advisory Council on Historic Preservation (ACHP). At the State level, the NHPA is implemented by the State Historic Preservation Officer.

The use of Federal funds and the requirement of Federal permits for the project triggers the need for National Historic Preservation Act (NHPA), Section 106 compliance. The purpose of the NHPA Section 106 review process is to evaluate the potential for effects on existing historic sites, if any, resulting from the project.

The NHPA Section 106 review process encompasses a "good faith effort" in ascertaining the existence and location of historic properties near and within the project site, establishing an Area of Potential Effect (APE) of the project, identifying whether a potential for "adverse effects" on historic properties by the project exists, and developing a reasonable and acceptable resolution in the monitoring and treatment of any historic sites that is agreed upon by the DTS and consulted government agencies, community associations, and native Hawaiian organizations. The APE of the project is an area approximately 150 feet offset from the proposed roadway right-of-way.

"Historic properties are properties that are included in the *National Register of Historic Places* or that meet the criteria for the National Register (ACHP, 2008)." Public involvement is a key ingredient in successful Section 106 consultation, and the views of the public should be solicited and considered throughout the process.

As part of the planning process the Area of Potential Effect (APE) was defined as the study corridor being approximately 300 feet wide by 4,500 feet long encompassing approximately 31 acres. As summarized in Section 4.11 an inventory of the APE was conducted to determine if any historic properties would be impacted. The survey identified four (4) sites with features that made them eligible for nomination as a historic site (see Appendix C). Based on an evaluation of the proposed alignment and the location of the identified historic sites it was determined that none of the sites located will be impacted by the proposed roadway alignment.

During the survey phase of the project, 23 individuals and groups were identified who may have an interest in the project and the potential impact it may have on traditional cultural practices. Hawaiian organizations, agencies and community members were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the study area and the vicinity. The organizations consulted included the SHPD, OHA, OIBC, Hui Malama I Na Kupuna o Hawai'i Nei, 'Ahahui Siwila Hawai'i o Kapolei Hawaiian Civic Club, Mr. Shad Kane, and the

Makakilo-Kapolei Neighborhood Board. Appendix F summarized the findings of this investigation. The study did not uncover any individual or group with a direct interest in the study area. While stories and lore about the area were revealed, it was noted that the proposed roadway will not impact a specific location as the stories were referenced of the general "area." The trail identified by Mr. Kane will also not be impacted by the proposed roadway.

Discussion:

The proposed roadway does not impact any historic properties or traditional cultural practices and no mitigation is required. In the event that historic or cultural features are found during construction, work in the area shall cease, and the State Historic Preservation Division notified.

6.2.5 COASTAL ZONE MANAGEMENT

The Coastal Zone Management Act (CZMA), enacted in 1972, provides states with financial incentives for the development and implementation of coastal zone management practices, and limited review power over federal actions affecting the state's coastal zone. The CZMA requires federally assisted actions, including federally-funded state and local government projects, be consistent with Hawai'i's CZM Program objectives and policies. The national CZM program is administered by the Office of Ocean and Coastal Resources Management (OCRM), an office within the National Oceanic and Atmospheric Administration, under the U.S. Department of Commerce. Provision of the CZMA is administer by the Hawai'i State Office of Planning. Administrative authority is defined by Chapter 205A, Hawai'i Revised Statutes.

Discussion:

The proposed roadway is under the jurisdiction of the CZMA, however, no coastal resources will be impacted and, therefore no mitigation is required.

6.2.6 SECTION 6 LAND AND WATER CONSERVATION FUND (LWCF) CONSULTATION

Section 6(f)(3) of the LWCF Act (36 CRF 59.3) is the cornerstone of Federal compliance efforts to ensure that the Federal investments in LWCF assistance are being maintained in public outdoor recreation use. This section of the Act assures that once an area has been funded with LWCF assistance, it is continually maintained in public recreation use

unless National Park Service approves substitution property of reasonably equivalent usefulness and location and of at least equal fair market value (NPS, 2008). The NPS established the following criteria for the conversion of public outdoor space funded by LWCF:

> *Requests from the project sponsor for permission to convert LWCF assisted properties in whole or in part to other than public outdoor recreation uses must be submitted by the State Liaison Officer to the appropriate NPS Regional Director in writing. NPS will consider conversion requests if the following prerequisites have been met: (NPS, 2008)*
>
> *(1) All practical alternatives to the proposed conversion have been evaluated.*
>
> *(2) The fair market value of the property to be converted has been established and the property proposed for substitution is of at least equal fair market value as established by an approved appraisal (prepared in accordance with uniform Federal appraisal standards) excluding the value of structures or facilities that will not serve a recreation purpose.*
>
> *(3) The property proposed for replacement is of reasonably equivalent usefulness and location as that being converted. Dependent upon the situation and at the discretion of the Regional Director, the replacement property need not provide identical recreation experiences or be located at the same site, provided it is in a reasonably equivalent location. Generally, the replacement property should be administered by the same political jurisdiction as the converted property. NPS will consider State requests to change the project sponsor when it is determined that a different political jurisdiction can better carry out the objectives of the original project agreement.*
>
> *Equivalent usefulness and location will be determined based on the following criteria:*
>
> > *(i) Property to be converted must be evaluated in order to determine what recreation needs are being fulfilled by the facilities which exist and the types of outdoor recreation resources and opportunities available. The property being proposed for substitution must then be evaluated in a similar manner to determine if it will meet recreation needs which are at least like in magnitude and impact to the user community as the converted site (NPS, 2008).“*

This criterion is applicable in the consideration of all conversion requests with the exception of those where wetlands are proposed as replacement property. (NPS, 2008).

Discussion:

In order to ascertain if land that fall within the objectives of Section 6 of the Land and Water Conservation Fund are impacted, the following agencies were consulted: State Division of State Parks, Department of Parks and Recreation, and the National Park Service. Each agency was provided with a project summary, a location map, a map of the proposed roadway alignment, the typical roadway section. None of the agencies consulted responded to inquiries. The proposed roadway was determined not to impact resources funded by the LWCF, and therefore no mitigation is required.

6.2.7 ENVIRONMENTAL JUSTICE

In 1994, President Clinton signed Executive Order 12898 to demonstrate "fair treatment" meaning that "no groups of people, including racial, ethnic or socioeconomic groups, should bear a disproportionate share of negative environmental consequences from industrial, municipal, and commercial operations, or the execution of federal, state, local, and tribal programs and policies."

The Executive Order further directed efforts to prevent environmental racism under Title VI of the 1964 Civil Rights Act. Title VI prohibits discrimination on the basis of race, color or national origin. It also prohibits recipients of federal funds, including federal and state agencies, from discriminatory actions.

FHWA defines Environmental Justice (EJ) persons as anyone belonging to any of the following groups:

- **Black** - a person having origins in any of the black racial groups of Africa.
- **Hispanic** - a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.
- **Asian** - a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent.
- **American Indian and Alaskan Native** - a person having origins in any of the original people of North America and who maintains cultural identification through tribal affiliation or community recognition.

- **Native Hawaiian or Other Pacific Islander** - a person having origins in any of the original peoples of Hawai'i, Guam, Samoa, or other Pacific Islands.
- **Low-Income** - a person whose household income (or in the case of a community or group, whose median household income) is at or below the U.S. Department of Health and Human Services poverty guidelines.

There are three fundamental environmental justice principles:

- To avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low -income populations.
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority and low-income populations.

To satisfy Title VI and EJ requirements, a project must illustrate that concern for environmental justice is integrated into every transportation decision, from the first thought about a transportation plan to the post-construction operations and maintenance. Every effort was made to ensure that a full and fair opportunity was made available to all members of all communities to participate in the development of the plan. In particular, the public outreach program was designed to ensure that this was accomplished. For example, the members of the Citizen Advisory Committees were invited from a broad spectrum of each community on each island in the state to ensure that all potential groups, interests, and points of view would be represented on each committee. This included the low-income and minority population, the elderly, the disabled or otherwise challenged individuals, and special interest groups.

Discussion:

The proposed roadway plan does not impact any EJ or Title VI population as discussed in Section 4.16. The proposed roadway will not require any relocation or dislocation of residences or businesses, and therefore no mitigation is required.

6.3 CITY AND COUNTY OF HONOLULU

6.3.1 GENERAL PLAN

The proposed roadway conforms to the following objectives and policies of the Honolulu General Plan:

III. Natural Environment:

Objective A: To protect and preserve the natural environment.

Policy 1: Protect O'ahu's natural environment, especially the shoreline, valleys, and ridges, from incompatible development.

Objective B: To preserve and enhance the natural monuments and scenic views of O'ahu for the benefit of both residents and visitors.

Policy 2: Protect O'ahu's scenic views, especially those seen from highly developed and heavily traveled areas.

Policy 3: Locate roads, highways, and other public facilities and utilities in areas where they will least obstruct important views of the mountains and the sea.

V. Transportation & Utilities

Objective A: To create a transportation system which will enable people and goods to move safely, efficiently, and at a reasonable cost; serve all people, including the poor, the elderly, and the physically handicapped; and offer a variety of attractive and convenient modes of travel.

Policy 4: Improve transportation facilities and services in the 'Ewa corridor and in the trans-Ko'olau corridors to meet the needs of 'Ewa and Windward communities.

VII. Physical Development and Urban Design

Objective C: To develop a secondary urban center in 'Ewa with its nucleus in the Kapolei area.

Policy 1: Allocate funds from the City and County's capital-improvement program for public projects that are needed to facilitate development of the secondary urban center at Kapolei

Discussion:

The proposed roadway plan is consistent with the General Plan.

6.3.2 'EWA DEVELOPMENT PLAN (OCTOBER 2008)

The recent Draft 'Ewa Development Plan (October 2008) currently list the Makakilo Extension as a new roadway facility (Table 4.1). Both the ORTP and the 'Ewa DP describes major elements of the future 'Ewa roadway network improvements that include: (see Figure 28 and Figure 29)

- Kapolei Parkway which is planned as a major east-west corridor, connecting the eastern parts of ʻEwa with the City of Kapolei and employment areas to the west,
- A new North-South Road which will link Kapolei Parkway with Farrington Highway and the H-1 Freeway and extend on mauka of the H-1 Freeway interchange to become part of Makakilo Drive,
- Improvements to existing H-1 Freeway interchanges at Palailai, Makakilo, and Kunia,
- New H-1 Freeway interchanges at Kapolei and Makaiwa Hills, and
- Extension of Hanua Street parallel to Kalaeloa Boulevard to enhance truck access between the H-1 Freeway and Campbell Industrial Park.

According to the 2030 Oʻahu Regional Transportation Plan (ORTP, April 2006)(see discussion in Section 6.3.4), the existing transportation system in ʻEwa has sufficient capacity for current traffic volumes during peak hour traffic, but experiences congested conditions because of bottlenecks and lack of capacity on the corridor from Pearl City to Downtown Honolulu. Traffic volume on the H-1 at Waikele is projected to increase by over 60% by 2030, while traffic on the H-1 by Aiea is projected to increase by 10%. The substantial development of Secondary Urban Center jobs (from 17,000 jobs in 1990 to over 64,000 jobs by 2020) is projected to increase the number of ʻEwa residents who work in the area.

However, it is also projected that the number of commuters traveling to the Primary Urban Center from ʻEwa and Central Oʻahu will still increase, although at a lower rate than would occur if development of the Secondary Urban Center was not supported.

Discussion:

The proposed roadway will not require changes or amendments to the ʻEwa Development Plan because it is currently in conformance with the existing Plan as well as the proposed Plan.

Figure 28. ‘Ewa Development Plan (August 1997)

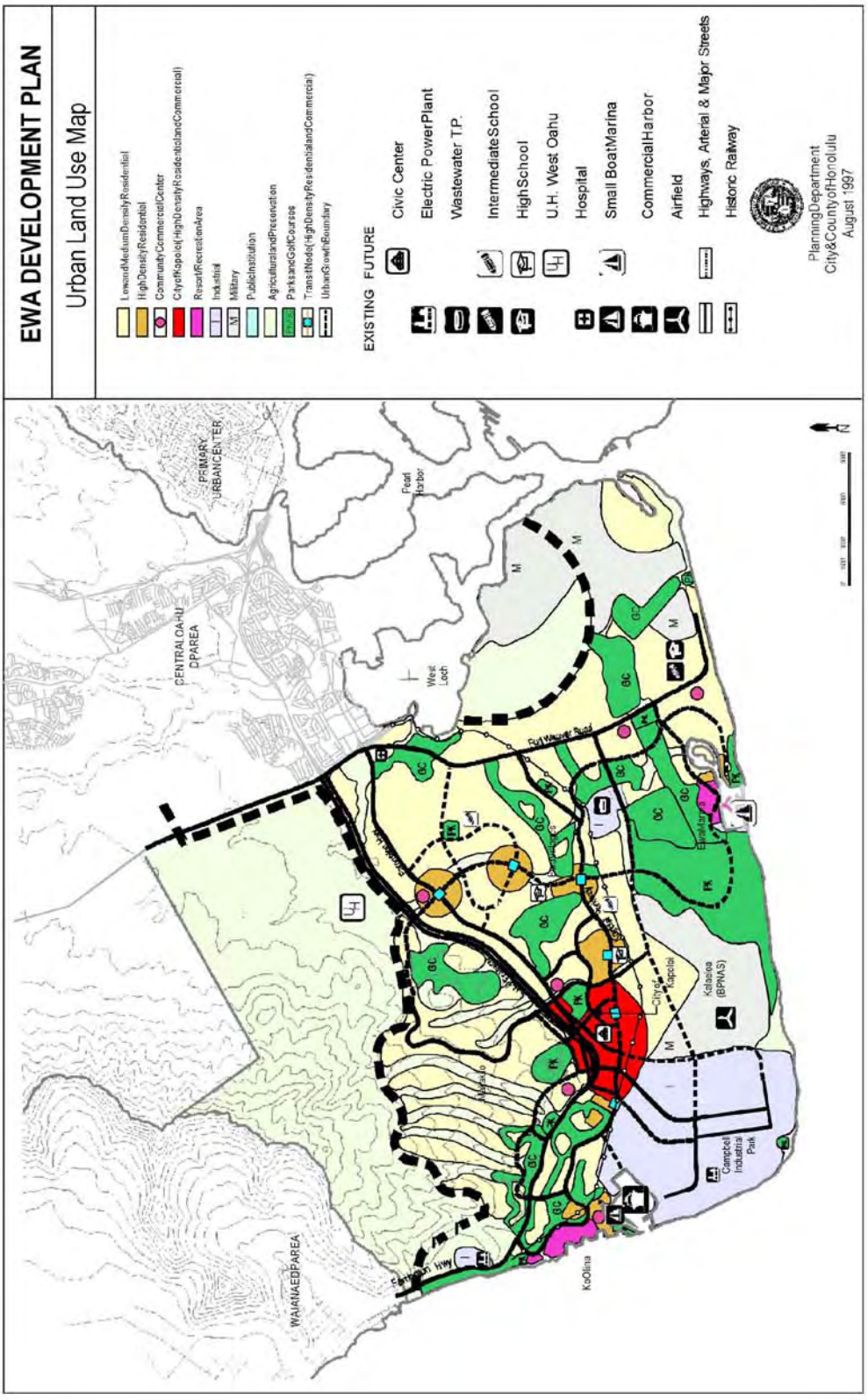
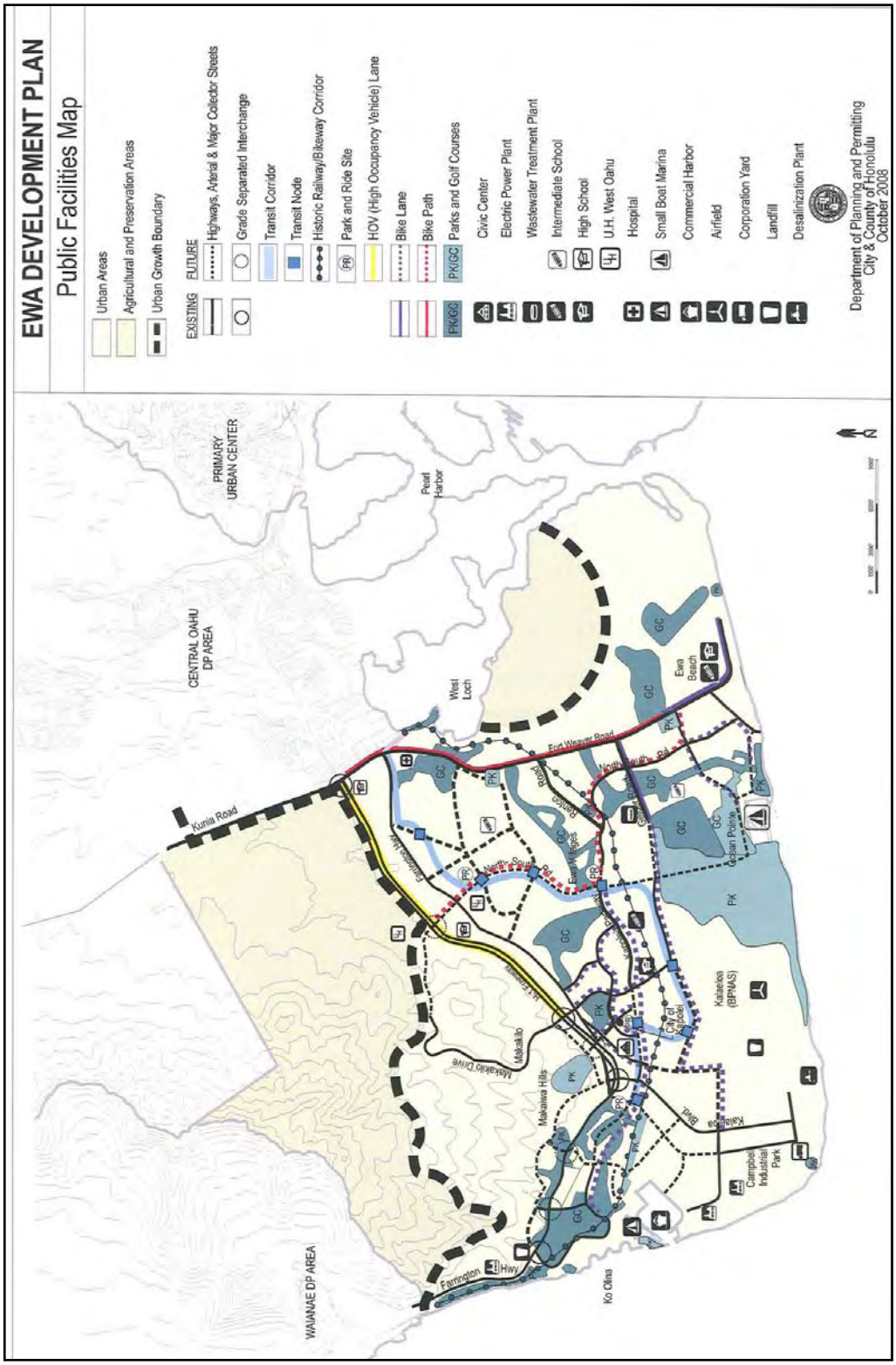


Figure 29. ‘Ewa Development Plan Public Facilities Map (Oct. 2008)


EWA DEVELOPMENT PLAN
Public Facilities Map
Urban Areas
Agricultural and Preservation Areas
Urban Growth Boundary
EXISTING
FUTURE
Highways, Arterial & Major Collector Streets
Grade Separated Interchange
Transit Corridor
Transit Node
Historic Railway/Bikeway Corridor
Park and Ride Site
HOV (High Occupancy Vehicle) Lane
Bike Lane
Bike Path
Parks and Golf Courses
Civic Center
Electric Power Plant
Wastewater Treatment Plant
Intermediate School
High School
U.H. West Oahu
Hospital
Small Boat Marina
Commercial Harbor
Airfield
Corporation Yard
Landfill
Desalinization Plant
Department of Planning and Permitting
City & County of Honolulu
October 2008
PRIMARY URBAN CENTER
CENTRAL OAHU DP AREA
WAIANAE DP AREA
Pearl Harbor
West Loch
Ewa Beach
Kunia Road
Fort Weaver Road
Farrington Hwy
Makakilo Drive
Makakilo
Makaiwa Hills
Kalaeloa (BPNAS)
Kalaeloa Blvd
Campbell Industrial Park
Ko Olina
Ewa Villages
Golf Course
Golf Course
Golf Course

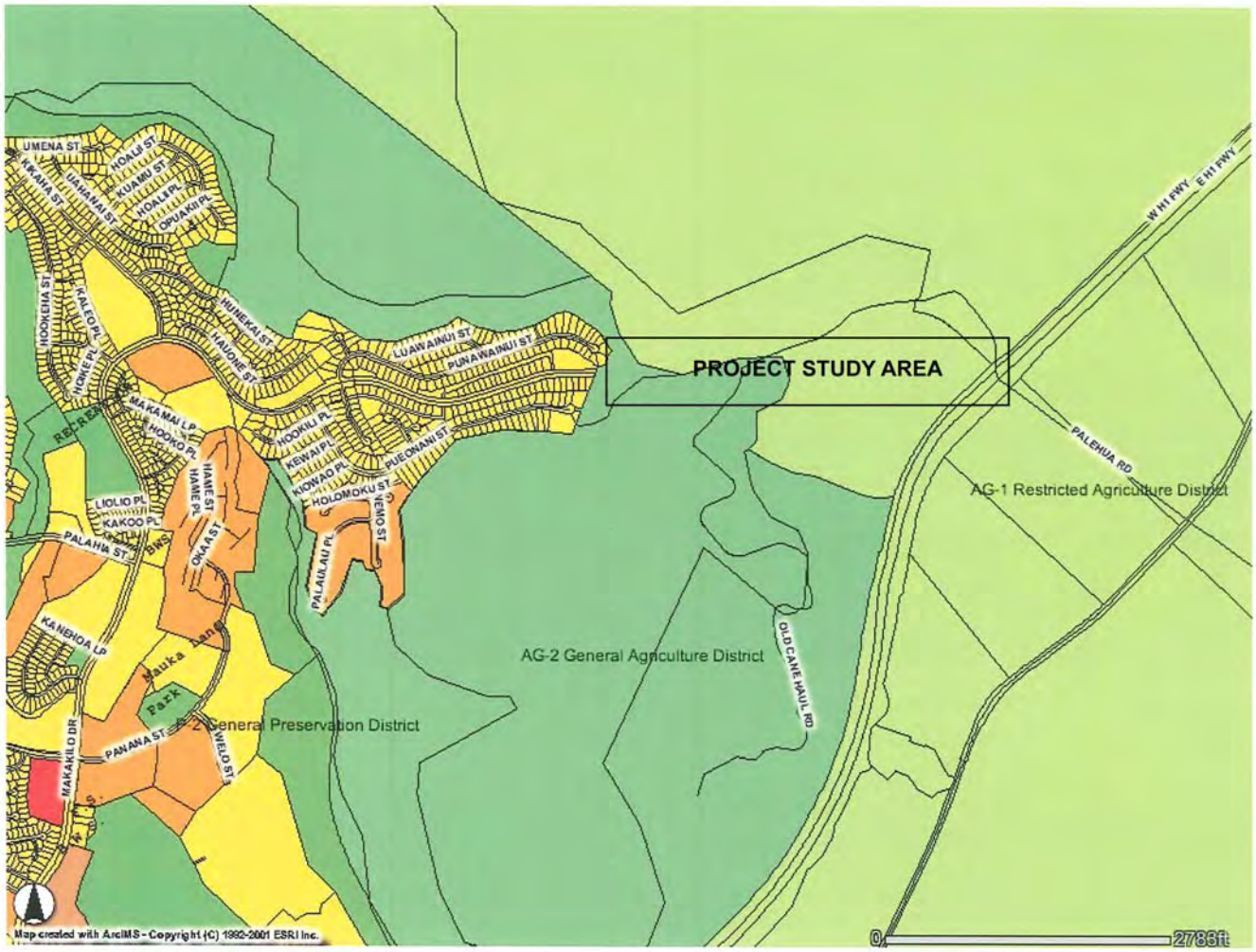
6.3.3 'EWA ZONING

Zoning in the project area is AG-1, Restricted Agriculture and AG-2, General Agriculture (see Figure 30). While the land is zoned agriculture, the land to be used for the roadway does not impact existing agricultural activities.

Discussion:

The proposed roadway will not require changes or zoning amendments because it is in conformance with existing zoning.

Figure 30. 'Ewa Zoning Map



6.3.4 O'AHU REGIONAL TRANSPORTATION PLAN (ORTP) 2030

The Policy Committee of the OMPO approved the ORTP, 2030 in April 2006 and modified it through Amendment #1 in May 2007.

The ORTP 2030 is a policy document for transportation planning as it addresses mobility issues and transportation needs of our community. It is a multifaceted plan that integrates planned growth patterns and reflects available financial resources over the next 25 years. It includes a vision and goals, identifies projects, and provides an implementation program for mid- and long-range investment of the available transportation funds across O'ahu in a fair and equitable manner (ORTP, 2006). Any proposed federal funded project must be included in the ORTP. The proposed Makakilo Extension Project is included in the current ORTP (see Table 1, ORTP 2030, Amendment #1, Mid-Range Plan and Long-Range Plan Project List). The ORTP required by a number of state and federal mandates and requirements, which include the Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users ("SAFETEALU").

Any future transportation improvement for O'ahu that receives federal transportation funds must be consistent with the ORTP in order to be eligible for these funds. These requirements are mandated by the U.S. Department of Transportation as a means of verifying the eligibility of metropolitan areas for federal funds earmarked for surface transportation systems.

The ORTP is updated every five years to ensure that transportation decisions are based on current information and community priorities. As part of each update, future population and employment are projected and corresponding changes in travel patterns, revenue, and construction costs are forecast to validate and test past and new directions for transportation development on O'ahu.

To meet our vision, the island-wide transportation plan for O'ahu is defined by three overarching goals (ORTP 2006):

1. Transportation Services System:

   Develop and maintain O'ahu's island-wide transportation system to ensure efficient, safe, convenient, and economical movement of people and goods.

   The objectives guiding this goal include: increasing capacity of the system; providing an efficient and convenient transit system; providing access to all important destinations; serving all intermodal terminals; ensuring that projects are distributed equitably; ensuring that safety and security are provided; integrating the entire system; supporting economic development; and providing for system preservation.

2. Environment and Quality of Life:

   Develop and maintain O'ahu's transportation system in a manner that maintains environmental quality and community cohesiveness. The objectives associated with this goal are directed at developing a plan that satisfies noise, air, and water quality standards; encouraging energy conservation; preserving cultural integrity and natural resources; developing alternative transportation modes that are environmentally friendly, including pedestrian walkways and bicycle routes; optimizing use of transportation resources; minimizing disruption of neighborhoods; ensuring compatibility with the physical and social character of existing development; incorporating landscaping and public safety; and planning for emergencies.

3. Land Use and Transportation Integration System Goal:

   Develop and maintain O'ahu's transportation system in a manner that integrates land uses and transportation. The objectives that support this goal include reinforcing planned population distribution and land use development policies; encouraging innovation; and encouraging implementation of land use policies that support efficient use of transportation systems.

Table 1 of the ORTP 2030 lists the proposed project as follows:

Table 1
O'ahu Regional Transportation Plan 2030
Mid-Range Plan (2006 To 2015)

PROJECT NO.	29 C (City)
FACILITY TITLE:	Makakilo Drive, Second Access, Makakilo Drive to North-South Road/Interstate Route H-1 Interchange
PROJECT DESCRIPTION	Extend Makakilo Drive (vicinity Pueonani Street) south to the Interstate Route H-1 Freeway Interchange as 4-lane roadway, connecting Makakilo Drive to North-South Road.
ESTIMATED COST	$32.8

Source: ORTP 2030, May 2007

Discussion:

The proposed roadway will not require any changes or amendments to the ORTP 2030 because it is currently in conformance with the amended Plan. The ORTP is currently being updated by OMPO. The DTS will be participating in the update process and will be updating the Makakilo Extension Project, as required.

SECTION 7
NECESSARY PERMITS AND APPROVALS

Permits and approvals that may be required include the following:

7.1 STATE OF HAWAI'I

7.1.1 COMMUNITY NOISE CONTROL –DEPARTMENT OF HEALTH

A Noise Permit will be required during construction from the State Department of Health.

7.1.2 COMMISSION ON PERSONS WITH DISABILITIES

Plan review is required for compliance with the American Disability Act.

7.1.3 NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM PERMIT

Required by the State Department of Health for potential discharges of construction stormwater for land areas greater than one (1) acres of land.

7.1.4 STATE DEPARTMENT OF TRANSPORTATION

Plan review and approval for connection to the North-South Road interchange.

7.2 CITY AND COUNTY OF HONOLULU

7.2.1 GRADING PERMIT

Required from the Department of Planning and Permitting.

7.2.2 PLAN REVIEW

Plan review by the Department of Planning and Permitting and Board of Water Supply

7.3 FEDERAL

7.3.1 FEDERAL HIGHWAY ADMINISTRATION

Plan review and approval.

7.4 UTILITY COMPANIES

7.4.1 PLAN REVIEW AND APPROVAL FOR UTILITY CONNECTIONS

SECTION 8
AGENCIES, ORGANIZATIONS, AND INDIVIDUALS CONSULTED

The following agencies, organization and individuals were consulted to provide input into the Draft EA. Persons and agencies responding are identified by an '*'. Responses to comments received are located in Appendix I.

8.1 FEDERAL AGENCIES

- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service *
- National Marine Fisheries Service
- Federal Highway Administration

8.2 STATE AGENCIES

- Department of Land and Natural Resources *
- Department of Transportation *
- Department of Health
- Office of Planning *
- University of Hawai'i
- Office of Hawaiian Affairs *

8.3 CITY AND COUNTY OF HONOLULU

- Department of Planning and Permitting *
- Neighborhood Board (Makakilo)
- Board of Water Supply *
- Honolulu Police Department *
- Honolulu Fire Department *
- Department of Facility Management *
- Department of Parks and Recreation *

8.4 ORGANIZATIONS AND INDIVIDUALS

- Hawaiian Telcom
- Pacific Lightnet
- Oceanic-Time Warner Cable *
- Hawaiian Electric Company**

- DR Horton-Schuler Homes *
- Grace Pacific Inc.
- James Campbell Company
- Castle and Cooke Homes Hawai'i
- Councilman Nestor Garcia
- Councilman Todd Apo

8.5 MAKAKILO DRIVE ADVISORY COMMITTEE

- Gerald Vanderbeck
- Jackie Zahn
- M. Kioni Dudley *
- John Ridines
- Brian Kanno
- Mike Golojuich
- Frank Genadio
- Evelyn Souza
- Suk Moses
- Leonara S. Olsen
- Alan R. Gano
- Councilman Nestor Garcia
- Councilman Todd Apo
- Lester Chang, Director, Dept. of Parks and Recreation
- Director, Dept. of Facility Maintenance
- Henry Eng, Director, Dept. of Planning and Permitting
- Patrick Phung, PJKK Building, FHWA
- George Kuo, Board of Water Supply
- Eugene Lee, Director, Dept. of Design and Construction
- Darrel Young, Dept. of Transportation
- Dean Uchida, DR Horton Schuler
- Robert Creps, Grace Pacific
- Steve Kelly, Campbell Estate
- Nathan Liang, HECO – Distribution Planning
- Gene Awakuni, Chancellor, UH West Oahu
- Jed Miyazaki, Castle and Cooke Homes Hawai'i

** Comments received after close of comment period.

SECTION 9
SIGNIFICANCE ANALYSIS

Chapter 200 of Title 11 (HAR) of the State Department of Health establishes criteria for determining whether an action may have a significant impact on the environment. The Rules establishes "significance criteria" for making the determination. The relationship of the proposed land use to the thirteen criteria is discussed below.

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

   The project area site was modified when the lands were cultivated for sugarcane production. Subsequently, some areas were modified and cleared for development and access roads. The proposed roadway will remove land designated for agriculture for a public facility. The roadway, however, will not involve the destruction of natural or cultural resources. The roadway will avoid historic resources found in the area.

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

   The proposed roadway will curtail other uses of the area. The proposed changes, however, are consistent with the 'Ewa Development Plan and the Kapolei Master Plan.

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

   The proposed roadway is consistent with the 'Ewa Development Plan, the Kapolei Master Plan, and the provision of Chapter 343, HRS.

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

   The proposed roadway project will generally benefit the community through the provision of additional access to the Makakilo community. During construction, the roadway project will provide employment for the construction contractor and employees. It is not anticipated that the proposed roadway will impact cultural practices in the area.

5. **Substantially affects public health.**

   There are no public health concerns related to the proposed roadway development. Construction impacts will be mitigated by the contractor.

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

The proposed roadway project will not involve substantial secondary impacts in the form of population changes or effects on public facilities. The roadway project will entail the conversion of open space into roadway. The roadway will be constructed on lands designated for agricultural purposes, however, because of the slopes and Kalo'i Gulch, the land is not ideally suitable for agriculture. The roadway will, however, have the effect of providing access to adjoining lands where development has been proposed. The details of development adjoining the roadway was not available that the time of the preparation of this document. Their impacts will be addressed by the adjoining landowners and developers.

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

The proposed roadway project does not constitute substantial degradation of environmental quality.

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

The proposed roadway project does not involve a commitment for a larger action at this time. The proposed project does not create significant adverse effects upon the environment. The roadway will, however, have the effect of providing access to adjoining lands where development has been proposed. The details of development adjoining the roadway was not available at the time of the preparation of this document. Their impacts will be addressed by the adjoining landowners and developers.

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

The project area has been previously disturbed as a result of past agricultural activities and current development. Studies conducted for this project did not identify rare, threatened or endangered species or habitats for such rare, endangered or threatened species within the study area.

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

The proposed roadway project will not detrimentally affect air or water quality or ambient noise levels.

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.**

The project area is not located near and adjacent to any environmentally sensitive area such as a flood plain, estuary, fresh-water, tsunami zone, or erosion-prone area, and therefore long-term "damage" is not anticipated. During construction, care will be taken to minimize stormwater runoff.

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

The roadway project is in a prominent location that can be seen from Interstate Route H-1. Because the roadway is on a slope its visual appearance cannot be fully obscured. Landscaping in the form of street trees will be utilized to soften the visual appearance of the roadway. The curves in the roadway will also soften the views. The roadway will also present new panoramic views of the Honolulu landscape as one moves from the Makakilo community to the North-South Road Interchange.

13. **Requires substantial energy consumption.**

The proposed roadway improvements will require the consumption of energy in the form of petroleum products to fuel the equipment required for the construction of the roadway. Following its completions, additional energy will be required to light the roadway.

SECTION 10
FINDINGS AND DETERMINATION

In accordance with the provisions set forth in Chapter 343, HRS, and the significance criteria in Section 11-200-12 of HAR, Title 11, Chapter 200, it is anticipated that the proposed roadway development will have no significant adverse impacts to air quality, water quality, noise levels, social welfare, population, historic sites, or wildlife habitat.

Long-term and secondary impacts anticipated are both beneficial and adverse. Beneficial impacts are related to:

- Increased capacity at the Kapolei-Makakilo Interchange due the traffic being diverted to the North-South Road Interchange.
- Increased accessibility between Makakilo and Kapolei.
- Alternative access route to access the Makakilo community.

Long-term impacts are also related to the conversation of agricultural lands for the roadway.

Adverse impacts are also related to the required land acquisition from private landowners thus reducing their ability to use the land for other purposes. The proposed action, however, will not result in the displacement of businesses or residents. Changes to the landscape will impact the current views of the area. The change will be from a view of open undeveloped land to one that has a 4-lane roadway.

Short-term impacts will be limited to construction impacts that include: release of fugitive dust, potential for increased run-off during severe storm events, increased noise, and traffic congestion.

Overall, the long-term benefits of the proposed project are believed to outweigh the potential for adverse impacts as these adverse impacts can be mitigated. Therefore, an Environmental Impact Statement (EIS) will not be required, and that a Finding of No Significant Impact (FONSI) will be issued for this project.

SECTION 11
REFERENCES

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APPENDIX

A. Environmental Site Assessment, Kaua'i Environmental, April 2008

B. Traffic Projections for Makakilo Drive, Julian Ng, October 2008

C. Archaeological Inventory Survey, Cultural Surveys Hawai'i, April 2008.

D. Botanical Resources Assessment for the Makakilo Drive Extension, LeGrande Biological Surveys, Inc., March 2008

E. Avifauna and Feral Mammal Survey of Makakilo Drive Expansion Project, Phillip Bruner, February 2008

F. Cultural Impact Assessment, Cultural Surveys Hawai'i, July 2008

G. Environmental Noise Assessment Report Makakilo Drive Extension, D.L. Adams, October 2008

H. Social Impact Assessment, September 2008

I. Responses to Comments Received on the Draft EA

APPENDIX A

Environmental Site Assessment, Kaua‘i Environmental, April 2008

April 2008

PHASE 1 ENVIRONMENTAL SITE ASSESSMENT



MAKAKILO DRIVE ROADWAY EXTENSION

Makakilo, West Oahu

Prepared For:

City and County of Honolulu
Department of Transportation Services
c/o: R. M. Towill Corporation
2024 N. King Street, Suite 200
Honolulu, HI 96819

Prepared by:

Kauai Environmental, Inc.
P.O. Box 1280
Kilauea, Hawaii 96754

ENVIRONMENTAL SITE ASSESSMENT

Makakilo Drive Roadway Extension Project

MAKAKILO, OAHU

April 2008

Prepared For:

City and County of Honolulu
Department of Transportation Services
c/o: R. M. Towill Corporation
2024 N. King Street, Suite 200
Honolulu, HI 96819

Prepared by:

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Kilauea, Hawaii 96754

ENVIRONMENTAL SITE ASSESSMENT

Makakilo Drive
Roadway Extension Project

April, 2008

Prepared for:

City and County of Honolulu
Department of Transportation Services
in care of:

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ENVIRONMENTAL SITE ASSESSMENT

Makakilo Drive
Roadway Extension Project

EXECUTIVE SUMMARY

Kauai Environmental Inc. performed a Phase I Environmental Site Assessment (ESA) for the properties along the proposed route of the Makakilo Drive Roadway Extension, a new section of Makakilo Drive which will connect the existing Makakilo Drive to the H-1 Freeway. The exact route for this section of Makakilo Drive has not yet been determined, however the proposed alignment will traverse portions of one or more of the following properties TMK Nos. (1) 9-2-002: Parcel 006 and (1) 9-2-003: Parcels 074 and 079. This ESA covers those sections of these properties which would be affected by any of the three proposed alignments. While the roadway extension will only be constructed on a small portion of the referenced parcels, the entire area defined in Figure 1 (the proposed roadway extension corridor) was evaluated in order to allow planners to assess the impact of the different possible routes for the project.

This assessment was conducted in conformance with the 2000 ASTM Standard for Phase 1 Environmental Site Assessments to determine whether conditions or situations on the properties in question might result in real or potential hazards, or environmental liabilities, that might impact or complicate construction of this roadway extension. Specific items investigated included: present and historical uses of the subject properties and adjacent properties; signs of gross surface contamination; the presence of hazardous materials and wastes; above ground and underground storage tanks (ASTs and USTs), and other indications of the presence of chemical contamination.

A review of State and Federal environmental regulatory databases indicated the following:

- No sites listed by the U.S. EPA on the NPL (Superfund) or delisted NPL databases were identified within the recommended search distances from the proposed roadway extension corridor.

- No CERCLIS (or CERC-NFRAP) sites were identified within the recommended search distance from the proposed roadway extension corridor.

- No RCRA corrective action sites or treatment, storage, and disposal facilities were identified within the recommended search distances from the proposed roadway extension corridor.

- No RCRA hazardous waste generators were identified within the recommended search distance from the proposed roadway extension corridor.

- No state-recognized hazardous waste sites were identified within one mile of the proposed roadway extension corridor.

- No registered underground storage tank (UST) sites were identified within the recommended search distance from the proposed roadway extension corridor.

- One leaking underground storage tank (LUST) site was identified within the recommended search distance from the proposed roadway extension corridor. No impact to the subject properties is anticipated due to the distance to this site of over a quarter mile, and the fact that a site clean-up has been completed.

- No active landfills were identified within the recommended search distance from the proposed roadway extension corridor.

- There have been no spill incidents connected with the subject properties that were reported to the HEER office or entered on the ERNS database.

- No Brownsfields sites, or sites with institutional or engineering controls, were identified within the recommended search distances from the proposed roadway extension corridor.

A review of relevant State and Federal databases did not identify any institutional controls, engineering controls, or activity and use limitations associated with the subject properties or adjacent properties.

A site reconnaissance at the subject properties was performed on April 7, 2008. The environmental issues identified during this inspection are listed below.

- Extensive erosion was evident in areas that were landscaped and graded as part of the former golf course on the site. It appears that much of the eroding material was imported fill. While this material may have been brought in from the nearby quarries, the source of the material is unknown.

A review of historical land use information including aerial photographs, historical topographic maps, and interviews with persons familiar with the history of the property has indicated the following:

- The subject property has been largely undeveloped.

- Possible historical uses included cattle ranching and limited agricultural production.

- Palehua Road, which runs through the property, was originally an unpaved road dating back to at least the 1960s. The roadway was paved to facilitate the delivery of raw materials to the Makakilo subdivision from the quarries nearby

- A portion of the subject property was previously developed as a golf course, which has since been abandoned and has fallen into neglect. Potential environmental concerns related to this abandoned golf course include the use of imported fill materials and the

possibility of residual contamination associated with chemicals or petroleum products that may have been stored and used at the golf course for maintenance purposes. Whether or not the golf course had a functional maintenance facility is unknown, as is the location of any such facility. Neither of these issues are considered to be recognized environmental conditions.

In summary, no recognized environmental conditions or historical recognized environmental conditions have been identified in association with the subject properties during the process of completing this Phase 1 Environmental Site Assessment.

ENVIRONMENTAL SITE ASSESSMENT

MAKAKILO DRIVE
ROADWAY EXTENSION PROJECT

1.0 INTRODUCTION

Kauai Environmental Inc. (KEI) performed a Phase 1 Environmental Site Assessment (ESA) for property along the proposed route for Makakilo Drive Roadway Extension, a new section of Makakilo Drive which will connect the existing Makakilo Drive to the H-1 Freeway, as shown in Figures 1-3 (Appendix A). The exact route for this section of Makakilo Drive has not yet been determined, however the proposed alignments (shown in Figure 2) will traverse portions of one or more of the following properties: TMK Nos. (1) 9-2-002: Parcel 006 and (1) 9-2-003: Parcels 074 and 079.

This ESA has been conducted for those portions of the above-referenced properties which may be affected by the alignment of the roadway extension as currently proposed,. The scope of this investigation is limited to the area below the existing Makakilo residential subdivision and above the property in use as a quarry along the H-1 Freeway, as shown in Figure 3. Throughout this report, the portions of those properties included in this assessment will be referred to collectively as: *the subject property*; *the property*; or: *the proposed roadway extension corridor.*

This assessment was performed in accordance with the guidelines established in the American Society for Testing and Materials (ASTM) 2000 Standard: E 1527-00, "Standard Practice for Environmental Site Assessments: Phase 1 Environmental Site Assessment Process."

1.1 *Purpose*

This investigation has been performed for R. M. Towill Corporation, on behalf of the City and County of Honolulu Department of Transportation Services to identify any potential environmental hazards or liabilities that might be encountered during the construction of the Makakilo Drive Roadway Extension, from the existing Makakilo Drive to the H-1 Freeway As such, the purpose of this assessment was to investigate past and present land uses of the subject properties and surrounding areas to determine if the potential exists for hazardous materials contamination or other significant, adverse environmental liabilities associated with the properties. These conditions may affect the selection of the best route for the roadway extension and may affect the cost or construction methods required to complete the roadway in some areas.

As defined by the 2000 ASTM Standard, the objective of the Phase 1 ESA process is to identify any "recognized environmental conditions" associated with a Parcel of commercial real estate. A "recognized environmental condition" is defined as: "*the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, ground water, or surface*

water of the property." The term may include hazardous substances or petroleum products even when stored under conditions in compliance with applicable laws and regulations, but is not intended to include *de minimis* conditions that would not require enforcement action if brought to the attention of the appropriate government agencies.

1.2 *Scope of Work*

The exact route for this section of Makakilo Drive has not yet been determined; therefore, a corridor encompassing the areas where the road may be built was defined in consultation with planners at R.M. Towill Corporation. This Phase 1 ESA is limited to this corridor, defined as the area that may be affected by the construction of the Makakilo Drive Roadway Extension along any of the three currently proposed alignments. The scope of this Phase 1 ESA is further limited to the area above the Grace-Pacific quarry and below the existing Makakilo residential subdivision. The proposed alignments for roadway extension are shown in Figure 2; project limits are shown in Figure 3.

The 2000 ASTM Standard defines the four components of the Phase 1 ESA process as follows:

- Records Review
- Site Reconnaissance
- Interviews
- Report

These ASTM Standard states that these four components are to be used in concert, with each component providing information that may be used to inform the other components.

In the process of completing this Phase 1 ESA, KEI has performed the following tasks:

- Conducted a review of available environmental records including State and Federal regulatory databases, and contacted local and State agencies to determine the regulatory history associated with the properties, as well as other properties in the vicinity where current or historical commercial or industrial activities might impact the subject properties;

- Reviewed available sources of historical information for the subject properties and surrounding areas, including historical topographic maps and aerial photographs, to assess past land use in the vicinity of the subject properties;

- Conducted a thorough site reconnaissance to assess current uses and condition of the subject properties and adjacent properties;

- Interviewed persons familiar with the properties and the history of the area for information on current and past uses of the subject properties and other properties in the surrounding areas;

- Reviewed information on site geology, soils, and hydrogeology of the area; and

- Prepared this Environmental Site Assessment Report which documents the findings of this evaluation.

A review of historical and environmental records pertaining to the subject properties and surrounding properties is documented in Section 3.0. Site reconnaissance, performed by a qualified environmental professional, is documented in Section 4.0. Interviews, also conducted by a qualified environmental professional, are documented in Section 5.0.

1.3 *Limitations and Exceptions*

KEI has completed this Phase 1 ESA for portions of the properties identified by TMK Nos. (1)9-2-002:006, (1)9-2-003:074 and (1)9-2-003:079 as delineated in Figure 1 (the "Subject Property"). KEI's findings and conclusions in this Phase 1 ESA are professional opinions based solely upon visual observations and interviews conducted by KEI, KEI's interpretation of the available environmental records and historical information, information provided by the Designated Users of this report, and KEI's interpretation of other documents reviewed during this Phase 1 ESA process. Requests for information resources are made by KEI to collect relevant data on current and past practices at the Subject Property. KEI may not receive all information requested or be able to verify or confirm received information during the Phase 1 ESA process. Therefore, KEI shall not be held responsible for errors, omissions, or misrepresentations resulting from missing documentation or from inaccurate information provided by such sources.

Limitations encountered during the physical inspection of the subject properties included: many areas within the subject properties are overgrown or inaccessible, and physical access for visual inspection was limited in some areas. Limitations to physical inspection included tall, thick grasses and shrubs throughout much of the subject property, as well as a steep ravine (Kaloi Gulch) on Parcel 074, along the eastern edge of the project area. The presence of what appears to be thick fill materials was also a limitation in some areas of the site.

KEI has performed its services for this project with the degree of care, skill and diligence ordinarily exercised by professional consultants performing the same or similar services. No warranty or representation, either expressed or implied, is included or intended in KEI's proposals, contracts, or reports.

Opinions stated in this report do not apply to changes that may have occurred after services were performed. Opinions and recommendations presented herein apply to site conditions existing at the time of our investigation. They do not apply to site changes of which KEI is not aware and has not had the opportunity to evaluate.

This Phase 1 ESA is limited to the scope of ASTM Standard E 1527-00. No additional services were contracted in conjunction with this Phase 1 ESA.

Designated Users of this Phase 1 ESA include: R.M. Towill Corporation and the City and County of Honolulu. This report is intended for the sole use of these Users on this Project. This report

shall not be reused and is not intended or represented to be suitable for reuse by any other person or entity, whether on this project or any other project, or by the Designated Users on any other project. Any reuse of this document or the findings, conclusions, or recommendations presented herein will be at the user's sole risk and without liability or legal exposure to KEI.

2.0 SITE DESCRIPTION

2.1 *Location and Legal Description*

This assessment was performed for a corridor that includes the proposed alignments for the Makakilo Drive Roadway Extension. The scope of this investigation is limited to the area that may be affected by the construction of the Makakilo Roadway Extension along any of the currently proposed alignments, below the existing Makakilo residential subdivision and above the property in use as a quarry along the H-1 Freeway. The three currently proposed alignments are shown in Figure 2; project limits are shown in Figure 3. This area includes portions of the following properties: TMK Nos. (1) 9-2-002: Parcel 006 and (1) 9-2-003: Parcels 074 and 079. A list of the Parcels included in this assessment is included below in Table 1. This assessment is limited to the proposed roadway extension corridor and does not include the entire extent of the parcels listed below.

Table 1: Properties Included in this Phase 1 ESA

Parcel (TMK No.)	Area* (acres)	Location / Property Description	Owner
(1) 9-2-002: 006	115.77	Property extending from H-I Freeway and including steep ravine along eastern edge of subject property.	D. R Horton-Schuler Homes LLC
(1) 9-2-003: 074	311.83	Parcel below existing Makakilo subdivision including former golf course.	Pu'u Makakilo Inc.
(1) 9-2-003: 079	83.29	Narrow strip along eastern edge of existing Makakilo subdivision including upper portion of steep ravine to east edge of subject property.	Wai Kaloi of Makakilo Community Association

* The total area of each parcel is listed here. Only a portion of this area was included in this ESA.

2.2 *Site and Vicinity Characteristics*

2.2.1 Geologic Setting and Soils

The site is located on the lower, southern flanks of the Waianae Mountains. These mountains were formed by volcanic eruptions over that past 3 million years. Significant erosion of the original mountains has contributed to the development of thick soils in this area. The lower portion of the site is located at the point that the mountains meet the coastal Ewa plain and extend to an elevation of approximately 460 feet above sea level at the northern boundary.

The general soils on the subject property are in the Halemao - Wahiawa Association. These soils are deep, nearly level to moderately sloping well drained soils that have a fine textured subsoil. There are several sub-types of the soil on this parcel due to the varying terrain from deep gulches to steep hillsides and upland areas.

In the gulch areas and alluvial areas below them, the soils are of the Kawaihapai Series. These clayey, loamy soils are formed by the erosion of the igneous rocks from humid uplands. In the uplands areas, the soils are typically of the Molokai Series. These silty clay loam soils are well drained soils found at higher elevations that are formed by the weathering of igneous rock in areas that are relatively dry. On the steep hillsides, the soils consist of Mahana - Badland soils and stony rocky areas. These soils are often found in areas with high ash content resulting in a high erosion potential and limited agricultural options.

2.2.2 Groundwater

The subject property is located in an area that is above the Underground Injection Control Line as set by the Hawaii Department of Health. The groundwater located beneath this property is therefore defined as a potable, useful resource that retains full protection under state law. While no extraction of the groundwater is likely at this site due to its use as a roadway corridor, the groundwater resource must be protected from impacts due to hazardous chemicals.

Based on the use of the property as grazing land and a golf course, no impacts to the groundwater are likely from the use of the property in the past. No records of any groundwater impacts has been found during the research on the history of these properties.

No drinking water wells or Public Water System wells are located within a mile of the subject property. Several agricultural wells installed in the area are not in use, and several injection wells for septic wastes are in use, however the planned or past uses of the subject property are not likely to have impacted any of the groundwater uses in the vicinity.

2.2.3 Surface Waters

No pools or ponds of standing water were identified on the subject property. On the higher-elevation plateau to the west of Kaloi Gulch there are several eroding washes that carry storm waters from the higher elevations. To the east, Kaloi Gulch caries storm waters from the Makakilo subdivision (storm drain outfalls are visible in Photo 2) The nearest body of water is the Pacific Ocean, which is located to the south and west of the subject properties.

2.2.4 Site Flood Boundaries

According to the Flood Insurance Rate Map (FIRM) #150001-0105A, the subject property is outside the 100 year flood zone. The entire area is considered within the 500 year flood zone.

2.3 *General Site Setting*

This section summarizes general information about the subject properties as derived from various sources including information from review of historical use and environmental records (Section 3.0), observations made during site reconnaissance (Section 4.0), and information obtained during interviews (Section 5.0).

2.3.1 Current Uses of Subject Properties

The subject properties are relatively undeveloped, and most of the area is not in use at this time. The lower portion of Parcel 006, above the quarry at the freeway, is in use as a cattle ranch. A well-maintained asphalt road traverses the parcel from the quarry, passing above the ranch area. The property above this road (Parcel 074) is fenced off and inaccessible to the public. An unmaintained asphalt road traverses this parcel form the quarry road to the bottom of the existing Makakilo subdivision, where the proposed roadway extension corridor includes the lower end of Parcel 079.

2.3.2 Past Uses of Subject Properties

The higher elevation section of the subject property, on Parcel 074, was developed as a golf course in the late 1980s or early 1990s. The golf course never opened and was never completed, though a significant amount of grading and landscaping work was completed. The asphalt road that traverses this parcel was paved during the construction of the Makakilo subdivision, to allow for the direct transport of material from the Grace-Pacific quarry along H-1. No other historical uses of the subject property are known, although it is possible that some of the area may have been used as grazing land for ranching or for agricultural production.

2.3.3 Current Uses of Adjacent Properties

The subject property is bounded to the north by the existing Makakilo residential subdivision, and to the south by the Grace Pacific quarry and the H-1 Freeway. The properties to the west and the east are undeveloped.

2.3.4 Past Uses of Adjacent Properties

The adjacent properties may have been used in the past for cattle ranching and limited agricultural production. No other historical uses of the adjacent properties are known.

3.0 REVIEW OF ENVIRONMENTAL AND HISTORICAL RECORDS

In order to identify the presence of recognized environmental conditions at the subject properties, several published sources of environmental records were searched, including databases maintained for this purpose by state and federal regulatory agencies. This section lists the environmental databases that were searched, and describes the results of each search.

3.1 *Standard Environmental Record Sources*

The 2000 ASTM Standard for the Practice of Conducting Phase 1 ESAs (ASTM E 1527-00) defines a list of Federal and State regulatory databases as "Standard Environmental Record Sources" to be searched for relevant information as part of the Phase 1 ESA process. These databases record reported environmental incidents, conditions, and permitted or regulated operations that have the potential to impact the subject properties.

A summary of standard environmental database records was provided to KEI by Environmental Data Resources, Inc on April 1, 2008 (*EDR, 2008a*). This summary included the most recent versions available at that time for all required database records, as described below. Federal environmental databases reviewed for this report are detailed in Section 3.1.1. State environmental databases are detailed in Section 3.1.2. Tribal databases were also reported in EDR's summary, however these results are not included here since, at this time, there are no tribal lands in the State of Hawaii.

3.1.1 Federal Database Search Results

Table 2 lists the major Federal database records that were searched for this report. The ASTM methodology (ASTM Standard: E 1527-00) specifies a minimum search distance for each database, and also mandates that each database record used must have been updated by the source within 90 days of the search. The dates of the most recent update for each Federal database source are also listed in Table 2, along with the ASTM-mandated search distance for each database and the number of hits, or listed sites identified from each database within the recommended search distance. Results from each database search are described individually below.

Table 2: Federal Environmental Databases Reviewed

Database	Source Category (Gov't Agency)	Updated by Source	Search Distance	Hits
NPL	National Priority List (Superfund) Sites (USEPA)	1/28/08	1 mile	0
DELISTED NPL	National Priority List Deletions	1/28/08	0.5 mile	0
CERCLIS	CERCLIS Site Event List (USEPA)	3/20/08	0.5 mile	0
CERC-NFRAP	CERCLIS -No Further Remedial Action Planned	3/17/08	0.5 mile	0

Database	Source Category (Gov't Agency)	Updated by Source	Search Distance	Hits
CORRACTS	RCRA Corrective Action List (USEPA)	3/03/08	1 mile	0
RCRA	TSD Facility List (USEPA)	3/06/08	0.5 mile	0
RCRA	Generators Facility List (USEPA)	3/06/08	0.25 miles	0
US ENG CONTROLS	Engineering Controls Sites List	3/31/08	0.5 mile	0
US INST CONTROL	Sites with Institutional Controls	3/31/08	0.5 mile	0
ERNS	Emergency Response Notification System (USEPA)	1/23/08	Site only	0

NPL = National Priority List
CERCLIS = Comprehensive Environmental Response, Compensation, and Liability Information System
CORRACTS = Corrective Action Report
RCRA = Resource Conservation and Recovery Act
RCRIS = Resource Conservation and Recovery Information System
TSD = Transport, Storage and Disposal

USEPA National Priorities List (NPL)

The National Priorities List compiled by the U.S. Environmental Protection Agency lists the Superfund Hazardous Waste Sites as required by federal law. The identification of the hazardous waste sites presenting the greatest risk to human health and the environment is mandated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) passed in 1980. This list is prioritized according to the severity of the risk to public health and the environment. **No NPL sites were identified within one mile of the proposed roadway extension corridor.**

USEPA National Priorities List Deletions (DELISTED NPL)

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CRF 300.425.(e) sites may be deleted from the NPL when no further response is appropriate. **No De-listed NPL sites were identified within one half mile of the proposed roadway extension corridor.**

USEPA CERCLIS List (CERCLIS)

The CERCLIS List, or Comprehensive Environmental Response, Compensation, and Liability Information System database, contains data on potentially hazardous waste sites that have been reported to the EPA by states, municipalities, private companies, and private persons. These sites are considered for possible clean up activities or inclusion onto the NPL. **No CERCLIS sites were identified within one half mile of the proposed roadway extension corridor.**

USEPA CERCLIS List-No Further Remedial Action Planned (CERC-NFRAP)

The CERC-NFRAP List contains sites that have been removed from the CERCLIS list and archived. Archived status indicates that, to the best of the EPA's knowledge, assessment at a site has been completed and the EPA has determined that no further steps will be taken to list the site on the NPL at this time. This decision does not necessarily mean that there is no hazard associated with a given site, it only means that, based upon available information, the location is not judged to be a potential NPL site. **No CERC-NFRAP sites were identified within one half mile of the proposed roadway extension corridor.**

USEPA RCRA CORRACTS List (CORRACTS)

The RCRA CORRACTS or Corrective Action Report database lists those facilities that generate, treat, store, or dispose of hazardous wastes that have undergone remediation activity. These sites have experienced spills or releases of hazardous chemicals prompting the need for clean up action. The extent and type of contamination is listed in this report as well as the status of the corrective actions. **No hazardous waste facilities that have undergone corrective action were identified within one mile of the proposed roadway extension corridor.**

USEPA RCRA TSD Facilities List (RCRA)

The EPA maintains a list of Treatment, Storage, and Disposal (TSD) Facilities that either handle or dispose of hazardous waste as defined by the hazardous waste regulations published by the EPA according to the Resource Conservation and Recovery Act (RCRA). This information is contained in the Resource Conservation and Recovery Information System (RCRIS). **No TSD facilities were identified within one half mile of the proposed roadway extension corridor.**

USEPA RCRA Generators List (RCRA)

The EPA tracks all facilities that generate hazardous wastes in excess of threshold quantities set in the RCRA regulations. RCRA large quantity generators (LQG) are those that produce in excess of 1000 kilograms of hazardous waste per month, and small quantity generators (SQG) are those that produce greater than 100 kg per month but less than 1000 kg per month. This information is also contained in the Resource Conservation and Recovery Information System (RCRIS). **No hazardous waste generators were identified within one quarter mile of the proposed roadway extension corridor.**

USEPA Engineering Controls Sites List (US ENG CONTROLS)

The EPA maintains this list of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to prevent regulated or hazardous substances from entering environmental media or effecting human health. **No sites with engineering controls were identified within one half mile of the proposed roadway extension corridor.**

USEPA Institutional Controls Sites List (US INST CONTROL)

The EPA maintains this list of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of institutional

controls. **No sites with institutional controls were identified within one half mile of the proposed roadway extension corridor.**

USEPA ERNS List (ERNS)
The Emergency Release Notification System list, compiled by the US EPA, lists the locations and other data on reported releases of oil and hazardous substances. All releases in excess of threshold quantities are required to be reported and included in this list. **No entries on the ERNS database were identified for the subject properties.**

3.1.2 State and Local Database Search Results

Table 3 lists the major State database records that were searched for this report. These records are maintained by the State Department of Health. The ASTM methodology (ASTM: E 1527-00) specifies a minimum search distance for each database, and also mandates that each database record used must have been updated by the source within 90 days of the search. Table 4 lists the dates of the most recent update for each State database source, along with the ASTM-mandated search distance for each database and the number of hits, or listed sites identified from each database within the recommended search distance. Results from each database search are described individually below.

Table 3: State Environmental Databases Reviewed

Database	Source Category	Updated by Source	Search Distance	Hits
SHWS	State-recognized Hazardous Waste Sites (Hawaii DOH)	3/20/08	1 mile	0
SWF/LF	Permitted Solid Waste Facilities and Landfills (Hawaii DOH)	2/20/08	0.5 mile	0
UST	Registered Underground Storage Tank sites (Hawaii DOH)	3/26/08	0.25 mile	0
LUST	Leaking UST sites (Hawaii DOH)	3/26/08	0.5 mile	1
SPILLS	HEER Release Notifications (Hawaii DOH)	3/20/08	site only	0
INST CONTROLS	Sites with Institutional Controls	3/20/08	site only	0
VCP	Voluntary Response Program Sites	3/20/08	0.5 mile	0
DRYCLEANERS	Permitted Dry Cleaning Facilities	3/27/08	0.5 mile (not required)	0
BROWNSFIELDS	Brownsfields Sites	3/20/08	0.5 mile	0

DOH = Hawaii State Department of Health
HEER = Hazard Evaluation and Emergency Response

State of Hawaii Hazardous Waste Sites (SHWS)
This list includes all facilities, sites, or areas in which the Office of Hazard Evaluation and Emergency Response has an interest, has investigated, or may investigate under Hawaii Revised Statutes. **No state-recognized hazardous waste sites were identified within one mile of the proposed roadway extension corridor.**

State of Hawaii Landfill Sites (SWF/LF)
The state list of Solid Waste Facilities and Landfill Sites contains an inventory of solid waste disposal facilities or landfills in the state. These facilities may be active or inactive or open dumps that failed to meet RCRA criteria for proper solid waste landfills. **No state recognized landfills or disposal sites were identified within a half mile of the proposed roadway extension corridor.**

State of Hawaii UST List (UST)
This list of registered underground storage tanks is administered by the State of Hawaii Underground Storage Tank (UST) division. All tanks that are registered as required by the federal RCRA regulations are contained on this list. The database also includes the number and types of tanks registered, the regulatory status of the tanks, and whether they have been removed and closed according to state law. **No registered underground storage tank sites were identified within a quarter mile of the proposed roadway extension corridor.**

State of Hawaii Leaking UST List (LUST)
The state Department of Health UST Division records the location and regulatory status of all sites in which leaking underground storage tanks have been identified.

One leaking underground storage tank site was identified within a half mile of the proposed roadway extension corridor. This site, the fuel tank on the backup generator for the KSSK-FM radio transmitter, is located more than one quarter mile from the subject properties, and has been cleaned up to the satisfaction of the State Department of Health. No impact to the subject properties is anticipated.

State of Hawaii Hazard Evaluation and Emergency Response Spills List (SPILLS)
The Department of Health HEER office maintains a record of all spills and releases of chemicals and petroleum products above the regulatory threshold quantity that have been reported to the HEER office since 1988. These records are used to track all incidents to ensure that they are properly cleaned up. **No record of any spills on the subject properties that have been reported to the HEER office was identified in the database report.**

State of Hawaii Institutional Controls Sites List (INST CONTROLS)
The Department of Health maintains this list of Voluntary Response Program and Brownsfields sites with institutional controls in place. **The subject properties were not identified as sites with institutional controls in place.**

State of Hawaii Voluntary Response Program Sites List (VCP)
The Department of Health maintains this list of Voluntary Response Program sites, which are sites where voluntary clean-up projects are underway or have been completed by current or former

owners. **No Voluntary Response Program sites were identified within a half mile of the proposed roadway extension corridor.**

State of Hawaii Drycleaners Sites List (DRYCLEANERS)
The Department of Health maintains this list of permitted dry cleaning facilities in the state, which are common sources of groundwater contamination. This search is not required by the ASTM standard but is included due to the prevalence of contamination associated with dry cleaning facilities. **No dry cleaners were identified within a half mile of the proposed roadway extension corridor.**

State of Hawaii Brownsfields Sites List (BROWNSFIELDS)
The Department of Health maintains this list of Brownsfields sites.
No Brownsfields sites were identified within a half mile of the proposed roadway extension corridor.

3.2 *Standard Historical Use Information Sources*

The following information was reviewed pertaining to the historical uses of the subject properties and the surrounding area.

3.2.1 Aerial Photographs

Aerial photographs of the subject properties and the surrounding area were obtained from the Photogrammetry Department at R. M. Towill Corporation in Honolulu, HI. Aerial photographs covering the subject properties were available from the years 1970, 1975, 1982, 1987, 1995 and 2001. These photographs were examined for evidence of previous site usage. The following discussion describes the apparent uses of the subject properties and the adjacent areas noted in each of the photos reviewed.

1970 Photo: In this black and white photo taken from an altitude of 6,700 feet, the subject property appears completely undeveloped and does not appear to be in use. The area can be identified by its proximity to the existing H-1 Freeway and Puu Makakilo. There are no other visible distinguishing features in the vicinity of the property.

1975 Photo: In this black and white photo taken from an altitude of 6,500 feet, the subject property remains undeveloped, but there are some unpaved roads or paths through the property that are visible. The lower portion of Parcel 006, below the subject property, appears to be cultivated, possibly as sugar cane.

1982 Photo: In this black and white photo taken from an altitude of 13,000 feet, the entire Makakilo residential area is visible. Although the photo is taken from a high elevation, some details of the golf course on Parcel 074 are visible, including golf cart paths and a water feature. No other sign of development is visible on the subject property.

1987 Photo: In this black and white photo taken from an altitude of 13,000 feet, the subject property appears unchanged from 1982. The golf course does not appear to have been completed or maintained.

1995 Photos: In this color photo taken from an altitude of 19,400 feet, the golf course again appears to be under development, with a significant amount of grading activity underway. The presence of some of the exposed soils may be due to erosion rather than development. Palehua Road appears to have been expanded and improved, and residential development is continuing along Makakilo Drive toward the subject property.

2001 Photos: In this black and white photo taken from an altitude of 10,500 feet, the layout of the golf course remains visible and Palehua Road can also be seen. Makakilo and Kapolei have expanded considerably. The rock quarry along H-1 to the west of the subject property is notably larger, but there is no sign of the Grace-Pacific quarry below the subject property. There is no indication of additional development on the subject property.

3.2.2 Sanborn Fire Insurance Maps

The Sanborn Library includes a large collection of historical fire insurance maps dating back to the late 1800's. These maps show all insurable structures in a given area at a specific point in time, and are thus useful indicators of historical land use and changes in land use over time.

A Sanborn Map Report was not requested for the subject properties as there are no existing or historical structures in the area.

3.2.3 Historical Topographic Maps

A Historical Topographic Map Report, including copies of all historical USGS topographic maps available for the site and vicinity of the subject properties, was provided to KEI by Environmental Data Resources, Inc on April 2, 2008 (*EDR, 2008b*). Historical topographic maps of the Ewa Quadrangle, which include the subject properties and the surrounding area, were available from the years 1962, 1968, 1983 and 1998. These maps were examined for evidence of historic land use patterns. The following discussion describes the apparent uses of the subject properties and the adjacent areas noted in each of the maps provided by EDR. A copy of EDR's Historical Topographic Map Report is included here as Appendix D.

1962 Topo Map: The USGS Topographic Map of the Ewa Quadrangle from 1962 shows a relatively undeveloped Ewa Plain and Makakilo area. Farrington Highway and Waimanalo Road are the only major roadways through the Kapolei area. There is no residential community in the Makakilo area, though there is a small airstrip above Puu Kapolei. The subject property can be identified by its proximity to Puu Makakilo and Kaloi Gulch. The only development in the area is an aqueduct and Palehua Road, an unpaved road

which runs through the subject property and across Farrington Highway onto the Ewa plain.

1968 Topo Map: The USGS Topographic Map of the Ewa Quadrangle from 1968 shows almost no change in the vicinity of the subject property. There is a water tank and pumping station above the subject property, as well as a small quarry, but no other building or infrastructure in the area. To the south, the H-1 Freeway has been constructed. Further west, development of Makakilo City has been begun but there is not yet any sign of modern Kapolei as it exists today.

1983 Topo Map: The USGS Topographic Map of the Ewa Quadrangle from 1983 shows no change to the immediate vicinity of the subject property. Excavation has begun at the large rock quarry to the west of the subject property along H-1, and residential development in Makakilo continues to expand up the slope of the hillside.

1998 Topo Map: The USGS Topographic Map of the Ewa Quadrangle from 1998 shows the clubhouse of the golf course that was partially constructed on the subject property. No other improvements or changes are notable in the vicinity of the subject property. To the south, the quarry has expanded, and both Kapolei and Makakilo have continued to expand. The Makakilo subdivision has also continued to expand above the subject property. There is no sign of the Grace-Pacific quarry below the subject property.

4.0 SITE RECONNAISSANCE

A visual inspection of the subject properties and surrounding areas was performed by Benjamin Owen of KEI. Photographs of the property taken at the time of the inspection are included in Appendix B.

4.1 *Methodology and Limiting Conditions*

Inspection of the subject properties was performed on April 7, 2008. Methodology for these inspection consisted of walking and visually inspecting all accessible areas of the subject properties, including all existing and accessible roads, paths and trails, and noting all observable features.

Some areas of the site are open and level; however many areas are overgrown or inaccessible, and physical access for visual inspection was limited. Limitations to physical inspection included tall, thick grasses and shrubs which limited access to many areas, fencing around the cattle ranching area on Parcel 006, and imported fill materials used for landscaping in the area formerly developed as a golf course.

4.2 *Observations*

This section documents observations recorded at the time of the physical inspection of the subject properties and the adjacent properties.

Most of the subject property is enclosed within a locked perimeter fence to discourage unauthorized dumping in the area. Mr. Owen was escorted on the property by Sidney Aki of Grace Pacific. The locked access gate along the existing quarry road was opened and Mr. Owen was allowed full access to the area.

The property is traversed by a poorly maintained asphalt roadway, which according to Mr. Aki was paved to facilitate transport of raw materials from the quarry below to the expanding Makakilo subdivision. This road ends at the lower edge of the existing Makakilo Drive subdivision, which is in the final stages of development.

Other than the paved access road, the only signs of development or use in the area are the abandoned remnants of the golf course infrastructure including concrete golf cart paths, landscaping features and an artificial lake bed. Much of the area is overgrown with thick grasses and brush. The concrete golf cart paths provide virtually the only access onto the property, with the exception of large swaths of open, eroded areas. These areas appear to have been covered with imported fill materials which have not been retained due to the lack of landscaping maintenance.

At the top of the subject property, the paved access road abuts the existing Makakilo subdivision where the subdivision approached the edge of Kaloi Gulch. At the bottom of the subject property, a portion of Parcel 006 is enclosed and is used as a cattle pasture. Below this pasture lies the Grace-Pacific quarry and the H-1 freeway. No indications of any potential recognized environmental conditions were observed on any of these adjacent properties.

5.0 INTERVIEWS

This section documents interviews conducted in the process of conducting this Phase 1 ESA. All interviews conducted for this assessment were conducted by Benjamin Owen of KEI.

Sidney Aki , Operations Manager, Grace Pacific Inc.
Mr. Aki was interviewed as a representative of Grace Pacific, which leases much of the subject property and operates the quarry below the property at the intersection of Palehua Road and H-1 Freeway. Mr. Aki is responsible for security and operations in the area for Grace Pacific. He indicated that the subject property had been originally developed as a golf course, but that the developers had run out of money and abandoned the project. Mr. Aki also provided details of when Palehua Road was paved to facilitate delivery of material to Makakilo. When asked if he was familiar with any current or historical use or storage of chemicals or petroleum products on the property, Mr. Aki indicated that he was not.

Dean Uchida, Vice President, D. R. Horton-Schuler Homes LLC
Mr. Uchida was interviewed as a representative for D. R. Horton-Schuler Homes, the owners of Parcel 074, a 115 acre parcel which encompasses the Kaloi Gulch and the property to the east of the subject property. Mr. Uchida stated that D. R. Horton-Schuler Homes had purchased the property in 2005 from Campbell Estate as part of a bulk land purchase including over 1500 acres. Mr. Uchida stated that D. R. Horton-Schuler Homes has not used or developed the parcel in any way since 2005 but he was not familiar with the history of the property prior to that date. He referred any further questions to Steve Kelly of Kapolei Property Development.

Steve Kelly, Kapolei Property Development
Several attempts were made to contact Mr. Kelly by telephone. He was not available to be interviewed for this report.

6.0 FINDINGS AND OPINION

This section lists findings of fact, which may include known or suspected recognized environmental conditions, historical recognized environmental conditions, and *de minimis* conditions associated with the subject properties that have been identified during the course of this Phase 1 ESA, as well as KEI's assessment of the potential impact on the subject properties from the conditions identified here.

FINDING: A LUST site was identified within one half mile from the subject property. The site has been remediated and DOH has issued a letter requiring no further action.
OPINION: No impact to the subject property is anticipated.

FINDING: An historic golf course was constructed or partially constructed on a portion of the subject property. The course was not completed and was never opened but much of the infrastructure remains in place and has not been maintained.
OPINION: It is unlikely that the presence of this abandoned golf course will have an impact on the use or development of the subject property, since the course was never operational. However, golf courses often have large supplies of pesticides and fertilizers as well as mechanical shops in their maintenance areas. In this case, the location of any historic maintenance area that may have been present on the site is not known.

FINDING: Imported fill materials appear to have been used extensively in the construction and development of the abandoned golf course.
OPINION: The impact of this fill material cannot be determined, as the source of the material is unknown. However, given the proximity of several large commercial quarries, it is likely that the materials were brought in from these sites.

FINDING: Several large quarry operations are located in close proximity to the property.
OPINION: No impact to the subject property is expected.

FINDING: A cattle ranch is located in close proximity to the subject property.
OPINION: No impact to the subject property is expected.

No recognized environmental conditions or historical recognized environmental conditions have been identified in association with the subject properties during the process of completing this assessment.

7.0 CONCLUSIONS

Kauai Environmental Inc. has performed this Phase 1 Environmental Site Assessment (ESA) for the properties along the proposed route of the Makakilo Drive Roadway Extension, a new section of Makakilo Drive planned to connect the existing Makakilo Drive to the H-1 Freeway. The exact route for this section of Makakilo Drive has not yet been determined, however the proposed alignment will traverse portions of one or more of the following properties TMK Nos. (1) 9-2-002: Parcel 006 and (1) 9-2-003: Parcels 074 and 079. This ESA covers those sections of these properties which would be affected by any of the three proposed alignments.

A review of State and Federal environmental regulatory databases indicated the following:

- No sites listed by the U.S. EPA on the NPL (Superfund) or delisted NPL databases were identified within the recommended search distances from properties which include the proposed roadway extension corridor.

- No CERCLIS (or CERC-NFRAP) sites were identified within the recommended search distance from properties which include the proposed roadway extension corridor.

- No RCRA corrective action sites or treatment, storage, and disposal facilities were identified within the recommended search distances from properties which include the proposed roadway extension corridor.

- No RCRA hazardous waste generators were identified within the recommended search distance from properties which include the proposed roadway extension corridor..

- No state-recognized hazardous waste sites were identified within one mile of the properties which include the proposed roadway extension corridor.

- No registered underground storage tank (UST) sites were identified within the recommended search distance from properties which include the proposed roadway extension corridor.

- One leaking underground storage tank (LUST) site was identified within the recommended search distance from properties which include the proposed roadway extension corridor. No impact to the subject properties is anticipated due to the location of this site relative to the subject properties, and the fact that a site clean-up has been completed.

- No active landfills were identified within the recommended search distance from properties which include the proposed roadway extension corridor.

- There have been no spill incidents connected with the subject properties that were reported to the HEER office or entered on the ERNS database.

- No Brownsfields sites, or sites with institutional or engineering controls, were identified within the recommended search distances from properties which include the proposed roadway extension corridor.

A review of relevant State and Federal databases did not identify any institutional controls, engineering controls, or activity and use limitations associated with the subject properties or adjacent properties.

A site reconnaissance at the subject properties was performed on April 7, 2008. The environmental issues identified during this inspection are listed below.

- Extensive erosion was evident in areas that were landscaped and graded as part of the former golf course on the site. It appears that much of the eroding material was imported fill. While this material may have been brought in from the nearby quarries, the source of the material is unknown.

A review of historical land use information including aerial photographs, historical topographic maps, and interviews with persons familiar with the history of the property has indicated the following:

- The subject property has been largely undeveloped.

- Possible historical uses included cattle ranching and limited agricultural production.

- Palehua Road, which runs through the property, was originally an unpaved road dating back to at least the 1960s. The roadway was paved to facilitate the delivery of raw materials to the Makakilo subdivision from the quarries nearby

- A portion of the subject property was previously developed as a golf course, which has since been abandoned and has fallen into neglect. Potential environmental concerns related to this abandoned golf course include the use of imported fill materials and the possibility of residual contamination associated with chemicals or petroleum products that may have been stored and used at the golf course for maintenance purposes. Whether or not the golf course had a functional maintenance facility is unknown, as is the location of any such facility. Neither of these issues are considered to be recognized environmental conditions.

In summary, no recognized environmental conditions or historical recognized environmental conditions have been identified in association with the subject properties during the process of completing this Phase 1 Environmental Site Assessment.

8.0 SIGNATURE

This Phase 1 Environmental Site Assessment was performed by Benjamin Owen of Kauai Environmental, Inc., a Registered Environmental Assessor (CA Certification # 08030). A copy of Mr. Owen's qualifications is included in Appendix D. Mr. Owen performed the site reconnaissance and interviews personally and performed or supervised and reviewed all remaining elements of this Phase 1 ESA.



Benjamin Owen, MS, REA

4/14/08

Date

9.0 REFERENCES

American Society for Testing and Materials (ASTM); *"Standard Practice for Environmental Site Assessments: Phase 1 Environmental Site Assessment Process,"* ASTM 2005 Standard: E 1527-00

Environmental Data Resources, Inc. (EDR); *Environmental Database Search Results for Makakilo Road Extension, Kapolei, HI* (April 1, 2008).

EDR; *Historical Topographic Map Report for Makakilo Road Extension, Kapolei, HI* (April 2, 2008).

Sato, Ikeda, Paeth, Smythe, and Takehiro; *Soil Survey of the Island of Hawaii, State of Hawaii* (December, 1973).

APPENDIX A:

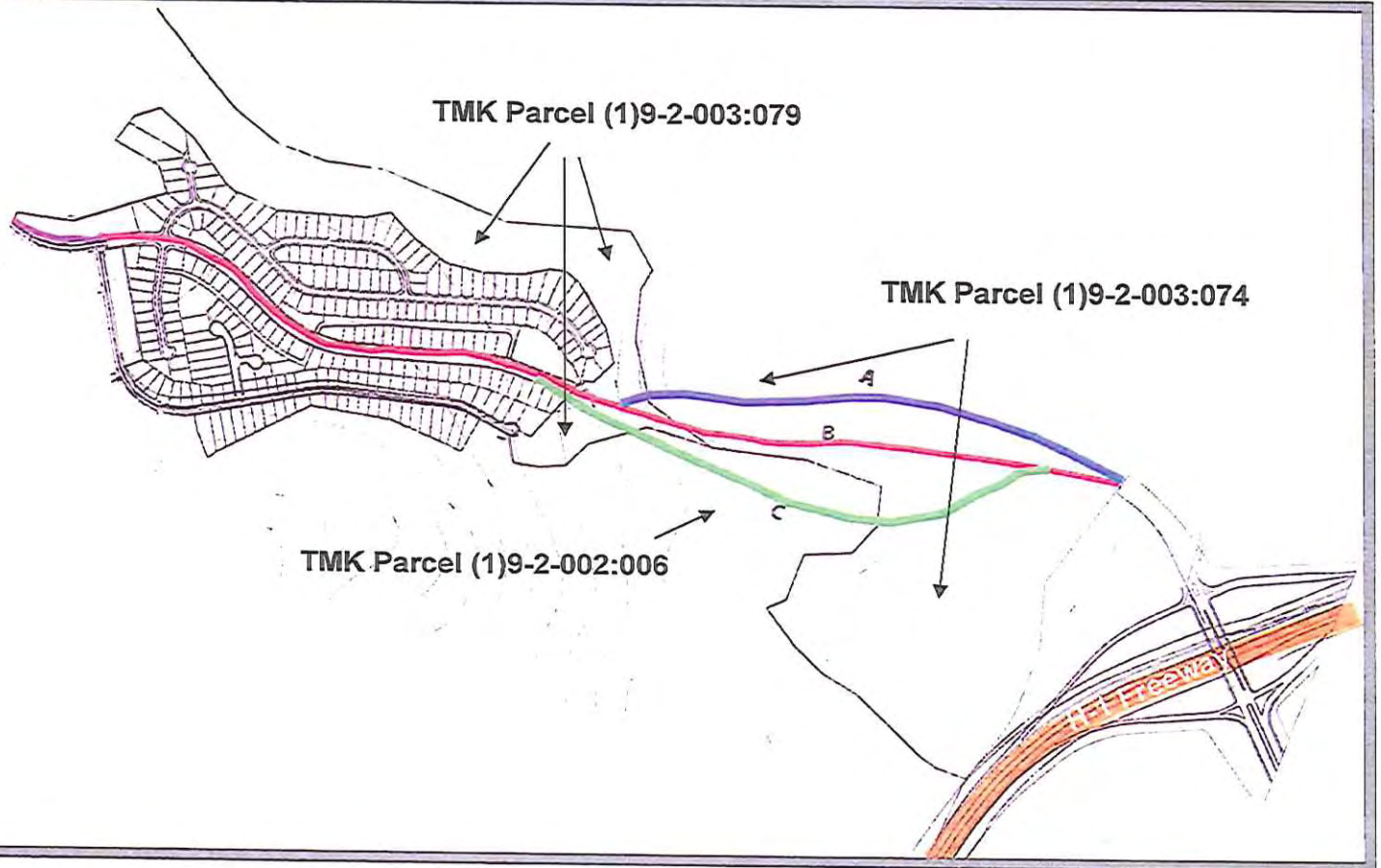
FIGURES



Environmental Site Assessment
Makakilo Drive Roadway Extension
April 2008

Figure 1: Project Location,
West Oahu, Hawaii

Source: GoogleEarth

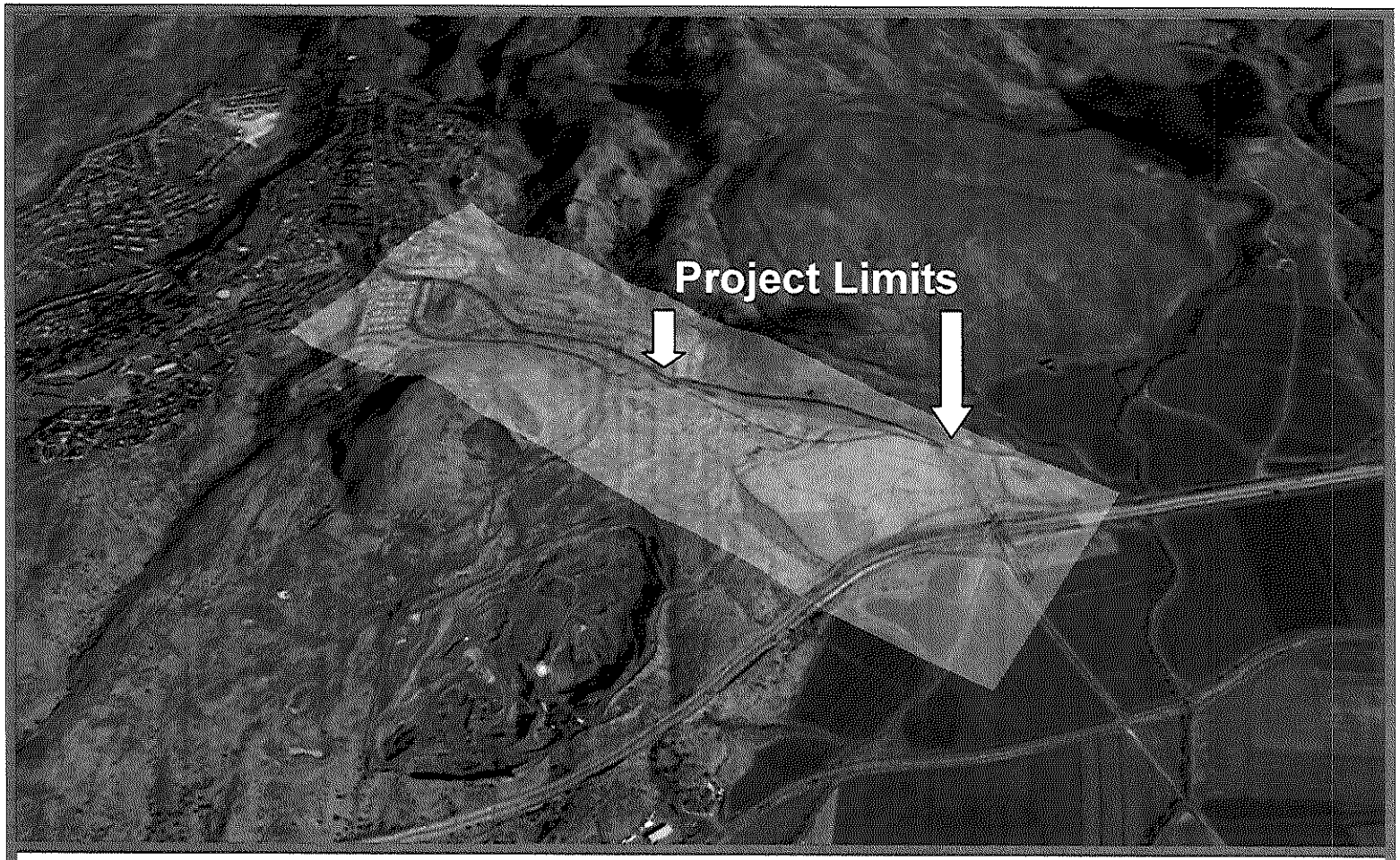


Environmental Site Assessment
Makakilo Drive Roadway Extension
April 2008

N

Figure 2: Proposed Alignments,
West Oahu, Hawaii

Source: R.M. Towill Corporation



Environmental Site Assessment
Makakilo Drive Roadway Extension
April 2008

N

Figure 3: Project Limits,
West Oahu, Hawaii

Source: GoogleEarth

APPENDIX B:

PHOTOGRAPHS

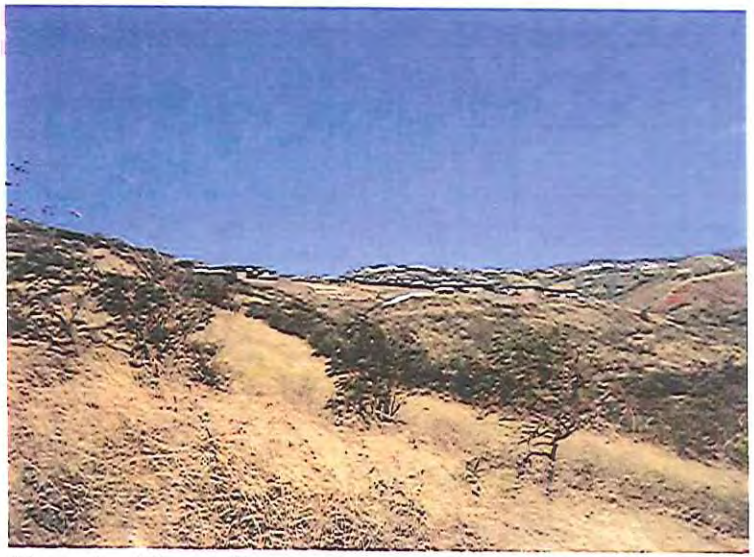


Photo 1: View of Makakilo subdivision at the end of the existing Makakilo Drive, as seen from the slope below.



Photo 2: View of Kaloi Gulch as seen from the existing Makakilo subdivision.



Photo 3: View of asphalt quarry road through subject property as seen from above.



Photo 4: Asphalt roadway through subject property.



Photo 5: Concrete golf cart pathway alongside asphalt road through subject property.



Photo 6: Drain line in abandoned concrete golf cart path.



Photo 7: Typical view of concrete golf cart path through upper portion of subject property.



Photo 8: Access gate at lower end of asphalt roadway through subject property.



Photo 9: Ranching operation below quarry access road.

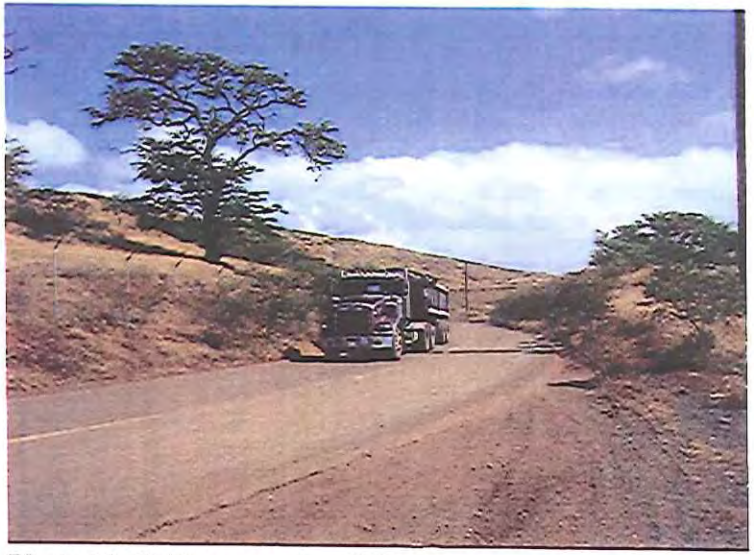


Photo 10: Delivery truck arriving at rock quarry below subject property.



Photo 11: Rock quarry along freeway below subject property.



Photo 12: New Makakilo Drive freeway off-ramp under construction below subject property.

APPENDIX C:

HISTORIC TOPOGRAPHIC MAP REPORT

EDR Historical Topographic Map Report

Makakilo Road Extension
Makakilo Rd.
Kapolei, HI 96707

Inquiry Number: 2183791.4

April 02, 2008



EDR® Environmental
Data Resources Inc

The Standard in Environmental Risk Information

440 Wheelers Farms Rd
Milford, Connecticut 06461

Nationwide Customer Service

Telephone: 1-800-352-0050
Fax: 1-800-231-6802
Internet: www.edrnet.com

EDR Historical Topographic Map Report

Environmental Data Resources, Inc.s (EDR) Historical Topographic Map Report is designed to assist professionals in evaluating potential liability on a target property resulting from past activities. EDRs Historical Topographic Map Report includes a search of a collection of public and private color historical topographic maps, dating back to the early 1900s.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

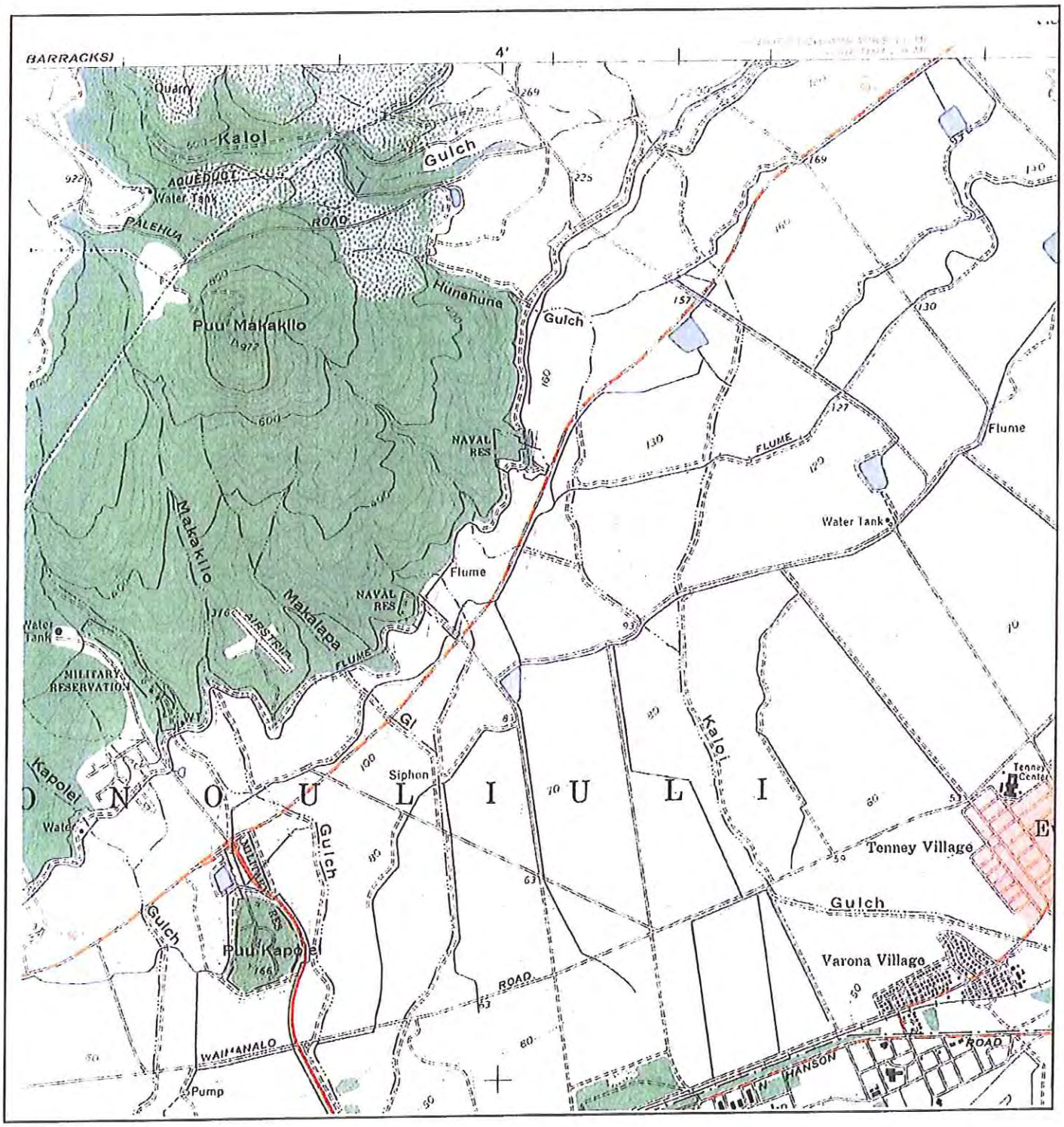
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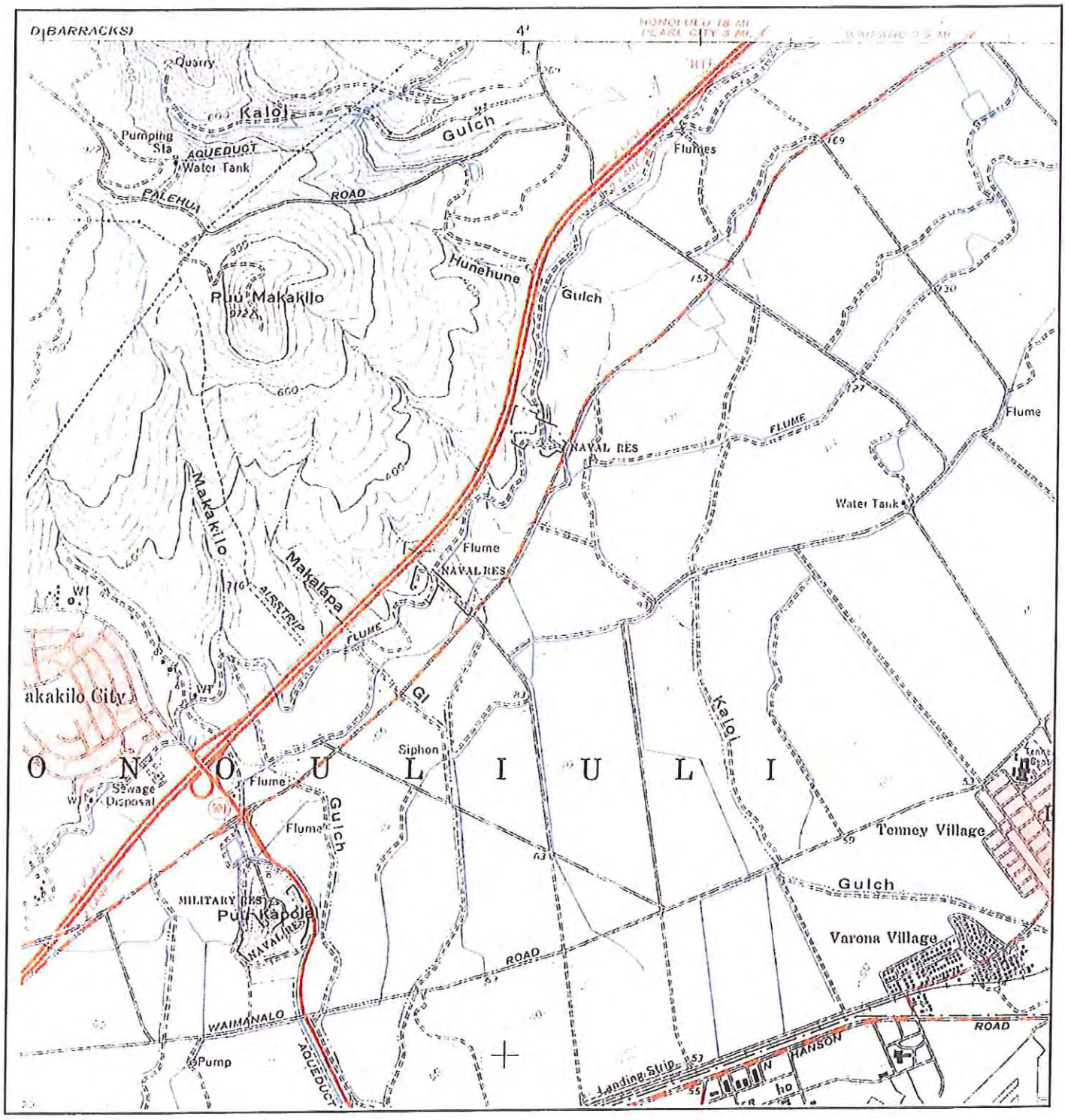
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Historical Topographic Map



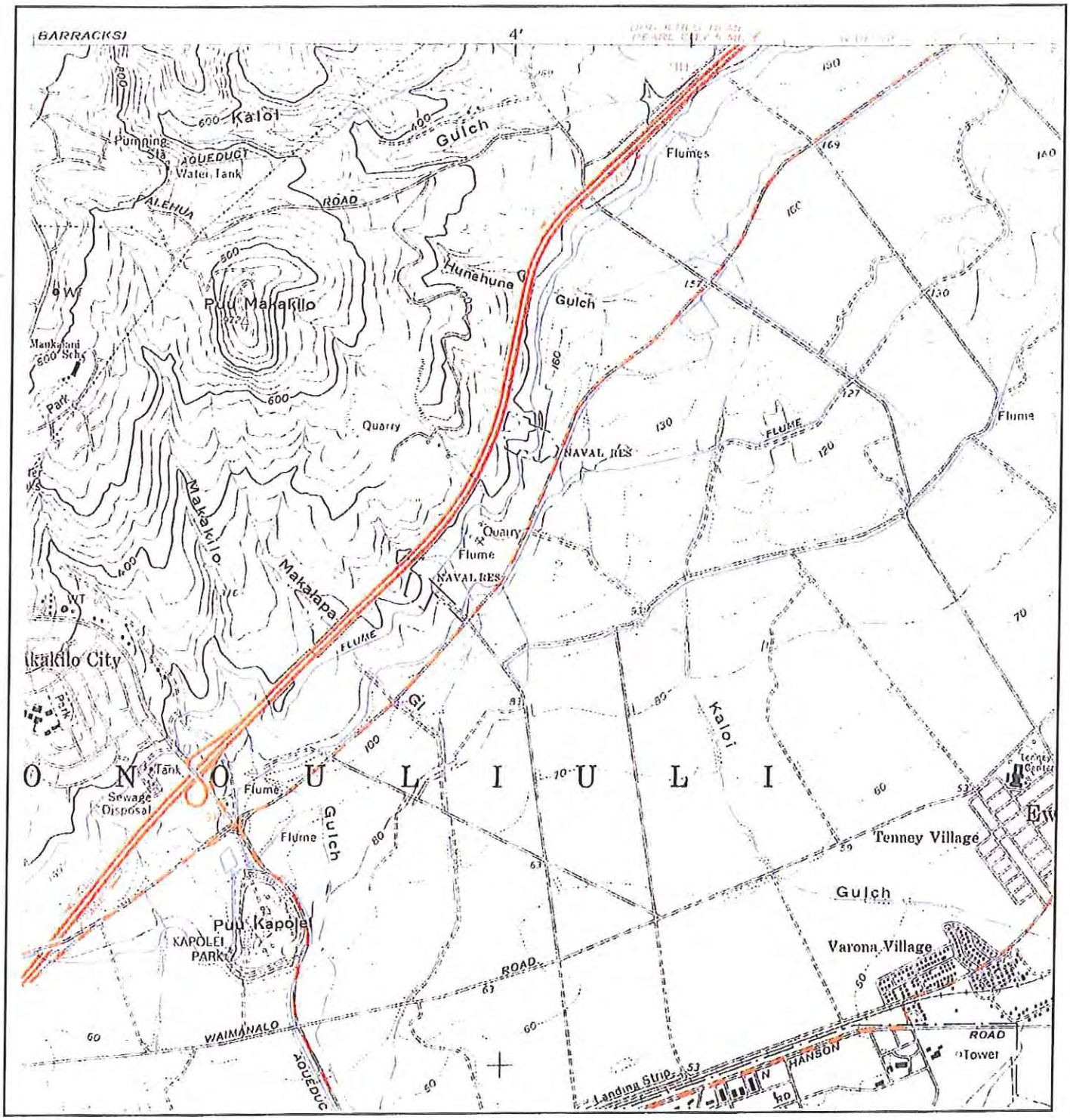
N	TARGET QUAD NAME: EWA, HI MAP YEAR: 1962 SERIES: 7.5 SCALE: 1:24,000	SITE NAME: Makakilo Road Extension ADDRESS: Makakilo Rd. Kapolei, HI 96707 LAT/LONG: 21.3662 / 158.062	CLIENT: Kauai Environmental CONTACT: David Gerow INQUIRY#: 2183791.4 RESEARCH DATE: 04/02/2008

Historical Topographic Map



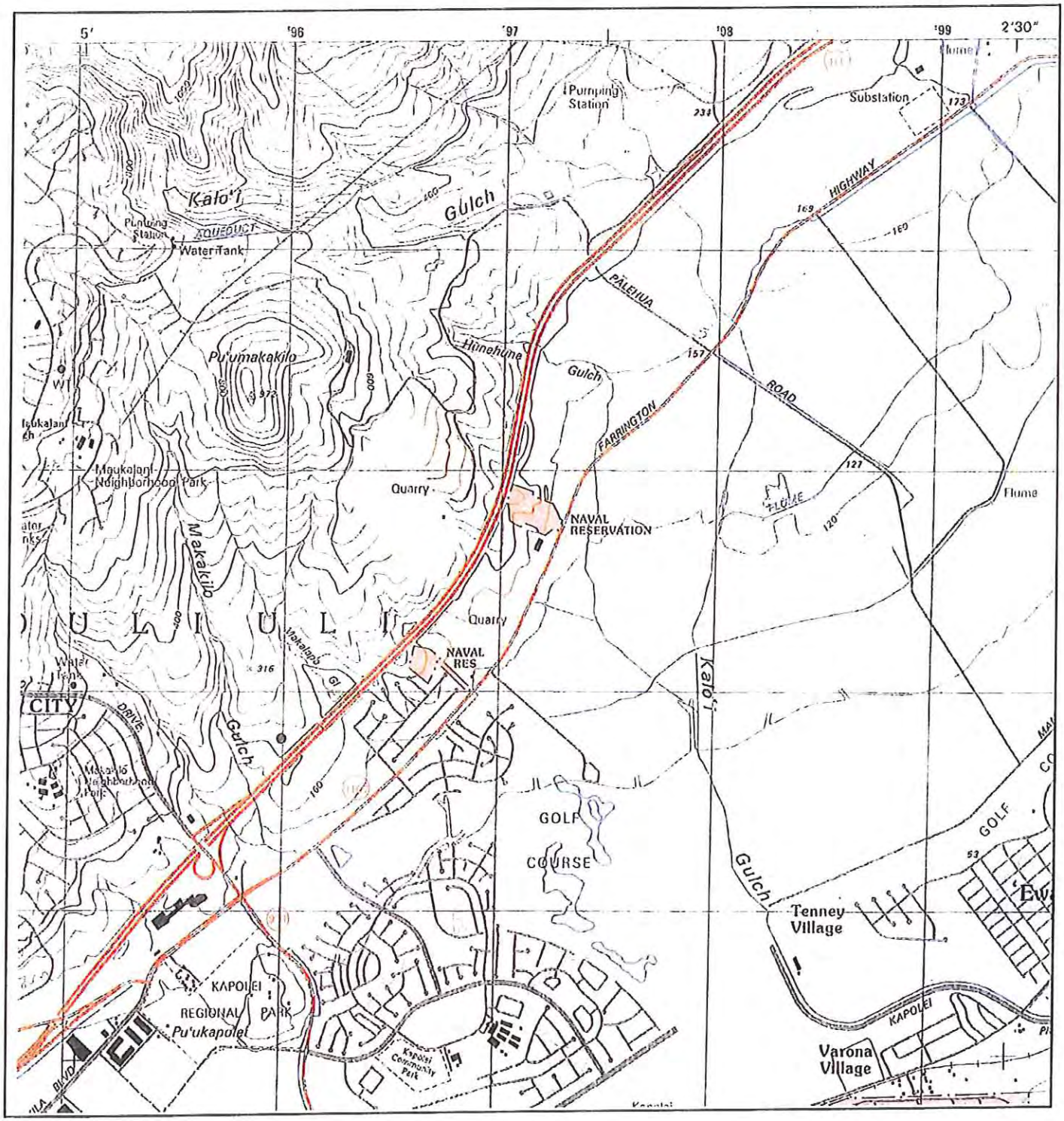
N	TARGET QUAD NAME: EWA, HI MAP YEAR: 1968 SERIES: 7.5 SCALE: 1:24,000	SITE NAME: Makakilo Road Extension ADDRESS: Makakilo Rd. Kapolei, HI 96707 LAT/LONG: 21.3662 / 158.062	CLIENT: Kauai Environmental CONTACT: David Gerow INQUIRY#: 2183791.4 RESEARCH DATE: 04/02/2008

Historical Topographic Map



N	TARGET QUAD NAME: EWA, HI MAP YEAR: 1983 SERIES: 7.5 SCALE: 1:24,000	SITE NAME: Makakilo Road Extension ADDRESS: Makakilo Rd. Kapolei, HI 96707 LAT/LONG: 21.3662 / 158.062	CLIENT: Kaual Environmental CONTACT: David Gerow INQUIRY#: 2183791.4 RESEARCH DATE: 04/02/2008

Historical Topographic Map



N	TARGET QUAD NAME: EWA, HI MAP YEAR: 1998 SERIES: 7.5 SCALE: 1:24,000	SITE NAME: Makakilo Road Extension ADDRESS: Makakilo Rd. Kapolei, HI 96707 LAT/LONG: 21.3662 / 158.062	CLIENT: Kaual Environmental CONTACT: David Gerow INQUIRY#: 2183791.4 RESEARCH DATE: 04/02/2008

APPENDIX D:

QUALIFICATIONS OF ENVIRONMENTAL PROFESSIONAL

BENJAMIN OWEN, MS, REA

Project Manager

EDUCATION

- M.S. Marine Science, University of California at Santa Cruz, 1996
- B.A. Anthropology, The University of Chicago, 1992

ACTIVE REGISTRATIONS

- AHERA Asbestos Inspector
- AHERA Asbestos Project Designer
- Registered Environmental Assessor

PROFESSIONAL EXPERIENCE

Mr. Owen has over 10 years experience in chemistry, toxicology, environmental science and industrial hygiene. His background includes trace metal and trace organic sampling and analysis, sediment toxicology, project management, hazardous materials assessments and occupational health and safety.

Since joining Kauai Environmental in 2002, Mr. Owen has gained considerable experience in the field of industrial hygiene, performing numerous asbestos inspections and hazardous materials surveys throughout the state; conducting environmental site assessments in residential, commercial, and industrial settings; designing, managing and monitoring asbestos abatement projects, and writing emergency response, environmental protection, and health and safety plans for various construction, demolition, and remediation projects.

PROJECT EXPERIENCE

Statewide Airports Asbestos Inventory for DOT-Airports, with R.M. Towill Corporation. Mr. Owen is the assistant project manager and for this effort to identify and inventory all asbestos containing materials in all DOT-Airports buildings. Under this ongoing project KEI has reviewed and verified historical inspection data, surveyed DOT-A facilities statewide, created a GIS database to be linked to DOT-A's GIS system, and assisted with abatements, management and planning, and operations and maintenance as related to asbestos containing materials. Mr. Owen is responsible for coordinating and performing all inspections and maintaining the GIS database.

Risk Assessment and Emergency Response, International Arrivals Building, Honolulu International Airport. When asbestos-containing materials were released in the IAB due to heavy rains in the winter of 2003-'04, Kauai Environmental was called upon to manage the situation under the DOT contract listed above. Kauai Environmental coordinated emergency abatements of the damaged materials, performed a human health risk assessment for the entire building and designed an emergency response program to minimize any future releases of asbestos fibers.

Sand Island WWTP Site Investigation, City and County of Honolulu. Mr. Owen coordinated this extensive site investigation to identify subsurface contamination of soils to be disturbed during the Primary Treatment Expansion Project. The project required sampling soils and groundwater at 150 locations with analysis for a wide variety of potential contaminants.

Ewa Mill Environmental Site Remediation, City and County of Honolulu. Mr. Owen supervised remediation field work at this historic sugar mill and mixed use industrial site. The project included removal and disposal of lead and PCB contaminated soils, air monitoring, subsurface investigations, excavation of buried waste drums, closure and removal of sumps, ASTs and USTs. Mr. Owen helped develop and implement a health and safety program for the project, and compiled an extensive report documenting all environmental work and results of all sampling for submission to DOH.

Hazardous Materials Surveys Mr. Owen has performed or assisted with many comprehensive hazardous materials surveys for facilities undergoing demolition and/or renovation, including: Guam Naval Hospital, Guam; Pier 1 Cargo Facility, Honolulu, HI; Frear Hall Dormitory, UH Manoa, Honolulu, HI; Bank of Hawaii, Lihue, Kauai.

Environmental Site Assessments. Mr. Owen is a Registered Environmental Assessor (REA) and has performed over 40 Phase I and Phase II site assessments over the past 5 years.

APPENDIX B

Traffic Projections for Makakilo Drive, Julian Ng, October 2008

Julian Ng, Incorporated
Transportation Engineering Consultant

P. O. Box 816
Kaneohe, Hawaii 96744-0816

phone: (808) 236-4325
fax: (808) 235-8869
email: jnghi@hawaii.rr.com

October 5, 2008

Mr. Craig Luke
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819-3494

Subject: Traffic Projections for Makakilo Drive Extension
North of H-1 Freeway (North-South Road Interchange)
Ewa, Oahu, Hawaii

Dear Mr. Luke:

This letter responds to your request for future traffic projections for noise and related studies for the Makakilo Drive Extension project. The traffic projections are based on analyses that we had done in the past for development projects in Makakilo and our review of traffic studies prepared by others for the North-South Road and for the University of Hawaii West Oahu campus development.

Summary

Recommended projections of traffic volumes on the Makakilo Drive Extension, north of the North-South Road Interchange with Interstate Route H-1 are as follows:

Table 1 – Recommended Traffic Projections

	2025		Ultimate	
Average Daily Traffic (two-way, vehicles per day)	17,700		19,500	
	SB	NB	SB	NB
AM Peak Hour (vehicles per hour)	940	335	1,030	370
PM Peak Hour (vehicles per hour)	525	850	580	940
SB = southbound NB = northbound				

If a mix of vehicle type is needed in these studies, the earlier recommendations for a T_{24} (trucks as a percentage of daily traffic) of 1.5% should be used. Previous recommendations also have been that these trucks would consist of 82% two-axle trucks, 6% three-axle trucks (together totaling 88% “medium” trucks), and 12% four-or-more axle (“heavy”) trucks.

Background

Several traffic studies showed future traffic volumes on the Makakilo Drive Extension at the H-1 Freeway. In late-2002, we evaluated the traffic impacts of the proposed Palehua East development at Makakilo, estimated traffic volumes, and recommended a street cross section for the Makakilo Drive Extension within the subdivision.

The Final Environmental Assessment (NS FEA) for the North-South Road and Kapolei Parkway, prepared by Parsons Brinckerhoff Quade & Douglas, Inc., was completed in September 2004. It showed peak hour traffic projections for those roadways and for the Makakilo Drive Extension north of the North-South Interchange. In our review of the NS FEA, we note that the traffic study was based on the University of Hawaii West Oahu campus located southwest of the intersection of North-South Road and Farrington Highway.

In July 2007, the developer of Palehua East, Castle & Cooke Homes Hawaii, asked that we reevaluate the Palehua East project by reviewing more recent traffic data. We found that our earlier project traffic estimates were still applicable and provided to the developer traffic projections for 2025 and beyond to be used in the design of the roadway pavement for the portion of Makakilo Drive within the subdivision. We recommended that the highest projections plus 10% be used for the pavement design. These projections were submitted along with the pavement design (by others) to the City and County of Honolulu Department of Planning and Permitting for approval prior to construction of the roadway.

In August 2007, an update of the traffic study for the University of Hawaii West Oahu development was completed by PB Americas, Inc. It showed slightly revised traffic volumes on the Makakilo Drive Extension north of the interchange. Table 2 compares the 2025 projections.

Table 2 – Traffic Projections for 2025

	AM Peak Hour		PM Peak Hour	
	SB	NB	SB	NB
Letter dated December 10, 2002[a]	775	255	425	780
September 2004 FEA[b] for North-South Road and Kapolei Parkway	940	335	525	850
August 2007 Traffic Study[c] for University of Hawaii West Oahu	940	175	525	315

SB = southbound NB = northbound

[a] Julian Ng, Inc. letter to GEB Funding II Corporation
[b] Parsons Brinckerhoff Quade & Douglas, Inc, *Final Environmental Assessment, North-South Road and Kapolei Parkway*, September 2004.
[c] PB Americas, Inc. *Traffic Study, University of Hawai`i West O`ahu*, August 2007.

Analyses

The traffic projections that we had made for the developer, which considered other traffic in Makakilo that would use the Extension instead of the existing Makakilo Drive, were lower than the projections made by Parsons Brinckerhoff for the NS FEA traffic study. These projections, however, did not include any other new development north of Interstate Route H-1. The latest projections made as part of the University of Hawaii West Oahu development show the same southbound volumes as the NS FEA; however, the northbound traffic volumes are lower. Because of the reductions in northbound traffic volumes, the latest projections do not seem reasonable for the residential character of the area served by the Makakilo Drive Extension.

The projections that were made as part of the July 2007 reevaluation also considered that the traffic projections from the NS FEA would have the interchange terminals operating at about 90% of capacity. That reevaluation recommended use of the traffic projections from the FEA for the North-South Road and Kapolei Parkway for 2025, with a 10% increase applied to account for other development that could occur beyond 2025.

Conclusions and Recommendations

The use of traffic projections for 2025 from the NS FEA would be appropriate for any evaluation of year 2025 conditions. If a later year were to be evaluated, the 2025 projections should be increased by 10% (this reflects an average annual increase of 1.9% if the future year is 2030).

Should you have any questions, please contact me.

Sincerely,

JULIAN NG, INCORPORATED



Julian Ng, P.E., P.T.O.E.*
President

* PTOE is the Professional Traffic Operations Engineer certification from Transportation Professional Certification Board, Inc. For more information, please see http://www.ite.org/certification/PTOE/certification_about.asp

APPENDIX C

Archaeological Inventory Survey, Cultural Surveys Hawai'i, April 2008

Archaeological Inventory Survey for the Approximately 62-acre Makakilo Drive Extension Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu Island TMK: [1] 9-2-002:006, 9-2-003:079

Prepared for
R. M. Towill Corporation

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Management Summary

Reference	Archaeological Inventory Survey for the Approximately 62-acre Makakilo Drive Extension Project, Honouliuli Ahupua‘a, ‘Ewa District, Island of O‘ahu (TMK: (1) 9-2-002:006, 9-2-003:079) (Hunkin et al. 2008)
Date	December 2008
Project Number	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: HONOULIULI 8
Investigation Permit Number	CSH completed the inventory survey fieldwork under state archaeological permit No. 08-14 issued by the State Historic Preservation Division, per Hawai‘i Administrative Rules (HAR) Chapter 13-13-282.
Project Location	The project area consists of portions of TMK: (1) 9-2-002:006 and 9-2-003:079. The project area is generally bound on the west by the Makakilo Drive, on the south by Quarry Road, which connects Old Pālehua Road to the Grace Pacific Makakilo Quarry, on the east by Interstate highway H-1, and on the north by the Kalo‘i Gulch floodplain. The project area is depicted on the USGS 7.5 minute series ‘Ewa quadrangle topographic map (Figure 1)
Land Jurisdiction	Private, D.R. Horton – Schuler Homes LLC, Castle & Cooke Homes Hawaii, Inc.
Agencies	State Historic Preservation Division / Department of Land and Natural Resources (SHPD/DLNR).
Project Description	Plans are to develop the project area into a roadway to connect the northeast end of Makakilo Drive to Interstate highway H-1.
Project Acreage	Approximately 62 acres
Area of Potential Effect (APE) and Survey Acreage	For the purposes of this study the area of potential effect (APE) and the project area are considered one and the same.
Historic Preservation Regulatory Context	The proposed project requires compliance with and review under State of Hawai‘i historic preservation review legislation [Hawai‘i Revised Statutes (HRS) Chapter 6E-42 and Hawai‘i Administrative Rules (HAR) 13-284]. At the request of R.M. Towill Corporation, CSH completed an archaeological inventory survey of the subject project area, per the requirements of HAR Chapter 13-13-276. This archaeological inventory survey report was prepared to support the proposed property’s historic preservation review and any other project-related historic preservation consultation. A previous draft of this study was commented on by the SHPD (November 11, 2008; Log No. 2008.2057; Doc No 0811LM11)
Fieldwork Effort	Todd Tulchin, B.S., Jon Tulchin, B.A., David Shideler, M.A., and Nifae Hunkin, B.A., under the general direction of Hallett H. Hammatt, Ph.D., conducted surface survey in the project area. Field work was conducted between January 31 and February 1, 2008.

Number of Historic Properties Identified	Two (2) new historic sites (SIHP Nos. 50-80-12-6950 and 50-80-12-6951) were recorded. SIHP No. 6950 is a drainage ditch associated with the historic-era commercial sugar cane industry. SIHP No. 6951 is a small reservoir associated with the historic-era commercial sugar cane industry. In addition to these historic properties, two (2) newly identified features associated with previously documented SIHP No. 50-80-09-2268 (Waiāhole Ditch System) were also recorded.
Historic Properties Recommended Eligible to the Hawai‘i Register of Historic Places (Hawai‘i Register)	Three (SIHP Nos. 50-80-09-2268, 50-80-12-6950, and 50-80-12-6951)
Historic Properties Recommended Ineligible to the Hawai‘i Register	None
Effect Recommendation	The specific effect of the proposed project on the historic properties present in the subject project area depends on which “Alignment Alternative” is ultimately chosen (see Figures 1, 2 and 49). In response, at least in part, to archaeological concerns a new, presently-preferred, alignment (Figure 49) avoids adverse impact to archaeological sites. In accordance with HAR 13-13-284, the determination of effect for this project for the presently preferred alignment is recommended as “No historic properties affected.”
Mitigation Recommendation	CSH has recommended consideration of an alignment alternative that avoids most or all of SIHP No. 50-80-09-2268, a portion of the Waiāhole Ditch System, which is, by far, the most significant historic property located in the subject project area. The Waiāhole Ditch System is eligible for the State Register of Historic Places on the basis of three criteria that recognize its widespread importance to the history of O‘ahu and the State. The presently-preferred alignment (Figure 49) avoids adverse impact to archaeological sites. If impact to SIHP No. 50-80-09-2268 is anticipated (which is not the case at present) then timely consultation with the State Historic Preservation Division regarding possible mitigation (which might include Historic American Engineering Record documentation) is recommended.

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Section 1 Introduction

1.1 Project Background

At the request of R. M. Towill Corporation, Cultural Surveys Hawai‘i, Inc. (CSH) conducted an archaeological inventory survey for the Makakilo Drive Extension project, at Makakilo, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu, TMK (1) 9-2-002:006, 9-2-003:079. A previous draft of this study was commented on by the SHPD (November 11, 2008; Log No. 2008.2057; Doc No 0811LM11)

The project area is approximately 3,300 feet long by 300 feet wide extending from the end of the existing Makakilo Drive to the proposed North-South Road interchange with Interstate H-1, thus making it approximately 62-acre project. The project area consists of the south-southeastern portion of the Kalo‘i gulch floodplain. Kalo‘i Stream channel runs from the central portion of the project area to the northeast. The southern face of Kalo‘i Gulch is at the central portion, and the base of the northeastern slope of Pu‘umakakilo is at the southwestern portion of the project area. Old Pālehua Road enters the project area from its eastern side, splits into Quarry Road heading south, and Old Pālehua continues to the southwest section of the project area, where due to much less traffic than the Quarry Road section is less maintained and in substandard condition. As the well-maintained part of Old Pālehua Road runs from the easternmost section of the project area, it continues south-southwest, where it becomes Quarry Road. There were three alignment alternatives for proposed roadways within the project area at the time the first draft of this study was produced (Figure 1, Figure 2 and Figure 3). Subsequently in response, at least in part, to archaeological concerns a new, presently-preferred, alignment (Figure 49) avoids adverse impact to archaeological sites. The project area has not changed but only the alignment within the project area.

The project area connects Interstate H-1 and Makakilo Drive from the northern side of Pu‘umakakilo.

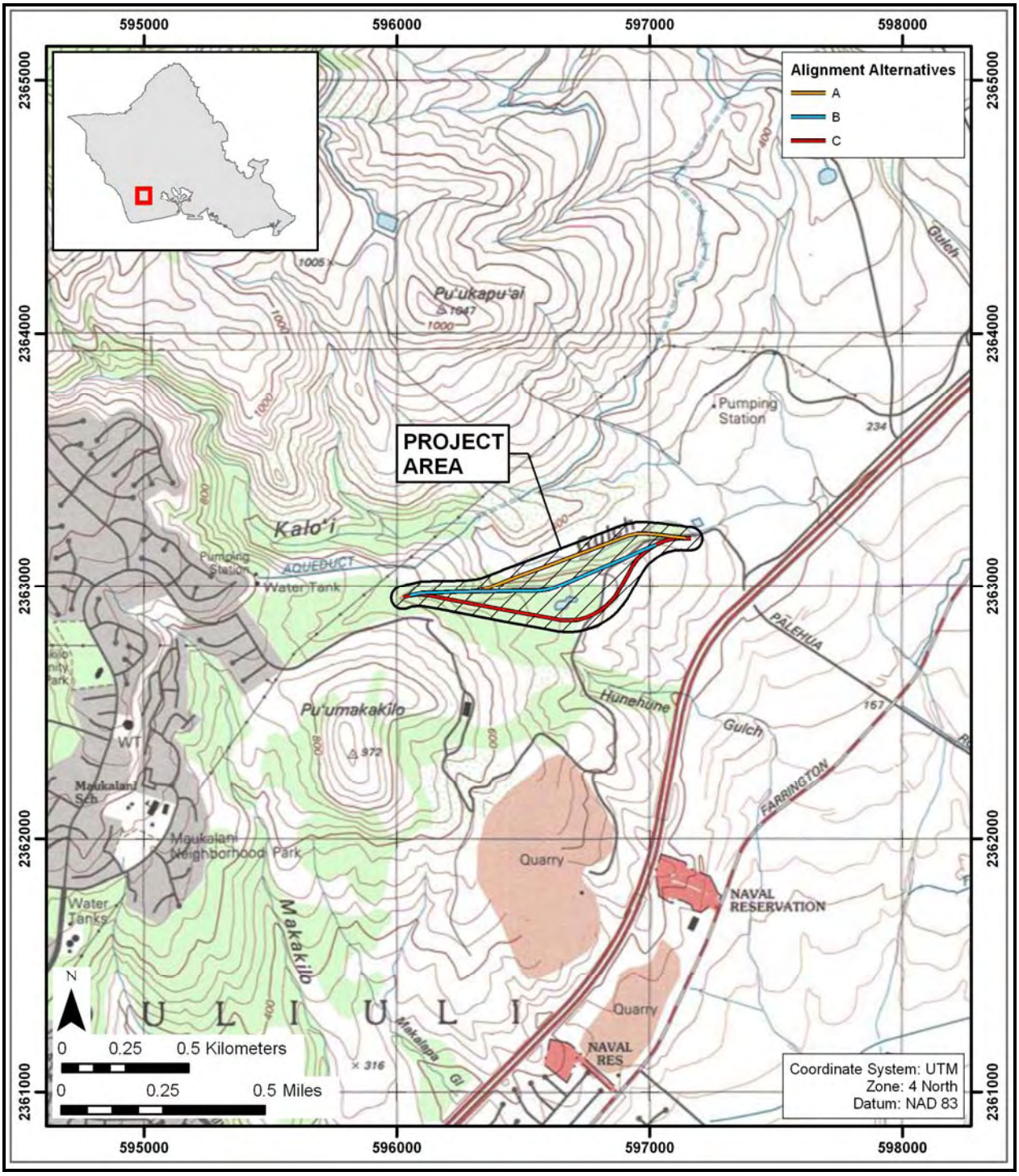


Figure 1. USGS 7.5 minute series Ewa quadrangle topographic map of project area showing initially proposed roadway alternatives

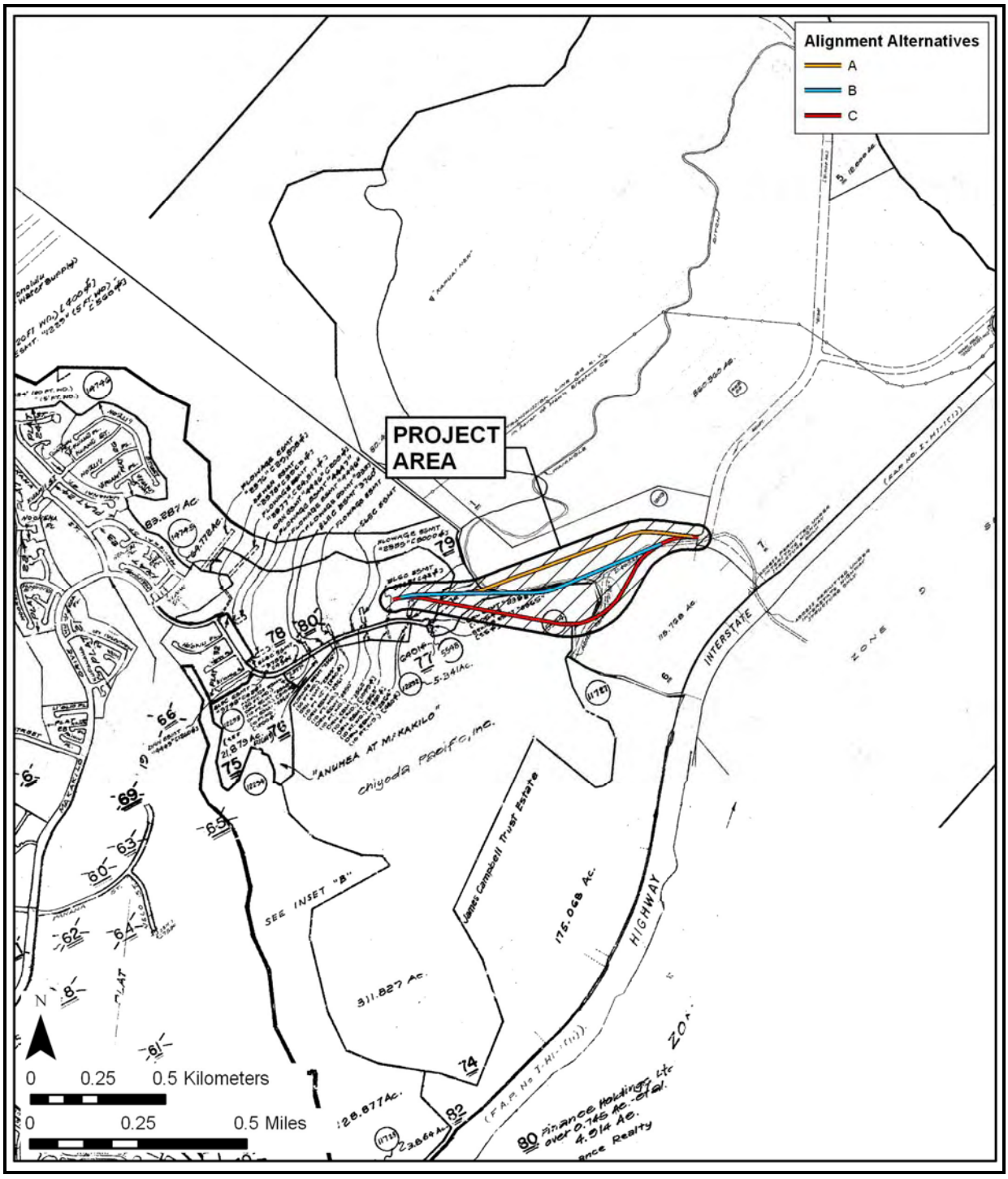


Figure 2. Portion of Tax Map Key plat maps 9-2-002 and 9-2-003 showing project area and showing initially proposed roadway alternatives

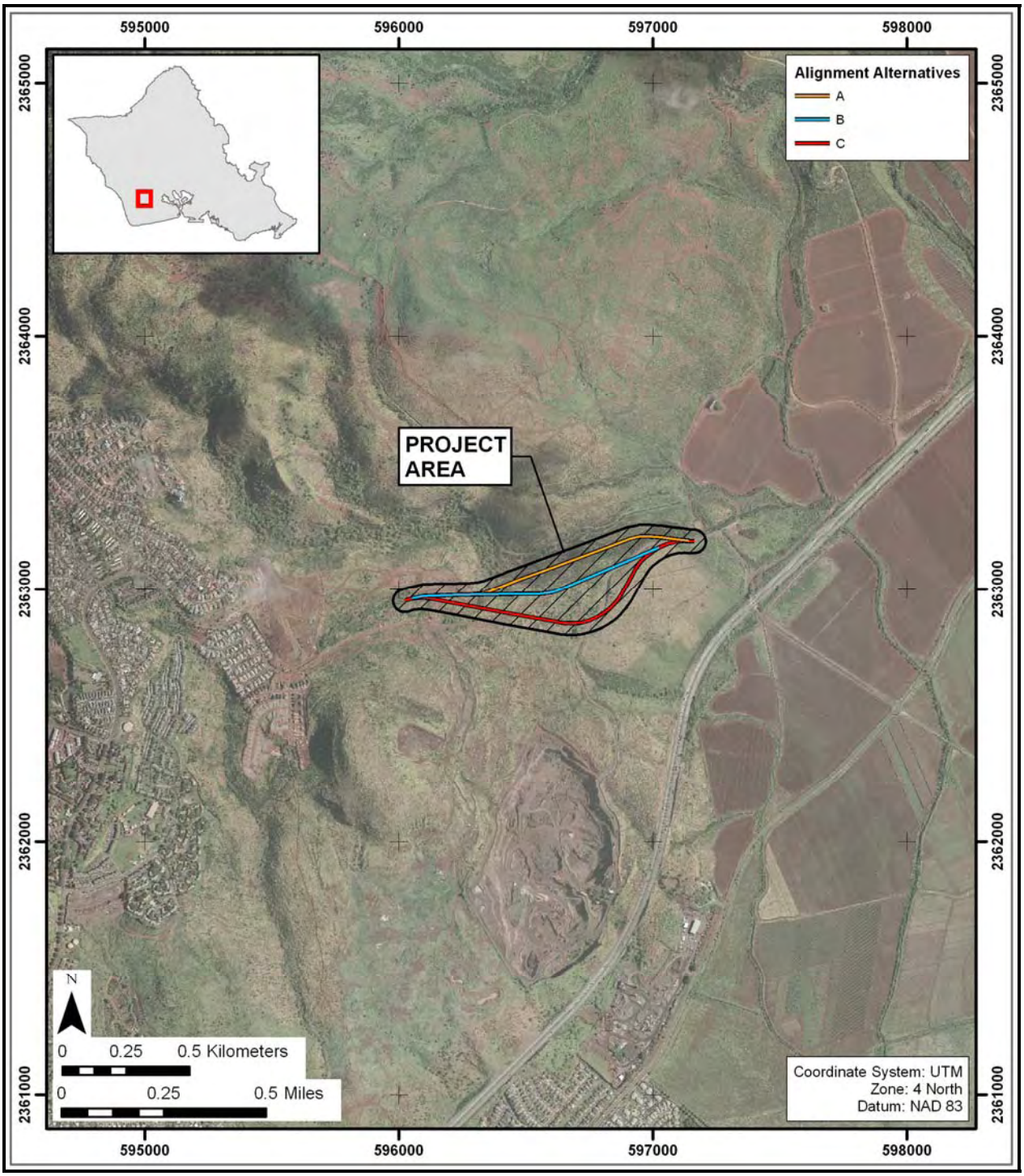


Figure 3. Aerial view of project area, including initially proposed roadway alternatives

1.2 Scope of Work

The scope of work for this project follows HAR 13-13-276, which governs archaeological inventory survey in the State of Hawai‘i:

1. Appropriate consultation with knowledgeable members of the community, requesting information on historic properties in the project area.
2. A complete ground survey of the entire project area for the purpose of historic property identification and documentation. All historic properties were to be located, described, and mapped with evaluation of function, interrelationships, and significance. Documentation was to include photographs and scale drawings of selected historic properties. All historic properties were to be assigned State Inventory of Historic Properties (SIHP) numbers. All historic properties were to be located with Trimble GPS equipment that is accurate to less than a meter. This locational information will be sufficient for subdivision planning purposes and layout.
3. Subsurface testing as appropriate. If appropriate samples from these excavations are found, they were to be analyzed for chronological information.
4. Research on historic and archaeological background, including search of historic maps, written records, and Land Commission documents. This research was to focus on the specific area with general background on the *ahupua‘a* and district and was to emphasize settlement patterns.
5. Preparation of a survey report to include the following:
    a. A topographic map of the survey area showing all historic properties;
    b. Results of consultation with knowledgeable community members about the property’s past land use and historic properties.
    c. Description of all historic properties with selected photographs, scale drawings, and discussions of function;
    d. Historical and archaeological background sections summarizing prehistoric and historic land use as they relate to the project area’s historic properties;
    e. A summary of historic property categories and their significance in an archaeological and historic context;
    f. Recommendations based on all information generated that will specify what steps should be taken to mitigate impact of development on the project area’s significant historic properties—such as data recovery (excavation) and preservation of specific areas. These recommendations will be developed in consultation with the client and the State agencies.

This scope of work also includes full coordination with the State Historic Preservation Division (SHPD), and county relating to archaeological matters. This coordination takes place after consent of the owner or representatives.

1.3 Environmental Setting

1.3.1 Natural Environment

Located in the dry, leeward area of O‘ahu, the project area receives an average of approximately 28 in. (600 mm) of annual rainfall (Giambelluca et al. 1986). Elevations within the project area ranged from approximately 300 – 410 meters above mean annual sea level (AMSL). The land surface within the majority of the Kalo‘i Gulch portion of the project area ranges from moderately sloping to very steep, with many vertical rock cliffs. The western boundary of the project area is east of the extent of residential Makakilo. The southeastern boundary of the project area is at the southern end Kalo‘i Gulch, where the steep gulch slope gives way to the flat ‘Ewa plain. The southern portion of Kalo‘i Gulch is very wide, characterized by a broad, flat base and moderately sloping walls. The gulch becomes increasingly narrow and steep to the northwest. The base of Kalo‘i Gulch included a dry streambed at the time of the pedestrian inspection, though the high waterline indicated significant flooding during periods of heavy precipitation. The base of the gulch was also observed to have undergone significant deposition of both alluvial and colluvial sediments, as indicated by the channeling of floodwaters through 1-3 m of sediment down to the natural bedrock stream channel.

Soils within the project area (Figure 4) consist predominantly of Mahana-Badland Complex (MBL) and Rock Land (rRK) (Foote et al. 1972). Soils of the Mahana Series are described as “well-drained soils…developed in volcanic ash” (Foote et al. 1972:86). Mahana-Badland Complex consists of Mahana soils and Badland, or “steep or very steep, nearly barren land, ordinarily not stony” (Foote et al. 1972:28). Rock Land “is made up of areas where exposed rock covers 25 to 90 percent of the surface” (Foote et al. 1972:119). In addition, an area of Helemano Silty Clay (HLMG) is located within the project area, near the base of Kalo‘i Gulch. Soils of the Helemano Series are described as “well-drained soils on alluvial fans and colluvial slopes on the sides of gulches” (Foote et al. 1972:40).

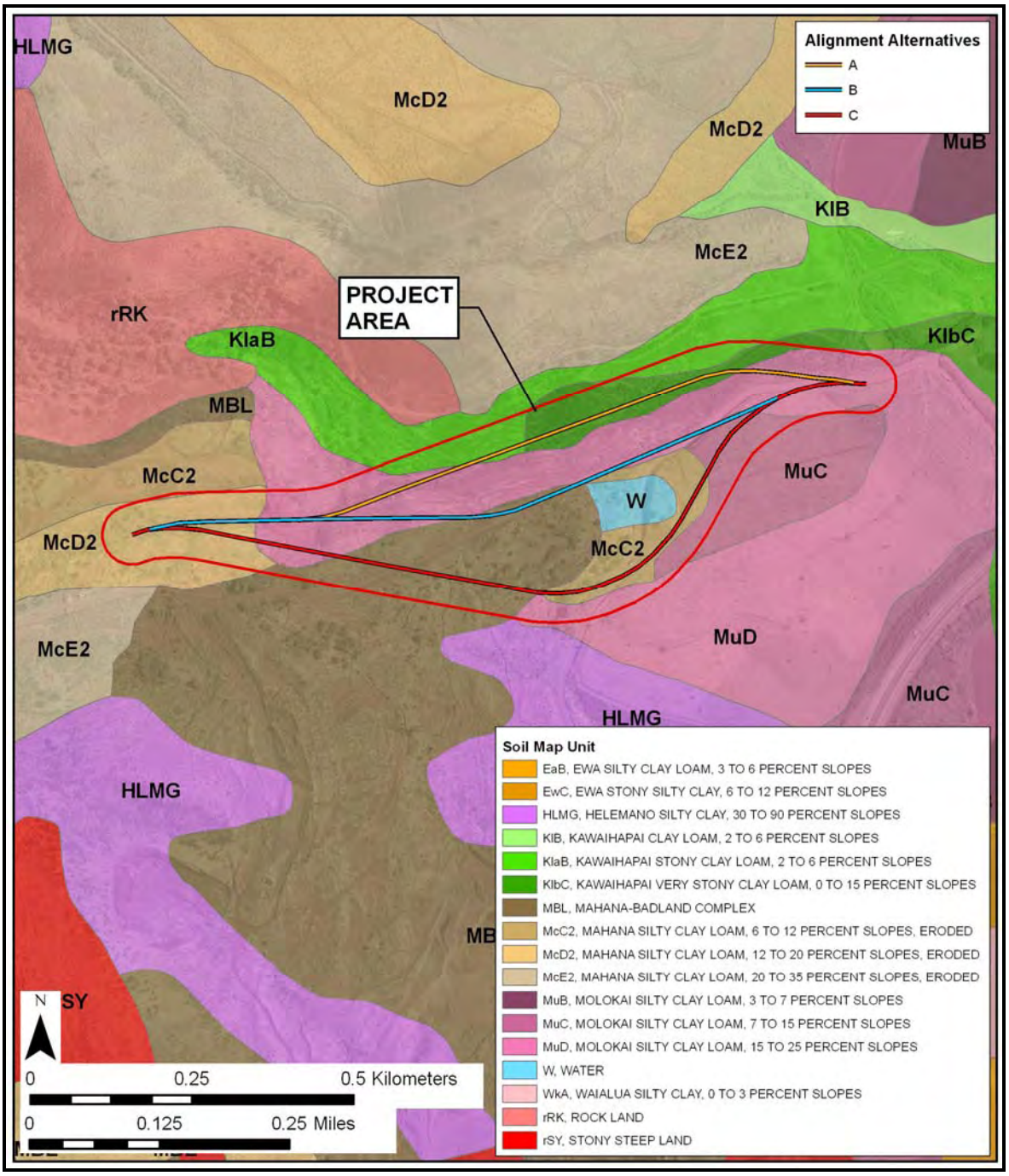


Figure 4. Soils of the project area (Foote et al. 1972)

Vegetation generally covered 85-95% of the ground surface within the project area (Figure 5). Heavy precipitation in the weeks preceding the pedestrian inspection of the project area made for unusually dense exotic grass cover in the normally dry southern Wai‘anae Range. In addition to the predominantly exotic grass cover, *‘Ilima* (*Sida fallax*), *‘A‘ali‘i* (*Dodonaea viscose*), *‘Iliahi* (*Santalum spp.*) (see Figure 5), *Lama* (*Diospyros sandwicensis*), *Koa Haole* (*Leucaena leucocephala*), *Kiawe* (*Prosopis pallida*), Lantana (*Lantana camara*), Silk Oak (*Grevillea robusta*), *Wiliwili* (*Erythrina sandwicensis*), and *Kukui* (*Aleurites moluccana*) were also observed.

1.3.2 Built Environment

During the post-contact period, the project area was primarily used for pastureland and for sugar cane irrigation and cultivation. Currently, the project area is used for diversified agricultural activities, pastureland, seed cultivation, as well as a thruway for traffic to and from Makakilo Rock Quarry, which is approximately 400 meters south of the project area. New increments of the Makakilo suburban development abut the west end of the project area with the present east end of Makakilo Drive virtually hanging over the back of Kalo‘i Gulch (Figure 6).

The southern portion of the project area is the remnants of an abandoned golf course, the construction of which was discontinued in the early 1990’s. Landscaping and irrigation systems associated with the construction of the golf course remain in disrepair (Figure 7, Figure 8, Figure 9 and Figure 10). Utilities manholes without lids were observed during survey, making it particularly dangerous for pedestrian access in this portion of the project area. There are low-density residential areas to the west of the project area, and Interstate H-1 to the east and south (see Figure 3).



Figure 5. General view of vegetation in project area with Hawaiian Sandalwood tree (*Santalum spp.*) in foreground



Figure 6. East view showing northern portion of project area, Interstate H-1 shown in background, and portion of Makakilo Drive that will connect to Interstate H-1 in foreground



Figure 7. West view of artificial pond in southwestern portion of project area



Figure 8. SE view of intersection of golf cart paths in southern portion of project area



Figure 9. Southwest view of irrigation and control box in south-central portion of project area



Figure 10. North view of artificial pond in south-central portion of project area

Section 2 Methods

2.1 Field Methods

Fieldwork for the archaeological inventory survey was conducted from January 31 to February 1, 2008 by David Shideler, M.A., Todd Tulchin, B.S., Jon Tulchin, B.A., and Nifae Hunkin, B.A., under the overall supervision of Hallett H Hammatt, Ph.D. The pedestrian inspection of the project area was accomplished through systematic sweeps. The interval between the three archaeologists was generally less than 10 meters. Sweeps were made generally following the contour of the north face of Kalo‘i Gulch. The survey began at the western end of the project area and proceeded east, incrementally, descending to the base of the gulch. All encountered sites were recorded and documented with a written field description, site maps, photographs, and each site was located using GPS survey technology.

Surveying consisted of clearing vegetation by hand of selected surface archaeological features located during the pedestrian survey. In accordance with HAR 13-13-276, which governs archaeological inventory survey procedures, no subsurface excavation was conducted at these features because their form and function are clear and unambiguous.

2.2 Laboratory Methods

Because no archaeological artifacts, midden, or soil samples were recovered, no laboratory work was undertaken.

2.3 Document Review

Historic and archival research included information obtained from the UH Hamilton Library and the State Historic Preservation Division Library. Previous archaeological reports for the area were reviewed, as were historic maps and primary and secondary historical sources. Information on Land Commission Awards was accessed through Waihona ‘Aina Corporation at www.waihona.com.

2.4 Consultation

No evidence of the presence of pre-Contact sites was indicated in the literature review and no pre-Contact sites were observed within the project area. There appears to be little likelihood that the undertaking will impact any ongoing cultural practices. Pursuant to Chapter 13-276-5 (g), there was no need indicated for consultation. Extensive consultation, however, is being conducted as part of a companion Cultural Impact Assessment by CSH.

Section 3 Background Research

3.1 Traditional and Historical Background

3.1.1 Historical Setting

Honouliuli Ahupua‘a, as a traditional land unit, had tremendous and varied resources available for exploitation by early Hawaiians. Within Honouliuli Ahupua‘a, not only is there a long coastline fronting the normally calm waters of leeward O‘ahu, but there are also four miles of waterfront along the west side of the West Loch of Pearl Harbor. The “karstic desert” and marginal characterization of the limestone plain, which is the most readily visible terrain, does not do justice to the *ahupua‘a* as a whole. The richness of this land unit is marked by the following available resources:

1. 12 miles of coastline with continuous shallow fringing reef, which offered rich marine resources

2. Four miles of frontage on the waters of West Loch that offered extensive fisheries (mullet, *awa*, shellfish) as well as frontage suitable for development of fishponds (for example, Laulaunui).

3. The lower portion of Honouliuli Valley in the ‘Ewa plain offered rich level alluvial soils with plentiful water for irrigation from the stream as well as abundant springs. This irrigable land would have stretched well up the valley.

4. A broad limestone plain which, because of innumerable limestone sinkholes, offered a nesting home for a large population of avifauna. This resource may have been one of the early attractions to human settlement.

5. An extensive upland forest zone extending as much as 12 miles inland from the edge of the coastal plain. As Handy and Handy (1972:469) have pointed out, the forest was much more distant from the lowlands here than on the windward coast, but it was much more extensive. Much of the upper reaches of the *ahupua‘a* would have had species-diverse forest with *kukui*, *‘ōhia*, *‘iliahi* (sandalwood), *hau*, *ti*, banana, etc.

The political and cultural center of the *ahupua‘a* is understood to have been the relatively dense settlement and rich lands for irrigated taro cultivation at the *‘ili* of Honouliuli located where Honouliuli Stream empties into the north portion of West Loch (east of the present study area). The name of the *ahupua‘a*, translated as “dark bay” (Pukui et al. 1974:51) may refer to the nature of the waters of West Loch at the mouth of Honouliuli Stream. Early accounts and maps indicate a large settlement at the *‘ili* of Honouliuli and it may well be that the political power of this village was so great that it was able to extend its jurisdiction well to the northwest into an area which might have been anticipated to fall under the dominion of the Wai‘anae ruling chiefs.

3.1.2 Mythological and Traditional Accounts

The traditions of Honouliuli Ahupua‘a have been complied and summarized numerous times, in studies by Sterling and Summers (1978), Hammatt and Folk (1981), Kelly (1991), Charvet-Pond and Davis (1992), Maly et al. (1993), and Tuggle and Tuggle (1997). Some of the themes of these traditions, include connections with Kahiki (the traditional homeland of Hawaiians, probably in reference to central Polynesia) and the special character and relationship of the places known as Pu‘uokapolei and Kualaka‘i.

Connections with Kahiki are found in numerous place names, traditional events, and with the beings associated with Honouliuli. There are several versions of Kaha‘i leaving from Kalaeloa for a trip to Kahiki to bring breadfruit back to ‘Ewa (e.g. Kamakau 1991:110). There are several stories that associate places in the region with Kamapua‘a and the Hina family, as well as with Pele’s sisters, all of whom have strong connections with Kahiki (cf. Kamakau 1961:111; Pukui et al. 1974:200).

Pu‘uokapolei was one of the most sacred places in Honouliuli (cf Sterling and Summers 1978:33). Pu‘uokapolei’s connections with Kahiki are emphasized when it is noted that the hill was the home of Kamapua‘a’s grandmother, Kamaunuaniho, the Kahiki ancestor to the people of O‘ahu (Fornander 1916-20, V:318; Kahiolo 1978:81, 107). By name, Kapolei is associated with the goddess Kapo, another connection with the Pele and Kamapua‘a stories (Kamakau 1976:14).

McAllister (1933:108) records that a *heiau*, or temple, was located on Pu‘uokapolei, but was destroyed before his survey of the early 1930s. The *heiau* may have been associated with the sun (Fornander 1916-20, III:292). The hill was used as a point of solar reference or as a place where such observations were made. Pu‘uokapolei might have been understood as the gate of the setting sun. It is notable that the rising sun at the eastern gate of Kumukahi in Puna is associated with the Hawaiian goddess Kapo (Emerson 1978:41). There is little specific information for Pu‘uokapolei, but the place name itself (“hill of beloved Kapo”) is hard to ignore. It is mentioned in some cosmologies that Kū was the god of the rising sun, and Hina should be associated with the setting sun (Hina is the mother of Kamapua‘a). Fornander (1916-20, III; 292) states, Pu‘uokapolei may have been a jumping off place (also connected with the setting sun) and associated with the dead who roamed the adjacent Plain of Kaupe‘a.

Pu‘uokapolei was also the primary landmark for travelers between Pearl Harbor and the west O‘ahu coast, with a main trail running just inland of it (‘Ī‘ī 1959:27, 29). Pu‘uokapolei was probably the most common name used as a reference for the area of the ‘Ewa Plain in traditional Hawai‘i (cf. Nakuina 1992:54; Fornander 1916-20, II: 318; E.M. Nakuina 1904, in Sterling and Summers 1978:34).

3.1.3 Pre-Contact and Early History

Various Hawaiian legends and early historical accounts indicate that the *ahupua‘a* of Honouliuli was once widely inhabited by pre-Contact Hawaiian populations, including the Hawaiian *ali‘i*. This substantial population is attributable for the most part to the plentiful marine and estuarine resources available at the coast, along which several sites interpreted as permanent habitations were located. Other attractive subsistence-related features of the *ahupua‘a* included

irrigated lowlands suitable for wet land taro cultivation (Hammatt and Shideler 1990), as well as the lower forest area of the mountain slopes for the procurement of forest goods.

Exploitation of the forest resources along the slopes of the Wai‘anae Range - as suggested by E. S. and E.G. Handy - probably acted as a viable subsistence alternative during times of famine:

> ...The length or depth of the valleys and the gradual slope of the ridges made the inhabited lowlands much more distant from the *‘wao*, or upland jungle, than was the case on the windward coast. Yet the *‘wao* here was more extensive, giving greater opportunity to forage for wild foods during famine time. (Handy and Handy 1972:469-470)

These upper valley slopes may have also been a significant resource for opportunistic quarrying of basalt for the manufacturing of stone tools. This is evidenced in part by the existence of a probable quarrying site (50-80-12-4322) in Makaīwa Gulch at 152 m (500 ft.) AMSL, west of the current study area (Hammatt et al. 1991).

The Hawaiian *ali‘i* were also attracted to the region. One historical account of particular interest refers to an *ali‘i* residing in Ko Olina, southwest of the current study area:

> Ko Olina is in Waimānalo near the boundary of ‘Ewa and Wai‘anae. This was a vacationing place for chief Kākuhihewa and the priest Napuaikamao was the caretaker of the place. Remember reader, this Ko Olina is not situated in the Waimānalo on the Ko‘olau side of the island but the Waimānalo in ‘Ewa. It is a lovely and delightful place and the chief, Kākuhihewa loved this home of his (Sterling and Summers 1978:41).

John Papa ‘Ī‘ī describes a network of Leeward O‘ahu trails (Figure 11) which in later historic times encircled and crossed the Wai‘anae Range, allowing passage from West Loch to the Honouliuli lowlands, past Pu‘u Kapolei and Waimānalo Gulch to the Wai‘anae coast and onward circumscribing the shoreline of O‘ahu (‘Ī‘ī 1959:96-98).

Other early historical accounts of the general region typically refer to the more populated areas of the ‘Ewa district, where missions and schools were established and subsistence resources were perceived to be greater. However, the presence of archaeological sites along the coral plains and coast of southwest Honouliuli Ahupua‘a, indicate that prehistoric and early historic populations also adapted to less inviting areas, despite the environmental hardships.

Subsequent to western contact in the area, the landscape of the ‘Ewa plains and Wai‘anae slopes was adversely affected by the removal of the sandalwood and other trees, and the introduction of domesticated animals and new vegetation. Goats, sheep and cattle were brought to the Hawaiian Islands by Vancouver in the early 1790s, and allowed to graze freely about the land for some time after. L.A. Henke reports the existence of a longhorn cattle ranch in Wai‘anae by at least 1840 (Frierson 1972:10). During this time, perhaps as early as 1790, exotic vegetation species were introduced to the area. These typically included vegetation best suited to a terrain disturbed by the logging of sandalwood forest and eroded by animal grazing. The following dates of introduced vegetation are given by R. Smith and outlined by Frierson (1972:10-11):

1. “early,” c. 1790:
   Prickly pear cactus, *Opuntia tuna*
   Haole koa, Leucaena leucocephala
   Guava, *Psidium guajava*

2. 1835-1840:
   Burmuda [sic] grass, *Cynodon dactylon*
   Wire grass, *Eleusine indica*
3. 1858:
   Lantana, *Lantana camara*

The *kiawe* tree (*Prosopis pallida*) was also introduced during this period, either in 1828 or 1837 (Frierson 1972:11).

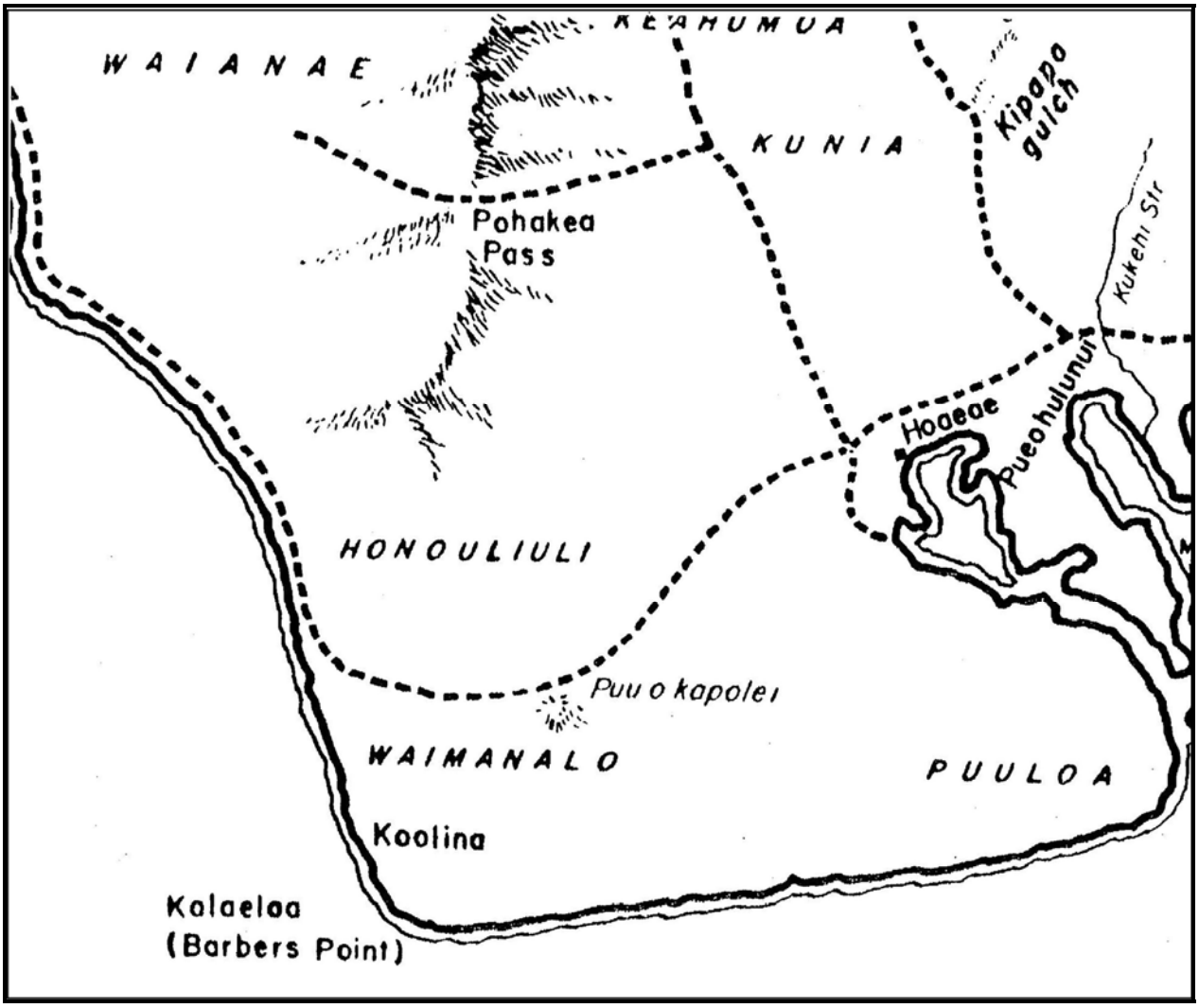


Figure 11. Trails of Leeward O‘ahu as described by John Papa ‘Ī‘ī (1983:96)

3.1.4 Mid to late 19th Century

During the Māhele of 1848, 99 individual land claims in the *ahupua‘a* of Honouliuli were registered and awarded by King Kamehameha III. No claims were made for land within the current study area or vicinity. The vast majority of the Land Commission Awards (LCA) were located near the Pu‘uloa Salt Works and the taro lands of the *‘ili* of Honouliuli. The largest award (Royal Patent 6071, LCA 11216, *‘Āpana* 8) granted in Honouliuli Ahupua‘a was to Miriam Ke‘ahi-Kuni Kekau‘onohi on January 1848 (Native Register). Kekau‘onohi acquired a deed to all unclaimed land within the *ahupua‘a*, including a total of 43,250 acres.

Samuel Kamakau relates the following about Kekau‘onohi as a child:

> Kamehameha's granddaughter, Ke-ahi-Kuni Kekau-‘onohi...was also a tabu chiefess in whose presence the other chiefesses had to prostrate and uncover themselves, and Kamehameha would lie face upward while she sat on his chest. (Kamakau 1961:208-209).

Kekau‘onohi was one of Liholiho’s (Kamehameha II’s) wives, and after his death, she lived with her half-brother, Luanu‘u Kahala‘i‘a, who was governor of Kaua‘i (Kamakau 1961:20). Subsequently, Kekau‘onohi ran away with Queen Ka‘ahumanu’s stepson, Keli‘i-ahonui, and then became the wife of Chief Levi Ha‘alelea. Upon her death on June 2, 1851, all her property was passed on to her husband and his heirs. When Levi Ha‘alelea died, the property went to his surviving wife, who in turn leased it to James Dowsett and John Meek in 1871 for stock running and grazing.

In 1877, James Campbell purchased most of Honouliuli Ahupua‘a for a total of $95,000. He then drove off 32,347 head of cattle belonging to Dowsett, Meek and James Robinson and constructed a fence around the outer boundary of his property (Bordner and Silva 1983:C-12). In 1879, Campbell brought in a well-driller from California to search the ‘Ewa plains for water, and a “vast pure water reserve” was discovered (Armstrong and Bier 1983). Following this discovery, plantation developers and ranchers drilled numerous wells in search of the valuable resource. By 1881, the Campbell property of Honouliuli prospered as a cattle ranch with “abundant pasturage of various kinds” (Briggs in Haun and Kelly 1984:45). Within 10 years of the first drilled well in ‘Ewa, the addition of a series of artesian wells throughout the island was supplying most of Honolulu’s water needs (Armstrong and Bier 1983).

In 1889, Campbell leased his property to Benjamin Dillingham, who subsequently formed the Oahu Railway & Land Co. (O.R. & L) in 1890. To attract business to his new railroad system, Dillingham subleased all land below 200 feet elevation to William Castle who in turn sublet the area to the Ewa Plantation Company for sugar cane cultivation (Frierson 1972:15). Dillingham’s Honouliuli lands above 200 feet elevation that were suitable for sugar cane cultivation were sublet to the O‘ahu Sugar Co.

Ewa Plantation Co. was incorporated in 1890 and continued in full operation up into modern times. The plantation grew quickly with the abundant artesian water. As a means to generate soil deposition on the coral plain and increase arable land in the lowlands, the Ewa Plantation Co. installed ditches running from the lower slopes of the mountain range to the lowlands and then plowed the slopes vertically just before the rainy season to induce erosion (Frierson 1972:17).

The Oahu Sugar Co. was incorporated in 1897, and included lands in the foothills above the ‘Ewa plain and Pearl Harbor. Prior to commercial sugar cultivation, the lands occupied by the Oahu Sugar Co. were described as being “of near desert proportion until water was supplied from drilled artesian wells and the Waiāhole Water project” (Conde and Best 1973:313). The Oahu Sugar Co. took control over the Ewa Plantation lands in 1970 and continued operations into the 1990s.

Dillingham’s *mauka* lands in western Honouliuli that were unsuitable for commercial sugar production remained pasture for grazing livestock. From 1890 to 1892 the Ranch Department of the O.R. & L. Co. desperately sought water for their herds of cattle by tapping plantation flumes and searching for alternative sources of water. Ida von Holt leaves this account of her husband Harry’s (Superintendent of the O.R. & L Ranch Dept.) search for water in the foothills of the Wai‘anae Range:

> One of those places is on the old trail to Palehua, and had evidently been a place of which the Hawaiians had known, for its name is Kaloi (the taro patch), and even in dry weather water would be standing in the holes made by the cattle, as they tried to get a drop or two. (Von Holt 1985:136)

It is believed that the spring depicted in this account may have been located during an inventory survey of the adjacent Pālehua East B project area (Tulchin and Hammatt 2005). The spring was located along the upper slopes of the southern face of Kalo‘i Gulch. A second account is given of the discovery of spring water in an area over the ridge on the north side of Kalo‘i Gulch:

> Shouting to the men to come over with their picks and shovels, he [Harry von Holt] soon got them busy clearing away lots of small stones and earth. Almost at once they could see that there were evidences of a paved well, and at about three feet down they came upon a huge flat rock, as large around as two men could span with their arms. Digging the rock loose and lifting it to one side, what was their astonishment to find a clear bubbling spring! (Von Holt 1985:138).

Following the discovery, two old Hawaiians began to ask Von Holt about the spring:

> Finally he [Harry von Holt] got them to explain that the spring, called “Waihuna” (Hidden Spring) had been one of the principal sources of water for all that country, which was quite heavily populated before the smallpox epidemic of 1840…A powerful Kahuna living at the spring had hidden it before he died of the smallpox, and had put a curse on the one who disturbed the stone, that he or she would surely die before a year was out. (Von Holt 1985:138-140)

3.1.5 Early 1900s to Present

Much of the *mauka* lands in western Honouliuli, including ridges and deep gulches, were unsuitable for commercial sugar cultivation and remained pasture land for grazing livestock. By 1920, however, much of the lands of Honouliuli were used for commercial sugar cane cultivation (Frierson 1972:18). By 1919 a reservoir had been established just south of Pālehua Road in the central portion of the project area (Figure 12). In the late 1920s, the main residential

communities were at the northeast edge of the ‘Ewa Plain. The largest community was still at Honouliuli village. ‘Ewa was primarily a plantation town, focused around the sugar mill, with a public school as well as a Japanese school. Additional settlement was in Waipahu, centered around the Waipahu sugar mill, operated by the O‘ahu Sugar Company. A 1925 Oahu Sugar Company plantation map shows Field 29 covering the northeast portion of the project area northeast of the reservoir (Figure 13). A 1927/28 map (Figure 14) shows an irrigation ditch following the contour of Kalo‘i Gulch within the project area.

Historic maps of the Makakilo area indicate a lack of any other significant development in the area into the 1940s. Major land use changes came to western Honouliuli when the U.S. Military began development in the area. Military installations were constructed both near the coast, as well as in the foothills and upland areas. Barbers Point Military Reservation (a.k.a. Battery Barbers Point from 1937-1944), located at Barbers Point Beach, was used beginning in 1921 as a training area for firing 155 mm guns (Payette 2003). Also in the vicinity were Camp Malakole Military Reservation (a.k.a. Honouliuli Military Reservation), used from 1939, and Gilbert Military Reservation, used from 1922-1944. Barbers Point NAS, in operation from 1942 into the 1990s, was the largest and most significant base built in the area. It housed numerous naval and defense organizations, including maritime surveillance and anti-submarine warfare aircraft squadrons, a U.S. Coast Guard Air Station, and the U.S. Pacific Fleet.

Fort Barrette (a.k.a. Kapolei Military Reservation and Battery Hatch), located atop Pu‘u Kapolei, was in use from 1931 to 1948 for housing four 3-inch anti-aircraft batteries (Payette 2003). In the 1950s, the site was used as a NIKE missile base. Palailai Military Reservation, located atop Pu‘u Pālailai in Makakilo, was in service from 1921, housing Battery Palailai and Fire Control Station B (Payette 2003). Fire Control Station A, was located atop Pu‘u Makakilo. From 1942 to 1945 the Pu‘u Makakilo Training Area, including lands in and around Pu‘u Makakilo, was used for military training during WWII (Environment Hawai‘i 1992).

The maps from the war years indicate little further development in the vicinity of the present project area (Figure 15). A new water-catchment ditch appears to be shown extending south from the reservoir in the central portion of the project area following the land contour.

Historic USGS maps of the area indicated the presence of an industrial quarry located within Kalo‘i Gulch, half a mile northwest (outside) of the current study area. The quarry first appears on the 1953 USGS topographic map (Figure 16). The exact date in which the quarry was initially constructed could not be determined, though research of historic maps indicated construction between 1943 and 1952. In 2004, CSH conducted an archaeological inventory survey of a property in which the quarry was observed and documented and assigned State Inventory of Historic Properties (SHIP) No. 50-80-12-6680.

The 1956 map (Figure 16) also shows an irrigation ditch entering the northwest portion of the project area, arcing around the back of Kalo‘i Gulch, and extending to the reservoir in the central portion of the project area. Whether this ditch was in fact older and was simply not shown on earlier maps is unclear. A 1977 aerial photograph (Figure 17) shows sugar cane fields still dominating the east portion of the project area.

In response to increased demand for housing, spurred by the increased development at Barbers Point NAS, the Estate of James Campbell set aside land in the foothills of the southern

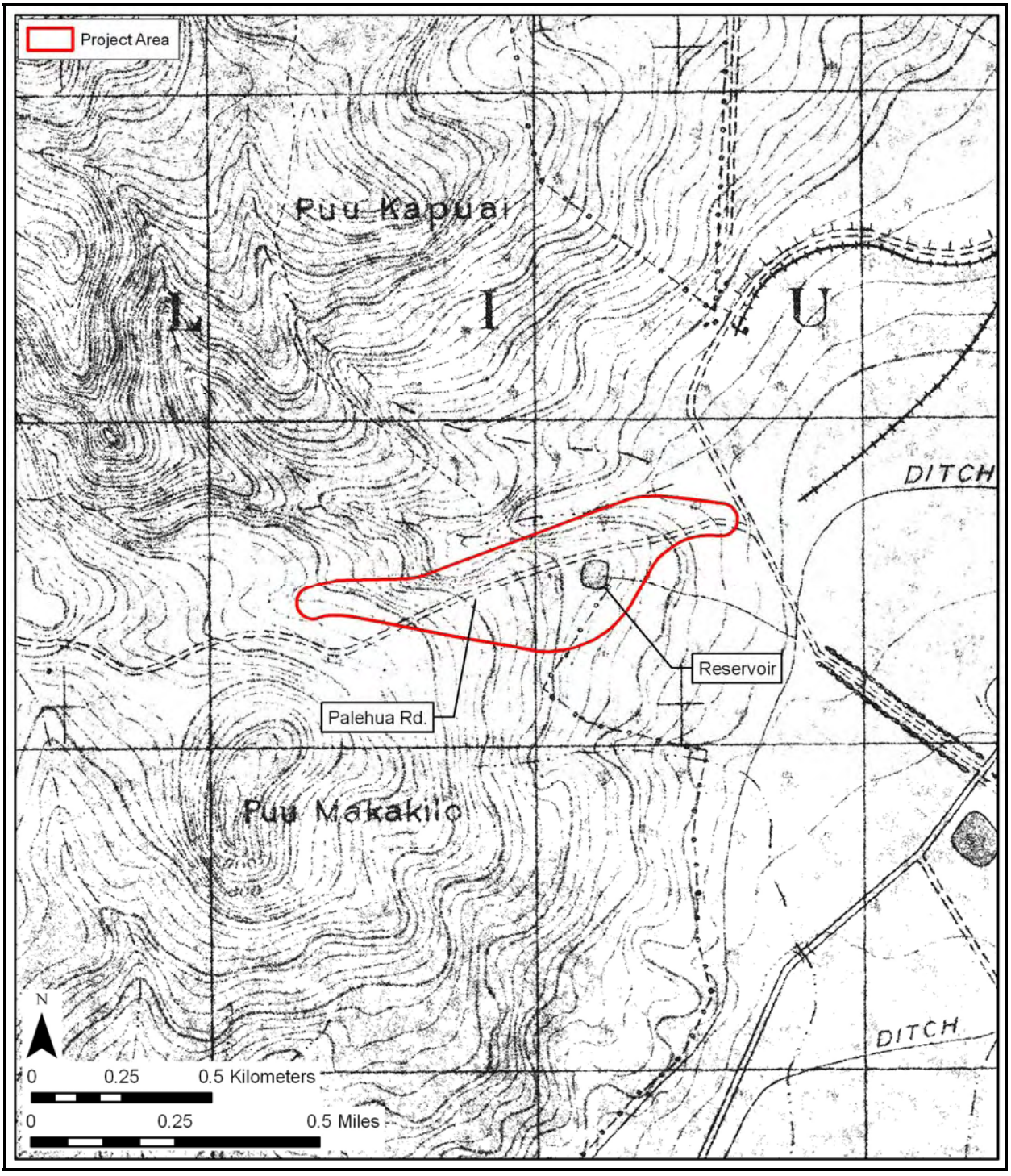


Figure 12. 1919 Fire Control Nanakuli Quad map showing section of Pālehua Road bisecting the project area, as well as a reservoir associated with plantation irrigation system

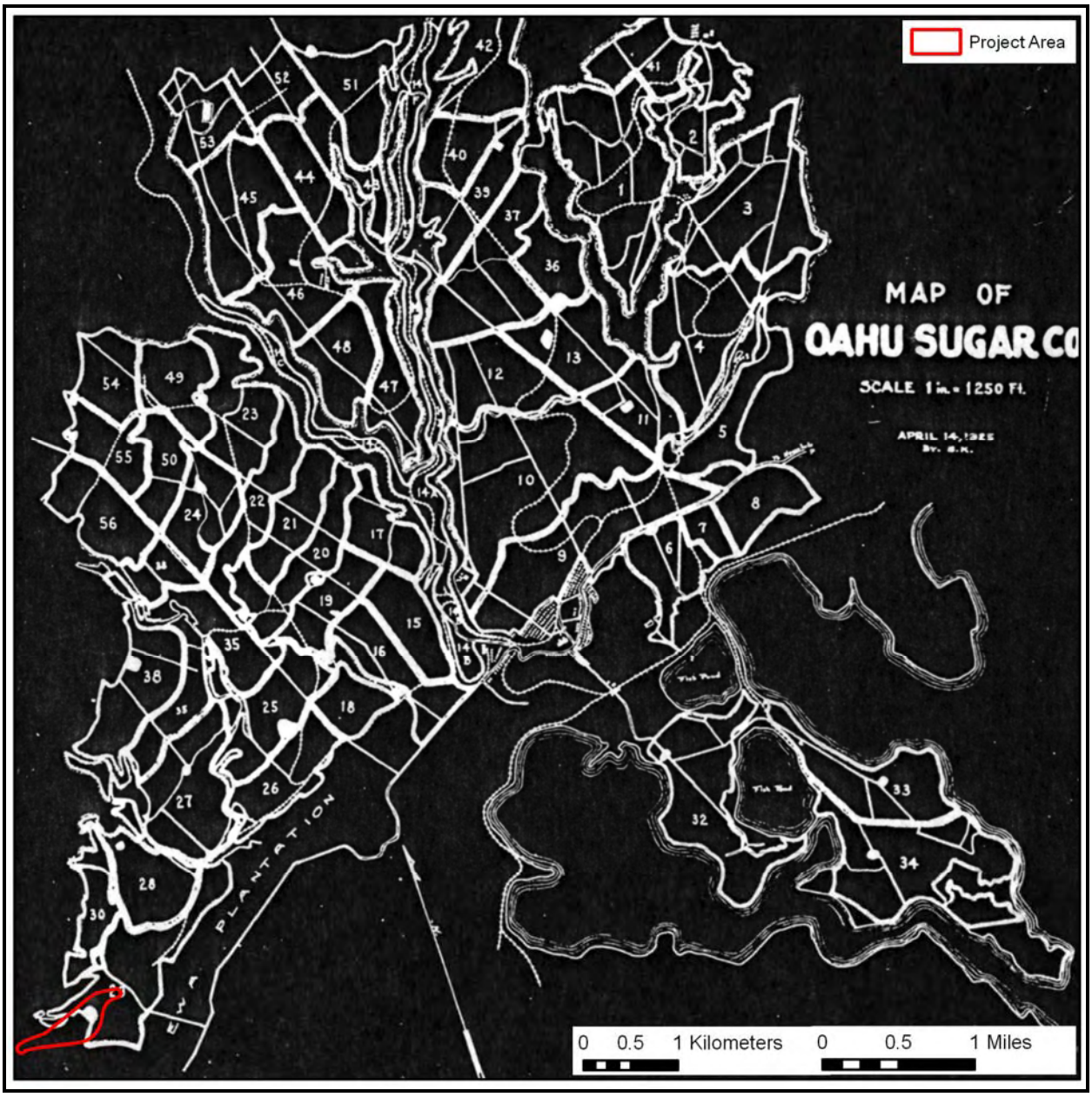


Figure 13. 1925 Oahu Sugar Company plantation map showing project area (red) with Field 29 covering northeast portion of the project area

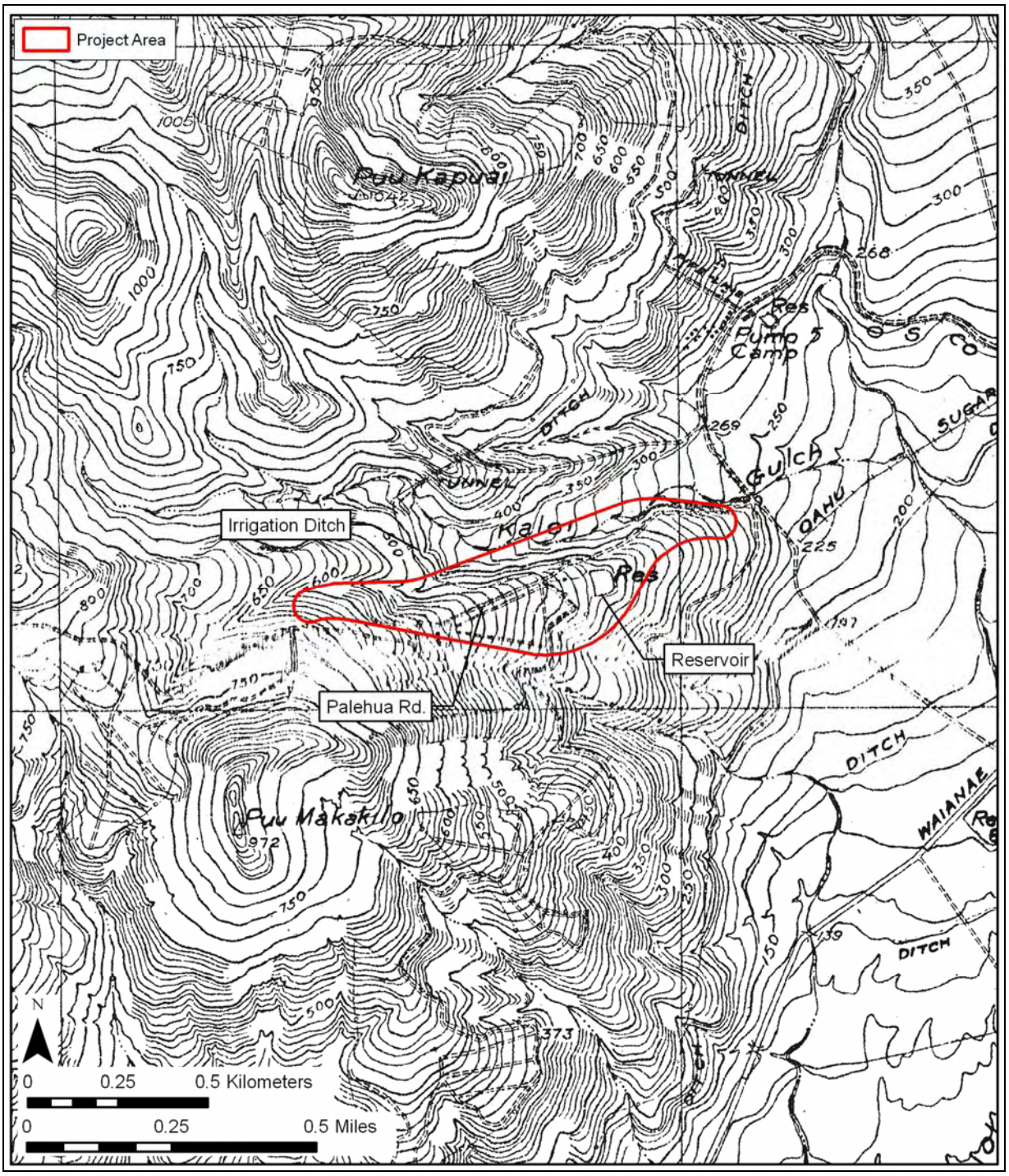


Figure 14. 1927/1928 U.S. Geological Survey Waianae Quad Map showing project area

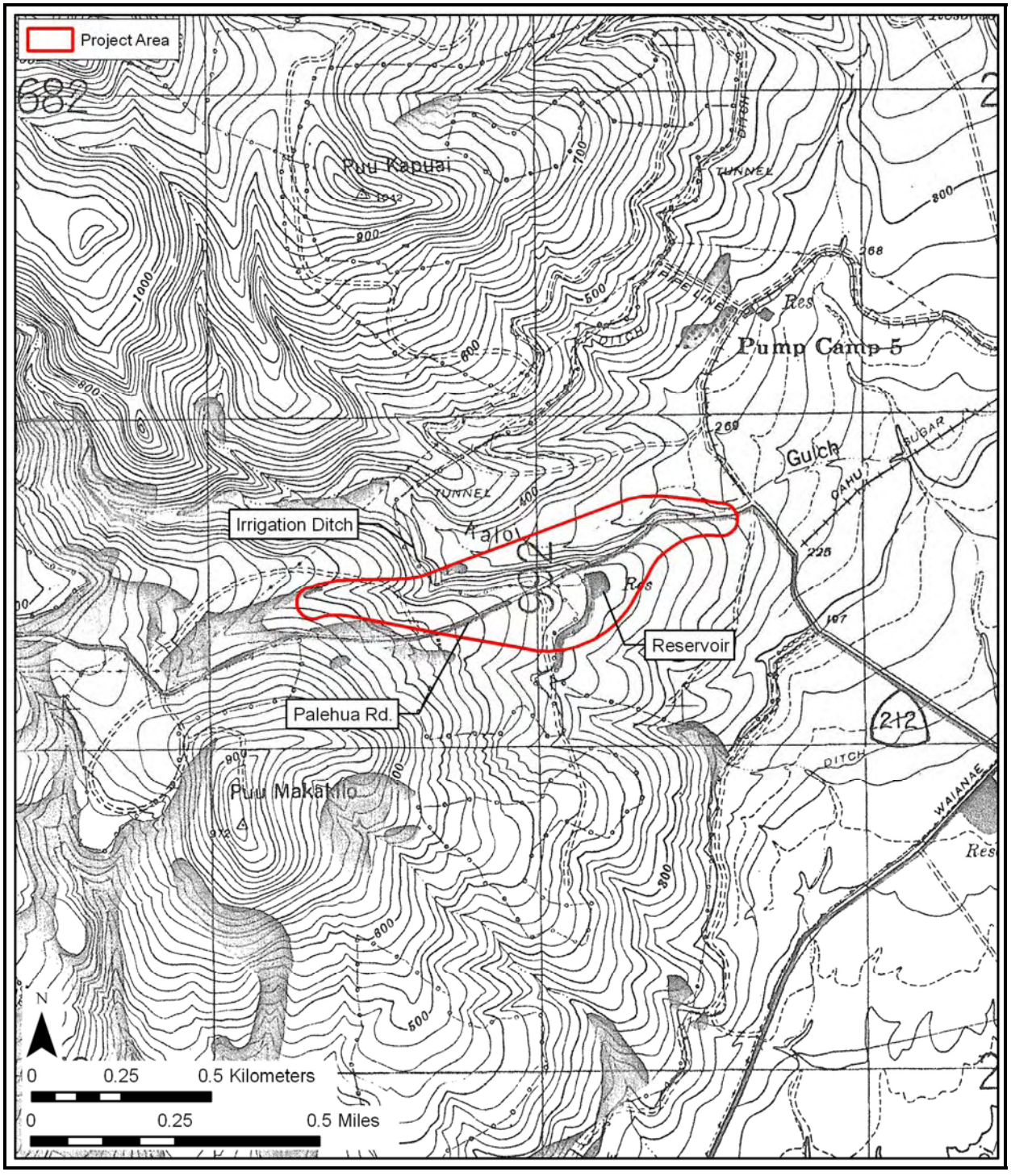


Figure 15. 1943 War Department Map of Waipahu and surrounding areas

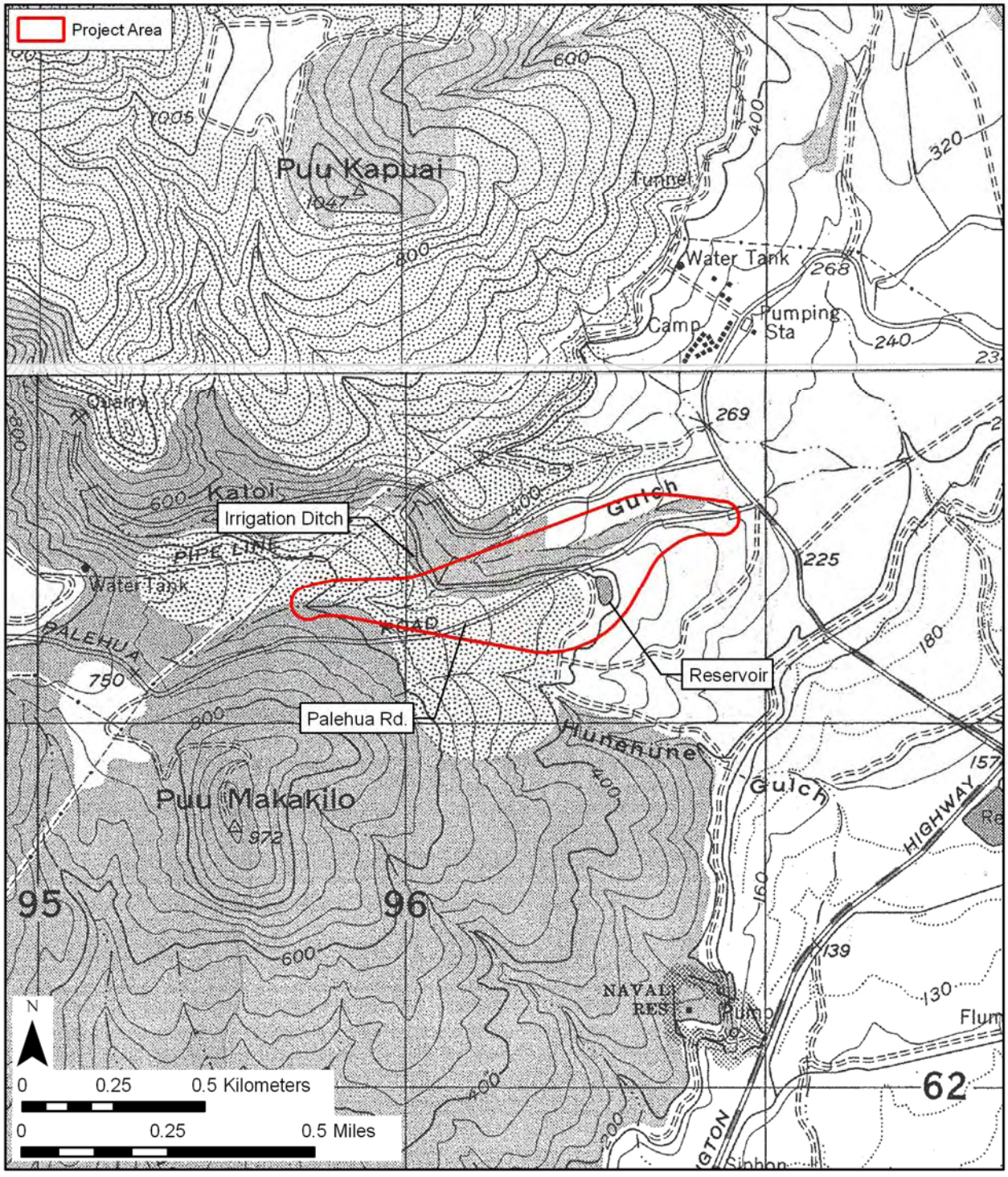


Figure 16. 1956 U. S. Geological survey map showing project area

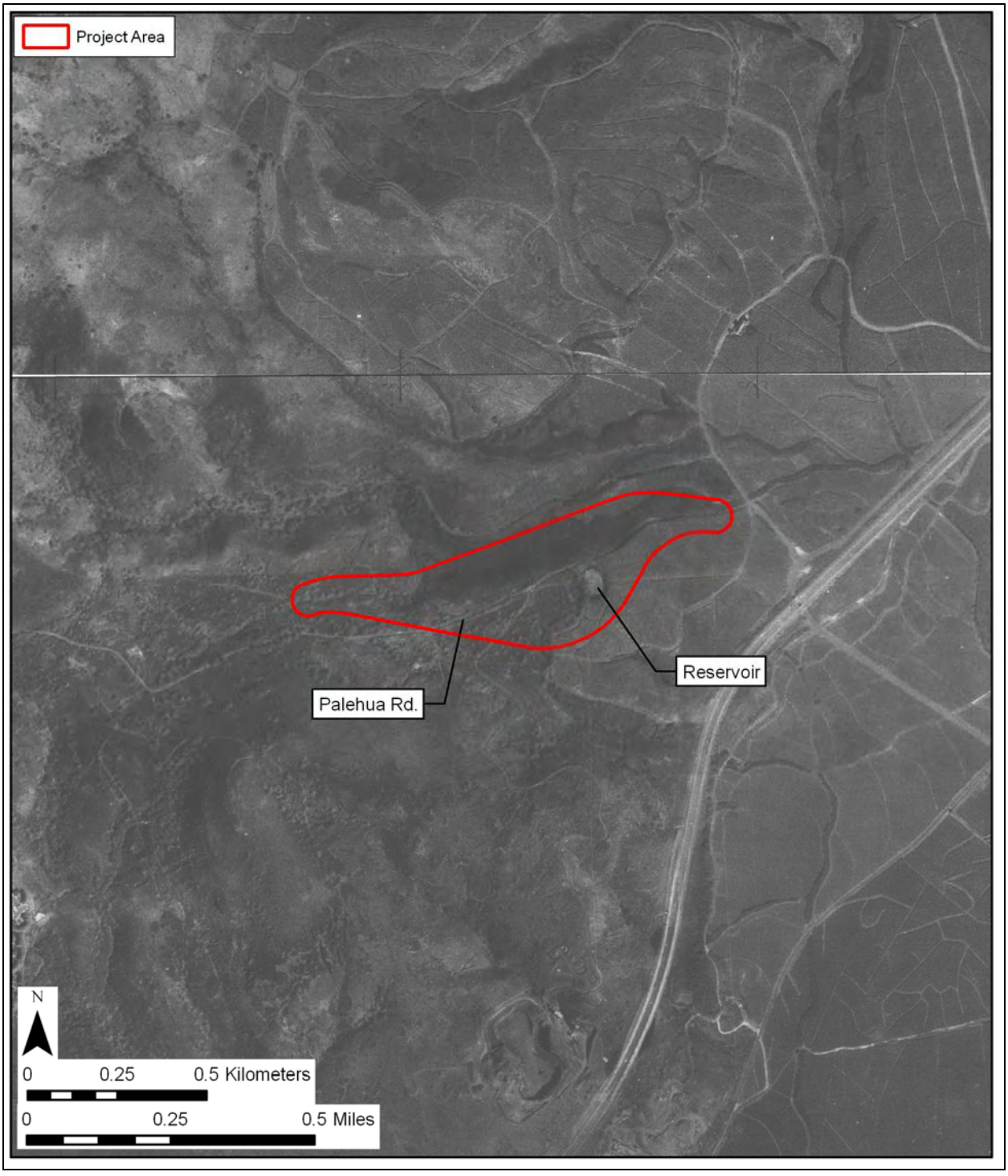


Figure 17. 1977 aerial photograph showing project area

Wai‘anae Range in 1960 for the development of the residential community of Makakilo. Development began just *mauka* of the H-1 Freeway and continued *mauka*, with ranch lands being incrementally replaced by subdivision construction. At present, former ranching pasture lands are continually being replaced by residential house lots.

3.2 Honouliuli Settlement Patterns

Archaeological and traditional sources show a general pattern of three main areas of settlement within Honouliuli Ahupua‘a: a coastal zone, the Honouliuli taro lands, and inland settlement at Pu‘u Ku‘ua.

3.2.1 The Coastal Zone - Kalaeloa (Barber's Point), Ko‘olina (West Beach)

3.2.1.1 Kalaeloa (Barber's Point)

Archaeological research at Barber's Point has focused on the areas in and around the Deep Draft Harbor (Barrera 1975; Davis and Griffin 1978; Hammatt and Folk 1981; McDermott et al. 2000). Series of small clustered shelters, enclosures and platforms show limited but recurrent use at the shoreline zone for marine oriented exploitation. This settlement covers much of the shoreline, with more concentrated features around small marshes and wet sinks. Immediately behind the shoreline, under a linear dune deposit is a buried cultural layer believed to contain some of the earliest habitation evidence in the area.

The attraction of the area to early Hawaiians was the plentiful and easily exploited bird population. Particular evidence for taking of petrel occurs at SIHP No. -2763 (Hammatt and Folk 1981 197:213). Initial heavy exploitation of nesting seabirds and other species, in conjunction with habitat destruction, probably led to early extinction.

There is some indication of limited agriculture in mulched sinkholes and limited soil areas. Considering rainfall, this activity would have been limited, but probably involved tree crops and roots (sweet potatoes). The archaeological content of the sites indicates a major focus on marine resources.

Davis and Griffin (1978) distinguish functional classes of sites based on surface area size, and argue that the Barber's Point settlement consists of functionally integrated, multi-household residence groups. Density contours of midden (by weight) and artifacts (by numbers) plotted for residence sites by Hammatt and Folk (1981) generally indicate narrowly defined spatial foci of discard, possibly indicating continuous use, or at least with no refurbishing or additions to the structures over time (Hammatt and Folk 1981). The focus is small habitation sites, typically lacking the full range of features found in large permanent residence complexes such as high platforms, complex enclosures, and ceremonial sites.

3.2.1.2 Ko‘Olina (West Beach)

There are three available studies on the Ko‘Olina project area (Davis et al. 1986a; Davis et al. 1986b; and Davis and Haun 1987).

Davis documents approximately 180 component features at 48 sites and site complexes consisting of habitation sites, gardening areas, and human burials. Chronologically, the

occupation covers the entire span of Hawaiian settlement in what Davis and Haun describe as “one of the longest local sequences in Hawaiian prehistory” (Davis and Haun 1987:37). The earliest part of the sequence relates to the discovery of an inland marsh and early dates were also obtained for the beachfront site and an inland rock shelter.

3.2.2 Honouliuli Taro Lands

Centered around the west side of Pearl Harbor at Honouliuli Stream and its broad outlet into the West Loch are the rich irrigated lands of the *‘ili* of Honouliuli, which give the *ahupua‘a* its name. The major archaeological reference to this area is Dicks, Haun and Rosendahl (1987) who documented remnants of a once widespread wetland system (*lo‘i* and fishponds), as well as dry-land cultivation of the adjacent slopes.

Carol Silva has conducted “Historic Research Relative to the Land of Honouliuli” (Dicks et al. 1987) and the reader is referred to this work for an overview of the history of Honouliuli.

The area bordering West Loch was clearly a major focus of population within the Hawaiian Islands and this was a logical response to the abundance of fish and shellfish resources in close proximity to a wide expanse of well-irrigated bottomland suitable for wetland taro cultivation. The earliest detailed map (Malden 1825) shows all the roads of southwest O‘ahu coalescing and descending the *pali* as they funnel into the locality (i.e. Honouliuli Village) which gave the *ahupua‘a* of Honouliuli its name. Dicks et al. (1987:78-79) conclude, on the basis of 19 carbon isotope dates and 3 volcanic glass dates, that “agricultural use of the area spans over 1,000 years.” Undoubtedly, Honouliuli was a locus of habitation for thousands of Hawaiians. Prehistoric population estimates are a matter of some debate but it is worth pointing out that in the earliest mission census (Schmitt 1973:19) in 1831-1832, the land (*‘āina*) of Honouliuli contained 1026 men, women, and children. It is not clear whether this population relates to Honouliuli Village or Honouliuli Ahupua‘a, but the village probably contained the vast majority of the district’s population. The nature of the reported population structure for Honouliuli (less than 20% children under 12 years of age) and the fact that the population decreased more than 15% in the next 4 years (Schmitt 1973:22) suggests that the prehistoric population of Honouliuli Village may well have been significantly greater than it was in 1831-1832. A conservative estimate would be that tens of thousands of Hawaiians lived and died at Honouliuli Village.

3.2.3 Pu‘u Ku‘ua: Inland Settlement

Documentation of inland settlement in Honouliuli Ahupua‘a is more problematic in that there are relatively few documented archaeological sources. However, it is probable that the area around Pu‘u Ku‘ua, on the east side of the Wai‘anae Ridge, seven miles inland of the coast, was a Hawaiian place of some importance.

In 1899, the Hawaiian Newspaper “*Ka Loea Kalaiaina*” relates a story of Pu‘u Ku‘ua as “a place where chiefs lived in ancient times” and a “battle field,” “thickly populated.” The article summarizes:

1) This place was entirely deserted and left uninhabited and it seems that this happened before the coming of righteousness to Hawai‘i Nei. Not an inhabitant is left.

2) The descendants of the people of this place were so mixed that they were all of one class. Here the gods became tired and returned to Kahiki (Sterling and Summers 1978:33).

McAllister recorded three sites in this area, two *heiau* (134 - Pu‘u Kuina and 137 -Pu‘u Ku‘ua, both destroyed) and a series of enclosures in Kukuilua which he calls “*kuleana* sites” (McAllister 1933). On the opposite side of the Wai‘anae range, along the trail to Pōhākea Pass, Cordy (2002) states “Kākuihihewa was said to have built (or rebuilt) Nīoi‘ula, a *po‘okanaka heiau* (1,300 sq. m.) in Hālona in upper Lualualei, along the trail to Pōhākea Pass leading into ‘Ewa, ca. A.D. 1640-1660” (Cordy 2002:36). There is no direct archaeological evidence available to the authors’ knowledge that intensive Hawaiian settlement occurred here, but it is considered as a place of high probability, based on the above indications. John Papa ‘Ī‘ī (1959) described a journey that Liholiho took which led him and an entourage through inland Honouliuli and over Pōhākea Pass. Geographically, the area receives sufficient quantities of water and would have had abundant locally available forest resources.

3.2.4 Summary

Based on the above summary of areas of Honouliuli settlement, the following general considerations are made to place the study area in the context of the *ahupua‘a* pattern.

1. There are three areas of Hawaiian settlement in the *ahupua‘a*; two are well documented and the inland settlement in the vicinity of Pu‘u Ku‘ua is problematic.

    b. The extensive limestone plain with recurrent use habitations for fishermen and gatherers, and sometime gardeners;

    c. The rich cultivated lands of Honouliuli *‘ili* for extensive wetland taro and clearly the *ahupua‘a* population center;

    d. The uplands around Pu‘u Ku‘ua for probable agriculture and forest resource utilization.

2. Honouliuli is designed as a unit to contain all the geographic elements of a typical Hawaiian valley *ahupua‘a*, except they are arranged geomorphically in an atypical relationship. The *ahupua‘a* is not organized around a single drainage network but shares the west portions of Waikele drainage in its upper reaches. A typical and highly advantageous characteristic for human subsistence is included in a vast coastline and fringing reef, an extensive limestone plain which would support only limited agriculture, but would be excellent for bird catching in early times. The richest forest land for foraging for wood, birds, feathers, etc. would have been the east slope of the Wai‘anae Range. The *mauka/makai* route would have been up Honouliuli Gulch or up the Makakilo ridge, paralleling the coast from Honouliuli Gulch to Kahe. The most convenient route to *mauka* lands, even from the western end of the coast near Kahe Point, would have been *mauka* only to the base of the hills and then either up the Makakilo Ridge or northeast to a trail to Pu‘u Ku‘ua and Pōhākea Pass. The *makai* slope is the dry side of the ridgeline. Here, streams would respond to rainfall quickly but drain quickly leaving little available water for even short-term use. However, abundant springs may have provided adequate water for localized dry land cultivation.

3. The *makai* slope of the Wai‘anae Range (i.e. *mauka* of Ko‘Olina) was not a major thoroughfare. We can see some very limited evidence of part-time agriculture in and around gulches and 2 foci of sparse habitation with the first limited to *makai* portions of gulches and lava flats. This habitation is considered a *mauka* component or continuation of the Ko‘Olina coastal settlement rather than an independent focus. The second focus, separated from the first by a barren zone, is generally above the 800-foot elevation. This *mauka* habitat, which could have been supported by seasonal dry land planting and forest foraging, may be the lower portion of a thinly scattered but widespread zone of settlement. This zone stretches eastward and northeast along the east Wai‘anae Range slopes and may increase in intensity along the more watered lands forming the *mauka* western boundary of Honouliuli.
4. The central place of the *ahupua‘a* of Honouliuli in terms of population, as well as cultivated foods, was the *‘ili* of Honouliuli. There is good reason to assume, given the lack of intensive agricultural resources in other locations during prehistoric times, that all other habitation zones were economically and socially co-dependent.
5. There is to date no archaeological evidence of high status residence in Honouliuli. Large residential structures are not present along the Pacific shoreline where they would be expected. The late prehistoric occurrence of chiefs' houses is not apparent, perhaps because the ocean shoreline, although rich in marine resources, is uninviting for sport and unsuitable for fishponds. The chiefly focus of ‘Ewa District was Waipi‘o. Whatever activities of this class occurred in Honouliuli would have been in or near the rich lands fronting West Loch (the ‘ili of Honouliuli) but to date there is no direct archaeological evidence of this. Concerning status associations with Honouliuli it is interesting to note the connection of the Pu‘u Ku‘ua settlement with pariah (*kauwā*), the lowest class of Hawaiians (Sterling and Summers 1978:33).

3.3 Previous Archaeological Research

The coral plains of ‘Ewa have been the focus of more than 50 archaeological studies over the last two decades, largely as the result of required compliance with county, state, and federal legislation. The Kalaeloa (Barber’s Point) area is one of the most studied places in Polynesia. However, relatively little research has been conducted along the southern slopes of the Wai‘anae Range (Table 1 and Figure 18).

The earliest attempt to record archaeological remains in Honouliuli Ahupua‘a was made by Thrum (1906). He reports the existence of a *heiau* located on Pu‘u Kapolei, approximately 2 miles (3.2 km) south of the current project area. Pu‘u Kapolei Heiau is described as “Ewa-size and class unknown. Its walls thrown down for fencing” (Thrum 1906:46).

In his surface survey of 1930, archaeologist J. Gilbert McAllister recorded the specific locations of important sites, and the general locations of less important sites (at least at Honouliuli). Archaeological investigations by McAllister along the southern slopes of the Wai‘anae Range identified a number of sites which are of interest.

McAllister documents Pu‘u Kapolei Heiau as Site 138 and notes:

> The stones from the heiau supplied the rock crusher which was located on the side of this elevation, which is about 100 feet away on the sea side. There was formerly a large rock shelter on the sea side where Kamapuaa (the pig-god) is said to have lived with his grandmother (Kamaunuahihio). (McAllister 1933:108)

McAllister's Site 136 is located near Mauna Kapu, northwest of the current project area, and is described as a small platform on the ridge dividing the ‘Ewa and Wai‘anae districts. The 4 to 6 square foot platform was constructed of coral and basalt stones, and was believed to be an alter (McAllister 1933:107). It is noted to have been destroyed by the time of Sterling and Summers' work in the late 1950's (Sterling and Summers 1978:32).

McAllister's Site 137 is at Pu‘u Ku‘ua, a prominent landmark 1.8 miles (2.9 km) north of the current project area. Pu‘u Ku‘ua Heiau is described by McAllister as:

> (Destroyed) The heiau was located on the ridge overlooking Nanakuli as well as Honouliuli at the approximate height of 1800 feet. Most of the stones of the heiau were used for a cattle pen located on the sea side of the site. The portion of the heiau which has not been cleared for pineapple has been planted in ironwoods. (McAllister 1933:32)

The presence of Pu‘u Ku‘ua *heiau*, provides some archaeological evidence of the Pu‘u Ku‘ua settlement described in the Hawaiian Newspaper "*Ka Loea Kalaiaina.*"

None of these sites are in the immediate vicinity of the current project area. However, the presence of extant or former archaeological remains demonstrates Hawaiian use of these *mauka* lands.

Recent archaeological investigations in the southern Wai‘anae Range have generally been focused on deep gulch areas for potential landfill locations, lower slopes for residential development, and mountain peaks for antennae or satellite tracking infrastructure.

Makaīwa Gulch, just north of the project area was surveyed as a potential landfill location (Bordner 1977a).

An archaeological inventory survey of the "Makaīwa Hills" development project located several traditional as well as post-contact archaeological sites (Hammatt et al. 1991). The project area included a 1,915 acre parcel in Honouliuli Ahupua‘a, located between the town of Makakilo and Waimanalo Gulch, and bounded to the south by Farrington Highway and to the north by Pālehua Road (southwest of the current project area). 34 sites were located, including prehistoric habitation structures (temporary and permanent), agricultural features (terrace and mounds), rock shelters, petroglyphs, *ahu*, and various sugar cane cultivation infrastructure.

Within the "Makaīwa Hills" project area, habitation sites were found to be clustered in higher elevations above 1000 ft., and in lower elevations below 500 ft (Hammatt et al. 1991). The higher elevations would contain ample forest subsistence resources for gathering on both a continual basis, as well as during times of famine and drought. The lower elevations would be in close proximity to the shoreline and bountiful coastal resources.

> In sum, this site type and patterning sample suggests that prehistoric and historic Hawaiian populations utilized the present study area as a recurrent and temporary

Table 1. Previous Archaeological Investigations in the Uplands of Honouliuli Ahupua‘a

Reference	Type of Investigation	General Location	Findings
Bordner 1977	Archaeological Reconnaissance	Proposed Makaīwa Gulch Landfill Site	No archaeological sites identified
Sinoto 1988	Archaeological Reconnaissance	Makakilo Golf Course	low stacked boulder wall (-1975)
Spear 1996	Archaeolocial Reconnaisssnce	East Kapolei, TMK: 9-1-16: 17	No sites were discovered within project area.
Dega et al. 1998	Archaeological Inventory Survey	UH West O‘ahu, TMK: [1] 9-2-002: 001 & [1] 9-2-002: 001	Two historic site complexes, (50-80-08-5593 historic irrigation system and 50-80-09-2268 Waiāhole Ditch System)
Tulchin and Hammatt 2004	Archaeological Inventory Survey	86-Acre Proposed Pālehua Community Association (PCA) Common Areas Parcels, Makakilo (TMK: 9-2-03: 78 por. and 79)	4 historic properties identified: a complex of concrete and iron structures associated with industrial rock quarry operations (Site 50-80-12-6680); three boulder mounds believed to be related to land clearing or ditch construction by the O‘ahu Sugar Co. (Site 50-80-12-6681); a small terrace believed to function as a historic water diversion feature (Site 50-80-12-6682); and a remnant portion of the Waiāhole Ditch (Site 50-80-09-2268).
Tulchin and Hammatt 2005	Archaeological Inventory Survey	71-Acre Proposed Pālehua East B Project, Makakilo, (TMK: 9-2-03: 76 and 78)	Three historic properties identified: SIHP No. 50-80-12-6666 (pre-Contact agricultural alignment and mound), SIHP No. -6667 (plantation-era stacked basalt boulder walls and a ditch), and SIHP No. -6668 (single alignment of upright basalt boulders and a small, low terrace).

Reference	Type of Investigation	General Location	Findings
Tulchin and Hammatt 2007	Archaeological Literature Review and Field Inspection	Approximately 790-Acre Parcel at Palehua, Honouliuli Ahupua‘a, (TMK: [1] 9-2-003:002 por. and 005 por.)	Confirmed the area to be rich in archaeological remains. Because the lands within the project area were almost exclusively used for ranching purposes from historic times until the present, much of the pre-Contact landscape remains intact and relatively undisturbed. Archaeological features included: pre-Contact indigenous Hawaiian habitation and associated agricultural and ceremonial features; historic ranching and related features; and historic quarrying and related features.
Tulchin, Shideler and Hammatt 2007	Archaeological Literature Review	Approximately 4,600-Acre Property at the Honouliuli Forest Reserve Honouliuli Ahupua‘a, (TMK: [1] 9-2-004:001 por., 005 por.; 9-2-005:013 por., 016, 018)	Because the lands within the project area were almost exclusively used for ranching and forestry purposes from the mid 1800s until the present, much of the pre-Contact landscape remains intact and relatively undisturbed. Archaeological features representing distinct periods of land use are likely to be identified in the project area, including: pre-Contact indigenous Hawaiian habitation and associated agricultural and ceremonial features; historic homestead and ranching related features; historic agricultural features; and historic military-related features.
Tulchin and Hammatt 2008	Archaeological Literature Review and Field Inspection	Approximately 809 Acres of Kahe Ranch Land, Honouliuli Ahupua‘a, (TMK: [1] 9-2-003: 004, 009, 029, 084 por., & 085)	Identifies 10 archaeological sites within the study area. Archaeological features representing distinct periods of land use were observed, including: pre-Contact indigenous Hawaiian habitation; historic ranching; and historic railroad operations.

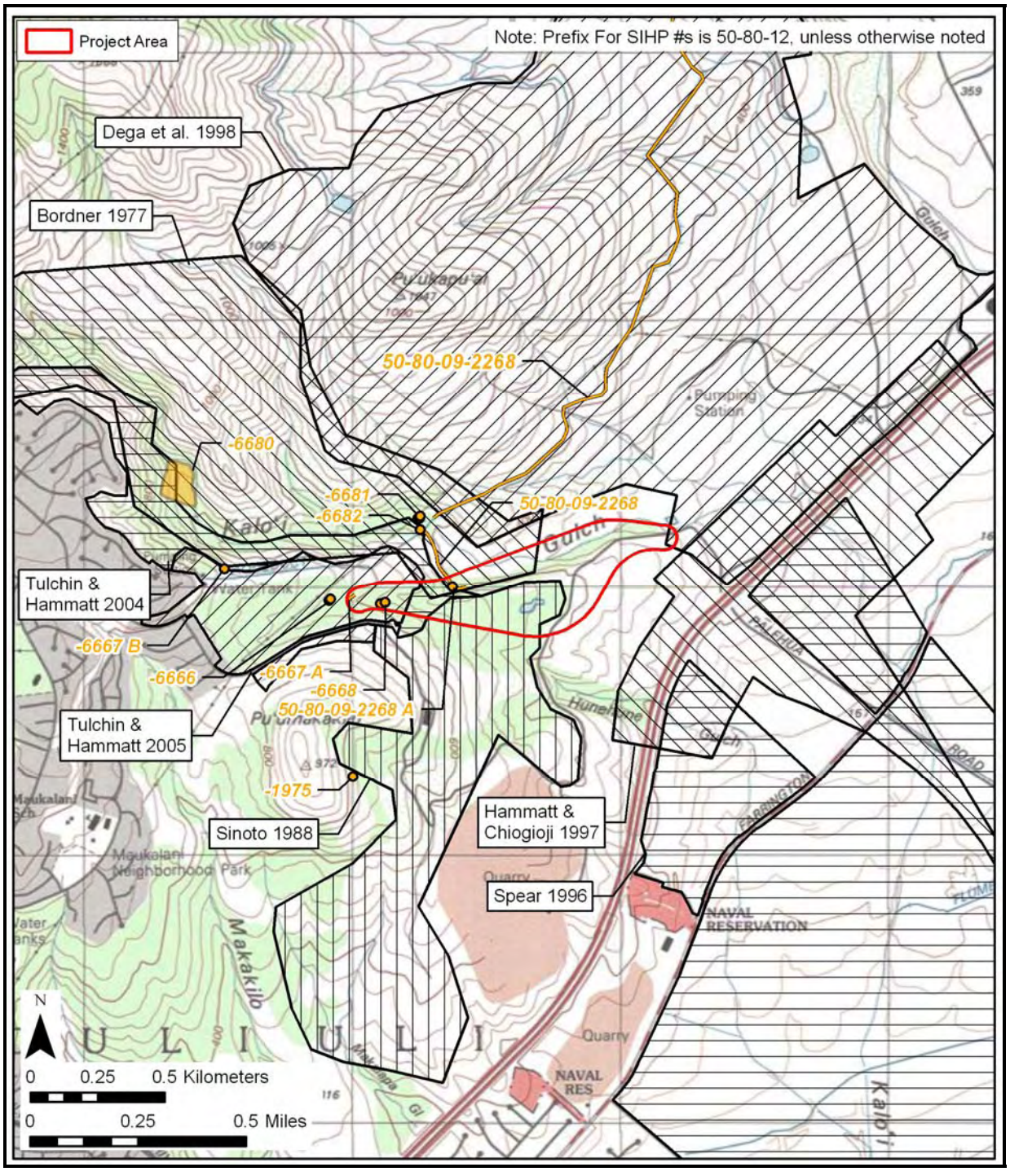


Figure 18. Map showing previous archaeological studies conducted in vicinity

> habitation area focused mainly on the gathering of specialized goods, such as wild forest plants from the upper elevations and the quarrying of lithic material within the lower elevations. (Hammatt et al. 1991:106)

Two archaeological studies were made in the upland Pālehua area, *mauka* of Makakilo. An archaeological inventory survey of the proposed KAIM radio tower (Hammatt 1992), located northwest of the current project area, identified no archaeological remains. An archaeological assessment for the proposed Ministry of Transportation Satellite Multi-Ranging Station project site (Borthwick 1997), which abuts the western perimeter of the Air Force Solar Observatory facility, identified no archaeological remains.

Relatively few archaeological sites have been located by archaeological studies made in the vicinity of the current project area (Figure 17). Archaeological studies associated with the proposed Makakilo Golf Course (Sinoto 1988) and the Makakilo D and D-1 Development Parcels (Nakamura et al. 1993) were conducted in the vicinity of the current project area. Archaeological reconnaissance of the Makakilo Golf Course property included lands along the southern and eastern slopes of Pu‘u Makakilo. Severe erosion was noted throughout the property. A single archaeological feature, a low stacked basalt boulder wall (50-80-12-1975), was identified (Sinoto 1988). Archaeological inventory survey of the Makakilo D and D-1 Development Parcels included lands on the southern and western slopes of Pu‘u Makakilo, adjacent to the golf course property. A single historic property, a cement irrigation flume (50-80-12-4664), was located in the southern portion of the project area near the H-1 Freeway (Nakamura et al. 1993).

An archaeological inventory survey for the proposed UH West O‘ahu campus was conducted by Dega et al. (1998). The survey area included 991 acres in the vicinity of Pu‘u Kapu‘ai, north of the current project area. No traditional Hawaiian sites were located. The project area was noted to have undergone extensive land modification associated with commercial agriculture. Two historic site complexes (5593, irrigation system & 2268, Waiāhole Ditch System) were documented. Identified features included flumes, aqueducts, ditches, pumps, and other irrigation infrastructure. It was noted that the Waiāhole Ditch crossed through the project area and “exits the property to the west near Kaloi Gulch” (Dega et al. 1998:17).

Kalo‘i Gulch, including current project area, was surveyed as a potential landfill location (Bordner 1977b). The archaeological reconnaissance survey included lands within Kalo‘i Gulch and its smaller tributaries from the *makai* end of the gulch up to the 1,400 ft elevation. It was noted that lands at the base of the gulch, *makai* of an historic quarry, were extensively modified by bulldozing. In the *mauka* portion of the project area, three sites, possibly prehistoric, were identified (Table 2). The three sites (50-80-12-2600, -2601, -2602) consisted of low stacked basalt boulder walls located along the north side of the Kalo‘i Stream channel.

Within the “Makaīwa Hills” project area, habitation sites were found to be clustered in higher elevations above 1000 ft., and in lower elevations below 500 ft (Hammatt et al. 1991). The higher elevations would contain ample forest subsistence resources for gathering on both a continual basis, as well as during times of famine and drought. The lower elevations would be in close proximity to the shoreline and bountiful coastal resources.

An archaeological inventory survey for the proposed UH West O‘ahu campus was conducted by Dega et al. (1998). The survey area included 991 acres in the vicinity of Pu‘u Kapu‘ai, just east of the current study area. No pre-Contact Hawaiian sites were located. The project area was extensively modified by commercial agriculture. Two historic site complexes (SIHP No. 50-80-08-5593: historic irrigation system, SIHP No. 50-80-09-2268: Waiāhole Ditch System) were documented. Identified features included flumes, aqueducts, ditches, pumps, and other irrigation infrastructure. It was noted that the Waiāhole Ditch crossed through the project area and “exits the property to the west near Kaloi Gulch” (Dega et al. 1998:17).

Tulchin and Hammatt (2004) conducted an inventory survey of the approximately 86-acre proposed Pālehua Community Association (PCA) Common Areas on the northwestern side of Makakilo. The study area abuts the northern boundary of the current study area. Historic sites located during the inventory survey included: a complex of concrete and iron structures associated with industrial rock quarry operations (SIHP No. 50-80-12-6680); three boulder mounds believed to be related to land clearing or ditch construction by the O‘ahu Sugar Co. (SIHP No. 50-80-12-6681); a small terrace believed to function as an historic water diversion feature (SIHP No. 50-80-12-6682); and a remnant portion of the Waiāhole Ditch (SIHP No. 50-80-09-2268). No pre-Contact historic properties were identified.

Tulchin and Hammatt (2004) undertook a field inspection of four locations just west of the current study area. Three small stone features were identified: an *ahu*, a stone terrace, and a small C-shape. An archaeological inventory survey was recommended should any construction activities be proposed for those parcels of land.

Tulchin and Hammatt (2005) conducted an inventory of a 71-acre parcel located just south of the current study area. Three historic properties were identified: SIHP No. 50-80-12-6666, a pre-Contact agricultural alignment and mound; SIHP No. 50-80-12-6667, Plantation-era stacked basalt boulder walls and a ditch; and SIHP No. 50-80-12-6668, two pre-Contact agricultural features consisting of a single alignment of upright basalt boulders and a small, low terrace.

3.4 Background Summary and Predictive Model

Historical background research of Honouliuli Ahupua‘a indicated that pre-Contact settlement was centered around the rich cultivated lands of Honouliuli ‘Ili for extensive wetland taro cultivation and abundant coastal resources. The extensive limestone plain would also include recurrent use habitations for fishermen and gatherers, and sometimes gardeners. The upland dry forest areas would be used for hunting and gathering of forest resources, but likely not for widespread permanent settlement. In the intermediate area between the limestone plain and the upland forests, in the vicinity of the current study area, indigenous Hawaiian activities would have been limited to dry land agriculture within gulches or near springs, and *mauka* to *makai* trails and associated temporary shelters.

Within the “Makaīwa Hills” project area, which abuts the western boundary of the current study area, pre-Contact habitation sites were found to be clustered in higher elevations above 1000 ft., and in lower elevations below 500 ft (Hammatt et al. 1991). The higher elevations, in which the current study area is located, would contain ample forest subsistence resources for gathering on both a continual basis, as well as during times of famine and drought.

In Von Holt’s (1985) accounts of discovering spring water within the study area, it is noted that Kalo‘i had “been a place of which the Hawaiians had known” and the area “had been quite heavily populated before the smallpox epidemic of 1840” (Von Holt 1985:138-140).

By 1920, the lands of Honouliuli were used primarily for commercial sugar cane cultivation and ranching (Frierson 1972:18). Much of the *mauka* lands in western Honouliuli, including ridges and deep gulches, were unsuitable for commercial sugar cultivation and remained pasture land for grazing livestock. Historic maps indicate a lack of any significant development within the study area into the 1940s suggesting that the lands within the study area were unsuitable for commercial sugar cane cultivation and were utilized as pasture land for grazing livestock. Modest constructions in the area included Pālehua Road, allowing access to the uplands of western Honouliuli, as well as plantation irrigation infrastructure that runs through the current study area (see Figure 14). Also of note are the presence an unidentified enclosure within the northwest corner of the study area and a trail running roughly northwest by southeast through the middle of the study area leading to tunnels and a tank within the northern portion of the study area. This trail is likely the Pālehua Trail along which Von Holt located and tapped various springs to supply water to his herds of cattle. The tunnels located along the northern end of this trail are likely water tunnels excavated into the hillside in order to secure water.

Previous archaeological research in the vicinity of the study area has identified numerous pre-Contact sites including: habitation structures (temporary and permanent) and agricultural features (terrace and mounds). Of particular interest are three pre-Contact sites (SIHP No. -2600, -2601, & -2602) located within Kalo‘i Gulch, in the northern portion of the study area. All three sites were determined to related to erosion control and water management and suggest that in the past water was fairly abundant within the study area. This coincides with Von Holt’s (1985) accounts of discovering spring water within the study area, and that Kalo‘i had “been a place of which the Hawaiians had known”.

Historic archaeological sites identified in the vicinity of the study area include Plantation Era infrastructure (ditches, flumes, clearing mounds, etc.) related to the Ewa Plantation Co. and Oahu Sugar Co., walls and fences attributed to the Campbell Ranch, and industrial quarry infrastructure (rock crusher, concrete platforms and structures, etc.).

Based on background research expected finds during the field inspection of the study area are likely to include both pre-Contact and historic archaeological sites. Pre-Contact archaeological sites may include: dry land agricultural sites, including planting mounds and terraces in the vicinity of springs or drainage gulches; habitation sites, including enclosures and platforms; trail markers (*ahu)*; religious sites (*heiau*), including enclosures, terraces, platforms, and/or upright stones located on prominent hills or other significant locations. Historic archaeological sites may include: ranch related structures, including walls, fences, maintained springs, and water tunnels; irrigation infrastructure, including ditches and flumes related to the Ewa Plantation Co. and Oahu Sugar Co., or industrial quarry infrastructure.

Section 4 Results of Fieldwork

A pedestrian inspection of the project area was conducted between January 31 and February 1, 2008 by four Cultural Surveys Hawai‘i staff archaeologists, under the general direction of Hallett H. Hammatt, Ph.D. In general, lands within the project area appeared to have undergone significant erosion of topsoil. The relatively flat portions of the project area exhibited substantial land modification in the form of machine graded dirt roads, bulldozed clearings, excavated ditches, and remnants of landscaping irrigation lines associated with the abandoned golf course located in the southern portion of the project area (see Figure 7, Figure 8, Figure 9 and Figure 10). A remnant of a paved portion of Pālehua Road, which runs east to west through the project area, was also observed. The drainage utility infrastructure of the Makakilo Drive area was designed to send water from the upland residential areas down slope into the lowland areas of the project area. As the pedestrian inspection of the project area was made following a period of unusually heavy precipitation, it was unclear whether the water observed in the marshy areas and flowing into the gulch originated upslope as runoff or through a storm drain outlet from the residential area to the west. Although streambed formation at lower elevations within the project area may have originated from erosion caused by spring-fed natural channeling, no springs or other naturally occurring water sources were observed within the course of this investigation.

4.1 Survey Findings

Two (2) new historic sites (SIHP Nos. 50-80-12-6950 and 50-80-12-6951) were discovered on survey and documented with written descriptions, graphic illustrations, and photographs. These sites functioned to feed sugar cane fields as well as control water flow coming from those cane fields to areas of lower elevation. Channels and ditches observed were constructed during historic times, and their purpose was to minimize the impact of erosion as well as prevent mud and debris from entering the existing water supply structures associated with the Waiāhole Ditch System, which supplied the region with the much needed water for irrigation in the sugar industry.

Besides the newly identified sites observed on survey, two (2) new features associated with the SIHP No. 50-80-09-2268 (Waiāhole Ditch System) were also observed and documented, further extending the geographical context in which SIHP No. -2268 is referenced. The newly recognized features are labeled SIHP No. -2268, Feature A and SIHP No. -2268, Feature B (Figure 19 and Figure 20).

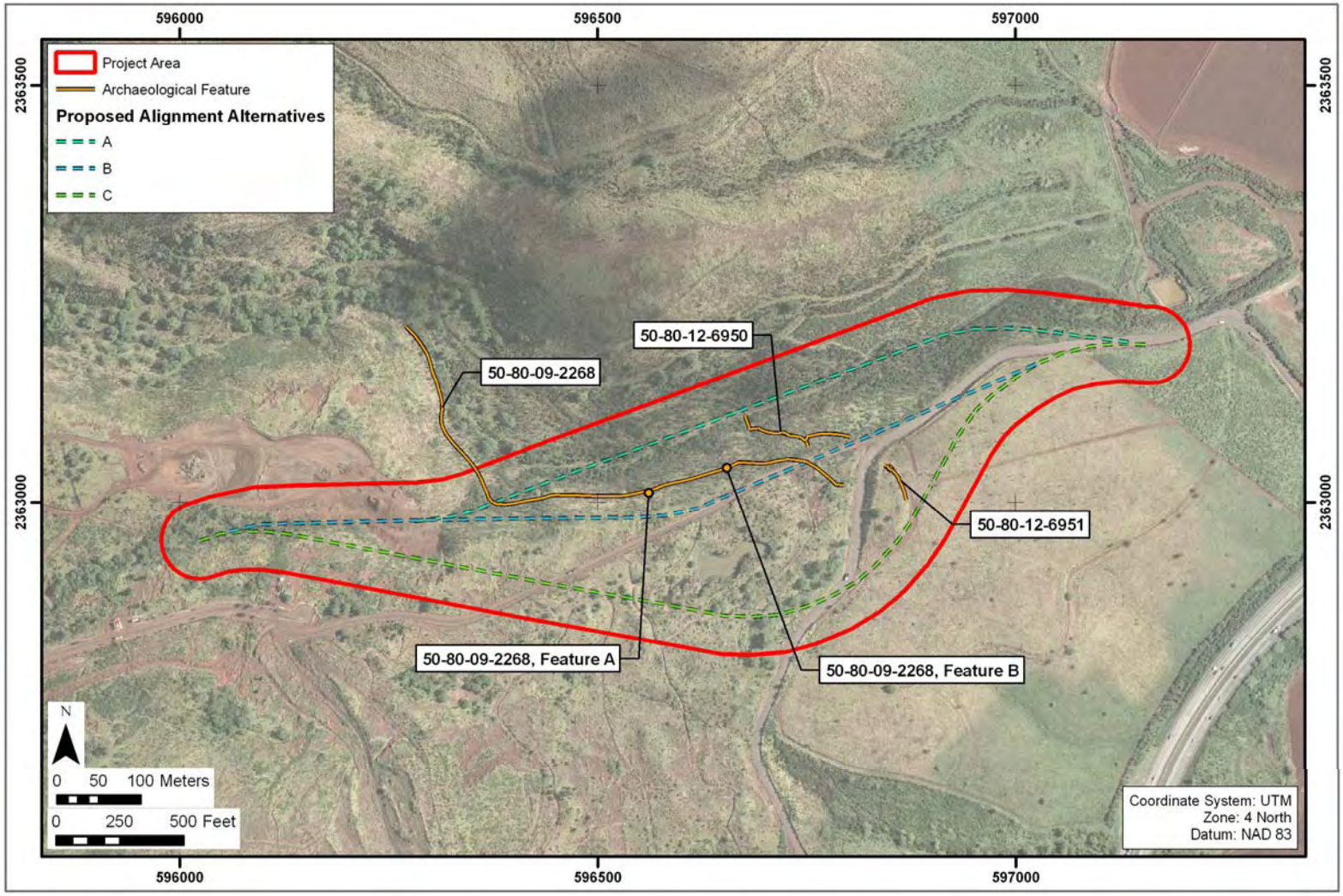


Figure 19. Aerial photograph showing the locations of historic properties identified in the project area, in relation to the three proposed Makakilo Drive Extension alignment alternatives

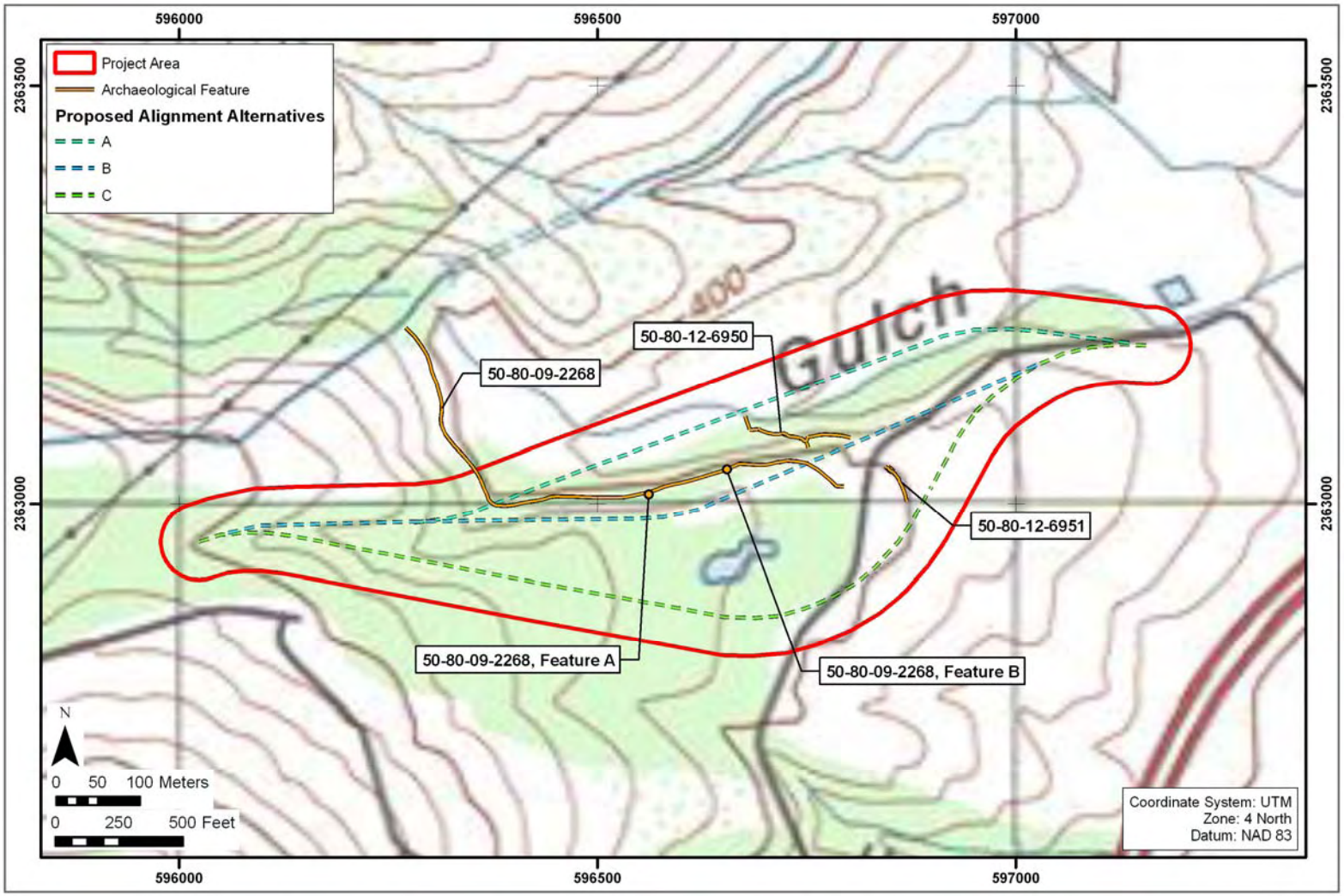


Figure 20. USGS 7.5 minute series Ewa quadrangle topographic map showing the locations of historic properties identified in the project area, in relation to the three proposed Makakilo Drive Extension alignment alternatives

4.2 Site Descriptions

4.2.1 SIHP No.: 50-80-12-6950

Site Type: Modified Drainage Ditch

Function: Water Control

Features: 3

Age: Historic

Site -6950 is a reinforced drainage ditch that was built to divert water to either cross Kalo‘i Stream entirely or to flow into Kalo‘i Stream through an iron pipe. As water flowed downhill it was channeled east to west along the contour of the north-facing, southern slope, near the center of the project area, through this modified drainage ditch. The features observed in this site functioned to control the flow of water towards the base of Kalo‘i Gulch. A total of three (3) features (i.e. Features A-C) were observed on survey, covering an area of approximately 100 square meters (Figure 21).

Feature A is located in the westernmost portion of Site -6950. It consists of a long iron pipe and a pre-fabricated cement ditch, which is located slightly upslope from the pipe. A single foundation was constructed to support the iron pipe spanning the approximately three to four meters across an underlying stream. The pipe was probably used to feed fields at the base of Kalo‘i Gulch.

Feature B is a series of freestanding rock walls, which are labeled as Retaining Walls 1 through 3, forming a channel for water flowing down from the cane fields above. Retaining Wall 1 is five meters east of the pre-fabricated cement ditch; Retaining Wall 2 is approximately twenty-five meters east of Retaining Wall 1; Retaining Wall 3 is located approximately fifteen meters east of Retaining Wall 2.

Feature C, located on the eastern side of Site -6950, is a graded path, and is probably a filled ditch. It is lined on both sides with barbed wire supported by wooden fence posts, and abuts a mound of soil and stones. Water coming from Feature C flowed east to west and merged with water coming from the “Modified Drainage Channel” at the “Mound of Soil and Stones,” near the center of Site -6950.

SIHP No. 50-80-12-6950 is not associated with the irrigation supply function of SIHP No. 50-80-09-2268 (Waiāhole Ditch System), but considering the volume of water Site -6950 was designed to sustain and the relative natural aridity of the region, drainage of the large amounts of water required for sugar cane cultivation is a very likely function for this site. Without such safeguards against the impact of erosion from running water, the landscape of the area could have been impacted in ways that would have adversely affected the efficiency and productivity of this area for agriculture. Two objectives are apparent in the engineered modification of the area: to feed water to the cane fields, and to maintain the physical landscape.

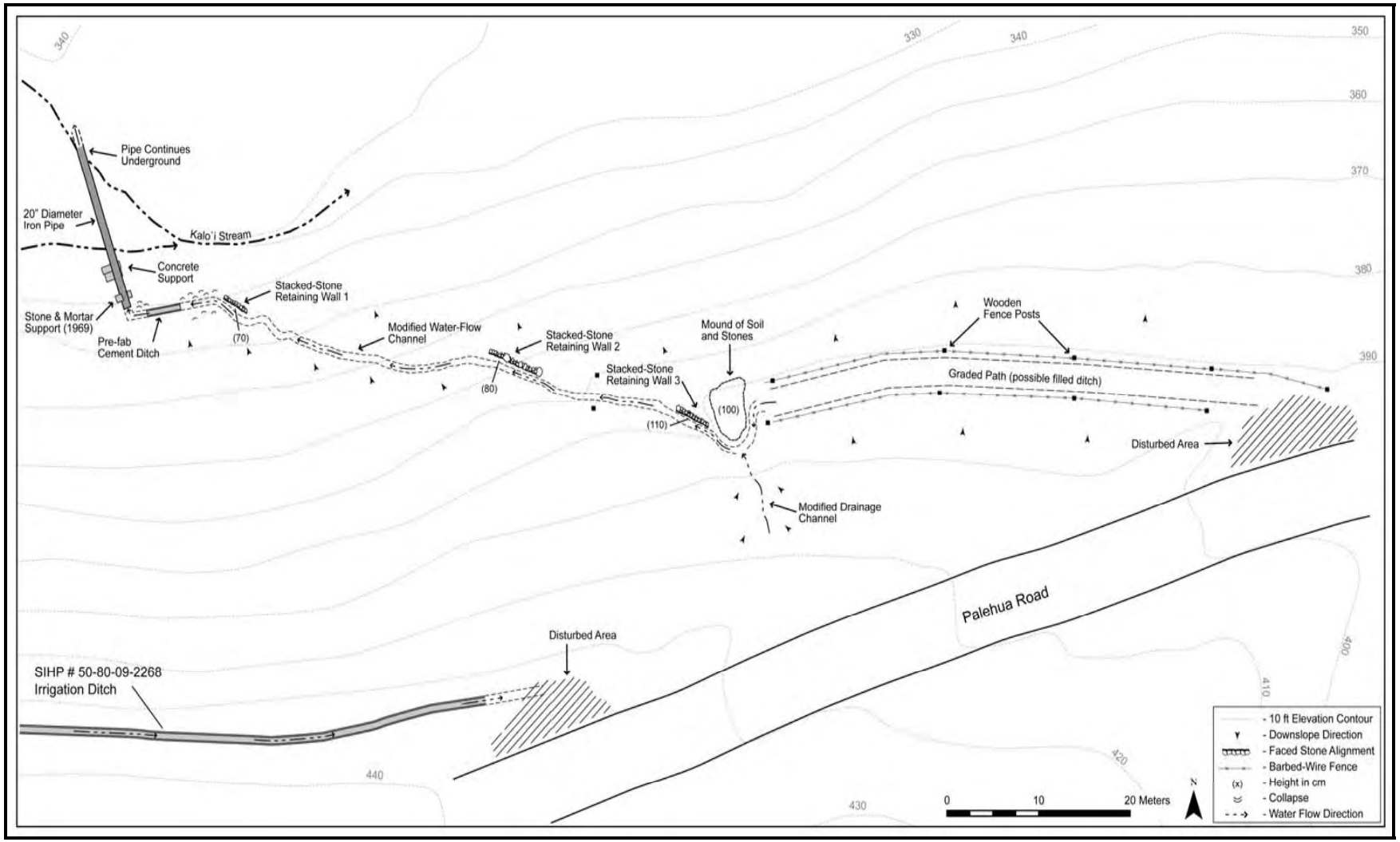


Figure 21. Plan view of SIHP No. 50-80-12-6950.

4.2.1.1 Feature A

Feature A consists of two parts: a 20-inch diameter iron pipe (Figure 22), and a U-shaped, prefabricated ditch constructed of cement boards, with a flat bottom and vertical sides (Figure 23). The iron pipe slopes upward, north to south, at an approximately 10 degree slope (Figure 24). The higher, southern end of the pipe is reinforced with a stone and mortar platform that catches water flowing downhill from the prefabricated cement ditch. The exposed portion of the pipe measures approximately 15 meters, end to end, and continues for an indeterminate length underground (Figure 25). Inscribed atop the partially overarching stone and mortar support of this foundation is “969” and “y 12, 1969.” The missing portion of this support arch would have revealed the month as well as the year “1969,” of which only the “y” remains (Figure 26), if it had not collapsed. The U-shaped prefabricated cement ditch slopes slightly uphill for approximately 3 meters towards Retaining Wall 1 of Feature B before ending the extent of Feature A.



Figure 22. North view of 20-inch iron pipe, Feature A, SIHP No. 50-80-12-6950.



Figure 23. Southern end of 20-inch pipe, where a pre-fabricated ditch faces the iron pipe.



Figure 24. West view of 20-inch iron pipe crossing streambed at the base of Kalo‘i Gulch



Figure 25. South view of northernmost section of iron pipe, where pipe goes underground



Figure 26. Inscription of part of a date on a stone and mortar support

4.2.1.2 Feature B

Feature B consists of three separate sections of a partially collapsed rock wall expanse that once retained water flow to cause a diversion down slope into Feature A. Retaining Wall 1, the rock wall section closest to Feature A, begins approximately 5 meters east of Feature A (Figure 27). Retaining Wall 2 begins approximately 25 meters east of Retaining Wall 1, through a modified channel (Figure 28). Retaining Wall 3 begins approximately 15 meters east of Retaining Wall 2. The bend in the channel is where Feature B, the “Modified Drainage Channel,” and the “Mound of Soil and Stones” meet and merge with Feature C (see Figure 21).

Remnants of the freestanding rock wall were chosen to be documented based on the amount of collapse sustained, but a substantial amount of the overall structure was observed to have once been intact between the designated sections as well. Retaining Wall 1 measures approximately 2.50 meters long, approximately 50 centimeters tall, and stacked 3-4 courses high (see Figure 27). Between Retaining Wall 1 and Retaining Wall 2 is part of a modified channel measuring approximately 25 meters long and ranging between one and two meters wide (see Figure 28). Retaining Wall 2 is approximately seven meters long, 40 to 50 centimeters tall, and stacked 3-4 courses high (Figure 29). Retaining Wall 3 is the most intact section in Feature B. In this section a curve in its horizontal shape turns the ditch slightly south to abut the “Mound of Soil and Stones” (see Figure 21), before merging with Feature C. Retaining Wall 3 measures approximately 5 meters long, 50 centimeters tall, stacked 5-6 courses high (Figure 30 and Figure 31).



Figure 27 East view of Retaining Wall 1.



Figure 28 East view of ditch, between Retaining Wall 1 and Retaining Wall 2.



Figure 29 NE view of Retaining Wall 2.



Figure 30. East view of Retaining Wall 3, showing curve to the south, upslope.



Figure 31. NE view of Retaining Wall 3.

4.2.1.3 Feature C

Feature C is a graded path with some characteristics of a filled ditch. It is lined on either side with barbed wire and intermittent wood posts (see Figure 21). The level area and the proximity to other water and erosion control features in the area suggest that this area could have been a ditch either used concurrently or prior to the construction of Feature B (Figure 32).



Figure 32. East view of Feature C, showing degree of overgrowth of surrounding vegetation

4.2.2 SIHP No.: 50-80-12-6951

Site Type: Irrigation Reservoir

Function: Water Control

Age: Historic

SIHP No. -6951 is a series of remnant portions of a sugar cane irrigation reservoir that once fed into the O‘ahu Sugar Company’s plantation lot number 29 (Figure 33). This structure is parallel to the eastern base of a mound approximately 3 meters above the average surrounding ground surface, which is bound on its north side by Old Pālehua Road, on its east and south sides by O‘ahu Sugar Company’s plantation lot number 29 (see Figure 13), and on its west side by Quarry Road. Site -6951 consists of remnant reservoir ditching infrastructure. The ditch structure ranges in width between 190 and 90 centimeters. As water was collected in the reservoir it was distributed into the cane fields below, transporting water from higher elevations down slope to the eastward and southward fields (Figure 34). Excess moisture that flowed further north continued into features associated with SIHP No. 50-80-12-6950 as well as the newly discovered and documented features associated with SIHP No. 50-80-09-2268 (Waiāhole Ditch System), proceeding to the floodplain at the base of Kalo‘i gulch (see Figure 20 and Figure 21).

Included in this site is an irrigation valve in the northern section of Site -6951 (Figure 35). Across 1.9 meters of ditch from this valve is a freestanding stone and mortar wall. The western side of the ditch is a retaining wall, constructed with stacked stone, five to six courses high (Figure 36). Freestanding rock walls were constructed abutting the slope of the mound, on the west side of the ditch to retain the earthen mound to the west and to minimize the effects of erosion to the overall structure. In contrast, stone and mortar walls were constructed to contain flowing water in areas of the structure where water was either constantly moving or stagnant.

Approximately 6 meters south of the north end of the freestanding stone and mortar wall are six (6) sections of railroad tracks lying parallel to each other, crossing the ditch. Each measuring approximately 1.5 meters, and loosely placed across the rim of the ditch. These rails are rusted and weathered, and no indication of age was observed. It is unknown why they were placed here, but they could have served as a clandestine or long-term walkway for pedestrian access to either side of the ditch, perhaps for use when the reservoir was fully functional.

Two (2) channels were observed branching off of the main ditch and proceeding east into the fields down slope (Figure 37 and Figure 38). The channel and gate near the center of the reservoir ditch is in relatively good condition, the other ditch further south is in remnant condition. The channels functioned as conduits designed to feed water into O‘ahu Sugar Company’s lot #29.

Freestanding rock walls were constructed abutting the slope of the mound on the west side of the ditch to retain an earthen mound and to minimize the effects of erosion to the overall structure. In contrast, stone and mortar walls were constructed to contain flowing water in areas of the structure where water was either in motion or stagnancy. Water came into the reservoir from the west, through the Waiāhole Ditch System and was dispersed into the fields through this reservoir system of channels and gates (see Figure 13).

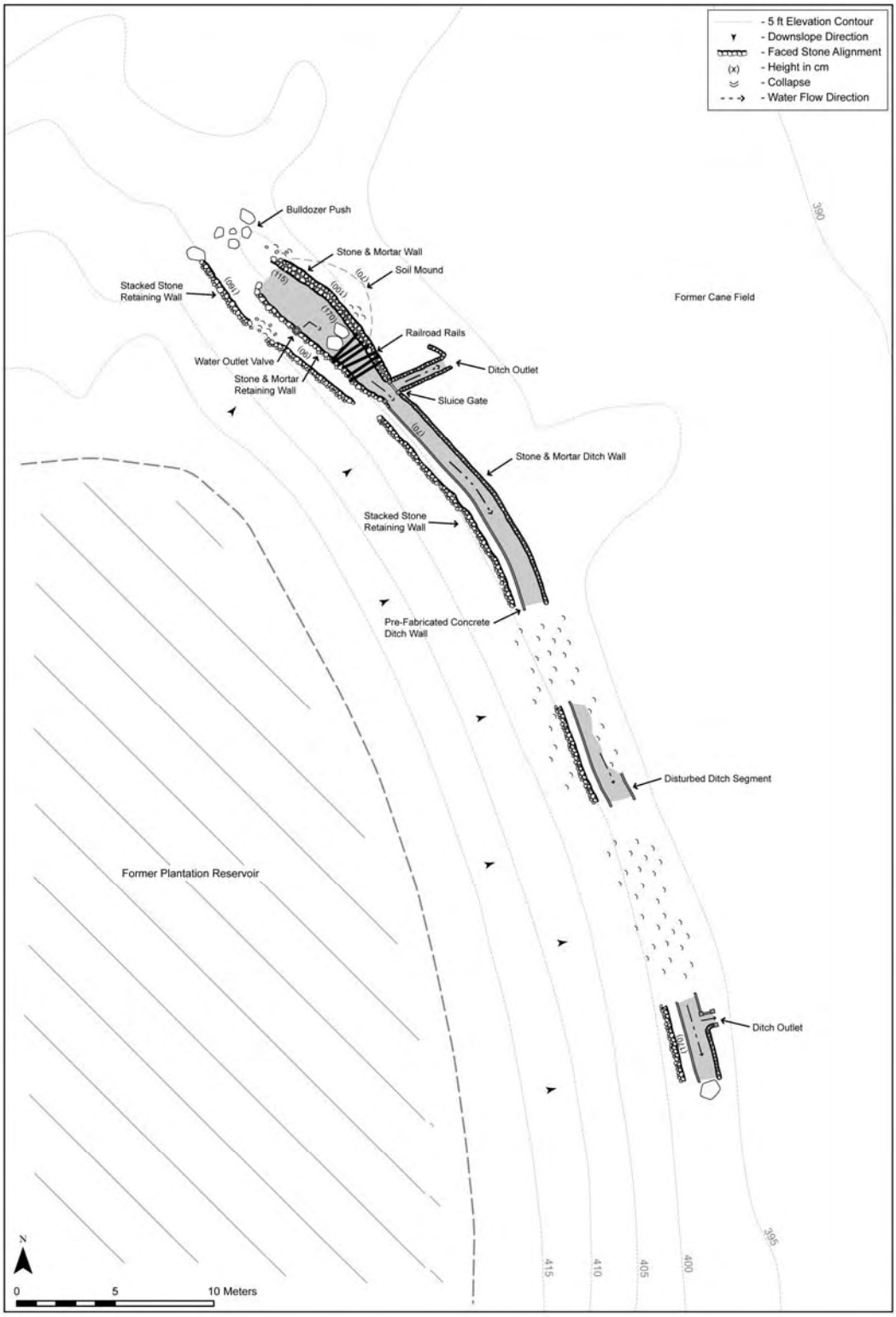


Figure 33. State Site 50-80-12-6951



Figure 34. East view of O‘ahu Sugar Company's lot #29



Figure 35. Valve observed as part of Site -6951



Figure 36. South view of length of reservoir ditch



Figure 37. East view of central outflow ditch and gate



Figure 38. West view of collapsed outflow ditch, south of central outflow ditch and gate

4.2.3 SIHP No.: 50-80-08-2268

Site Type: Improved Ditch

Function: Agricultural (Plantation Era)

Features: 2

Age: Historic

Two newly documented features associated with SIHP No. -2268 were observed on survey, adding to the existing site description (found in Tulchin and Hammatt 2004: 52). The improved ditch functions in transporting water from the extensive Waiāhole Ditch irrigation network to the northeast, to SIHP No. 50-80-12-6951 of the current project area. The two features include an intact metal flume and a remnant wooden flume, respectively labeled features A and B (see Figure 20 and Figure 21). Both have been determined to be connected in function to SIHP No. -2268 because of their geographic locations and functional purpose in relation to the design of the drainage infrastructure associated with the Waiāhole Ditch System.

4.2.3.1 Feature A

Feature Type: Metal Flume Bridge

Function: Drainage, Water Control

Condition: Good

Feature A is a metal flume that is comparable in construction and function to the flume bridge inventoried in previous studies in the region relating to SIHP No. -2268 (Tulchin and Hammatt 2004: 52). It functions to catch and divert water flowing down from a natural drainage feature (Figure 39). The southern end of the metal flume connects to a drainage landing with a constructed stone and mortar support and retaining wall that served the dual purpose of keeping water in on its southeastern side and to prevent erosion on the opposite side of the wall (Figure 40). The northern end of the metal flume is supported with a soil berm, which is further reinforced with a stacked stone retaining wall. As the path of water flow continues down slope, northward, there are remnants of a wooden extension of this flume that transported water the rest of the way before flowing downhill, towards the floodplain of Kalo‘i Gulch (Figure 41). The central part of the flume bridge is constructed with three (3) riveted sections of U-shaped sheets of iron, which are supported lengthwise by wooden support beams and crossed with wooden cross beams (Figure 42 & Figure 43).

The function of Feature A is to enable water flowing downhill to cross over an irrigation ditch section of Site -2268. The size and structural integrity of the structure is indicative of the high volume of water once expected to stream through this area (Figure 44 & Figure 45).



Figure 39. South view of Natural drainage area that flows into metal flume, Feature A, SIHP No. -2268



Figure 40. North view of landing area and cut basalt stone and mortar retaining wall



Figure 41. South View of wooden extension of metal flume, Feature A, Site -2268



Figure 42. East view of Feature A

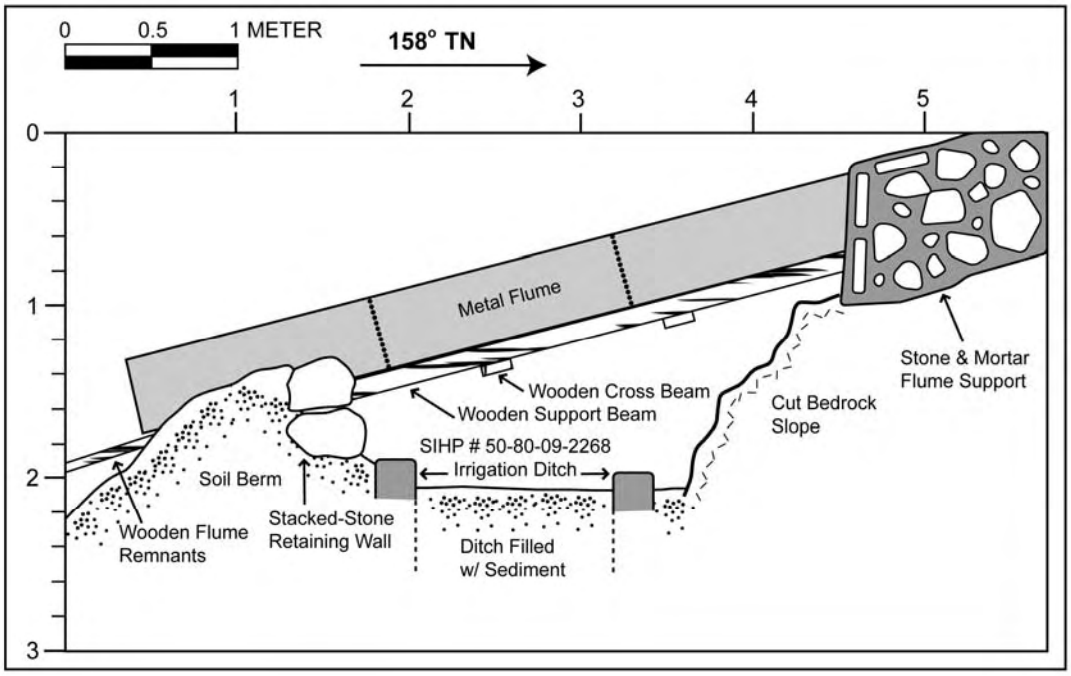


Figure 43. East view of Feature A



Figure 44. North view of metal flume, Feature A, Site -2268

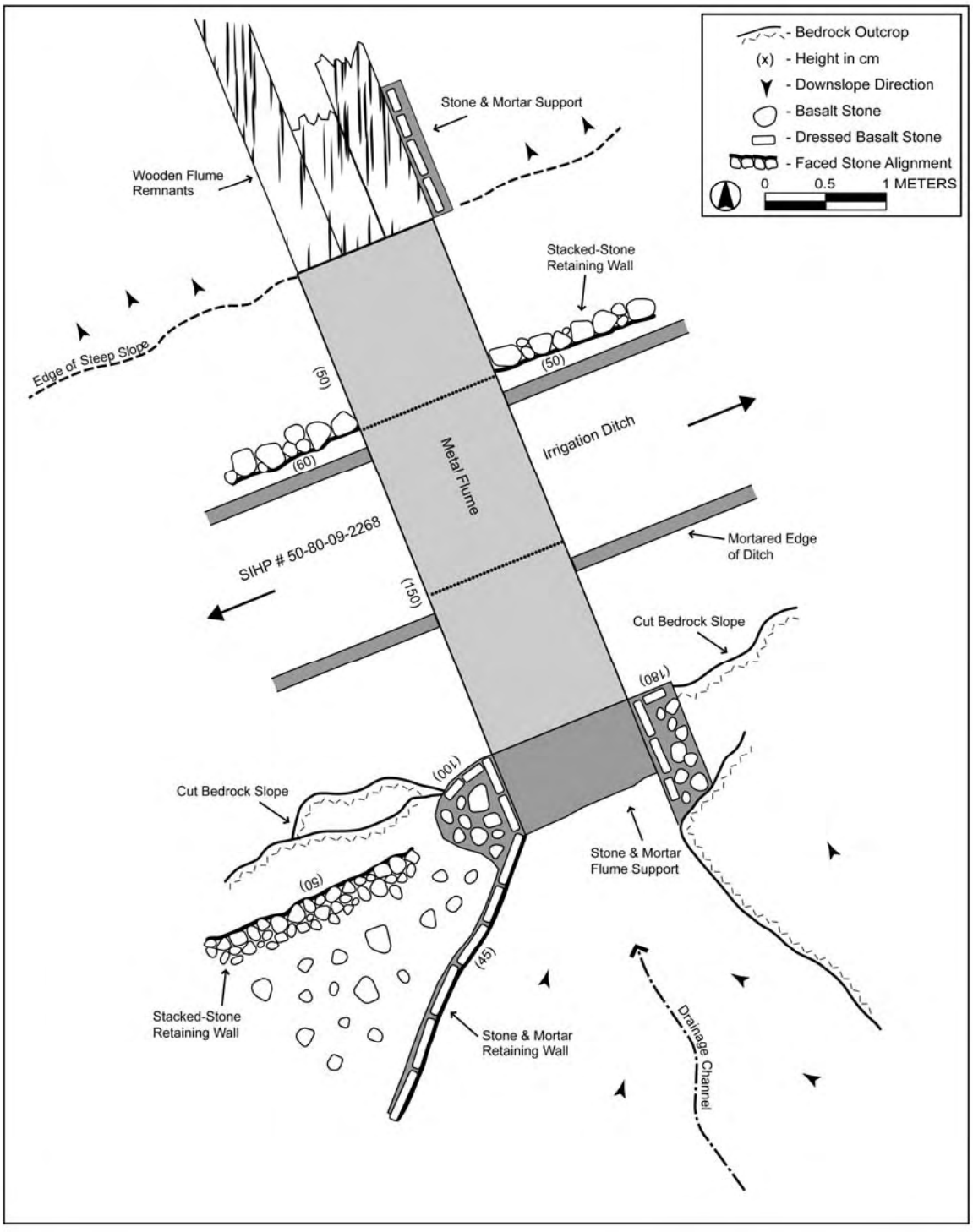


Figure 45. Plan view of Feature A, SIHP No. -2268

4.2.3.2 Feature B

Feature Type: Wooden Flume Bridge

Function: Drainage, Water Control

Condition: Remnant

Feature B of SIHP No. -2268 is a wooden flume that was constructed to control water flow down slope from a modified natural drainage channel, and to cause it to cross over a ditch related to the Waiāhole Ditch System. Remnants of this wooden flume extends from its southern end to the northwest for approximately four meters, where the steep terrain of the area drops into the ravine floor, towards Kalo‘i Stream. Remnants of this feature reveal that it was constructed in a U-shape, with a flat bottom and vertical sides (Figure 46).

It is supported on its higher, southern end by a stone and mortar support, which was constructed atop cut bedrock shaped to accommodate this flume as it carried water over the underlying irrigation ditch, a small portion of Site -2268 (Figure 47). Abutting the stone and mortar support on its southern side is a wooden forming support that retained the stone and mortar portion of this side of the flume. A soil berm supports its northern end, from which water was made to flow down onto a steep slope (Figure 48).



Figure 46. South view of Feature B, SIHP No. -2268, showing its northern end

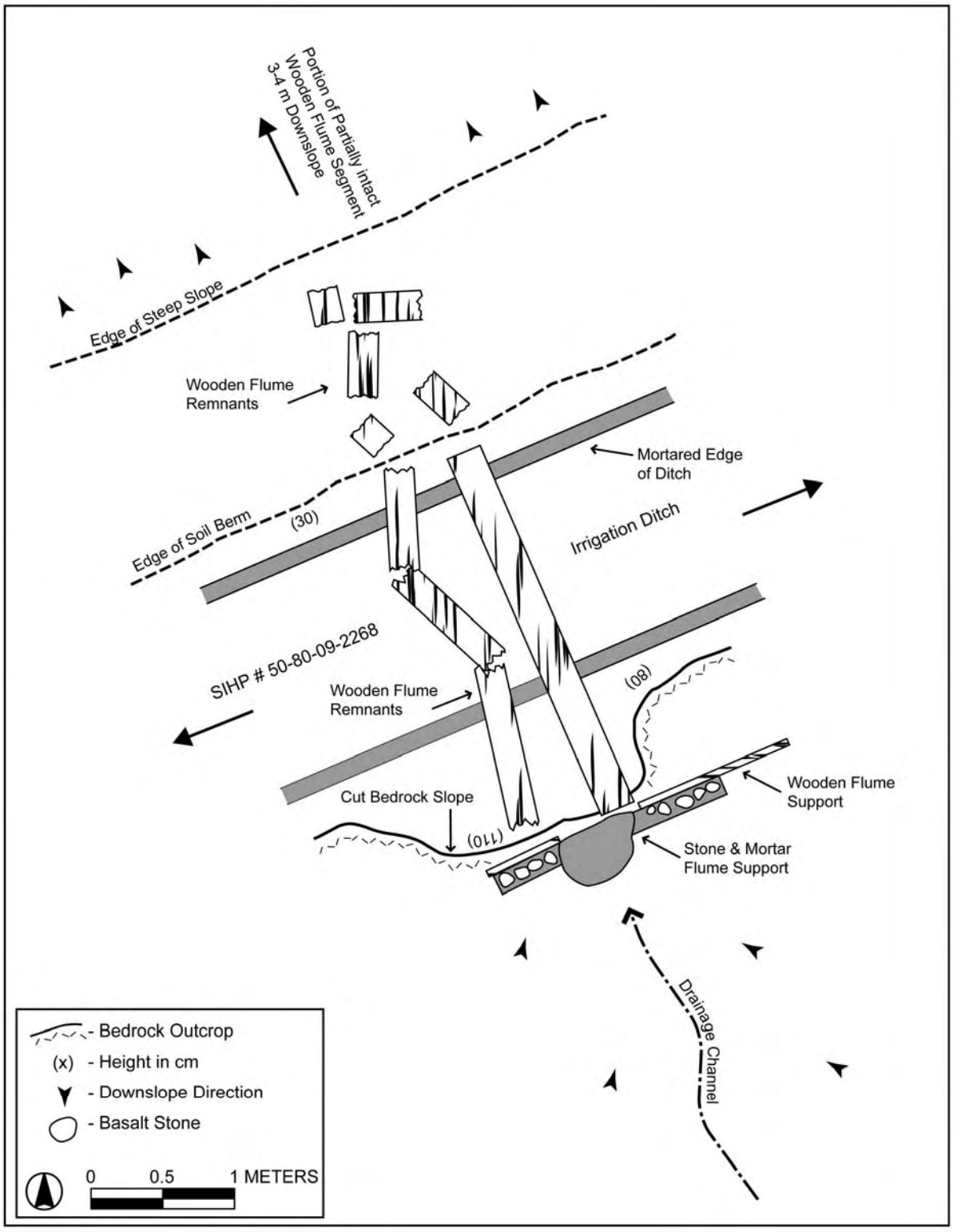


Figure 47. Plan view of Feature B, SIHP No. -2268



Figure 48. South view of Feature B, SIHP No. -2268

Section 5 Summary and Interpretation

The approximately 62-acre proposed Makakilo Drive Extension Project study area is located in western Honouliuli Ahupua‘a at approximately 400-600 ft. elevation along the southern foothills of the Wai‘anae Range. Background research indicates that pre-Contact settlement within Honouliuli Ahupua‘a would have been centered on the rich cultivated lands of Honouliuli *‘ili*. In the intermediate area between the limestone plain and the upland forests, in the vicinity of the current project area, traditional Hawaiian activities would have been limited to dry land agriculture within gulches or near springs, and *mauka* to *makai* transportation routes (i.e. trails) and associated temporary shelters. Historic land use within the project area has included ranching, modifications related to commercial sugar plantation irrigation, and industrial rock quarry operations. Findings by previous archaeological investigations in the immediate vicinity of the project area (i.e. Kalo‘i Gulch, Makakilo Golf Course, Makakilo D and D-1, and U.H. West O‘ahu) were generally limited to historic ranching and commercial sugar plantation infrastructure, including irrigation ditches, aqueducts, and flumes, and stone walls.

The project area is in dry, leeward O‘ahu, with no seasonal or perennial streams in the vicinity. At present, Kalo‘i Stream is an intermittent stream, limited to the channeling flood waters during periods of heavy precipitation. However, historical documentation indicated abundant spring water in the area. Kalo‘i spring was described in the 1890s as having standing water even in dry weather (Von Holt 1985). Additional springs were located in the vicinity by Von Holt, including a paved well, known to Hawaiians as the “Hidden Spring.” It was also noted that the Kalo‘i Gulch area was populated in pre-Contact times, though the population was wiped out by the smallpox epidemic of the mid-1800s (Von Holt 1985). No evidence of traditional Hawaiian agriculture or habitation was located within the project area.

Two new sites have been given SIHP numbers for their archaeological significance: SIHP No. 50-80-12-6950 is a reinforced drainage ditch utilized to divert water flowing down slope; and SIHP No. 50-80-12-6951 is an irrigation reservoir that fed water into the sugar cane fields on its east and south sides, into Oahu Sugar Company’s lot #29 (see Figure 13). All plantation-era archaeological sites observed in the region are probably interrelated in function: excessive water that flowed from cane fields fed from Site -6951 was likely diverted by the structures of Site -6950 to minimize the effects of erosion on the landscape, then proceeded to the base of the gulch.

Previously identified historic sites located during the inventory survey include two newly documented features associated with SIHP No. 50-80-09-2268, a metal flume bridge, a wooden flume bridge, and stone and mortar walls (see Figures 20 and 21).

The limited nature of findings by the current study, despite the historic accounts of a substantial population of Hawaiians in the vicinity of Kalo‘i Gulch and Spring, may be due to the extensive land modification within the project area by historic ranching, commercial sugar plantation endeavors, and industrial rock quarrying operations. It is plausible that the settlement in the area was generally restricted to areas near the mouth of Kalo‘i Gulch, with only limited use of the surrounding areas, including the current project area.

Section 6 Significance Assessments

During the survey of the 62-acre Makakilo Drive Extension Project study area, two (2) new sites related to the Oahu Sugar Company's sugar cane cultivation and irrigation were recorded. 50-80-12-6950 consists of three (3) features that cooperatively functioned to divert water through engineered channeling to lower ground; 50-80-12-6951 is a remnant reservoir of irrigation infrastructure that fed into cane fields upslope from Site -6950. Both sites are associated with water control and plantation irrigation. In addition, two (2) new features associated with SIHP No. 50-80-09-2268 (Waiāhole Ditch System) were discovered on survey and documented. No surface remains were found in the vicinity of the sites and the only surface remains found within the project area was modern refuse and evidence of bulldozing and rock quarrying industry.

6.1 Significance Assessments

Sites are evaluated for significance according to the broad criteria established for the National and State Registers. The five criteria are:

A Site reflects major trends or events in the history of the state or nation.
B Site is associated with the lives of persons significant in our past.
C Site is an excellent example of a site type.
D Site may be likely to yield information important in prehistory or history.
E Site has cultural significance; probable religious structures and/or burials present.

Sites 50-80-12-6950 and 50-80-12-6951 are significant under the Criterion D for the information that has or can be obtained from them. The Waiāhole Ditch, SIHP No. 50-80-09-2268 continues to be significant under criteria A, C, and D.

Table 2. Significance Assessments and Recommendations for All Identified Archaeological Sites Located within the Project Area.

SIHP No.	Type	Function	Significance	Work Accomplished	Recommendation
50-80-12-6950	Water Drainage	Water Control	D	L, M, P, D	No Further Work
50-80-12-6951	Irrigation Reservoir	Water Control	D	L, M, P, D	No Further Work
50-80-09-2268, Feature A	Flume Bridge	Drainage, Water Control	A, C, D	L, M, P, D	No Further Work
50-80-09-2268, Feature B	Flume Bridge	Drainage, Water Control	A, C, D	L, M, P, D	No Further Work

L=Located with a GPS, M. = Mapped, P = Photographed, D=Described, T=Tested

Section 7 Project Effect and Mitigation Recommendations

7.1 Project Effect

The specific effect of the proposed project on the historic properties present in the subject project area depends on which "Alignment Alternative" is ultimately chosen (see Figures 1, 2 and 49). In response, at least in part, to archaeological concerns a new, presently-preferred, alignment (Figure 49) avoids adverse impact to archaeological sites.

In accordance with HAR 13-13-284, the determination of effect for this project for the presently preferred alignment is recommended as "No historic properties affected."

7.2 Mitigation Recommendations

CSH has recommended consideration of an alignment alternative that avoids most or all of SIHP No. 50-80-09-2268, a portion of the Waiāhole Ditch System, which is, by far, the most significant historic property located in the subject project area. The Waiāhole Ditch System is eligible for the State Register of Historic Places on the basis of three criteria that recognize its widespread importance to the history of O‘ahu and the State, in general. If impact to SIHP No. 50-80-09-2268 is anticipated (which is not the case at present) then timely consultation with the State Historic Preservation Division regarding possible mitigation (which might include Historic American Engineering Record documentation) is recommended.

In a Chapter 6E-42 review (dated November 11, 2008; Log No: 2008.2057, Doc No: 0811LM11) of a previous draft of this study the SHPD commented

> The sections of SIHP #-2268, the Waiāhole Ditch System, that are eligible for the National and State registers should undergo photographic documentation of National Register Standards. If you have any questions about the photographic documentation needed to fulfill National Register Standards please contact our Architecture Branch Astrid Liverman or Susan Tasaki at (808) 692-8015.

It is understood that this requirement would be operative if there were to be a project-related adverse impact to the Waiāhole Ditch System. The presently preferred alignment (Figure 49) would appear not to have an adverse impact to the Waiāhole Ditch System.

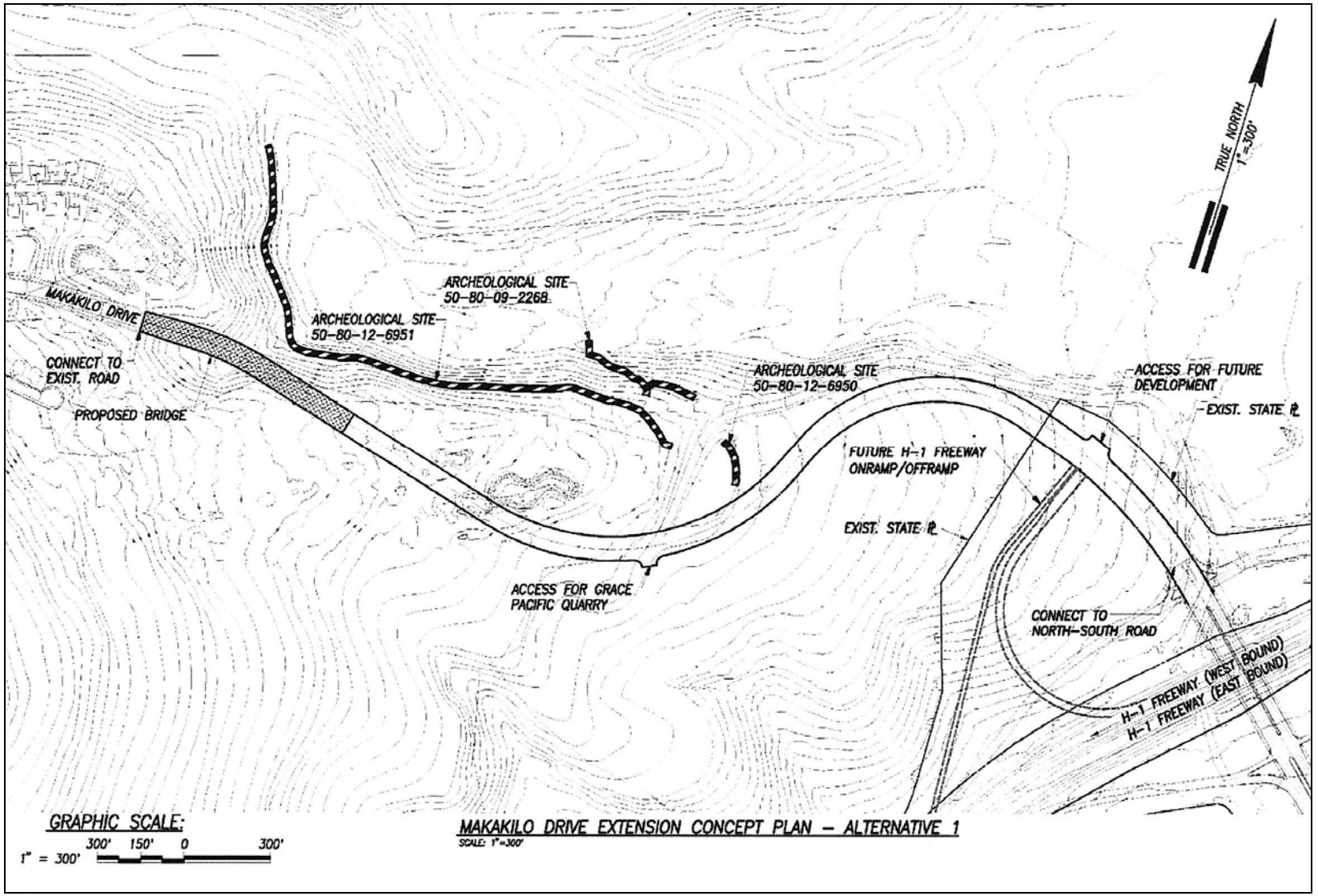


Figure 49. Preferred Alternative Plan

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APPENDIX D

Botanical Resources Assessment, LeGrande Biological Surveys, Inc.,

March 2008

BOTANICAL RESOURCES ASSESSMENT FOR THE MAKAKILO DRIVE EXTENSION HONOULIULI, OAHU, HAWAII

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INTRODUCTION

This report includes the findings of a botanical study conducted for the proposed Makakilo Drive Extension, Honouliuli, Oahu. LeGrande Biological Surveys Inc. carried out a botanical field survey of the above location on the 15th of February 2008 for R.M. Towill Corporation. The primary objectives of the field studies were to:

1) provide a general description of the vegetation on the project site;
2) inventory the flora; and
3) search for threatened and endangered species as well as species of concern

Federal and State of Hawaii listed species status follows U.S. Fish and Wildlife (USFWS) (1999a and 1999b, 2004) and Federal Register (2002).

GENERAL SITE DESCRIPTION

The area proposed for the Makakilo Drive Extension is located on a dry leeward slope at the southern end of the Waianae Mountain range in Honouliuli. The survey area includes a gradual sloping plateau and existing roadway that lies to the south of Kalo`i Gulch and to the north of Pu`umakakilo. The survey area is a rectangular section including the existing Palehua Road from the H-1 Highway to a gravel road that follows the southern edge of Kalo`i Gulch up to the cul-de-sac of Pueonani Street. The highest elevation is at the Pueonani cul-de-sac at approximately 184 meters and gradually slopes to the junction at the H-1 Highway at an elevation of 70 meters.

SURVEY METHODS

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

A walk-through survey method was used. The existing roadway was surveyed as well as up to 250 meters buffer on either side of the roadway (north and south). A section of the steep upper slope of Kalo`i Gulch was included in the survey area from 90 to 130 meters in elevation. Notes were made on plant associations and distribution, disturbances, topography, substrate types, exposure, drainage, etc. Plant identifications were made in the field; plants that could not be positively identified were collected for later determination in the herbarium, and for comparison with the recent taxonomic literature.

DESCRIPTION OF THE VEGETATION

The site proposed for the road extension is dominated by a non-native guinea grass (*Panicum maximum*)/Koa haole (*Leucaena leucocephala*) matrix with a small pocket of native `A`ali`i Lowland Shrubland. There are a total of 60 plant species observed within the survey site. 55 are alien (introduced), four are indigenous (native to the Hawaiian

Islands and elsewhere), and one endemic (native only to the Hawaiian Islands). Therefore, over 91% of the plant species observed are alien. An inventory of all the plants observed within the survey area is presented in the species list at the end of the report.

The lower section of the survey area is dominated by monotypic stands of guinea grass with scattered koa haole shrubs, large sections of land have been cleared or graded as roadway and quarry work is presently active in the area. As the survey area gains elevation short weedy species dominate the roadside such as buffelgrass, coat buttons (*Tridax procumbens*), spiny amaranth (*Amaranthus spinosa*), false mallow (*Malvastrum coromandelianum*), boerhavia (*Boerhavia coccinea*), manienie grass (*Cynodon dactylon*), and slender mimosa (*Desmanthus pernambucans*); with a taller shrubby plant matrix characterizing the upper slopes of Kalo`i Gulch. Some of the larger shrubs include sourbush (*pluchea carolinensis*), tree tobacco (*Nicotiana glauca*), klu (*Acacia farnesiana*), Formosa koa (*Acacia confusa*) and koa haole. Vines such as ivy-leaved morning glory (*Ipomoea cairica*) and hairy merremia (*Merremia aegyptia*) were locally abundant growing along the gravel roadway near the upper elevations of the survey area.

There were several large trees observed during the survey including, pepper tree (*Schinus molle*), kiawe (*Prosopis pallida*), monkeypod (*Samanea saman*), and yellow elder (*Tecoma stans*).

A small degraded `A`ali`i shrubland is located at the upper elevations of the survey area. A pocket on the upper slope of Kalo`i Gulch, to the north of the existing gravel roadway, from an elevation of 184 meters down to about 155 meters harbors several hundred `a`ali`i plants as well as an estimated 40 to 50 `iliahialo`e or coastal sandalwood (*Santalum ellipticum*) trees. A Bishop Museum plant survey was conducted in 2004 for 155 acres in the Makakilo area, including sections of the Kalo'i gulch and portions of the present survey area. Over 90 *Santalum ellipticum* plants were located and tagged during the 2004 survey. A large section of the *Santalum* population has since been cleared for housing development along the present Pueonani Street.

Other native plant species observed were mainly scattered along the edges of the existing gravel roadway at the upper elevations of the survey area. They include `ilima (*Sida fallax*), `uhaloa (*Waltheria indica*), and popolo (*Solanum americanum*).

Several native Blackburn's Blue butterflies (*Udara blackburni*) were observed flitting among the `a`ali`i and sandalwood flowers. It is a relatively small butterfly with light green on the underside and blue on the topside of the wings. Its range is declining due to habitat loss. Butterflies tend to be host specific, unlike moths that are considered generalists and can adapt to vegetation changes more readily. *U. blackburni* prefers `a`li`i and koa (*Acacia koa*), but also appears to utilize other native shrubs and trees in its habitat, including Santalum. The Balckburn butterfly is one of only two native Hawaiian butterflies the other is the Kamehameha butterfly (*Vanessa tameamea*).

DISCUSSION AND RECOMMENDATIONS

None of the plants observed on the project site is a federally listed threatened or endangered species or a species of concern (U.S. Fish and Wildlife Service, 1999a, 1999b, 2004; Wagner et. al., 1999). The majority of the plants observed during the survey are non-native, dominated by a non-native guinea grass (*Panicum maximum*)/Koa haole (*Leucaena leucocephala*) matrix with a small pocket of native `A`ali`i Lowland Shrubland. The `iliahialo`e (*Santalum ellipticum*) population found at the upper elevations of the survey area is significant, the species as a whole is declining due to urbanization throughout its home range.

The landscape manager, Sidney Aki (Grace Pacific) mentioned that several sandalwood plants were removed for transplanting prior to building the recent housing on Pueonani Street. Present status and location of these plants is not known. Sandalwood has proven to be a difficult species to transplant or grow from seed, as it needs a symbiotic microorganism in order to germinate. During the 2004 survey, sandalwood seed predation was noted and very few fruit were collected with viable seeds. During the present survey, the fruit again appeared to have been chewed open and the seeds were gone, mice are the most likely culprit.

Avoiding and or minimizing alteration of the extant sandalwood trees and `a`ali`i shrubs during the construction of the Makakilo Drive Extension would give the plants the best chance of future survival as well as retain native habitat for the native Blackburn butterfly.

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PLANTS SPECIES LIST – MAKAKILO DRIVE EXTENSION, Oahu, Hawaii

The following checklist is an inventory of all the plant species observed within the survey area for the proposed Makakilo Drive Extension. The plant names are arranged alphabetically by family and then by species into each of two groups: Monocots, and Dicots. The taxonomy and nomenclature of the flowering plants (Monocots and Dicots) are in accordance with Wagner *et al*. (1990), Wagner and Herbst (1999) and Staples and Herbst (2005). Recent name changes are those recorded in the Hawaii Biological Survey series (Evehuis and Eldredge, eds., 1999-2002).

For each species, the following name is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name(s), when known.
3. Biogeographic status. The following symbols are used:

   E: endemic: native, occurring only in the Hawaiian Archipelago

   I: indigenous: native, occurring naturally in the Hawaiian archipelago but also outside of Hawaii

   X: introduced or alien- all those plants brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact, that is Cook's arrival in the islands in 1778.

   X?: questionably introduced- probably introduced, possibly indigenous

MAKAKILO DRIVE EXTENSION
PLANT SPECIES LIST
FEBRUARY 2008

SCIENTIFIC NAME	COMMON NAME	STATUS
MONOCOTS		
COMMELINACEAE		
Commelina benghalensis L.	Hairy honohono, dayflower	X
POACEAE		
Cenchrus ciliaris L.	Buffelgrass	X
Chloris barbata (L.) Sw.	Swollen fingergrass	X
Cynodon dactylon (L.) Pers	manienie	X
Digitaria insularis (L.) Mez ex Ekman	sourgrass	X
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	X
Melinus repens (Willd.) Zizka	Natal redtop	X
Panicum maximum L.	Guinea grass	X
Setaria parviflora (Poir.) Kerguelen	Yellow foxtail	X
DICOTS		
AMARANTHACEAE		
Alternanthera pungens Kunth	Khaki weed	X
Amaranthus spinosus L.	Spiny amaranth	X
ANACARDIACEAE		
Schinus molle L.	Pepper tree	X
Schinus terebinthifolius Raddi	Christmas berry	X
ASTERACEAE		
Ageratum conyzoides L.	Maile honohono	X
Bidens pilosa L.	Spanish needle	X
Conyza bonariensis (L.) Cronq.	Hairy horseweed	X
Emilia fosbergii Nicolson	Red pualele	X
Pluchea carolinensis (Jacq.) G. Don	sourbush	X
Pluchea indica (L.) Less.	Indian fleabane	X
Sonchus oleraceus L.	pualele	X
Tridax procumbens (L.)	Coat buttons	X
Verbesina encelioides (Cav.) Benth. & Hook	Golden crown-beard	X
Xanthium strumarium L. var. *canadense* (Miller)	kikania	X
BIGNONIACEAE		
Tecoma stans (L.) Juss. Ex Kunth	Yellow elder	X

SCIENTIFIC NAME	COMMON NAME	STATUS
CONVOLVULACEAE		
Ipomoea cairica (L.) Sweet	Ivy-leaved morning glory	X?
Ipomoea obscura (L.) Ker Gawl.		X
Merremia aegyptia (L.) Urb.	Hairy merremia	X
CUCURBITACEAE		
Coccinea grandis (L.) Voigt	Ivy gourd	X
EUPHORBIACEAE		
Chamaesyce hirta (L.) Millsp.	hairy spurge, garden spurge	X
Euphorbia heterophylla L.	kaliko	X
Ricinus communis L.	Castor bean	X
FABACEAE		
Acacia confusa Merr.	Formosa koa	X
Acacia farnesiana (L.) Willd.	Klu, aroma	X
Chamaecrista nictitans (L.) Moench	Partridge pea	X
Crotalaria incana L.	Fuzzy rattlepod	X
Crotalaria pallida Aiton	Smooth rattlepod	X
Desmanthus pernambucanus (L.) Thell.	Slender or virgate mimosa	X
Indigofera hendecaphylla Jacq.	Creeping indigo	X
Leucaena leucocephala (Lam.) de Wit	Koa haole	X
Macroptilium lathyroides (L.) Urb.	Wild bean, cow pea	X
Prosopis pallida (Humb. & Bonpl. Ex Willd.) Kunth	Kiawe, algaroba	X
Samanea saman (Jacq.) Merr.	monkeypod	X
LAMIACEAE		
Hyptis pectinata (L.) Poit.	Comb hyptis	X
Leonotis nepetifolia (L.) R.Br.	Lion’s ear	X
Ocimum gratissimum L.		X
MALVACEAE		
Abutilon grandifolium (Willd.) Sweet	Hairy abutilon	X
Malva parviflora L.	Cheese weed	X
Malvastrum coromandelianum (L.) Garcke	False mallow	X
Sida fallax Walp.	`ilima	I
Sida ciliaris L.		X
Sida rhombifolia L.		X

SCIENTIFIC NAME	COMMON NAME	STATUS
NYCTAGINACEAE		
Boerhavia coccinea Mill.		X
SANTALACEAE		
Santalum ellipticum Gaudich.	`iliahialo`e. coast sandalwood	E
SAPINDACEAE		
Dodonaea viscosa Jacq.	`a`ali`i	I
SOLANACEAE		
Nicotiana glauca R.C. Graham	Tree tobacco	X
Solanum americanum Mill.	Glossy nightshade, popolo	I
Solanum lycopersicum L. var. *cerasiforme* (Dunal) Spooner, G.J. Anderson & R.K. Jansen	Cherry tomato	X
STERCULIACEAE		
Waltheria indica L.	`uhaloa	I
VERBENACEAE		
Lantana camara L.	lantana	X
Stachytarpheta jamaicensis (L.) Vahl	Jamaican vervain	X

APPENDIX E

Avifauna and Feral Mammal Survey, Phillip Bruner, February 2008

AVIFAUNAL AND FERAL MAMMAL SURVEY OF

MAKAKILO DRIVE EXPANSION PROJECT, OAHU

Prepared for:

RM Towill Corporation

Prepared by:

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20 February 2008

INTRODUCTION

This report provides the findings of a one day (12 February 2008) field survey of property involved in the proposed Makakilo Drive Expansion Project, Oahu. References to pertinent published and unpublished sources are also noted to provide a broader perspective of the species known from this region on Oahu. The goals of the field survey were to:

1- Document the species of birds and mammals on or near the property.

2- Note any features of the site or nearby lands that contain habitat of importance to native or migratory birds.

SITE DESCRIPTION

The property is currently covered in second growth alien vegetation. Kiawe (*Prosopis pallida*) and Koa Haole (*Leucaena leucocephala*) are the predominant trees on the site. No natural wetlands occur on the property but a large, lined, drainage catchment occurs just makai of a partially paved road that runs down the length of the proposed project site. Residential property occurs on the mauka end of the road alignment and industrial activity lies downslope.

METHODS OF THE SURVEY

A morning (0800-1100 hrs) walking survey examined the entire proposed expansion road alignment as well as a buffer zone of nearby surrounding lands. All species observed were noted and a tally of the total number of individuals of each species were recorded in order to estimate their relative abundance. Data on mammals were obtained by visual observations only. No trapping of mammals to determine their presence or relative abundance was attempted. The length and nature of this survey did not warrant trapping. Weather during the survey was clear and calm.

Scientific and common names used in this report follow Pyle (2002), Honacki et al. (1982), and Pratt (1999). These sources give names currently found in the scientific literature.

RESULTS

Native land Birds:

No native land birds were observed on the survey. The only potential species that might forage in this region is the Hawaiian Owl or Pueo (*Asio flammeus sandwichensis*). This bird is listed by the State of Hawaii as endangered on the island of Oahu. They nest on the ground in tall grass and forage over a variety of habitats including but not limited

to: forests, grasslands and agricultural lands (Hawaii Audubon Society 2005). My most recent sighting of Pueo in this region of Oahu was at Barbers Point in 2005.

Native Waterbirds:

Two endangered Hawaiian Duck or Koloa (*Anas wyvilliana*) were observed at the drainage catchment. This species will utilize any sizeable body of water including: coastal ponds, mountain streams, irrigation ditches and reservoirs (Pratt et al. 1987, Hawaii Audubon Society 2005). No other native waterbirds were recorded. The endangered Hawaiian or Black-necked Stilt (*Himantopus mexicanus knudseni*) could also forage at the drainage catchment.

Migratory Birds:

The only migratory bird recorded was the Pacific Golden-Plover or Kolea (*Pluvialis fulva*). Two Kolea were also observed at the drainage catchment. This species is the most abundant migrant in Hawaii. It is not listed as threatened or endangered. Kolea prefer open habitat such as lawns and cleared agricultural fields for foraging. Extensive, longterm studies have document many details of their life history (Johnson et al. 1981, 1989, 1993, 2001).

Alien Birds:

Sixteen species of alien (introduced, non-native) birds were recorded on the survey. Table One gives the names and relative abundance of these species. The array of alien species at this site is typical of what would be expected in this area (Pratt et al. 1987, Hawaii Audubon Society 2005, Bruner 1989a, 1989b,1991a, 1991b, 1991c, 1993, 1995, 2002, 2003, 2005, 2007). None of these introduced birds are listed as threatened or endangered.

Mammals:

The only mammal observed on the survey was the Small Indian Mongoose (*Herpestes auropunctatus*). Feral cats (*Felis catus*), rats (*Rattus rattus spp.*) and House Mouse (*Mus musculus*) likely also occur in this area. The only native land mammal in Hawaii is the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*). This species is infrequently recorded on Oahu but is more common on Kauai and the Big Island (Tomich 1986, Kepler and Scott 1990). They roost solitarily in trees and forage for flying insects in a wide variety of native and non-native habitats including urban areas. None was seen on this survey. I do not know of any documented observations of bats at this location.

EXECUTIVE SUMMARY

The field survey examined the entire property proposed for the Makakilo Drive Expansion Project and a buffer zone of nearby adjacent lands. The array of introduced birds and mammals recorded was typical for this area. No native land birds were found but the endangered Hawaii Duck was recorded on the site. The endangered (State of Hawaii, Oahu only) Hawaiian Owl or Pueo does forage in the undeveloped areas of West Oahu. I have seen this species as recently as 2005 on Barbers Point property. Pacific Golden-Plover (the most abundant migratory shorebird) was observed on the property. They typically establish foraging territories on lawns and other open lands during their winter (August – April) stay in Hawaii. They are not listed as endangered or threatened. This property does not contain any unusual or unique habitat for birds and mammals. The drainage catchment is likely an ephemeral water resource for waterbirds and shorebirds. The development of this site should have no measurable effect on the populations of alien birds and mammals in West Oahu. If more of the site is converted to roadside lawns then a few more Pacific golden-Plover might winter on the property.

TABLE ONE

Alien birds recorded on a field survey of the proposed Makakilo Drive Expansion Project site in West Oahu. Data were obtained on 12 February 2008. Relative abundance estimates are based on totals obtained on the walking survey. Abundant (A) =20+, Common (C) =10-19, Uncommon (U) =5-9, Rare (R) =Number which follows is the toal recorded.

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE
Cattle Egret	*Bubulcus ibis*	U
Gray Francolin	*Francolinus pondicerianus*	U
Black Francolin	*Francolinus francolinus*	U
Ring-necked Pheasant	*Phasianus colchicus*	R=1
Spotted Dove	*Streptopelia chinensis*	C
Zebra Dove	*Geopelia striata*	A
Red-vented Bulbul	*Pycnonotus caffer*	C
Japanese White-eye	*Zosterops japonicus*	A
Common Myna	*Acridoteres tristis*	C
Red-crested Cardinal	*Paroaria coronata*	U
Northern Cardinal	*Cardinalis cardinalis*	R=3
House Finch	*Carpodacus mexicanus*	R=2
Common Waxbill	*Estridla astrild*	A
Red Avadavat	*Amandava amandava*	R=2
Nutmeg Mannikin	*Lonchura punctulata*	R=4
Chestnut Mannikin	*Lonchura atricapilla*	U

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APPENDIX F

Cultural Impact Assessment, Cultural Surveys Hawai'i, July 2008

Cultural Impact Assessment for the Approximately 23-acre Makakilo Drive Extension Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu Island TMK: [1] 9-2-002:006, 9-2-003:079

Prepared for

R.M. Towill Corporation

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Management Summary

Reference	Cultural Impact Assessment for the Makakilo Drive Extension Project, Honouliuli Ahupua‘a, ‘Ewa District, Island of O‘ahu, TMK: (1) 9-2-002:006, 9-2-003:079 (Gollin and Hammatt 2008)
Date	July 2008
Project Number(s)	Cultural Surveys Hawai‘i (CSH) Job Code: HONOULIULI 9 (see also companion document CSH Job Code HONOULIULI 8, an archaeological inventory survey report)
Project Location	The project area consists of portions of TMK: (1) 9-2-002:006 and 9-2-003:079. The project area is generally bound on the west by the Makakilo Drive, on the south by Quarry Road, which connects Old Pālehua Road to the Grace Pacific Makakilo Quarry, on the east by Interstate highway H-1, and on the north by the Kalo‘i Gulch floodplain. The project area is depicted on the USGS 7.5 minute series ‘Ewa quadrangle topographic map (Figure 1)
Land Jurisdiction	Private, D.R. Horton – Schuler Homes LLC, Castle & Cooke Homes Hawaii, Inc.
Agencies	State of Hawai‘i Department of Health, Office of Environmental Quality Control (DOH / OEQC), and State Historic Preservation Division, Department of Land and Natural Resources (SHPD/DLNR)
Project Description	Plans are to develop the project area into a roadway to connect the northeast end of Makakilo Drive to Interstate highway H-1.
Project Acreage	Approximately 23 acres
Area of Potential Effect (APE)	For the purposes of this Cultural Impact Assessment (CIA), the APE is defined by the approximately 23-acre project area footprint. However, since the proposed project is directly associated with enabling the proposed expansion of development in Makakilo, this CIA also assesses the cumulative impacts of this expansion of the greater Makakilo development area.
Document Purpose	The project requires compliance with the State of Hawai‘i environmental review process [Hawai‘i Revised Statutes (HRS) Chapter 343], which requires consideration of a proposed project’s effect on cultural practices and resources. At the request of R.M. Towill Corporation, CSH is undertaking this CIA. Through document research and (ongoing) cultural consultation efforts this report provides information pertinent to the assessment of the proposed project’s impacts to cultural practices (per the OEQC’s Guidelines for Assessing Cultural Impacts). The document is intended to support the project’s environmental review and may also serve to support the project’s historic preservation review under HRS Chapter 6E-42 and Hawai‘i Administrative Rules Chapter 13-284.

Community Consultation	Hawaiian organizations, agencies and community members were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the project area and the vicinity. The organizations consulted included the SHPD, the Office of Hawaiian Affairs (OHA), the O‘ahu Island Burial Council (OIBC), Hui Mālama I Nā Kūpuna ‘O Hawai‘i Nei, ‘Ahahui Siwila Hawai‘i o Kapolei Hawaiian Civic Club and the Makakilo/Kapolei Neighborhood Board.
Results of Background Research	Background research yields the following relevant information: (1) The project area is located in the Kalo‘i Gulch floodplain, which includes the Kalo‘i Stream channel. Kalo‘i, which translates as “the taro patch,” was a well-known place of Native Hawaiian activity from before the historic era. Given the physiographic location and characteristics of the project area, it is unlikely to have ever been a place of permanent Hawaiian settlement; however, the presence of several small fresh-water springs in the general gulch system, as described in historic accounts, suggests Hawaiians used at least portions of the project area as gardening sites. (2) The project area also contains remnants of one or more old Hawaiian trails. (3) Given its location within Honouliuli Ahupua‘a, the project area is generally associated with a wide variety and extensive number of *mo‘olelo* (oral histories), including legends, mythological accounts, stories, parables and sayings; these include, for example, the exploits of gods and demi-gods such as Kāne, Kanaloa, Māui, Kamapua‘a (the pig god), Maunauna (the shark deity), Ka‘ahupāhau, and the hero Palila. There are several references associated with Honouliuli to chiefly lineages and to the ruling chiefs Hilo-a-Lakapu and Kūali‘i. (4) The project area is also closely associated with commercial sugar cane agriculture on O‘ahu; in particular, the project area retains archaeological features related to water-management and transport facilities, including the famous Waiāhole Ditch.
Results of Community Consultation	Twenty-three community contacts (government agency or community organization representatives, or individuals such as long-time area residents and cultural practitioners) were contacted for the purposes of this Cultural Impact Assessment. 14 did not respond; four provided referrals to other individuals; and five participated in formal “talk story” interviews. Community consultation yielded the following cultural concerns: (1) Several participants are very concerned about one or more trails crossing through the subject project area; at least one of the trails is perceived to be an old Hawaiian trail dating from early historic or perhaps even pre-Contact times. Mr. Shad Kane, in particular,

	stressed that this trail—part of which is depicted in Figure 24—should not be sacrificed or physically compromised to make way for the proposed project. (2) Several participants talked about a wide variety of "ghost stories" and unexplained phenomena either experienced personally or related by others in old stories dealing with the general vicinity of the project area, and extending to much of the entire *ahupua‘a* of Honouliuli. (3) Some participants stressed the importance of not losing any additional Hawaiian features of the landscape, such as trails, to development in and around the project area, which has experienced substantial losses in historic and more recent times. (4) One participant talked about the cultural significance of *wiliwili* trees (*Erythrina sandwicensis*), which are closely associated with "*ao kuewa*," a kind of Hawaiian purgatory.
Recommendations	Based on all available information, including background research and community consultation, CSH recommends the following measures, which, if addressed in a good faith manner, will help mitigate potentially adverse effects of the proposed project: (1) The old Hawaiian trail depicted in Figure 24 of this report, and described by several participants in this CIA, should be preserved in its entirety and protected from potential harm during project construction. Preservation and protection of this trail may require a formal preservation plan with additional fieldwork directed towards obtaining accurate GPS data to adequately mark and flag the feature during construction. (2) All Native Hawaiian trees, including *wiliwili* and ‘*iliahi* (sandalwood, *Santalum ellipticum*) should be preserved within the project area in perpetuity and protected from harm during construction. (3) Cultural monitoring of the two aforementioned items (i.e., trail and native tree protection) should be conducted by qualified and interested individuals or organizations such as the participants in the "talk story" interviews included above. (4) Consultation with the organizations, agencies and individuals listed in this CIA should continue throughout the project, including any future alterations or updated proposals.

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Section 1 Introduction

1.1 Project Background

At the request of R. M. Towill Corporation, Cultural Surveys Hawai‘i, Inc. (CSH) prepared this Cultural Impact Assessment (CIA) for the approximately 23-acre Makakilo Drive Extension Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu (TMK [1] 9-2-002: 006 & 9-2-003:079). The project area is approximately 3,300 feet long by 300 feet wide (i.e., approximately 23 acres), extending from the end of the existing Makakilo Drive to the proposed North-South Road interchange with Interstate H-1. The project area consists of the south-southeastern portion of the Kalo‘i Gulch floodplain. Kalo‘i Stream channel runs from the central portion of the project area to the northeast. The southern face of Kalo‘i Gulch is at the central portion of the project area, and the base of the northeastern slope of Pu‘umakakilo is at the southwestern portion of the project area. Old Pālehua Road enters the project area from its eastern side, splits into Quarry Road heading south, and continues to the southwest section of the project area. Old Pālehua Road is poorly maintained and in substandard condition compared with the Quarry Road section. As the well-maintained part of Old Pālehua Road runs from the easternmost section of the project area, it continues south-southwest, where it becomes Quarry Road. There are three alignment alternatives for proposed roadways within the project area, one of which will be constructed upon determination by planners and developers (Figures 1, 2 and 3). The project area is depicted on the 1998 USGS 7.5-Minute Series Topographic Map, ‘Ewa Quadrangle.

The project area is privately owned by D.R. Horton – Schuler Homes LLC, Castle & Cooke Homes Hawaii, Inc. Minimally, land-disturbing activities will include grubbing and grading and excavations for subsurface utilities and associated infrastructure improvements.

1.2 Document Purpose

The project requires compliance with the State of Hawai‘i environmental review process [Hawai‘i Revised Statutes (HRS) Chapter 343], which requires consideration of a proposed project’s effect on cultural practices. At the request of R.M. Towill Corporation, CSH is conducting this CIA. Through document research and (ongoing) cultural consultation efforts this interim report document provides preliminary information pertinent to the assessment of the proposed project’s impacts to cultural practices and resources (per the OEQC’s Guidelines for Assessing Cultural Impacts). The document is intended to support the project’s environmental review and may also serve to support the project’s historic preservation review under HRS Chapter 6E-42 and Hawai‘i Administrative Rules (HAR) Chapter 13-284.

1.3 Archaeological Inventory Survey

An archaeological inventory survey has recently been conducted at the subject project area by CSH (Tulchin et al. 2008), following the procedures described in HAR Chapter 13-276, in accordance with the historic preservation review process for privately-owned and -funded projects (i.e., HAR Chapter 13-284). Two (2) new historic sites [State Inventory of Historic Properties (SIHP) Nos. 50-80-12-6950 and 50-80-12-6951] were recorded during the recent survey by CSH: SIHP No. 6950 is a drainage ditch associated with the historic-era commercial

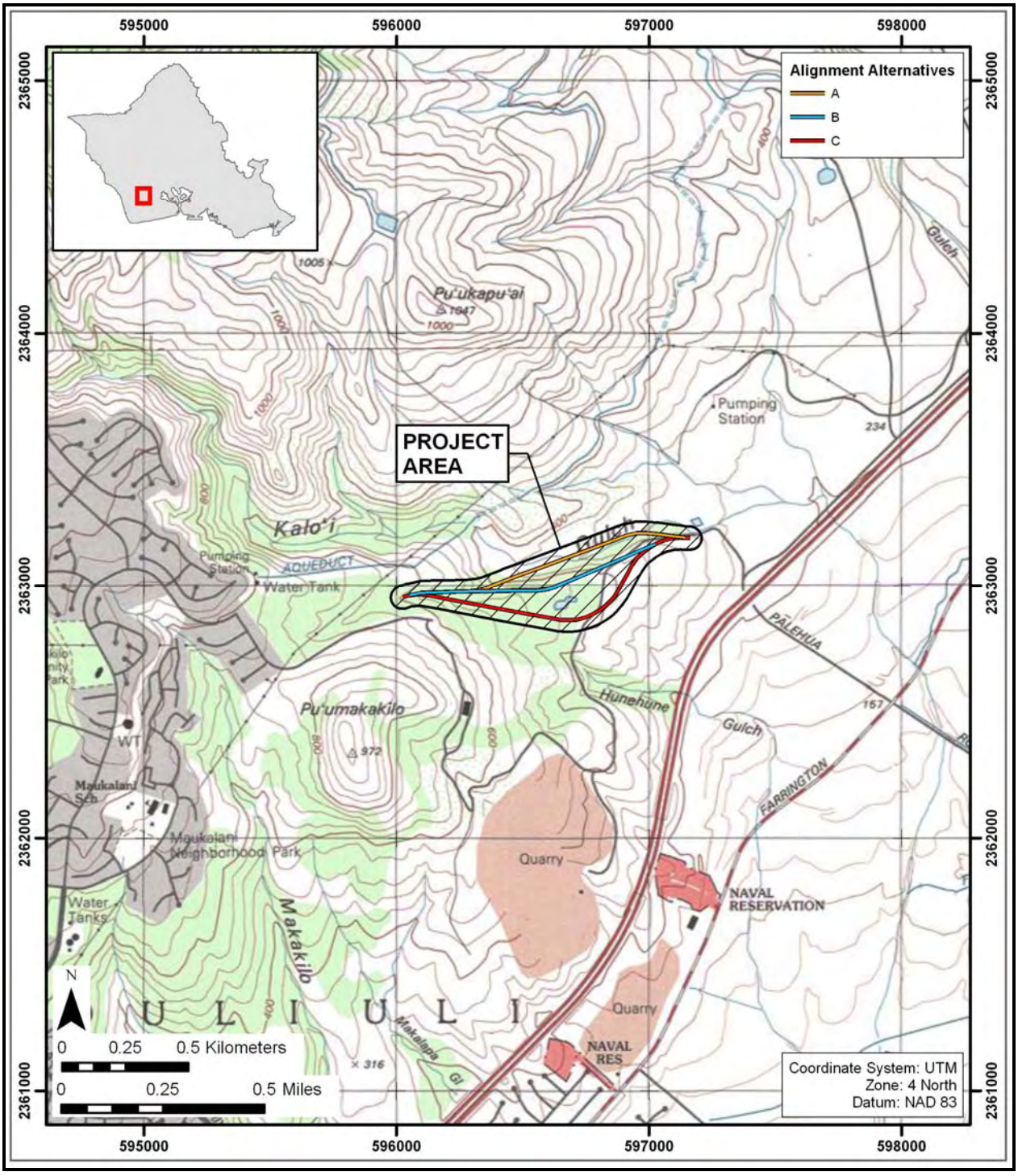


Figure 1. USGS 7.5 minute series topographic map, ‘Ewa Quadrangle (1998), showing the location of the project area

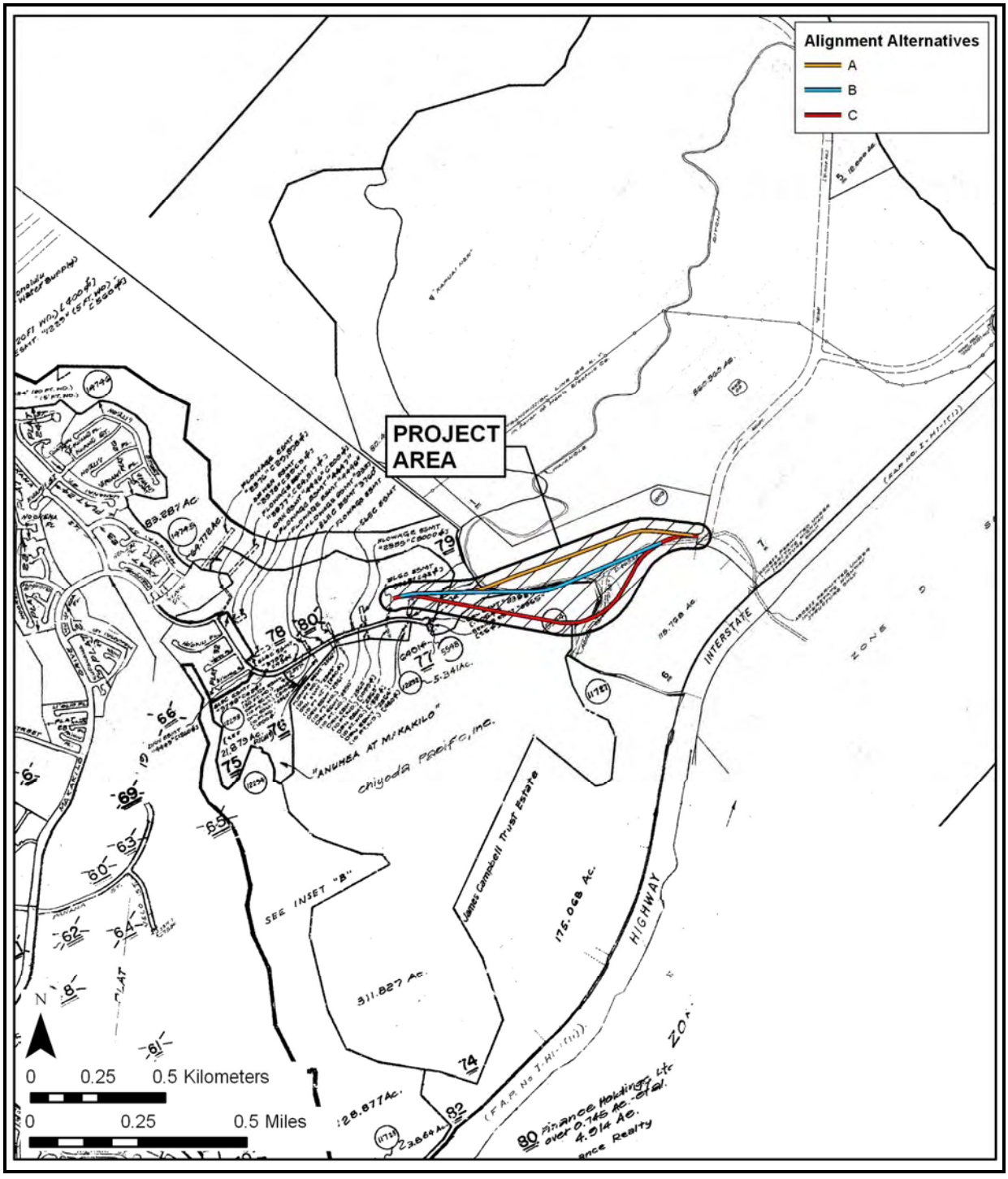


Figure 2. Tax Map Key of project area

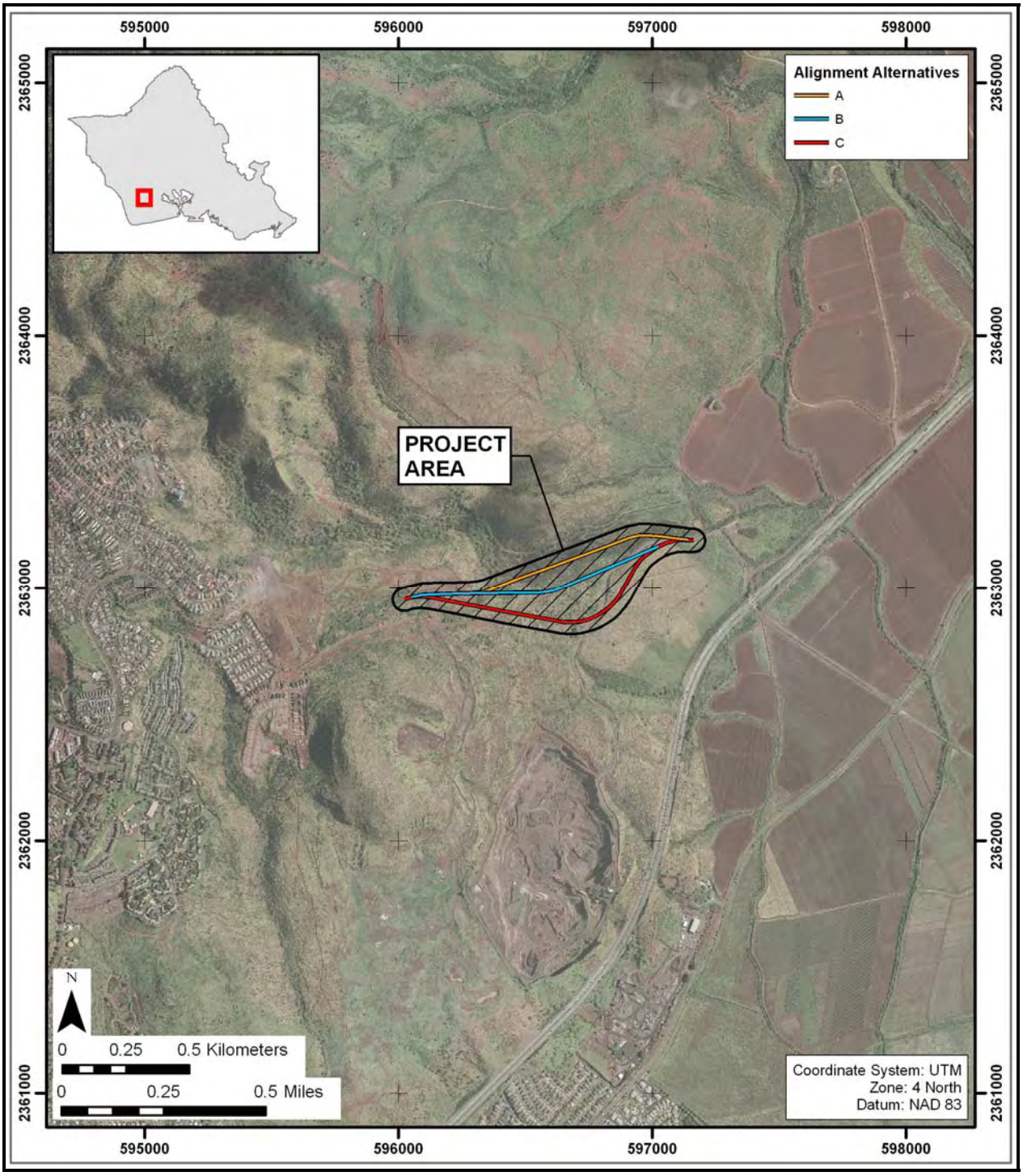


Figure 3. Aerial view of project area, including proposed roadway alternatives

sugar cane industry. SIHP No. 6951 is a small reservoir associated with the historic-era commercial sugar cane industry. In addition to these historic properties, two (2) newly identified features associated with the previously documented SIHP No. 50-80-09-2268 (Waiāhole Ditch System) were also recorded. More detailed results and implications of these finds are discussed in this report.

1.4 Scope of Work

The scope of work for this CIA includes:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. A review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Consultation and interviews with knowledgeable parties regarding traditional cultural practices at or near the parcel; present uses of the parcel; and / or other (non-Hawaiian) practices, uses, or traditions associated with the parcel.
4. Preparation of a report summarizing the results of these research activities.

1.5 Environmental Setting

1.5.1 Natural Environment

Located in the dry, leeward area of O‘ahu, the project area receives an average of approximately 28 in. (600 mm) of annual rainfall (Giambelluca et al. 1986). Elevations within the project area range from approximately 300–410 meters (m) (984–1345 feet) (ft) above mean annual sea level. The land surface within the majority of the Kalo‘i Gulch portion of the project area ranges from moderately sloping to very steep, with many vertical rock cliffs. The western boundary of the project area is east of the extent of residential Makakilo. The southeastern boundary of the project area is at the southern end of Kalo‘i Gulch, where the steep gulch slope gives way to the flat ‘Ewa plain. The southern portion of Kalo‘i Gulch is very wide, characterized by a broad, flat base and moderately sloping walls. The gulch becomes increasingly narrow and steep to the northwest. The base of Kalo‘i Gulch includes a dry streambed at the time of the recent archaeological fieldwork by CSH, although the high waterline indicated significant flooding during periods of heavy precipitation. The base of the gulch was also observed to have undergone significant deposition of both alluvial and colluvial sediments, as indicated by the channeling of floodwaters through 1–3 m (3.3–9.8 ft) of sediment down to the natural bedrock stream channel.

Soils within the project area (Figure 4) consist predominantly of Mahana-Badland Complex (MBL) and Rock Land (rRK) (Foote et al. 1972). Soils of the Mahana Series are described as “well-drained soils…developed in volcanic ash” (Foote et al. 1972:86). Mahana-Badland Complex consists of Mahana soils and Badland, or “steep or very steep, nearly barren land,

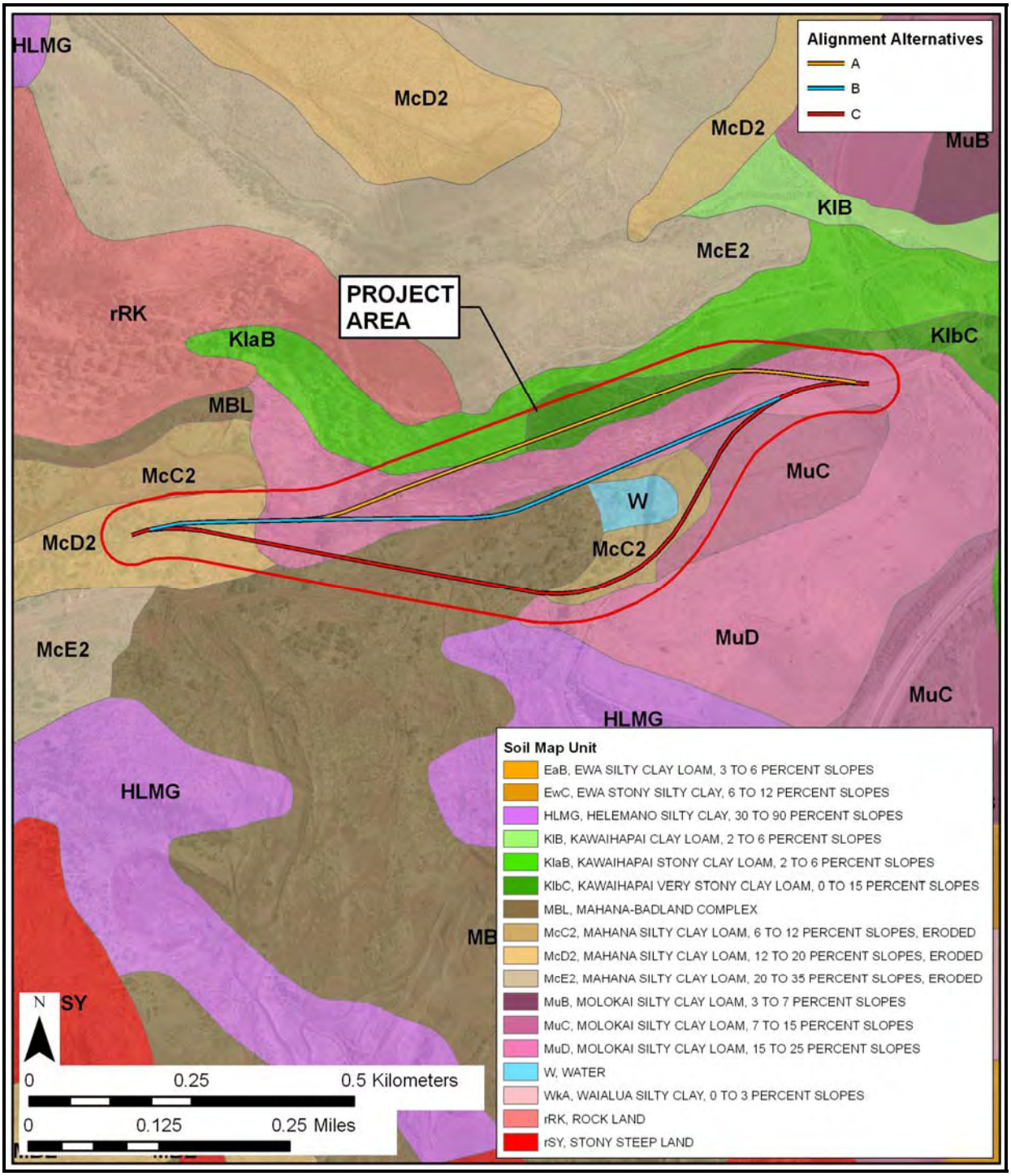


Figure 4. Soils of the project area (Foote et al. 1972)

ordinarily not stony" (Foote et al. 1972:28). Rock Land "is made up of areas where exposed rock covers 25 to 90 percent of the surface" (Foote et al. 1972:119). In addition, an area of Helemano Silty Clay (HLMG) is located within the project area, near the base of Kalo‘i Gulch. Soils of the Helemano Series are described as "well-drained soils on alluvial fans and colluvial slopes on the sides of gulches" (Foote et al. 1972:40).

Vegetation covers approximately 85–95% of the ground surface within the project area (Figure 5). Heavy precipitation in the weeks preceding the pedestrian inspection of the project area made for unusually dense exotic grass cover in the normally dry southern Wai‘anae Range. In addition to the predominantly exotic grass cover, *‘Ilima* (*Sida fallax*), *‘A‘ali‘i* (*Dodonaea viscose*), *‘Iliahi* (*Santalum* spp.) (See Figure 5), *Lama* (*Diospyros sandwicensis*), *Koa Haole* (*Leucaena leucocephala*), *Kiawe* (*Prosopis pallida*), Lantana (*Lantana camara*), Silk Oak (*Grevillea robusta*), *Wiliwili* (*Erythrina sandwicensis*), and *Kukui* (*Aleurites moluccana*) were also observed.

It is important to highlight the presence of mature healthy *Wiliwili* and *‘Iliahi* (sandalwood) trees, both of which are rarely seen in developed and populated areas in O‘ahu. Both of these trees are culturally significant to Kānaka Maoli (Native Hawaiians), a topic that is considered in more depth further in the report.

1.5.2 Built Environment

During the post-Contact period, the project area was primarily used for pastureland and for sugar cane irrigation and cultivation. Currently, the project area is used for diversified agricultural activities, pastureland, seed cultivation, as well as a thruway for traffic to and from Makakilo Rock Quarry, which is approximately 400 m (1312 ft) south of the project area. New increments of the Makakilo suburban development abut the west end of the project area with the present east end of Makakilo Drive virtually hanging over the back of Kalo‘i Gulch (Figure 6).

The southern portion of the project area includes the remnants of an abandoned golf course, the construction of which was discontinued in the early 1990s. Landscaping and irrigation systems associated with the construction of the golf course remain in disrepair (Figures 7 to 10). Utility manholes without lids were observed during survey, making it particularly dangerous for pedestrian access in this portion of the project area. There are low-density residential areas to the west of the project area, and Interstate H-1 to the east and south (see Figure 3).



Figure 5. General view of project area with *‘Iliahi* (sandalwood) tree in foreground



Figure 6. East view of northern portion of project area, Interstate H-1 shown in background, and portion of Makakilo Drive that will connect to Interstate H-1 in foreground



Figure 7. West view of artificial pond in southwestern portion of project area



Figure 8. Southeast view of intersection of golf cart paths in southern portion of project area



Figure 9. Southwest view of irrigation and control box in south-central portion of project area



Figure 10. North view of artificial pond in south-central portion of project area

Section 2 Methods

Historical documents, maps and existing archaeological information pertaining to the sites in the vicinity of this project were researched at the CSH library. Information on Land Commission Awards was accessed through Waihona ‘Aina Corporation’s Māhele Data Base (www.waihona.com). The SHPD, Office of Hawaiian Affairs (OHA), O‘ahu Island Burial Council (OIBC), and other community and cultural organizations in the Kapolei/Makakilo area were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the project area and the surrounding vicinity. The names of potential community contacts were also provided by colleagues at CSH and from the authors’ familiarity with people who live in or around the project area. The cultural specialist conducting research on this assessment employed snowball and judgment sampling methods, an informed consent process and semi-structured interviews according to standard ethnographic methods (as suggested by Bernard 2005). Some of the prospective community contacts were not available to be interviewed as part of this project. A discussion of the consultation process can be found in Section 6 on Community Consultation. Please refer to Table 2, Section 6 for a complete list of individuals and organizations contacted.

Section 3 Traditional Background

Honouliuli Ahupua‘a, as a traditional land unit, had tremendous and varied resources available for exploitation by early Hawaiians. Within Honouliuli Ahupua‘a, not only is there a long coastline fronting the normally calm waters of leeward O‘ahu, but there are also four miles of waterfront along the west side of the West Loch of Pearl Harbor. The “karstic desert” and marginal characterization of the limestone plain, which is the most readily visible terrain, does not do justice to the *ahupua‘a* as a whole. The following available resources contribute to the richness of this land unit:

1. 12 miles of coastline with continuous shallow fringing reef, which offers rich marine resources.

2. Four miles of frontage on the waters of West Loch (west side of Pearl Harbor, or Pu‘uloa) that offered extensive fisheries (mullet, *awa*, shellfish) as well as frontage suitable for development of fishponds (e.g., Laulaunui).

3. The lower portion of Honouliuli Valley in the ‘Ewa plain offered rich level alluvial soils with plentiful water for irrigation from the stream as well as abundant springs. This irrigable land would have stretched well up the valley.

4. A broad limestone plain which, because of innumerable limestone sinkholes, offered a nesting home for a large population of avifauna. This resource may have been one of the early attractions to human settlement.

5. An extensive upland forest zone extending as much as 12 miles inland from the edge of the coastal plain. As Handy and Handy (1972:469) have pointed out, the forest was much more distant from the lowlands here than on the windward coast, but it was much more extensive. Much of the upper reaches of the *ahupua‘a* contained biologically-diverse forest with *kukui*, *‘ōhia*, *‘iliahi* (sandalwood), *hau*, *tī*, banana, etc.

The political and cultural center of the *ahupua‘a* is understood to have been the relatively dense settlement and rich lands for irrigated taro cultivation at the *‘ili* of Honouliuli located where Honouliuli Stream empties into the north portion of West Loch (east of the present study area). The name of the *ahupua‘a*, translated as “dark bay” (Pukui et al. 1974:51) may refer to the nature of the waters of West Loch at the mouth of Honouliuli Stream. Early accounts and maps indicate a large settlement at the *‘ili* of Honouliuli and it may well be that the political power of this village was so great that it was able to extend its jurisdiction well to the northwest into an area which might have been anticipated to fall under the dominion of the Wai‘anae ruling chiefs.

3.1 Mythological and Traditional Accounts

The traditions of Honouliuli Ahupua‘a have been complied and summarized numerous times by Sterling and Summers (1978), Hammatt and Folk (1981), Kelly (1991), Charvet-Pond and Davis (1992), Maly and Rosendahl (1993), and Tuggle and Tuggle (1997). Some of the themes of these traditions include connections with Kahiki (i.e., Tahiti, thought to be one of the primary

sources of major migrations to Hawai‘i in pre-Contact times) and the special character and relationship of the places known as Pu‘uokapolei and Kualaka‘i.

Honouliuli, O‘ahu is associated with a number of legendary accounts. Many of these concern the actions of gods or demi-gods such as Kāne, Kanaloa, Māui, Kamapua‘a, the pig god, Maunauna, the shark deity, Ka‘ahupāhau, and the hero Palila. There are several references to chiefly lineages and to the ruling chiefs Hilo-a-Lakapu and Kūali‘i. Ko ‘Olina is reported to have been a vacationing place for Kākuhihewa.

3.1.1 The Naming of Honouliuli (Legend of Lepeamo‘a)

In the legend of Lepeamo‘a, the chicken-girl of Pālama, Honouliuli is the name of the husband of the chiefess Kapālama and grandfather of Lepeamo‘a (Thrum 1923:164-184). “Her grandfather gave his name, Honouliuli to a land district west of Honolulu...” (Thrum 1923:170). Westervelt (1916:209) gives an almost identical account. Other place names of Honouliuli are shown in Figure 11.

3.1.2 The Pele Family at Honouliuli

Kapolei (literally “beloved Kapo”), specifically the 166-foot high cone of that name, is understood to have been named in reference to one of the volcano goddess Pele’s sisters, Kapo (Pukui et al. 1974:89). Pōhākea Pass is understood as one of the resting places of another of Pele’s sisters, Hi‘iaka, as she was returning from Kaua‘i with Pele’s lover Lohiau (Fornander 1919 Vol. V: 188 note 6). A considerable number of *mele* (songs) and *pule* (prayers) are ascribed to Hi‘iaka as she stood at the summit of Pōhākea (*Aluna au a Pōhākea, Kū au, nānā ia Puna*, in Emerson 1915:162-168). From this vantage point Hi‘iaka could see, through her powers of vision, that her beloved *lehua* groves and friend Hopoe at Puna, Hawai‘i Island had been blasted by her jealous sister Pele. She could also see that in her canoe, off the coast of Wai‘anae, Lohiau was seducing her traveling companion Wahine‘ōma‘o! A spring located at Kualaka‘i near Barbers Point was named Hoaka-lei (*lei* reflection) because Hi‘iaka picked *lehua* flowers here to make a *lei* and saw her reflection in the water.

3.1.3 Keahumoa, Residence of Māui’s Grandfather (Legend of Māui’s Flying Expedition)

In the Legend of Māui’s Flying Expedition (Thrum 1923:252-259), Māui-kupua looks toward Pōhākea Pass and sees his wife, Kumulama, being carried away by chief Pe‘ape‘amakawalu. After failing to recover her, Māui returns and tells his problems to his mother, Hina. Hina instructs her son to go to Keahumoa and visit his grandfather Kuolokele, who lives there in a large hut. The hump-backed Kuolokele returns home with a load of potato leaves and Māui cures him by striking him in the back with a stone (which Kuolokele throws to Waipahu where it remains). Kuolokele has Māui gather *kī* (or *tī, Cordyline terminalus*) leaves, *‘ie‘ie* (*Freycinetia arborea*) vines and bird feathers from which the old man fabricates a “bird-ship” (*moku-manu*) which Māui uses to defeat Pe‘ape‘amakawalu and recover his wife. They return to Kuolokele’s house where they feast and Māui eats Pe‘ape‘amakawalu’s eyeballs.

3.1.4 Kāne and Kanaloa and the Boundaries of ‘Ewa (Simeon Nawaa account)

It seems likely that the boundary between the districts of ‘Ewa and Wai‘anae, which is today also the western boundary of Honouliuli Ahupua‘a, has often been contested between the Wai‘anae and ‘Ewa people:

> When Kāne and Kanaloa were surveying the islands they came to Oah‘u and when they reached Red Hill saw below them the broad plains of what is now ‘Ewa. To mark boundaries of land they would throw a stone and where the stone fell would be the boundary line...They hurled the stone as far as the Wai‘anae Range and it landed somewhere in the Waimānalo section...Eventually the stone was found at Pili o Kahe. This is a spot where two small hills of the Wai‘anae Range come down parallel on the boundary between Honouliuli and Nanakuli (Ewa and Wai‘anae). The ancient Hawaiians said the hill on the ‘Ewa side was the male and the hill on the Wai‘anae side was female. The stone was found on the Wai‘anae side hill and the place is known as Pili o Kahe (Pili = to cling to, Kahe = to flow). The name refers, therefore, to the female or Wai‘anae side hill. And that is where the boundary between the two districts runs. (Simeon Nawaa in Sterling and Summers 1978:1)

3.1.5 Kamapua‘a

Kamapua‘a, the pig god, is associated with Honouliuli:

> Kamapua‘a subsequently conquered most of the island of O‘ahu, and, installing his grandmother [Kamaunuaniho] as queen, took her to Puuokapolei, the lesser of the two hillocks forming the southeastern spur of the Wai‘anae Mountain Range, and made her establish her court there. This was to compel the people who were to pay tribute to bring all the necessities of life from a distance, to show his absolute power over all. (Nakuina 1904:50)

Emma Nakuina goes on to note: “A very short time ago [prior to 1904] the foundations of Kamaunuaniho’s house could still be seen at Puuokapolei” (Nakuina 1904:50). Another account (*Ka Loea Kālai‘āina* January 13, 1900) speaks of Kekeleaiku, the older brother of Kamapua‘a, who also was said to have lived on Pu‘uokapolei.

3.1.6 Home of the Shark-Goddess Ka‘ahupāhau (Legend of Ka‘ehuikimanōo Pu’uloa)

In the Legend of Ka‘ehuikimanōo Pu‘uloa (Thrum 1923:293-306), the Big Island shark god, Ka‘ehuiki travels to visit the famous shark deity Ka‘ahupāhau “reaching Honouliuli, the royal residence.” Ka‘ahupāhau is said to have lived in a royal cave at Honouliuli (Thrum 1923:302).

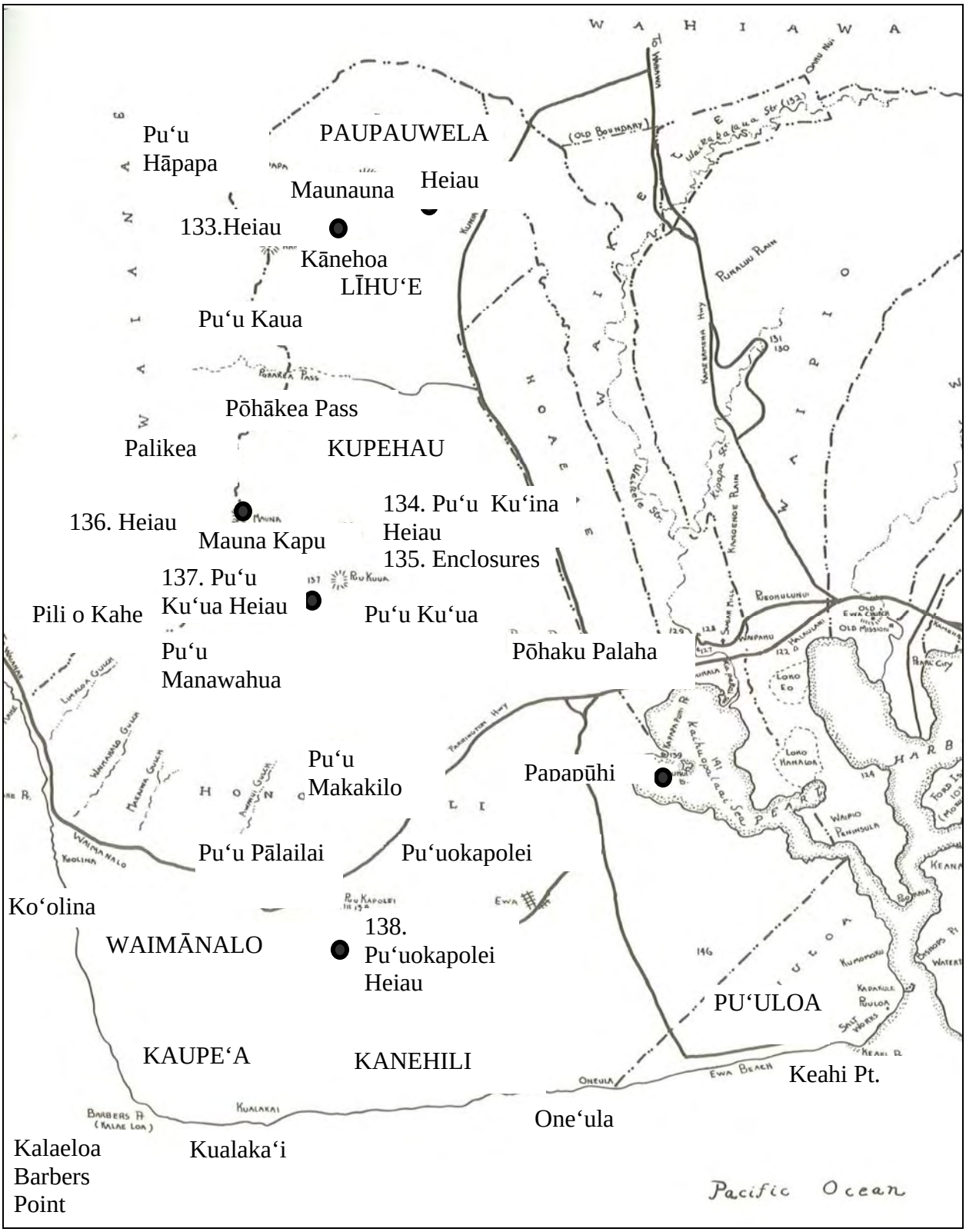

Pu‘u Hāpapa
PAUPAUWELA
Maunauna
Heiau
133.Heiau
Kānehoa
LĪHU‘E
Pu‘u Kaua
Pōhākea Pass
Palikea
KUPEHAU
136. Heiau
Mauna Kapu
134. Pu‘u Ku‘ina Heiau
135. Enclosures
137. Pu‘u Ku‘ua Heiau
Pili o Kahe
Pu‘u Ku‘ua
Pu‘u Manawahua
Pōhaku Palaha
Pu‘u Makakilo
Papapūhi
Pu‘u Pālailai
Pu‘uokapolei
Ko‘olina
WAIMĀNALO
138. Pu‘uokapolei Heiau
PU‘ULOA
KAUPE‘A
KANEHILI
Keahi Pt.
One‘ula
Kualaka‘i
Kalaeloa Barbers Point
Pacific Ocean

Figure 11. Place names of Honouliuli (adapted from Sterling and Summers 1978)

3.1.7 The Frightened Populace of Honouliuli *(He Ka‘ao no Palila*)

In the Legend of Palila, the *kupua*, or demigod hero, of Kaua‘i, lands at Ka‘ena point with his fabulous war club (*lā‘au pālau*), which required eighty men to carry, and crosses into Honouliuli through the Pōhākea Pass. He descends to the plain of Keahumoa:

> Kū kēia i laila nānā i ke kū ka ea o ka lepo i nā kānaka, e pahu aku ana kēia i ka lā‘au pālau aia nei i kai o Honouliuli, kū ka ea o ka lepo o ka honua, me he ōla‘i la, maka‘u nā kānaka holo a hiki i Waikele…
>
> At this place he stood and looked at the dust as it ascended to the sky caused by the people who had gathered there; he then pushed his war club toward Honouliuli. When the people heard something roar like an earthquake they were afraid and they all ran to Waikele ... (Fornander 1917 Vol. V 136-153)

3.1.8 Two Old Women Who Turned To Stone *(Ka Loea Kālai‘āina*)

The Hawaiian language newspaper *Ka Loea Kālai‘āina* relates that near Pu‘uokapolei, on the plain of Pu‘ukaua, on the *mauka* side of the road, there was a large rock. The legend is as follows:

> There were two supernatural old women or rather peculiar women with strange powers and Pu‘ukaua belonged to them. While they were down fishing at Kualaka‘i [near Barbers Point] in the evening, they caught these things, ‘a‘ama crabs, pipipi shellfish, and whatever they could get with their hands. As they were returning to the plain from the shore and thinking of getting home while it was yet dark, they failed for they met a one-eyed person [bad omen]. It became light as they came near to the plain, so that passing people were distinguishable. They were still below the road and became frightened lest men see them. They began to run - running, leaping, falling, sprawling, rising up and running on, without a thought of the ‘a‘ama crabs and seaweeds that dropped on the way, so long as they would reach the upper side of the road. They did not go far for by then it was broad daylight. One woman said to the other, “Let us hide lest people see us,” and so they hid. Their bodies turned into stone and that is one of the famous things on this plain to this day, the stone body. This is the end of these strange women. When one visits the plain, it will do no harm to glance on the upper side of the road and see them standing on the plain. (Ka Loea Kālai‘āina, January 13, 1900)

3.1.9 The Strife of Nāmakaokapāo‘o and Puali‘i (*Ka‘ao no* Nāmakaokapāo‘o)

In the Legend of Nāmakaokapāo‘o the brave boy, Nāmakaokapāo‘o, and his mother, Pōka‘ī, appear to have been living near the coast but were quite destitute (*‘ilihune loa*). His mother met Puali‘i when he came from Līhu‘e to fish at Honouliuli and the family went to live on the plains of Keahumoa (*ke kula o Keahumoa*). Puali‘i kept sweet potato patches (*māla ‘uala*) and fished for *ulua*. Following a dispute over sweet potatoes, Nāmakaokapāo‘o defeated his step-father, Puali‘i and:

> Lālau aku la o Nāmakaokapāo‘o i ke po‘o o Puali‘i a kiola aku la i kai o Waipouli, he ana ma kahakai o Honouliuli, o kona loa, ‘elima mile ka loa…
>
> Nāmakaokapāo‘o picked up Puali‘i’s head and threw it towards Waipouli, a cave situated on the beach at Honouliuli (a distance of about five miles)... (Fornander 1917 Vol. V 274-277)

3.1.10 The Story of Kaihuopala‘ai Pond, Honouliuli (*Ka‘ao no Maikohā)*

In the Legend of Maikohā, a sister of Maikohā (a deified hairy man who became the god of tapa makers) named Kaihuopala‘ai, journeys to O‘ahu:

> ‘Ike aku la o Kaihuopala‘ai i ka maikai o Kapapaapuhi, he kāne e noho ana ma Honouliuli ma ‘Ewa. Moe iho la lāua, a noho iho la o Kaihuopala‘ai i laila a hiki i kēia lā. ‘Oia kēlā loko kai e ho‘opuni ia nei i ka ‘anae, nona nā i‘a he nui loa, a hiki i kēia kākau ana.
>
> Kaihuopala‘ai saw a goodly man by the name of Kapapaapuhi who was living at Honouliuli, ‘Ewa; she fell in love with him and they were united, so Kaihuopala‘ai has remained in ‘Ewa to this day. She was changed into that fishpond in which mullet are kept and fattened, and that fishpond is used for that purpose to this day [1919]. (Fornander 1917 Vol. V 270-271)

3.1.11 The Traveling Mullet of Honouliuli (Fish Stories)

The story of (Ka)Ihuopala‘ai is also associated with the tradition of the *‘anae-holo* or traveling mullet (Thrum 1907:270-272):

> The home of the ‘anae-holo is at Honouliuli, Pearl Harbor, at a place called Ihuopala‘ai. They make periodical journeys around to the opposite side of the island, starting from Pu‘uloa and going to windward, passing successively Kumumanu, Kalihi, Kou, Kālia, Waikīkī, Ka‘alāwai, and so on, around to the Ko‘olau side, ending at Lā‘ie, and then returning by the same course to their starting point.(Thrum 1907:271)

In Thrum’s account, Ihuopala‘ai is a male who possesses a Kū‘ula, or fish god, which supplied the large mullet known as *‘anae*. His sister lived in Lā‘ie and there came a time when there were no fish. She sent her husband to visit Ihuopala‘ai who was kind enough to send the fish following his brother-in-law on his trip back to Lā‘ie.

This story is associated with a poetical saying documented by Mark Pukui about Honouliuli:

> *Ka i‘a hali a ka makani*
>
> The fish fetched by the wind (Pukui 1983: # 1330)

Pukui explains “The *‘anaeholo*, a fish that travels from Honouliuli, where it breeds, to Kaipāpa‘u on the windward side of O‘ahu. It then turns about and returns to its original home. It is driven closer to shore when the wind is strong.” Whether this saying was used in contexts other than in reference to mullet is unclear.

3.1.12 Honouliuli and the Head of Hilo-a-Lakapu (Legend of the Sacred Spear-point)

In the Legend of the Sacred Spear-point (Kalākaua 1888:209-225) is a reference to the Hawai‘i Island chief Hilo-a-Lakapu. Following his unsuccessful raid against O‘ahu “he was slain at Waimano, and his head was placed upon a pole near Honouliuli for the birds to feed upon”(Kalākaua 1888:224).

3.1.13 The Strife at Honouliuli from which Kūali‘i unites Hawai‘i nei (Mo‘olelo o Kūali‘i)

The celebrated chief, Kūali‘i, is said to have led an army of twelve thousand *(‘ekolu mano*) against the chiefs of Ko‘olauloa with an army of twelve hundred *(‘ekolu lau*) upon the plains of Keahumoa (Fornander 1917 Vol. IV 364-401). Perhaps because the odds were so skewed the battle was called off and the *ali‘i* (chiefs) of Ko‘olau ceded (*ha‘awi a‘e*) the districts of Ko‘olauloa, Ko‘olaupoko, Waialua and Wai‘anae to Kūali‘i. When the *ali‘i* of Kaua‘i heard of this victory at Honouliuli they gave Kaua‘i to Kūali‘i as well and thus he became possessed of all the islands (*a lilo a‘e la nā moku a pau ia Kūali‘i mai Hawai‘i a Ni‘ihau*). The strife at Honouliuli was the occasion of the recitation of a song for Kūali‘i by a certain Kapa‘ahulani (*Ka Pule Ana a Kapa‘ahulani*) that makes passing reference in word play to the blue *poi*, which appeases the hunger of Honouliuli (*Uliuli ka poi e piha nei - o Honouliuli*).

3.1.14 The Last Days of Kahahana and Honouliuli (The Land is the Sea’s)

In the tradition of the prophecy of the *kahuna* Ka‘opulupulu, Moke Manu relates that the deposed O‘ahu chief Kahahana fled for his life:

> Upon the arrival here at O‘ahu of Kahekili, Kahahana fled, with his wife Kekuapoi, and friend Alapa‘i, and hid in the shrubbery of the hills. They went to Āliamanu, Moanalua, to a place called Kinimakalehua; then moved along to Keanapua‘a, and Kepo‘okala, at the lochs of Pu‘uloa, and from there to upper Waipi‘o; thence to Wahiawā, Helemano, and on to Līhu‘e; thence they came to Po‘ohilo, at Honouliuli, where they first showed themselves to the people and submitted themselves to their care. (Thrum 1907:203-214)
>
> Through treachery, Kahahana was induced to leave Po‘ohilo, Honouliuli and was killed on the plains of Hō‘ae‘ae [the *ahupua‘a* between Honouliuli and Waikele] (Thrum 1907:213-214).

3.1.15 Pu‘uokapolei and the Reckoning of the Seasons (Kamakau)

Samuel Kamakau relates:

> …the people of O‘ahu reckoned from the time when the sun set over Pu‘uokapolei until it set in the hollow of Mahinaona and called this period Kau [summer], and when it moved south again from Pu‘uokapolei and it grew cold and the time came when young sprouts started, the season was called from their germination (‘ōilo) the season of Ho‘oilo [winter, rainy, season]. (Kamakau 1870:23)

3.1.16 Honouliuli in the Poetry of Halemano (Ka‘ao no Halemano)

In the Legend of Halemano, the romantic O‘ahu anti-hero, he chants a love song with a reference to Honouliuli:

> Huli a‘e la Ka‘ala kau i luna, Waiho wale kai o Pōka‘ī, Nānā wale ke aloha i Honouliuli, Kokolo kēhau he makani no Līhu‘e…
>
> Search is made to the top of Ka‘ala, the lower end of Pōka‘ī is plainly seen. Love looks in from Honouliuli, The dew comes creeping, it is like the wind of Līhu‘e... (Fornander 1917 Vol. V 252)

3.2 Legends and Traditional Places in Upland Honouliuli

3.2.1 Kahalaopuna at Pōhākea Pass

One of the most popular legends of O‘ahu is that of Kahalaopuna (or Kaha), a young woman of Mānoa who is slandered by others and then killed by her betrothed, Kauhi, a chief from Ko‘olau, O‘ahu. While the numerous accounts (e.g., Day 1906:1-11; Fornander 1919 Vol. V: 188-193; Kalākaua 1888:511-522; Nakuina 1904:41-45; Patton 1932:41-49; Skinner 1971:220-223; Thrum 1907:118-132) vary in details they typically have Kahalaopuna slain and then revived repeatedly with the aid of a protective owl spirit. Kauhi forces her to hike west from Mānoa through the uplands until they get to Pōhākea Pass through the southern Wai‘anae Range in north Honouliuli. At Pōhākea Pass, Kauhi beats her with a stick until she is very dead ("*Ia hahau ana a Kauhi i ka lā‘au, make loa o Kahalaopuna*"). Her spirit (‘*uhane*) flies up into a *lehua* tree and chants for someone to go notify her parents of her fate. Upon hearing the news her parents fetch Kahalaopuna back to Mānoa and she is restored to life.

3.2.2 Mo‘o at Maunauna (*Kuokoa*)

Moses Manu in recounting the Legend of Keaomelemele makes a reference to a *mo‘o* (supernatural water spirit) named Maunauna who lived above Līhu‘e (presumably at the landform of that name in extreme northern Honouliuli) and who was regarded as a bad lizard (*Kuokoa* April 25, 1885).

3.2.3 Paupauwela and Līhu‘e

Paupauwela, also spelled Popouwela (derivation unknown), is the name of the land area in the extreme *mauka* section of Honouliuli Ahupua‘a. The land area of Līhu‘e is just *makai* of this land, and extends into the *ahupua‘a* of Waipi‘o (adjacent to the eastern border of Honouliuli). Both place names are mentioned in a chant recorded by Abraham Fornander, which was composed as a *mele* for the O‘ahu king, Kūali‘i, as he was preparing to battle Kuiaia, the chief of Wai‘anae:

Where? Where is the battle field	Ihea, ihea la ke kahua,
Where the warrior is to fight?	Paio ai o ke koa-a?
On the field of Kalena,	I kai i kahua i Kalena,
At Manini, at Hanini,	I Manini, i Hanini

Where was poured the water of the god	I ninia i ka wai akua,
By your work at Malamanui;	I ko hana i Malamanui
On the heights of Kapapa, at Paupauwela,	Ka luna o Kapapa, i Paupauwela,
Where they lean and rest;	I ka hilinai i ke kalele,
At the hala trees of indolent Halahalanui,	Ka hala o Halahalanui maauea,
At the ohia grove of Pule-e	E kula ohia ke Pule-e,
The god of Lono, of Makalii	Ke ‘kua o Lono o Makalii
The fragrant branch of the Ukulonoku,	Ka lala aalao Ukulonoku,
Mayhap from Kona, from Lihue,	No Kona paha, no Lihue.
For the day at Maunauna	No ka la i Maunauna,
For the water at Paupauwela.	No ka wai i Paupauwela.
Red is the water of Paupauwela,	Ula ka wai i Paupauwela,
From the slain at Malamani,	Ke kilau o Malamani,
The slain on the ridge at Kapapa.	Ka moo kilau I Kapapa.

(Fornander 1917, Vol. IV, Part 2:384-386).

The icy winds of Honouliuli are also noted in a *mele* for the high king Kūali‘i. In this *mele*, the cold winds of Kumomoku and Leleiwe, near Pu‘uloa in Honouliuli are compared unfavorably to the god Kū.

Not like these are thou, Ku	Aole i like Ku.
[Nor] the rain that brings the land breeze,	Ia ua hoohali kehau,
Like a vessel of water poured out.	Mehe ipu wai ninia la,
Nor to the mountain breeze of Kumomoku,	Na hau o Kumomoku;
[The] land breeze coming round to Leleiwi.	Kekee na hau o Leleiwi,
Truly, have you not known?	Oi ole ka oe i ike
The mountain breezes, that double up your back,	I ka hau kuapuu.
[That make you] sit crooked and cramped at Kaimohala,	Kekee noho kee, o Kaimohala,
The Kanehili at Kaupea?	O Kanehili i Kaupea-la
Not like these are thou, Ku.	Aole i like Ku.

(Fornander 1917, Vol. IV, Part II:390-391)

3.2.4 Hill of Maunauna

The hill Maunauna lies between the lands Paupauwela and Līhu‘e. One translation of Maunauna is “mountain sent [on errands].” Two servant *mo‘o* who lived here had no keepers to supply their needs” (Pukui et al. 1974:149). It was at Maunauna, according to one tradition, that the forces of the chiefs Kūali‘i and Kuiaia of Wai‘anae met to do battle, which was averted when a *mele* honoring the god Kū was chanted (see previous section). (Fornander 1917, Vol IV, Part 2:348). In the Legend of Ke-ao-melemele, a woman named Paliuli traveled in this area.

> In a very short time she [Paliuli] walked over the plain of ‘Ewa; ‘Ewa that is known as the land of the silent fish [pearl oysters]…She went on to the plain of Punalu‘u and turned to gaze at Maunauna point and the plain of Lihue. (Manu 1885, translation in Sterling and Summers 1978:21)

Certain place names in the uplands, including Maunauna, are also mentioned in the story of Lo-lae’s Lament. The place of Lolale’s residence is given in King Kalākaua’s version of this story (Kalākaua 1888:232): “There lived there at that time in Lihue, in the district of ‘Ewa, on the island of O‘ahu, a chief named Lo-lale, son of Kalona-iki, and brother of Piliwale, the *alii-nui*, or nominal sovereign, of the island, whose court was established at Waialua.”

In this story, Lolale was a chief of O‘ahu who asked his friend Kalamakua to find him a bride (Kalākaua 1888:228-246; Skinner 1971:217-219). Kalamakua traveled to Maui and chose Kelea, the chief’s sister, and returned with her to O‘ahu; during this time the two grew close. Kelea lived with Lolale for a while, but he was a silent type that was often away from home playing sports and walking in the woodlands. Longing for Kalamakua, Kelea decided to leave her husband, Lolale voiced no “spoken bitterness;” however, after she left, he sang this lament:

> Farewell, my partner of the lowland plains,
>
> On the waters of Pohakeo, above Kanehoa,
>
> On the dark mountain spur of Mauna-una!
>
> O, Lihue, she is gone!
>
> Sniff the sweet scent of the grass,
>
> The sweet scent of the wild vines
>
> That are twisted by Waikoloa,
>
> By the winds of Waiopua,
>
> My flower!
>
> As if a mote were in my eye.
>
> The pupil of my eye is troubled.
>
> Dimness covers my eyes. Woe is me!
>
> (Kalākaua 1990:224-245)

3.3 Pre-Contact and Early History

Various Hawaiian legends and early historical accounts indicate that the *ahupua‘a* of Honouliuli was once widely inhabited by pre-Contact Hawaiian populations, including the Hawaiian *ali‘i*. This substantial population was supported by the plentiful marine and estuarine resources available at the coast, along which several sites interpreted as permanent habitations were located. Other attractive subsistence-related features of the *ahupua‘a* included irrigated lowlands suitable for wetland taro cultivation (Hammatt and Shideler 1990), as well as the lower forest area of the mountain slopes for the procurement of forest goods.

Exploitation of the forest resources along the slopes of the Wai‘anae Range - as suggested by Handy and Handy - probably acted as a viable subsistence alternative during times of famine:

> ...The length or depth of the valleys and the gradual slope of the ridges made the inhabited lowlands much more distant from the *‘wao*, or upland jungle, than was the case on the windward coast. Yet the *‘wao* here was more extensive, giving greater opportunity to forage for wild foods during famine time. (Handy and Handy 1972:469-470)

These upper valley slopes may have also been a significant resource for opportunistic quarrying of basalt for the manufacturing of stone tools. This is evidenced in part by the existence of a probable quarrying site (50-80-12-4322) in Makaīwa Gulch at 152 m (500 ft.) elevation, west of the current study area (Hammatt et al. 1991)

The Hawaiian *ali‘i* were also attracted to the region. One historical account of particular interest refers to an *ali‘i* residing in Ko ‘Olina, southwest of the current study area:

> Ko ‘Olina is in Waimānalo near the boundary of ‘Ewa and Wai‘anae. This was a vacationing place for chief Kakuhihewa and the priest Napuaikamao was the caretaker of the place. Remember Reader; this Koolina is not situated in the Waimānalo on the Koolau side of the island but the Waimānalo in ‘Ewa. It is a lovely and delightful place and the chief; Kakuhihewa loved this home of his. (Sterling and Summers 1978:41)

John Papa ‘Ī‘ī describes a network of Leeward O‘ahu trails (Figure 12), which in later historic times encircled and crossed the Wai‘anae Range, allowing passage from West Loch to the Honouliuli lowlands, past Pu‘u Kapolei and Waimānalo Gulch to the Wai‘anae coast and onward circumscribing the shoreline of O‘ahu (‘Ī‘ī 1959:96-98).

Other early historical accounts of the general region typically refer to the more populated areas of the ‘Ewa district, where missions and schools were established and subsistence resources were perceived to be greater. However, the presence of archaeological sites along the coral plains and coast of southwest Honouliuli Ahupua‘a, indicate that prehistoric and early historic populations also adapted to less inviting areas, despite the environmental hardships.

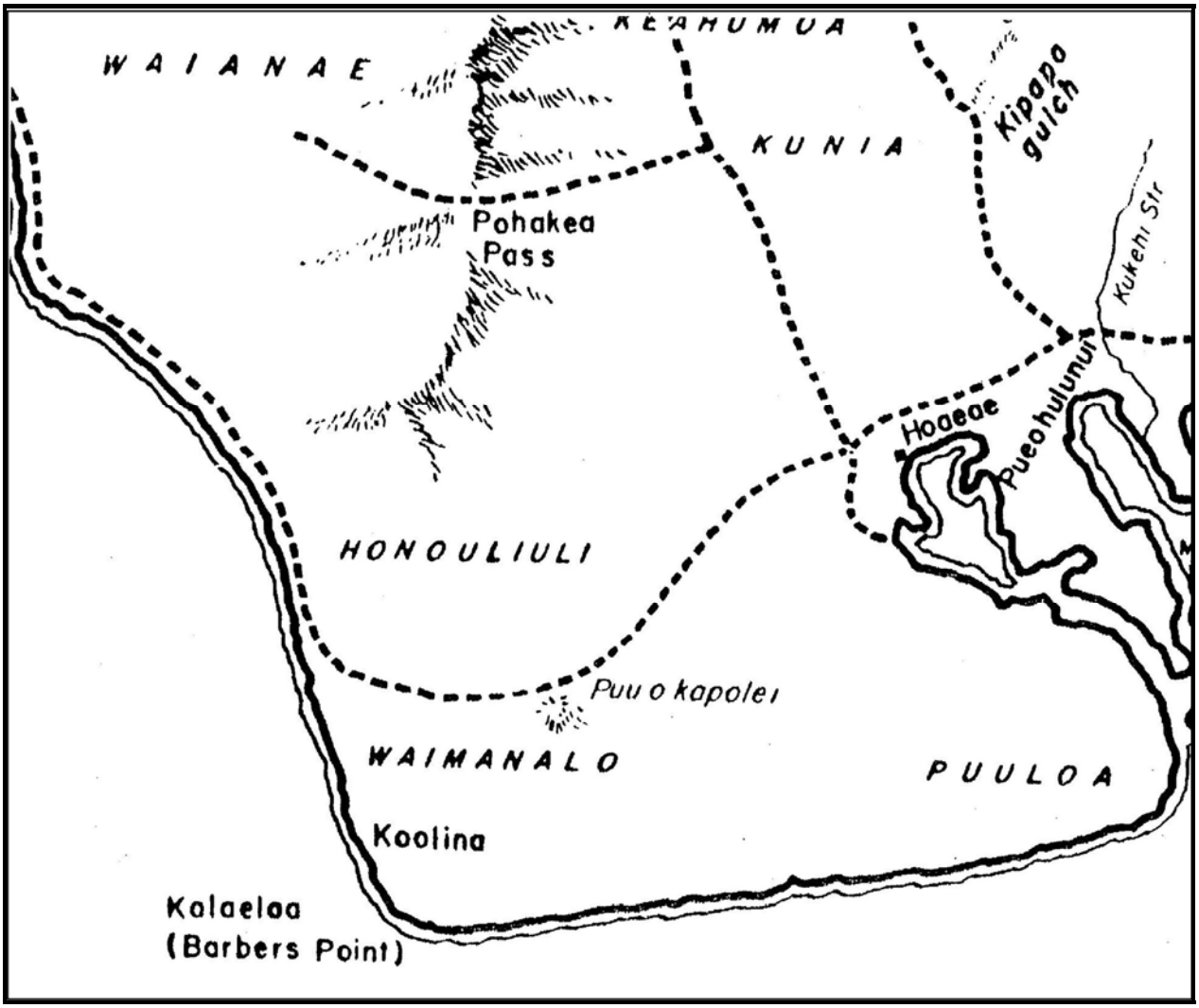


Figure 12. Trails of Leeward O‘ahu as described by John Papa ‘Ī‘ī (1959:96)

HonouliuliSubsequent to western contact in the area, the landscape of the ‘Ewa plains and Wai‘anae slopes was adversely affected by the removal of the sandalwood and other trees, and the introduction of domesticated animals and new vegetation. Goats, sheep and cattle were brought to the Hawaiian Islands by Vancouver in the early 1790s, and allowed to graze freely about the land for some time after. L.A. Henke reports the existence of a longhorn cattle ranch in Wai‘anae by at least 1840 (Frierson 1972:10). During this time, perhaps as early as 1790, exotic plant species were introduced to the area. These typically included vegetation best suited to a terrain disturbed by the logging of sandalwood forest and eroded by animal grazing. The following dates of introduced vegetation are given by R. Smith and outlined by Frierson (1972:10-11):

1. “early,” circa 1790:
   Prickly pear cactus, *Opuntia tuna*

Haole koa, Leucaena leucocephala
Guava, *Psidium guajava*

2. 1835-1840:
   Burmuda [sic] grass, *Cynodon dactylon*
   Wire grass, *Eleusine indica*
3. 1858:
   Lantana, *Lantana camara*

The *kiawe* tree (*Prosopis pallida*) was also introduced during this period, either in 1828 or 1837 (Frierson 1972:11).

3.4 Honouliuli Settlement Patterns

Archaeological and traditional sources show a general pattern of three main areas of settlement within Honouliuli Ahupua‘a: a coastal zone, the Honouliuli taro lands, and inland settlement at Pu‘u Ku‘ua.

3.4.1 The Coastal Zone - Kalaeloa (Barbers Point), Ko‘olina (West Beach)

3.4.1.1 Kalaeloa (Barbers Point)

Archaeological research at Barbers Point has focused on the areas in and around the Deep Draft Harbor (Barrera 1975; Davis and Griffin 1978; Hammatt and Folk 1981; McDermott et al. 2000). Series of small clustered shelters, enclosures and platforms show limited but recurrent use at the shoreline zone for marine-oriented exploitation. This settlement covers much of the shoreline, with more concentrated features around small marshes and wet sinks. Immediately behind the shoreline, under a linear dune deposit is a buried cultural layer believed to contain some of the earliest habitation evidence in the area.

The attraction of the area to early Hawaiians may have been the plentiful and easily exploited bird population. Particular evidence for taking of petrel occurs at SIHP No. -2763 (Hammatt and Folk 1981). Initial heavy exploitation of nesting seabirds and other species, in conjunction with habitat destruction, may have contributed to some avian extinctions.

There is some indication of limited agriculture in mulched sinkholes and limited soil areas. Considering rainfall, this activity would have been limited, but probably involved tree crops and roots (sweet potatoes). The archaeological content of the sites indicates a major focus on marine resources.

Davis and Griffin (1978) distinguish functional classes of sites based on surface area size, and argue that the Barbers Point settlement consists of functionally integrated, multi-household residence groups. Density contours of midden (by weight) and artifacts (by numbers) plotted for residence sites by Hammatt and Folk (1981) generally indicate narrowly defined spatial foci of discard, possibly indicating continuous use, or at least with no refurbishing or additions to the structures over time (Hammatt and Folk 1981). The focus is small habitation sites, typically lacking the full range of features found in large permanent residence complexes such as high platforms, complex enclosures, and conspicuous ceremonial sites.

3.4.1.2 Ko‘Olina (West Beach)

There are three available studies on the Ko‘Olina project area (Davis et al. 1986a; Davis et al. 1986b; Davis and Haun 1987). These studies document approximately 180 component features at 48 sites and site complexes consisting of habitation sites, gardening areas, and human burials. Chronologically, the occupation covers the entire span of Hawaiian settlement in what Davis and Haun describe as “one of the longest local sequences in Hawaiian prehistory” (Davis and Haun 1987:37). The earliest part of the sequence relates to the discovery of an inland marsh and early dates were also obtained for the beachfront site and an inland rock shelter.

3.4.2 Honouliuli Taro Lands

Centered around the west side of Pearl Harbor at Honouliuli Stream and its broad outlet into the West Loch are the rich irrigated lands of the *‘ili* of Honouliuli, which give the *ahupua‘a* its name. The major archaeological reference to this area is Dicks et al. (1987), who documented remnants of a once widespread wetland system (*lo‘i* and fishponds), as well as dry-land cultivation of the adjacent slopes.

According to Carol Silva’s “Historic Research Relative to the Land of Honouliuli” (in Dicks et al. 1987), the Honouliuli area bordering West Loch was clearly a major population center, a logical response to the abundance of fish and shellfish resources in close proximity to a wide expanse of well-irrigated bottomland suitable for wetland taro cultivation. The earliest detailed map by Malden (from 1825) shows all the roads of southwest O‘ahu coalescing and descending the *pali* (cliff) as they funnel into the area of Honouliuli Village. Dicks et al (1987:78-79) conclude, on the basis of 19 carbon isotope dates and 3 volcanic glass dates, that “agricultural use of the area spans over 1,000 years.” Undoubtedly, Honouliuli was a locus of habitation for thousands of Hawaiians. Prehistoric population estimates are a matter of some debate, but it is worth pointing out that in the earliest mission census (Schmitt 1973:19) in 1831-1832, the land (*‘āina*) of Honouliuli contained 1026 men, women, and children. It is not clear whether this population relates to Honouliuli Village or Honouliuli Ahupua‘a, but the village probably contained the vast majority of the district’s population. The nature of the reported population structure for Honouliuli (less than 20% children under 12 years of age) and the fact that the population decreased more than 15% in the next 4 years (Schmitt 1973:22) suggests that the prehistoric population of Honouliuli Village may well have been significantly greater than it was in 1831-1832. A conservative estimate would be that tens of thousands of Hawaiians lived and died at Honouliuli Village.

3.4.3 Pu‘u Ku‘ua: Inland Settlement

Documentation of inland settlement in Honouliuli Ahupua‘a is more problematic in that there are relatively few documented archaeological sources. However, it is probable that the area around Pu‘u Ku‘ua, on the east side of the Wai‘anae Ridge, seven miles inland of the coast, was a Hawaiian place of some importance.

In 1899, the Hawaiian Newspaper “Ka Loea Kalaiaina” relates a story of Pu‘u Ku‘ua as “a place where chiefs lived in ancient times” and a “battle field,” “thickly populated.” The article summarizes:

1) This place was entirely deserted and left uninhabited and it seems that this happened before the coming of righteousness to Hawai‘i Nei. Not an inhabitant is left.

2) The descendants of the people of this place were so mixed that they were all of one class. Here the gods became tired and returned to Kahiki (Sterling and Summers 1978:33).

McAllister recorded three sites in this area, two *heiau* (134 - Pu‘u Kuina, and 137 -Pu‘u Ku‘ua, both destroyed) and a series of enclosures in Kukuilua which he calls “*kuleana* sites” (McAllister 1933). On the opposite side of the Wai‘anae range, along the trail to Pōhākea Pass, Cordy (2002) states “Kākuhihewa was said to have built (or rebuilt) Nīoi‘ula, a *po‘okanaka* [sacrificial] *heiau* (1,300 sq. m.) in Hālona in upper Lualualei, along the trail to Pōhākea Pass leading into ‘Ewa, circa A.D. 1640-1660” (Cordy 2002:36). There is no direct archaeological evidence available to the authors’ knowledge that intensive Hawaiian settlement occurred here, but it is considered as a place of high probability, based on the above indications. John Papa ‘Ī‘ī (1959) described a journey that Liholiho took which led him and an entourage through inland Honouliuli and over Pōhākea Pass. Geographically, the area receives sufficient quantities of water and would have had abundant locally available forest resources.

3.4.4 Summary

Based on the above summary of areas of Honouliuli settlement, the following general considerations are made to place the study area in the context of the *ahupua‘a* pattern.

1. There are three areas of Hawaiian settlement in the *ahupua‘a*; two are well documented and the inland settlement in the vicinity of Pu‘u Ku‘ua is less clear.
    a. The extensive limestone plain with recurrent use habitations for fishermen and gatherers, and sometime gardeners;
    b. The rich cultivated lands of Honouliuli ‘Ili for extensive wetland taro and clearly the *ahupua‘a* population center;
    c. The uplands around Pu‘u Ku‘ua for probable agriculture and forest resource utilization.
2. Honouliuli is designed as a unit to contain all the geographic elements of a typical Hawaiian valley *ahupua‘a*, except they are arranged geomorphically in an atypical relationship. The *ahupua‘a* is not organized around a single drainage network but shares the west portions of Waikele drainage in its upper reaches. A typical and highly advantageous characteristic for human subsistence is included in a vast coastline and fringing reef, an extensive limestone plain, which would support only limited agriculture, but would be excellent for bird catching in early times. The richest forestland for foraging for wood, birds, feathers, etc. would have been the east slope of the Wai‘anae Range. The *mauka/makai* route would have been up Honouliuli Gulch or up the Makakilo ridge, paralleling the coast from Honouliuli Gulch to Kahe. The most convenient route to *mauka* lands, even from the western end of the coast near Kahe Point, would have been *mauka* only to the base of the hills and then either up the Makakilo Ridge or northeast to a trail to Pu‘u Ku‘ua and Pōhākea Pass. The *makai* slope is the dry side of the ridgeline. Here, streams would respond to rainfall quickly but drain quickly leaving little available

water for even short-term use. However, abundant springs may have provided adequate water for localized dryland cultivation.

3. The *makai* slope of the Wai‘anae Range (i.e., *mauka* of Ko‘Olina) was not a major thoroughfare. We can see some very limited evidence of part-time agriculture in and around gulches and two foci of sparse habitation with the first limited to *makai* portions of gulches and lava flats. This habitation is considered a *mauka* component or continuation of the Ko‘Olina coastal settlement rather than an independent focus. The second focus, separated from the first by a barren zone, is generally above the 800-foot elevation. This *mauka* habitat, which could have been supported by seasonal dryland planting and forest foraging, may be the lower portion of a thinly scattered but widespread zone of settlement. This zone stretches eastward and northeast along the east Wai‘anae Range slopes and may increase in intensity along the more watered lands forming the *mauka* western boundary of Honouliuli.
4. The central place of the *ahupua‘a* of Honouliuli in terms of population, as well as cultivated foods, was the *‘ili* of Honouliuli, near the West Loch of Pearl Harbor. There is good reason to assume, given the lack of intensive agricultural resources in other locations during prehistoric times, that all other habitation zones were economically and socially co-dependent.
5. There is to date no archaeological evidence of high status residence in Honouliuli. Large residential structures are not present along the seashore where they would be expected. The late prehistoric occurrence of chiefs’ houses is not apparent, perhaps because the ocean shoreline, although rich in marine resources, is uninviting for sport and unsuitable for fishponds. The chiefly focus of ‘Ewa District was Waipi‘o. Whatever activities of this class occurred in Honouliuli would have been in or near the rich lands fronting West Loch (the *‘ili* of Honouliuli) but to date there is no direct archaeological evidence of this. Concerning status associations with Honouliuli it is interesting to note the connection of the Pu‘u Ku‘ua settlement with pariah (*kauwā*), or “slaves,” the lowest class of Hawaiians (Sterling and Summers 1978:33).

Section 4 Historical Background

4.1 Mid to late 19th Century

During the Māhele of 1848, 99 individual land claims in the *ahupua‘a* of Honouliuli were registered and awarded by King Kamehameha III. No claims were made for land within the current study area or vicinity. The vast majority of the Land Commission Awards (LCA) were located near the Pu‘uloa Salt Works and the taro lands of the *‘ili* of Honouliuli. The largest award (Royal Patent 6071, LCA 11216, *‘Āpana* 8) granted in Honouliuli Ahupua‘a was to Miriam Ke‘ahi-Kuni Kekau‘onohi on January 1848. Kekau‘onohi acquired a deed to all unclaimed land within the *ahupua‘a*, including a total of 43,250 acres. Samuel Kamakau (1961:208-209) relates the following about Kekau‘onohi as a child:

> Kamehameha’s granddaughter, Ke-ahi-Kuni Kekau-‘onohi...was also a tabu chiefess in whose presence the other chiefesses had to prostrate and uncover themselves, and Kamehameha would lie face upward while she sat on his chest.

Kekau‘onohi was one of Liholiho’s (Kamehameha II’s) wives, and after his death, she lived with her half-brother, Luanu‘u Kahala‘i‘a, who was governor of Kaua‘i (Kamakau 1961:20). Subsequently, Kekau‘onohi ran away with Queen Ka‘ahumanu’s stepson, Keli‘i-ahonui, and became the wife of Chief Levi Ha‘alelea. Upon her death on June 2, 1851, all her property was passed on to her husband and his heirs. When Ha‘alelea died, the property went to his surviving wife, who in turn leased it to James Dowsett and John Meek in 1871 for ranching operations.

In 1877, James Campbell purchased most of Honouliuli Ahupua‘a for $95,000. He then drove off 32,347 head of cattle belonging to Dowsett, Meek and James Robinson and constructed a fence around his property (Bordner and Silva 1983:C-12). In 1879, Campbell brought in a well driller from California to search the ‘Ewa plains for water, and a significant untapped source was discovered. Following this discovery, plantation developers and ranchers drilled numerous wells in search of the valuable resource. By 1881, the Campbell property of Honouliuli prospered as a cattle ranch with “abundant pasturage of various kinds” (Briggs in Haun and Kelly 1984:45). Within 10 years of the first drilled well in ‘Ewa, the addition of a series of artesian wells throughout the island was supplying most of Honolulu’s water needs.

In 1889, Campbell leased his property to Benjamin Dillingham, who subsequently formed the O‘ahu Railway & Land Co. (O.R. & L) in 1890. To attract business to his new railroad, Dillingham subleased all land below 200 feet elevation to William Castle who in turn sublet the area to the ‘Ewa Plantation Company for sugar cane cultivation (Frierson 1972:15). Dillingham’s Honouliuli lands above 200 feet elevation that was suitable for sugar cane cultivation were sublet to the O‘ahu Sugar Co.

‘Ewa Plantation Co. was incorporated in 1890 and continued in full operation up into modern times. The plantation grew quickly with the abundant artesian water. As a means to generate soil deposition on the coral plain and increase arable land in the lowlands, the ‘Ewa Plantation Co. installed ditches running from the lower slopes of the mountain range to the lowlands and then plowed the slopes vertically just before the rainy season to induce erosion (Frierson 1972:17).

The O‘ahu Sugar Co. was incorporated in 1897, and included lands in the foothills above the ‘Ewa plain and Pearl Harbor. Prior to commercial sugar cultivation, the lands occupied by the O‘ahu Sugar Co. were described as being “of near desert proportion until water was supplied from drilled artesian wells and the Waiāhole Water project” (Conde and Best 1973:313). O‘ahu Sugar took over ‘Ewa Plantation lands in 1970 and continued operations into the 1990s.

Dillingham’s *mauka* lands in western Honouliuli that were unsuitable for commercial sugar production remained pasture for grazing livestock. From 1890 to 1892 the Ranch Department of the O.R. & L. Co. tapped plantation flumes and searched for alternative sources of water. Ida von Holt leaves this account of her husband Harry’s (Superintendent of the O.R. & L Ranch Dept.) search for water in the foothills of the Wai‘anae Range:

> One of those places is on the old trail to Pālehua, and had evidently been a place of which the Hawaiians had known, for its name is Kalo‘i (the taro patch), and even in dry weather water would be standing in the holes made by the cattle, as they tried to get a drop or two. (Von Holt 1985:136)

The spring depicted in this account may have been located during an inventory survey of the adjacent Pālehua East B project area (Tulchin and Hammatt 2005). The spring was located along the upper slopes of the southern face of Kalo‘i Gulch. A second account is given of the discovery of spring water in an area over the ridge on the north side of Kalo‘i Gulch:

> Shouting to the men to come over with their picks and shovels, he [Harry von Holt] soon got them busy clearing away lots of small stones and earth. Almost at once they could see that there were evidences of a paved well, and at about three feet down they came upon a huge flat rock, as large around as two men could span with their arms. Digging the rock loose and lifting it to one side, what was their astonishment to find a clear bubbling spring! (Von Holt 1985:138)

Following the discovery, two old Hawaiians began to ask Von Holt about the spring:

> Finally he [Harry von Holt] got them to explain that the spring, called “Waihuna” (Hidden Spring) had been one of the principal sources of water for all that country, which was quite heavily populated before the smallpox epidemic of 1840…A powerful Kahuna living at the spring had hidden it before he died of the smallpox, and had put a curse on the one who disturbed the stone, that he or she would surely die before a year was out. (Von Holt 1985:138-140)

4.2 Early 1900s to Present

Much of the *mauka* lands in western Honouliuli, including ridges and deep gulches, were unsuitable for commercial sugar cultivation and remained pastureland for grazing livestock. By 1920, however, many of the lands of Honouliuli were used for commercial sugar cane cultivation (Frierson 1972:18). By 1919 a reservoir had been established just south of Pālehua Road in the central portion of the project area (Figure 13). In the late 1920s, the main residential communities were at the northeast edge of the ‘Ewa Plain. The largest community was still at Honouliuli Village. ‘Ewa was primarily a plantation town, focused around the sugar mill, with a public school as well as a Japanese school. Additional settlement was in Waipahu, centered on the Waipahu sugar mill, operated by the O‘ahu Sugar Company. A 1925 Oahu Sugar Company

plantation map shows Field 29 covering the northeast portion of the project area northeast of the reservoir (Figure 14). A 1927/28 map (Figure 15) shows an irrigation ditch following the contour of Kalo‘i Gulch within the project area.

Historic maps of the Makakilo area indicate a lack of any other significant development in the area into the 1940s. Major land use changes came to western Honouliuli when the U.S. Military began development in the area. Military installations were constructed both near the coast, as well as in the foothills and upland areas. Barbers Point Military Reservation (a.k.a. Battery Barbers Point from 1937-1944), located at Barbers Point Beach, was used beginning in 1921 as a training area for firing 155 mm guns (Payette 2003). Also in the vicinity were Camp Malakole Military Reservation (a.k.a. Honouliuli Military Reservation), used from 1939, and Gilbert Military Reservation, used from 1922-1944. Barbers Point NAS, in operation from 1942 into the 1990s, was the largest and most significant base built in the area. It housed numerous naval and defense organizations, including maritime surveillance and anti-submarine warfare aircraft squadrons, a U.S. Coast Guard Air Station, and the U.S. Pacific Fleet.

Fort Barrette (a.k.a. Kapolei Military Reservation and Battery Hatch), located atop Pu‘u Kapolei, was in use from 1931 to 1948 for housing four 3-inch anti-aircraft batteries (Payette 2003). In the 1950s, the site was used as a NIKE missile base. Pālailai Military Reservation, located atop Pu‘u Pālailai in Makakilo, was in service from 1921, housing Battery Pālailai and Fire Control Station B (Payette 2003). Fire Control Station A was located atop Pu‘u Makakilo. From 1942 to 1945 the Pu‘u Makakilo Training Area, including lands in and around Pu‘u Makakilo, was used for military training during WWII.

Maps from the war years indicate little further development in the vicinity of the present project area (Figure 16). A new water-catchment ditch appears to be shown extending south from the reservoir in the central portion of the project area following the land contour.

Historic USGS maps of the area indicate the presence of an industrial quarry located within Kalo‘i Gulch, half a mile northwest (outside) of the current study area. The quarry first appears on the 1953 USGS topographic map. The exact date in which the quarry was initially constructed could not be determined, although research of historic maps indicated construction between 1943 and 1952. In 2004, CSH conducted an archaeological inventory survey of a property in which the quarry was observed and documented SIHP No. 50-80-12-6680.

The 1956 map (Figure 17) also shows an irrigation ditch entering the northwest portion of the project area, arcing around the back of Kalo‘i Gulch, and extending to the reservoir in the central portion of the project area. Whether this ditch was in fact older and was simply not shown on earlier maps is unclear. A 1977 aerial photograph (Figure 18) shows sugar cane fields still dominating the east portion of the project area.

In response to increased demand for housing, spurred by the increased development at Barbers Point NAS, the Estate of James Campbell set aside land in the foothills of the southern Wai‘anae Range in 1960 for the development of the residential community of Makakilo. Development began just *mauka* of the H-1 Freeway and continued *mauka*, with ranch lands being incrementally replaced by subdivision construction. At present, former ranching pasturelands are continually being replaced by residential houselots.

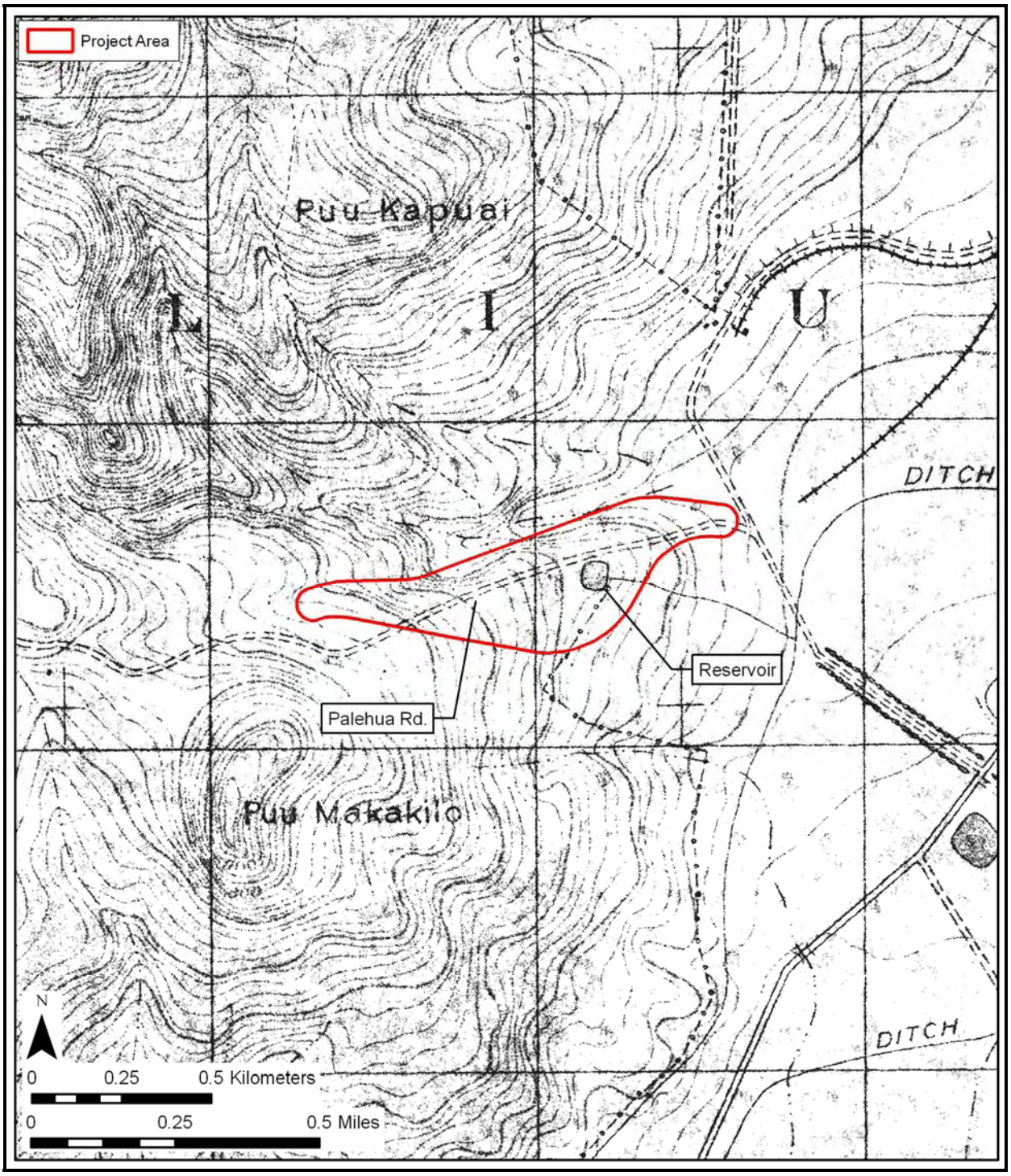


Figure 13. 1919 Fire Control Nanakuli Quad map showing section of Pālehua Road bisecting the project area, as well as a reservoir associated with plantation irrigation system

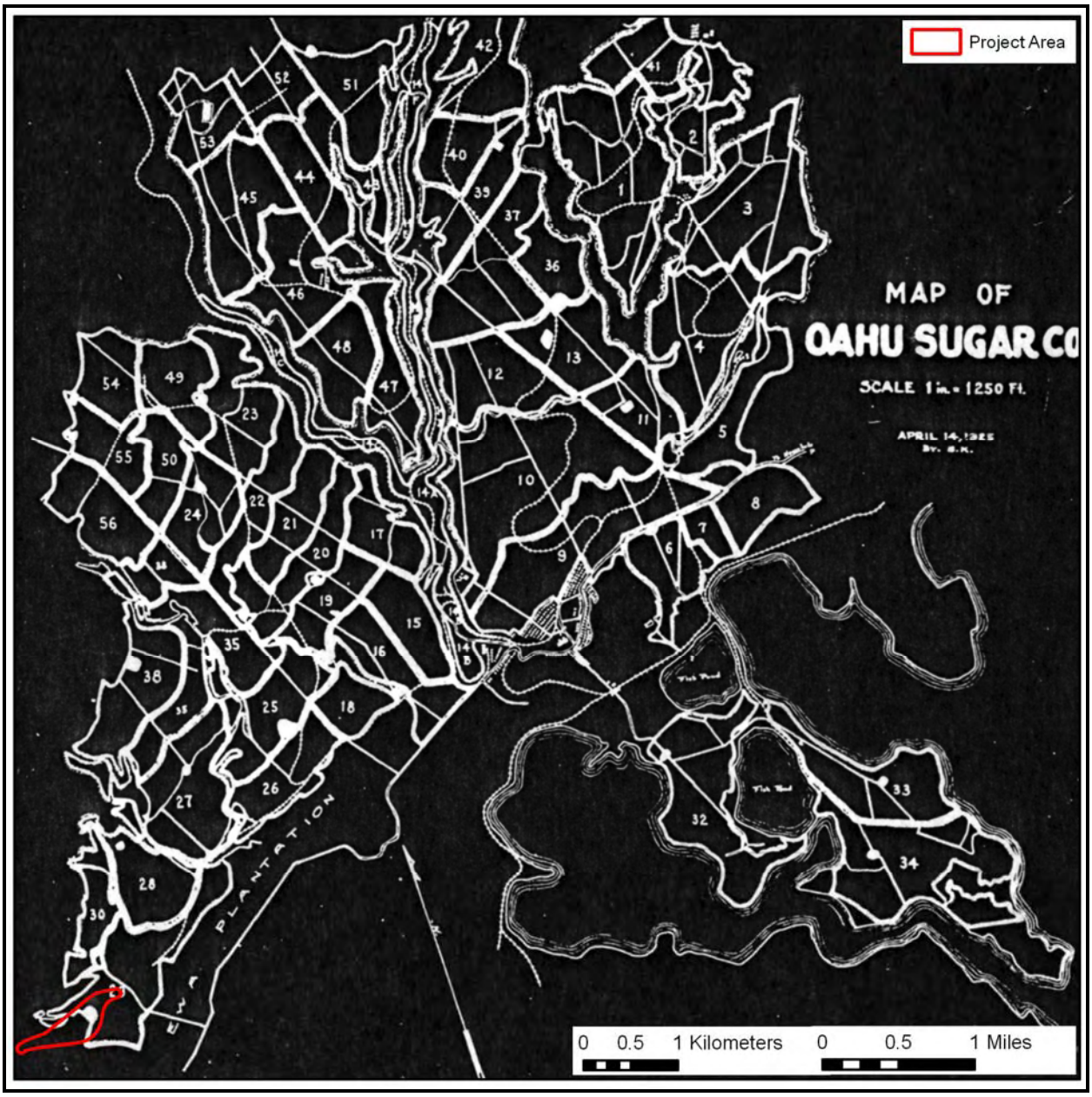


Figure 14. 1925 Oahu Sugar Company plantation map showing project area (red) with Field 29 covering northeast portion of the project area

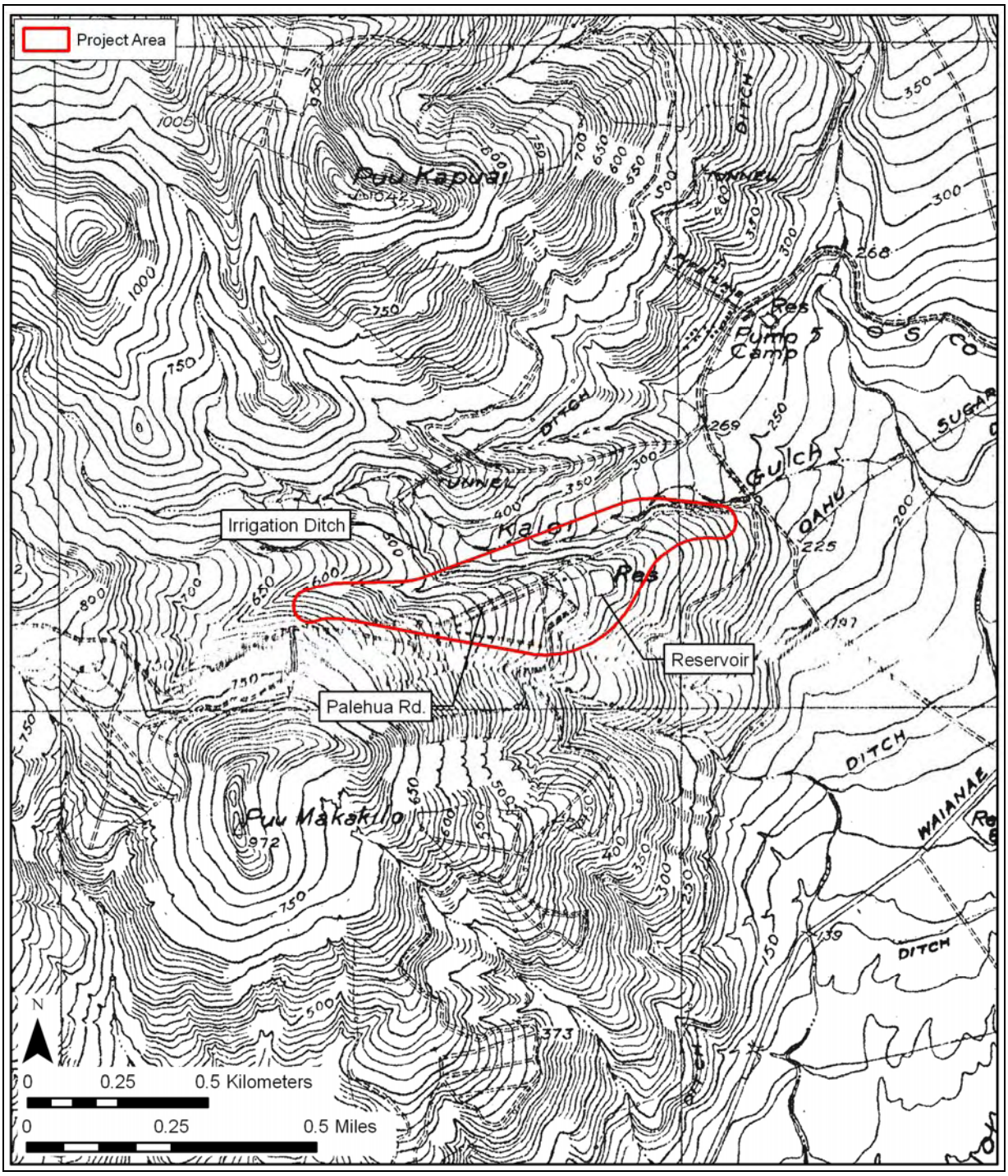


Figure 15. 1927/1928 U.S. Geological Survey Wai‘anae Quad Map showing project area

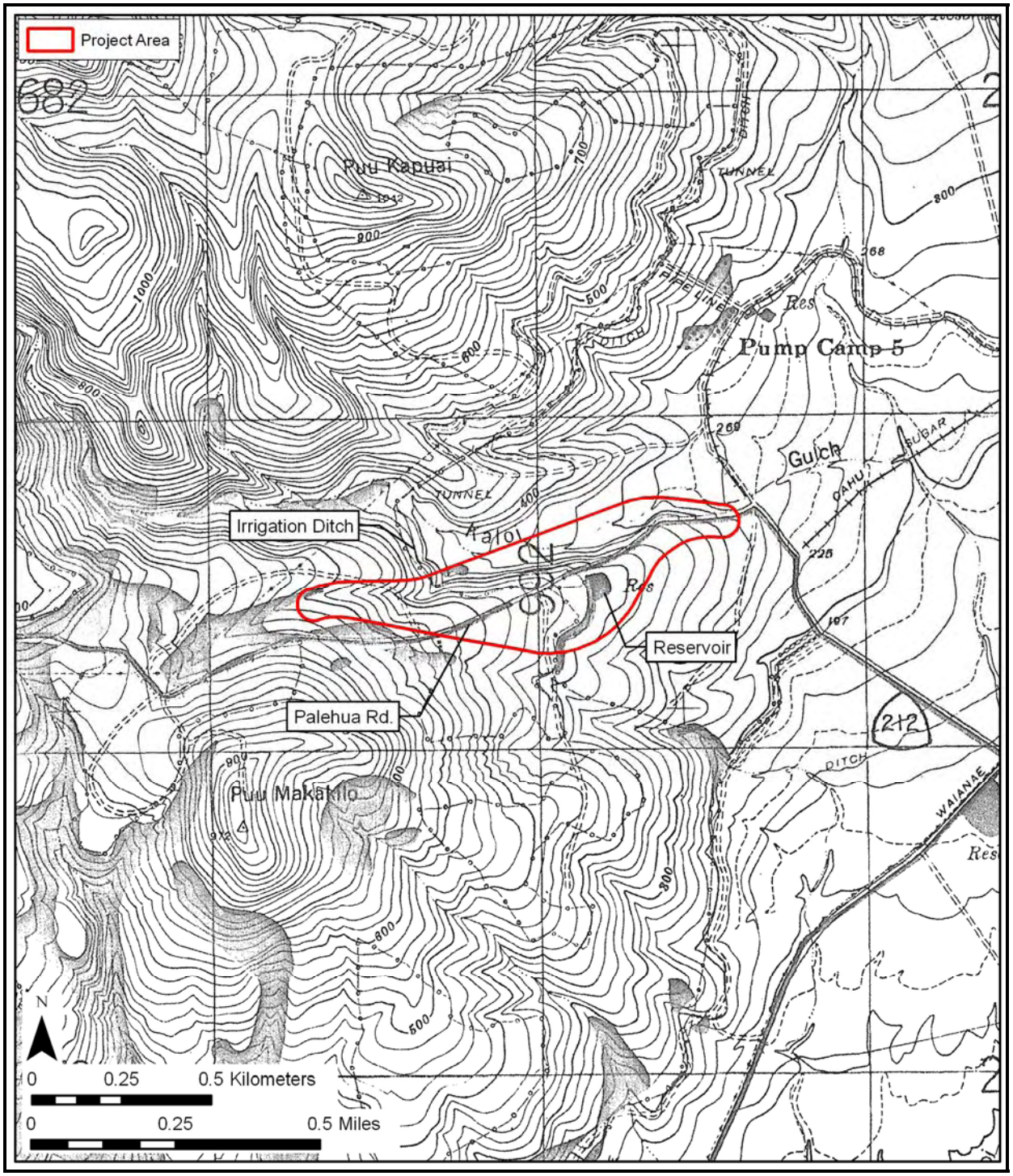


Figure 16. 1943 War Department Map of Waipahu and surrounding areas

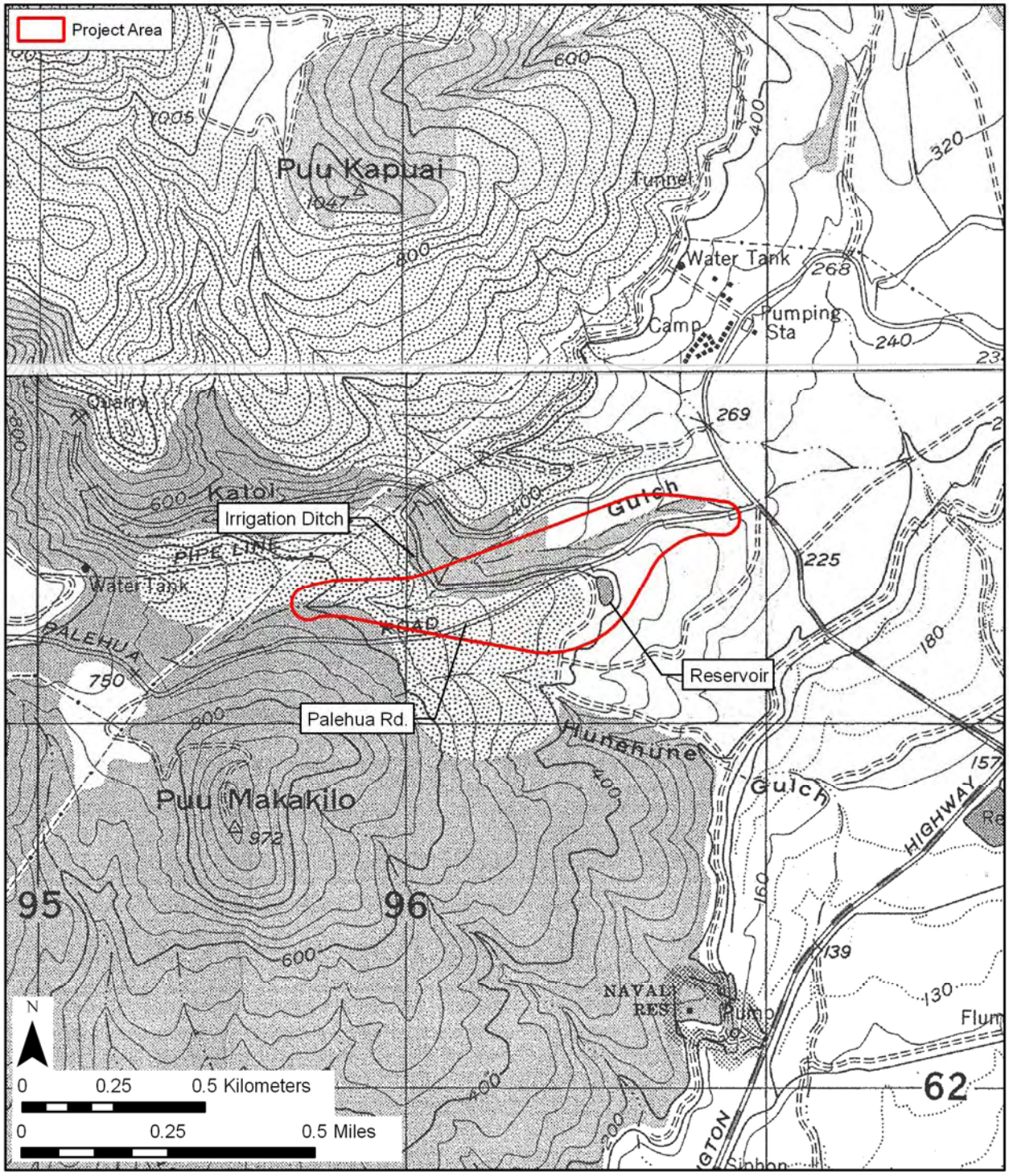


Figure 17. 1956 U. S. Geological survey map showing project area

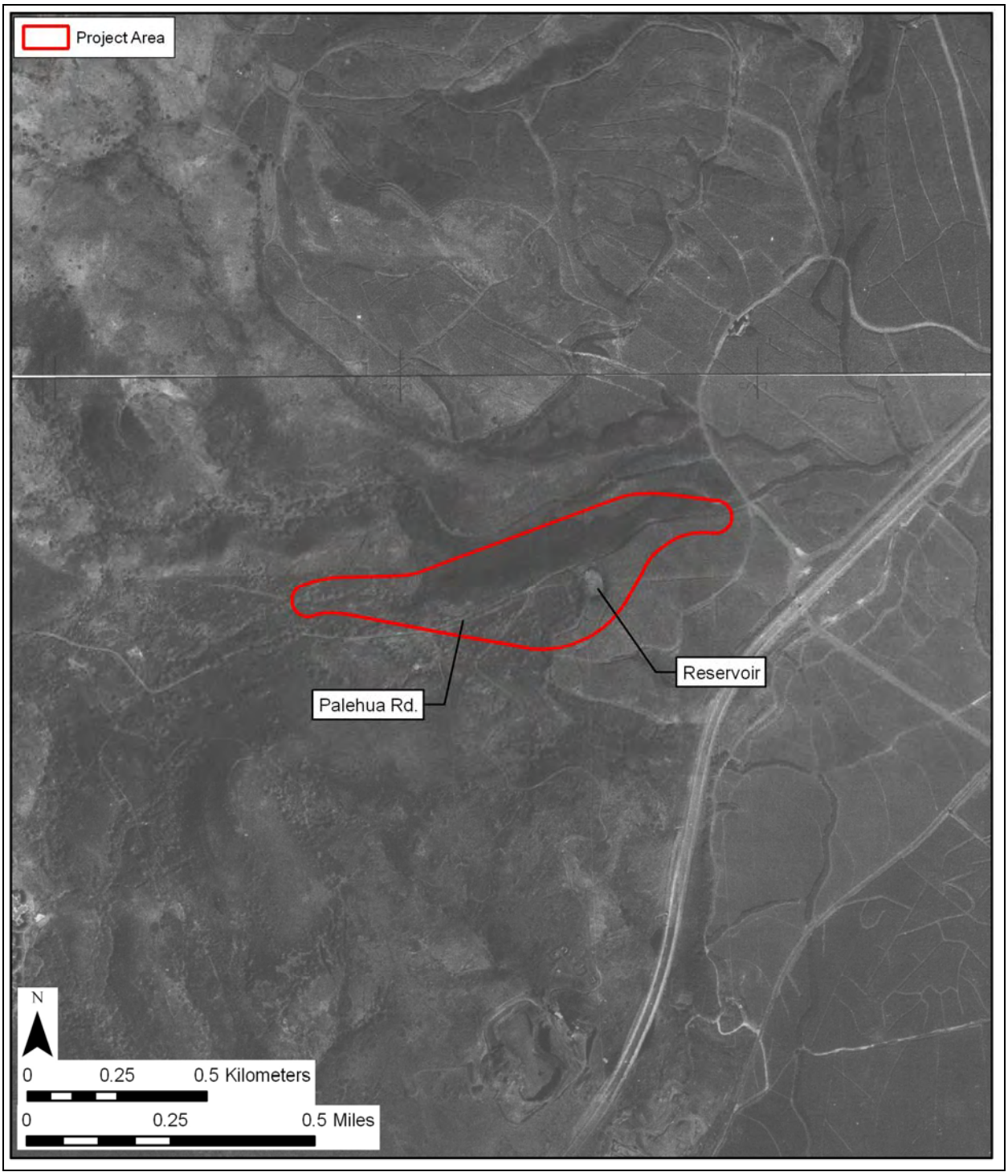


Figure 18. 1977 aerial photograph showing project area

Section 5 Archaeological Research

The coral plains of ‘Ewa have been the focus of more than 50 archaeological studies over the last two decades. The Kalaeloa (Barbers Point) area is one of the most studied places in Polynesia. However, relatively little research has been conducted along the southern slopes of the Wai‘anae Range (Table 1).

The earliest attempt to record archaeological remains in Honouliuli Ahupua‘a was made by Thrum (1906) who described a *heiau* located on Pu‘u Kapolei, approximately 2 miles (3.2 km) south of the current project area. Pu‘u Kapolei Heiau is described as “Ewa-size and class unknown, its walls thrown down for fencing” (Thrum 1906:46).

In his surface survey of 1930, archaeologist J. Gilbert McAllister recorded the specific locations of important sites, and the general locations of less important sites (at least at Honouliuli). Archaeological investigations by McAllister along the southern slopes of the Wai‘anae Range identified a number of sites that are of interest.

McAllister documents Pu‘u Kapolei Heiau as Site 138 and notes:

> The stones from the heiau supplied the rock crusher that was located on the side of this elevation, which is about 100 feet away on the seaside. There was formerly a large rock shelter on the seaside where Kamapua‘a (the pig-god) is said to have lived with his grandmother (Kamaunuahihio). (McAllister 1933:108)

McAllister’s Site 136 is located near Mauna Kapu, northwest of the current project area, and is described as a small platform on the ridge dividing the ‘Ewa and Wai‘anae districts. The 4 to 6 square foot platform was constructed of coral and basalt stones, and was believed to be an altar (McAllister 1933:107). It is noted to have been destroyed by the time of Sterling and Summers’ work in the late 1950s (Sterling and Summers 1978:32).

McAllister’s Site 137 is at Pu‘u Ku‘ua, a prominent landmark 1.8 miles (2.9 km) north of the current project area. Pu‘u Ku‘ua Heiau is described by McAllister as:

> (Destroyed) The heiau was located on the ridge overlooking Nanakuli as well as Honouliuli at the approximate height of 1800 feet. Most of the stones of the heiau were used for a cattle pen located on the seaside of the site. The portion of the heiau that has not been cleared for pineapple has been planted in ironwoods. (McAllister 1933:32)

The presence of Pu‘u Ku‘ua Heiau provides some archaeological evidence of the Pu‘u Ku‘ua settlement described in the Hawaiian Newspaper “*Ka Loea Kalaiaina.*”

None of these sites are in the immediate vicinity of the current project area. However, it is important to recognize that the presence of extant or former archaeological remains demonstrates Hawaiian use of these *mauka* lands.

Recent archaeological investigations in the southern Wai‘anae Range have generally been focused on deep gulch areas for potential landfill locations, lower slopes for residential development, and mountain peaks for antennae or satellite tracking infrastructure.

Table 1. Previous Archaeological Investigations in the Uplands of Honouliuli Ahupua‘a

Reference	Type of Investigation	General Location	Findings
Bordner 1977a	Archaeological Reconnaissance	Proposed Makaīwa Gulch Landfill Site	No archaeological sites identified
Sinoto 1988	Archaeological Reconnaissance	Makakilo Golf Course	Low stacked boulder wall (SIHP No. 50-80-12-1975)
Spear 1996	Archaeolocial Reconnaisssnce	East Kapolei, TMK: 9-1-16: 17	No sites were discovered within project area.
Dega et al. 1998	Archaeological Inventory Survey	UH West O‘ahu, TMK: 9-2-002: 001 & 9-2-002: 001	Two historic site complexes, (SIHP No. 50-80-08-5593, historic irrigation system and SIHP No. 50-80-09-2268, Waiāhole Ditch System)
Tulchin and Hammatt 2004	Archaeological Inventory Survey	86-Acre Proposed Pālehua Community Association (TMK: 9-2-03: 78 por. and 79)	4 historic properties identified: a complex of structures associated with industrial rock quarry operations (Site 50-80-12-6680); three boulder mounds believed to be related to land clearing or ditch construction by the O‘ahu Sugar Co. (Site 50-80-12-6681); a small terrace believed to function as a historic water diversion feature (Site 50-80-12-6682); and a remnant portion of the Waiāhole Ditch (Site 50-80-09-2268).
Tulchin and Hammatt 2005	Archaeological Inventory Survey	71-Acre Pālehua East B, Makakilo, (TMK: 9-2-03:76 & 78)	3 historic properties identified: SIHP Nos. 50-80-12-6666 (pre-Contact agricultural alignment and mound), -6667 (plantation-era walls and ditch), and -6668 (single alignment of upright basalt boulders and a small, low terrace).

Reference	Type of Investigation	General Location	Findings
Tulchin and Hammatt 2007	Archaeological Literature Review and Field Inspection	~790-Acre Parcel at Pālehua, Honouliuli Ahupua‘a, (TMK: [1] 9-2-003:002 por. and 005 por.)	Confirmed the area to be rich in archaeological remains. Because the lands within the project area were almost exclusively used for ranching purposes from historic times until the present, much of the pre-Contact landscape remains intact and relatively undisturbed. Archaeological features included: pre-Contact indigenous Hawaiian habitation and associated agricultural and ceremonial features; historic ranching and related features; and historic quarrying and related features.
Tulchin, Shideler and Hammatt 2007	Archaeological Literature Review	~4,600-Acre Property at the Honouliuli Forest Reserve Honouliuli (TMK: 9-2-004:001 por., 005 por.; 9-2-005:013 por., 016, 018)	Because the lands within the project area were almost exclusively used for ranching and forestry purposes from the mid 1800s until the present, much of the pre-Contact landscape remains intact and relatively undisturbed. Archaeological features representing distinct periods of land use are likely to be identified in the project area, including: pre-Contact indigenous Hawaiian habitation and associated agricultural and ceremonial features; historic homestead and ranching related features; historic agricultural features; and historic military-related features.
Tulchin and Hammatt 2008	Archaeological Literature Review and Field Inspection	~809 Acres of Kahe Ranch Land Honouliuli (TMK: 9-2-003: 004, 009, 029, 084 por., & 085)	Identifies 10 archaeological sites within the study area. Archaeological features representing distinct periods of land use were observed, including: pre-Contact indigenous Hawaiian habitation; historic ranching; and historic railroad operations.

An archaeological inventory survey of the “Makaīwa Hills” development project located several traditional as well as post-Contact archaeological sites (Hammatt et al. 1991). The project area included a 1,915-acre parcel in Honouliuli Ahupua‘a, located between the town of Makakilo and Waimanalo Gulch, and bounded to the south by Farrington Highway and to the north by Pālehua Road (southwest of the current project area). Thirty-four sites were located, including prehistoric habitation structures (temporary and permanent), agricultural features (terrace and mounds), rock shelters, petroglyphs, *ahu* (stone markers), and various sugar cane cultivation infrastructures.

Within the “Makaīwa Hills” project area, habitation sites were found clustered in higher elevations above 1000 ft, and in lower elevations below 500 ft (Hammatt et al. 1991). Especially in pre-Contact times, the higher elevations were an important source of many varied forest resources, including both foodstuffs and other key items (e.g., wood, stone, medicinal plants, bird feathers). The lower elevations were in close proximity to the shoreline and its bountiful coastal resources.

> In sum, this site type and patterning sample suggests that prehistoric and historic Hawaiian populations utilized the present study area as a recurrent and temporary habitation area focused mainly on the gathering of specialized goods, such as wild forest plants from the upper elevations and the quarrying of lithic material within the lower elevations. (Hammatt et al. 1991:106)

Two archaeological studies were made in the upland Pālehua area, *mauka* of Makakilo. An archaeological inventory survey of the proposed KAIM radio tower (Hammatt 1992), located northwest of the current project area, identified no archaeological remains. An archaeological assessment for the proposed Ministry of Transportation Satellite Multi-Ranging Station project site (Borthwick 1997), which abuts the western perimeter of the Air Force Solar Observatory facility, identified no archaeological remains.

Relatively few archaeological sites have been located by archaeological studies made in the vicinity of the current project area (Figure 19). Archaeological studies associated with the proposed Makakilo Golf Course (Sinoto 1988) and the Makakilo D and D-1 Development Parcels (Nakamura et al. 1993) were conducted in the vicinity of the current project area. Archaeological reconnaissance of the Makakilo Golf Course property included lands along the southern and eastern slopes of Pu‘u Makakilo. Severe erosion was noted throughout the property. A single archaeological feature, a low-stacked basalt boulder wall (SIHP No. 50-80-12-1975), was identified (Sinoto 1988). Archaeological inventory survey of the Makakilo D and D-1 Development Parcels included lands on the southern and western slopes of Pu‘u Makakilo, adjacent to the golf course property. A single historic property, a cement irrigation flume (SIHP No. 50-80-12-4664), was located in the southern portion of the project area near the H-1 Freeway (Nakamura et al. 1993).

An archaeological inventory survey for the proposed UH West O‘ahu campus was conducted by Dega et al. (1998). The survey area included 991 acres in the vicinity of Pu‘u Kapu‘ai, north of the current project area. No traditional Hawaiian sites were located. The project area was noted to have undergone extensive land modification associated with commercial agriculture. Two historic site complexes (SIHP Nos. 50-80-12-5593, irrigation system, and 50-80-09-2268, Waiāhole Ditch System) were documented. Identified features included flumes, aqueducts,

ditches, pumps, and other irrigation infrastructure. It was noted that the Waiāhole Ditch crossed through the project area and “exits the property to the west near Kalo‘i Gulch” (Dega et al. 1998:17).

Kalo‘i Gulch, including current project area, was surveyed as a potential landfill location (Bordner 1977b). The archaeological reconnaissance survey included lands within Kalo‘i Gulch and its smaller tributaries from the *makai* end of the gulch up to the 1,400 ft elevation. It was noted that bulldozing extensively modified the lands at the base of the gulch, *makai* of an historic quarry. In the *mauka* portion of the project area, three possibly prehistoric sites were identified (SIHP Nos. 50-80-12-2600, -2601, and -2602), including low-stacked basalt boulder walls located along the north side of the Kalo‘i Stream channel.

Tulchin and Hammatt (2004) conducted an archaeological inventory survey of the approximately 86-acre proposed Pālehua Community Association Common Areas on the northwestern side of Makakilo. The study area abuts the northern boundary of the current study area. Historic properties located during the inventory survey included: a complex of concrete and iron structures associated with industrial rock quarry operations (SIHP No. 50-80-12-6680); three boulder mounds believed to be related to land clearing or ditch construction by the O‘ahu Sugar Co. (SIHP No. 50-80-12-6681); a small terrace believed to function as an historic water diversion feature (SIHP No. 50-80-12-6682); and a remnant portion of the Waiāhole Ditch (SIHP No. 50-80-09-2268). No pre-Contact historic properties were identified.

Tulchin and Hammatt (2004) undertook a field inspection of four locations just west of the current study area. Three small stone features were identified: an *ahu*, a stone terrace, and a small C-shape. An archaeological inventory survey was recommended should any construction activities be proposed for those parcels of land.

Tulchin and Hammatt (2005) conducted an inventory of a 71-acre parcel located just south of the current study area. Three historic properties were identified: SIHP No. 50-80-12-6666, a pre-Contact agricultural alignment and mound; SIHP No. 50-80-12-6667, a plantation-era stacked basalt boulder walls and a ditch; and SIHP No. 50-80-12-6668, two pre-Contact agricultural features consisting of a single alignment of upright basalt boulders and a small, low terrace.

5.1 Results from the Project Area

Two new historic properties (SIHP Nos. 50-80-12-6950 and 50-80-12-6951) were identified during a recent archaeological inventory survey of the current project area by CSH. These sites functioned to water sugar cane fields as well as control water flow coming from those cane fields to areas of lower elevation. Channels and ditches observed were constructed during historic times, and their purpose was to minimize the impact of erosion as well as prevent mud and debris from entering the existing water supply structures associated with the Waiāhole Ditch System, which supplied the region with the much needed water for irrigation in the sugar industry.

Besides the newly identified sites observed on survey, two new features associated with SIHP No. 50-80-09-2268 (Waiāhole Ditch System) were also identified, further extending the documented geographic extent of this site (Figures 20 and 21).

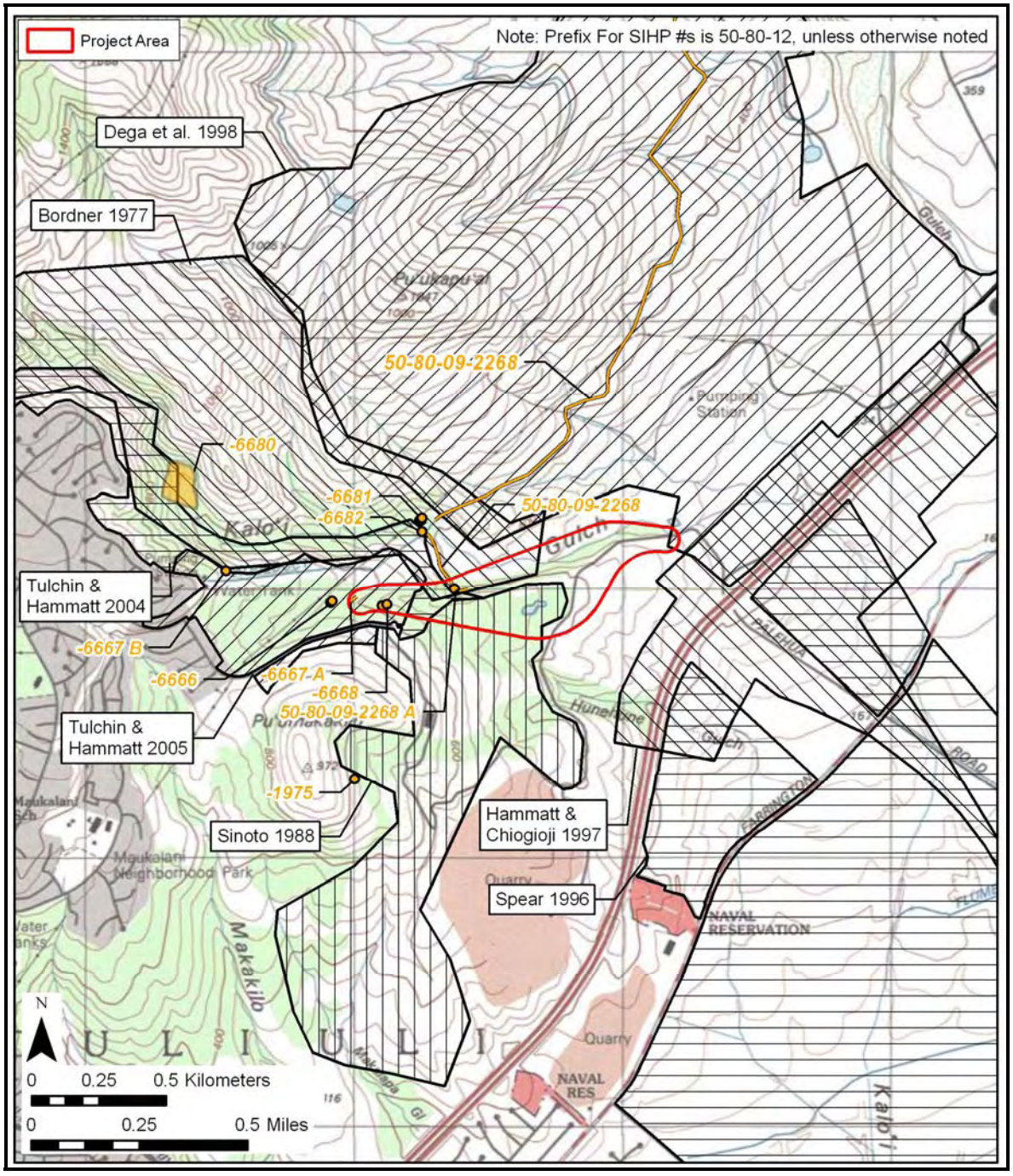


Figure 19. Map showing previous archaeological studies conducted in vicinity

5.2 Background Summary

Historical background research of Honouliuli Ahupua‘a shows that pre-Contact settlement was centered on the rich cultivated lands of Honouliuli ‘Ili for extensive wetland taro cultivation and abundant coastal resources. The upland dry forest areas were used for hunting and gathering of forest resources, but likely not for widespread permanent settlement. In the intermediate area between the limestone plain and the upland forests—in the vicinity of the current study area—indigenous Hawaiian activities were limited to dryland agriculture within gulches or near springs, and *mauka* to *makai* trails and associated temporary shelters.

Within the “Makaīwa Hills” project area, which abuts the western boundary of the current study area, pre-Contact habitation sites were clustered in higher elevations above 1000 ft, and in lower elevations below 500 ft (Hammatt et al. 1991). The higher elevations, in which the current study area is located, contained ample forest subsistence resources for gathering on both a continual basis, as well as during times of famine and drought. In Von Holt’s (1985) accounts of discovering spring water within the study area, it is noted that Kalo‘i had “been a place of which the Hawaiians had known” and the area “had been quite heavily populated before the smallpox epidemic of 1840” (Von Holt 1985:138-140).

By 1920, the lands of Honouliuli were used primarily for commercial sugar cane cultivation and ranching (Frierson 1972:18). Much of the *mauka* lands in western Honouliuli, including ridges and deep gulches, were unsuitable for commercial sugar cultivation and remained pasture land for grazing livestock. Historic maps indicate a lack of any significant development within the study area into the 1940s suggesting these lands were unsuitable for commercial sugar cane cultivation. Modest constructions in the area included Pālehua Road, allowing access to the uplands of western Honouliuli, as well as plantation irrigation infrastructure that runs through the current study area (see Figure 9). Also of note are the presence an unidentified enclosure within the northwest corner of the study area and a trail running roughly northwest by southeast through the middle of the study area leading to tunnels and a tank within the northern portion of the study area. This trail is likely the Pālehua Trail along which Von Holt located and tapped various springs to supply water to his herds of cattle. The tunnels located along the northern end of this trail are likely water tunnels excavated into the hillside in order to secure water.

Previous archaeological research in the vicinity of the study area has identified numerous pre-Contact sites including: habitation structures (temporary and permanent) and agricultural features (terrace and mounds). Of particular interest are three pre-Contact sites (SIHP No. 50-80-12-2600, -2601, and -2602) located within Kalo‘i Gulch, in the northern portion of the study area. All three sites were determined to related to erosion control and water management and suggest that in the past water was fairly abundant within the study area. This is consistent with Von Holt’s (1985) accounts of discovering spring water within the study area. Other archaeological sites in the vicinity of the study area include plantation-era infrastructure related to the ‘Ewa Plantation Co. and O‘ahu Sugar Co., walls and fences attributed to the Campbell Ranch, and industrial quarry infrastructure.

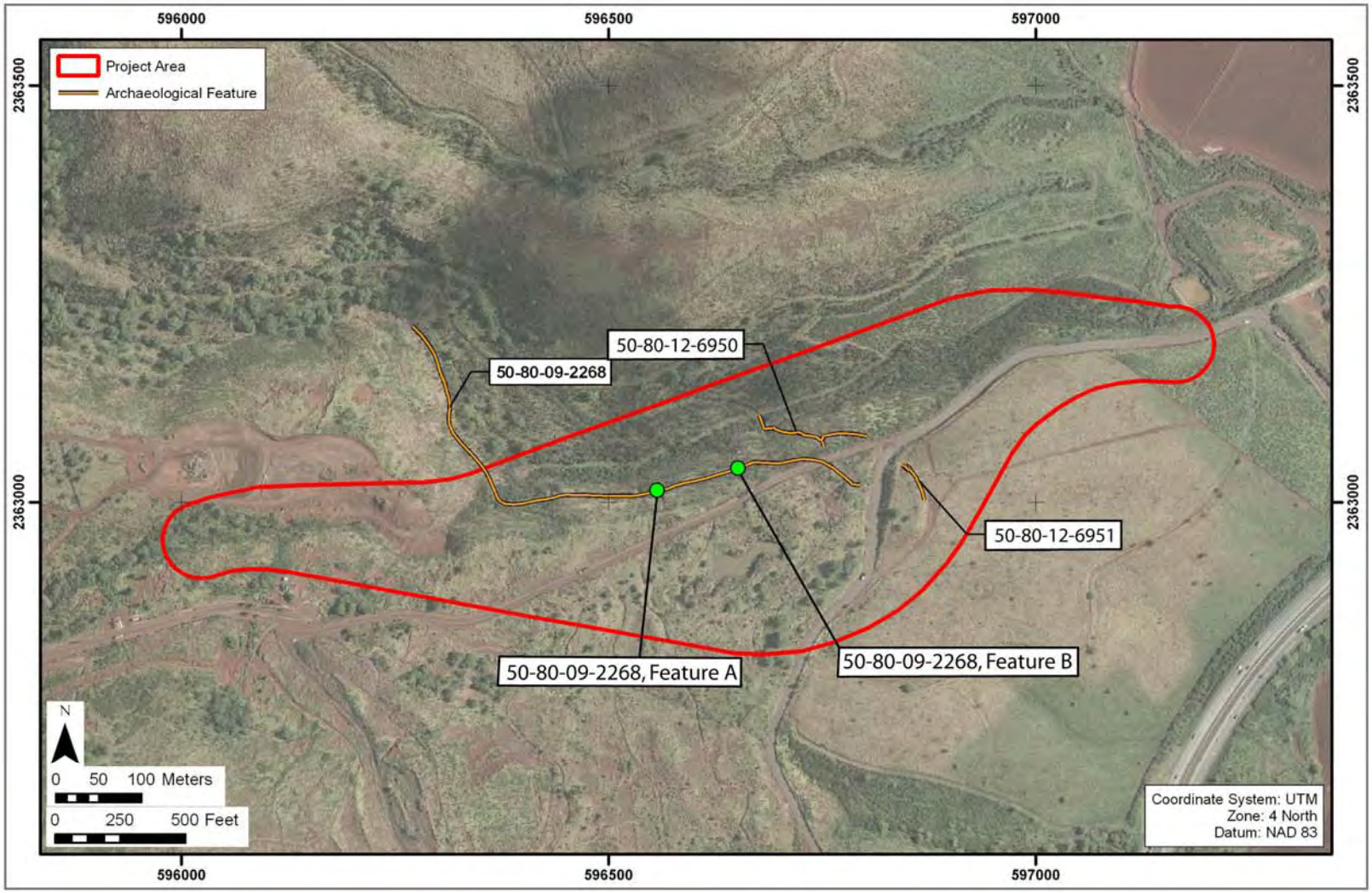


Figure 20. Aerial site map, showing assigned SIHP numbers

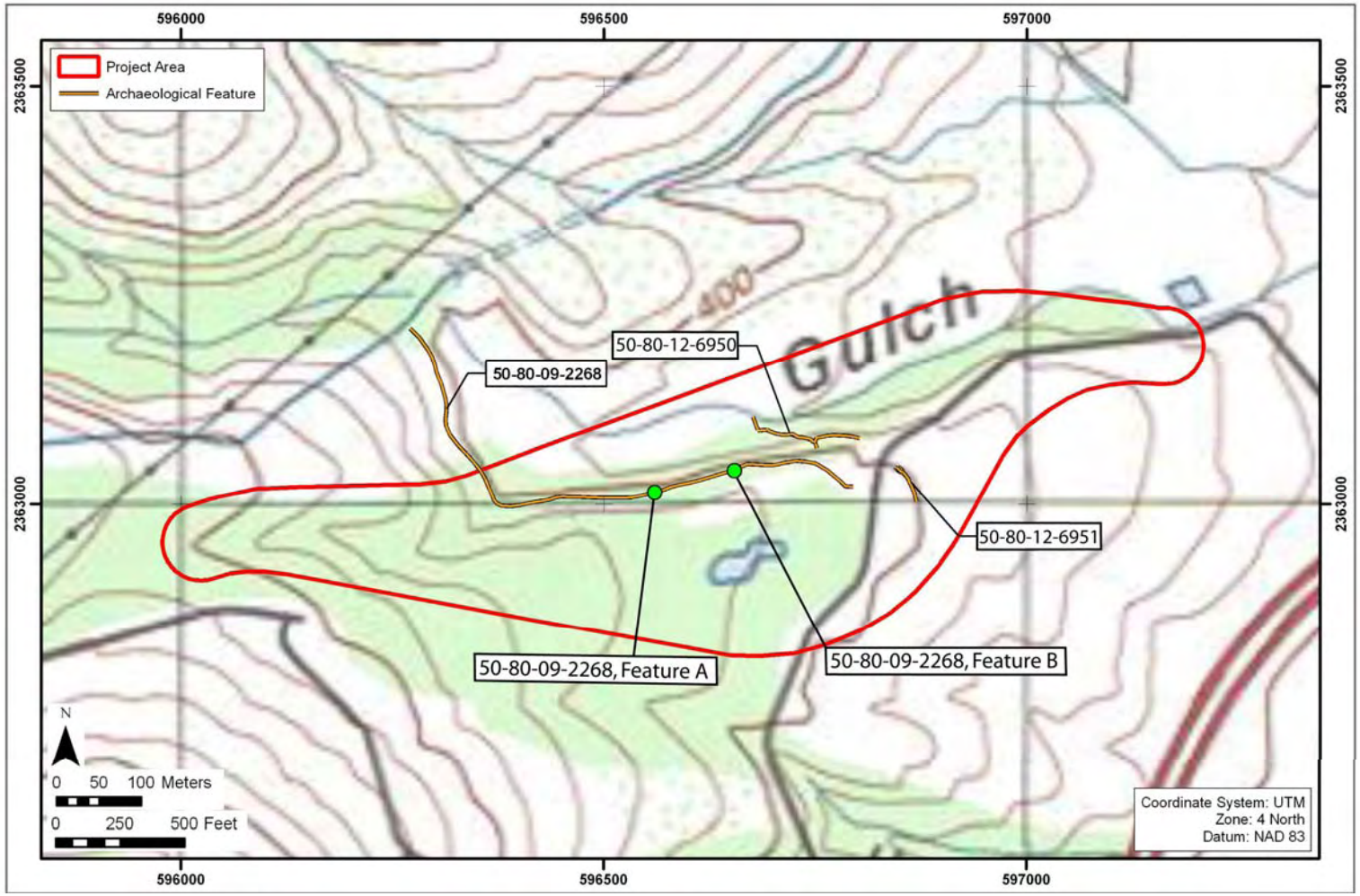


Figure 21. USGS 7.5 minute series ‘Ewa quadrangle topographic map of project area showing assigned SIHP numbers

Section 6 Community Consultation

Throughout the course of this assessment, an effort was made to contact and consult with Hawaiian cultural organizations, government agencies, and individuals who might have knowledge of and/or concerns about traditional cultural practices specifically related to the project area. This effort was made by letter, e-mail, telephone and in person. In the majority of cases, letters with a detailed description of the proposed action—including project acreage, a conceptual plan provided by R.M.Towill Corporation, a map and an aerial photograph of the project area—was mailed with the following text:

> At the request of R.M. Towill Corporation, Cultural Surveys Hawai‘i, Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the proposed 23-acre Makakilo Drive Extension project at Makakilo, Honouliuli Ahupua‘a, ‘Ewa District, on the Island of O‘ahu, TMK (1) 9-2-002:006, 9-2-003:079.
>
> The project area is approximately 3,300 feet long by 300 feet wide extending from the end of the existing Makakilo Drive to the proposed North-South Road interchange with Interstate H1 and will be a 4-lane facility. The project area consists of the south-southeastern portion of the Kalo’i Gulch floodplain. Kalo’i Stream channel runs from the central portion of the project area to the northeast. The southern face of Kalo‘i Gulch is at the central portion of the project area, and the base of the northeast slope of Pu‘umakakilo is at the southwestern portion of the project area. See attached USGS maps and the aerial photograph of project.
>
> The purpose of this cultural study is to assess potential impacts to cultural practices as a result of proposed development in Honouliuli. We are seeking your *kōkua* and guidance regarding the following aspects of our study:
>
> - **General history and present and past land use of the project area.**
> - **Knowledge of cultural sites which may be impacted by future development of the project area - for example, historic sites, archaeological sites, and burials.**
> - **Knowledge of traditional gathering practices in the project area, both past and ongoing.**
> - **Cultural associations of the project area, such as legends and traditional uses.**
> - **Referrals of *kūpuna* or elders and *kama‘āina* who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua‘a* lands.**
> - **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.**

Several (3-9) attempts were made to contact individuals, organizations, and agencies apposite to the CIA for Honouliuli. The results of all consultations are presented in Table 3.**Error! Reference source not found.**. Excerpts from more extensive interviews and statements specifically related to Honouliuli and its environs are presented in Section 7 below.

Table 2. Results of Community Consultation

Name	Affiliation	Comments
Ailā, William	Hui Mālama I Nā Kūpuna o Hawai‘i Nei	Made referral to Shad Kane.
Alaka‘i, Robert	‘Ahahui Siwila Hawai‘i O Kapolei Hawaiian Civic Club	See Section 7 below for response.
Ayau, Edward Halealoha	Hui Mālama I Nā Kūpuna o Hawai‘i Nei	Will forward community outreach information to other members.
Ching, Baron	Hawaiian Cultural Practitioner	Made referral to Shad Kane.
Clark, Melvin Kauwila	Hawaiian Cultural Practitioner	No response
Eaton, Arlene	Hale o Na‘auao	See Section 7 below for response
Golojuch, Michael	Makakilo/Kapolei Neighborhood Board (MKNB)	No response
Holt, Ruth	Hawaiian Cultural Practitioner	No response
Kane, Shad	‘Ahahui Siwila Hawai‘i O Kapolei Hawaiian Civic Club	See Section 7 below for response
Keala, Jane	‘Ahahui Siwila Hawai‘i O Kapolei Hawaiian Civic Club	No response
Makaiwi, Martha	MKNB	No response
Matanane, Eric	Wahipana O ‘Ewa	No response
McKeague, Kawika	O‘ahu Island Burial Council, ‘Ewa	No response
McQuivey, Jace	Chair, O‘ahu Island Burial Council	No response
Nahulu-Mahelona, Moani	Kapolei High School, Hawaiian Studies Department	No response
Nāmu‘o, Clyde	Administrator, Office of Hawaiian Affairs	See Figure 22 below
Nunes, Keoni	Hawaiian Cultural Practitioner	See Section 7 below for response
Paik, Linda Kaleo	State Historic Preservation Division	Made referral to Shad Kane and Nettie Tiffany
Philpotts, Douglas McD	Hawaiian Cultural Practitioner	See Section 7 below for response
Tiffany, Nettie	Kahu Lanikuhonua	No response
Timson, Maeda	MKNB	No response
Yamamoto, George	MKNB	No response
Young, Helen	Hawaiian Cultural Practitioner	No response

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STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

HRD08/3635

June 12, 2008

Brian Kawika Cruz, Cultural Impact Assessment Specialist
Cultural Surveys Hawai'i, Inc.
P.O. Box 1114
Kailua, Hawai'i 96734

Re: Cultural Impact Assessment
Makakilo Drive Extension project
Makakilo, Honouliuli Ahupua'a, 'Ewa District, Island of O'ahu
Tax Map Key: (1) 9-2-002:006 and 9-2-003:079

Aloha e Mr. Cruz,

The Office of Hawaiian Affairs is in receipt of your letter initiating consultation ahead of a cultural impact assessment for the proposed Makakilo Drive Extension project. Based on the information contained within your letter, the 23-acre project will consist of constructing an approximately 3,300 feet long by 300 feet wide four lane road which will extend from the end of the existing Makakilo Drive to the proposed North-South Road interchange with Interstate H-1.

The past and present uses of the subject parcel are unclear. OHA requests that your firm conduct a thorough review of all archaeological reports and cultural studies related to the larger area which will be subject to the cultural impact assessment. OHA believes there is a possibility that your firm has previously conducted interviews with individuals who have knowledge of cultural sites and traditional practices within the proposed project area.

In the event a comprehensive archaeological inventory survey for the project area is conducted and submitted to the Department of Land and Natural Resources- Historic Preservation Division for review and approval, OHA should be allowed the opportunity to comment on the criteria assigned to any cultural or archaeological sites identified within the archaeological inventory survey pursuant to §13-284-6(c), Hawaii Administrative Rules.

Brian Kawika Cruz, Cultural Impact Assessment Specialist
Cultural Surveys Hawai'i, Inc.
June 12, 2008
Page 2

Thank you for initiating consultation at this early stage of the consultation process. We look forward to the opportunity to review the completed cultural impact assessment. Should you have any questions please contact Keola Lindsey, Lead Advocate-Culture at 594-1904 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Administrator

Figure 22. Office of Hawaiian Affairs Response Letter, June 12, 2008

Section 7 Summaries of Kama‘āina “Talk Story” Interviews

Kama‘āina and *kūpuna* (elders) with knowledge of Honouliuli Ahupua‘a and the area within the vicinity of the proposed Makakilo Drive Expansion project participated in “talk-story” sessions for this assessment. The approach of CSH to cultural impact studies affords community contacts an opportunity to review transcriptions and/or interview notes and to make any corrections, deletions or additions to the substance of their testimony.

CSH employs snowball sampling, an informed consent process and semi-structured interviews (cf. Bernard 2005). A total of 23 individuals were contacted for this CIA (see Table 2, above); 14 did not respond; four provided referrals to other individuals; and five participated in formal “talk story” interviews. To assist in discussion of natural and cultural resources and any cultural practices specific to the project area, CSH initiated the “talk-story” sessions with questions from the five broad categories: Resource Gathering Practices, Marine and Freshwater Resources, Burials, Trails and Historic Properties. Presented below are brief backgrounds of participants’ “talk-story” sessions and their comments and concerns about the proposed project area.

7.1 Arlene Eaton

Arlene Eaton was born November 11, 1927 in Kapālama on the island of O‘ahu. Her *tūtū* (beloved relative, in this case, an aunty) Malia Kealoha in the Pu‘uloa and Honouliuli Ahupua‘a raised her.

Arlene Eaton was interviewed by CSH at McDonald’s Restaurant in ‘Ewa Beach on April 25, 2008. Mrs. Eaton, who is now 81 years old, kindly shared her memories and knowledge of Honouliuli Ahupua‘a and the project area.

The lower plains of Honouliuli Ahupua‘a contain innumerable limestone sinkholes. When Mrs. Eaton (AE) was asked about the events of December 7, 1941, she shared this story about both that tragic Sunday morning and a sinkhole cave in which her family took shelter:

> CSH: Do you remember the events of December 7, 1941? Were you at home at the time?
>
> AE: Yes, we didn’t know what it was. And so I said to *tūtū* [Grandma] in Hawaiian, “How come? What’s all that smoke up there?” She told me to stay inside. Near our *hale* [house)], we had a cove made out of coral, rock, natural. So we went in there and sat down. We watched all the things that were going on. I didn’t know what was going on.
>
> CSH: Did you hear the sounds of the bombs?
>
> AE: Oh, yes, terrible. You could hear the machines. You could hear the explosions. Even fragments of things would fly into our area. Again, we didn’t know what it was. Tūtū told me to go in the cove. So that nothing would come through to hurt us. It was dark so you could see the things going on…
>
> CSH: It was early in the morning time before the sun came up?

AE: Oh yeah, early in the morning. You know, you could hear the planes. I said to my grandfather, “I wonder what’s going on?” So he went to look outside because we used to take care of the ranch outside. All the *paniolo* (cowboys) outside were talking. I wasn’t supposed to be listening, but I could hear my grandfather say to them to take care of the animals then go in the cave. There were different caves. I was in one with my grandfather and my *tūtū* was in another cave with the men. We were watching the thing that was going on. It was only later we found out what was happening. We didn’t have a *ka‘a* [car]. The only time we had one was when my mom and dad would come down with the car. We had an Oakland. Do you know what an Oakland is? It looks like a Ford Model-T.

CSH: The hand crank kind?

AE: Yeah. So after that was all over my father took me to take me with him to *kula* [school]. But they were using the school as a hospital. In one of my classes, one of my good friends was a Japanese. She lived up the road from us in Kalihi right above School Street. I asked for her but no one knew where she was. Whenever we were going home, there was only one road to Honouliuli. When you get to the old Fort Weaver Road, no more street- you have to make your own. In that area, that’s where they put the Japanese, they were all prisoners. And my dad would go in there to get fresh water from the artesian well. Campbell asked that man to start the well. That’s where we got the water from. So he told me, “Come, your friend is in there.” There was all this iron with sharp things…

CSH: Barbed wire?

AE: Yes… I ran up to her and then she came to me. Even when I talk about it now… I asked her, “Fusae, what are you doing here?” And we hugged each other. Then I realized that my dad told me that we were at war with the Japanese. But I said, “And Fusae is not in Japan, she’s in Hawai‘i.” I always thought to her to be Hawaiian because she’s like me. But my Daddy said they put her in with her mother and the rest of them. I don’t how he did it, but my dad got them out.

CSH: Really? Wow!

AE: Yes, like I said, I lived in two worlds. Mom and Dad had maids in their houses. It never dawned on me about all of this because I was still young yet. Because she worked for us and he cleaned the yard and they stayed in a cottage in the back.

CSH: Did they have to stay in hiding?

AE: No, not in our area. They were not allowed to go out unless Dad took them. They needed a pass of some sort from what I understand. Our place was big- over 20,000 feet with the house and everything - so it was enough for them to play around in.

CSH: Were you able to maintain a friendship with them?

AE: Oh yes, of course. Like I said, they all passed away. Mother and Dad and Fusae.

CSH: What were their names?

AE: Kitamura. Fusae Kitamura. That I’ll never forget. She always would correct me because I only speak Hawaiian. She went to Japanese school and I like the bags they have. Japanese bag- all one thing, made out of a rice bag. I think that it had something a little sturdier on the inside. I said, “I want that bag.” She said, “No, you have to go to Japanese school.” I said, “Ok!” I never even told my mom. When she went, I followed here. Even now I remember how to say, “*Kita kita fune ga kita*- coming, coming, the boat is coming.” I’ll never forget that. Then she asked me, “What did you learn?” I said, “*Kita kita fune ga kita*, now give me that bag.” So I got the bag. I always remember that. When I got home, my mom was so upset. Then I showed my mom the bag and she said, “Don’t do that again.”

Honouliuli Ahupua‘a is well known for ghost sightings and spooky stories. Kaupe’a, an area located in the southwestern portion of Honouliuli Ahupua‘a, has been referred to as “*ao kuewa”* or a “barren or desolate place” for the island of O’ahu. Individuals who were unsuccessful in *leina ka ‘uhane* (leap into afterlife) due to disrespect to his or her *‘aumākua* (family deities) or parents, were banned to dwell at “*ao kuewa,”* a place in limbo between the living and the afterlife. In a Christian sense there are three places in the afterlife, heaven, hell and limbo or purgatory. From a Hawaiian cultural perspective, purgatory is “*ao kuewa.”* Mrs. Eaton shared this story about her *tūtū* and her encounter with the wandering spirits of Kaupe‘a:

AE: One day, she (*tūtū*) was sitting down and this handsome man came up to her. And he said, “Beautiful, the *kai* [ocean]. You come from here?” “She says, *‘ae* [yes] I come from here.” “You want to go to the ocean?” She didn’t know him but because he was handsome, she went with him. They were swimming and he was nice to her. They were bodysurfing. When she was done, she wanted to thank him because he gave her a push on the wave and turned around. But he wasn’t there. She came inside and sat down and she felt sad. While she was sitting there, an old man comes by.

“*E hele ana i ke kai? Maika‘i?*” [Did you go to the sea? Good?]

“*‘Ae* [Yes],” I said.

“Why you *‘uwe* [crying]? Why you crying for?” She told him a handsome man came and took her out but when she turned around, he was gone. The man told her, “Because this man is not a handsome man. He’s a *kupua* [ghost or supernatural being]”. Spooky yeah? “You better go home.” But she said she never forgot that. Whenever they talk about *kupua* she said to mind your own business. She says she would think about someday meeting a handsome man (this was before she met Tūtū, Grandpa). She said later on when she did meet Tūtū [Grandpa], she couldn’t believe it: that was her handsome man. You know, they never got married; they never knew what it was to be married. Not until later, families like my mother and father would come down and tell them to get married. They would ask, “What is that to get married? We already promised each other.”

Hāpu‘u (*Cibotium splendens)*, an indigenous tree fern (Figure 23) found in Hawai‘i and other Pacific islands, can reach a height of 35 to 40 feet. The tree fern has a thick, false trunk with a stem in the center and aerial roots on the outside. The following is a story Mrs. Eaton shared about her Tūtū being caught in a rainstorm and the shelter of the *hāpu’u* tree.

> AE: My *mo‘opuna* (grandchild) called me- she teaches and is going to graduate from UH this year. Her brother Makana needed a story about *hāpu‘u* for a project.
>
> “Why didn’t you go library?”
>
> “We looked, nothing.”
>
> I gave her a story about my Tūtū when she was young about *hāpu‘u*. This boy took it down and took it to *kula* [school] and he got an A+. People don’t understand that this area we had all this *hāpu‘u*. We had all these different kinds of plants that people never thought of. They think it’s too dry. My Tūtū was born and raised here. She never left this area. Not even to go on a canoe or anywhere else. She stayed here. I remember her telling me, it was raining. The wetlands were a forest. She had gone to get *kalo* [taro]. Then it started pouring. She saw the *hāpu‘u*. She imagined it to be big enough for her to get under but she realized “*Auwē* [oh no]! I can’t go under here, the rain will come through!” It was too rainy for her to get home and the only thing there was the *hāpu‘u*. Pretty soon she *oli* [chant] and *kāhea* [to call out] and asked for a place she could go under. One *hāpu‘u* opened its branches and another one opened over the little one and it covered right over her just like an umbrella. It rained and she sat under there. It was all *pau* [finished]; she was ready to go home. She went like that [motions hugging the *hāpu‘u*]. When she got home, my great grandmother said to her, “How come you not wet?” She said, “I gotta tell you something!” She said the story all over again. She said she’d never forget.
>
> I told my *mo‘opuna* he could add anything he wanted but don’t exaggerate but what I said was the truth. It’s such a small little thing, but imagine what had been in the forest.



Figure 23. Hāpu‘u Tree fern (*Cibotium Splendens)*

7.2 Shad Kane

Shad Kane, member of ‘Ahahui Siwila Hawai’i O Kapolei Hawaiian Civic Club, was interviewed by CSH at his home in Makakilo on April 24, 2008. As a Hawaiian cultural practitioner, Mr. Kane kindly shared his knowledge about the cultural significance of Kalo‘i Gulch and the area surrounding the Makakilo Drive Extension Project.

Mr. Kane (SK), a retired officer in the Honolulu Police Department, talked about numerous mysterious accidents that happened in and around the project area in Honouliuli Ahupua‘a:

> SK: I was an administrative lieutenant with the Honolulu Police Department from 1997 to 2000, when I retired. My job was to read reports. I had a lot of police reports I had to read. But the ones that I found really interesting were the accidents, all the fatal accidents between Makakilo and Waimanalo Gulch. And what was common in all the reports that I read, was that they mostly happen at night. The report shows they were simply driving around at night, and what’s hard to understand is that they just turned off the road. And in those few cases when someone survived, they all say they saw someone on the road. And that’s why they turned. Whether they saw someone or not, we don’t know. But they’re driving at night, no traffic and suddenly turn off the road and hit a pole or something.

Within the project area is an ancient Hawaiian trail (Figure 24) that runs from the bottom of Kalo‘i Gulch up towards the connection point of Makakilo Drive. The trail runs adjacent to the proposed project route below the Wai‘anae side ridgeline of Kalo‘i Gulch. Part of the trail has been destroyed in previous development projects. The remaining portion is a major concern for community members we interviewed:

> SK: The thing in my mind that’s most important is that Hawaiian Trail. Because this is it, this is the end of it. We actually have given it away for past projects for people to have beautiful homes. There’s only one piece of the trail left. It’s right there where Makakilo Drive ends. So, hopefully they don’t destroy what’s left. The scary part is that the Makakilo Drive extension will have to cross over the gulch to get to the ridge. This crossing will be right over the trail. You can actually still see the trail. It’s dry season now so you can see the trail easier. This Hawaiian trail is higher up on the ridge. So the trail is very close to their proposed routes for Makakilo Drive. The biggest impact that I see is going to be on the trail.



Figure 24. Hawaiian Trail extending from the bottom-right to the upper-left in Kalo‘i Gulch

7.3 Robert Alaka‘i

Robert Alaka‘i, cultural practitioner and member of Nakoa O Pālehua, was interviewed by CSH at the home of Shad Kane in Makakilo on April 24, 2008. Although he was present during the interview with Shad Kane, he did offer his insight regarding the project area and the *ahupua‘a* of Honouliuli.

When the subject of Huaka‘i Pō (Procession of the Night Marchers) in Honouliuli Ahupua‘a was mentioned in the interview with Shad Kane, Mr. Alaka‘i (RA) talked about something he experienced in the Kalo‘i area:

> RA: I am speaking from personal experience. You know right where the bridge is where they are hooking up the North/South Road [to the H1 Freeway]; I was coming home with my family at night. It was raining. I was driving in the extreme right lane. When I got to the bridge, a coral leaped about this big [his hands indicating the size of a basketball], came flying from the side of the road and hit my car, my front tire. But my car never shake, never do nothing…just kept on going. And when I got home, I turned on all the lights and I crawled underneath the car…I look what’s going on? Is there anything? You know the jeep in the back of me in this lane [indicating the left lane], when the thing hit, the coral went

> all over the road. And the Jeep in the back went slow down and then he kind of kept his distance till I got home. The next morning, in the papers, had one *wahine* [woman] coming home…hit that bridge…right there…die. So there’s something there. Right on that bridge, in that path, that’s where the rock came from…right in that area. So there’s something there. And you know, you can just look at…in this area, if you look at the highway, there’s certain spots on the highway has real high fatality rates.

Mr. Alaka‘i also expressed his concern for the remains of an ancient Hawaiian trail located in Kalo‘i Gulch.

7.4 Douglas ‘McD’ Philpotts

Douglas McDonald Philpotts (McD) is a long-time resident of the *ahupua‘a* of Honouliuli. His current residence in upper Makakilo has been his family’s home since 1970. He is a cultural practitioner in the art of Hawaiian woodworking. McD was previously interviewed by CSH for the Waimanalo Gulch Landfill Expansion Project in 2007 and again for the Makakilo Drive Expansion Project in June of 2008.

According to Bushnell (1993), at the time of the arrival of the first foreigners in 1778, the Hawaiian population was approximately 300,000. By the year 1820, when the first missionaries landed, the population was estimated at 150,000. Outbreaks of diseases, infections and other illnesses contributed greatly to the depopulation of the Native Hawaiians. By the time of the overthrow (or occupation, according to some) of the Hawaiian Kingdom in 1893, the Native Hawaiian population was reduced by 87 percent to about 40,000. McD shared the following statements about the native Hawaiian population in Honouliuli Ahupua‘a:

> McD: The fact that this community had the limited resources they did, is really part of this place and the story of the Hawaiians that lived here. This *ahupua‘a* was the most cooperative existence. We study the *ahupua‘a* of Kamehameha School’s resource book and posters and stuff like that. We see our cultural *ahupua‘a* cooperative system in Honouliuli. The *kahuna lāpa‘au*, you know everybody was a specialist, a *kahuna* [priest or specialist] of some sort…and they all brought in food and the farmer…but here it was critical. Just see the distance between Kalo‘i Gulch and where the *kalo* or the forest resources were. Or where the fish was coming from down at Lanikohunua. You couldn’t farm and fish in the same day. So you needed everybody doing their job so when the missionaries came up here and put their school in the *pa* [stone or walled enclosure] and spread the smallpox germ around, this whole thing came crashing down because everybody needed each other. They couldn’t run and hide and let the plague go by. So as soon as the medicine man is sick…*auwē* [an expression of grief]. As soon as the *kahuna* can’t get his people together, he can’t solve it. At a certain point, there may be 5 to 10 percent of the population left. Honouliuli was the major population center for the surrounding area. If the population had survived the massive outbreaks of diseases, or even if the surrounding communities had survived or were more intact, we would have so much more mo‘olelo to give us all the clues to this. I really feel we got to put together every little drop from the

> physical evidence to looking at the alignments, looking at chants and things that have been recorded, newspaper clippings that mention this place in relationship to all the places around our state and it gives you an idea of the importance of this place. It makes you want to go farther. This community went out in a flash. So that whole oral tradition of passing it on it just wiped out right there.

Mr. McD Philpotts also expressed his concern for the remains of an ancient Hawaiian trail located in Kalo‘i Gulch that travels upwards to where he lives now. As a child, McD would walk along this trail from Old Farrington Highway to the uplands of Pālehua to get home from school.

7.5 Keoni Nunes

Keoni Nunes is one of Hawai‘i’s leading experts on Hawaiian culture, customs and *kakau* (tattooing). He is a *kahuna ka kakau* (expert tattooist) who was raised on the leeward side of O‘ahu.

In the beginning of our interview with Keoni Nunes, he began describing his knowledge on the southwest portion of Honouliuli Ahupua‘a called Kaupe‘a. Referred to as “*ao kuewa,*” or purgatory, Kaupe‘a is synonymous with ghostly tales and strange occurrences:

> KN: This area, Pu‘uokapolei, that’s where they built the archery place. And they built a military establishment at Pu‘ukapolei and that was significant because of the stories of Kamapua‘a, who is the Hawaiian pig god. Prior to that this whole plain area was known as Kaupe‘a. Kaupe‘a was known as the “desolate and barren” area. There were a lot of *wiliwili* trees. And this area, at one point in time, in essence, was the Hawaiian equivalent of purgatory.
>
> CSH: Yes, it’s called *ao kuewa* (realm of homeless spirits). Kaupe‘a was O‘ahu’s *ao kuewa*, with it’s partner, *Leina ka ‘Uhane* [a place where spirits leaped into the nether world; literally, leap of the soul] located at Ka‘ena Point.
>
> KN: It was said that the *‘uhane* [spirit] would reside in the *wiliwili* trees. They ate moths and stuff. At one point in time, everything was cleared. It was really interesting because where they have Nānākai Hale and Honokai Hale [modern residential developments] …when they first built it up, they started re-planting *wiliwili* trees. People started to wonder why there was such a high amount of accidents in the area. So I was told by one of my *kūpuna* [elders] in Wai‘anae, Jay Landis, from what he understood, some of the relatives of Kamokila Campbell are still there. I think Aunty Lei Fernandez called some *kahu* [priest] to come out to do a blessing. And after the blessing, the accidents subsided. But I don’t know the whole story for that.
>
> CSH: So the place with the accidents happened with the new set of *wiliwili* trees or the original?
>
> KN: The new *wiliwili* trees. This whole area was cleared for development. There was a lot of sugarcane here at one time. The rail for the sugarcane was here also. So the original *wiliwili* that was here was pretty much destroyed. But *wiliwili* continued to grow up in the gullies and the gulches. Not so much in the plains

area, but near Honokai Hale they started planting *wiliwili*. And it started re-attracting all that kind ghosts over there. One of the reasons why Kaupe‘a was an area in which the souls dwelled is because you probably find many burials in that area. There are a lot of small cave sites in the area. So I believe there are many burials in the Kaupe‘a area, more on the *makai* [towards the ocean] side. As far as I understand, the people who didn’t live their lives well, ended up in the Kaupe‘a. But the journey to *Leina ka ‘Uhane* took a year. That’s why traditionally it was a year after a person’s death, there was a ceremony. I think they still practice that now but not so much anymore. The thought was that it took a year after you died to get to *Leina ka ‘Uhane*. A year after the year that you died, you’re let into Pō. What was told to me was that the Night Marchers had *kuleana* [responsibilities], or things they had to do in that existence. One time I took a friend of mine named Grant out there, we went out there and we went to look for some wood. We entered this area; it was really interesting because the wind was blowing a little bit. We entered this area in which everything was still, like we were in a bubble. We could see the wind blowing around this area, and right in this area, where we were, nothing was blowing. We couldn’t hear the wind. It became really quiet. We were right *mauka* [upland] of Pōhā Cave. I said, “Hmmm, it could be because the Night Marchers are getting ready to march.” And he just freaked out. And it was early enough in the evening so it would’ve been conducive to the Night Marcher procession. So we just left quickly. And he just bolted. I was laughing.

Section 8 Cultural Landscape of the Project Area

Specific aspects of traditional Hawaiian culture as they may relate to the project area in the broader context of the encompassing Honouliuli Ahupua‘a landscape are discussed below. Excerpts from the previous section (Kama‘āina “Talk Story” Interviews) are incorporated throughout this section where applicable.

8.1 Agriculture and Gathering of Plant Resources

The project area is located in Kalo‘i Gulch in the uplands of Honouliuli Ahupua‘a. Various Hawaiian legends and early historical accounts indicate that the *ahupua‘a* of Honouliuli was once widely inhabited by pre-Contact Hawaiian populations, including the Hawaiian *ali‘i* Attractive subsistence-related features of the *ahupua‘a* included irrigated lowlands suitable for wetland taro cultivation (Hammatt and Shideler 1990), as well as the lower forest area of the mountain slopes for the procurement of forest goods. Dicks et al (1987:78-79) conclude, on the basis of 19 carbon isotope dates and 3 volcanic glass dates, that “agricultural use of the area spans over 1,000 years.” Undoubtedly, Honouliuli was a locus of habitation for thousands of Hawaiians.

The area is associated with *‘iliahi alo‘e*, or sandalwood trees (*Santalum ellipticum*), endemic to the Hawaiian Islands. The open, drier forest and woodland area in the upper Honouliuli Ahupua‘a region is the ideal place for *‘iliahi alo‘e* to grow. During Kamehameha the Great’s reign (on O‘ahu) in the early 1800s, various foreign traders and native chiefs knew the commercial value of Hawaiian sandalwood as an export item. Before the introduction of Hawaiian sandalwood into the Canton market, most of the wood sold in China was white sandalwood (*Santalum album*), which was imported from India and the East Indies. Around the end of the 18th century, the supply of this Asian white sandalwood was becoming insufficient to meet market demands in China. This shortage resulted in an increasing market value of acceptable sandalwood from a variety of source areas, including Hawai‘i. As the islands emerged as a major source of raw material, the remote archipelago soon became known in China as “Tahn Heung Sahn” or “the Sandalwood Mountains” (Kepler 1983). The great burden of harvesting the sandalwood necessary to pay for the debts Kamehameha I (and many other chiefs) had incurred was principally laid upon the common Hawaiian people. The King “ordered men to go out in the mountains to cut sandalwood,” and then to transport this heavy harvest “...to the landings” (Kuykendall 1938). In an interview with Shad Kane, he points out that many of those sandalwood trees came from the *ahupua‘a* of Honouliuli.

8.2 Aquaculture, Marine and Fresh Water Resources

Within Honouliuli Ahupua‘a, not only is there a 12-mile-long coastline fronting the normally calm waters of leeward O‘ahu, but there are also four miles of waterfront along the west side of the West Loch of Pearl Harbor that offered extensive fisheries (mullet, *awa*, shellfish) as well as frontage suitable for development of fishponds and salt pans. In an interview with Arlene Eaton in May 2008, she described the coastal areas of Honouliuli and West Loch as rich *limu* (seaweed) gathering places. She says many types of *limu* could be harvested in the shallow waters off the ‘Ewa coastline, including the popular *limu kohu* and *limu manauea* or *ogo*. These

two types of *limu* are commonly use in *poke*, a local Hawaiian raw-fish dish that is a favorite delicacy for many island residents.

Mrs. Eaton also described the coastal landscape of the ‘Ewa plains as filled with numerous saltpans. She says some saltpans were as far inland as a mile to two miles. Salt harvesting was one of Honouliuli Ahupua‘a’s most important resource-gathering activities. Mrs. Eaton remembers as a child, whaling ships would dock at Pearl Harbor and the shipmen would come to Honouliuli and take the salt from the saltpans. She mentioned that when they left for their ship, the saltpans would all be destroyed and the salt gone.

Historic accounts of a Mr. Harry von Holt (Superintendent of the O.R. & L Ranch Department in the 1890s) describe his efforts to find water in the foothills of the Wai‘anae Range. Part of this search led to the description of the Pālehua Trail, along which were noted several small fresh-water springs that doubtless were known to local Native Hawaiians at that time. One or more of these small springs may have been located in the project area.

8.3 Historic Properties

As described in Section 3, there are numerous sites in Honouliuli Ahupua‘a of historic and cultural significance. The most famous of these sites is Pearl Harbor, which borders Honouliuli Ahupua‘a to the west. Mrs. Arlene Eaton, who was raised on the shores of Pearl Harbor in Pu‘uloa, recalled the events of December 7th, 1941 when the Japanese attacked Pearl Harbor. She and her family took shelter in one of the many sinkholes located throughout the ‘Ewa plains landscape. From a cave along the shores of west Pearl Harbor, they had a front row seat of the bombing of Pearl Harbor by the Japanese.

In Section 3 (Figure 11, Place names of Honouliuli, adapted from Sterling and Summers 1978), several *heiau* existed in the *ahupua‘a* of Honouliuli. Many of these *heiau* have been destroyed. Pālehua Heiau, located above Pu’u Makakilo, remains preserved and cared for until this day. Cared for by Nā Koa o Pālehua (The Warriors of Pālehua), the *heiau* continues to represent a significant cultural resource to many Hawaiian cultural practitioners. Pālehua literally translates to “*lehua* flower enclosure”(Pukui et al. 1974). Kawika McKeague, Vice Chair of the OIBC, gives an alternate meaning: “I disagree with Pukui; I don’t believe it’s only meaning is the *lehua* enclosure; I see two other words prominent- *pale* and *hua*, the idea that this place is where the *hua* is protected or perhaps in another meaning one is protected by *hua*, by jealousy.” According to the hawaiiwarrior.com website, *lehua* is another term for warrior based on a Chief’s lament after a battle. The *lehua* blossom is bright red and after one battle the field was covered with fallen warriors. The Chief reflected, poetically, on the bloody battlefield as fallen lehua. Pālehua may have been a training ground for warriors, “warrior enclosure.”

8.4 Burials

The coral plains of ‘Ewa have been the focus of more than 50 archaeological studies over the last two decades. The Kalaeloa (Barbers Point) area is one of the most studied places in Polynesia. There are three available studies on the Ko‘Olina project area on the west side of Honouliuli (Davis et al. 1986a; Davis et al. 1986b; Davis and Haun 1987). These studies documented approximately 180 component features at 48 sites and site complexes consisting of

habitation sites, gardening areas, and human burials dating from pre-Contact and early historic times.

No burials were documented at Kalo‘i Gulch during the recent archaeological inventory survey of the project area by CSH. In an interview with Keone Nunes, he believes Kaupe‘a—referring to the entire southwestern portion of Honouliuli, but specifically those portions along the coast—may contain many Hawaiian burials. Kaupe‘a is known as *“ao kuewa,”* a place of purgatory, barren and desolate; a place where the souls would wander around the Wiliwili trees.

8.5 Trails

There are several different references to trails in relation to the current project area. John Papa ‘Ī‘ī’s (1959) well-known descriptions of a network of leeward O‘ahu trails (see Figure 12) has been discussed above (see Section 3.3 Pre-Contact and Early History). ‘Ī‘ī described in general terms several major trail systems that in later historic times encircled and crossed the entire islands. One of these major trails passed from West Loch (western side of Pu‘uloa, or Pearl Harbor) through the Honouliuli lowlands—relatively close to the subject project area and in the general vicinity of the H-1 highway, past Pu‘u Kapolei and onto the Wai‘anae coast, eventually circumscribing the entire shoreline of O‘ahu (‘Ī‘ī 1959:96-98).

Another trail, possibly known as the Pālehua Trail, oriented roughly northwest by southeast and traversing the middle of the project area, appears to date from historic (late 19th century) times, and perhaps represents an earlier pre-Contact Hawaiian trail. Historic accounts of a Mr. Harry von Holt (Superintendent of the O.R. & L Ranch Department in the 1890s) describe his efforts to find water in the foothills of the Wai‘anae Range. Part of this search led to the description of the Pālehua Trail, along which were noted several small fresh-water springs that doubtless were known to local Native Hawaiians at that time.

Finally, several participants described an ancient Hawaiian trail within the project area (see Figure 24) that runs from the bottom of Kalo‘i Gulch up towards the connection point of Makakilo Drive. The trail runs adjacent to the proposed project route below the Wai‘anae side ridgeline of Kalo‘i Gulch. Part of the trail has been destroyed in previous development projects. The remaining portion is a major concern for community members we interviewed. Mr. Shad Kane talked specifically about the cultural and historic significance of this trail, as well as the imminent danger the trail is in due to the proposed project:

> The thing in my mind that’s most important is that Hawaiian Trail. Because this is it, this is the end of it. We actually have given it away for past projects for people to have beautiful homes. There’s only one piece of the trail left. It’s right there where Makakilo Drive ends. So, hopefully they don’t destroy what’s left. The scary part is that the Makakilo Drive extension will have to cross over the gulch to get to the ridge. This crossing will be right over the trail. You can actually still see the trail. It’s dry season now so you can see the trail easier. This Hawaiian trail is higher up on the ridge. So the trail is very close to their proposed routes for Makakilo Drive. The biggest impact that I see is going to be on the trail.

8.6 Wahipana

The term *wahipana* translates literally as “legendary” or “storied place,” and, as demonstrated in Sections 3.1 (Mythological and Traditional Accounts) and 3.2 (Legends and Traditional Places in Upland Honouliuli), Honouliuli Ahupua‘a is home to numerous such accounts. This subsection briefly reiterates several of the most relevant *wahipana* directly associated with the subject project area.

Honouliuli Ahupua‘a is well known for ghost sightings and spooky stories. Several of the participants in the community consultation phase of this project spoke of direct, personal experiences with such phenomena, as well as *mo‘olelo* handed down from others, including their *kūpuna.* It is striking how many different people have different stories or legends to tell about ghost sightings and spooky occurrences in and around the project area and the rest of Honouliuli.

Kaupe’a, an area located in the southwestern portion of Honouliuli Ahupua‘a, is an important part of this rich oral history related to ghostly sighting and happenings. Kaupe‘a has been referred to as “*ao kuewa*” or a “barren or desolate place” for the island of O’ahu. Individuals who were unsuccessful in *leina ka ‘uhane* (leap into afterlife) due to disrespect to his or her *‘aumakua* (family deities) or parents, were banned to dwell at *ao kuewa*, a place in limbo between the living and the afterlife. In a Christian sense there are three places in the afterlife, heaven, hell and limbo or purgatory. From a Hawaiian cultural perspective, purgatory is similar to *ao kuewa,* and Honouliuli is such a place.

Related also to this culturally-shared belief in Honouliuli’s ghostly tradition are *mo‘olelo* dealing with Huaka‘i Pō (Procession of the Night Marchers), a widespread traditional belief about processions or parades of spirits that typically travel down ridgelines from the mountains to the sea, which is the earthly entrance to *pō* (the “otherworld”). One of the participants for this study, Mr. Alaka‘i, spoke about a personal encounter with the “night marchers” in the Kalo‘i area:

> I am speaking from personal experience. You know right where the bridge is where they are hooking up the North/South Road [to the H1 Freeway], I was coming home with my family at night. It was raining. I was driving in the extreme right lane. When I got to the bridge, a coral leaped about this big [his hands indicating the size of a basketball], came flying from the side of the road and hit my car, my front tire. But my car never shake, never do nothing…just kept on going. And when I got home, I turned on all the lights and I crawled underneath the car…I look what’s going on? Is there anything? You know the jeep in the back of me in this lane [indicating the left lane], when the thing hit, the coral went all over the road. And the Jeep in the back went slow down and then he kind of kept his distance till I got home. The next morning, in the papers, had one *wahine* [woman] coming home…hit that bridge…right there…die. So there’s something there. Right on that bridge, in that path, that’s where the rock came from…right in that area. So there’s something there. And you know, you can just look at…in this area, if you look at the highway, there’s certain spots on the highway has real high fatality rates.

Closer to the specific area of the proposed project, Kalo‘i, which translates as “the taro patch,” was a well-known place of Native Hawaiian activity from before the historic era, and represents another important *wahipana.* Given the physiographic location and characteristics of the project area, it is unlikely to have ever been a place of permanent Hawaiian settlement; however, the presence of several small fresh-water springs in the general gulch system, as described in historic accounts, suggests Hawaiians used at least portions of the project area as gardening sites.

Finally, as discussed in some detail above (see Section 8.1.5 Trails), the project area is home to one or more old trails that also constitute important *wahipana* to many Native Hawaiians.

Section 9 Summary and Recommendations

At the request of R. M. Towill Corporation, Cultural Surveys Hawai‘i, Inc. (CSH) prepared this Cultural Impact Assessment (CIA) for the approximately 23-acre Makakilo Drive Extension Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu (TMK [1] 9-2-002: 006 & 9-2-003:079). The project area is approximately 3,300 feet long by 300 feet wide, extending from the end of the existing Makakilo Drive to the proposed North-South Road interchange with Interstate H-1.

Currently three alignment options have been identified by the project proponents; one of these will eventually be selected, in consultation with the community and relevant government agencies. The project area is privately owned by D.R. Horton – Schuler Homes LLC, Castle & Cooke Homes Hawaii, Inc. Minimally, land-disturbing activities will include grubbing and grading and excavations for subsurface utilities and associated infrastructure improvements. This CIA is intended to support the project’s environmental review, in accordance with applicable laws, and may also serve to support the project’s historic preservation review.

A recent archaeological inventory survey of the subject project area by CSH (Tulchin et al. 2008) identified two previously-undocumented historic sites: State Inventory of Historic Properties (SIHP) Nos. 50-80-12-6950, a drainage ditch associated with the historic-era commercial sugar cane industry; and 50-80-12-6951, a small reservoir associated with the historic-era commercial sugar cane industry. In addition to these historic properties, two newly-identified features associated with the previously documented SIHP No. 50-80-09-2268 (Waiāhole Ditch System) were also recorded.

9.1 Results of background Research

Background research yields the following relevant information:

1. The project area is located in the Kalo’i Gulch floodplain, which includes the Kalo‘i Stream channel. Kalo‘i, which translates as “the taro patch,” was a well-known place of Native Hawaiian activity from before the historic era. Given the physiographic location and characteristics of the project area, it is unlikely to have ever been a place of permanent Hawaiian settlement; however, the presence of several small fresh-water springs in the general gulch system, as described in historic accounts, suggests Hawaiians used at least portions of the project area as gardening sites.
2. The project area also contains remnants of one or more old Hawaiian trails.
3. Given its location within Honouliuli Ahupua‘a, the project area is generally associated with a wide variety and extensive number of *mo‘olelo* (oral histories), including legends, mythological accounts, stories, parables and sayings; these include, for example, the exploits of gods and demi-gods such as Kāne, Kanaloa, Māui, Kamapua‘a (the pig god), Maunauna (the shark deity), Ka‘ahupāhau, and the hero Palila. There are several references associated with Honouliuli to chiefly lineages and to the ruling chiefs Hilo-a-Lakapu and Kūali‘i.

4. The project area is also closely associated with commercial sugar cane agriculture on O‘ahu; in particular, the project area retains archaeological features related to water-management and transport facilities, including the famous Waiāhole Ditch.

9.2 Results of Community Consultation

A total of 23 individuals were contacted for this CIA; 14 did not respond; four provided referrals to other individuals; and five participated in formal “talk story” interviews. Community consultation yielded the following cultural concerns:

1. Several participants are very concerned about one or more trails crossing through the subject project area; at least one of the trails is perceived to be an old Hawaiian trail dating from early historic or perhaps even pre-Contact times. Mr. Shad Kane, in particular, stressed that this trail—part of which is depicted in Figure 23—should not be sacrificed or physically compromised to make way for the proposed project.
2. Several participants talked about a wide variety of “ghost stories” and unexplained phenomena either experienced personally or related by others in old stories dealing with the general vicinity of the project area, and extending to much of the entire *ahupua‘a* of Honouliuli.
3. Some participants stressed the importance of not losing any additional Hawaiian features of the landscape, such as trails, to development in and around the project area, which has experienced substantial losses in historic and more recent times.
4. One participant talked about the cultural significance of *wiliwili* trees, which are closely associated with “*ao kuewa*,” a kind of Hawaiian purgatory.

9.3 Recommendations

Based on all available information, including background research and community consultation, CSH recommends the following measures, which, if addressed in a good faith manner, will help mitigate potentially adverse effects of the proposed project:

1. The old Hawaiian trail depicted in Figure 24 of this report, and described by several participants in this CIA, should be preserved in its entirely and protected from potential harm during project construction. Preservation and protection of this trail may require a formal preservation plan with additional fieldwork directed towards obtaining accurate GPS data to adequately mark and flag the feature during construction.
2. All Native Hawaiian trees, including *wiliwili* and *‘iliahi* (sandalwood) should be preserved within the project area in perpetuity, and protected from harm during construction.
3. Cultural monitoring of the two aforementioned items (i.e., trail and native tree protection) should be conducted by qualified and interested individuals or organizations such as the participants in the “talk story” interviews included above.

4. Consultation with the organizations, agencies and individuals listed in this CIA should continue throughout the project, including any future alterations or updated proposals.

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APPENDIX G

Noise Study, D.L. Adams, October 2008

D. L. ADAMS ASSOCIATES, LTD.
Consultants in Acoustics and Performing Arts Technologies

Environmental Noise Assessment Report
Makakilo Drive Extension
Ewa, Oahu, Hawaii

October 2008

DLAA Project No. 08-48

Prepared for:
R.M. Towill Corporation
Honolulu, Hawaii

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1.0 EXECUTIVE SUMMARY

1.1 The Makakilo Drive Extension project proposes to extend Makakilo Drive south (makai) and connect to the H-1 Freeway interchange. The completed project will connect east Makakilo Drive to the H-1 Freeway and the future North/South Road. The existing project site is undeveloped land with vegetation. Makakilo Drive currently dead ends in the newly developed Wai Kalo'i residential neighborhood in Makakilo Heights, makai of Pueonani Street.

1.2 The project area currently experiences noise levels typical of a suburban/rural environment. Noise measurements taken on the existing project property show an average day-night level, L_{dn}, of 50 dBA. These noise levels are well within the threshold of the EPA and HUD exterior noise design goal of $L_{dn} \leq 65$ dBA. Ambient noise levels near the project site will increase with the extension, but will still be within the current EPA and HUD exterior noise design goals.

1.3 During the project construction, the dominant noise sources will likely be earth moving equipment, such as bulldozers and diesel powered trucks. Noise from construction activities will occur on the project site. Noise from construction activities should be short term and must comply with State of Hawaii Community Noise Control Rules and a construction noise permit issued by the Department of Health.

1.4 The results of the vehicular traffic noise analysis show increases in traffic noise levels due to the project for the residents who live adjacent to Makakilo Drive east of Kikaha Street. Since this increase does not substantially exceed existing traffic noise levels and future predicted noise levels are below the FHWA/HDOT maximum noise limit of 67 dBA, the project is not expected to produce a significant traffic noise impact on these residences.

1.5 Makakilo Drive Extension project is expected to ease the traffic burden along (west) Makakilo Drive. Therefore, residences along (west) Makakilo Drive (Location C) should experience decreased vehicular traffic noise levels due to the project.

1.6 Noise levels in the vicinity of the extended Makakilo Drive are expected to increase by a significant amount but will still meet the current EPA design goal as well as the HUD noise criteria for "Acceptable" housing sites.

2.0 PROJECT DESCRIPTION

The Makakilo Drive Extension project proposes to extend Makakilo Drive south (makai) and connect to the H-1 Freeway interchange. The completed project will connect east Makakilo Drive to the H-1 Freeway and the future North/South Road. The existing project site is undeveloped land with vegetation. Makakilo Drive currently dead ends in the newly developed Wai Kalo'i residential neighborhood in Makakilo Heights, makai of Pueonani Street.

3.0 NOISE STANDARDS

Various local and federal agencies have established guidelines and standards for assessing environmental noise impacts and set noise limits as a function of land use. A brief description of common acoustic terminology used in these guidelines and standards is presented in Appendix A.

3.1 State of Hawaii, Community Noise Control

The State of Hawaii Community Noise Control Rule [Reference 1] defines three classes of zoning districts and specifies corresponding maximum permissible sound levels due to *stationary* noise sources such as air-conditioning units, exhaust systems, generators, compressors, pumps, etc. The Community Noise Control Rule does not address most *moving* sources, such as vehicular traffic noise, air traffic noise, or rail traffic noise. However, the Community Noise Control Rule does regulate noise related to agricultural, construction, and industrial activities, which may not be stationary.

The maximum permissible noise levels are enforced by the State Department of Health (DOH) for any location at or beyond the property line and shall not be exceeded for more than 10% of the time during any 20-minute period. The specified noise limits which apply are a function of the zoning and time of day as shown in Figure 1. With respect to mixed zoning districts, the rule specifies that the primary land use designation shall be used to determine the applicable zoning district class and the maximum permissible sound level. In determining the maximum permissible sound level, the background noise level is taken into account by the DOH.

3.2 U.S. Federal Highway Administration (FHWA)

The FHWA defines four land use categories and assigns corresponding maximum hourly equivalent sound levels, $L_{eq(h)}$, for traffic noise exposure [Reference 2], which are listed in Figure 2. For example, Category B, defined as picnic and recreation areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals, has a corresponding maximum exterior L_{eq} of 67dBA and a maximum interior L_{eq} of 52 dBA. These limits are viewed as design goals, and all projects meeting these limits are deemed in conformance with FHWA noise standards. Calculation of traffic noise levels should be conducted using a Federal Highway Administration traffic noise model [Reference 3].

3.3 Hawaii Department of Transportation (HDOT)

The HDOT has adopted FHWA's design goals for traffic noise exposure in its noise analysis and abatement policy [Reference 4]. According to the policy, a traffic noise impact occurs when the predicted traffic noise levels "approach" or exceed FHWA's design goals or when the predicted traffic noise levels "substantially exceed the existing noise levels." The policy also states that "approach" means at least 1 dB less than FHWA's design goals and "substantially exceed the existing noise levels" means an increase of at least 15 dB.

3.4 U.S. Environmental Protection Agency (EPA)

The U.S. EPA has identified a range of yearly day-night equivalent sound levels, L_{dn}, sufficient to protect public health and welfare from the effects of environmental noise [Reference 5]. The EPA has established a goal to reduce exterior environmental noise to an L_{dn} not exceeding 65 dBA and a future goal to further reduce exterior environmental noise to an L_{dn} not exceeding 55 dBA. The EPA has also identified an interior noise level goal of 45 dBA to protect public health from indoor activity interference and annoyance. Additionally, the EPA states that these goals are not intended as regulations as it has no authority to regulate noise levels, but rather they are intended to be viewed as levels below which the general population will not be at risk from any of the identified effects of noise.

3.5 U.S. Department of Housing and Urban Development (HUD)

HUD's environmental noise criteria and standards in 24 CFR 51 [Reference 6] were established for determining housing project site acceptability. These standards are based on day-night equivalent sound levels, L_{dn}, and are not limited to traffic noise exposure. However, for project sites in the vicinity of highways, the L_{dn} may be estimated to be equal to the design hour $L_{eq}(h)$, provided "heavy trucks (vehicles with three or more axles) do not exceed 10 percent of the total traffic flow in vehicles per 24 hours and the traffic flow between 10:00 p.m. and 7:00 a.m. does not exceed 15 percent of the average daily traffic flow in vehicles per 24 hours." For these same conditions, L_{dn}, may also be estimated as 3 dB less than the design hour L_{10}.

HUD site acceptability criteria rank sites as Acceptable, Normally Unacceptable, or Unacceptable. "Acceptable" sites are those where exterior noise levels do not exceed an L_{dn} of 65 dBA. Proposed housing projects on "Acceptable" sites do not require additional noise attenuation other than that provided by customary building techniques. "Normally Unacceptable" sites are those where the L_{dn} is above 65 dBA, but does not exceed 75 dBA. Housing on "Normally Unacceptable" sites requires some form of noise abatement, either at the property line or in the building construction, to ensure the interior noise levels are acceptable. "Unacceptable" sites are those where the L_{dn} is 75 dBA or higher. The term "Unacceptable" does not necessarily mean that housing cannot be built on those sites; however, more elaborate sound attenuation will likely be needed.

HUD's regulations do not contain standards for interior noise levels, rather attenuation requirement to achieve a goal of 45 dBA. This assumes that standard construction of any building will provide sufficient attenuation such that if the exterior L_{dn} is 65 dBA or less (i.e., an "acceptable site"), the interior L_{dn} will be 45 dBA or less.

4.0 EXISTING ACOUSTICAL ENVIRONMENT

Two types of noise measurements were conducted to assess the existing acoustical environment in the vicinity of the project location, as shown in Figure 3. The first noise measurement type consisted of continuous long-term ambient noise level measurements (Location L1). The second type of noise measurement was short-term and included traffic counts (Location S1). The purpose of the short-term noise measurements and corresponding traffic counts were to validate a traffic noise prediction model. All noise measurements were conducted between October 3, 2008 and October 6, 2008.

4.1 Noise Measurement Procedure

Long-Term Noise Measurement Procedure

Continuous, hourly averaged, statistical sound levels were recorded for 3 days. The measurements were taken using a Larson-Davis Laboratories, Model 820, Type-1 Sound Level Meter together with a Larson-Davis, Model 2560 Type-1 Microphone. Calibration was checked before and after the measurements with a Larson-Davis Model CAL200 calibrator. Both the sound level meter and the calibrator have been certified by the manufacturer within the recommended calibration period. The microphone was mounted on a fence, approximately 5 feet above grade. A windscreen covered the microphone during the entire measurement period. The sound level meter was secured in a weather resistant case.

Short-Term Noise Measurement Procedure

An approximate 30-minute equivalent sound level, L_{eq}, was measured. Vehicular traffic counts and traffic mix were documented during the measurement period. The noise measurement was taken using a Larson-Davis Laboratories, Model 824, Type-1 Sound Level Meter together with a Larson-Davis, Model 2541 Type-1 Microphone. Calibration was checked before and after the measurements with a Larson-Davis Model CAL200 calibrator. Both the sound level meter and the calibrator have been certified by the manufacturer within the recommended calibration period. The microphone and sound level meter were mounted on a tripod, approximately 5 feet above grade. A windscreen covered the microphone during the entire measurement period.

4.2 Noise Measurement Locations

Long-Term Noise Measurement Location

Location L1: Positioned along the boundary fence of the Wai Kalo'i at Makakilo residential development near the terminus of the existing Makakilo Drive.

Short-Term Noise Measurement Locations

Location S1: Positioned adjacent to Makakilo Drive, between Kikaha Street and Alahoi Street, approximately 40 feet southwest of the edge-of-pavement.

4.3 Long-Term Noise Measurement Results

The measured ambient sound levels are representative of a quiet suburban/rural environment. The hourly equivalent sound levels, $L_{eq,}$ at Location L1 generally range from 42 to 52 dBA during the day. At night, noise levels drop off and the hourly L_{eq} ranges from 40 to 47 dBA. The average day-night Level, L_{dn}, was calculated from the measured noise levels to be 50 dBA.

The results from the long-term noise measurement are graphically presented in Figure 4, which shows the measured equivalent sound level, L_{eq}, in A-weighted decibels (dBA) as a function of the measurement date and time. Construction activities may have occurred in the vicinity of the measurement location during the noise measurement period

The dominant and secondary noise sources are described below:

Noise Sources

Dominant: Birds, wind

Secondary: Traffic noise from the distant H-1 Freeway, typical suburban noises such as dogs barking, sirens, pedestrians, aircraft flyovers, distant construction noise, etc.

5.0 POTENTIAL NOISE IMPACTS DUE TO THE PROJECT

5.1 Project Construction Noise

Development of the project area will involve excavation, drilling, grading, paving, and other typical construction activities during construction. The various construction phases of the project may generate significant amounts of noise. The residences located near the existing Makakilo Drive terminus may be impacted by the construction noise due to their proximity to the project. The actual noise levels produced during construction will be a function of the methods employed during each stage of the construction process. Typical ranges of construction equipment noise are shown in Figure 5. Earthmoving equipment, e.g., bulldozers and diesel-powered trucks, and drilling rigs will probably be the loudest equipment used during construction.

5.2 Compliance with FHWA/HDOT Noise Limits

A vehicular traffic noise analysis was completed for the existing conditions and the future year (2025) projections using the FHWA Traffic Noise Model Look-up Tables Software Version 2.5 (2004) [Reference 7]. The traffic noise analysis is based on the traffic counts taken along the existing Makakilo Drive and future traffic volumes at the Makakilo Drive/North-South Road/H-1 Freeway

interchange provided by the Traffic Consultant [Reference 8]. This traffic impact analysis report shows predicted traffic volumes for the year 2025 at the North-South Road/H-1 interchange only and did not include existing and future traffic volumes for the existing Makakilo Drive in upper Makakilo. Vehicular traffic noise levels were calculated for 2 locations (Locations A and B) along Makakilo Drive, as shown in Figure 3. The results of the traffic noise analysis are described below and summarized in Table 1.

Noise Prediction Location A:
The extension of Makakilo Drive will provide a continuation of the existing roadway down to the H-1 Freeway interchange and will change the traffic patterns for the residents of Makakilo. Currently, the only access in and out of Makakilo and Makakilo Heights is via (west) Makakilo Drive. The Makakilo Drive extension to the east will provide an alternate route for the existing and future residents of Makakilo Heights and will be the shortest route to the H-1 Freeway and North-South Road for those residents. Therefore, traffic volumes will significantly increase for the residents who live adjacent to Makakilo Drive east of Kikaha Street. Future noise level projections for the existing homes along Makakilo Drive (Location A) are predicted to be below the FHWA/HDOT maximum noise limit of 67 dBA and residences are expected to experience a traffic noise level increase of approximately 6 dB due to the project. Since this increase does not substantially exceed existing traffic noise levels, a noise impact on these existing residences due to vehicular traffic noise is not expected.

Noise Prediction Location B:
A vehicular traffic noise analysis was also completed for the existing and future year projections (with and without the project) at the existing (west) Makakilo Drive. Existing and future traffic volumes for the west Makakilo Drive/H-1 interchange were provided in a separate traffic impact analysis report [Reference 9]. The traffic report shows that the Makakilo Drive Extension project will ease the traffic burden along (west) Makakilo Drive when compared to year 2025 traffic projects without the project. Therefore, residences along (west) Makakilo Drive (Location C) are expected to experience a traffic noise level *decrease* of approximately 2 dB due to the project.

Future Homes along Makakilo Drive:
The future Wai Kalo'i homes located near the terminus of Makakilo Drive currently experience low ambient noise levels due to the lack of major roadways in the area. Once the Makakilo Drive extension is complete, vehicular traffic noise will increase the ambient noise in the area. The traffic noise analysis shows that traffic noise from the future Makakilo Drive extension should be less than 15 dB over existing ambient noise levels at these homes. Therefore, a significant noise impact on these future residences due to vehicular traffic noise is not expected. New homes should be built at least 25 feet from the edge-of-pavement from new road to avoid a noise impact due to traffic noise.

The Makakilo Drive Extension project is a county road, not funded by Federal or State agencies. Therefore, compliance with FHWA and HDOT noise limits is not

required. However, the FHWA/HDOT standards provide a good guide for evaluating noise impacts due to the new road.

5.3 Compliance with HUD and EPA Noise Guidelines

The HUD noise guidelines state an exterior design goal of $L_{dn} \leq 65$. Similarly, the EPA has an existing design goal of $L_{dn} \leq 65$ dBA and a future design goal $L_{dn} \leq 55$ dBA for exterior noise levels. The results from the long-term noise measurements conducted at the proposed project site show a calculated day-night level, L_{dn}, of 50 dBA. Noise levels in the vicinity of the extended roadway are expected to increase significantly but will still meet the current EPA design goal as well as the HUD noise criteria for "Acceptable" housing sites.

It is important to note that the EPA noise guidelines are design goals and are not enforceable regulations. However, these guidelines and design goals are useful tools for assessing the noise environment.

6.0 NOISE IMPACT MITIGATION

6.1 Mitigation of Construction Noise

In cases where construction noise exceeds, or is expected to exceed the State's "maximum permissible" property line noise levels [Reference 1], a permit must be obtained from the State DOH to allow the operation of vehicles, cranes, construction equipment, power tools, etc., which emit noise levels in excess of the "maximum permissible" levels.

In order for the State DOH to issue a construction noise permit, the Contractor must submit a noise permit application to the DOH, which describes the construction activities for the project. Prior to issuing the noise permit, the State DOH may require action by the Contractor to incorporate noise mitigation into the construction plan. The DOH may also require the Contractor to conduct noise monitoring or community meetings inviting the neighboring residents and business owners to discuss construction noise. The Contractor should use reasonable and standard practices to mitigate noise, such as using mufflers on diesel and gasoline engine machines, using properly tuned and balanced machines, etc. However, the State DOH may require additional noise mitigation, such as temporary noise barriers, or time of day usage limits for certain kinds of construction activities.

Specific permit restrictions for construction activities [Reference 1] are:

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

"No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels... before 9:00 a.m. and after 6:00 p.m. on Saturday."

"No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels on Sundays and on holidays."

The use of hoe rams and jack hammers 25 lbs. or larger, high pressure sprayers, chain saws, and pile drivers are restricted to 9:00 a.m. to 5:30 p.m., Monday through Friday. In addition, construction equipment and on-site vehicles or devices whose operations involve the exhausting of gas or air, excluding pile hammers and pneumatic hand tools weighing less than 15 pounds, must be equipped with mufflers [Reference 1].

The DOH noise permit does not limit the noise level generated at the construction site, but rather the times at which noisy construction can take place. Therefore, noise mitigation for construction activities should be addressed using project management, such that the time restrictions within the DOH permit are followed.

6.2 Mitigation of Vehicular Traffic Noise

The traffic noise analysis shows no significant noise impacts to the project or the surrounding community. Therefore, noise mitigation for vehicular traffic noise is not required.

REFERENCES

1. Chapter 46, *Community Noise Control*, Department of Health, State of Hawaii, Administrative Rules, Title 11, September 23, 1996.

2. *Department of Transportation, Federal Highway Administration Procedures for Abatement of Highway Traffic Noise*, Title 23, CFR, Chapter 1, Subchapter J, Part 772, 38 FR 15953, June 19, 1973; Revised at 47 FR 29654, July 8, 1982.

3. *Federal Highway Administration's Traffic Noise Model*, FHWA-RD-77-108; U.S. Department of Transportation, December 1978.

4. *Noise Analysis and Abatement Policy*, Department of Transportation, Highways Division, State of Hawaii, June 1977.

5. *Toward a National Strategy for Noise Control*, U.S. Environmental Protection Agency, April 1977.

6. *Department of Housing and Urban Development Environmental Criteria and Standards*, Title 24 CFR, Part 51, 44 FR 40860, July 12, 1979, Amended by 49 FR 880, January 6, 1984.

7. Federal Highway Administration's Traffic Noise Model Look-up Tables Software, Ver. 2.5; U.S. Department of Transportation, December 17, 2004.

8. *Traffic Projections for Makakilo Drive Extension Memorandum,* Julian Ng, Inc., October, 2008.

9. *North-South Road Corridor Study – Final Interstate Access Modification Request,* Parsons Brinckerhoff Quade & Douglas, Inc., December 2004.

TABLE 1:
Predicted Traffic Noise Levels and Resulting Increases Due to the Project[+]

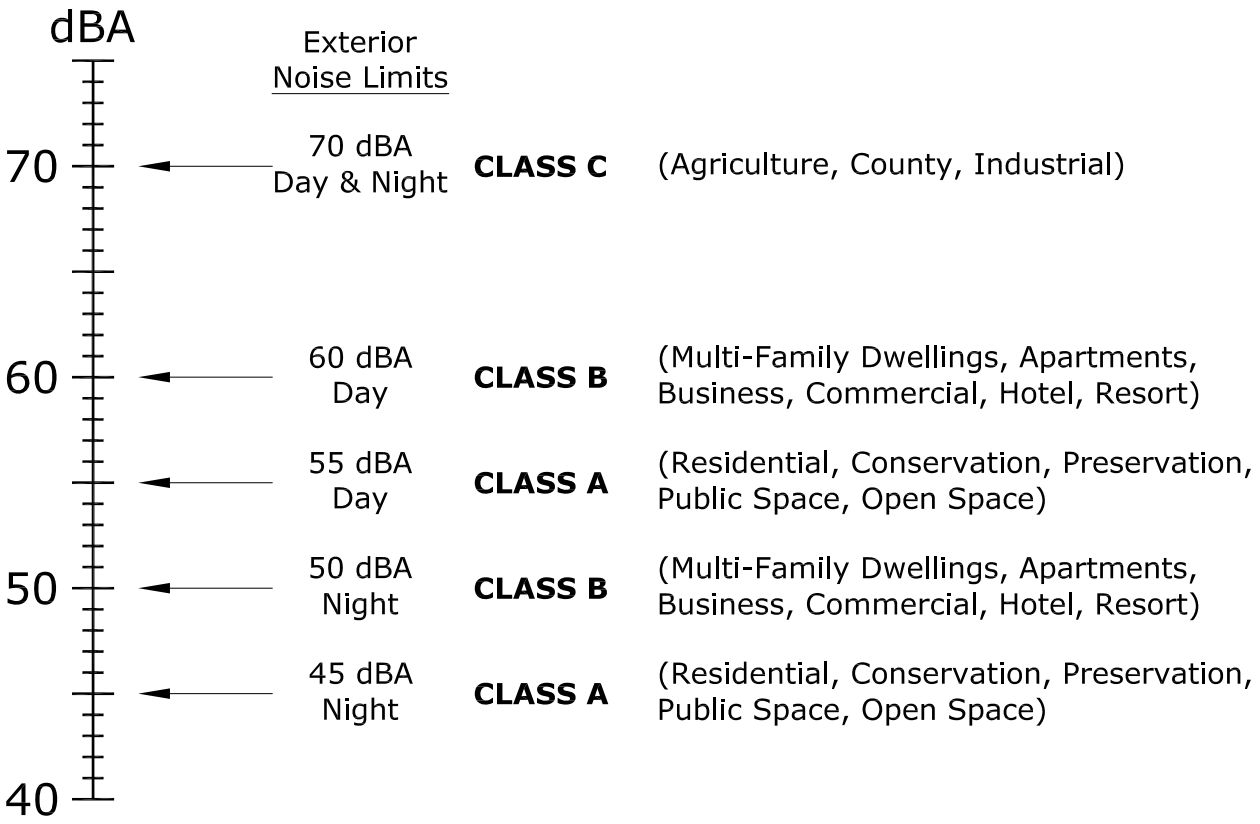
Noise levels shown in the table are based on peak-hour traffic volumes, and are expressed in A-weighted decibels (dBA).

	Location A[*]		Location B[*]	
	AM	**PM**	**AM**	**PM**
Existing (Calculated)	58.2	58.3	65.6	65.8
Future Without Project (2025)	N/A	N/A	68.2	67.5
Future With Project (2025)	64.2	64.5	66.3	65.3
Future Increase Without Project (2025)	N/A	N/A	2.6	1.7
Future Increase With Project (2025)	6.0	6.2	0.7	-0.5
Future Increase Due to Project (2025)	**6.0**	**6.2**	**-1.9**	**-2.2**

[+] The noise level calculations were based on the traffic studies provided for this project [References 8 & 9].

[*] Location A - 25 feet north of (East) Makakilo Drive edge-of-pavement
Location B – 25 feet north east of (West) Makakilo Drive edge of pavement

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



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Hawaii Maximum Permissible Sound Levels for Various Zoning Districts

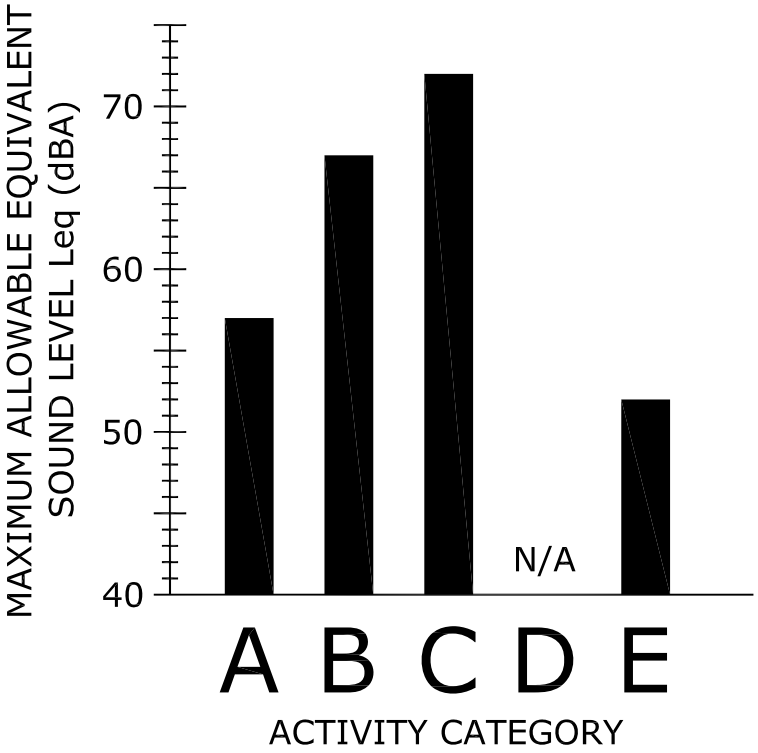
Makakilo Drive Extension

Not to Scale

Figure No 1

Date	Project No.	Drawn By
October 2008	08-48	TRB

ACTIVITY CATEGORY	ACTIVITY CATEGORY DESCRIPTION	MAXIMUM EQUIVALENT SOUND LEVEL $L_{eq(h)}$
A	LANDS ON WHICH SERENITY AND QUIET ARE OF EXTRAORDINARY SIGNIFICANCE AND SERVE AN IMPORTANT PUBLIC NEED AND WHERE THE PRESERVATION OF THOSE QUALITIES IS ESSENTIAL IF THE AREA IS TO CONTINUE TO SERVE ITS INTENDED PURPOSE.	57 dBA (EXTERIOR)
B	PICNIC AREAS, RECREATION AREAS, PLAYGROUNDS, ACTIVE SPORT AREAS, PARKS, RESIDENCES, MOTELS, HOTELS, SCHOOLS, CHURCHES, LIBRARIES, AND HOSPITALS.	67 dBA (EXTERIOR)
C	DEVELOPED LANDS, PROPERTIES, OR ACTIVITIES NOT INCLUDED IN ACTIVITY CATEGORIES A OR B ABOVE.	72 dBA (EXTERIOR)
D	UNDEVELOPED LAND	N/A
E	RESIDENCES, MOTELS, HOTELS, PUBLIC MEETING ROOMS, SCHOOLS, CHURCHES, LIBRARIES, HOSPITALS, AND AUDITORIUMS.	52 dBA (INTERIOR)



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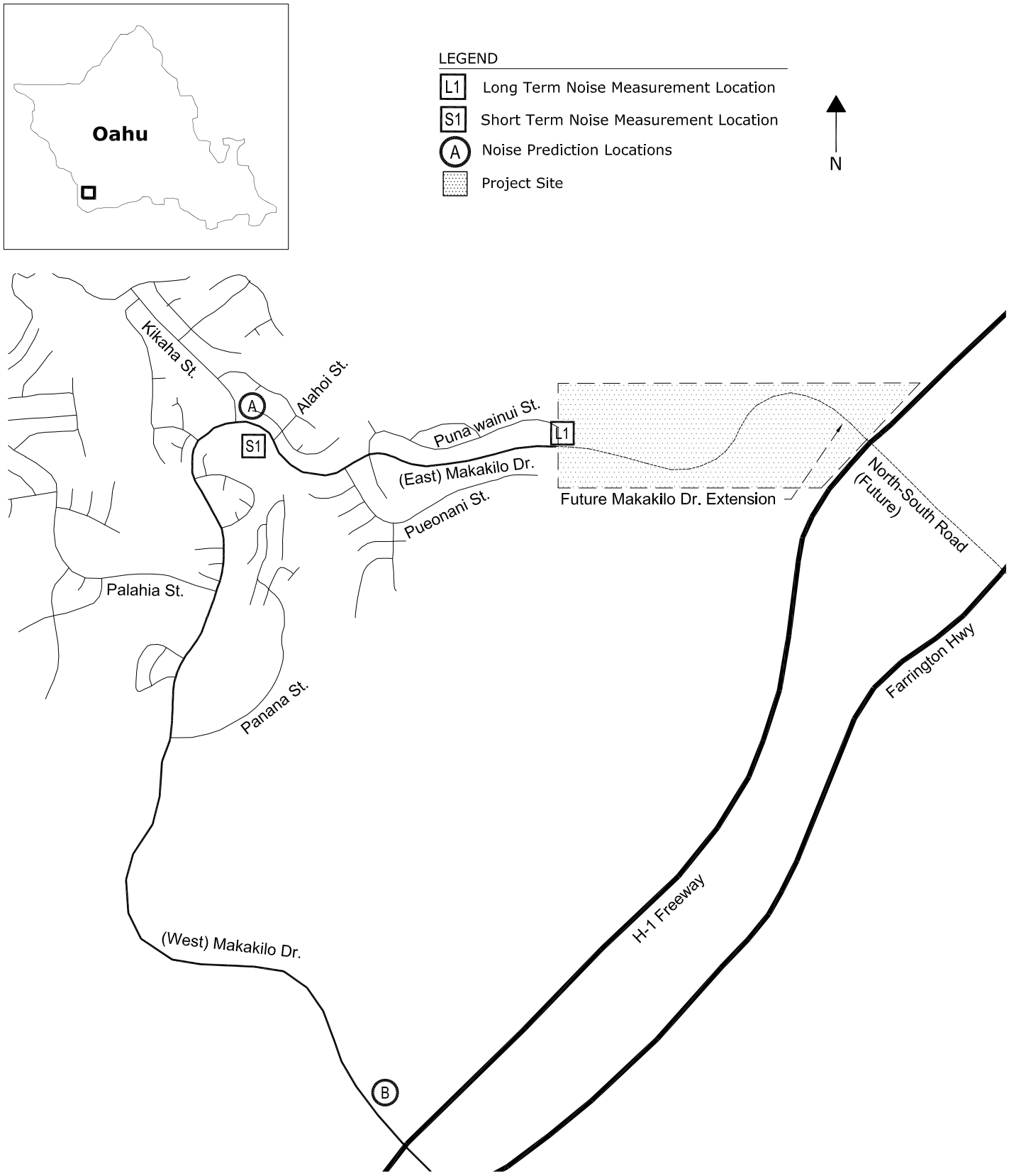
Federal Highways Administration Recommended Equivalent Hourly Sound Levels Based on Land Use

Makakilo Drive Extension

Not to Scale

Figure No 2

Date	Project No.	Drawn By
October 2008	08-48	TRB



Noise Measurement and Prediction Locations

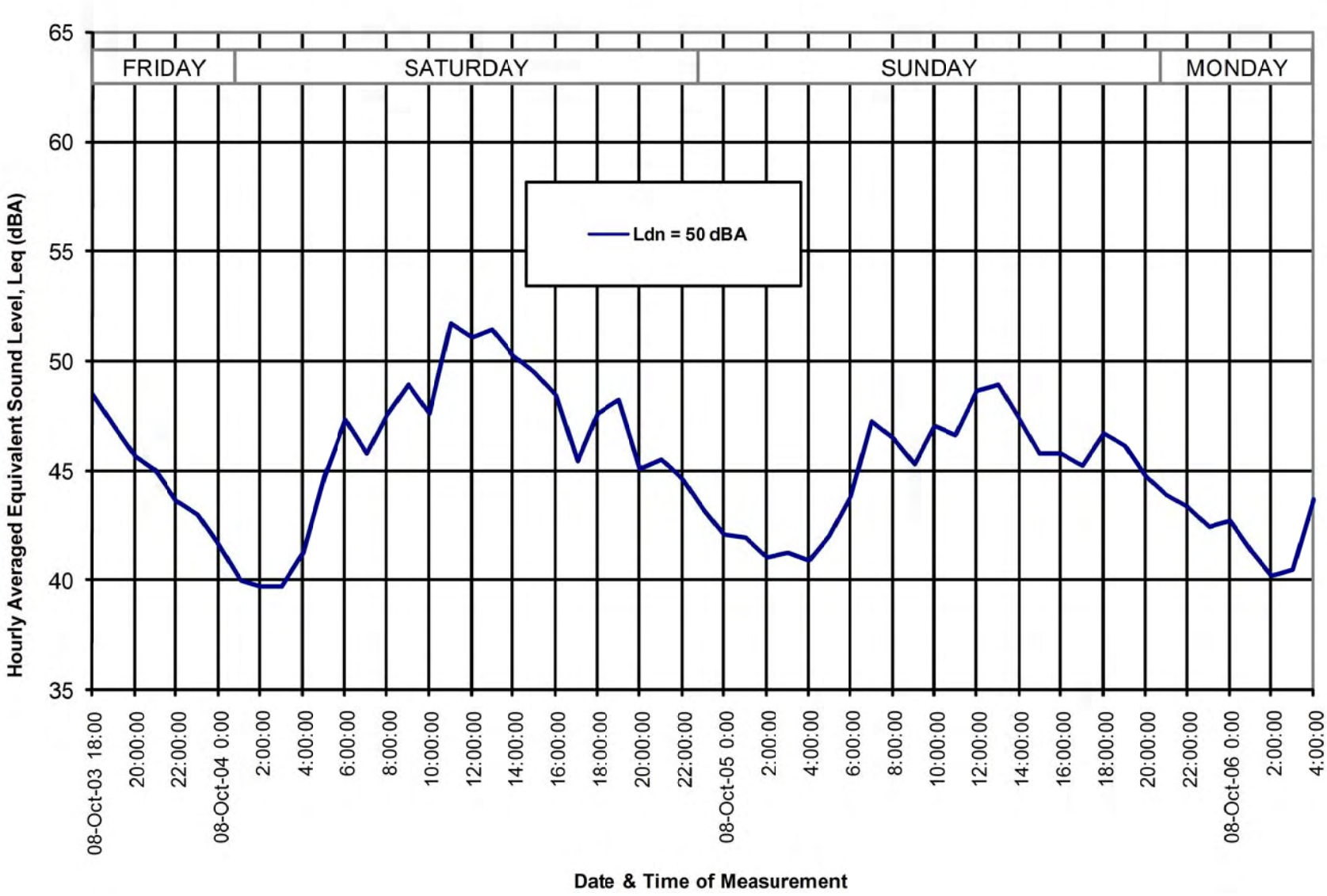
Makakilo Drive Extension

Not to Scale

Figure No 3

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Date	Project No.	Drawn By
October 2008	08-48	KMF



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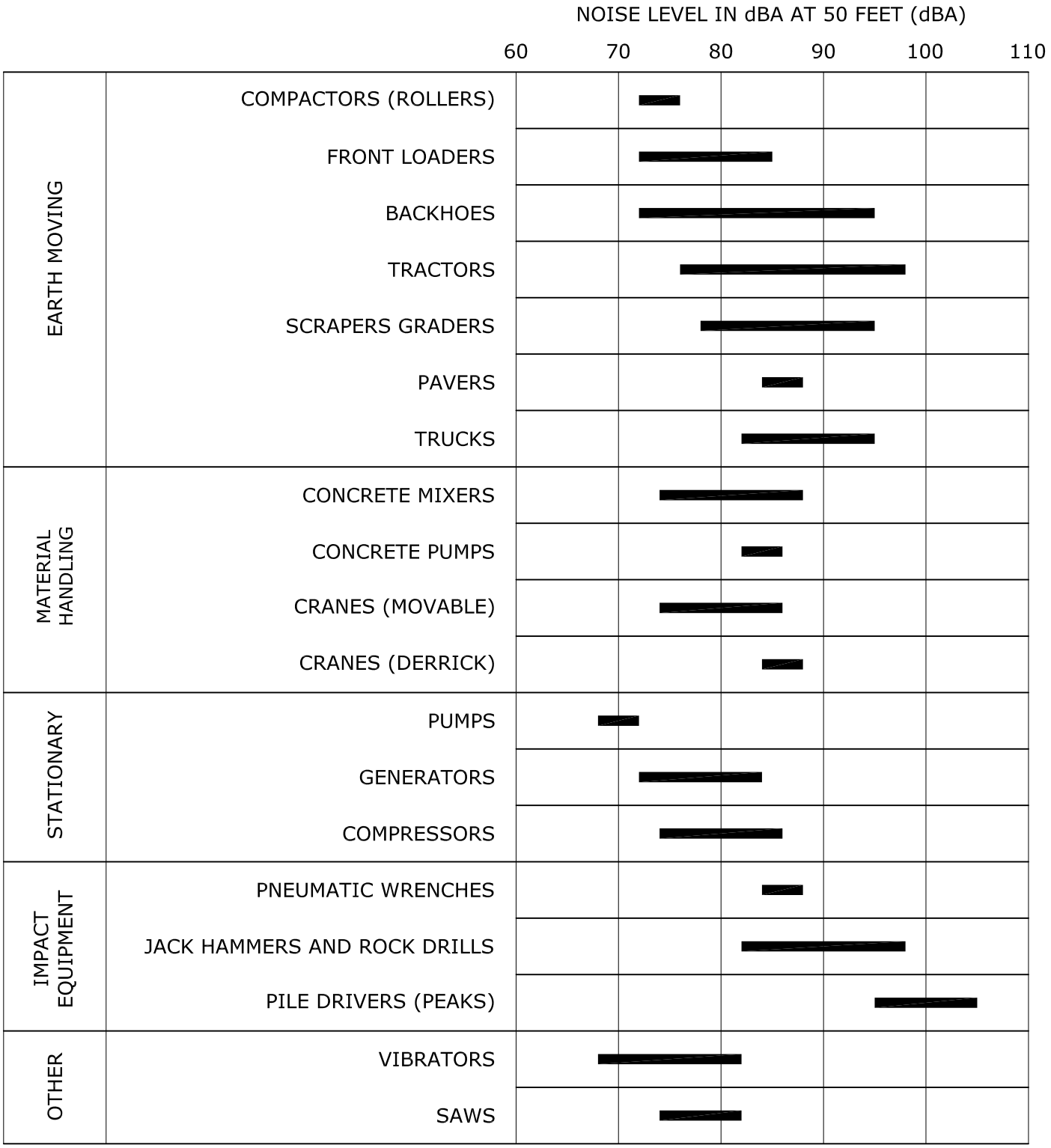
Graph of Long Term Noise Measurements

Makakilo Drive Extension

Not to Scale

Date	Project No.	Drawn By
October 2008	08-48	KMF

Figure No
4



NOTE: BASED ON LIMITED AVAILABLE DATA SAMPLES

Typical Sound Levels from Construction Equipment

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Makakilo Drive

Not to Scale

Date	Project No.	Drawn By
October 2008	08-048	TRB

Figure No 5

APPENDIX A

Acoustic Terminology

Acoustic Terminology

Sound Pressure Level

Sound, or noise, is the term given to variations in air pressure that are capable of being detected by the human ear. Small fluctuations in atmospheric pressure (sound pressure) constitute the physical property measured with a sound pressure level meter. Because the human ear can detect variations in atmospheric pressure over such a large range of magnitudes, sound pressure is expressed on a logarithmic scale in units called decibels (dB). Noise is defined as "unwanted" sound.

Technically, sound pressure level (SPL) is defined as:

$$SPL = 20 \log (P/P_{ref}) \text{ dB}$$

where P is the sound pressure fluctuation (above or below atmospheric pressure) and P_{ref} is the reference pressure, 20 μPa, which is approximately the lowest sound pressure that can be detected by the human ear. For example:

If P = 20 μPa, then SPL = 0 dB
If P = 200 μPa, then SPL = 20 dB
If P = 2000 μPa, then SPL = 40 dB

The sound pressure level that results from a combination of noise sources is not the arithmetic sum of the individual sound sources, but rather the logarithmic sum. For example, two sound levels of 50 dB produce a combined sound level of 53 dB, not 100 dB. Two sound levels of 40 and 50 dB produce a combined level of 50.4 dB.

Human sensitivity to changes in sound pressure level is highly individualized. Sensitivity to sound depends on frequency content, time of occurrence, duration, and psychological factors such as emotions and expectations. However, in general, a change of 1 or 2 dB in the level of sound is difficult for most people to detect. A 3 dB change is commonly taken as the smallest perceptible change and a 6 dB change corresponds to a noticeable change in loudness. A 10 dB increase or decrease in sound level corresponds to an approximate doubling or halving of loudness, respectively.

A-Weighted Sound Level

Studies have shown conclusively that at equal sound pressure levels, people are generally more sensitive to certain higher frequency sounds (such as made by speech, horns, and whistles) than most lower frequency sounds (such as made by motors and engines)[1] at the same level. To address this preferential response to frequency, the A-weighted scale was developed. The A-weighted scale adjusts the sound level in each frequency band in much the same manner that the

[1] D.W. Robinson and R.S. Dadson, "A Re-Determination of the Equal-Loudness Relations for Pure Tones," *British Journal of Applied Physics*, vol. 7, pp. 166 - 181, 1956. (Adopted by the International Standards Organization as Recommendation R-226.

human auditory system does. Thus the A-weighted sound level (read as "dBA") becomes a single number that defines the level of a sound and has some correlation with the sensitivity of the human ear to that sound. Different sounds with the same A-weighted sound level are perceived as being equally loud. The A-weighted noise level is commonly used today in environmental noise analysis and in noise regulations. Typical values of the A-weighted sound level of various noise sources are shown in Figure A-1.

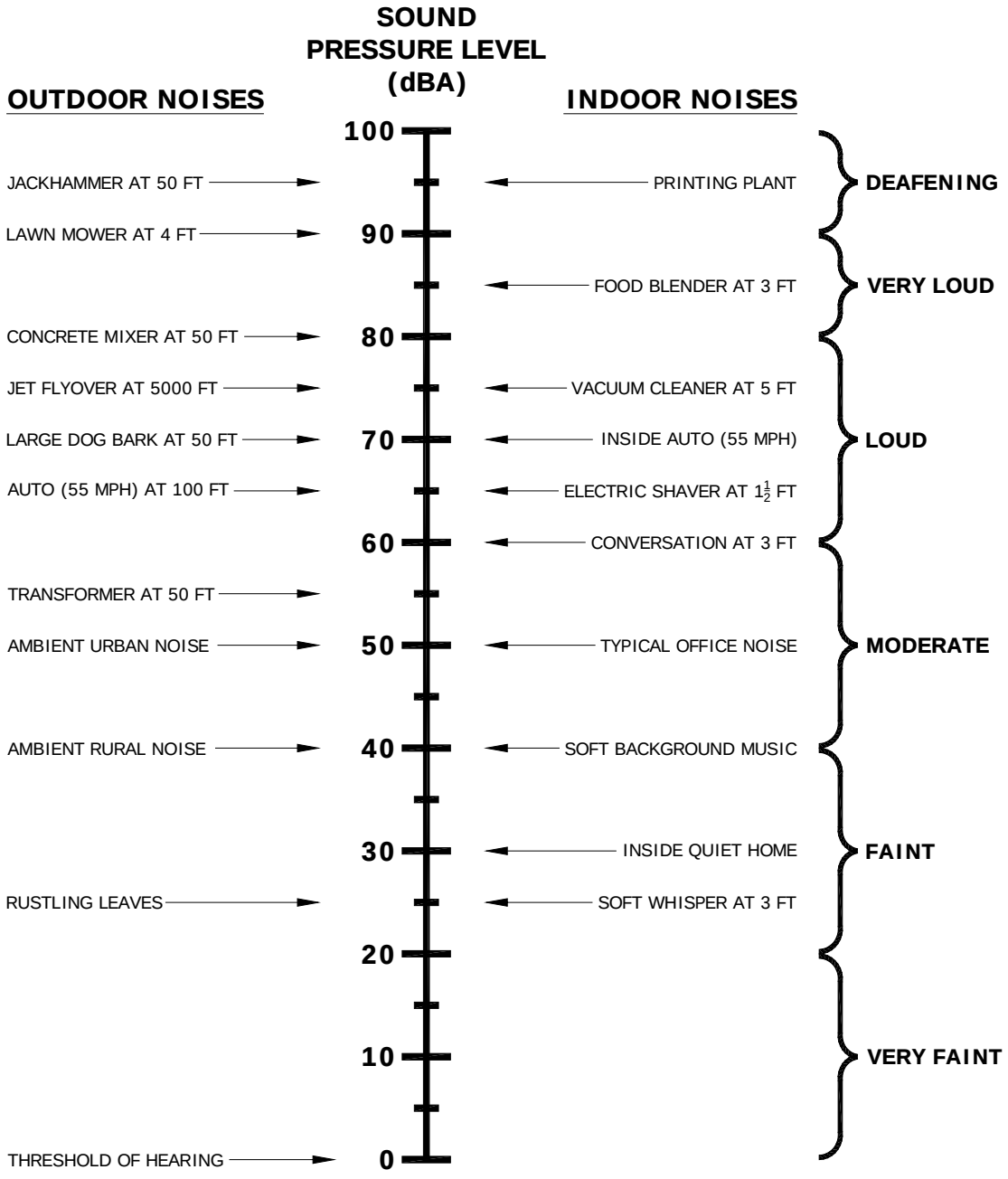


Figure A-1. Common Outdoor/Indoor Sound Levels

Equivalent Sound Level

The Equivalent Sound Level (L_{eq}) is a type of average which represents the steady level that, integrated over a time period, would produce the same energy as the actual signal. The actual *instantaneous* noise levels typically fluctuate above and below the measured L_{eq} during the measurement period. The A-weighted L_{eq} is a common index for measuring environmental noise. A graphical description of the equivalent sound level is shown in Figure A-2.

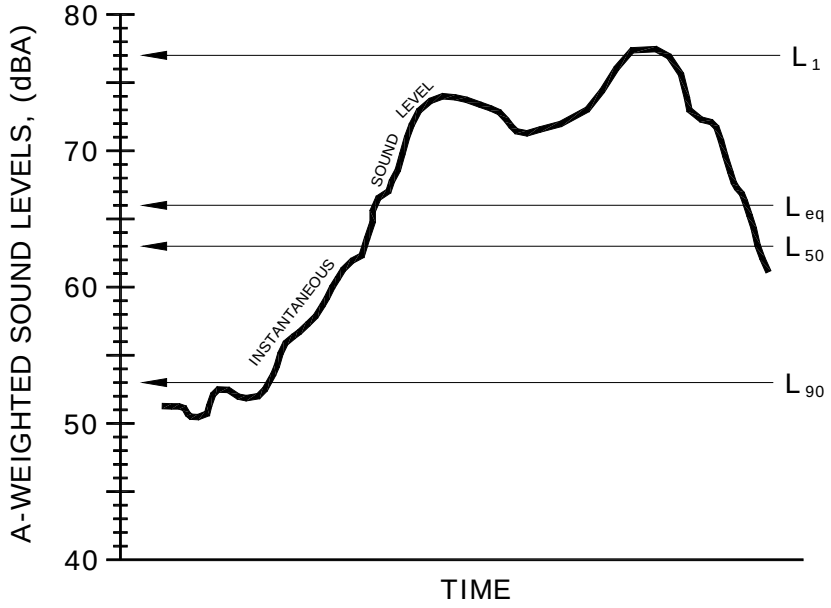


Figure A-2. Example Graph of Equivalent and Statistical Sound Levels

Statistical Sound Level

The sound levels of long-term noise producing activities such as traffic movement, aircraft operations, etc., can vary considerably with time. In order to obtain a single number rating of such a noise source, a statistically-based method of expressing sound or noise levels has been developed. It is known as the Exceedence Level, L_n. The L_n represents the sound level that is exceeded for n% of the measurement time period. For example, L_{10} = 60 dBA indicates that for the duration of the measurement period, the sound level exceeded 60 dBA 10% of the time. Typically, in noise regulations and standards, the specified time period is one hour. Commonly used Exceedence Levels include L_{01}, L_{10}, L_{50}, and L_{90}, which are widely used to assess community and environmental noise. A graphical description of the equivalent sound level is shown in Figure A-2.

Day-Night Equivalent Sound Level

The Day-Night Equivalent Sound Level, L_{dn}, is the Equivalent Sound Level, L_{eq}, measured over a 24-hour period. However, a 10 dB penalty is added to the noise levels recorded between 10 p.m. and 7 a.m. to account for people's higher sensitivity to noise at night when the background noise level is typically lower. The L_{dn} is a commonly used noise descriptor in assessing land use compatibility, and is widely used by federal and local agencies and standards organizations.

APPENDIX H

Social Impact Assessment, October 2008

SOCIO-ECONOMIC ASSESSMENT

MAKAKILO DRIVE EXTENSION PROJECT

(Makakilo Drive to North-South Road Interchange)

'Ewa, O'ahu

October 2008

Department of Transportation Services

City and County of Honolulu

R.M. Towill Corporation

Honolulu, Hawai'i

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SOCIO-ECONOMIC ASSESSMENT
MAKAKILO DRIVE EXTENSION PROJECT
(Makakilo Drive to North-South Road Interchange)
ʻEwa, Oʻahu
October 2008

A. INTRODUCTION

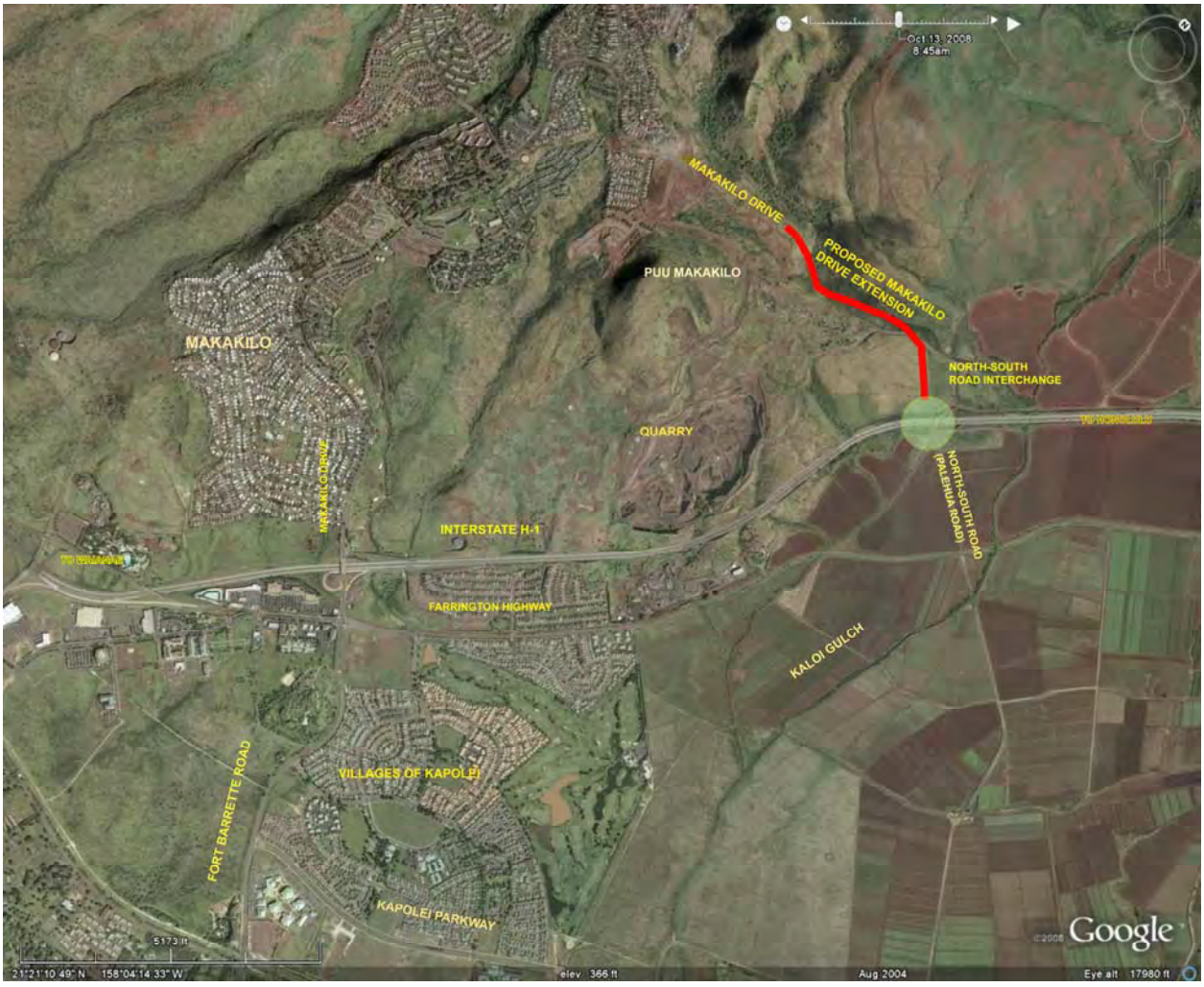
The Department of Transportation Services (DTS), City and County of Honolulu, proposes the development of a 4-lane, median separated roadway that connects the end of the existing Makakilo Drive to the proposed North-South Road interchange currently under construction. The interchange construction is scheduled for completion by Fall 2009. The Makakilo Drive extension, however, will not be completed to 2014. The proposed roadway will provide an alternative means for existing Makakilo residents to access from and to the Interstate H-1.

The purpose of the project is to provide greater accessibility and an alternative means for commuters to access the Makakilo community and its facilities and services. The project will benefit area commuters by decreasing the volume of traffic at the Kapolei-Makakilo Interchange by diverting in-bound and out-bound traffic from the interchange. Diverting traffic at the Kapolei-Makakilo Interchange will improve the level of service at the interchange. The development of this new roadway, however, will not change the volume of traffic on Interstate H-1. This project further implements the ʻEwa Development Plan and the Oʻahu Metropolitan Planning Organization (OMPO) Oʻahu Regional Transportation Plan (ORTP).

B. PROJECT LOCATION

The Makakilo Drive Extension Project area is located in the ʻEwa District of the Island of Oʻahu. The roadway extension project proposes to connect the existing Makakilo Drive with the North-South Road Interchange at Interstate H-1 (see Figure 1, Location Map). The portion of the roadway within the Makakilo Community starts at the recently completed Castle and Cooke Homes Hawaiʻi subdivision. The Interstate H-1 connection is at the new North-South Road Interchange.

Figure 1. Project Location Map



E. PROJECT DESCRIPTION

The preferred alignment of the project is shown in Figure 1. The roadway is approximately 4,300 feet long and includes a 700 feet elevated (bridge) section at the connection with Makakilo Drive. The roadway cross-section is 78 feet and is shown in Figure 2, Typical Section. The roadway will feature a 4-lane median separated travelways with sidewalks, bike lanes, streetlights, and a landscaping strip.

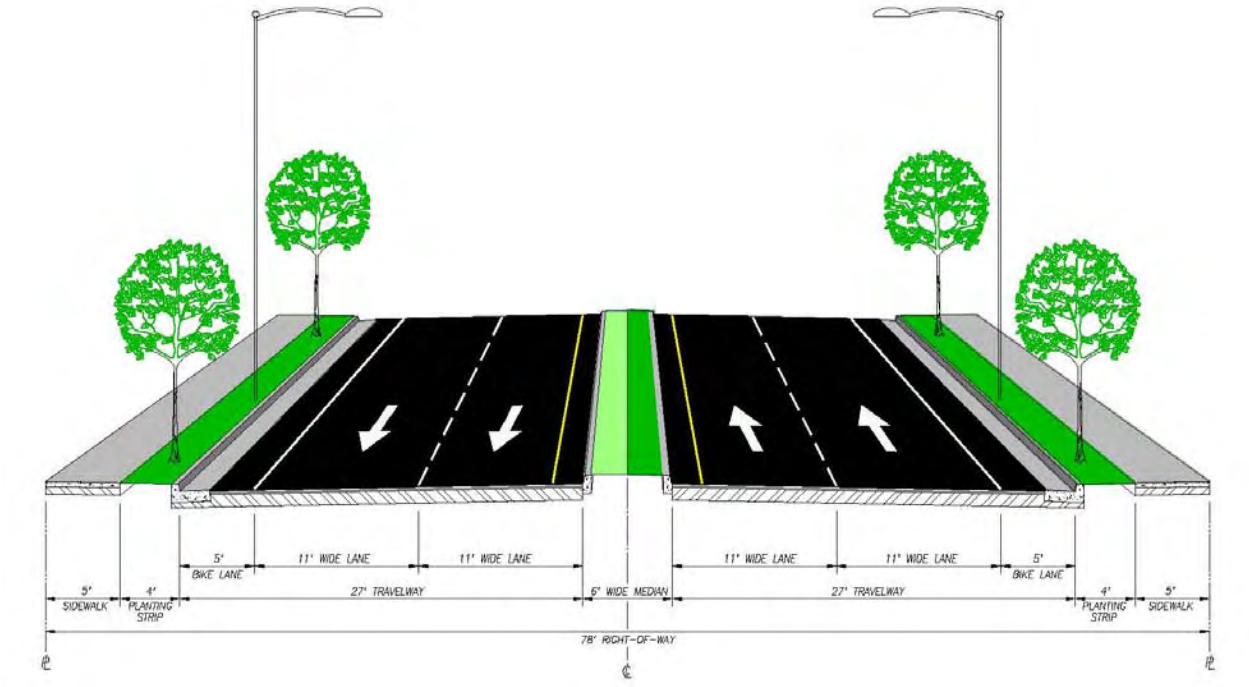


Figure 2. Typical Road Section

D. COMMUNITY OVERVIEW

The ʻEwa area was designated to be the second growth center on Oʻahu. The Oʻahu General Plan (2002, amended) designated the area as Oʻahu's second city. Planning for the area is shown in Figure 3, ʻEwa Development Plan (may 2000, revised), below. The ʻEwa plan includes the major populated areas of Makakilo, Kapolei, ʻEwa and ʻEwa Beach, and Honokai Hale. The development district also includes all of Kalealoa and Campbell Industrial Park. It is anticipated that approximately 13% or Oʻahu's population will reside in this region.

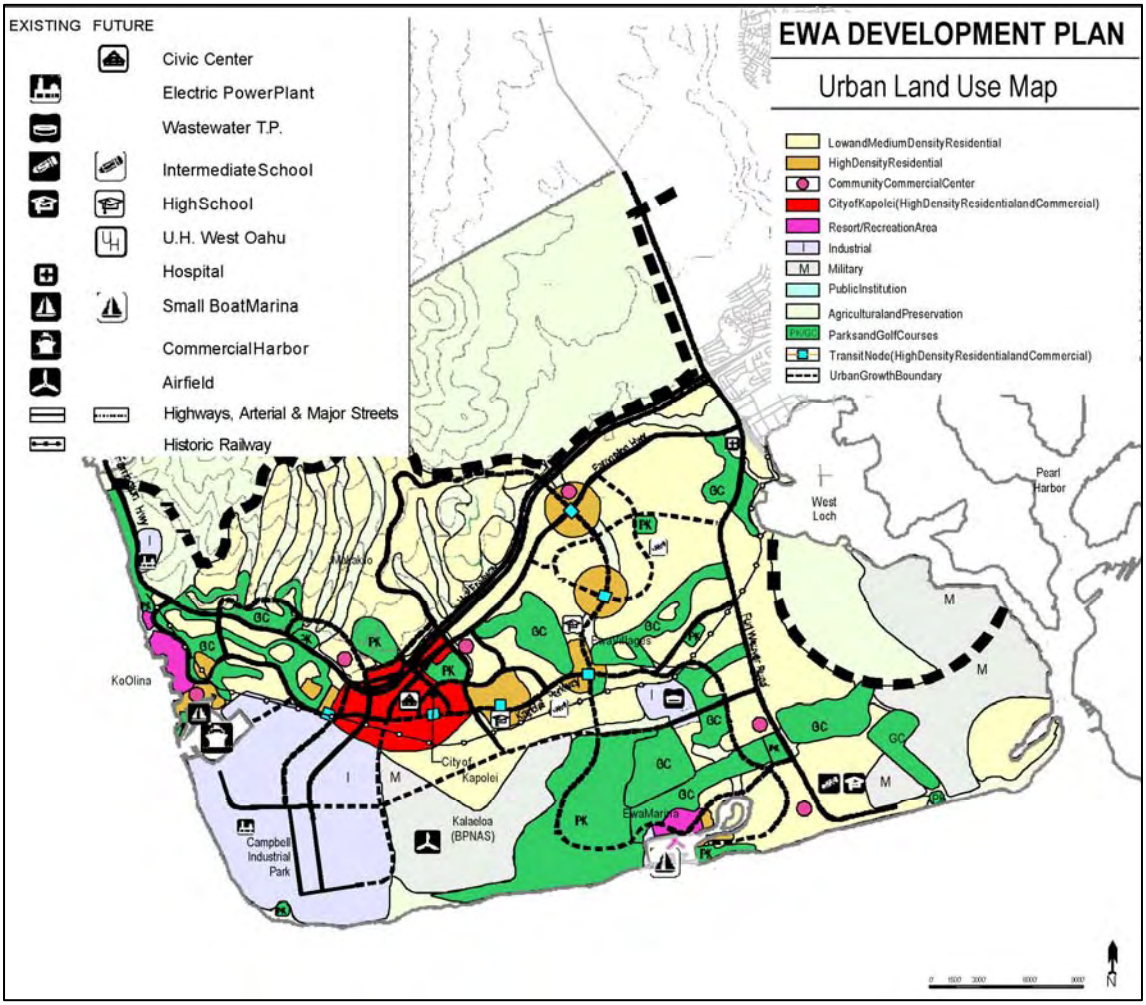
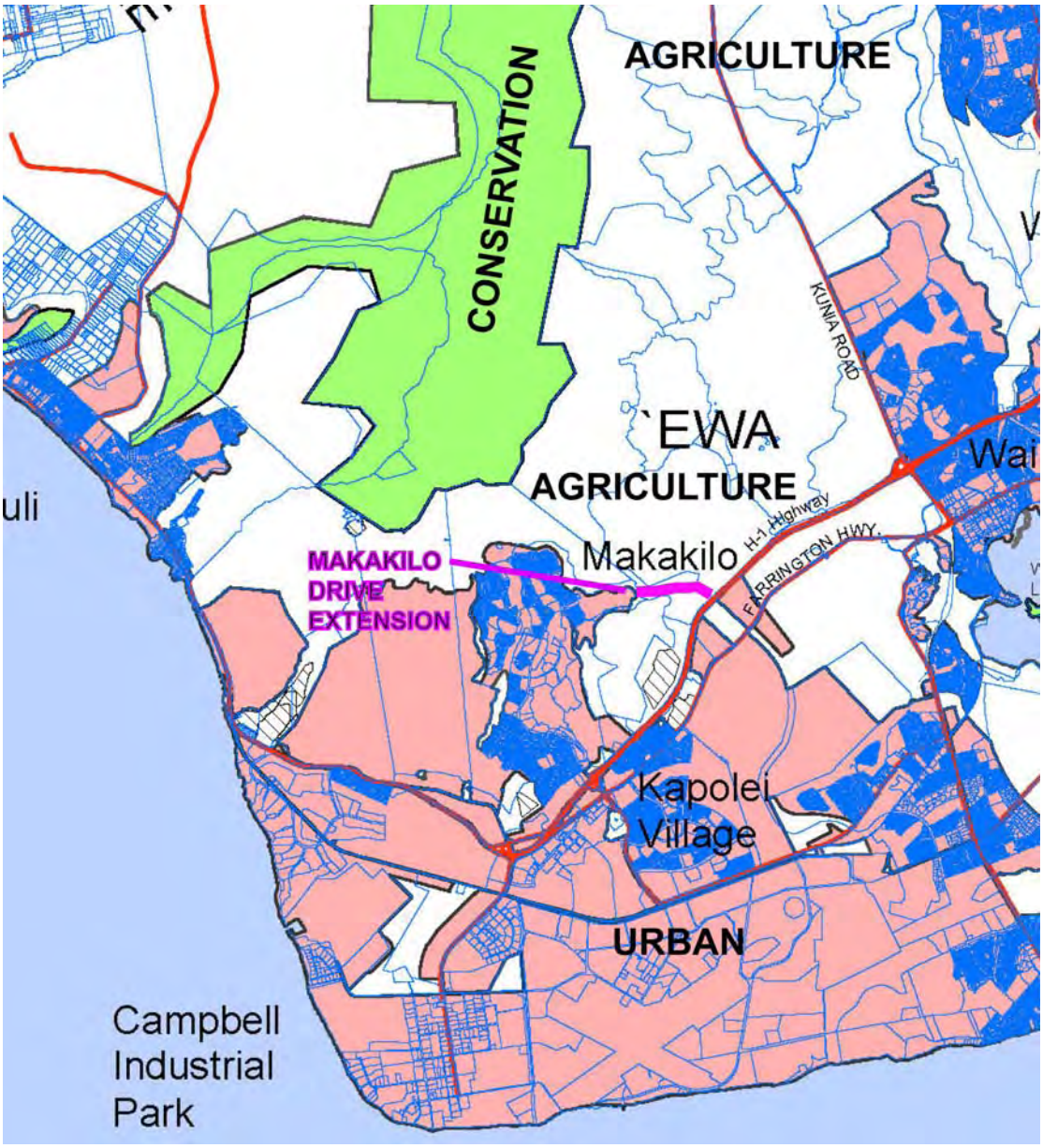


Figure 3. ʻEwa Development Plan, Land Use Map (May 2000)

D. STATE LAND USE

Chapter 205, Hawai'i Revised Statutes (HRS), relating to the Land Use Commission, establishes the four (4) major land use districts in which all lands in the State are placed: Urban, Rural, Agricultural, and Conservation. Criteria for these land use designations are cited below. The proposed roadway will traverse land that is designated as Agriculture (see Figure 23). The proposed roadway plan does not require changing



existing State Land Use designations as the current State land use designations are compatible and allowed with the current land use designations.

E. GENERAL PLAN (2002, amended)

The proposed roadway conforms to the following objectives and policies of the Honolulu General Plan in the following areas: Population, Natural Environment, Transportation and Utilities, and Physical Development and Urban Design. Applicable policies and objectives are discussed below.

1. Population: Objective C

To establish a pattern of population distribution that will allow the people of Oahu to live and work in harmony.

Policy 1. *Facilitate the full development of the primary urban center.*

Policy 2. *Encourage development within the secondary urban center at Kapolei and the Ewa and Central Oahu urban-fringe areas to relieve developmental pressures in the remaining urban-fringe and rural areas and to meet housing needs not readily provided in the primary urban center.*

Policy 3. *Manage physical growth and development in the urban-fringe and rural areas so that:*

a. An undesirable spreading of development is prevented; and

b. Their population densities are consistent with the character of development and environmental qualities desired for such areas.

Policy 4 (Amended, Resolution 02-205, CD1). *Direct growth according to Policies 1, 2, and 3 above by providing land development capacity and needed infrastructure to seek a 2025 distribution of Oahu's residential population as follows:*

Table 1

Distribution of Residential Population – ISLANDWIDE (O'ahu General Plan, 2002)

LOCATION POPULATION	% SHARE OF 2025
Primary Urban Center	46.0%
'Ewa	13.0%
Central O'ahu	17.0%
East Honolulu	5.3%
Koolaupoko	11.6%
Koolauloa	1.4%
North Shore	1.7%
Waianae	4.0%
TOTAL	100.0%

2. Natural Environment:

Objective A: To protect and preserve the natural environment.

Policy 1: Protect Oahu's natural environment, especially the shoreline, valleys, and ridges, from incompatible development.

Objective B: To preserve and enhance the natural monuments and scenic views of Oahu for the benefit of both residents and visitors.

Policy 2: Protect Oahu's scenic views, especially those seen from highly developed and heavily traveled areas.

Policy 3: Locate roads, highways, and other public facilities and utilities in areas where they will least obstruct important views of the mountains and the sea.

3. Transportation & Utilities

Objective A: To create a transportation system which will enable people and goods to move safely, efficiently, and at a reasonable cost; serve all people, including the poor, the elderly, and the physically handicapped; and offer a variety of attractive and convenient modes of travel.

Policy 4: Improve transportation facilities and services in the Ewa corridor and in the trans-Ko'olau corridors to meet the needs of Ewa and Windward communities.

4 Physical Development and Urban Design

Objective C: To develop a secondary urban center in Ewa with its nucleus in the Kapolei area.

Policy 1: Allocate funds from the City and County's capital-improvement program for public projects that are needed to facilitate development of the secondary urban center at Kapolei

F. ʻEWA AND THE MAKAKILO-KAPOLEI REGION

The Makakilo community represents approximately 1.5 percent (13,322 persons) of the entire population of Oʻahu (see Table 2) in 2000; and 52.9 percent (25,158 persons) of the area represented by the Makakilo-Kapolei-Honokai Hale Neighborhood Board No. 34 in 2000.

Table 3 show that the Neighborhood Board No. 34 area having the following demographic characteristics:

- 3,946 households
- 3.37 persons per household
- 66.6 percent of the homes are owner occupied
- Race Distribution
    - White 45.2%
    - Black 4%
    - American Indian 2.3%
    - Asian 55.6%
    - Native Hawaiian 28.4%
    - Other 5.2%

Table 4 show that Neighborhood Board No. 34 area having the following characteristics:

- 3.4 % of the population is unemployed (2000)
- 89% of workers in the area commute (drive) to work
- 5.8% use public transport to commute to work
- $64,560 median household income (1999)

Table 2. Population of Counties in Hawai‘i – 1831 – 2000

Table 1.01-- POPULATION OF COUNTIES: 1831 TO 2000

Census date	Total population		City & County of Honolulu	Hawaii County	Kauai County	Maui County 2/
	Number	Percent change 1/				
1900: June 1	154,001	9.4	58,504	46,843	20,734	27,920
1910: April 15	191,874	2.2	81,993	55,382	23,952	30,547
1920: January 1	255,881	3.0	123,496	64,895	29,438	38,052
1930: April 1	368,300	3.6	202,887	73,325	35,942	56,146
1940: April 1	422,770	1.4	257,696	73,276	35,818	55,980
1950: April 1	499,794	1.7	353,020	68,350	29,905	48,519
1960: April 1	632,772	2.4	500,409	61,332	28,176	42,855
1970: April 1	769,913	2.0	630,528	63,468	29,761	46,156
1980: April 1	964,691	2.3	762,565	92,053	39,082	70,991
1990: April 1	1,108,229	1.4	836,231	120,317	51,177	100,504
2000: April 1	1,211,537	0.9	876,156	148,677	58,463	128,241

1/ Annual rate since the preceding census, based on the formula for continuous compounding.

2/ Maui County including Kalawao County.

3/ Total population also reported as 129,814.

4/ Total population also reported as 108,393 and 108,568.

Source: Robert C. Schmitt, *Historical Statistics of Hawaii* (University Press of Hawaii, 1977), pp. 11-14; U.S. Bureau of the Census, *1980 Census of Population*, PC80-1-A13 (October 1981), table 2, and *1990 Census of Population and Housing*, 1990 CPH-1-13 (August 1991), table 2; and U.S. Census Bureau, Census 2000 Redistricting Data (P.L. 94-171) Summary File (March 19, 2001).

Table 3. General Demographics Characteristics – 2000

'Ewa (Makakilo, Makaiwa Hills, and Kunia)

Subject	Number	Percent
Total Population	**13,322**	**100.0**
SEX AND AGE		
Male	6,698	50.3
Female	6,624	49.7
Under 5 years	1,137	8.5
5 - 17 years	2,922	21.9
18 - 64 years	8,452	63.4
65 years and over	811	6.1
Median age (years)	32.5	-
RACE		
One Race	9,424	70.7
White	3,216	24.1
Black or African American	337	2.5
American Indian and Alaska Native	26	0.2
Asian	4,282	32.1
Native Hawaiian and other Pacific Islander	1,361	10.2
Other	202	1.5
Two or more races	3,898	29.3
Race alone or in combination with other races:		
White	6,017	45.2
Black or African American	539	4.0
American Indian and Alaska Native	303	2.3
Asian	7,404	55.6
Native Hawaiian and other Pacific Islander	3,781	28.4
Other	737	5.5
RELATIONSHIP		
Total population	**13,322**	**100.0**
In households	13,290	99.8
Householder	3,946	29.6
Spouse	2,603	19.5
Child	4,569	34.3
Grandchild	553	4.2
Parent	195	1.5
Other relatives	702	5.3
Nonrelatives	722	5.4
In Group Quarters	32	0.2
In nursing homes	-	0.0

Subject	Number	Percent
HOUSEHOLD BY TYPE		
Total households	**3,946**	**100.0**
Family households (families)	3,268	82.8
With own children under 18 years	1,744	44.2
Married-couple family	2,603	66.0
With own children under 18 years	1,380	35.0
Female householder, no husband present	449	11.4
With own children under 18 years	244	6.2
Non-families	678	17.2
Living with nonrelatives	238	6.0
Living alone and 65 years and over	56	1.4
Households with individuals under 18 years	2,031	51.5
Households with individuals 65 years and over	598	15.2
Average persons per household	3.37	-
Average persons per family	3.76	-
Median age of householder	44.3	-
Owner	48.0	-
Renter	36.9	-
HOUSING OCCUPANCY AND TENURE		
Total Housing Units	**4,173**	**100.0**
Occupied units	3,946	94.6
By owner	2,780	66.6
By renter	1,166	27.9
Vacant units	227	5.4
Other than for sale or for rent	100	2.4
Available housing vacancy rate (%)	3.1	-
Homeowner vacancy rate (%)	1.8	-
Rental vacancy rate (%)	6.1	-
Homeownership rate (%)	70.5	-

Source: 2000 Census SF1 File; Planning Division, Honolulu Department of Planning and Permitting January 2002

Table 4. Selected Economic Characteristics – Makakilo, Kapolei, and Honokai Hale 2000

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**17,726**	**100.0**
In labor force	13,302	75.0
Civilian labor force	12,383	69.9
Employed	11,776	66.4
Unemployed	607	3.4
% of civilian labor force	4.9	-
Armed Forces	919	5.2
Not in labor force	4,424	25.0
Females 16 years and over	**8,910**	**100.0**
In labor force	6,335	71.1
Civilian labor force	6,226	69.9
Employed	5,949	66.8
Own children under 6 years	**2,645**	**100.0**
All parents in family in labor force	1,906	72.1
COMMUTING TO WORK		
Workers 16 years and over	**12,402**	**100.0**
Car, truck, or van -- drove alone	8,282	66.8
Car, truck, or van -- carpooled	2,847	23.0
Public transportation (including taxicab)	721	5.8
Walked	151	1.2
Other means	140	1.1
Worked at home	261	2.1
Mean travel time to work (minutes)[1]	35.3	-
Employed civilian population 16 years and over	**11,776**	**100.0**
OCCUPATION		
Management, professional, and related occupations	3,635	30.9
Service occupations	2,048	17.4
Sales and office occupations	3,736	31.7
Farming, fishing, and forestry occupations	23	0.2
Construction, extraction, and maintenance occupations	1,294	11.0
Production, transportation, and material moving occupations	1,038	8.8
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	58	0.5
Construction	911	7.7
Manufacturing	497	4.2
Wholesale trade	331	2.8
Retail trade	1,519	12.9
Transportation and warehousing, and utilities	923	7.8
Information	324	2.8
Finance, insurance, real estate, and rental and leasing	1,084	9.2
Professional, scientific, management, administrative, and waste management services	1,120	9.5
Educational, health and social services	2,018	17.1
Arts, entertainment, recreation, accommodation and food services	1,183	10.0
Other services (except public administration)	439	3.7
Public administration	1,369	11.6

Subject	Number	Percent
CLASS OF WORKER		
Private wage and salary workers	8,508	72.2
Government workers	2,767	23.5
Self-employed workers in own not incorporated business	477	4.1
Unpaid family workers	24	0.2
INCOME IN 1999		
Households	**7,313**	**100.0**
Less than $10,000	168	2.3
$10,000 to $14,999	77	1.1
$15,000 to $24,999	402	5.5
$25,000 to $34,999	656	9.0
$35,000 to $49,999	1,119	15.3
$50,000 to $74,999	2,140	29.3
$75,000 to $99,999	1,430	19.6
$100,000 to $149,999	1,019	13.9
$150,000 to $199,999	196	2.7
$200,000 or more	104	1.4
Median household income ($)	64,560	-
With earnings	6,947	95.0
Mean earnings ($)	65,936	-
With Social Security income	1,114	15.2
Mean Social Security income ($)	10,420	-
With Supplemental Security income	177	2.4
Mean Supplemental Security income ($)	6,860	-
With public assistance income	422	5.8
Mean public assistance income ($)	4,775	-
With retirement income	1,267	17.3
Mean retirement income ($)	19,160	-
Families	**6,280**	**100.0**
Less than $10,000	162	2.6
$10,000 to $14,999	76	1.2
$15,000 to $24,999	306	4.9
$25,000 to $34,999	529	8.4
$35,000 to $49,999	926	14.7
$50,000 to $74,999	1,859	29.6
$75,000 to $99,999	1,296	20.6
$100,000 to $149,999	850	13.5
$150,000 to $199,999	186	3.0
$200,000 or more	88	1.4
Median family income ($)	65,528	-
Per capita income ($)[1]	20,619	-
	Number below poverty level	**Percent below poverty level**
POVERTY STATUS IN 1999		
Families	**268**	**4.3**
With related children under 18 years	236	5.8
With related children under 5 years	129.0	7.2
Families with female householder, no husband present	**159**	**20.4**
With related children under 18 years	159	31.2
With related children under 5 years	75	32.8
Individuals	**1,190**	**4.7**
18 years and over	620	3.6
65 years and over	31	2.1

G. Potential Impacts and Mitigation

The proposed roadway will not have a direct impact the demographics of the area in the near term. As the land surrounding the roadway is developed as depicted on the ʻEwa Development, it is anticipated that the population will increase. Project planned for the area include: the University of Hawaiʻi West Oʻahu Campus, Department of Hawaiian Home Lands, and Makaiwa Hills.

The planned roadway may have the secondary impact of making the area much more desirable to live because of the increased access into the community. Further, as the population increases there will likely be additional demand for professional and retail services in the area. This will further add to the economic growth to the area as an employment center.

APPENDIX I

Agency and Community Consultation

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU

KAPOLEI HALE • 1000 ULUOHIA STREET, SUITE 309 • KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3003 • FAX: (808) 768-7053 • INTERNET: www.honolulu.gov

MUFI HANNEMANN
MAYOR

LESTER K.C. CHANG
DIRECTOR

GAIL Y. HARAGUCHI
DEPUTY DIRECTOR

December 11, 2008

TO: WAYNE YOSHIOKA, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

ATTENTION: BRIAN SUZUKI, AICP

FROM: LESTER K. C. CHANG, DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT
MAKAKILO DRIVE EXTENSION

Thank you for the opportunity to review and comment on the Draft Environmental Assessment for the Makakilo Drive Extension.

The Department of Parks and Recreation has no comment and as this project will not impact any program or facility of the department you are invited to remove us as a consulted party from the balance of the EIS process.

Should you have any questions, please contact Mr. John Reid, Planner, at 768-3017.

LESTER K. C. CHANG
Director

LKCC:jr
(289185)

cc: Office of Environmental Quality Control
Mr. Chester Koga, R. M. Towill Corporation

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
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MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP12/08-291732R

January 26, 2009

MEMORANDUM

TO: LESTER K.C. CHANG, DIRECTOR
DEPARTMENT OF PARKS AND RECREATION

FROM: WAYNE Y. YOSHIOKA, ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)
MAKAKILO DRIVE EXTENSION

This is to acknowledge your letter of December 11, 2008. Thank you for taking the time to review the Draft EA for the subject project. Please contact Brian Suzuki at 768-8349 if you have additional comments or questions.

WAYNE Y. YOSHIOKA
Acting Director

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
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MUFI HANNEMANN
MAYOR

BOISSE P. CORREA
CHIEF

PAUL D. PUTZULU
KARL A. GODSEY
DEPUTY CHIEFS

OUR REFERENCE BS-DK

December 9, 2008

TO: WAYNE Y. YOSHIOKA, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

ATTENTION: BRIAN SUZUKI, AICP

FROM: BOISSE P. CORREA, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT
MAKAKILO DRIVE EXTENSION
TMKS: (1) 9-2-002: 01, 06, 07, AND 08 AND 9-2-003: 74

Thank you for the opportunity to review and comment on the subject project.

This project should have no adverse impact on the facilities or operations of the Honolulu Police Department.

If there are any questions, please call Major Michael Moses of District 8 at 692-4253 or Mr. Brandon Stone of the Executive Bureau at 529-3644.

BOISSE P. CORREA
Chief of Police

By
DEBORA A. TANDAL
Assistant Chief of Police
Support Services Bureau

cc: OEQC
Mr. Chester Koga,
R.M. Towill Corporation

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

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MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP12/08-291119R

January 28, 2009

MEMORANDUM

TO: BOISSE P. CORREA, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

FROM: WAYNE Y. YOSHIOKA, ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)
MAKAKILO DRIVE EXTENSION

This is to acknowledge your letter of December 9, 2008. Thank you for taking the time to review the Draft EA for the subject project. Please contact Brian Suzuki at 768-8349 if you have additional comments or questions.

WAYNE Y. YOSHIOKA
Acting Director

BOARD OF WATER SUPPLY

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

December 3, 2008

MUFI HANNEMANN, Mayor

RANDALL Y. S. CHUNG, Chairman
SAMUEL T. HATA
ALLY J. PARK
ROBERT K. CUNDIFF
MARC C. TILKER

CRAIG I. NISHIMURA, Ex-Officio
BRENNON T. MORIOKA, Ex-Officio

CLIFFORD P. LUM
Manager and Chief Engineer

DEAN A. NAKANO
Deputy Manager and Chief Engineer

TO: BRIAN SUZUKI, AICP
DEPARTMENT OF TRANSPORTATION SERVICES

FROM: KEITH S. SHIDA, PROGRAM ADMINISTRATOR
CUSTOMER CARE DIVISION

SUBJECT: YOUR LETTER REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE MAKAKILO DRIVE EXTENSION, TMK: 9-2-002:1,6,7,8; 9-2-003:074

Thank you for the opportunity to comment on the proposed Makakilo Drive Extension.

The construction drawings should be submitted for our review and approval.

If you have any questions, please contact Robert Chun at 748-5443.

cc: Office of Environmental Quality Control
Mr. Chester Koga, R.M. Towill Corporation

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 523-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP12/08-290192R

January 26, 2009

MEMORANDUM

TO: KEITH S. SHIDA, PROGRAM ADMINISTRATOR
BOARD OF WATER SUPPLY

FROM: WAYNE Y. YOSHIOKA, ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)
MAKAKILO DRIVE EXTENSION

This is to acknowledge your letter of December 3, 2008. Thank you for taking the time to review the Draft EA for the subject project. Please contact Brian Suzuki at 768-8349 if you have additional comments or questions.

WAYNE Y. YOSHIOKA
Acting Director

DEPARTMENT OF FACILITY MAINTENANCE

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

MUFI HANNEMANN
MAYOR

CRAIG I. NISHIMURA, P.E.
DIRECTOR AND CHIEF ENGINEER

GEORGE "KEOKI" MIYAMOTO
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 08-1176

December 22, 2008

MEMORANDUM

TO: WAYNE Y. YOSHIOKA, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

ATTENTION: BRIAN SUZUKI, AICP
TRANSPORTATION PLANNING DIVISION

FROM: CRAIG I. NISHIMURA, P.E.
DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF FACILITY MAINTENANCE

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (DEA)
MAKAKILO DRIVE EXTENSION

Thank you for the opportunity to review and comment on the subject DEA dated November 23, 2008 for the proposed extension of Makakilo Drive to the North-South Road interchange.

We request that the narrow 6-foot wide grassed median with chain link fence down the middle of the median, proposed in the preferred plan, be eliminated and the planter strips between the concrete curb and sidewalk on both sides of the roadway be increased in width. The narrow median with chain link fence will be difficult and hazardous for our crews to maintain. The grass between the median curb and fence will have to be cut manually with our crews working close to traffic in both directions. Furthermore, wider planter strips will provide greater space for the planted street trees to mature and grow without damaging the adjacent sidewalk and curb.

If it is determined that a barrier between the opposite lanes of traffic is required, we request that the cross-section Alternate 5 be selected with the construction of a concrete Jersey barrier down the middle of the roadway. The concrete barrier will require minimal maintenance with less traffic exposure for our crews.

Should you have any questions, please call Charles Pignataro of the Division of Road Maintenance, at 768-3697.

c: Office of Environmental Quality Control
R.M. Towill Corporation, Attn: Chester Koga

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
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MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP12/08-293191R

January 26, 2009

MEMORANDUM

TO: JEOFFREY CUDIAMAT, ACTING DIRECTOR
DEPARTMENT OF FACILITY MAINTENANCE

FROM: WAYNE Y. YOSHIOKA, ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)
MAKAKILO DRIVE EXTENSION

This is to acknowledge your letter of December 22, 2008. Thank you for taking the time to review the Draft EA for the subject project. Please contact Brian Suzuki at 768-8349 if you have additional comments or questions.

WAYNE Y. YOSHIOKA
Acting Director

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

MUFI HANNEMANN
MAYOR

KENNETH G. SILVA
FIRE CHIEF

ALVIN K. TOMITA
DEPUTY FIRE CHIEF

December 18, 2008

TO: WAYNE YOSHIOKA, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

ATTN: BRIAN SUZUKI, AICP
REGIONAL PLANNING BRANCH

FROM: KENNETH G. SILVA, FIRE CHIEF

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT
MAKAKILO DRIVE EXTENSION
TAX MAP KEYS: 9-2-002: 001, 006, 007, AND 008
9-2-003: 074

In response to a letter from R.M. Towill Corporation received on December 4, 2008, regarding the above-mentioned subject, the Honolulu Fire Department reviewed the material provided and has no objections to the project.

Should you have any questions, please call Battalion Chief Socrates Bratakos of our Fire Prevention Bureau at 723-7151.

KENNETH G. SILVA
Fire Chief

KGS/KB:bh

cc: Office of Environmental Quality Control
Chester Koga, R.M. Towill Corporation ✓

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

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MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP1/09-296568R

January 26, 2009

MEMORANDUM

TO: KENNETH G. SILVA, CHIEF
HONOLULU FIRE DEPARTMENT

FROM: WAYNE Y. YOSHIOKA, ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)
MAKAKILO DRIVE EXTENSION

This is to acknowledge your letter of December 18, 2008. Thank you for taking the time to review the Draft EA for the subject project. Please contact Brian Suzuki at 768-8349 if you have additional comments or questions.

WAYNE Y. YOSHIOKA
Acting Director

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) 523-4567
Web site: www.honolulu.gov

MUFI HANNEMANN
MAYOR

EUGENE C. LEE, P.E.
DIRECTOR

RUSSELL H. TAKARA, P.E.
DEPUTY DIRECTOR

December 23, 2008

Mr. Brian Suzuki, AICP
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, Hawaii 96813

Dear Mr. Suzuki:

Subject: Draft Environmental Assessment
Makakilo Drive Extension

Thank you for giving us the opportunity to review the above Draft Environmental Assessment.

The Department of Design and Construction does not have any comments to offer at this time.

Very truly yours,

Eugene C. Lee, P.E.
Director

ECL:lt (289121)

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
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MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP1/09-296569R

January 26, 2009

MEMORANDUM

TO: RUSSELL TAKARA, P.E., ACTING DIRECTOR
DEPARTMENT OF DESIGN AND CONSTRUCTION

FROM: WAYNE Y. YOSHIOKA, ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)
MAKAKILO DRIVE EXTENSION

This is to acknowledge your letter of December 23, 2008. Thank you for taking the time to review the Draft EA for the subject project. Please contact Brian Suzuki at 768-8349 if you have additional comments or questions.

WAYNE Y. YOSHIOKA
Acting Director

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) 768-8041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

MUFI HANNEMANN
MAYOR

DAVID K. TANOUE
ACTING DIRECTOR

2008/ELOG-2881(mh)

January 12, 2009

MEMORANDUM

TO: WAYNE Y. YOSHIOKA, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

ATTN: BRIAN SUZUKI, AICP
DEPARTMENT OF TRANSPORTATION SERVICES

FROM: DAVID K. TANOUE, ACTING DIRECTOR
DEPARTMENT OF PLANNING AND PERMITTING

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (DEA)
MAKAKILO DRIVE EXTENSION

In response to your request for comments on the subject DEA, the Department of Planning and Permitting (DPP) has the following comments:

1. The Final Environmental Assessment (FEA) should provide Right-of-Way (ROW) information on the existing Makakilo Drive, including its cross-section, and discuss how and why the proposal is consistent with or modifies the current ROW section.

2. The proposed 78-foot ROW is a modification of the Subdivision Street Standards. The FEA should explain the less-than-standard 4-foot planter strips and the lack of median trees and median landscaping.

3. Page 7, Fig. 3 appears to be inconsistent with Table 2, Alternative 6 (preferred roadway cross-section) with respect to the median barrier. A fence is shown on Fig. 3 but there is no mention of a fence on Table 2. If a fence in the median is the preferred feature, the FEA should explain its intended purpose.

4. All street lights should be fully shielded instead of standard shielded lighting to avoid adverse impacts on avi-fauna and to minimize light pollution. Fully shielded lighting fixtures should eliminate any light being projected above the horizontal plane of the lowest point of the light fixture.

5. The projected implementation schedule on page 19 should be coordinated with the Oahu Metropolitan Planning Organization's Transportation Improvement Program (2008-2011) schedule which indicates construction funding in 2010.

6. If not already required under contract, contractors should be required to repair existing roadways damaged by the movement of construction equipment during construction of the Makakilo Drive extension.

7. Page 22 incorrectly assumes that construction would not disrupt traffic flow on existing streets. Slow moving heavy equipment on Makakilo Drive will interfere with traffic flow as traffic will be required to detour around slower moving construction vehicles carrying heavy loads such as concrete to the construction site.

8. Page 26 Land Use: The FEA should note that Makakilo Quarry located along the western side of the project was granted State Special Use Permit approval to continue operations until 2032.

9. The FEA should reference a future public access for pedestrians/bikes required under State Special Use Permit 73/SP-147. It is intended to connect to either Makakilo Drive Extension and/or Pueonani Street. See attached map.

10. Section 4.9: Discuss whether geological hazards (ex., rockfall) are present. If present, describe potential impacts/mitigation measures.

11. For hazard mitigation (potential for traffic accidents) a traffic signal and storage lane should be considered at the access driveway to Makakilo Quarry for heavy equipment negotiating left turn movements into the quarry from the proposed extension.

12. Check with the developers of the Waikalo`i Subdivision (shown in Figure 22, page 48) if they will require installation of sewer lines within the roadway ROW for their development. To the greatest extent possible, there should be coordination to logically/sequentially construct the transportation and wastewater systems at or around the same time to avoid ripping up and patching the roadway ROW on separate occasions.

13. Section 7.2: Subdivision application and approval are required to create the road Right-of-Way (ROW).

14. Section 7.2.1 (Grading Permit). Revise "Permit required for ground disturbance greater than 15 acres" to "Permit required from DPP."

15. Section 7.2.1 and 7.2.2. Revise wording to reference the specific guidelines and the date of publication, i.e. Section 7.2.1 "Permit required in accordance with Rules Relating to Soil Erosion Standards and Guidelines, April 1999."

16. Section 8.3: Revise last City agency listed to Department of Facility Maintenance. Also, do other City agencies need to be consulted (example, Department of Design and Construction and Department of Parks and Recreation)?

Should you have any questions, please contact Matt Higashida of our staff at 768-8045.

DKT:js

cc: Katherine Puana Kealoha, Esq., Director, Office of Environmental Quality Control
Chester Koga, R.M. Towill Corporation

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DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 523-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP1/09-294844R

January 28, 2009

MEMORANDUM

TO: DAVID K. TANOUE, ACTING DIRECTOR
DEPARTMENT OF PLANNING AND PERMITTING

FROM: WAYNE Y. YOSHIOKA, ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)
MAKAKILO DRIVE EXTENSION

This is to acknowledge your letter of January 12, 2009. Thank you for taking the time to review the Draft EA for the subject project. We offer the following in response to your comments relating to ocean resources:

1. The Final Environmental Assessment (FEA) should provide Right-of-Way (ROW) information on the existing Makakilo Drive, including its cross-section, and discuss how and why the proposal is consistent with or modifies the current ROW section.

   Response: Information on the existing Makakilo Drive will be added to the roadway description noting that the extension right-of-way is the same as the existing roadway and conforms with County standards.

2. The proposed 78-foot ROW is a modification of the Subdivision Street Standards. The FEA should explain the less-than-standard 4-foot planter strips and the lack of median trees and median landscaping.

   Response: The proposed roadway section was developed in consultation with an advisory group made up of community and agency representatives. Consideration of trees within the median was discussed however, there were several issues with tree plantings including visibility,

street illumination, maintenance, and safety. These issues invariably led to a compromise of a grassed landscaped median with a fence to discourage random pedestrian crossings.

3. Page 7, Fig. 3 appears to be inconsistent with Table 2, Alternative 6 (preferred roadway cross-section) with respect to the median barrier. A fence is shown on Fig. 3 but there is no mention of a fence on Table 2. If a fence in the median is the preferred feature, the FEA should explain its intended purpose.

   Response: The median fence was selected to prevent pedestrians from randomly crossing the roadway where there are no marked crosswalks and necessary signage.

4. All street lights should be fully shielded instead of standard shielded lighting to avoid adverse impacts on avi-fauna and to minimize light pollution. Fully shielded lighting fixtures should eliminate any light being projected above the horizontal plane of the lowest point of the light fixture.

   Response: This requirement will be noted in the Final EA and recommended as part of the final design.

5. The projected implementation schedule on page 19 should be coordinated with the Oahu Metropolitan Planning Organization's Transportation Improvement Program (2008-2011) schedule which indicates construction funding in 2010.

   Response: The department has requested that the OMPO TIP be revised. The department has in fact been notified by the State of Hawaii Department of Transportation (HDOT) that federal funding for the project must be "stretched out" over future years. Further, there is currently no local match funding appropriated for the construction of the project.

6. If not already required under contract, contractors should be required to repair existing roadways damaged by the movement of construction equipment during construction of the Makakilo Drive Extension.

   Response: A contractor has not been selected at this time; however, reference to your comment will be included in the Final EA for incorporation in final design documents.

7. Page 22 incorrectly assumes that construction would not disrupt traffic flow on existing streets. Slow moving heavy equipment on Makakilo Drive will interfere with traffic flow as traffic will be required to detour around slower moving construction vehicles carrying heavy loads such as concrete to the construction site.

   Response: The last paragraph on page 22 has been deleted to correctly represent potential traffic impacts during construction.

8. Page 26 Land Use: The FEA should note that Makakilo Quarry located along the western side of the project was granted State Special Use Permit approval to continue operations until 2032.

   Response: The text will be revised to include the information provided.

9. The FEA should reference a future public access for pedestrians/bikes required under State Special Use Permit 73/SP-147. It is intended to connect to either Makakilo Drive Extension and/or Pueonani Street. See attached map.

   Response: Public (pedestrian) access will be provided along the extension via sidewalks and bicycle lanes.

10. Section 4.9: Discuss whether geological hazards (ex., rockfall) are present. If present, describe potential impacts/mitigation measures.

    Response: Rockfall hazards are not anticipated at this time. During the design phase, this hazard potential will be re-evaluated.

11. For hazard mitigation (potential for traffic accidents) a traffic signal and storage lane should be considered at the access driveway to Makakilo Quarry for heavy equipment negotiating left turn movements into the quarry from the proposed extension.

    Response: Signalization of the proposed access roads is not addressed at this stage of planning because of the lack of information on the proposed plans of the adjoining landowners.

12. Check with the developers of the Waikalo'i Subdivision (shown in Figure 22, page 48) if they will require installation of sewer lines within the roadway ROW for their development. To the greatest extent possible, there should be coordination to logically/sequentially construct the

transportation and wastewater systems at or around the same time to avoid ripping up and patching the roadway ROW on separate occasions.

Response: The Wai Kalo'i Subdivision is already under construction and nearing completion. Some of the homes are being occupied at this writing. Therefore, addition sewer facilities are not required. In addition, the Department of Environmental Services did not indicate or offer any comments on the matter.

13. Section 7.2: Subdivision application and approval are required to create the road Right-of-Way (ROW).

    Response: A subdivision plat will be submitted to DPP during the design phase of the project.

14. Section 7.2.1 (Grading Permit). Revise "Permit required for ground disturbance greater than 15 acres" to "Permit required from DPP."

    Response: Text to be revised.

15. Section 7.2.1 and 7.2.2. Revise wording to reference the specific guidelines and the date of publication, i.e. Section 7.2.1 "Permit required in accordance with Rules Relating to Soil Erosion Standards and Guidelines, April 1999."

    Response: The cited text will be revised as proposed.

16. Section 8.3: Revise last City agency listed to Department of Facility Maintenance. Also, do other City agencies need to be consulted (example, Department of Design and Construction and Department of Parks and Recreation)?

    Response: Section 8.3 will be revised to include the agencies suggested.

Please contact Mr. Brian Suzuki at 768-8349 if you have additional comments or questions.

WAYNE Y. YOSHIOKA
Acting Director

N5

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
DIRECTOR

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

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

IN REPLY REFER TO:

HWY-PA
2.0227

January 7, 2009

Mr. Chester Koga
R. M.Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Mr. Koga:

Subject: Makakilo Drive Extension, Ewa District, Oahu, Hawaii

In regards to the draft Environmental Assessment for this project, we have the following comments:

1. As stated throughout the document, "Interstate H-1" should be changed to "Interstate Route H-1." Also, Interstate Route H-1 could be abbreviated as "H-1."

2. The last sentence of the second paragraph on page 2 should be clarified. We recommend, "...will not affect the volume of traffic on H-1 beyond the Kapolei-Makakilo Interchange."

3. The first sentence of the second paragraph, on page 3, should be changed as follows: "State of Hawaii and City and County of..."

4. The third and fourth sentences of the third paragraph, on page 3, may be revised as follows: "The portion of the proposed roadway within the Makakilo Community starts in the mauka area of the recently completed subdivision. The proposed H-1 connection is at the North-South Road Interchange, which is currently under construction.

5. The first paragraph on page 5 should probably be revised for clarification purposes. We suggest: "The project area is currently undeveloped except for access roadways which currently extend between Palehua Road, the Makakilo Community and the quarry as owned by Grace Pacific Corporation. Flora in the area is characterized primarily by introduced plant species. As shown in Figure 1, the two principal landforms in the area are: 1) Puu Makakilo and 2) Kaloi Gulch. The proposed roadway will be located within the Kaloi Gulch drainage area; this dry, intermittent stream bed is oriented in the northwest-southwest direction (refer to Figure 1)."

6. The first sentence of the second paragraph, on page 5, should probably state: "...a 4-lane median divided roadway within a minimum 78-foot right-of-way (ROW) width that..."

7. We recommend the following revisions of the second sentence of the third paragraph, on page 5: "Diverting traffic from the Kapolei-Makakilo Interchange...level of service at this interchange."

8. For the second, third and fourth sentences of the fourth paragraph, on page 5, we recommend the following changes: "...includes a 700-foot long, elevated (bridge) section...The roadway cross-section will have a minimum 78-foot width and...The roadway will feature a 4-lane median-separated travel way with sidewalks..."

9. Figure 2 shows a short distance (approximately 125 feet) between two of the proposed roadway curves. Does this distance conform to AASHTO guidelines? Can the proposed super elevation be transitioned to zero within one-half this distance?

10. For Figure 3, Proposed Roadway Cross-Section, the 6-foot median should include the inside shoulders or the area just within the yellow lines; the inside shoulders may have a one (1) foot width. Also, the "bike lane" should be labeled "shoulder/bikeway"; in addition, according to our standards, the bikeway should have a minimum width of five (5) feet, which is exclusive of the curb apron; the additional length which is needed for the bikeway may be provided by decreasing the width of either the planting strip or sidewalk. We prefer the "shoulder/bikeway" designation because this reduces the exclusive use of this area by bicyclists and lessens the opportunity for "accident" litigation.

11. For item c., of the second paragraph, on page 7, we recommend the following corrections: "...built within a 78-foot right-of-way width.

12. The DEA should also indicate the deficiencies of the proposed (but unaccepted) typical sections of the proposed highway.

13. There are other minor grammatical errors in the DEA which should be corrected. For instance, in the sixth sentence of the second paragraph, on page 26, we recommend the following revision: "Major planned development is proposed south of Interstate Route H-1 and..."

14. This project should also be coordinated with the Environmental Protection Agency in regards to the Southern Oahu Basil Aquifer (SOBA). It should be noted that this project is within the recharge area of this vital aquifer.

15. The project should also discuss the transition of the proposed roadway to the housing area of the Makakilo Subdivision.

16. As discussed on page 72, the Area of Potential Effect (APE) should be determined in consultation with the State Historic Preservation Officer.

17. It should also be indicated on page 73 that consistency with the Coastal Zone Management Act will be determined through coordination with the Office of Planning, of the Department of Business, Economic Development and Tourism.

If you have any questions, please contact Nelson Sagum, at 587-1834.

Very truly yours,

GLENN M. YASUI
Administrator
Highways Division

bc: HWY-PA

NS:th

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
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MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP1/09-296659R

January 28, 2009

Mr. Glenn M. Yasui, Administrator
Highways Division
State Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Yasui:

Subject: Draft Environmental Assessment (EA), Makakilo Drive Extension

This is to acknowledge your letter of January 9, 2009. Thank you for taking the time to review the Draft EA for the subject project. We offer the following in response to your comments:

1. As stated throughout the document, "Interstate H-1" should be changed to "Interstate Route H-1". Also, Interstate Route H-1 could be abbreviated as "H-1".

   Response: The Final EA will be revised to replace Interstate H-1 with Interstate Route H-1.

2. The last sentence of the second paragraph on page 2 should be clarified. We recommend, ". . . will not affect the volume of traffic on H-1 beyond the Kapolei-Makakilo Interchange."

   Response: The Final EA will be revised to reflect your proposed change.

3. The first sentence of the second paragraph, on page 3, should be changed as follows: "State of Hawaii and City and County of . . . "

   Response: The Final EA will be revised to reflect your proposed change.

4. The third and fourth sentences of the third paragraph, on page 3, may be revised as follows: "The portion of the proposed roadway within the Makakilo Community starts in the mauka area of the recently completed subdivision. The proposed H-1 connection is at the North-South Road Interchange, which is currently under construction."

   Response: The Final EA will be revised to reflect your proposed change.

5. The first paragraph on page 5 should probably be revised for clarification purposes. We suggest: "The project area is currently undeveloped except for access roadways which currently extend between Palehua Road, the Makakilo Community, and the quarry as owned by Grace-Pacific Corporation. Flora in the area is characterized primarily by introduced plant species. As shown in Figure 1, the two principal landforms in the area are: a) Puu Makakilo; and, 2) the Kaloi Gulch. The proposed roadway will be located within the Kaloi Gulch drainage area; this dry, intermittent stream bed is oriented in the northwest-southeast direction (refer to Figure 1)."

   Response: The Final EA will be revised to reflect your proposed change.

6. The first sentence of the second paragraph, on page 5, should probably state: ". . . a 4-lane median divided roadway within a minimum 78-foot right-of-way (ROW) width that . . ."

   Response: The Final EA will be revised to reflect your proposed change.

7. We recommend the following revisions of the second sentence of the third paragraph, on page 5: "Diverting traffic from the Kapolei-Makakilo Interchange . . . level of service at this interchange."

   Response: The Final EA will be revised to reflect your proposed change.

8. For the second, third, and fourth sentences of the fourth paragraph, on page 5, we recommend the following changes: ". . . includes a 700-foot long, elevated (bridge) section . . . The roadway cross-section will have a minimum 78-foot width and . . . The roadway will feature a 4-lane median-separated travelway with sidewalks . . ."

   Response: The Final EA will be revised to reflect your proposed change.

9. Figure shows a short distance (approximately 125 feet) between two of the proposed roadway curves. Does this distance conform with AASHTO guidelines? Can the proposed super elevation be transitioned to zero within one-half this distance?

   Response: The transition to the existing Makakilo Drive will include a transition section to accommodate the new cross-section that includes a median, the four travel lanes, and bike lanes. Note that the County roadway standards require crown-to-crown transition and therefore do not conform to AASHTO. The existing Makakilo Drive has a 50-feet curb-to-curb cross-section, whereas the extension has a curb-to-curb cross-section of 60 feet. The sidewalk and landscape strip will transition to match each other. An existing portion of Makakilo Drive will also include changes to the existing striping from 2-lanes to 4-lanes. Further, no parking will be allowed on the existing Makakilo Drive from the intersection with Pueonani to facilitate the transition. The transition at the North-South Road interchange, on the other hand, will conform to the State highway standards. The median on the extension will end at the Interstate Route H-1 right-of-way. The pedestrian facilities will transition to those planned for the interchange.

10. For Figure 3, Proposed Roadway Cross-Section, the 6-foot median should include the inside shoulders or the area just within the yellow lines; the inside shoulders may have a one (1) foot width. Also, the "bike lane" should be labeled "shoulder/bikeway"; in addition, according to our standards, the bikeway should have a minimum width of five (5) feet, which is exclusive of the curb apron; the additional length which is needed for the bikeway may be provided by decreasing the width of either the planting strip or sidewalk. We prefer the "shoulder/bikeway" designation because this reduces the exclusive use of this area by bicyclists and lessens the opportunity for "accident" litigation.

    Response: The Final EA will be revised to reflect your proposed change.

11. For item c., of the second paragraph, on page 7, we recommend the following corrections: ". . . built within a 78-<u>foot</u> right-of-way <u>width</u>."

    Response: The Final EA will be revised to reflect your proposed change.

12. The DEA should also indicate the deficiencies of the proposed (but unaccepted) typical sections for the proposed highway.

    Response: The 78-feet ROW as originally proposed is the County standard the Department accepts.

13. There are other minor grammatical errors in the DEA which should be corrected. For instance, in the sixth sentence of the second paragraph, on page 26, we recommend the following revision: "Major planned development is proposed south of Interstate Route H-1 and . . ."

    Response: The Final EA will be revised to reflect your proposed change as noted above.

14. This project should also be coordinated with the Environmental Protection Agency in regards to the Southern Oahu Basil Aquifer (SOBA). It should be noted that this project is within the recharge area of this vital aquifer.

    Response: The development of the Makakilo Drive Extension is being coordinated with the development of the North-South Road in that storm water generated by the project will be accommodated by the drainage system developed for the North-South Road. Because the project is within the limits of the South O'ahu Basal Aquifer (SOBA), stormwater will be conveyed to a point outside of the SOBA as prescribed by the regional drainage plan and the Environmental Protection Agency.

15. The project should also discuss the transition of the proposed roadway to the housing area of the Makakilo Subdivision.

    Response: As noted above (item #9), a transition area is planned to accommodate the new roadway cross-section. Of particular note are the median on the extension and the requirement for new striping on the existing Makakilo Drive.

16. As discussed on page 72, the Area of Potential Effect (APE) should be determined in consultation with the State Historic Preservation Officer.

    Response: Delineation of the APE will be shown in the Final EA.

17. It should also be indicated on page 73 that consistency with the Coastal Zone Management Act will be determined through coordination with the Office of Planning, of the Department of Planning, Economic Development and Tourism.

    Response: We will note that the Office of Planning was consulted for this project.

Please contact Mr. Brian Suzuki at 768-8349 if you have additional comments or questions.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

LINDA LINGLE
GOVERNOR OF HAWAII

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 22, 2008

Department of Transportation Services
650 South King Street 3rd Floor
Honolulu, Hawaii 96813

Attention: Mr. Brian Suzuki, AICP

Ladies and Gentlemen:

Subject: Makakilo Drive Extension

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 comment.

Other than the comments from Land Division, Division of Aquatic Resources, Engineering Division, the Department of Land and Natural Resources has no other comments to offer on the subject matter. Should you have any questions, please feel free to call our office at 587-0433. Thank you.

Sincerely,

Charlene E. Unoki
for Morris M. Atta
Administrator

Cc: OEQC
RM Towill Corporation

LINDA LINGLE
GOVERNOR OF HAWAII

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 28, 2008

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
x Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
__Commission on Water Resource Management
__~~Office of~~ Conservation & Coastal Lands
x Land Division – ~~Oahu District~~/Keith/Gavin

FROM: Morris M. Atta
SUBJECT: Draft environmental assessment for Makakilo Drive Extension
LOCATION: Ewa, Oahu, TMK: (1) 9-2-2:1, 6, 7, 8; 9-2-3:74
APPLICANT: RM Towill Corporation on behalf of Department of Transportation Services

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 20, 2008.

Only 1 copy of the draft environmental assessment available in Room 220.

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

Attachments

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

Signed: Jimmy Chu
Date: 12/10/08

BL

LINDA LINGLE
GOVERNOR OF HAWAII

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 28, 2008

MEMORANDUM

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x Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
x Engineering Division
__ Div. of Forestry & Wildlife
__ Div. of State Parks
__ Commission on Water Resource Management
__ Office of Conservation & Coastal Lands
x Land Division – Oahu District/Keith/Gavin

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Only 1 copy of the draft environmental assessment available in Room 220.

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

Attachments

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

Signed:
Date: 12/11/08

DEPT OF LAND & NATURAL RESOURCES STATE OF HAWAII
2008 DEC 11 A 11:50
RECEIVED
LAND DIVISION

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/MMA
REF: DEAforMakakiloDriveExtension
Oahu.008

COMMENTS

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

(X) Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone D, an area where flood hazards are undetermined.

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

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

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

- ( ) Mr. Robert Sumimoto at (808) 523-4254 or Mr. Mario Siu Li at (808) 523-4247 of the City and County of Honolulu, Department of Planning and Permitting.
- ( ) Mr. Kelly Gomes at (808) 961-8327 (Hilo) or Mr. Kiran Emler at (808) 327-3530 (Kona) of the County of Hawaii, Department of Public Works.
- ( ) Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.
- ( ) Mr. Mario Antonio at (808) 241-6620 of the County of Kauai, Department of Public Works.

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

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

( ) Additional Comments: _____

_____

( ) Other: _____

_____

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

Signed: _____
ERIC T. HIRANO, CHIEF ENGINEER

Date: 12/4/08

LINDA LINGLE
GOVERNOR OF HAWAII

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

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LAND DIVISION
2008 DEC 15 P 3:27
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

Am
GHL

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 28, 2008

MEMORANDUM

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

FROM: Morris M. Atta
SUBJECT: Draft environmental assessment for Makakilo Drive Extension
LOCATION: Ewa, Oahu, TMK: (1) 9-2-2:1, 6, 7, 8; 9-2-3:74
APPLICANT: RM Towill Corporation on behalf of Department of Transportation Services

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 20, 2008.

Only 1 copy of the draft environmental assessment available in Room 220.

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

Attachments

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

Signed:
Date: 15 Dec. 08

STATE OF HAWAII
Department of Land and Natural Resources
DIVISION OF AQUATIC RESOURCES

MEMORANDUM

TO: Dan A. Polhemus, Administrator
FROM: Glenn R. Higashi, Aquatic Biologist GRH
SUBJECT: Draft Environmental Assessment for Makakilo Drive Extension
Comments Requested By: Morris M. Atta, Land Division
Date of Request: 11/28/08 Date Received: 11/29/08

Summary of Project

Title: **Draft Environmental Assessment for Makakilo Drive Extension**
Project By: **Department of Transportation Services, City and County of Honolulu**
Location: **Ewa, Oahu – TMK: (1) 9-2-002:1,6,7,8; 9-2-003:74**

Brief Description:

The applicant, RM Towill Corporation on behalf of the City and County of Honolulu, Department of Transportation Services, proposes the development of a 4-lane, median separated roadway that connects the end of the existing Makakilo Drive to the proposed North-South Road Interchange currently under construction. The interchange construction is scheduled for completion by Fall 2009.

The roadway is approximately 4,300 feet long and includes 700 feet elevated (bridge) section at the connection of Makakilo Drive. The roadway cross-section is 78 feet and features a 4-lane median separated travel ways with curbs and gutters, sidewalks, streetlights, landscaping strips, fencing and bike lanes. The proposed roadway will provide a second means for Makakilo residents to access from and to the Interstate H-1.

The project area is currently undeveloped except for access roadways which currently extend between Palehua Road and the Makakilo Community and quarry. The proposed roadway will be within the Kalo'I Gulch drainage area, this dry, intermittent flow Kalo'i Gulch which is oriented in a northwest-southeast direction.

Comments:

The proposed activity is not expected to have any significant impact on the aquatic resource values in this area. Kalo'i Gulch contains Kalo'i Stream which is a non-perennial stream and usually dry in the lower reaches except during heavy rains. The following mitigative measures should be implemented during the construction of roadway and bridge to minimize the potential for erosion, siltation and pollution of the aquatic environment:

1) lands denuded of vegetation should be planted or covered as quickly as possible to prevent erosion;
2) scheduling site work during periods of minimal rainfall; and;
3) prevent petroleum products from mechanical equipment from the falling, blowing or leaching into the aquatic environment.

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 523-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP12/08-292718R

January 26, 2009

Mr. Morris M. Atta, Administrator
State of Hawaii
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Atta:

Subject: Draft Environmental Assessment (EA) Makakilo Drive Extension

This is to acknowledge your letter of December 22, 2008. Thank you for taking the time to review the Draft EA for the subject project. We offer the following in response to your comments:

1. Response to Engineering Division
   We acknowledge that portions of the project are within Zone D as delineated on the Flood Insurance Rate Map. The roadway, however, will not be impacted.

2. Response to Aquatic Resources Division
   In order to minimize the potential for erosion, siltation and pollution of the aquatic environment, we will include your proposed mitigation measures into the Final EA. They include:
   a) land denuded of vegetation should be planted or covered as quickly as possible to prevent erosion,
   b) scheduling site work during periods of minimal rainfall to the extent feasible, and
   c) preventing petroleum products from mechanical equipment from falling, blowing or leaching into the aquatic environment.

Please contact Mr. Brian Suzuki at 768-8349 if you have additional comments or questions.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

LINDA LINGLE
GOVERNOR
THEODORE E. LIU
DIRECTOR
MARK K. ANDERSON
DEPUTY DIRECTOR
ABBEY SETH MAYER
DIRECTOR
OFFICE OF PLANNING

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

OFFICE OF PLANNING

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

Telephone: (808) 587-2846
Fax: (808) 587-2824

P-12377

December 29, 2008

Mr. Brian Suzuki, AICP
City and County of Honolulu
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, Hawai`i 96813

Dear Mr. Suzuki:

Subject: Makakilo Drive Extension
Draft Environmental Assessment
TMK Nos: (1) 9-2-002: parcels 001, 006-008 and 9-2-003: 074
Honouliuli, `Ewa, O`ahu

Thank you for sending the Office of Planning the Draft Environmental Assessment (DEA) for the above referenced proposal to plan, design and construct a 4-lane, divided roadway from the end of the existing Makakilo Drive, connecting to the currently under construction North-South Road Interchange. The proposal anticipates using approximately 14.5 acres of vacant agricultural lands.

The action triggering the environmental assessment is the requested use of State of Hawai`i lands, City and County of Honolulu lands and federal funds. The proposed project does not anticipate any State or County regulatory land use changes.

The Office of Planning wants to insure that the Final Environmental Assessment (FEA) sufficiently covers areas of State concern. I am writing to request that the FEA consider the impacts of the proposed project on the following:

Ocean Resources – The State has an affirmative duty to protect Hawai`i's nearshore waters. Please discuss how storm water generated by the project will be addressed. In particular, the project-generated runoff will impact the Kalo`i Gulch drainage system. Other developments makai of the interchange have had specific limitations placed upon their discharge volumes into the Kalo`i Gulch drainage system. These developments have also been required to participate in a regional drainage planning effort to reduce the quantity and improve the quality of storm water runoff in the system. The FEA should

address the specific limitations, which can be found in both State Land Use Commission conditions and City and County development agreements, and their applicability to the proposed project.

The Office of Planning looks forward to receiving an updated FEA with the potential impacts and mitigation measures for the above issue addressed. If you have any questions, please call Scott Derrickson, AICP in the Land Use Division at 587-2805.

Sincerely,

Abbey Seth Mayer
Director

c: Chester Koga, R.M. Towill Corporation
Katherine Kealoha, OEQC

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 523-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP12/08-293218R

January 26, 2009

Mr. Abbey Seth Mayer, Director
Office of Planning
Department of Business, Economic
Development & Tourism
P.O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Mayer:

Subject: Draft Environmental Assessment (EA) Makakilo Drive Extension

This is to acknowledge your letter of December 29, 2008. Thank you for taking the time to review the Draft EA for the subject project. We offer the following in response to your comments relating to ocean resources:

Stormwater Run-Off and Regional Drainage
The development of the Makakilo Drive Extension is being coordinated with the development of the North-South Road in that stormwater generated by the project will be accommodated by the drainage system developed for the North-South Road. Because the project is within the limits of the South O'ahu Basal Aquifer (SOBA), stormwater from the roadway will be conveyed to a point outside of the SOBA as prescribed by the regional drainage plan and the Environmental Protection Agency.

Please contact Mr. Brian Suzuki at 768-8349 if you have additional comments or questions.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

TP 293317

United States Department of the Interior

FISH AND WILDLIFE SERVICE

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

In Reply Refer To:
2009-FA-0031
2009-TA-0059

DEC 29 2008

Department of Transportation Services
Hawaii State Government
Attn: Brian Suzuki, AICP
650 South King Street, 3rd Floor
Honolulu, Hawaii 96813

Subject: Draft Environmental Assessment for the Makakilo Drive to North-South Road Interchange, Ewa District, Oahu, Hawaii

Dear Mr. Suzuki:

We have received the above referenced document on November 28, 2008. Unfortunately, we will not be able to provide detailed comments on potential impacts of the proposed action on fish and wildlife resources due to our workload.

We appreciate your concern for fish and wildlife resources and have enclosed a list of standard best management practices for you to consider in relation to your particular proposed action. We recommend that the applicable measures identified in this list be incorporated into the action when it is implemented. In addition, we did note that two federally endangered Hawaiian ducks (*Anas wyvilliana*) were observed onsite during the avifauna surveys. The Draft Environmental Assessment does not adequately address potential direct or indirect project impacts to this species or its habitat. We recommend potential impacts to this endangered species be included in your final document. If the project has unavoidable impacts to this species, we recommend you contact our office regarding how to proceed pursuant to section 7 or 10 of the Endangered Species Act of 1973, as amended [16 U.S.C. 1531 et seq.]. This letter should not be considered a concurrence with your proposed action, and it is possible that we may have other comments or recommendations in the future.

TAKE PRIDE® IN AMERICA

Thank you for coordinating with us on your proposed action. If you have any questions, please contact Mr. Aaron Nadig at (808) 792-9400.

Sincerely,

Patrick Leonard
for Field Supervisor

Enclosure

U.S. Fish and Wildlife Service
Recommended Standard Best Management Practices

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

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

2. Dredging/filling in the marine environment shall be scheduled to avoid coral spawning and recruitment periods and sea turtle nesting and hatching periods.

3. Dredging and filling activities in the marine/aquatic environment shall be designed to avoid or minimize the loss of beach and special aquatic site (coral reefs, wetlands, streams etc.) habitat, and any ecological functions unavoidably lost as a result of the project shall be replaced.

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

5. No project-related materials (fill, revetment rock, pipe etc.) shall be stockpiled in the water (intertidal zones, reef flats, stream channels, wetlands etc.);

6. All debris removed from the marine/aquatic environment shall be disposed of at an approved upland or ocean dumping site.

7. No contamination (trash or debris disposal, non-native species introductions attraction of non-native pests etc.) of adjacent marine/aquatic environments (reef flats, channels, open ocean, stream channels, wetlands, beaches, forests etc.) shall result from project-related activities. This shall be accomplished by implementing a litter-control plan and developing a Hazard Analysis and Critical Control Point Plan (HACCP – see http://www.haccp-nrm.org/Wizard/default.asp) to prevent attraction and introduction of non-native species.

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

9. Any under-layer fills used in the project shall be protected from erosion with stones (or core-loc units) as soon after placement as practicable.

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

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 523-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP12/08-293317R

January 26, 2009

Mr. Patrick Leonard, Field Supervisor
Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

Dear Mr. Leonard:

Subject: Draft Environmental Assessment (EA) Makakilo Drive Extension

This is to acknowledge your letter of December 29, 2008. Thank you for taking the time to review the Draft EA for the subject project. We offer the following in response to your comments relating to biological resources:

Standard Best Management Practices (BMP)
The BMPs provided by your office will be included in the Final EA and applied as applicable to the project, particularly those that related to stormwater runoff and the resultant impacts of erosion and siltation.

Impacts to the Hawaiian Duck
The two individual Hawaiian ducks that were observed were in a drainage catchment that is outside of the project limits and will not be impacted by the project. The catchment is usually dry except for periods after rainfall events and is generally not considered a habitat for water fowl. Site monitoring will be proposed to be conducted by the contractor to ascertain if specific mitigation will be required during the construction period, particularly after rainfall events.

Please contact Mr. Brian Suzuki at 768-8349 if you have additional comments or questions.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

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

HRD08/3635C

December 26, 2008

Brian Suzuki
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, Hi 96813

RE: Request for comments on the Draft Environmental Assessment for the Makakilo Drive extension project, 'Ewa, O'ahu, TMK: (1) 9-2-002: 1, 6, 7 and 8, (1) 9-2-003: 74.

Aloha e Brian Suzuki,

The Office of Hawaiian Affairs (OHA) is in receipt of the above-mentioned letter dated November 23, 2008. The Department of Transportation proposes to develop an extension to Makakilo Drive. The proposed roadway will be approximately 4,300 feet long and include a 700-foot elevated bridge section. The road will feature four lanes, a median, sidewalks, bike lanes and landscaping strips. OHA has reviewed the project and offers the following comments.

Page 9 of the Draft Environmental Assessment (DEA) indicates that Alternative 1 was "rejected because of costs and impacts to historic resources." However, Table 1 on the same page indicates that Alternative 1 is the preferred plan. This discrepancy needs to be fixed in the Final EA.

Figure 2 on page 6 indicates that there is an access point at the North-South Road Interchange that is reserved for future development. OHA requests information on what this future development is and whether this future development falls outside of the Urban Growth Boundary, which is discussed in the Draft 'Ewa Development Plan.

OHA will rest upon the assurances of the applicant that the ancient Hawaiian trails of the area, such as Pālehua Trail or the "Hawaiian Trail" Shad Kāne describes in the DEA's Cultural Impact Assessment, will not be impacted by the project.

In addition, OHA recommends that the applicant use native vegetation in its landscaping plans for the project site, particularly the native plants that are currently found in the area, such as 'a'ali'i, 'ilima, popolo and 'uhaloa. We ask that, where possible, the populations of 'iliahialo'e, or coastal sandalwood trees (Santalum ellipticum), be protected. OHA would also like to see the replanting of 'iliahialo'e, either in the landscaping plans or in the general project site, as a large number of them were removed from a nearby area to accommodate a housing development. Landscaping with native plants furthers the traditional Hawaiian concept of mālama 'āina and creates a more Hawaiian sense of place. Moreover, the native plants of this area are best suited for the climate of the region, and as such would not require much additional care.

Thank you for the opportunity to comment. If you have further questions, please contact Sterling Wong by phone at (808) 594-0248 or e-mail him at sterlingw@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Administrator

C: Chester Koga
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hi 96819

Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hi 96813

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

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MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP1/09-296565R

January 28, 2009

Mr. Clyde W. Namu'o, Administrator
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

Dear Mr. Namu'o:

Subject: Draft Environmental Assessment (EA) Makakilo Drive Extension

This is to acknowledge your letter of December 26, 2008. Thank you for taking the time to review the Draft EA for the subject project. We offer the following in response to your comments relating to ocean resources:

1. Table 1 – Preferred Plan
   The information contained in Table 1 reflects the preferred Alternative 1. The accompanying text will be revised.

2. Figure 2 – Access Point
   During the course of consultation with the community, landowners and developers, it was noted that the adjoining landowners indicated they desire to develop their properties in the future though no specific plans and timetable were forwarded. The access points are shown on the preferred plan. The intersections will not be developed by the City and must be done by the landowner/developer prior to the development of their respective properties. Lands on the Honolulu-side of the proposed roadway are outside of the current Ewa Development Plan's Urban Growth Boundary.

3. Hawaiian Trail
   The trail identified during the archaeological inventory survey will not be impacted by the proposed roadway alignment as shown on the preferred plan.

4. Use of Native Vegetation for Landscaping
Final design and specification for the roadway landscaping has yet to begin and as a result, your recommendations will be forwarded to the roadway designer for consideration. The Department, as a matter of practice, considers the balancing of scenic value, cultural value and maintenance in choosing landscaping. However, the Department will seriously consider, and wherever possible utilize native plants for landscaping of the roadway.

Please contact Mr. Brian Suzuki at 768-8349 if you have additional comments or questions.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

200 Akamainui Street
Mililani, Hawaii 96789-3999
Tel 808-625-2100
Fax 808-625-5888

OCEANIC TIME WARNER CABLE

December 10, 2008

Mr. Brian Suzuki
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, Hawaii 96813

Subject: Makakilo Drive Extension

Dear Mr. Suzuki,

Thank you for giving Oceanic Time Warner Cable the opportunity to participate in the reviewing process for this project. Oceanic Cable does not have any comments regarding this project at this time. However, Oceanic Time Warner Cable would like to be kept informed as the project progresses.

Sincerely,

Darryl Osato
OSP Engineer

Cc: R. M. Towill Corporation
Attn: Mr. Chester Koga

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 523-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP1/09-296567R

January 26, 2009

Mr. Darryl Osato, OSP Engineer
Oceanic Time Warner
200 Akamainui Street
Mililani, Hawaii 96789

Dear Mr. Osato:

Subject: Draft Environmental Assessment (EA) Makakilo Drive Extension

This is to acknowledge your letter of December 10, 2008. Thank you for taking the time to review the Draft EA for the subject project. Please contact Brian Suzuki at 768-8349 if you have additional comments or questions.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

D·R·HORTON® DHI Listed NYSE
America's Builder
SCHULER DIVISION

December 26, 2008

Mr. Brian Suzuki, AICP
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, Hawaii 96813

Dear Mr. Suzuki,

Subject: Comments on Draft Environmental Assessment (DEA) for the proposed Makakilo Drive Extension, Ewa, Oahu

Thank you for providing us the opportunity to submit comments on the subject document.

At D.R. Horton-Schuler Division's invitation in October of 2005, community leaders and active residents from ʻEwa, Kapolei and Waipahu came together to share their visions for the future of ʻEwa. Over the following year, the group worked to identify the key aspects of the expected lifestyle for those living in the coming secondary urban center and the shape it should take. They also set out how Hoʻopili would play a role to bring this vision to life, and in the process thoughtfully created the kind of community they wanted to see built to help fulfill the vision to make ʻEwa a robust and healthy urban place.

Through 2007, the group obtained information from government and private transportation officials/experts in an attempt to address what most considered as the biggest challenge to Oahu's continued growth: transportation, particularly issues facing the rapidly developing secondary housing and employment center, the Ewa Plain.

The group prepared the attached Ewa Region Transportation Action Plan specifically focused on the pending update of the Ewa Regional Highway Impact Fee ordinance. The group used the following criteria to identify road improvements that they believed were required to support the anticipated build out in the region:

1. Roads that have regional significance;
2. Roads that are needed to accommodate growth in the region;
3. Roads that will be constructed based on land use patterns in the area by 2020;
4. Roads that provide greater connectivity to major east-west, north-south and mauka-makai routes;
5. Roads that will complement and accommodate access to public transit, including rail transit; and
6. Roads that will complement existing regional roadways already being constructed.

Using the criteria, the group determined that the proposed Makakilo Drive Extension was one of six (6) road improvements deemed to have regional significance and therefore recommended to be added to the update of the Ewa Highways impact fee ordinance.

The DEA mentions that land acquisition would be required in the Project Summary table on page 1; however, the proposed rights of ways and current landowners are not identified. Also, while the tmk maps are listed, maps identifying the specific parcels are not included in the DEA.

As an owner of a parcel that is directly impacted by the proposed alignment, we would request that a more detailed map showing how our property will be impacted by the proposed project be included in the DEA.

As you are aware, the State Department of Transportation is in the process of acquiring approximately 16 acres out of our 115 acre parcel located directly mauka of the H-1 and North South Road interchange. Your proposed project would bisect the remainder of our property. While access is being allowed to Grace Pacific for their existing Quarry operations, how will access be provided to the two parcels being created by bisecting our existing property?

Thank you for the opportunity to provide comments on the DEA. Should you have any questions regarding this matter, please feel free to contact us directly at 521.5661.

Sincerely,



Dean Uchida, Vice President

cc: Chester Koga

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 523-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP1/09-296637R

January 27, 2009

Mr. Dean Uchida, Vice President
D.R. Horton, Shuler Division
828 Fort Street Mall, 4th Floor
Honolulu, Hawaii 96813

Dear Mr. Uchida:

Subject: Draft Environmental Assessment (EA) Makakilo Drive Extension

This is to acknowledge your letter of December 26, 2008. Thank you for taking the time to review the Draft EA for the subject project. We offer the following in response to your comments:

1. Ewa Region Transportation Action Plan

   Response: We hereby acknowledge receipt of the Plan prepared by your organization. We believe that the proposed roadway plan meets the objectives of the plan developed by your organization.

2. Using the criteria, the group determined that the proposed Makakilo Drive Extension was one of six (6) road improvements deemed to have regional significance and therefore recommended to be added to the update of the Ewa Highways impact fee ordinance.

   Response: The Ewa Highway Impact Fees will be the subject of a study to be conducted this year (2009). The Makakilo Drive Extension will be one of the projects that will be considered in the study.

3. The DEA mentions that land acquisition would be required in the Project Summary table on page 1; however, the proposed rights of ways and current landowners are not identified. Also, while the TMK maps are listed, maps identifying the specific parcels are not included in the DEA. As an owner of a parcel that is directly impacted by the proposed alignment, we would request that a more detailed map showing how our property will be impacted by the proposed project be included in the DEA.

Response: A map showing the preferred roadway alignment overlain on a currently available tax map will be prepared and included in the Final EA. The approximate land area(s) to be acquired will also be shown in the Final EA. Please note that the areas are approximate and will not be finalized until design is completed.

4. As you are aware, the State Department of Transportation is in the process of acquiring approximately 16 acres out of our 115 acre parcel located directly mauka of the H-1 and North South Road interchange. Your proposed project would bisect the remainder of our property. While access is being allowed to Grace Pacific for their existing Quarry operations, how will access be provided to the two parcels being created by bisecting our existing property?

   Response: Access to the adjoining parcels was discussed but not specifically considered during the planning process. We had invited affected property owners to attend our advisory task force meetings and only UH-West O'ahu and Grace Pacific attended to express their future desires. The access shown on the preferred plan are concepts for access based on topography and preliminary roadway design and not for any specific landowner. Based on these factors and in lieu of any specific development proposals that were received, the access shown is the only proposed access points to the roadway at this time.

Please contact Mr. Brian Suzuki at 768-8349 if you have additional comments or questions.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

Hawaiian Electric Company, Inc. • PO Box 2750 • Honolulu, HI 96840-0001

January 22, 2009

Brian Suzuki, AICP
Department of Transportation Services
City & County of Honolulu
650 S. King Street - Third Floor
Honolulu, HI 96813

Dear Mr. Suzuki:

Re: Makakilo Drive Extension
Ewa, Oahu
TMKs: 9-2-002: Parcels 1, 6, 7, 8 &
9-2-003-74

Thank you for the opportunity to comment on the DEA of the above-referenced project. Hawaiian Electric Company, Inc. (HECO) has no objections. The following comments were received from the Transmission & Distribution Division of our Engineering Department:

(1) HECO currently has overhead lines within the area of the subject project, one of which is the 46kV Makakilo Golf line; and we will require continued access for maintenance purposes. We appreciate your efforts to keep us apprised of the planning process. As the project progresses, please continue to keep us informed. We will be better able to evaluate any effects on our system facilities further along in the project's development. We request that development plans show all affected HECO facilities and address any conflicts between the proposed plans and our existing facilities. Please forward the pre-final development plans to HECO for review. A brief description and environmental analysis of any requirements for relocation or new facilities should be included in the DEA.

(2) Should it become necessary to relocate HECO's facilities, please submit a request in writing and we will work with you so that construction of the project may proceed as smoothly as possible. Please note that there may be costs associated with any relocation work, and that such costs may be borne by the requestor. Because any redesign or relocation of our facilities may cause lengthy delays, upon determination that HECO facilities will need to be relocated or built, HECO should be notified immediately in order to minimize any delays in or impacts on the project schedule.

Our point of contact for this project is Michelle Yoshioka, Transmission & Distribution Division, Engineering Department (543-7082). I suggest dealing directly with her to coordinate HECO's continuing input in this project.

Sincerely,

Kirk S. Tomita
Senior Environmental Scientist

cc: Ms. Katherine P. Kealoha (OEQC)
Mr. Chester Koga (R.M. Towill Corp.)
M. Yoshioka/M. Lum/R. Tamayo

APPENDIX

A. Environmental Site Assessment, Kaua'i Environmental, April 2008

B. Traffic Projections for Makakilo Drive, Julian Ng, October 2008

C. Archaeological Inventory Survey, Cultural Surveys Hawai'i, April 2008

D. Botanical Resources Assessment, LeGrande Biological Surveys, Inc., March 2008

E. Avifauna and Feral Mammal Survey, Phillip Bruner, February 2008

F. Cultural Impact Assessment, Cultural Surveys Hawai'i, July 2008

G. Noise Study, D.L. Adams, October 2008

H. Social Impact Assessment, October 2008

I. Agency and Community Consultation

APPENDIX A

Environmental Site Assessment, Kaua‘i Environmental, April 2008

April 2008

PHASE 1 ENVIRONMENTAL SITE ASSESSMENT



MAKAKILO DRIVE ROADWAY EXTENSION

Makakilo, West Oahu

Prepared For:

City and County of Honolulu
Department of Transportation Services
c/o: R. M. Towill Corporation
2024 N. King Street, Suite 200
Honolulu, HI 96819

Prepared by:

Kauai Environmental, Inc.
P.O. Box 1280
Kilauea, Hawaii 96754

ENVIRONMENTAL SITE ASSESSMENT

Makakilo Drive Roadway Extension Project

MAKAKILO, OAHU

April 2008

Prepared For:

City and County of Honolulu
Department of Transportation Services
c/o: R. M. Towill Corporation
2024 N. King Street, Suite 200
Honolulu, HI 96819

Prepared by:

Kauai Environmental, Inc.
P.O. Box 1280
Kilauea, Hawaii 96754

ENVIRONMENTAL SITE ASSESSMENT

Makakilo Drive
Roadway Extension Project

April, 2008

Prepared for:

City and County of Honolulu
Department of Transportation Services
in care of:

R. M. Towill Corporation
2024 N. King Street, suite 200
Honolulu, HI 96819

Prepared by:

Kauai Environmental, Inc.
P.O. Box 1280
Kilauea, Hawaii 96754

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ENVIRONMENTAL SITE ASSESSMENT

Makakilo Drive
Roadway Extension Project

EXECUTIVE SUMMARY

Kauai Environmental Inc. performed a Phase I Environmental Site Assessment (ESA) for the properties along the proposed route of the Makakilo Drive Roadway Extension, a new section of Makakilo Drive which will connect the existing Makakilo Drive to the H-1 Freeway. The exact route for this section of Makakilo Drive has not yet been determined, however the proposed alignment will traverse portions of one or more of the following properties TMK Nos. (1) 9-2-002: Parcel 006 and (1) 9-2-003: Parcels 074 and 079. This ESA covers those sections of these properties which would be affected by any of the three proposed alignments. While the roadway extension will only be constructed on a small portion of the referenced parcels, the entire area defined in Figure 1 (the proposed roadway extension corridor) was evaluated in order to allow planners to assess the impact of the different possible routes for the project.

This assessment was conducted in conformance with the 2000 ASTM Standard for Phase 1 Environmental Site Assessments to determine whether conditions or situations on the properties in question might result in real or potential hazards, or environmental liabilities, that might impact or complicate construction of this roadway extension. Specific items investigated included: present and historical uses of the subject properties and adjacent properties; signs of gross surface contamination; the presence of hazardous materials and wastes; above ground and underground storage tanks (ASTs and USTs), and other indications of the presence of chemical contamination.

A review of State and Federal environmental regulatory databases indicated the following:

- No sites listed by the U.S. EPA on the NPL (Superfund) or delisted NPL databases were identified within the recommended search distances from the proposed roadway extension corridor.

- No CERCLIS (or CERC-NFRAP) sites were identified within the recommended search distance from the proposed roadway extension corridor.

- No RCRA corrective action sites or treatment, storage, and disposal facilities were identified within the recommended search distances from the proposed roadway extension corridor.

- No RCRA hazardous waste generators were identified within the recommended search distance from the proposed roadway extension corridor.

- No state-recognized hazardous waste sites were identified within one mile of the proposed roadway extension corridor.

- No registered underground storage tank (UST) sites were identified within the recommended search distance from the proposed roadway extension corridor.

- One leaking underground storage tank (LUST) site was identified within the recommended search distance from the proposed roadway extension corridor. No impact to the subject properties is anticipated due to the distance to this site of over a quarter mile, and the fact that a site clean-up has been completed.

- No active landfills were identified within the recommended search distance from the proposed roadway extension corridor.

- There have been no spill incidents connected with the subject properties that were reported to the HEER office or entered on the ERNS database.

- No Brownsfields sites, or sites with institutional or engineering controls, were identified within the recommended search distances from the proposed roadway extension corridor.

A review of relevant State and Federal databases did not identify any institutional controls, engineering controls, or activity and use limitations associated with the subject properties or adjacent properties.

A site reconnaissance at the subject properties was performed on April 7, 2008. The environmental issues identified during this inspection are listed below.

- Extensive erosion was evident in areas that were landscaped and graded as part of the former golf course on the site. It appears that much of the eroding material was imported fill. While this material may have been brought in from the nearby quarries, the source of the material is unknown.

A review of historical land use information including aerial photographs, historical topographic maps, and interviews with persons familiar with the history of the property has indicated the following:

- The subject property has been largely undeveloped.

- Possible historical uses included cattle ranching and limited agricultural production.

- Palehua Road, which runs through the property, was originally an unpaved road dating back to at least the 1960s. The roadway was paved to facilitate the delivery of raw materials to the Makakilo subdivision from the quarries nearby

- A portion of the subject property was previously developed as a golf course, which has since been abandoned and has fallen into neglect. Potential environmental concerns related to this abandoned golf course include the use of imported fill materials and the

possibility of residual contamination associated with chemicals or petroleum products that may have been stored and used at the golf course for maintenance purposes. Whether or not the golf course had a functional maintenance facility is unknown, as is the location of any such facility. Neither of these issues are considered to be recognized environmental conditions.

In summary, no recognized environmental conditions or historical recognized environmental conditions have been identified in association with the subject properties during the process of completing this Phase 1 Environmental Site Assessment.

ENVIRONMENTAL SITE ASSESSMENT

MAKAKILO DRIVE
ROADWAY EXTENSION PROJECT

1.0 INTRODUCTION

Kauai Environmental Inc. (KEI) performed a Phase 1 Environmental Site Assessment (ESA) for property along the proposed route for Makakilo Drive Roadway Extension, a new section of Makakilo Drive which will connect the existing Makakilo Drive to the H-1 Freeway, as shown in Figures 1-3 (Appendix A). The exact route for this section of Makakilo Drive has not yet been determined, however the proposed alignments (shown in Figure 2) will traverse portions of one or more of the following properties: TMK Nos. (1) 9-2-002: Parcel 006 and (1) 9-2-003: Parcels 074 and 079.

This ESA has been conducted for those portions of the above-referenced properties which may be affected by the alignment of the roadway extension as currently proposed,. The scope of this investigation is limited to the area below the existing Makakilo residential subdivision and above the property in use as a quarry along the H-1 Freeway, as shown in Figure 3. Throughout this report, the portions of those properties included in this assessment will be referred to collectively as: *the subject property*; *the property*; or: *the proposed roadway extension corridor.*

This assessment was performed in accordance with the guidelines established in the American Society for Testing and Materials (ASTM) 2000 Standard: E 1527-00, "Standard Practice for Environmental Site Assessments: Phase 1 Environmental Site Assessment Process."

1.1 *Purpose*

This investigation has been performed for R. M. Towill Corporation, on behalf of the City and County of Honolulu Department of Transportation Services to identify any potential environmental hazards or liabilities that might be encountered during the construction of the Makakilo Drive Roadway Extension, from the existing Makakilo Drive to the H-1 Freeway As such, the purpose of this assessment was to investigate past and present land uses of the subject properties and surrounding areas to determine if the potential exists for hazardous materials contamination or other significant, adverse environmental liabilities associated with the properties. These conditions may affect the selection of the best route for the roadway extension and may affect the cost or construction methods required to complete the roadway in some areas.

As defined by the 2000 ASTM Standard, the objective of the Phase 1 ESA process is to identify any "recognized environmental conditions" associated with a Parcel of commercial real estate. A "recognized environmental condition" is defined as: "*the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, ground water, or surface*

water of the property." The term may include hazardous substances or petroleum products even when stored under conditions in compliance with applicable laws and regulations, but is not intended to include *de minimis* conditions that would not require enforcement action if brought to the attention of the appropriate government agencies.

1.2 *Scope of Work*

The exact route for this section of Makakilo Drive has not yet been determined; therefore, a corridor encompassing the areas where the road may be built was defined in consultation with planners at R.M. Towill Corporation. This Phase 1 ESA is limited to this corridor, defined as the area that may be affected by the construction of the Makakilo Drive Roadway Extension along any of the three currently proposed alignments. The scope of this Phase 1 ESA is further limited to the area above the Grace-Pacific quarry and below the existing Makakilo residential subdivision. The proposed alignments for roadway extension are shown in Figure 2; project limits are shown in Figure 3.

The 2000 ASTM Standard defines the four components of the Phase 1 ESA process as follows:

- Records Review
- Site Reconnaissance
- Interviews
- Report

These ASTM Standard states that these four components are to be used in concert, with each component providing information that may be used to inform the other components.

In the process of completing this Phase 1 ESA, KEI has performed the following tasks:

- Conducted a review of available environmental records including State and Federal regulatory databases, and contacted local and State agencies to determine the regulatory history associated with the properties, as well as other properties in the vicinity where current or historical commercial or industrial activities might impact the subject properties;

- Reviewed available sources of historical information for the subject properties and surrounding areas, including historical topographic maps and aerial photographs, to assess past land use in the vicinity of the subject properties;

- Conducted a thorough site reconnaissance to assess current uses and condition of the subject properties and adjacent properties;

- Interviewed persons familiar with the properties and the history of the area for information on current and past uses of the subject properties and other properties in the surrounding areas;

- Reviewed information on site geology, soils, and hydrogeology of the area; and

- Prepared this Environmental Site Assessment Report which documents the findings of this evaluation.

A review of historical and environmental records pertaining to the subject properties and surrounding properties is documented in Section 3.0. Site reconnaissance, performed by a qualified environmental professional, is documented in Section 4.0. Interviews, also conducted by a qualified environmental professional, are documented in Section 5.0.

1.3 *Limitations and Exceptions*

KEI has completed this Phase 1 ESA for portions of the properties identified by TMK Nos. (1)9-2-002:006, (1)9-2-003:074 and (1)9-2-003:079 as delineated in Figure 1 (the "Subject Property"). KEI's findings and conclusions in this Phase 1 ESA are professional opinions based solely upon visual observations and interviews conducted by KEI, KEI's interpretation of the available environmental records and historical information, information provided by the Designated Users of this report, and KEI's interpretation of other documents reviewed during this Phase 1 ESA process. Requests for information resources are made by KEI to collect relevant data on current and past practices at the Subject Property. KEI may not receive all information requested or be able to verify or confirm received information during the Phase 1 ESA process. Therefore, KEI shall not be held responsible for errors, omissions, or misrepresentations resulting from missing documentation or from inaccurate information provided by such sources.

Limitations encountered during the physical inspection of the subject properties included: many areas within the subject properties are overgrown or inaccessible, and physical access for visual inspection was limited in some areas. Limitations to physical inspection included tall, thick grasses and shrubs throughout much of the subject property, as well as a steep ravine (Kaloi Gulch) on Parcel 074, along the eastern edge of the project area. The presence of what appears to be thick fill materials was also a limitation in some areas of the site.

KEI has performed its services for this project with the degree of care, skill and diligence ordinarily exercised by professional consultants performing the same or similar services. No warranty or representation, either expressed or implied, is included or intended in KEI's proposals, contracts, or reports.

Opinions stated in this report do not apply to changes that may have occurred after services were performed. Opinions and recommendations presented herein apply to site conditions existing at the time of our investigation. They do not apply to site changes of which KEI is not aware and has not had the opportunity to evaluate.

This Phase 1 ESA is limited to the scope of ASTM Standard E 1527-00. No additional services were contracted in conjunction with this Phase 1 ESA.

Designated Users of this Phase 1 ESA include: R.M. Towill Corporation and the City and County of Honolulu. This report is intended for the sole use of these Users on this Project. This report

shall not be reused and is not intended or represented to be suitable for reuse by any other person or entity, whether on this project or any other project, or by the Designated Users on any other project. Any reuse of this document or the findings, conclusions, or recommendations presented herein will be at the user's sole risk and without liability or legal exposure to KEI.

2.0 SITE DESCRIPTION

2.1 *Location and Legal Description*

This assessment was performed for a corridor that includes the proposed alignments for the Makakilo Drive Roadway Extension. The scope of this investigation is limited to the area that may be affected by the construction of the Makakilo Roadway Extension along any of the currently proposed alignments, below the existing Makakilo residential subdivision and above the property in use as a quarry along the H-1 Freeway. The three currently proposed alignments are shown in Figure 2; project limits are shown in Figure 3. This area includes portions of the following properties: TMK Nos. (1) 9-2-002: Parcel 006 and (1) 9-2-003: Parcels 074 and 079. A list of the Parcels included in this assessment is included below in Table 1. This assessment is limited to the proposed roadway extension corridor and does not include the entire extent of the parcels listed below.

Table 1: Properties Included in this Phase 1 ESA

Parcel (TMK No.)	Area* (acres)	Location / Property Description	Owner
(1) 9-2-002: 006	115.77	Property extending from H-I Freeway and including steep ravine along eastern edge of subject property.	D. R Horton-Schuler Homes LLC
(1) 9-2-003: 074	311.83	Parcel below existing Makakilo subdivision including former golf course.	Pu'u Makakilo Inc.
(1) 9-2-003: 079	83.29	Narrow strip along eastern edge of existing Makakilo subdivision including upper portion of steep ravine to east edge of subject property.	Wai Kaloi of Makakilo Community Association

* The total area of each parcel is listed here. Only a portion of this area was included in this ESA.

2.2 *Site and Vicinity Characteristics*

2.2.1 Geologic Setting and Soils

The site is located on the lower, southern flanks of the Waianae Mountains. These mountains were formed by volcanic eruptions over that past 3 million years. Significant erosion of the original mountains has contributed to the development of thick soils in this area. The lower portion of the site is located at the point that the mountains meet the coastal Ewa plain and extend to an elevation of approximately 460 feet above sea level at the northern boundary.

The general soils on the subject property are in the Halemao - Wahiawa Association. These soils are deep, nearly level to moderately sloping well drained soils that have a fine textured subsoil. There are several sub-types of the soil on this parcel due to the varying terrain from deep gulches to steep hillsides and upland areas.

In the gulch areas and alluvial areas below them, the soils are of the Kawaihapai Series. These clayey, loamy soils are formed by the erosion of the igneous rocks from humid uplands. In the uplands areas, the soils are typically of the Molokai Series. These silty clay loam soils are well drained soils found at higher elevations that are formed by the weathering of igneous rock in areas that are relatively dry. On the steep hillsides, the soils consist of Mahana - Badland soils and stony rocky areas. These soils are often found in areas with high ash content resulting in a high erosion potential and limited agricultural options.

2.2.2 Groundwater

The subject property is located in an area that is above the Underground Injection Control Line as set by the Hawaii Department of Health. The groundwater located beneath this property is therefore defined as a potable, useful resource that retains full protection under state law. While no extraction of the groundwater is likely at this site due to its use as a roadway corridor, the groundwater resource must be protected from impacts due to hazardous chemicals.

Based on the use of the property as grazing land and a golf course, no impacts to the groundwater are likely from the use of the property in the past. No records of any groundwater impacts has been found during the research on the history of these properties.

No drinking water wells or Public Water System wells are located within a mile of the subject property. Several agricultural wells installed in the area are not in use, and several injection wells for septic wastes are in use, however the planned or past uses of the subject property are not likely to have impacted any of the groundwater uses in the vicinity.

2.2.3 Surface Waters

No pools or ponds of standing water were identified on the subject property. On the higher-elevation plateau to the west of Kaloi Gulch there are several eroding washes that carry storm waters from the higher elevations. To the east, Kaloi Gulch caries storm waters from the Makakilo subdivision (storm drain outfalls are visible in Photo 2) The nearest body of water is the Pacific Ocean, which is located to the south and west of the subject properties.

2.2.4 Site Flood Boundaries

According to the Flood Insurance Rate Map (FIRM) #150001-0105A, the subject property is outside the 100 year flood zone. The entire area is considered within the 500 year flood zone.

2.3 *General Site Setting*

This section summarizes general information about the subject properties as derived from various sources including information from review of historical use and environmental records (Section 3.0), observations made during site reconnaissance (Section 4.0), and information obtained during interviews (Section 5.0).

2.3.1 Current Uses of Subject Properties

The subject properties are relatively undeveloped, and most of the area is not in use at this time. The lower portion of Parcel 006, above the quarry at the freeway, is in use as a cattle ranch. A well-maintained asphalt road traverses the parcel from the quarry, passing above the ranch area. The property above this road (Parcel 074) is fenced off and inaccessible to the public. An unmaintained asphalt road traverses this parcel form the quarry road to the bottom of the existing Makakilo subdivision, where the proposed roadway extension corridor includes the lower end of Parcel 079.

2.3.2 Past Uses of Subject Properties

The higher elevation section of the subject property, on Parcel 074, was developed as a golf course in the late 1980s or early 1990s. The golf course never opened and was never completed, though a significant amount of grading and landscaping work was completed. The asphalt road that traverses this parcel was paved during the construction of the Makakilo subdivision, to allow for the direct transport of material from the Grace-Pacific quarry along H-1. No other historical uses of the subject property are known, although it is possible that some of the area may have been used as grazing land for ranching or for agricultural production.

2.3.3 Current Uses of Adjacent Properties

The subject property is bounded to the north by the existing Makakilo residential subdivision, and to the south by the Grace Pacific quarry and the H-1 Freeway. The properties to the west and the east are undeveloped.

2.3.4 Past Uses of Adjacent Properties

The adjacent properties may have been used in the past for cattle ranching and limited agricultural production. No other historical uses of the adjacent properties are known.

3.0 REVIEW OF ENVIRONMENTAL AND HISTORICAL RECORDS

In order to identify the presence of recognized environmental conditions at the subject properties, several published sources of environmental records were searched, including databases maintained for this purpose by state and federal regulatory agencies. This section lists the environmental databases that were searched, and describes the results of each search.

3.1 *Standard Environmental Record Sources*

The 2000 ASTM Standard for the Practice of Conducting Phase 1 ESAs (ASTM E 1527-00) defines a list of Federal and State regulatory databases as "Standard Environmental Record Sources" to be searched for relevant information as part of the Phase 1 ESA process. These databases record reported environmental incidents, conditions, and permitted or regulated operations that have the potential to impact the subject properties.

A summary of standard environmental database records was provided to KEI by Environmental Data Resources, Inc on April 1, 2008 (*EDR, 2008a*). This summary included the most recent versions available at that time for all required database records, as described below. Federal environmental databases reviewed for this report are detailed in Section 3.1.1. State environmental databases are detailed in Section 3.1.2. Tribal databases were also reported in EDR's summary, however these results are not included here since, at this time, there are no tribal lands in the State of Hawaii.

3.1.1 Federal Database Search Results

Table 2 lists the major Federal database records that were searched for this report. The ASTM methodology (ASTM Standard: E 1527-00) specifies a minimum search distance for each database, and also mandates that each database record used must have been updated by the source within 90 days of the search. The dates of the most recent update for each Federal database source are also listed in Table 2, along with the ASTM-mandated search distance for each database and the number of hits, or listed sites identified from each database within the recommended search distance. Results from each database search are described individually below.

Table 2: Federal Environmental Databases Reviewed

Database	Source Category (Gov't Agency)	Updated by Source	Search Distance	Hits
NPL	National Priority List (Superfund) Sites (USEPA)	1/28/08	1 mile	0
DELISTED NPL	National Priority List Deletions	1/28/08	0.5 mile	0
CERCLIS	CERCLIS Site Event List (USEPA)	3/20/08	0.5 mile	0
CERC-NFRAP	CERCLIS -No Further Remedial Action Planned	3/17/08	0.5 mile	0

Database	Source Category (Gov't Agency)	Updated by Source	Search Distance	Hits
CORRACTS	RCRA Corrective Action List (USEPA)	3/03/08	1 mile	0
RCRA	TSD Facility List (USEPA)	3/06/08	0.5 mile	0
RCRA	Generators Facility List (USEPA)	3/06/08	0.25 miles	0
US ENG CONTROLS	Engineering Controls Sites List	3/31/08	0.5 mile	0
US INST CONTROL	Sites with Institutional Controls	3/31/08	0.5 mile	0
ERNS	Emergency Response Notification System (USEPA)	1/23/08	Site only	0

NPL = National Priority List
CERCLIS = Comprehensive Environmental Response, Compensation, and Liability Information System
CORRACTS = Corrective Action Report
RCRA = Resource Conservation and Recovery Act
RCRIS = Resource Conservation and Recovery Information System
TSD = Transport, Storage and Disposal

USEPA National Priorities List (NPL)

The National Priorities List compiled by the U.S. Environmental Protection Agency lists the Superfund Hazardous Waste Sites as required by federal law. The identification of the hazardous waste sites presenting the greatest risk to human health and the environment is mandated by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) passed in 1980. This list is prioritized according to the severity of the risk to public health and the environment. **No NPL sites were identified within one mile of the proposed roadway extension corridor.**

USEPA National Priorities List Deletions (DELISTED NPL)

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CRF 300.425.(e) sites may be deleted from the NPL when no further response is appropriate. **No De-listed NPL sites were identified within one half mile of the proposed roadway extension corridor.**

USEPA CERCLIS List (CERCLIS)

The CERCLIS List, or Comprehensive Environmental Response, Compensation, and Liability Information System database, contains data on potentially hazardous waste sites that have been reported to the EPA by states, municipalities, private companies, and private persons. These sites are considered for possible clean up activities or inclusion onto the NPL. **No CERCLIS sites were identified within one half mile of the proposed roadway extension corridor.**

USEPA CERCLIS List-No Further Remedial Action Planned (CERC-NFRAP)

The CERC-NFRAP List contains sites that have been removed from the CERCLIS list and archived. Archived status indicates that, to the best of the EPA's knowledge, assessment at a site has been completed and the EPA has determined that no further steps will be taken to list the site on the NPL at this time. This decision does not necessarily mean that there is no hazard associated with a given site, it only means that, based upon available information, the location is not judged to be a potential NPL site. **No CERC-NFRAP sites were identified within one half mile of the proposed roadway extension corridor.**

USEPA RCRA CORRACTS List (CORRACTS)

The RCRA CORRACTS or Corrective Action Report database lists those facilities that generate, treat, store, or dispose of hazardous wastes that have undergone remediation activity. These sites have experienced spills or releases of hazardous chemicals prompting the need for clean up action. The extent and type of contamination is listed in this report as well as the status of the corrective actions. **No hazardous waste facilities that have undergone corrective action were identified within one mile of the proposed roadway extension corridor.**

USEPA RCRA TSD Facilities List (RCRA)

The EPA maintains a list of Treatment, Storage, and Disposal (TSD) Facilities that either handle or dispose of hazardous waste as defined by the hazardous waste regulations published by the EPA according to the Resource Conservation and Recovery Act (RCRA). This information is contained in the Resource Conservation and Recovery Information System (RCRIS). **No TSD facilities were identified within one half mile of the proposed roadway extension corridor.**

USEPA RCRA Generators List (RCRA)

The EPA tracks all facilities that generate hazardous wastes in excess of threshold quantities set in the RCRA regulations. RCRA large quantity generators (LQG) are those that produce in excess of 1000 kilograms of hazardous waste per month, and small quantity generators (SQG) are those that produce greater than 100 kg per month but less than 1000 kg per month. This information is also contained in the Resource Conservation and Recovery Information System (RCRIS). **No hazardous waste generators were identified within one quarter mile of the proposed roadway extension corridor.**

USEPA Engineering Controls Sites List (US ENG CONTROLS)

The EPA maintains this list of sites with engineering controls in place. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to prevent regulated or hazardous substances from entering environmental media or effecting human health. **No sites with engineering controls were identified within one half mile of the proposed roadway extension corridor.**

USEPA Institutional Controls Sites List (US INST CONTROL)

The EPA maintains this list of sites with institutional controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of institutional

controls. **No sites with institutional controls were identified within one half mile of the proposed roadway extension corridor.**

USEPA ERNS List (ERNS)
The Emergency Release Notification System list, compiled by the US EPA, lists the locations and other data on reported releases of oil and hazardous substances. All releases in excess of threshold quantities are required to be reported and included in this list. **No entries on the ERNS database were identified for the subject properties.**

3.1.2 State and Local Database Search Results

Table 3 lists the major State database records that were searched for this report. These records are maintained by the State Department of Health. The ASTM methodology (ASTM: E 1527-00) specifies a minimum search distance for each database, and also mandates that each database record used must have been updated by the source within 90 days of the search. Table 4 lists the dates of the most recent update for each State database source, along with the ASTM-mandated search distance for each database and the number of hits, or listed sites identified from each database within the recommended search distance. Results from each database search are described individually below.

Table 3: State Environmental Databases Reviewed

Database	Source Category	Updated by Source	Search Distance	Hits
SHWS	State-recognized Hazardous Waste Sites (Hawaii DOH)	3/20/08	1 mile	0
SWF/LF	Permitted Solid Waste Facilities and Landfills (Hawaii DOH)	2/20/08	0.5 mile	0
UST	Registered Underground Storage Tank sites (Hawaii DOH)	3/26/08	0.25 mile	0
LUST	Leaking UST sites (Hawaii DOH)	3/26/08	0.5 mile	1
SPILLS	HEER Release Notifications (Hawaii DOH)	3/20/08	site only	0
INST CONTROLS	Sites with Institutional Controls	3/20/08	site only	0
VCP	Voluntary Response Program Sites	3/20/08	0.5 mile	0
DRYCLEANERS	Permitted Dry Cleaning Facilities	3/27/08	0.5 mile (not required)	0
BROWNSFIELDS	Brownsfields Sites	3/20/08	0.5 mile	0

DOH = Hawaii State Department of Health
HEER = Hazard Evaluation and Emergency Response

State of Hawaii Hazardous Waste Sites (SHWS)
This list includes all facilities, sites, or areas in which the Office of Hazard Evaluation and Emergency Response has an interest, has investigated, or may investigate under Hawaii Revised Statutes. **No state-recognized hazardous waste sites were identified within one mile of the proposed roadway extension corridor.**

State of Hawaii Landfill Sites (SWF/LF)
The state list of Solid Waste Facilities and Landfill Sites contains an inventory of solid waste disposal facilities or landfills in the state. These facilities may be active or inactive or open dumps that failed to meet RCRA criteria for proper solid waste landfills. **No state recognized landfills or disposal sites were identified within a half mile of the proposed roadway extension corridor.**

State of Hawaii UST List (UST)
This list of registered underground storage tanks is administered by the State of Hawaii Underground Storage Tank (UST) division. All tanks that are registered as required by the federal RCRA regulations are contained on this list. The database also includes the number and types of tanks registered, the regulatory status of the tanks, and whether they have been removed and closed according to state law. **No registered underground storage tank sites were identified within a quarter mile of the proposed roadway extension corridor.**

State of Hawaii Leaking UST List (LUST)
The state Department of Health UST Division records the location and regulatory status of all sites in which leaking underground storage tanks have been identified.

One leaking underground storage tank site was identified within a half mile of the proposed roadway extension corridor. This site, the fuel tank on the backup generator for the KSSK-FM radio transmitter, is located more than one quarter mile from the subject properties, and has been cleaned up to the satisfaction of the State Department of Health. No impact to the subject properties is anticipated.

State of Hawaii Hazard Evaluation and Emergency Response Spills List (SPILLS)
The Department of Health HEER office maintains a record of all spills and releases of chemicals and petroleum products above the regulatory threshold quantity that have been reported to the HEER office since 1988. These records are used to track all incidents to ensure that they are properly cleaned up. **No record of any spills on the subject properties that have been reported to the HEER office was identified in the database report.**

State of Hawaii Institutional Controls Sites List (INST CONTROLS)
The Department of Health maintains this list of Voluntary Response Program and Brownsfields sites with institutional controls in place. **The subject properties were not identified as sites with institutional controls in place.**

State of Hawaii Voluntary Response Program Sites List (VCP)
The Department of Health maintains this list of Voluntary Response Program sites, which are sites where voluntary clean-up projects are underway or have been completed by current or former

owners. **No Voluntary Response Program sites were identified within a half mile of the proposed roadway extension corridor.**

State of Hawaii Drycleaners Sites List (DRYCLEANERS)
The Department of Health maintains this list of permitted dry cleaning facilities in the state, which are common sources of groundwater contamination. This search is not required by the ASTM standard but is included due to the prevalence of contamination associated with dry cleaning facilities. **No dry cleaners were identified within a half mile of the proposed roadway extension corridor.**

State of Hawaii Brownsfields Sites List (BROWNSFIELDS)
The Department of Health maintains this list of Brownsfields sites.
No Brownsfields sites were identified within a half mile of the proposed roadway extension corridor.

3.2 *Standard Historical Use Information Sources*

The following information was reviewed pertaining to the historical uses of the subject properties and the surrounding area.

3.2.1 Aerial Photographs

Aerial photographs of the subject properties and the surrounding area were obtained from the Photogrammetry Department at R. M. Towill Corporation in Honolulu, HI. Aerial photographs covering the subject properties were available from the years 1970, 1975, 1982, 1987, 1995 and 2001. These photographs were examined for evidence of previous site usage. The following discussion describes the apparent uses of the subject properties and the adjacent areas noted in each of the photos reviewed.

1970 Photo: In this black and white photo taken from an altitude of 6,700 feet, the subject property appears completely undeveloped and does not appear to be in use. The area can be identified by its proximity to the existing H-1 Freeway and Puu Makakilo. There are no other visible distinguishing features in the vicinity of the property.

1975 Photo: In this black and white photo taken from an altitude of 6,500 feet, the subject property remains undeveloped, but there are some unpaved roads or paths through the property that are visible. The lower portion of Parcel 006, below the subject property, appears to be cultivated, possibly as sugar cane.

1982 Photo: In this black and white photo taken from an altitude of 13,000 feet, the entire Makakilo residential area is visible. Although the photo is taken from a high elevation, some details of the golf course on Parcel 074 are visible, including golf cart paths and a water feature. No other sign of development is visible on the subject property.

1987 Photo: In this black and white photo taken from an altitude of 13,000 feet, the subject property appears unchanged from 1982. The golf course does not appear to have been completed or maintained.

1995 Photos: In this color photo taken from an altitude of 19,400 feet, the golf course again appears to be under development, with a significant amount of grading activity underway. The presence of some of the exposed soils may be due to erosion rather than development. Palehua Road appears to have been expanded and improved, and residential development is continuing along Makakilo Drive toward the subject property.

2001 Photos: In this black and white photo taken from an altitude of 10,500 feet, the layout of the golf course remains visible and Palehua Road can also be seen. Makakilo and Kapolei have expanded considerably. The rock quarry along H-1 to the west of the subject property is notably larger, but there is no sign of the Grace-Pacific quarry below the subject property. There is no indication of additional development on the subject property.

3.2.2 Sanborn Fire Insurance Maps

The Sanborn Library includes a large collection of historical fire insurance maps dating back to the late 1800's. These maps show all insurable structures in a given area at a specific point in time, and are thus useful indicators of historical land use and changes in land use over time.

A Sanborn Map Report was not requested for the subject properties as there are no existing or historical structures in the area.

3.2.3 Historical Topographic Maps

A Historical Topographic Map Report, including copies of all historical USGS topographic maps available for the site and vicinity of the subject properties, was provided to KEI by Environmental Data Resources, Inc on April 2, 2008 (*EDR, 2008b*). Historical topographic maps of the Ewa Quadrangle, which include the subject properties and the surrounding area, were available from the years 1962, 1968, 1983 and 1998. These maps were examined for evidence of historic land use patterns. The following discussion describes the apparent uses of the subject properties and the adjacent areas noted in each of the maps provided by EDR. A copy of EDR's Historical Topographic Map Report is included here as Appendix D.

1962 Topo Map: The USGS Topographic Map of the Ewa Quadrangle from 1962 shows a relatively undeveloped Ewa Plain and Makakilo area. Farrington Highway and Waimanalo Road are the only major roadways through the Kapolei area. There is no residential community in the Makakilo area, though there is a small airstrip above Puu Kapolei. The subject property can be identified by its proximity to Puu Makakilo and Kaloi Gulch. The only development in the area is an aqueduct and Palehua Road, an unpaved road

which runs through the subject property and across Farrington Highway onto the Ewa plain.

1968 Topo Map: The USGS Topographic Map of the Ewa Quadrangle from 1968 shows almost no change in the vicinity of the subject property. There is a water tank and pumping station above the subject property, as well as a small quarry, but no other building or infrastructure in the area. To the south, the H-1 Freeway has been constructed. Further west, development of Makakilo City has been begun but there is not yet any sign of modern Kapolei as it exists today.

1983 Topo Map: The USGS Topographic Map of the Ewa Quadrangle from 1983 shows no change to the immediate vicinity of the subject property. Excavation has begun at the large rock quarry to the west of the subject property along H-1, and residential development in Makakilo continues to expand up the slope of the hillside.

1998 Topo Map: The USGS Topographic Map of the Ewa Quadrangle from 1998 shows the clubhouse of the golf course that was partially constructed on the subject property. No other improvements or changes are notable in the vicinity of the subject property. To the south, the quarry has expanded, and both Kapolei and Makakilo have continued to expand. The Makakilo subdivision has also continued to expand above the subject property. There is no sign of the Grace-Pacific quarry below the subject property.

4.0 SITE RECONNAISSANCE

A visual inspection of the subject properties and surrounding areas was performed by Benjamin Owen of KEI. Photographs of the property taken at the time of the inspection are included in Appendix B.

4.1 *Methodology and Limiting Conditions*

Inspection of the subject properties was performed on April 7, 2008. Methodology for these inspection consisted of walking and visually inspecting all accessible areas of the subject properties, including all existing and accessible roads, paths and trails, and noting all observable features.

Some areas of the site are open and level; however many areas are overgrown or inaccessible, and physical access for visual inspection was limited. Limitations to physical inspection included tall, thick grasses and shrubs which limited access to many areas, fencing around the cattle ranching area on Parcel 006, and imported fill materials used for landscaping in the area formerly developed as a golf course.

4.2 *Observations*

This section documents observations recorded at the time of the physical inspection of the subject properties and the adjacent properties.

Most of the subject property is enclosed within a locked perimeter fence to discourage unauthorized dumping in the area. Mr. Owen was escorted on the property by Sidney Aki of Grace Pacific. The locked access gate along the existing quarry road was opened and Mr. Owen was allowed full access to the area.

The property is traversed by a poorly maintained asphalt roadway, which according to Mr. Aki was paved to facilitate transport of raw materials from the quarry below to the expanding Makakilo subdivision. This road ends at the lower edge of the existing Makakilo Drive subdivision, which is in the final stages of development.

Other than the paved access road, the only signs of development or use in the area are the abandoned remnants of the golf course infrastructure including concrete golf cart paths, landscaping features and an artificial lake bed. Much of the area is overgrown with thick grasses and brush. The concrete golf cart paths provide virtually the only access onto the property, with the exception of large swaths of open, eroded areas. These areas appear to have been covered with imported fill materials which have not been retained due to the lack of landscaping maintenance.

At the top of the subject property, the paved access road abuts the existing Makakilo subdivision where the subdivision approached the edge of Kaloi Gulch. At the bottom of the subject property, a portion of Parcel 006 is enclosed and is used as a cattle pasture. Below this pasture lies the Grace-Pacific quarry and the H-1 freeway. No indications of any potential recognized environmental conditions were observed on any of these adjacent properties.

5.0 INTERVIEWS

This section documents interviews conducted in the process of conducting this Phase 1 ESA. All interviews conducted for this assessment were conducted by Benjamin Owen of KEI.

Sidney Aki , Operations Manager, Grace Pacific Inc.
Mr. Aki was interviewed as a representative of Grace Pacific, which leases much of the subject property and operates the quarry below the property at the intersection of Palehua Road and H-1 Freeway. Mr. Aki is responsible for security and operations in the area for Grace Pacific. He indicated that the subject property had been originally developed as a golf course, but that the developers had run out of money and abandoned the project. Mr. Aki also provided details of when Palehua Road was paved to facilitate delivery of material to Makakilo. When asked if he was familiar with any current or historical use or storage of chemicals or petroleum products on the property, Mr. Aki indicated that he was not.

Dean Uchida, Vice President, D. R. Horton-Schuler Homes LLC
Mr. Uchida was interviewed as a representative for D. R. Horton-Schuler Homes, the owners of Parcel 074, a 115 acre parcel which encompasses the Kaloi Gulch and the property to the east of the subject property. Mr. Uchida stated that D. R. Horton-Schuler Homes had purchased the property in 2005 from Campbell Estate as part of a bulk land purchase including over 1500 acres. Mr. Uchida stated that D. R. Horton-Schuler Homes has not used or developed the parcel in any way since 2005 but he was not familiar with the history of the property prior to that date. He referred any further questions to Steve Kelly of Kapolei Property Development.

Steve Kelly, Kapolei Property Development
Several attempts were made to contact Mr. Kelly by telephone. He was not available to be interviewed for this report.

6.0 FINDINGS AND OPINION

This section lists findings of fact, which may include known or suspected recognized environmental conditions, historical recognized environmental conditions, and *de minimis* conditions associated with the subject properties that have been identified during the course of this Phase 1 ESA, as well as KEI's assessment of the potential impact on the subject properties from the conditions identified here.

FINDING: A LUST site was identified within one half mile from the subject property. The site has been remediated and DOH has issued a letter requiring no further action.
OPINION: No impact to the subject property is anticipated.

FINDING: An historic golf course was constructed or partially constructed on a portion of the subject property. The course was not completed and was never opened but much of the infrastructure remains in place and has not been maintained.
OPINION: It is unlikely that the presence of this abandoned golf course will have an impact on the use or development of the subject property, since the course was never operational. However, golf courses often have large supplies of pesticides and fertilizers as well as mechanical shops in their maintenance areas. In this case, the location of any historic maintenance area that may have been present on the site is not known.

FINDING: Imported fill materials appear to have been used extensively in the construction and development of the abandoned golf course.
OPINION: The impact of this fill material cannot be determined, as the source of the material is unknown. However, given the proximity of several large commercial quarries, it is likely that the materials were brought in from these sites.

FINDING: Several large quarry operations are located in close proximity to the property.
OPINION: No impact to the subject property is expected.

FINDING: A cattle ranch is located in close proximity to the subject property.
OPINION: No impact to the subject property is expected.

No recognized environmental conditions or historical recognized environmental conditions have been identified in association with the subject properties during the process of completing this assessment.

7.0 CONCLUSIONS

Kauai Environmental Inc. has performed this Phase 1 Environmental Site Assessment (ESA) for the properties along the proposed route of the Makakilo Drive Roadway Extension, a new section of Makakilo Drive planned to connect the existing Makakilo Drive to the H-1 Freeway. The exact route for this section of Makakilo Drive has not yet been determined, however the proposed alignment will traverse portions of one or more of the following properties TMK Nos. (1) 9-2-002: Parcel 006 and (1) 9-2-003: Parcels 074 and 079. This ESA covers those sections of these properties which would be affected by any of the three proposed alignments.

A review of State and Federal environmental regulatory databases indicated the following:

- No sites listed by the U.S. EPA on the NPL (Superfund) or delisted NPL databases were identified within the recommended search distances from properties which include the proposed roadway extension corridor.

- No CERCLIS (or CERC-NFRAP) sites were identified within the recommended search distance from properties which include the proposed roadway extension corridor.

- No RCRA corrective action sites or treatment, storage, and disposal facilities were identified within the recommended search distances from properties which include the proposed roadway extension corridor.

- No RCRA hazardous waste generators were identified within the recommended search distance from properties which include the proposed roadway extension corridor..

- No state-recognized hazardous waste sites were identified within one mile of the properties which include the proposed roadway extension corridor.

- No registered underground storage tank (UST) sites were identified within the recommended search distance from properties which include the proposed roadway extension corridor.

- One leaking underground storage tank (LUST) site was identified within the recommended search distance from properties which include the proposed roadway extension corridor. No impact to the subject properties is anticipated due to the location of this site relative to the subject properties, and the fact that a site clean-up has been completed.

- No active landfills were identified within the recommended search distance from properties which include the proposed roadway extension corridor.

- There have been no spill incidents connected with the subject properties that were reported to the HEER office or entered on the ERNS database.

- No Brownsfields sites, or sites with institutional or engineering controls, were identified within the recommended search distances from properties which include the proposed roadway extension corridor.

A review of relevant State and Federal databases did not identify any institutional controls, engineering controls, or activity and use limitations associated with the subject properties or adjacent properties.

A site reconnaissance at the subject properties was performed on April 7, 2008. The environmental issues identified during this inspection are listed below.

- Extensive erosion was evident in areas that were landscaped and graded as part of the former golf course on the site. It appears that much of the eroding material was imported fill. While this material may have been brought in from the nearby quarries, the source of the material is unknown.

A review of historical land use information including aerial photographs, historical topographic maps, and interviews with persons familiar with the history of the property has indicated the following:

- The subject property has been largely undeveloped.

- Possible historical uses included cattle ranching and limited agricultural production.

- Palehua Road, which runs through the property, was originally an unpaved road dating back to at least the 1960s. The roadway was paved to facilitate the delivery of raw materials to the Makakilo subdivision from the quarries nearby

- A portion of the subject property was previously developed as a golf course, which has since been abandoned and has fallen into neglect. Potential environmental concerns related to this abandoned golf course include the use of imported fill materials and the possibility of residual contamination associated with chemicals or petroleum products that may have been stored and used at the golf course for maintenance purposes. Whether or not the golf course had a functional maintenance facility is unknown, as is the location of any such facility. Neither of these issues are considered to be recognized environmental conditions.

In summary, no recognized environmental conditions or historical recognized environmental conditions have been identified in association with the subject properties during the process of completing this Phase 1 Environmental Site Assessment.

8.0 SIGNATURE

This Phase 1 Environmental Site Assessment was performed by Benjamin Owen of Kauai Environmental, Inc., a Registered Environmental Assessor (CA Certification # 08030). A copy of Mr. Owen's qualifications is included in Appendix D. Mr. Owen performed the site reconnaissance and interviews personally and performed or supervised and reviewed all remaining elements of this Phase 1 ESA.



Benjamin Owen, MS, REA

4/14/08

Date

9.0 REFERENCES

American Society for Testing and Materials (ASTM); *"Standard Practice for Environmental Site Assessments: Phase 1 Environmental Site Assessment Process,"* ASTM 2005 Standard: E 1527-00

Environmental Data Resources, Inc. (EDR); *Environmental Database Search Results for Makakilo Road Extension, Kapolei, HI* (April 1, 2008).

EDR; *Historical Topographic Map Report for Makakilo Road Extension, Kapolei, HI* (April 2, 2008).

Sato, Ikeda, Paeth, Smythe, and Takehiro; *Soil Survey of the Island of Hawaii, State of Hawaii* (December, 1973).

APPENDIX A:

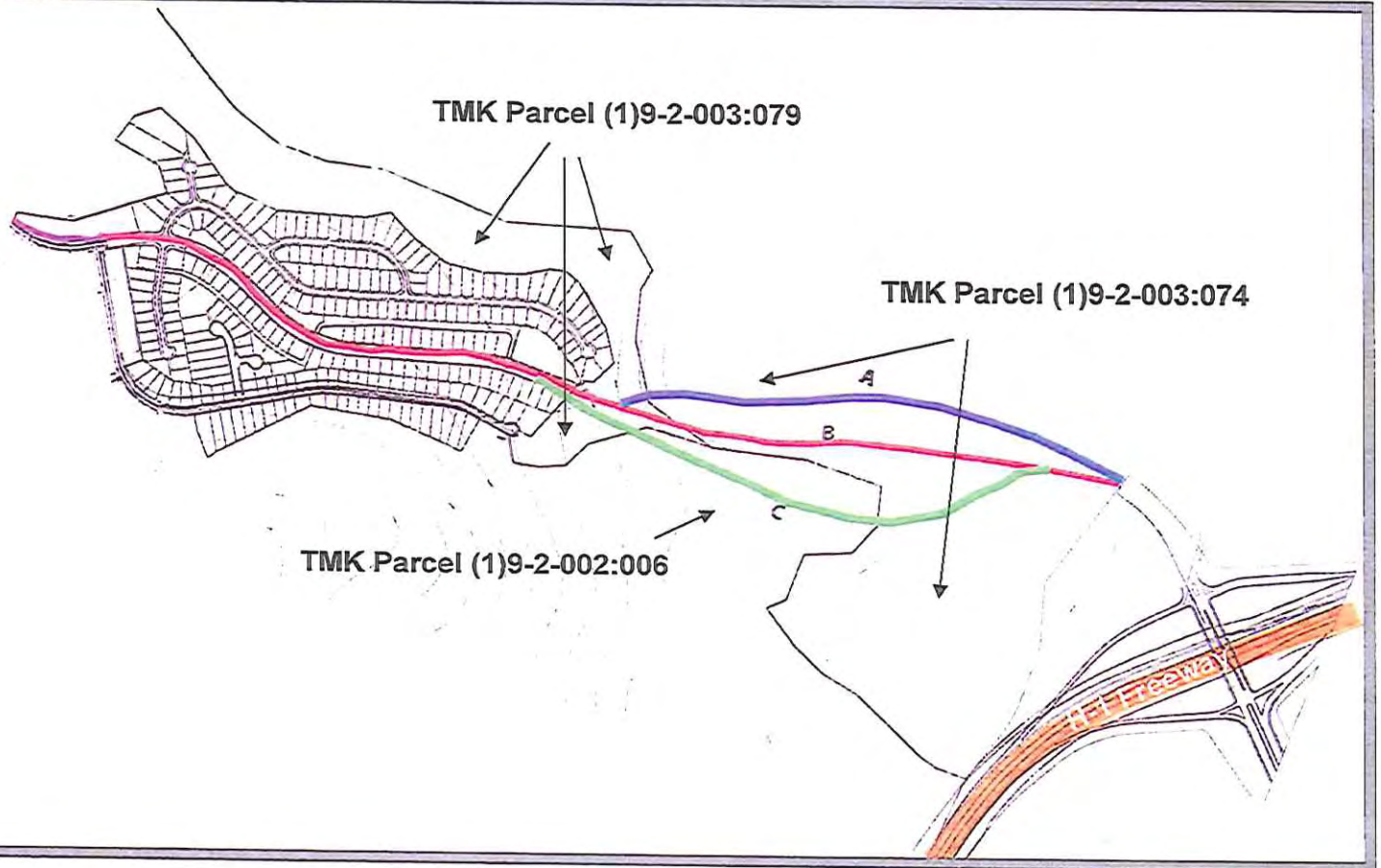
FIGURES



Environmental Site Assessment
Makakilo Drive Roadway Extension
April 2008

Figure 1: Project Location,
West Oahu, Hawaii

Source: GoogleEarth

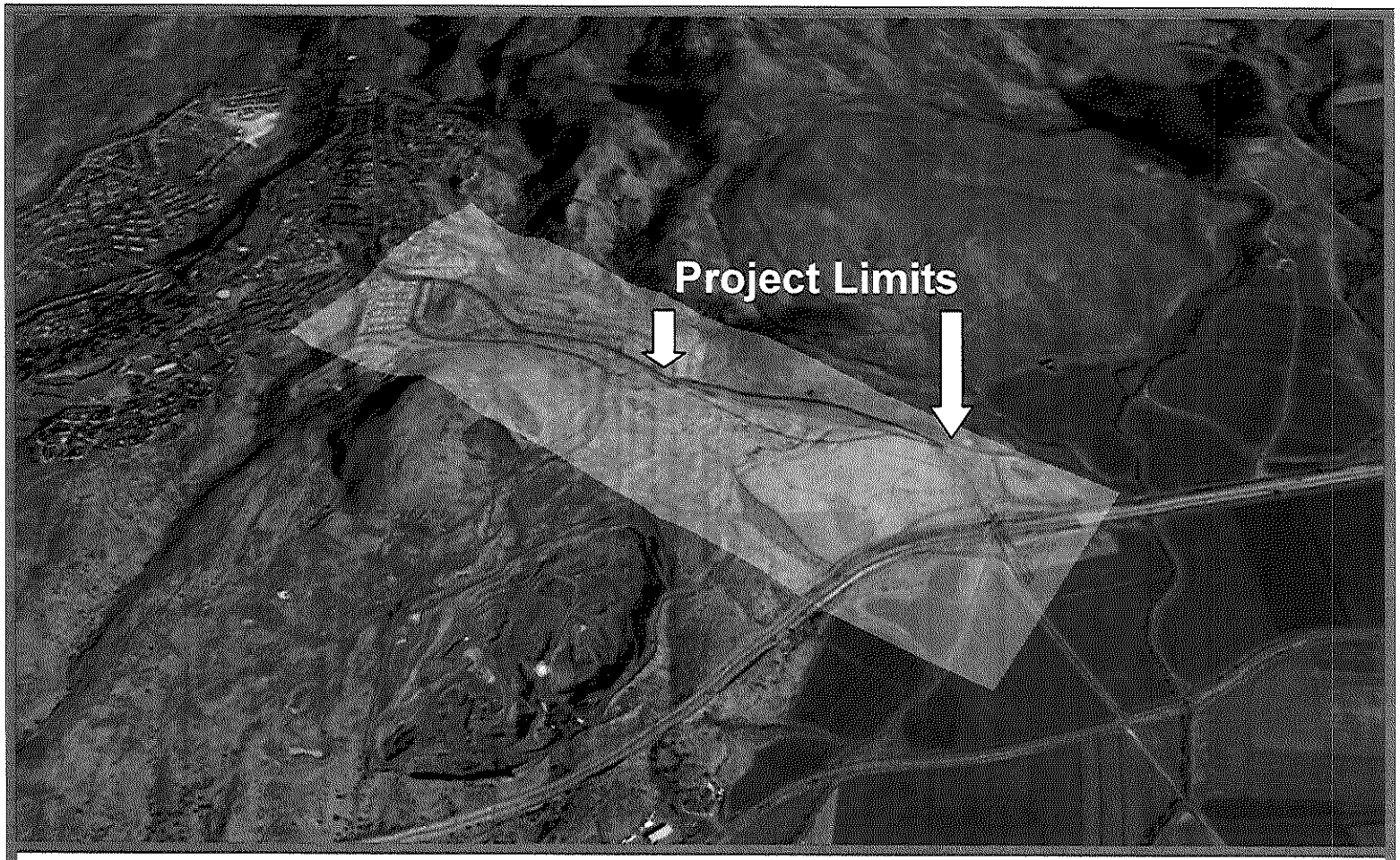


Environmental Site Assessment
Makakilo Drive Roadway Extension
April 2008

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Figure 2: Proposed Alignments,
West Oahu, Hawaii

Source: R.M. Towill Corporation



Environmental Site Assessment
Makakilo Drive Roadway Extension
April 2008

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Figure 3: Project Limits,
West Oahu, Hawaii

Source: GoogleEarth

APPENDIX B:

PHOTOGRAPHS

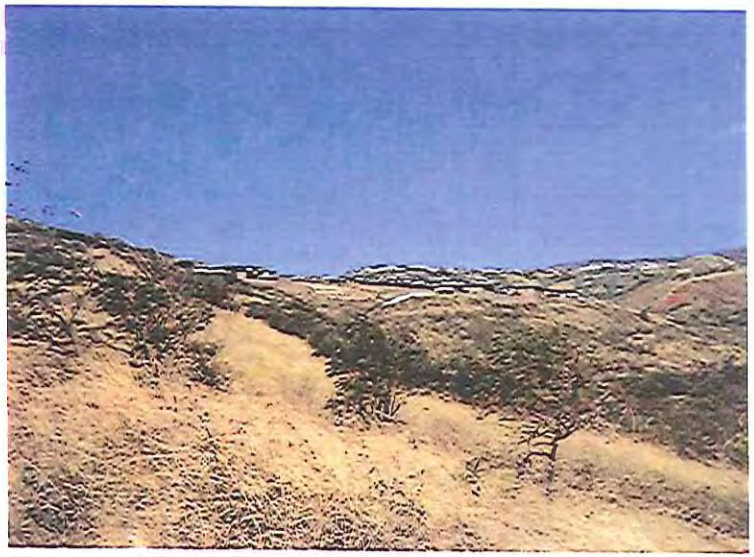


Photo 1: View of Makakilo subdivision at the end of the existing Makakilo Drive, as seen from the slope below.



Photo 2: View of Kaloi Gulch as seen from the existing Makakilo subdivision.



Photo 3: View of asphalt quarry road through subject property as seen from above.



Photo 4: Asphalt roadway through subject property.



Photo 5: Concrete golf cart pathway alongside asphalt road through subject property.



Photo 6: Drain line in abandoned concrete golf cart path.



Photo 7: Typical view of concrete golf cart path through upper portion of subject property.



Photo 8: Access gate at lower end of asphalt roadway through subject property.



Photo 9: Ranching operation below quarry access road.

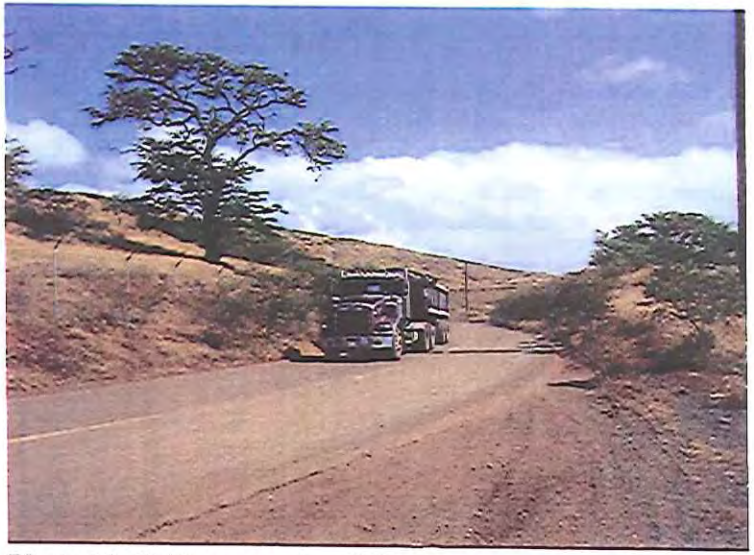


Photo 10: Delivery truck arriving at rock quarry below subject property.



Photo 11: Rock quarry along freeway below subject property.



Photo 12: New Makakilo Drive freeway off-ramp under construction below subject property.

APPENDIX C:

HISTORIC TOPOGRAPHIC MAP REPORT

EDR Historical Topographic Map Report

Makakilo Road Extension
Makakilo Rd.
Kapolei, HI 96707

Inquiry Number: 2183791.4

April 02, 2008



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EDR Historical Topographic Map Report

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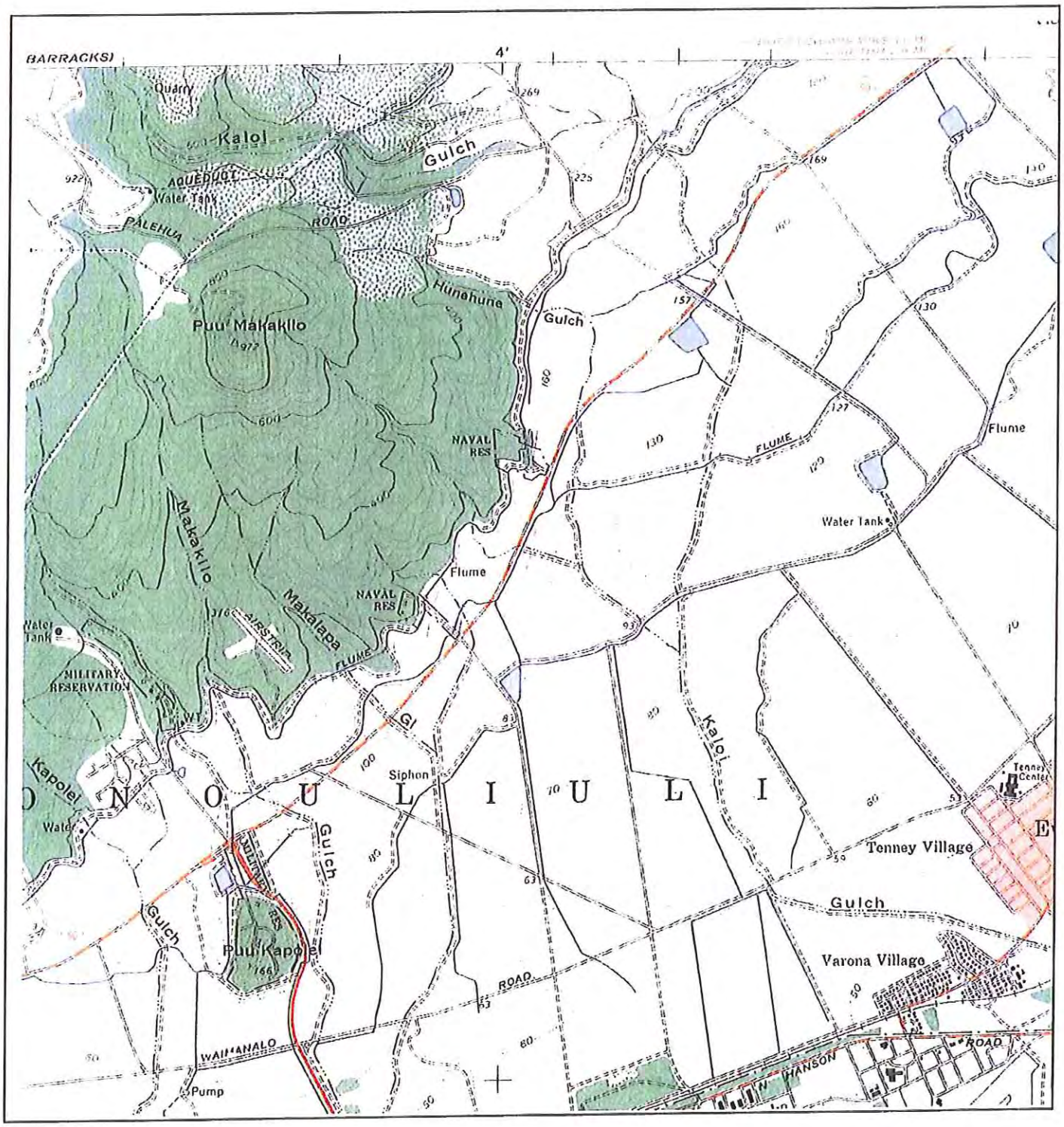
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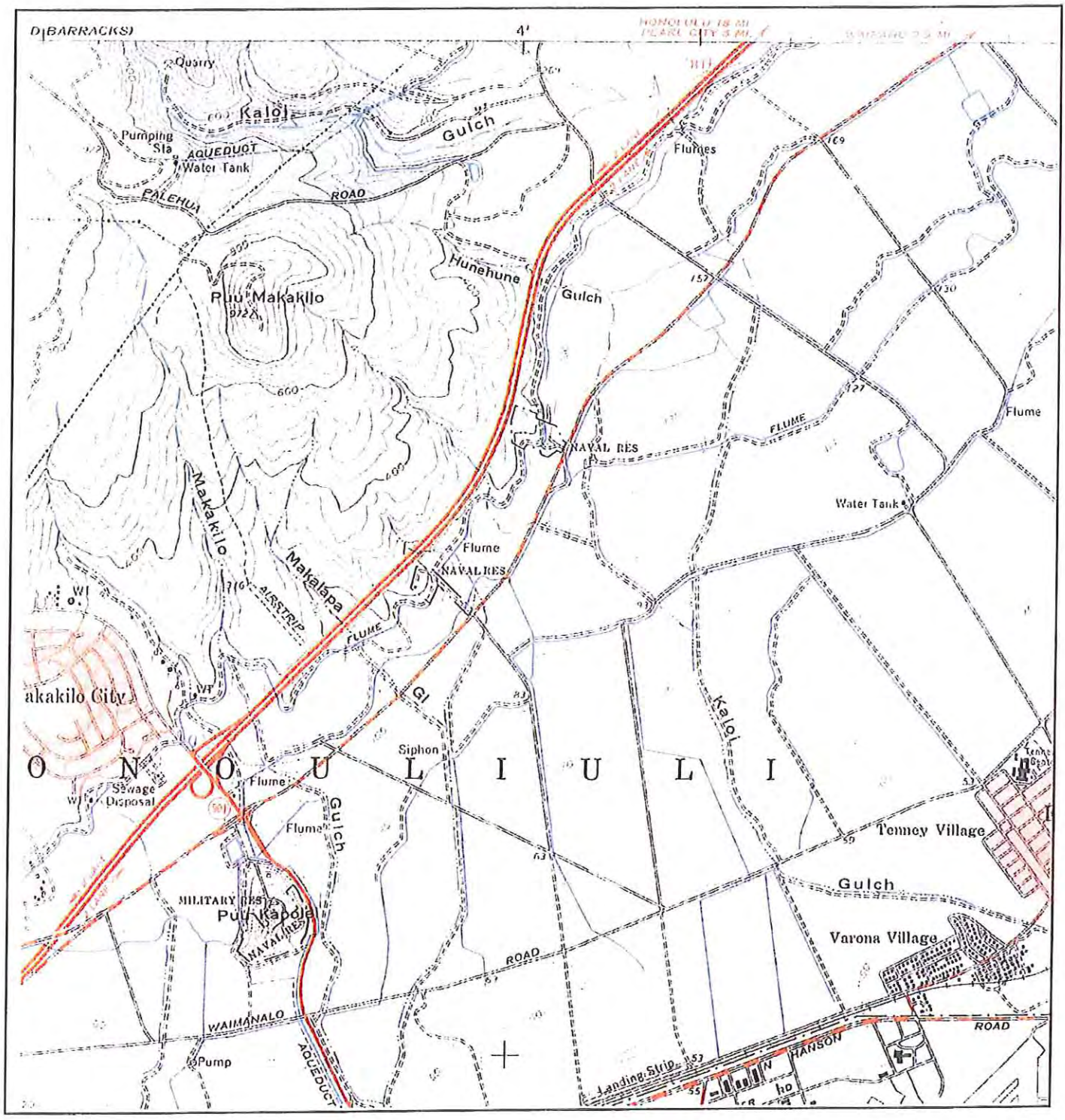
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Historical Topographic Map



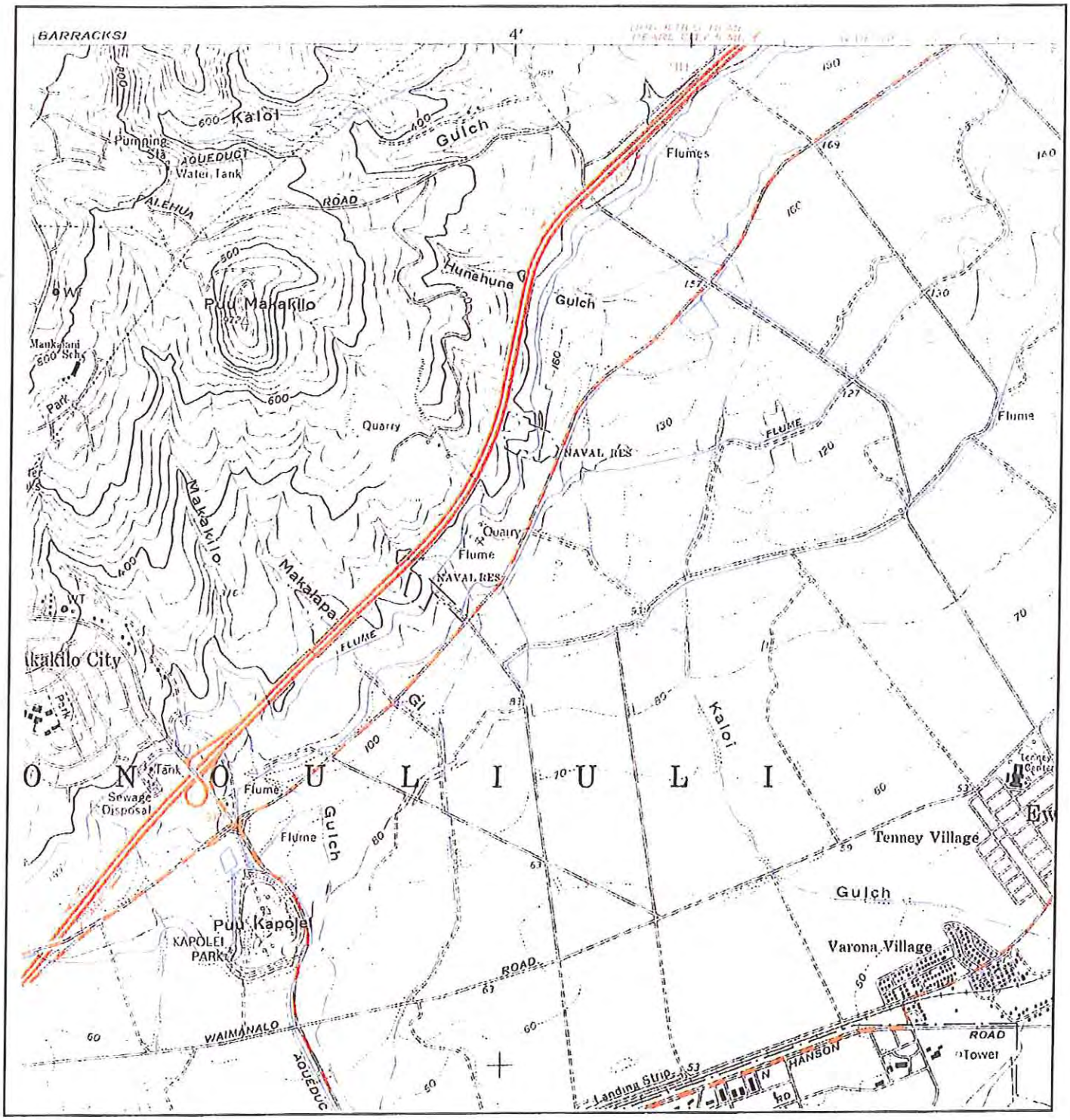
N	TARGET QUAD NAME: EWA, HI MAP YEAR: 1962 SERIES: 7.5 SCALE: 1:24,000	SITE NAME: Makakilo Road Extension ADDRESS: Makakilo Rd. Kapolei, HI 96707 LAT/LONG: 21.3662 / 158.062	CLIENT: Kauai Environmental CONTACT: David Gerow INQUIRY#: 2183791.4 RESEARCH DATE: 04/02/2008

Historical Topographic Map



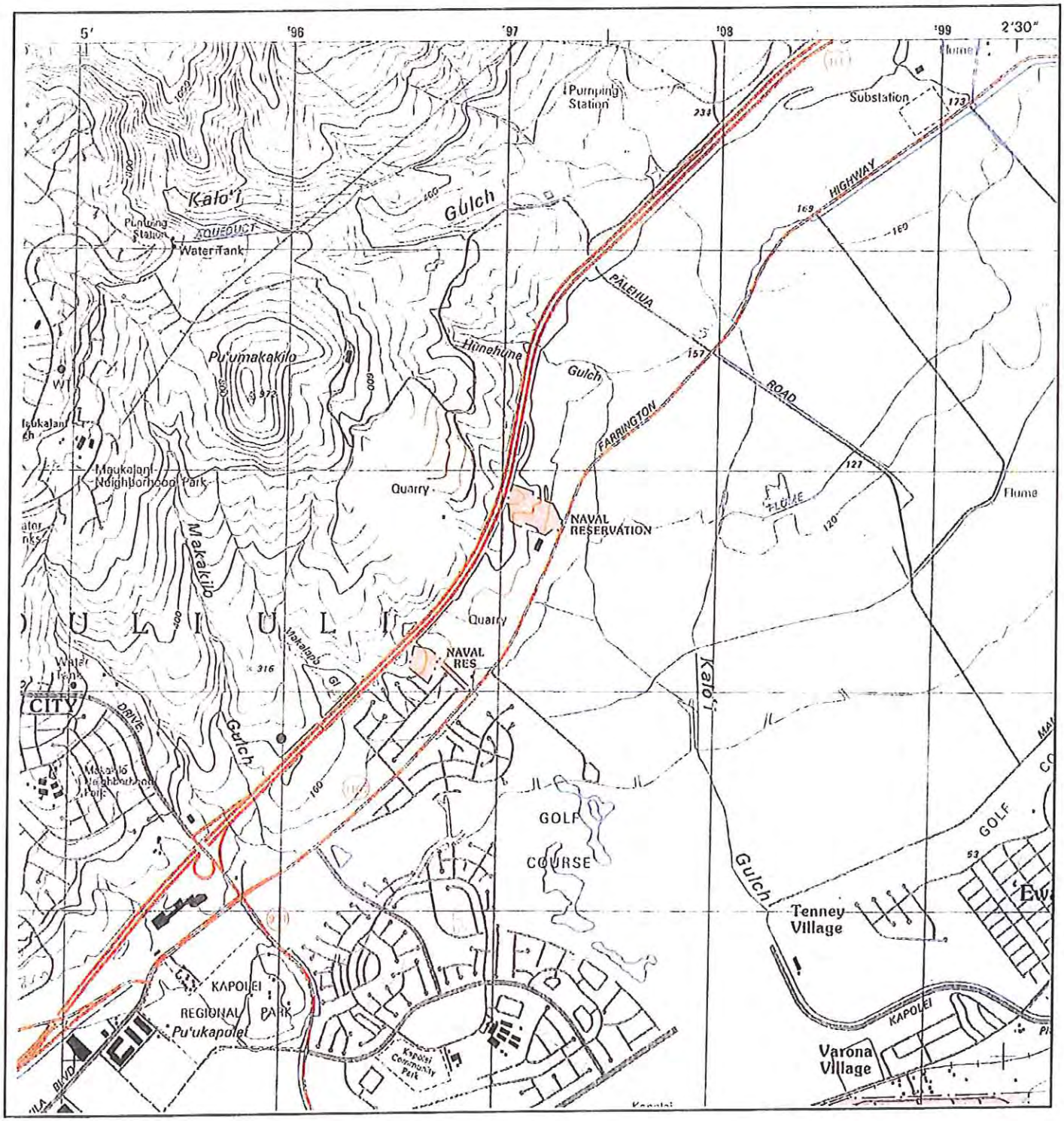
N	TARGET QUAD NAME: EWA, HI MAP YEAR: 1968 SERIES: 7.5 SCALE: 1:24,000	SITE NAME: Makakilo Road Extension ADDRESS: Makakilo Rd. Kapolei, HI 96707 LAT/LONG: 21.3662 / 158.062	CLIENT: Kauai Environmental CONTACT: David Gerow INQUIRY#: 2183791.4 RESEARCH DATE: 04/02/2008

Historical Topographic Map



N	TARGET QUAD NAME: EWA, HI MAP YEAR: 1983 SERIES: 7.5 SCALE: 1:24,000	SITE NAME: Makakilo Road Extension ADDRESS: Makakilo Rd. Kapolei, HI 96707 LAT/LONG: 21.3662 / 158.062	CLIENT: Kaual Environmental CONTACT: David Gerow INQUIRY#: 2183791.4 RESEARCH DATE: 04/02/2008

Historical Topographic Map



N	TARGET QUAD NAME: EWA, HI MAP YEAR: 1998 SERIES: 7.5 SCALE: 1:24,000	SITE NAME: Makakilo Road Extension ADDRESS: Makakilo Rd. Kapolei, HI 96707 LAT/LONG: 21.3662 / 158.062	CLIENT: Kaual Environmental CONTACT: David Gerow INQUIRY#: 2183791.4 RESEARCH DATE: 04/02/2008

APPENDIX D:

QUALIFICATIONS OF ENVIRONMENTAL PROFESSIONAL

BENJAMIN OWEN, MS, REA

Project Manager

EDUCATION

- M.S. Marine Science, University of California at Santa Cruz, 1996
- B.A. Anthropology, The University of Chicago, 1992

ACTIVE REGISTRATIONS

- AHERA Asbestos Inspector
- AHERA Asbestos Project Designer
- Registered Environmental Assessor

PROFESSIONAL EXPERIENCE

Mr. Owen has over 10 years experience in chemistry, toxicology, environmental science and industrial hygiene. His background includes trace metal and trace organic sampling and analysis, sediment toxicology, project management, hazardous materials assessments and occupational health and safety.

Since joining Kauai Environmental in 2002, Mr. Owen has gained considerable experience in the field of industrial hygiene, performing numerous asbestos inspections and hazardous materials surveys throughout the state; conducting environmental site assessments in residential, commercial, and industrial settings; designing, managing and monitoring asbestos abatement projects, and writing emergency response, environmental protection, and health and safety plans for various construction, demolition, and remediation projects.

PROJECT EXPERIENCE

Statewide Airports Asbestos Inventory for DOT-Airports, with R.M. Towill Corporation. Mr. Owen is the assistant project manager and for this effort to identify and inventory all asbestos containing materials in all DOT-Airports buildings. Under this ongoing project KEI has reviewed and verified historical inspection data, surveyed DOT-A facilities statewide, created a GIS database to be linked to DOT-A's GIS system, and assisted with abatements, management and planning, and operations and maintenance as related to asbestos containing materials. Mr. Owen is responsible for coordinating and performing all inspections and maintaining the GIS database.

Risk Assessment and Emergency Response, International Arrivals Building, Honolulu International Airport. When asbestos-containing materials were released in the IAB due to heavy rains in the winter of 2003-'04, Kauai Environmental was called upon to manage the situation under the DOT contract listed above. Kauai Environmental coordinated emergency abatements of the damaged materials, performed a human health risk assessment for the entire building and designed an emergency response program to minimize any future releases of asbestos fibers.

Sand Island WWTP Site Investigation, City and County of Honolulu. Mr. Owen coordinated this extensive site investigation to identify subsurface contamination of soils to be disturbed during the Primary Treatment Expansion Project. The project required sampling soils and groundwater at 150 locations with analysis for a wide variety of potential contaminants.

Ewa Mill Environmental Site Remediation, City and County of Honolulu. Mr. Owen supervised remediation field work at this historic sugar mill and mixed use industrial site. The project included removal and disposal of lead and PCB contaminated soils, air monitoring, subsurface investigations, excavation of buried waste drums, closure and removal of sumps, ASTs and USTs. Mr. Owen helped develop and implement a health and safety program for the project, and compiled an extensive report documenting all environmental work and results of all sampling for submission to DOH.

Hazardous Materials Surveys Mr. Owen has performed or assisted with many comprehensive hazardous materials surveys for facilities undergoing demolition and/or renovation, including: Guam Naval Hospital, Guam; Pier 1 Cargo Facility, Honolulu, HI; Frear Hall Dormitory, UH Manoa, Honolulu, HI; Bank of Hawaii, Lihue, Kauai.

Environmental Site Assessments. Mr. Owen is a Registered Environmental Assessor (REA) and has performed over 40 Phase I and Phase II site assessments over the past 5 years.

APPENDIX B

Traffic Projections for Makakilo Drive, Julian Ng, October 2008

Julian Ng, Incorporated
Transportation Engineering Consultant

P. O. Box 816
Kaneohe, Hawaii 96744-0816

phone: (808) 236-4325
fax: (808) 235-8869
email: jnghi@hawaii.rr.com

October 5, 2008

Mr. Craig Luke
R. M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819-3494

Subject: Traffic Projections for Makakilo Drive Extension
North of H-1 Freeway (North-South Road Interchange)
Ewa, Oahu, Hawaii

Dear Mr. Luke:

This letter responds to your request for future traffic projections for noise and related studies for the Makakilo Drive Extension project. The traffic projections are based on analyses that we had done in the past for development projects in Makakilo and our review of traffic studies prepared by others for the North-South Road and for the University of Hawaii West Oahu campus development.

Summary

Recommended projections of traffic volumes on the Makakilo Drive Extension, north of the North-South Road Interchange with Interstate Route H-1 are as follows:

Table 1 – Recommended Traffic Projections

	2025		Ultimate	
Average Daily Traffic (two-way, vehicles per day)	17,700		19,500	
	SB	NB	SB	NB
AM Peak Hour (vehicles per hour)	940	335	1,030	370
PM Peak Hour (vehicles per hour)	525	850	580	940
SB = southbound NB = northbound				

If a mix of vehicle type is needed in these studies, the earlier recommendations for a T_{24} (trucks as a percentage of daily traffic) of 1.5% should be used. Previous recommendations also have been that these trucks would consist of 82% two-axle trucks, 6% three-axle trucks (together totaling 88% “medium” trucks), and 12% four-or-more axle (“heavy”) trucks.

Background

Several traffic studies showed future traffic volumes on the Makakilo Drive Extension at the H-1 Freeway. In late-2002, we evaluated the traffic impacts of the proposed Palehua East development at Makakilo, estimated traffic volumes, and recommended a street cross section for the Makakilo Drive Extension within the subdivision.

The Final Environmental Assessment (NS FEA) for the North-South Road and Kapolei Parkway, prepared by Parsons Brinckerhoff Quade & Douglas, Inc., was completed in September 2004. It showed peak hour traffic projections for those roadways and for the Makakilo Drive Extension north of the North-South Interchange. In our review of the NS FEA, we note that the traffic study was based on the University of Hawaii West Oahu campus located southwest of the intersection of North-South Road and Farrington Highway.

In July 2007, the developer of Palehua East, Castle & Cooke Homes Hawaii, asked that we reevaluate the Palehua East project by reviewing more recent traffic data. We found that our earlier project traffic estimates were still applicable and provided to the developer traffic projections for 2025 and beyond to be used in the design of the roadway pavement for the portion of Makakilo Drive within the subdivision. We recommended that the highest projections plus 10% be used for the pavement design. These projections were submitted along with the pavement design (by others) to the City and County of Honolulu Department of Planning and Permitting for approval prior to construction of the roadway.

In August 2007, an update of the traffic study for the University of Hawaii West Oahu development was completed by PB Americas, Inc. It showed slightly revised traffic volumes on the Makakilo Drive Extension north of the interchange. Table 2 compares the 2025 projections.

Table 2 – Traffic Projections for 2025

	AM Peak Hour		PM Peak Hour	
	SB	NB	SB	NB
Letter dated December 10, 2002[a]	775	255	425	780
September 2004 FEA[b] for North-South Road and Kapolei Parkway	940	335	525	850
August 2007 Traffic Study[c] for University of Hawaii West Oahu	940	175	525	315

SB = southbound NB = northbound

[a] Julian Ng, Inc. letter to GEB Funding II Corporation
[b] Parsons Brinckerhoff Quade & Douglas, Inc, *Final Environmental Assessment, North-South Road and Kapolei Parkway*, September 2004.
[c] PB Americas, Inc. *Traffic Study, University of Hawai`i West O`ahu*, August 2007.

Analyses

The traffic projections that we had made for the developer, which considered other traffic in Makakilo that would use the Extension instead of the existing Makakilo Drive, were lower than the projections made by Parsons Brinckerhoff for the NS FEA traffic study. These projections, however, did not include any other new development north of Interstate Route H-1. The latest projections made as part of the University of Hawaii West Oahu development show the same southbound volumes as the NS FEA; however, the northbound traffic volumes are lower. Because of the reductions in northbound traffic volumes, the latest projections do not seem reasonable for the residential character of the area served by the Makakilo Drive Extension.

The projections that were made as part of the July 2007 reevaluation also considered that the traffic projections from the NS FEA would have the interchange terminals operating at about 90% of capacity. That reevaluation recommended use of the traffic projections from the FEA for the North-South Road and Kapolei Parkway for 2025, with a 10% increase applied to account for other development that could occur beyond 2025.

Conclusions and Recommendations

The use of traffic projections for 2025 from the NS FEA would be appropriate for any evaluation of year 2025 conditions. If a later year were to be evaluated, the 2025 projections should be increased by 10% (this reflects an average annual increase of 1.9% if the future year is 2030).

Should you have any questions, please contact me.

Sincerely,

JULIAN NG, INCORPORATED



Julian Ng, P.E., P.T.O.E.*
President

* PTOE is the Professional Traffic Operations Engineer certification from Transportation Professional Certification Board, Inc. For more information, please see http://www.ite.org/certification/PTOE/certification_about.asp

APPENDIX C

Archaeological Inventory Survey, Cultural Surveys Hawai'i, April 2008

Archaeological Inventory Survey for the Approximately 62-acre Makakilo Drive Extension Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu Island TMK: [1] 9-2-002:006, 9-2-003:079

Prepared for
R. M. Towill Corporation

Prepared by

Nifae Hunkin, B.A.,
David Shideler, M.A.,
and
Hallett H. Hammatt, Ph.D.

Cultural Surveys Hawai‘i, Inc.
Kailua, Hawai‘i
(Job Code: HONOULIULI 8)

December 2008

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Management Summary

Reference	Archaeological Inventory Survey for the Approximately 62-acre Makakilo Drive Extension Project, Honouliuli Ahupua‘a, ‘Ewa District, Island of O‘ahu (TMK: (1) 9-2-002:006, 9-2-003:079) (Hunkin et al. 2008)
Date	December 2008
Project Number	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: HONOULIULI 8
Investigation Permit Number	CSH completed the inventory survey fieldwork under state archaeological permit No. 08-14 issued by the State Historic Preservation Division, per Hawai‘i Administrative Rules (HAR) Chapter 13-13-282.
Project Location	The project area consists of portions of TMK: (1) 9-2-002:006 and 9-2-003:079. The project area is generally bound on the west by the Makakilo Drive, on the south by Quarry Road, which connects Old Pālehua Road to the Grace Pacific Makakilo Quarry, on the east by Interstate highway H-1, and on the north by the Kalo‘i Gulch floodplain. The project area is depicted on the USGS 7.5 minute series ‘Ewa quadrangle topographic map (Figure 1)
Land Jurisdiction	Private, D.R. Horton – Schuler Homes LLC, Castle & Cooke Homes Hawaii, Inc.
Agencies	State Historic Preservation Division / Department of Land and Natural Resources (SHPD/DLNR).
Project Description	Plans are to develop the project area into a roadway to connect the northeast end of Makakilo Drive to Interstate highway H-1.
Project Acreage	Approximately 62 acres
Area of Potential Effect (APE) and Survey Acreage	For the purposes of this study the area of potential effect (APE) and the project area are considered one and the same.
Historic Preservation Regulatory Context	The proposed project requires compliance with and review under State of Hawai‘i historic preservation review legislation [Hawai‘i Revised Statutes (HRS) Chapter 6E-42 and Hawai‘i Administrative Rules (HAR) 13-284]. At the request of R.M. Towill Corporation, CSH completed an archaeological inventory survey of the subject project area, per the requirements of HAR Chapter 13-13-276. This archaeological inventory survey report was prepared to support the proposed property’s historic preservation review and any other project-related historic preservation consultation. A previous draft of this study was commented on by the SHPD (November 11, 2008; Log No. 2008.2057; Doc No 0811LM11)
Fieldwork Effort	Todd Tulchin, B.S., Jon Tulchin, B.A., David Shideler, M.A., and Nifae Hunkin, B.A., under the general direction of Hallett H. Hammatt, Ph.D., conducted surface survey in the project area. Field work was conducted between January 31 and February 1, 2008.

Number of Historic Properties Identified	Two (2) new historic sites (SIHP Nos. 50-80-12-6950 and 50-80-12-6951) were recorded. SIHP No. 6950 is a drainage ditch associated with the historic-era commercial sugar cane industry. SIHP No. 6951 is a small reservoir associated with the historic-era commercial sugar cane industry. In addition to these historic properties, two (2) newly identified features associated with previously documented SIHP No. 50-80-09-2268 (Waiāhole Ditch System) were also recorded.
Historic Properties Recommended Eligible to the Hawai‘i Register of Historic Places (Hawai‘i Register)	Three (SIHP Nos. 50-80-09-2268, 50-80-12-6950, and 50-80-12-6951)
Historic Properties Recommended Ineligible to the Hawai‘i Register	None
Effect Recommendation	The specific effect of the proposed project on the historic properties present in the subject project area depends on which “Alignment Alternative” is ultimately chosen (see Figures 1, 2 and 49). In response, at least in part, to archaeological concerns a new, presently-preferred, alignment (Figure 49) avoids adverse impact to archaeological sites. In accordance with HAR 13-13-284, the determination of effect for this project for the presently preferred alignment is recommended as “No historic properties affected.”
Mitigation Recommendation	CSH has recommended consideration of an alignment alternative that avoids most or all of SIHP No. 50-80-09-2268, a portion of the Waiāhole Ditch System, which is, by far, the most significant historic property located in the subject project area. The Waiāhole Ditch System is eligible for the State Register of Historic Places on the basis of three criteria that recognize its widespread importance to the history of O‘ahu and the State. The presently-preferred alignment (Figure 49) avoids adverse impact to archaeological sites. If impact to SIHP No. 50-80-09-2268 is anticipated (which is not the case at present) then timely consultation with the State Historic Preservation Division regarding possible mitigation (which might include Historic American Engineering Record documentation) is recommended.

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Section 1 Introduction

1.1 Project Background

At the request of R. M. Towill Corporation, Cultural Surveys Hawai‘i, Inc. (CSH) conducted an archaeological inventory survey for the Makakilo Drive Extension project, at Makakilo, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu, TMK (1) 9-2-002:006, 9-2-003:079. A previous draft of this study was commented on by the SHPD (November 11, 2008; Log No. 2008.2057; Doc No 0811LM11)

The project area is approximately 3,300 feet long by 300 feet wide extending from the end of the existing Makakilo Drive to the proposed North-South Road interchange with Interstate H-1, thus making it approximately 62-acre project. The project area consists of the south-southeastern portion of the Kalo‘i gulch floodplain. Kalo‘i Stream channel runs from the central portion of the project area to the northeast. The southern face of Kalo‘i Gulch is at the central portion, and the base of the northeastern slope of Pu‘umakakilo is at the southwestern portion of the project area. Old Pālehua Road enters the project area from its eastern side, splits into Quarry Road heading south, and Old Pālehua continues to the southwest section of the project area, where due to much less traffic than the Quarry Road section is less maintained and in substandard condition. As the well-maintained part of Old Pālehua Road runs from the easternmost section of the project area, it continues south-southwest, where it becomes Quarry Road. There were three alignment alternatives for proposed roadways within the project area at the time the first draft of this study was produced (Figure 1, Figure 2 and Figure 3). Subsequently in response, at least in part, to archaeological concerns a new, presently-preferred, alignment (Figure 49) avoids adverse impact to archaeological sites. The project area has not changed but only the alignment within the project area.

The project area connects Interstate H-1 and Makakilo Drive from the northern side of Pu‘umakakilo.

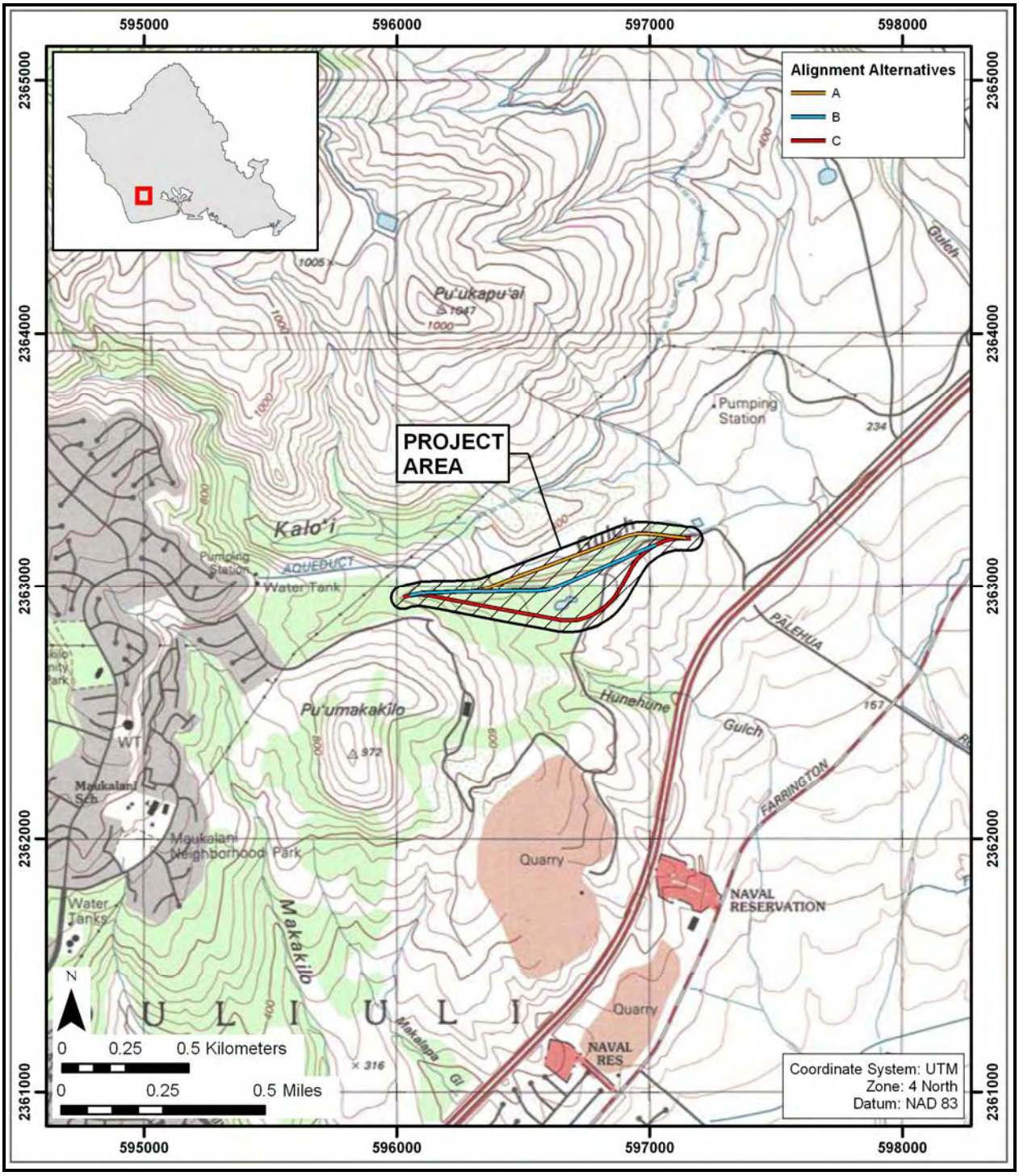


Figure 1. USGS 7.5 minute series Ewa quadrangle topographic map of project area showing initially proposed roadway alternatives

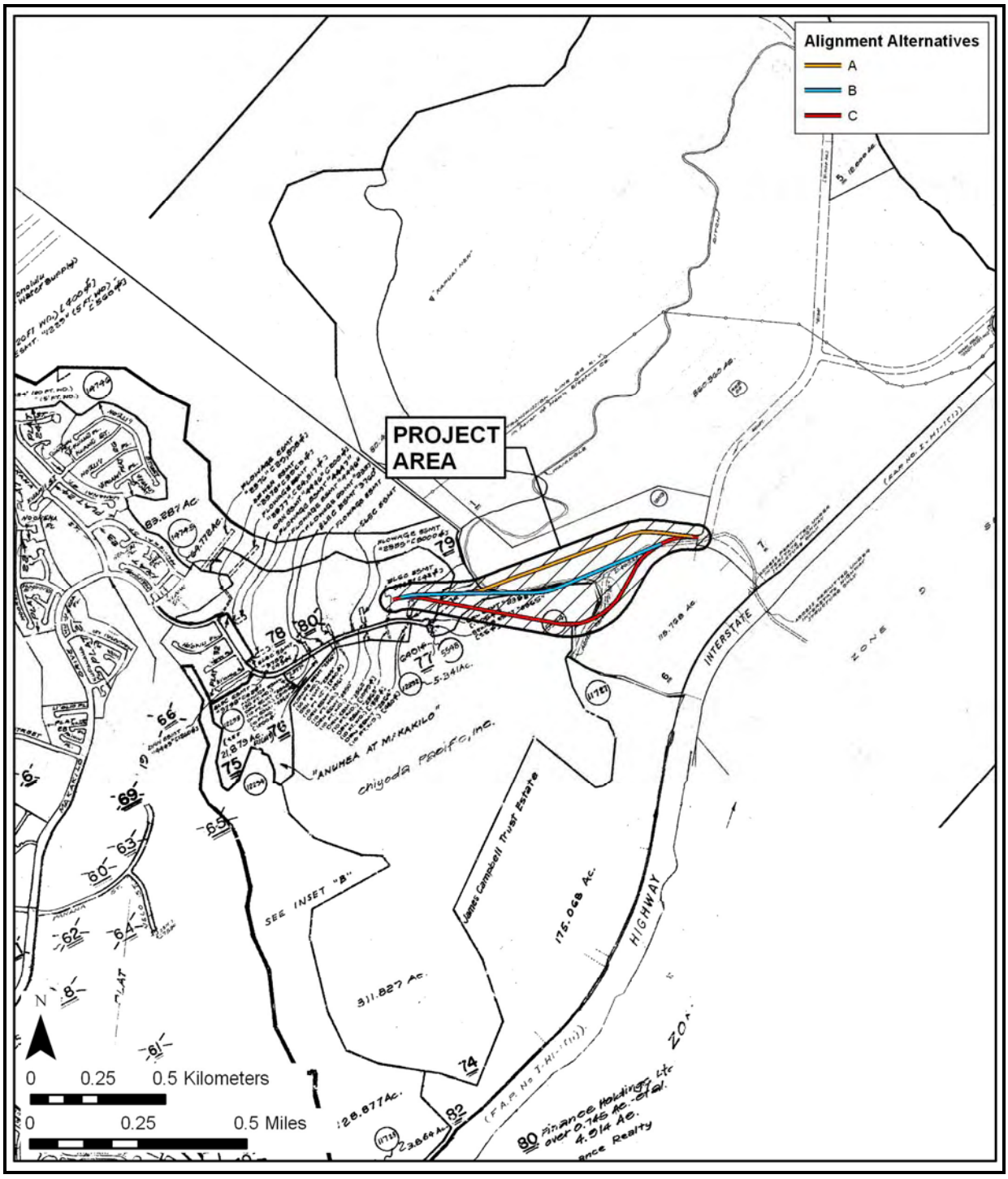


Figure 2. Portion of Tax Map Key plat maps 9-2-002 and 9-2-003 showing project area and showing initially proposed roadway alternatives

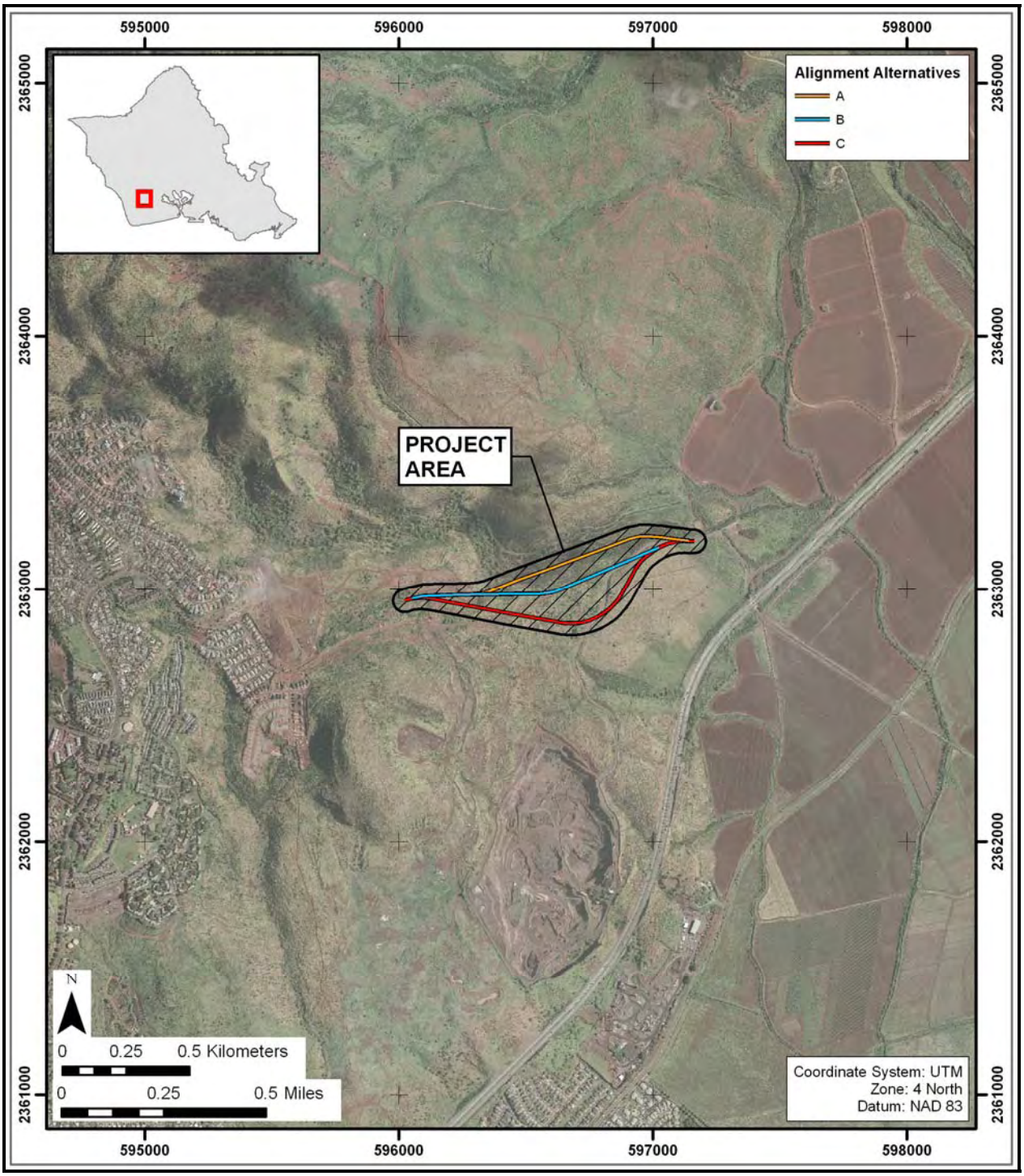


Figure 3. Aerial view of project area, including initially proposed roadway alternatives

1.2 Scope of Work

The scope of work for this project follows HAR 13-13-276, which governs archaeological inventory survey in the State of Hawai‘i:

1. Appropriate consultation with knowledgeable members of the community, requesting information on historic properties in the project area.
2. A complete ground survey of the entire project area for the purpose of historic property identification and documentation. All historic properties were to be located, described, and mapped with evaluation of function, interrelationships, and significance. Documentation was to include photographs and scale drawings of selected historic properties. All historic properties were to be assigned State Inventory of Historic Properties (SIHP) numbers. All historic properties were to be located with Trimble GPS equipment that is accurate to less than a meter. This locational information will be sufficient for subdivision planning purposes and layout.
3. Subsurface testing as appropriate. If appropriate samples from these excavations are found, they were to be analyzed for chronological information.
4. Research on historic and archaeological background, including search of historic maps, written records, and Land Commission documents. This research was to focus on the specific area with general background on the *ahupua‘a* and district and was to emphasize settlement patterns.
5. Preparation of a survey report to include the following:
    a. A topographic map of the survey area showing all historic properties;
    b. Results of consultation with knowledgeable community members about the property’s past land use and historic properties.
    c. Description of all historic properties with selected photographs, scale drawings, and discussions of function;
    d. Historical and archaeological background sections summarizing prehistoric and historic land use as they relate to the project area’s historic properties;
    e. A summary of historic property categories and their significance in an archaeological and historic context;
    f. Recommendations based on all information generated that will specify what steps should be taken to mitigate impact of development on the project area’s significant historic properties—such as data recovery (excavation) and preservation of specific areas. These recommendations will be developed in consultation with the client and the State agencies.

This scope of work also includes full coordination with the State Historic Preservation Division (SHPD), and county relating to archaeological matters. This coordination takes place after consent of the owner or representatives.

1.3 Environmental Setting

1.3.1 Natural Environment

Located in the dry, leeward area of O‘ahu, the project area receives an average of approximately 28 in. (600 mm) of annual rainfall (Giambelluca et al. 1986). Elevations within the project area ranged from approximately 300 – 410 meters above mean annual sea level (AMSL). The land surface within the majority of the Kalo‘i Gulch portion of the project area ranges from moderately sloping to very steep, with many vertical rock cliffs. The western boundary of the project area is east of the extent of residential Makakilo. The southeastern boundary of the project area is at the southern end Kalo‘i Gulch, where the steep gulch slope gives way to the flat ‘Ewa plain. The southern portion of Kalo‘i Gulch is very wide, characterized by a broad, flat base and moderately sloping walls. The gulch becomes increasingly narrow and steep to the northwest. The base of Kalo‘i Gulch included a dry streambed at the time of the pedestrian inspection, though the high waterline indicated significant flooding during periods of heavy precipitation. The base of the gulch was also observed to have undergone significant deposition of both alluvial and colluvial sediments, as indicated by the channeling of floodwaters through 1-3 m of sediment down to the natural bedrock stream channel.

Soils within the project area (Figure 4) consist predominantly of Mahana-Badland Complex (MBL) and Rock Land (rRK) (Foote et al. 1972). Soils of the Mahana Series are described as “well-drained soils…developed in volcanic ash” (Foote et al. 1972:86). Mahana-Badland Complex consists of Mahana soils and Badland, or “steep or very steep, nearly barren land, ordinarily not stony” (Foote et al. 1972:28). Rock Land “is made up of areas where exposed rock covers 25 to 90 percent of the surface” (Foote et al. 1972:119). In addition, an area of Helemano Silty Clay (HLMG) is located within the project area, near the base of Kalo‘i Gulch. Soils of the Helemano Series are described as “well-drained soils on alluvial fans and colluvial slopes on the sides of gulches” (Foote et al. 1972:40).

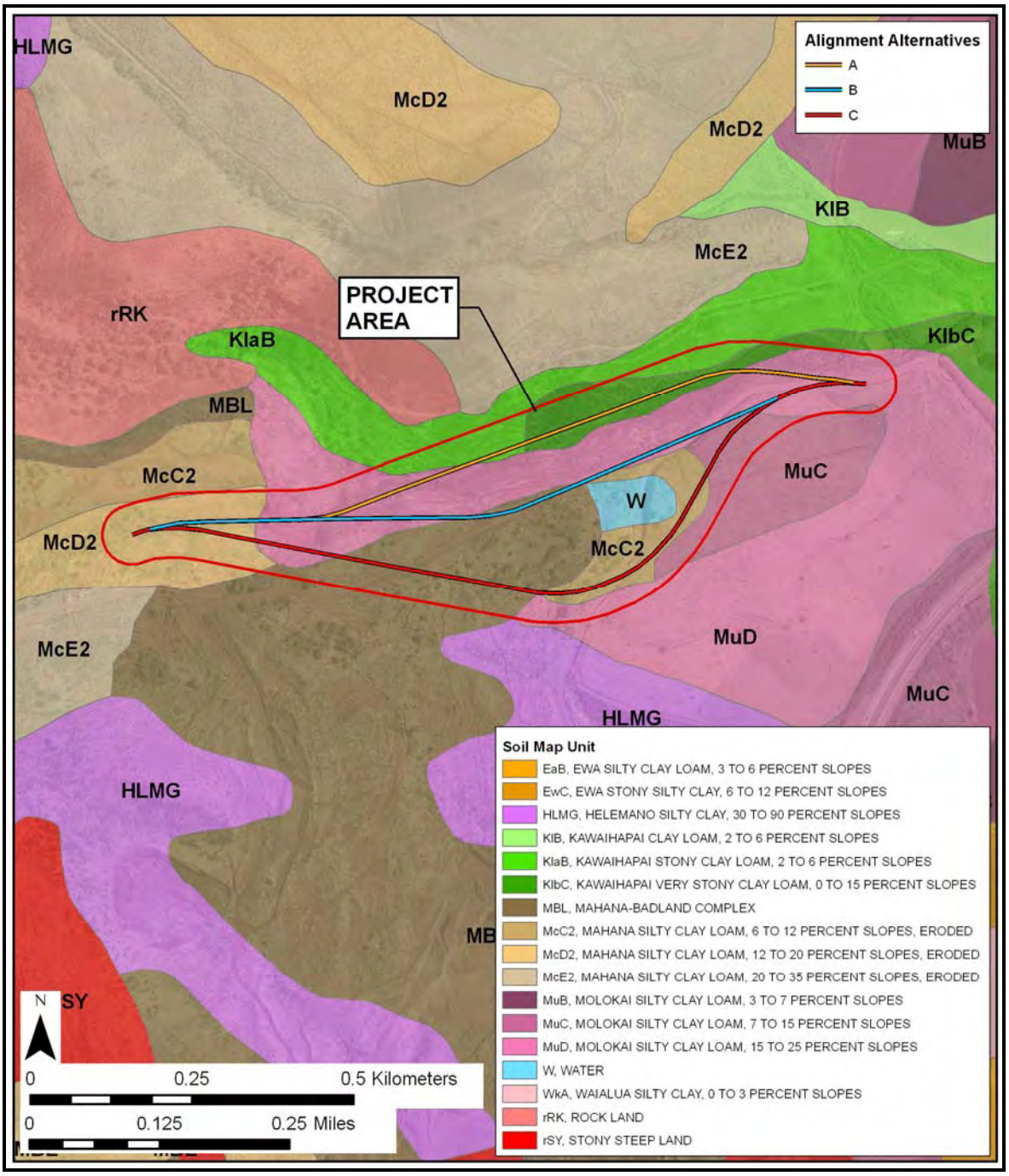


Figure 4. Soils of the project area (Foote et al. 1972)

Vegetation generally covered 85-95% of the ground surface within the project area (Figure 5). Heavy precipitation in the weeks preceding the pedestrian inspection of the project area made for unusually dense exotic grass cover in the normally dry southern Wai‘anae Range. In addition to the predominantly exotic grass cover, *‘Ilima* (*Sida fallax*), *‘A‘ali‘i* (*Dodonaea viscose*), *‘Iliahi* (*Santalum spp.*) (see Figure 5), *Lama* (*Diospyros sandwicensis*), *Koa Haole* (*Leucaena leucocephala*), *Kiawe* (*Prosopis pallida*), Lantana (*Lantana camara*), Silk Oak (*Grevillea robusta*), *Wiliwili* (*Erythrina sandwicensis*), and *Kukui* (*Aleurites moluccana*) were also observed.

1.3.2 Built Environment

During the post-contact period, the project area was primarily used for pastureland and for sugar cane irrigation and cultivation. Currently, the project area is used for diversified agricultural activities, pastureland, seed cultivation, as well as a thruway for traffic to and from Makakilo Rock Quarry, which is approximately 400 meters south of the project area. New increments of the Makakilo suburban development abut the west end of the project area with the present east end of Makakilo Drive virtually hanging over the back of Kalo‘i Gulch (Figure 6).

The southern portion of the project area is the remnants of an abandoned golf course, the construction of which was discontinued in the early 1990’s. Landscaping and irrigation systems associated with the construction of the golf course remain in disrepair (Figure 7, Figure 8, Figure 9 and Figure 10). Utilities manholes without lids were observed during survey, making it particularly dangerous for pedestrian access in this portion of the project area. There are low-density residential areas to the west of the project area, and Interstate H-1 to the east and south (see Figure 3).



Figure 5. General view of vegetation in project area with Hawaiian Sandalwood tree (*Santalum spp.*) in foreground



Figure 6. East view showing northern portion of project area, Interstate H-1 shown in background, and portion of Makakilo Drive that will connect to Interstate H-1 in foreground



Figure 7. West view of artificial pond in southwestern portion of project area



Figure 8. SE view of intersection of golf cart paths in southern portion of project area



Figure 9. Southwest view of irrigation and control box in south-central portion of project area



Figure 10. North view of artificial pond in south-central portion of project area

Section 2 Methods

2.1 Field Methods

Fieldwork for the archaeological inventory survey was conducted from January 31 to February 1, 2008 by David Shideler, M.A., Todd Tulchin, B.S., Jon Tulchin, B.A., and Nifae Hunkin, B.A., under the overall supervision of Hallett H Hammatt, Ph.D. The pedestrian inspection of the project area was accomplished through systematic sweeps. The interval between the three archaeologists was generally less than 10 meters. Sweeps were made generally following the contour of the north face of Kalo‘i Gulch. The survey began at the western end of the project area and proceeded east, incrementally, descending to the base of the gulch. All encountered sites were recorded and documented with a written field description, site maps, photographs, and each site was located using GPS survey technology.

Surveying consisted of clearing vegetation by hand of selected surface archaeological features located during the pedestrian survey. In accordance with HAR 13-13-276, which governs archaeological inventory survey procedures, no subsurface excavation was conducted at these features because their form and function are clear and unambiguous.

2.2 Laboratory Methods

Because no archaeological artifacts, midden, or soil samples were recovered, no laboratory work was undertaken.

2.3 Document Review

Historic and archival research included information obtained from the UH Hamilton Library and the State Historic Preservation Division Library. Previous archaeological reports for the area were reviewed, as were historic maps and primary and secondary historical sources. Information on Land Commission Awards was accessed through Waihona ‘Aina Corporation at www.waihona.com.

2.4 Consultation

No evidence of the presence of pre-Contact sites was indicated in the literature review and no pre-Contact sites were observed within the project area. There appears to be little likelihood that the undertaking will impact any ongoing cultural practices. Pursuant to Chapter 13-276-5 (g), there was no need indicated for consultation. Extensive consultation, however, is being conducted as part of a companion Cultural Impact Assessment by CSH.

Section 3 Background Research

3.1 Traditional and Historical Background

3.1.1 Historical Setting

Honouliuli Ahupua‘a, as a traditional land unit, had tremendous and varied resources available for exploitation by early Hawaiians. Within Honouliuli Ahupua‘a, not only is there a long coastline fronting the normally calm waters of leeward O‘ahu, but there are also four miles of waterfront along the west side of the West Loch of Pearl Harbor. The “karstic desert” and marginal characterization of the limestone plain, which is the most readily visible terrain, does not do justice to the *ahupua‘a* as a whole. The richness of this land unit is marked by the following available resources:

1. 12 miles of coastline with continuous shallow fringing reef, which offered rich marine resources

2. Four miles of frontage on the waters of West Loch that offered extensive fisheries (mullet, *awa*, shellfish) as well as frontage suitable for development of fishponds (for example, Laulaunui).

3. The lower portion of Honouliuli Valley in the ‘Ewa plain offered rich level alluvial soils with plentiful water for irrigation from the stream as well as abundant springs. This irrigable land would have stretched well up the valley.

4. A broad limestone plain which, because of innumerable limestone sinkholes, offered a nesting home for a large population of avifauna. This resource may have been one of the early attractions to human settlement.

5. An extensive upland forest zone extending as much as 12 miles inland from the edge of the coastal plain. As Handy and Handy (1972:469) have pointed out, the forest was much more distant from the lowlands here than on the windward coast, but it was much more extensive. Much of the upper reaches of the *ahupua‘a* would have had species-diverse forest with *kukui*, *‘ōhia*, *‘iliahi* (sandalwood), *hau*, *ti*, banana, etc.

The political and cultural center of the *ahupua‘a* is understood to have been the relatively dense settlement and rich lands for irrigated taro cultivation at the *‘ili* of Honouliuli located where Honouliuli Stream empties into the north portion of West Loch (east of the present study area). The name of the *ahupua‘a*, translated as “dark bay” (Pukui et al. 1974:51) may refer to the nature of the waters of West Loch at the mouth of Honouliuli Stream. Early accounts and maps indicate a large settlement at the *‘ili* of Honouliuli and it may well be that the political power of this village was so great that it was able to extend its jurisdiction well to the northwest into an area which might have been anticipated to fall under the dominion of the Wai‘anae ruling chiefs.

3.1.2 Mythological and Traditional Accounts

The traditions of Honouliuli Ahupua‘a have been complied and summarized numerous times, in studies by Sterling and Summers (1978), Hammatt and Folk (1981), Kelly (1991), Charvet-Pond and Davis (1992), Maly et al. (1993), and Tuggle and Tuggle (1997). Some of the themes of these traditions, include connections with Kahiki (the traditional homeland of Hawaiians, probably in reference to central Polynesia) and the special character and relationship of the places known as Pu‘uokapolei and Kualaka‘i.

Connections with Kahiki are found in numerous place names, traditional events, and with the beings associated with Honouliuli. There are several versions of Kaha‘i leaving from Kalaeloa for a trip to Kahiki to bring breadfruit back to ‘Ewa (e.g. Kamakau 1991:110). There are several stories that associate places in the region with Kamapua‘a and the Hina family, as well as with Pele’s sisters, all of whom have strong connections with Kahiki (cf. Kamakau 1961:111; Pukui et al. 1974:200).

Pu‘uokapolei was one of the most sacred places in Honouliuli (cf Sterling and Summers 1978:33). Pu‘uokapolei’s connections with Kahiki are emphasized when it is noted that the hill was the home of Kamapua‘a’s grandmother, Kamaunuaniho, the Kahiki ancestor to the people of O‘ahu (Fornander 1916-20, V:318; Kahiolo 1978:81, 107). By name, Kapolei is associated with the goddess Kapo, another connection with the Pele and Kamapua‘a stories (Kamakau 1976:14).

McAllister (1933:108) records that a *heiau*, or temple, was located on Pu‘uokapolei, but was destroyed before his survey of the early 1930s. The *heiau* may have been associated with the sun (Fornander 1916-20, III:292). The hill was used as a point of solar reference or as a place where such observations were made. Pu‘uokapolei might have been understood as the gate of the setting sun. It is notable that the rising sun at the eastern gate of Kumukahi in Puna is associated with the Hawaiian goddess Kapo (Emerson 1978:41). There is little specific information for Pu‘uokapolei, but the place name itself (“hill of beloved Kapo”) is hard to ignore. It is mentioned in some cosmologies that Kū was the god of the rising sun, and Hina should be associated with the setting sun (Hina is the mother of Kamapua‘a). Fornander (1916-20, III; 292) states, Pu‘uokapolei may have been a jumping off place (also connected with the setting sun) and associated with the dead who roamed the adjacent Plain of Kaupe‘a.

Pu‘uokapolei was also the primary landmark for travelers between Pearl Harbor and the west O‘ahu coast, with a main trail running just inland of it (‘Ī‘ī 1959:27, 29). Pu‘uokapolei was probably the most common name used as a reference for the area of the ‘Ewa Plain in traditional Hawai‘i (cf. Nakuina 1992:54; Fornander 1916-20, II: 318; E.M. Nakuina 1904, in Sterling and Summers 1978:34).

3.1.3 Pre-Contact and Early History

Various Hawaiian legends and early historical accounts indicate that the *ahupua‘a* of Honouliuli was once widely inhabited by pre-Contact Hawaiian populations, including the Hawaiian *ali‘i*. This substantial population is attributable for the most part to the plentiful marine and estuarine resources available at the coast, along which several sites interpreted as permanent habitations were located. Other attractive subsistence-related features of the *ahupua‘a* included

irrigated lowlands suitable for wet land taro cultivation (Hammatt and Shideler 1990), as well as the lower forest area of the mountain slopes for the procurement of forest goods.

Exploitation of the forest resources along the slopes of the Wai‘anae Range - as suggested by E. S. and E.G. Handy - probably acted as a viable subsistence alternative during times of famine:

> ...The length or depth of the valleys and the gradual slope of the ridges made the inhabited lowlands much more distant from the *‘wao*, or upland jungle, than was the case on the windward coast. Yet the *‘wao* here was more extensive, giving greater opportunity to forage for wild foods during famine time. (Handy and Handy 1972:469-470)

These upper valley slopes may have also been a significant resource for opportunistic quarrying of basalt for the manufacturing of stone tools. This is evidenced in part by the existence of a probable quarrying site (50-80-12-4322) in Makaīwa Gulch at 152 m (500 ft.) AMSL, west of the current study area (Hammatt et al. 1991).

The Hawaiian *ali‘i* were also attracted to the region. One historical account of particular interest refers to an *ali‘i* residing in Ko Olina, southwest of the current study area:

> Ko Olina is in Waimānalo near the boundary of ‘Ewa and Wai‘anae. This was a vacationing place for chief Kākuhihewa and the priest Napuaikamao was the caretaker of the place. Remember reader, this Ko Olina is not situated in the Waimānalo on the Ko‘olau side of the island but the Waimānalo in ‘Ewa. It is a lovely and delightful place and the chief, Kākuhihewa loved this home of his (Sterling and Summers 1978:41).

John Papa ‘Ī‘ī describes a network of Leeward O‘ahu trails (Figure 11) which in later historic times encircled and crossed the Wai‘anae Range, allowing passage from West Loch to the Honouliuli lowlands, past Pu‘u Kapolei and Waimānalo Gulch to the Wai‘anae coast and onward circumscribing the shoreline of O‘ahu (‘Ī‘ī 1959:96-98).

Other early historical accounts of the general region typically refer to the more populated areas of the ‘Ewa district, where missions and schools were established and subsistence resources were perceived to be greater. However, the presence of archaeological sites along the coral plains and coast of southwest Honouliuli Ahupua‘a, indicate that prehistoric and early historic populations also adapted to less inviting areas, despite the environmental hardships.

Subsequent to western contact in the area, the landscape of the ‘Ewa plains and Wai‘anae slopes was adversely affected by the removal of the sandalwood and other trees, and the introduction of domesticated animals and new vegetation. Goats, sheep and cattle were brought to the Hawaiian Islands by Vancouver in the early 1790s, and allowed to graze freely about the land for some time after. L.A. Henke reports the existence of a longhorn cattle ranch in Wai‘anae by at least 1840 (Frierson 1972:10). During this time, perhaps as early as 1790, exotic vegetation species were introduced to the area. These typically included vegetation best suited to a terrain disturbed by the logging of sandalwood forest and eroded by animal grazing. The following dates of introduced vegetation are given by R. Smith and outlined by Frierson (1972:10-11):

1. “early,” c. 1790:
   Prickly pear cactus, *Opuntia tuna*
   Haole koa, Leucaena leucocephala
   Guava, *Psidium guajava*

2. 1835-1840:
   Burmuda [sic] grass, *Cynodon dactylon*
   Wire grass, *Eleusine indica*
3. 1858:
   Lantana, *Lantana camara*

The *kiawe* tree (*Prosopis pallida*) was also introduced during this period, either in 1828 or 1837 (Frierson 1972:11).

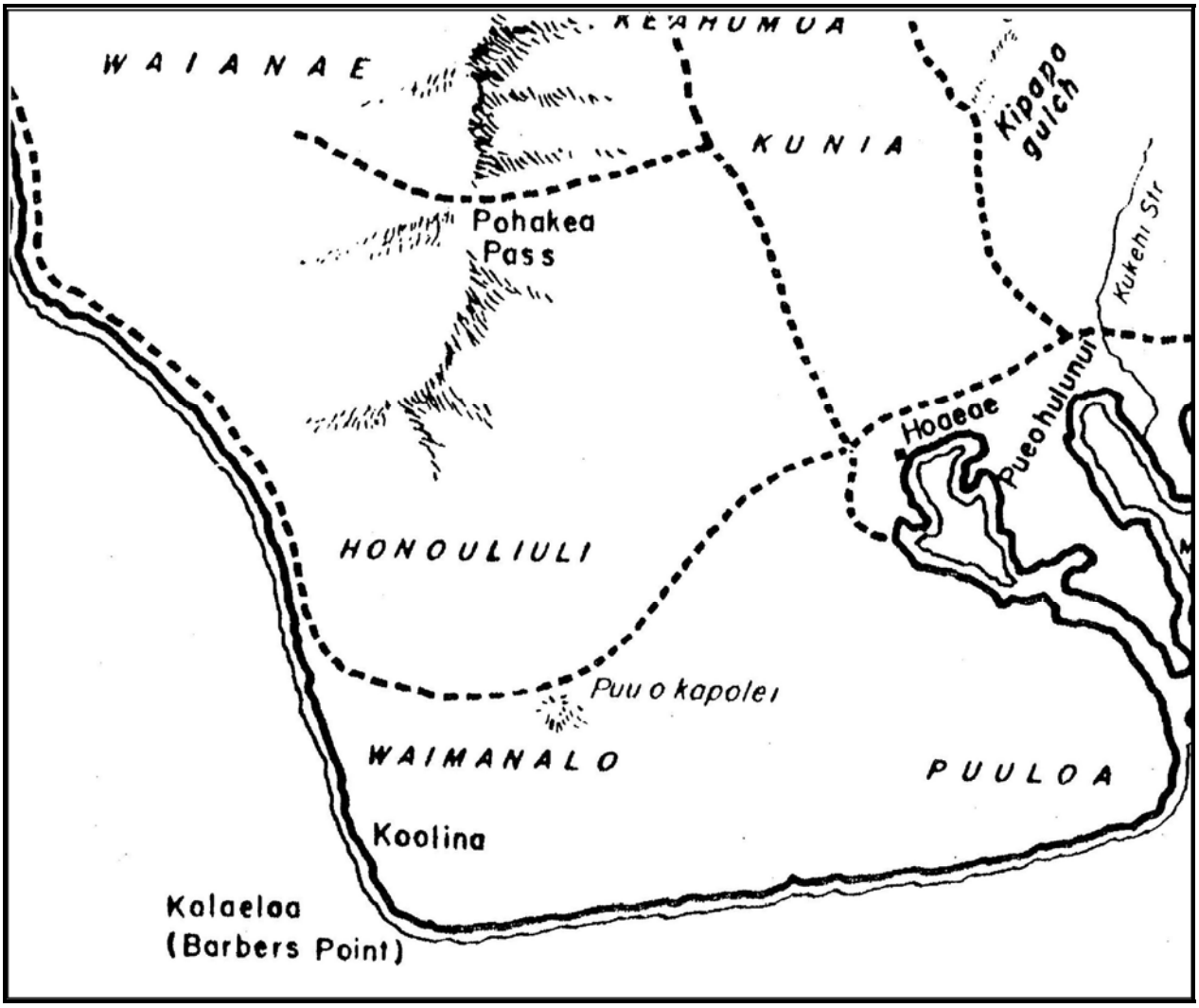


Figure 11. Trails of Leeward O‘ahu as described by John Papa ‘Ī‘ī (1983:96)

3.1.4 Mid to late 19th Century

During the Māhele of 1848, 99 individual land claims in the *ahupua‘a* of Honouliuli were registered and awarded by King Kamehameha III. No claims were made for land within the current study area or vicinity. The vast majority of the Land Commission Awards (LCA) were located near the Pu‘uloa Salt Works and the taro lands of the *‘ili* of Honouliuli. The largest award (Royal Patent 6071, LCA 11216, *‘Āpana* 8) granted in Honouliuli Ahupua‘a was to Miriam Ke‘ahi-Kuni Kekau‘onohi on January 1848 (Native Register). Kekau‘onohi acquired a deed to all unclaimed land within the *ahupua‘a*, including a total of 43,250 acres.

Samuel Kamakau relates the following about Kekau‘onohi as a child:

> Kamehameha's granddaughter, Ke-ahi-Kuni Kekau-‘onohi...was also a tabu chiefess in whose presence the other chiefesses had to prostrate and uncover themselves, and Kamehameha would lie face upward while she sat on his chest. (Kamakau 1961:208-209).

Kekau‘onohi was one of Liholiho’s (Kamehameha II’s) wives, and after his death, she lived with her half-brother, Luanu‘u Kahala‘i‘a, who was governor of Kaua‘i (Kamakau 1961:20). Subsequently, Kekau‘onohi ran away with Queen Ka‘ahumanu’s stepson, Keli‘i-ahonui, and then became the wife of Chief Levi Ha‘alelea. Upon her death on June 2, 1851, all her property was passed on to her husband and his heirs. When Levi Ha‘alelea died, the property went to his surviving wife, who in turn leased it to James Dowsett and John Meek in 1871 for stock running and grazing.

In 1877, James Campbell purchased most of Honouliuli Ahupua‘a for a total of $95,000. He then drove off 32,347 head of cattle belonging to Dowsett, Meek and James Robinson and constructed a fence around the outer boundary of his property (Bordner and Silva 1983:C-12). In 1879, Campbell brought in a well-driller from California to search the ‘Ewa plains for water, and a “vast pure water reserve” was discovered (Armstrong and Bier 1983). Following this discovery, plantation developers and ranchers drilled numerous wells in search of the valuable resource. By 1881, the Campbell property of Honouliuli prospered as a cattle ranch with “abundant pasturage of various kinds” (Briggs in Haun and Kelly 1984:45). Within 10 years of the first drilled well in ‘Ewa, the addition of a series of artesian wells throughout the island was supplying most of Honolulu’s water needs (Armstrong and Bier 1983).

In 1889, Campbell leased his property to Benjamin Dillingham, who subsequently formed the Oahu Railway & Land Co. (O.R. & L) in 1890. To attract business to his new railroad system, Dillingham subleased all land below 200 feet elevation to William Castle who in turn sublet the area to the Ewa Plantation Company for sugar cane cultivation (Frierson 1972:15). Dillingham’s Honouliuli lands above 200 feet elevation that were suitable for sugar cane cultivation were sublet to the O‘ahu Sugar Co.

Ewa Plantation Co. was incorporated in 1890 and continued in full operation up into modern times. The plantation grew quickly with the abundant artesian water. As a means to generate soil deposition on the coral plain and increase arable land in the lowlands, the Ewa Plantation Co. installed ditches running from the lower slopes of the mountain range to the lowlands and then plowed the slopes vertically just before the rainy season to induce erosion (Frierson 1972:17).

The Oahu Sugar Co. was incorporated in 1897, and included lands in the foothills above the ‘Ewa plain and Pearl Harbor. Prior to commercial sugar cultivation, the lands occupied by the Oahu Sugar Co. were described as being “of near desert proportion until water was supplied from drilled artesian wells and the Waiāhole Water project” (Conde and Best 1973:313). The Oahu Sugar Co. took control over the Ewa Plantation lands in 1970 and continued operations into the 1990s.

Dillingham’s *mauka* lands in western Honouliuli that were unsuitable for commercial sugar production remained pasture for grazing livestock. From 1890 to 1892 the Ranch Department of the O.R. & L. Co. desperately sought water for their herds of cattle by tapping plantation flumes and searching for alternative sources of water. Ida von Holt leaves this account of her husband Harry’s (Superintendent of the O.R. & L Ranch Dept.) search for water in the foothills of the Wai‘anae Range:

> One of those places is on the old trail to Palehua, and had evidently been a place of which the Hawaiians had known, for its name is Kaloi (the taro patch), and even in dry weather water would be standing in the holes made by the cattle, as they tried to get a drop or two. (Von Holt 1985:136)

It is believed that the spring depicted in this account may have been located during an inventory survey of the adjacent Pālehua East B project area (Tulchin and Hammatt 2005). The spring was located along the upper slopes of the southern face of Kalo‘i Gulch. A second account is given of the discovery of spring water in an area over the ridge on the north side of Kalo‘i Gulch:

> Shouting to the men to come over with their picks and shovels, he [Harry von Holt] soon got them busy clearing away lots of small stones and earth. Almost at once they could see that there were evidences of a paved well, and at about three feet down they came upon a huge flat rock, as large around as two men could span with their arms. Digging the rock loose and lifting it to one side, what was their astonishment to find a clear bubbling spring! (Von Holt 1985:138).

Following the discovery, two old Hawaiians began to ask Von Holt about the spring:

> Finally he [Harry von Holt] got them to explain that the spring, called “Waihuna” (Hidden Spring) had been one of the principal sources of water for all that country, which was quite heavily populated before the smallpox epidemic of 1840…A powerful Kahuna living at the spring had hidden it before he died of the smallpox, and had put a curse on the one who disturbed the stone, that he or she would surely die before a year was out. (Von Holt 1985:138-140)

3.1.5 Early 1900s to Present

Much of the *mauka* lands in western Honouliuli, including ridges and deep gulches, were unsuitable for commercial sugar cultivation and remained pasture land for grazing livestock. By 1920, however, much of the lands of Honouliuli were used for commercial sugar cane cultivation (Frierson 1972:18). By 1919 a reservoir had been established just south of Pālehua Road in the central portion of the project area (Figure 12). In the late 1920s, the main residential

communities were at the northeast edge of the ‘Ewa Plain. The largest community was still at Honouliuli village. ‘Ewa was primarily a plantation town, focused around the sugar mill, with a public school as well as a Japanese school. Additional settlement was in Waipahu, centered around the Waipahu sugar mill, operated by the O‘ahu Sugar Company. A 1925 Oahu Sugar Company plantation map shows Field 29 covering the northeast portion of the project area northeast of the reservoir (Figure 13). A 1927/28 map (Figure 14) shows an irrigation ditch following the contour of Kalo‘i Gulch within the project area.

Historic maps of the Makakilo area indicate a lack of any other significant development in the area into the 1940s. Major land use changes came to western Honouliuli when the U.S. Military began development in the area. Military installations were constructed both near the coast, as well as in the foothills and upland areas. Barbers Point Military Reservation (a.k.a. Battery Barbers Point from 1937-1944), located at Barbers Point Beach, was used beginning in 1921 as a training area for firing 155 mm guns (Payette 2003). Also in the vicinity were Camp Malakole Military Reservation (a.k.a. Honouliuli Military Reservation), used from 1939, and Gilbert Military Reservation, used from 1922-1944. Barbers Point NAS, in operation from 1942 into the 1990s, was the largest and most significant base built in the area. It housed numerous naval and defense organizations, including maritime surveillance and anti-submarine warfare aircraft squadrons, a U.S. Coast Guard Air Station, and the U.S. Pacific Fleet.

Fort Barrette (a.k.a. Kapolei Military Reservation and Battery Hatch), located atop Pu‘u Kapolei, was in use from 1931 to 1948 for housing four 3-inch anti-aircraft batteries (Payette 2003). In the 1950s, the site was used as a NIKE missile base. Palailai Military Reservation, located atop Pu‘u Pālailai in Makakilo, was in service from 1921, housing Battery Palailai and Fire Control Station B (Payette 2003). Fire Control Station A, was located atop Pu‘u Makakilo. From 1942 to 1945 the Pu‘u Makakilo Training Area, including lands in and around Pu‘u Makakilo, was used for military training during WWII (Environment Hawai‘i 1992).

The maps from the war years indicate little further development in the vicinity of the present project area (Figure 15). A new water-catchment ditch appears to be shown extending south from the reservoir in the central portion of the project area following the land contour.

Historic USGS maps of the area indicated the presence of an industrial quarry located within Kalo‘i Gulch, half a mile northwest (outside) of the current study area. The quarry first appears on the 1953 USGS topographic map (Figure 16). The exact date in which the quarry was initially constructed could not be determined, though research of historic maps indicated construction between 1943 and 1952. In 2004, CSH conducted an archaeological inventory survey of a property in which the quarry was observed and documented and assigned State Inventory of Historic Properties (SHIP) No. 50-80-12-6680.

The 1956 map (Figure 16) also shows an irrigation ditch entering the northwest portion of the project area, arcing around the back of Kalo‘i Gulch, and extending to the reservoir in the central portion of the project area. Whether this ditch was in fact older and was simply not shown on earlier maps is unclear. A 1977 aerial photograph (Figure 17) shows sugar cane fields still dominating the east portion of the project area.

In response to increased demand for housing, spurred by the increased development at Barbers Point NAS, the Estate of James Campbell set aside land in the foothills of the southern

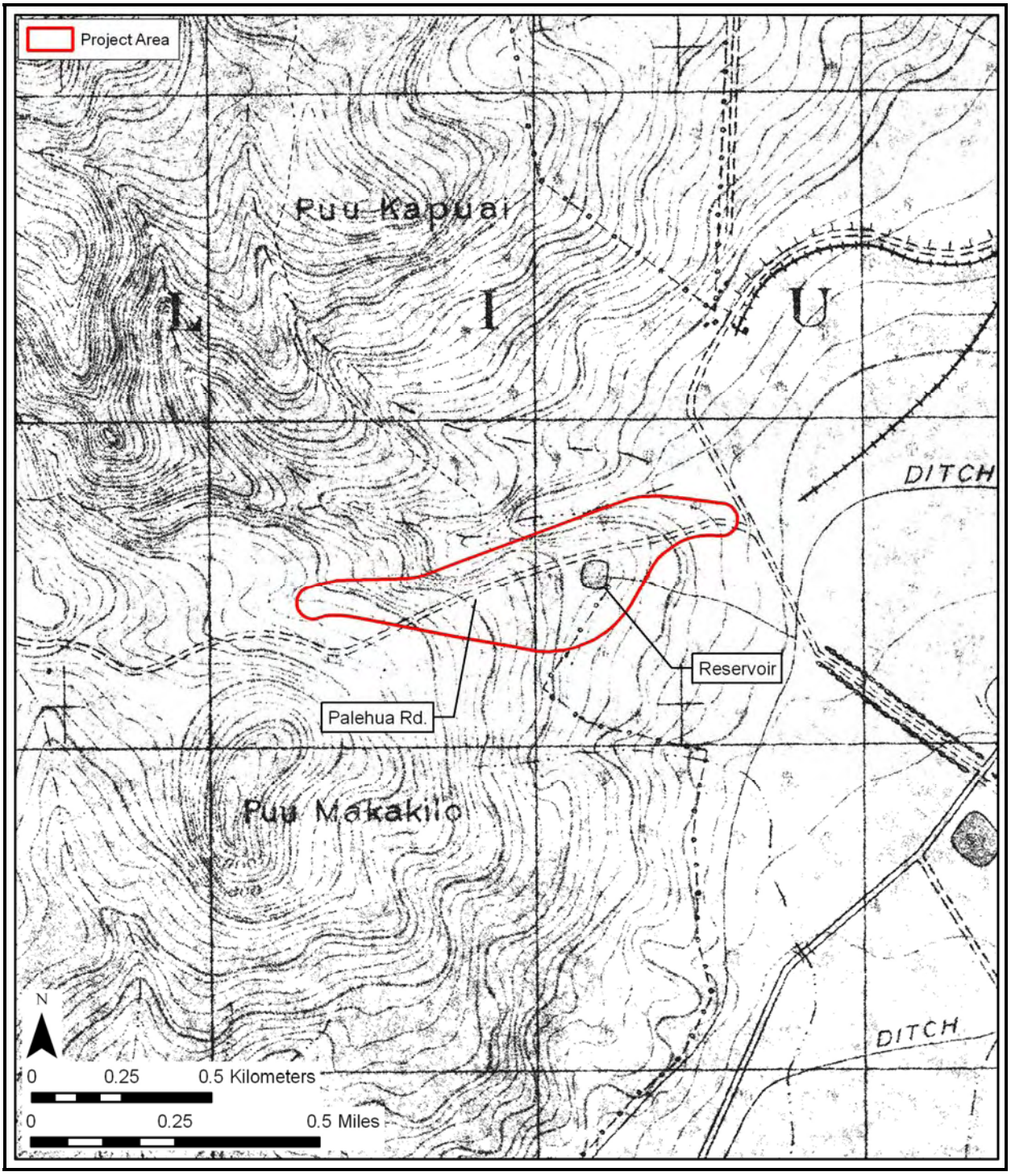


Figure 12. 1919 Fire Control Nanakuli Quad map showing section of Pālehua Road bisecting the project area, as well as a reservoir associated with plantation irrigation system

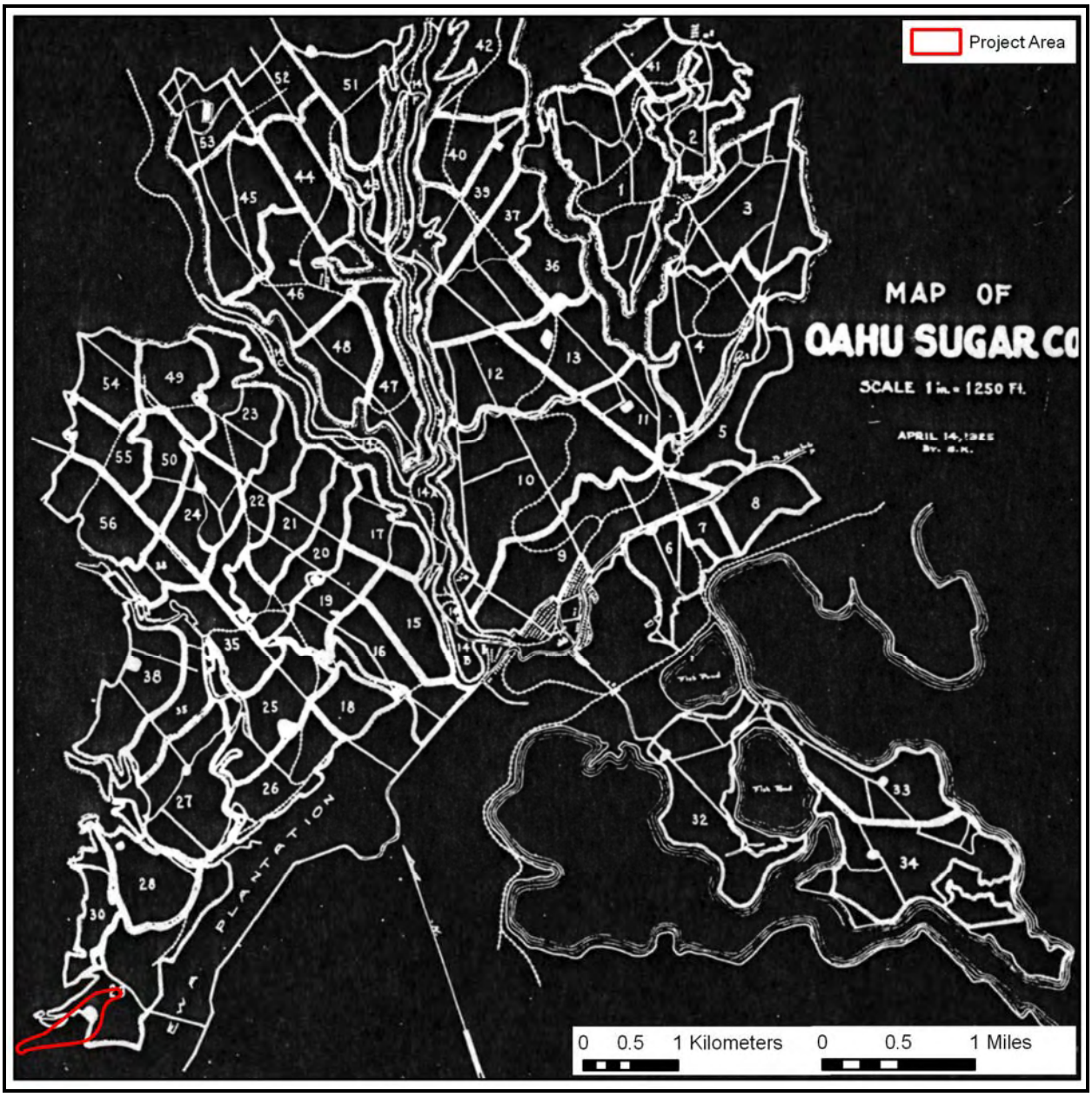


Figure 13. 1925 Oahu Sugar Company plantation map showing project area (red) with Field 29 covering northeast portion of the project area

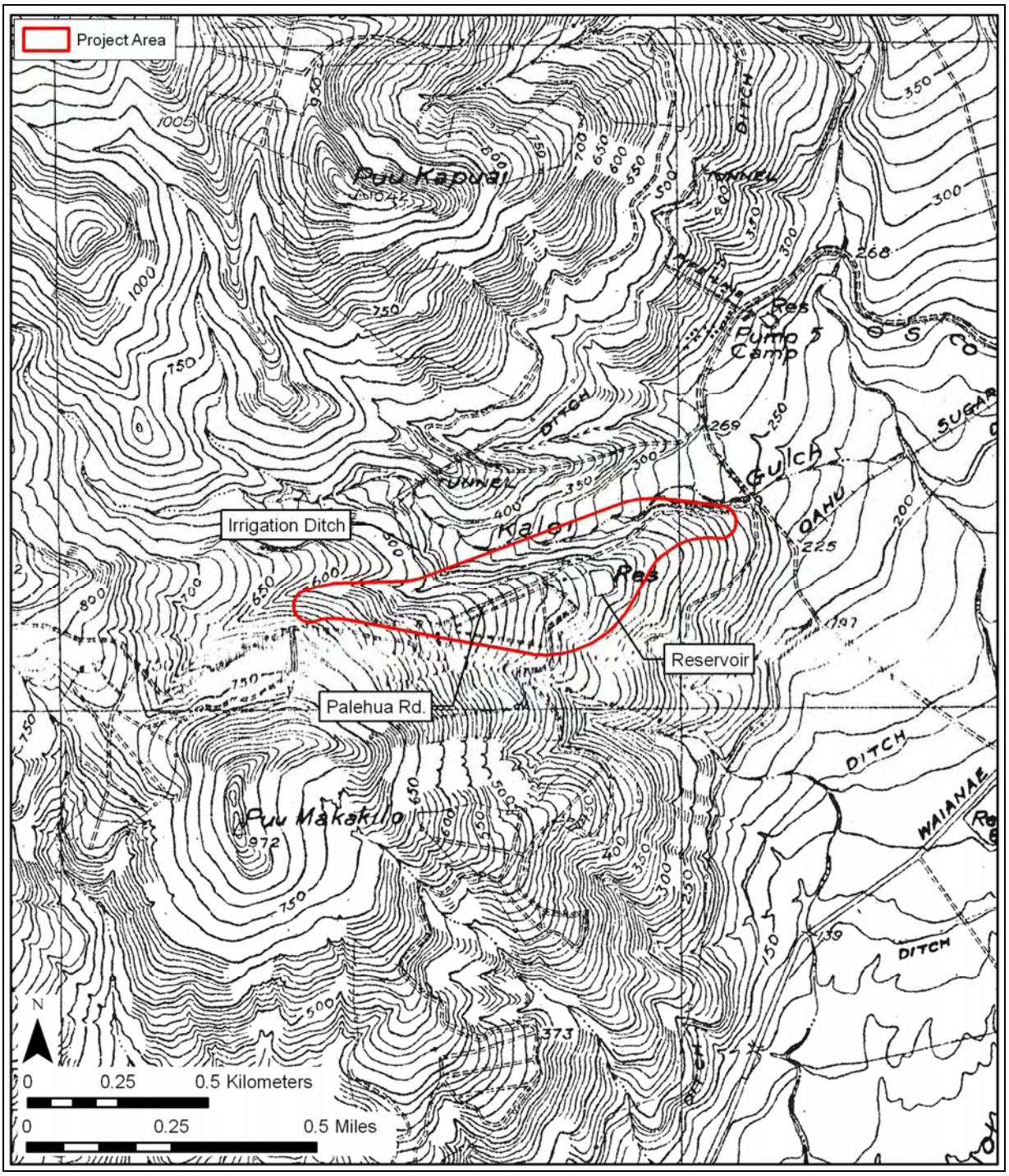


Figure 14. 1927/1928 U.S. Geological Survey Waianae Quad Map showing project area

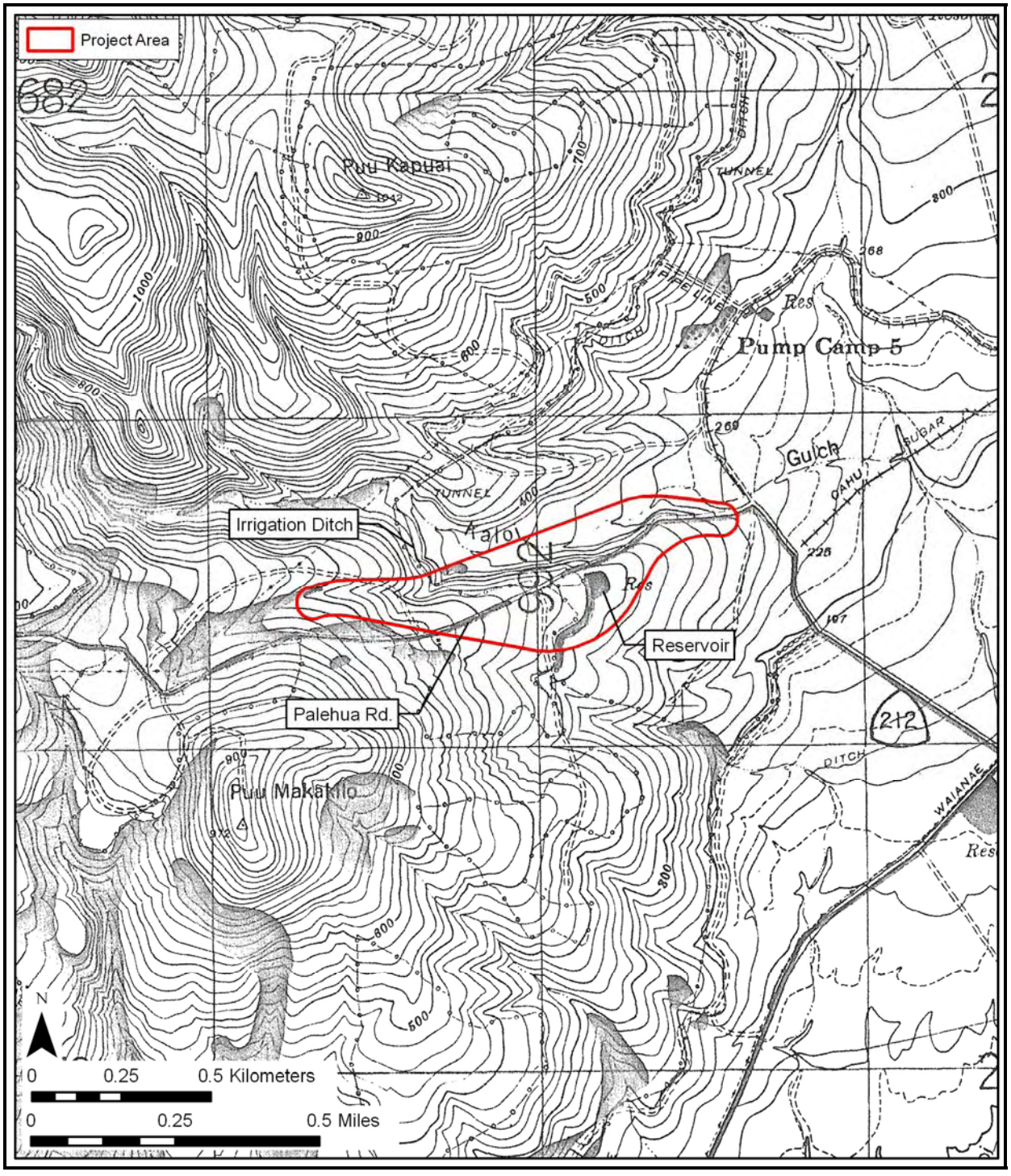


Figure 15. 1943 War Department Map of Waipahu and surrounding areas

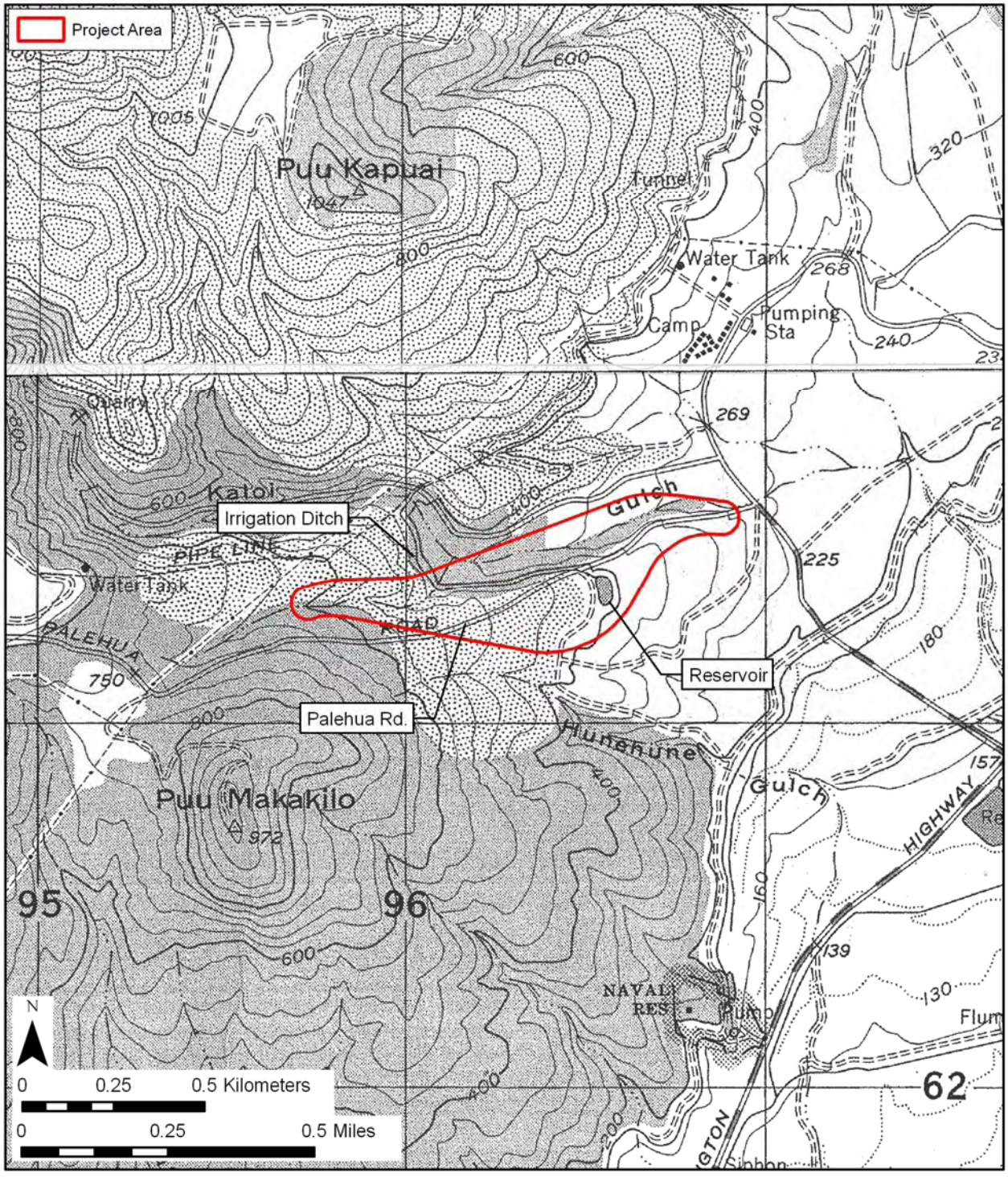


Figure 16. 1956 U. S. Geological survey map showing project area

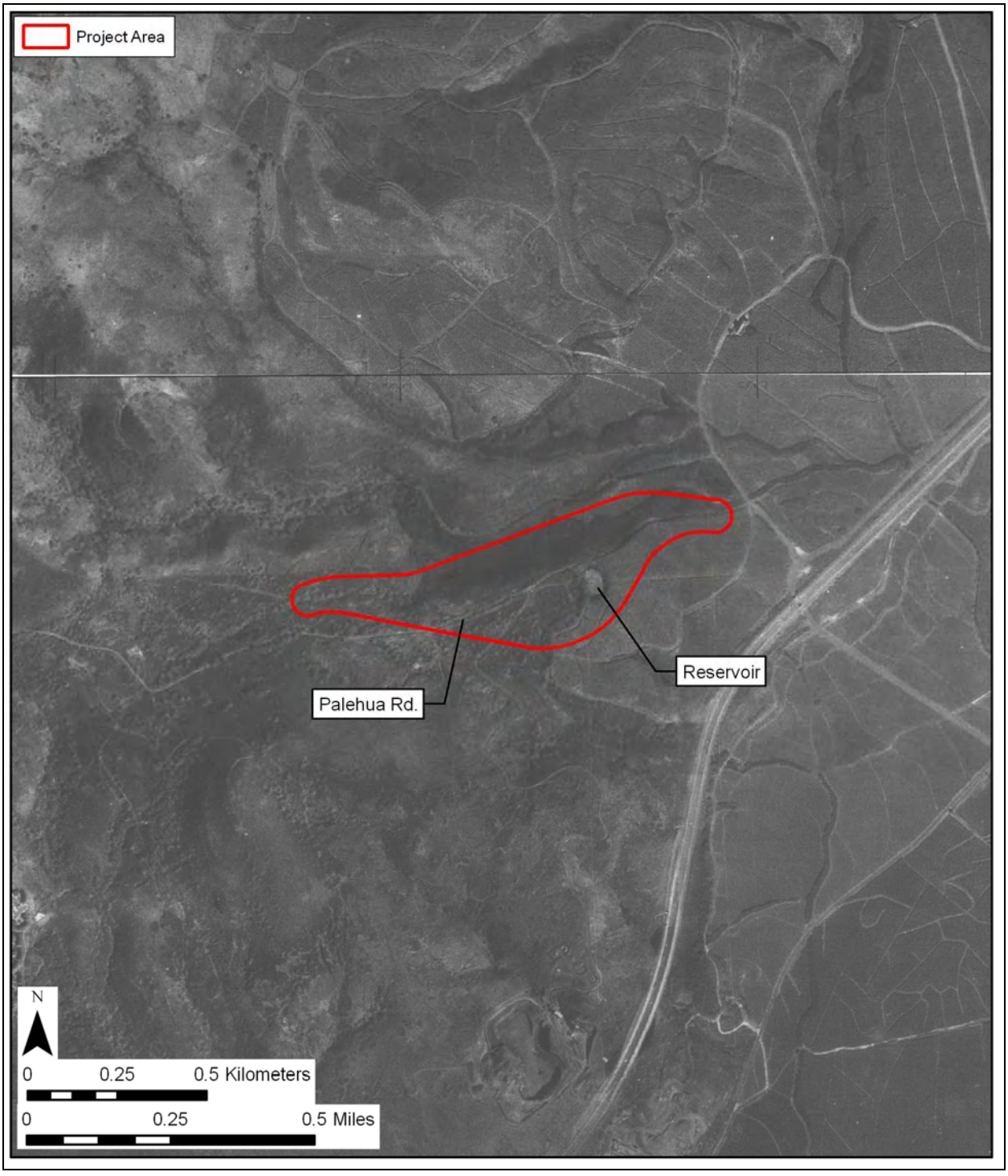


Figure 17. 1977 aerial photograph showing project area

Wai‘anae Range in 1960 for the development of the residential community of Makakilo. Development began just *mauka* of the H-1 Freeway and continued *mauka*, with ranch lands being incrementally replaced by subdivision construction. At present, former ranching pasture lands are continually being replaced by residential house lots.

3.2 Honouliuli Settlement Patterns

Archaeological and traditional sources show a general pattern of three main areas of settlement within Honouliuli Ahupua‘a: a coastal zone, the Honouliuli taro lands, and inland settlement at Pu‘u Ku‘ua.

3.2.1 The Coastal Zone - Kalaeloa (Barber's Point), Ko‘olina (West Beach)

3.2.1.1 Kalaeloa (Barber's Point)

Archaeological research at Barber's Point has focused on the areas in and around the Deep Draft Harbor (Barrera 1975; Davis and Griffin 1978; Hammatt and Folk 1981; McDermott et al. 2000). Series of small clustered shelters, enclosures and platforms show limited but recurrent use at the shoreline zone for marine oriented exploitation. This settlement covers much of the shoreline, with more concentrated features around small marshes and wet sinks. Immediately behind the shoreline, under a linear dune deposit is a buried cultural layer believed to contain some of the earliest habitation evidence in the area.

The attraction of the area to early Hawaiians was the plentiful and easily exploited bird population. Particular evidence for taking of petrel occurs at SIHP No. -2763 (Hammatt and Folk 1981 197:213). Initial heavy exploitation of nesting seabirds and other species, in conjunction with habitat destruction, probably led to early extinction.

There is some indication of limited agriculture in mulched sinkholes and limited soil areas. Considering rainfall, this activity would have been limited, but probably involved tree crops and roots (sweet potatoes). The archaeological content of the sites indicates a major focus on marine resources.

Davis and Griffin (1978) distinguish functional classes of sites based on surface area size, and argue that the Barber's Point settlement consists of functionally integrated, multi-household residence groups. Density contours of midden (by weight) and artifacts (by numbers) plotted for residence sites by Hammatt and Folk (1981) generally indicate narrowly defined spatial foci of discard, possibly indicating continuous use, or at least with no refurbishing or additions to the structures over time (Hammatt and Folk 1981). The focus is small habitation sites, typically lacking the full range of features found in large permanent residence complexes such as high platforms, complex enclosures, and ceremonial sites.

3.2.1.2 Ko‘Olina (West Beach)

There are three available studies on the Ko‘Olina project area (Davis et al. 1986a; Davis et al. 1986b; and Davis and Haun 1987).

Davis documents approximately 180 component features at 48 sites and site complexes consisting of habitation sites, gardening areas, and human burials. Chronologically, the

occupation covers the entire span of Hawaiian settlement in what Davis and Haun describe as “one of the longest local sequences in Hawaiian prehistory” (Davis and Haun 1987:37). The earliest part of the sequence relates to the discovery of an inland marsh and early dates were also obtained for the beachfront site and an inland rock shelter.

3.2.2 Honouliuli Taro Lands

Centered around the west side of Pearl Harbor at Honouliuli Stream and its broad outlet into the West Loch are the rich irrigated lands of the *‘ili* of Honouliuli, which give the *ahupua‘a* its name. The major archaeological reference to this area is Dicks, Haun and Rosendahl (1987) who documented remnants of a once widespread wetland system (*lo‘i* and fishponds), as well as dry-land cultivation of the adjacent slopes.

Carol Silva has conducted “Historic Research Relative to the Land of Honouliuli” (Dicks et al. 1987) and the reader is referred to this work for an overview of the history of Honouliuli.

The area bordering West Loch was clearly a major focus of population within the Hawaiian Islands and this was a logical response to the abundance of fish and shellfish resources in close proximity to a wide expanse of well-irrigated bottomland suitable for wetland taro cultivation. The earliest detailed map (Malden 1825) shows all the roads of southwest O‘ahu coalescing and descending the *pali* as they funnel into the locality (i.e. Honouliuli Village) which gave the *ahupua‘a* of Honouliuli its name. Dicks et al. (1987:78-79) conclude, on the basis of 19 carbon isotope dates and 3 volcanic glass dates, that “agricultural use of the area spans over 1,000 years.” Undoubtedly, Honouliuli was a locus of habitation for thousands of Hawaiians. Prehistoric population estimates are a matter of some debate but it is worth pointing out that in the earliest mission census (Schmitt 1973:19) in 1831-1832, the land (*‘āina*) of Honouliuli contained 1026 men, women, and children. It is not clear whether this population relates to Honouliuli Village or Honouliuli Ahupua‘a, but the village probably contained the vast majority of the district’s population. The nature of the reported population structure for Honouliuli (less than 20% children under 12 years of age) and the fact that the population decreased more than 15% in the next 4 years (Schmitt 1973:22) suggests that the prehistoric population of Honouliuli Village may well have been significantly greater than it was in 1831-1832. A conservative estimate would be that tens of thousands of Hawaiians lived and died at Honouliuli Village.

3.2.3 Pu‘u Ku‘ua: Inland Settlement

Documentation of inland settlement in Honouliuli Ahupua‘a is more problematic in that there are relatively few documented archaeological sources. However, it is probable that the area around Pu‘u Ku‘ua, on the east side of the Wai‘anae Ridge, seven miles inland of the coast, was a Hawaiian place of some importance.

In 1899, the Hawaiian Newspaper “*Ka Loea Kalaiaina*” relates a story of Pu‘u Ku‘ua as “a place where chiefs lived in ancient times” and a “battle field,” “thickly populated.” The article summarizes:

1) This place was entirely deserted and left uninhabited and it seems that this happened before the coming of righteousness to Hawai‘i Nei. Not an inhabitant is left.

2) The descendants of the people of this place were so mixed that they were all of one class. Here the gods became tired and returned to Kahiki (Sterling and Summers 1978:33).

McAllister recorded three sites in this area, two *heiau* (134 - Pu‘u Kuina and 137 -Pu‘u Ku‘ua, both destroyed) and a series of enclosures in Kukuilua which he calls “*kuleana* sites” (McAllister 1933). On the opposite side of the Wai‘anae range, along the trail to Pōhākea Pass, Cordy (2002) states “Kākuihihewa was said to have built (or rebuilt) Nīoi‘ula, a *po‘okanaka heiau* (1,300 sq. m.) in Hālona in upper Lualualei, along the trail to Pōhākea Pass leading into ‘Ewa, ca. A.D. 1640-1660” (Cordy 2002:36). There is no direct archaeological evidence available to the authors’ knowledge that intensive Hawaiian settlement occurred here, but it is considered as a place of high probability, based on the above indications. John Papa ‘Ī‘ī (1959) described a journey that Liholiho took which led him and an entourage through inland Honouliuli and over Pōhākea Pass. Geographically, the area receives sufficient quantities of water and would have had abundant locally available forest resources.

3.2.4 Summary

Based on the above summary of areas of Honouliuli settlement, the following general considerations are made to place the study area in the context of the *ahupua‘a* pattern.

1. There are three areas of Hawaiian settlement in the *ahupua‘a*; two are well documented and the inland settlement in the vicinity of Pu‘u Ku‘ua is problematic.

    b. The extensive limestone plain with recurrent use habitations for fishermen and gatherers, and sometime gardeners;

    c. The rich cultivated lands of Honouliuli *‘ili* for extensive wetland taro and clearly the *ahupua‘a* population center;

    d. The uplands around Pu‘u Ku‘ua for probable agriculture and forest resource utilization.

2. Honouliuli is designed as a unit to contain all the geographic elements of a typical Hawaiian valley *ahupua‘a*, except they are arranged geomorphically in an atypical relationship. The *ahupua‘a* is not organized around a single drainage network but shares the west portions of Waikele drainage in its upper reaches. A typical and highly advantageous characteristic for human subsistence is included in a vast coastline and fringing reef, an extensive limestone plain which would support only limited agriculture, but would be excellent for bird catching in early times. The richest forest land for foraging for wood, birds, feathers, etc. would have been the east slope of the Wai‘anae Range. The *mauka/makai* route would have been up Honouliuli Gulch or up the Makakilo ridge, paralleling the coast from Honouliuli Gulch to Kahe. The most convenient route to *mauka* lands, even from the western end of the coast near Kahe Point, would have been *mauka* only to the base of the hills and then either up the Makakilo Ridge or northeast to a trail to Pu‘u Ku‘ua and Pōhākea Pass. The *makai* slope is the dry side of the ridgeline. Here, streams would respond to rainfall quickly but drain quickly leaving little available water for even short-term use. However, abundant springs may have provided adequate water for localized dry land cultivation.

3. The *makai* slope of the Wai‘anae Range (i.e. *mauka* of Ko‘Olina) was not a major thoroughfare. We can see some very limited evidence of part-time agriculture in and around gulches and 2 foci of sparse habitation with the first limited to *makai* portions of gulches and lava flats. This habitation is considered a *mauka* component or continuation of the Ko‘Olina coastal settlement rather than an independent focus. The second focus, separated from the first by a barren zone, is generally above the 800-foot elevation. This *mauka* habitat, which could have been supported by seasonal dry land planting and forest foraging, may be the lower portion of a thinly scattered but widespread zone of settlement. This zone stretches eastward and northeast along the east Wai‘anae Range slopes and may increase in intensity along the more watered lands forming the *mauka* western boundary of Honouliuli.
4. The central place of the *ahupua‘a* of Honouliuli in terms of population, as well as cultivated foods, was the *‘ili* of Honouliuli. There is good reason to assume, given the lack of intensive agricultural resources in other locations during prehistoric times, that all other habitation zones were economically and socially co-dependent.
5. There is to date no archaeological evidence of high status residence in Honouliuli. Large residential structures are not present along the Pacific shoreline where they would be expected. The late prehistoric occurrence of chiefs' houses is not apparent, perhaps because the ocean shoreline, although rich in marine resources, is uninviting for sport and unsuitable for fishponds. The chiefly focus of ‘Ewa District was Waipi‘o. Whatever activities of this class occurred in Honouliuli would have been in or near the rich lands fronting West Loch (the ‘ili of Honouliuli) but to date there is no direct archaeological evidence of this. Concerning status associations with Honouliuli it is interesting to note the connection of the Pu‘u Ku‘ua settlement with pariah (*kauwā*), the lowest class of Hawaiians (Sterling and Summers 1978:33).

3.3 Previous Archaeological Research

The coral plains of ‘Ewa have been the focus of more than 50 archaeological studies over the last two decades, largely as the result of required compliance with county, state, and federal legislation. The Kalaeloa (Barber’s Point) area is one of the most studied places in Polynesia. However, relatively little research has been conducted along the southern slopes of the Wai‘anae Range (Table 1 and Figure 18).

The earliest attempt to record archaeological remains in Honouliuli Ahupua‘a was made by Thrum (1906). He reports the existence of a *heiau* located on Pu‘u Kapolei, approximately 2 miles (3.2 km) south of the current project area. Pu‘u Kapolei Heiau is described as “Ewa-size and class unknown. Its walls thrown down for fencing” (Thrum 1906:46).

In his surface survey of 1930, archaeologist J. Gilbert McAllister recorded the specific locations of important sites, and the general locations of less important sites (at least at Honouliuli). Archaeological investigations by McAllister along the southern slopes of the Wai‘anae Range identified a number of sites which are of interest.

McAllister documents Pu‘u Kapolei Heiau as Site 138 and notes:

> The stones from the heiau supplied the rock crusher which was located on the side of this elevation, which is about 100 feet away on the sea side. There was formerly a large rock shelter on the sea side where Kamapuaa (the pig-god) is said to have lived with his grandmother (Kamaunuahihio). (McAllister 1933:108)

McAllister's Site 136 is located near Mauna Kapu, northwest of the current project area, and is described as a small platform on the ridge dividing the ‘Ewa and Wai‘anae districts. The 4 to 6 square foot platform was constructed of coral and basalt stones, and was believed to be an alter (McAllister 1933:107). It is noted to have been destroyed by the time of Sterling and Summers' work in the late 1950's (Sterling and Summers 1978:32).

McAllister's Site 137 is at Pu‘u Ku‘ua, a prominent landmark 1.8 miles (2.9 km) north of the current project area. Pu‘u Ku‘ua Heiau is described by McAllister as:

> (Destroyed) The heiau was located on the ridge overlooking Nanakuli as well as Honouliuli at the approximate height of 1800 feet. Most of the stones of the heiau were used for a cattle pen located on the sea side of the site. The portion of the heiau which has not been cleared for pineapple has been planted in ironwoods. (McAllister 1933:32)

The presence of Pu‘u Ku‘ua *heiau*, provides some archaeological evidence of the Pu‘u Ku‘ua settlement described in the Hawaiian Newspaper "*Ka Loea Kalaiaina.*"

None of these sites are in the immediate vicinity of the current project area. However, the presence of extant or former archaeological remains demonstrates Hawaiian use of these *mauka* lands.

Recent archaeological investigations in the southern Wai‘anae Range have generally been focused on deep gulch areas for potential landfill locations, lower slopes for residential development, and mountain peaks for antennae or satellite tracking infrastructure.

Makaīwa Gulch, just north of the project area was surveyed as a potential landfill location (Bordner 1977a).

An archaeological inventory survey of the "Makaīwa Hills" development project located several traditional as well as post-contact archaeological sites (Hammatt et al. 1991). The project area included a 1,915 acre parcel in Honouliuli Ahupua‘a, located between the town of Makakilo and Waimanalo Gulch, and bounded to the south by Farrington Highway and to the north by Pālehua Road (southwest of the current project area). 34 sites were located, including prehistoric habitation structures (temporary and permanent), agricultural features (terrace and mounds), rock shelters, petroglyphs, *ahu*, and various sugar cane cultivation infrastructure.

Within the "Makaīwa Hills" project area, habitation sites were found to be clustered in higher elevations above 1000 ft., and in lower elevations below 500 ft (Hammatt et al. 1991). The higher elevations would contain ample forest subsistence resources for gathering on both a continual basis, as well as during times of famine and drought. The lower elevations would be in close proximity to the shoreline and bountiful coastal resources.

> In sum, this site type and patterning sample suggests that prehistoric and historic Hawaiian populations utilized the present study area as a recurrent and temporary

Table 1. Previous Archaeological Investigations in the Uplands of Honouliuli Ahupua‘a

Reference	Type of Investigation	General Location	Findings
Bordner 1977	Archaeological Reconnaissance	Proposed Makaīwa Gulch Landfill Site	No archaeological sites identified
Sinoto 1988	Archaeological Reconnaissance	Makakilo Golf Course	low stacked boulder wall (-1975)
Spear 1996	Archaeolocial Reconnaisssnce	East Kapolei, TMK: 9-1-16: 17	No sites were discovered within project area.
Dega et al. 1998	Archaeological Inventory Survey	UH West O‘ahu, TMK: [1] 9-2-002: 001 & [1] 9-2-002: 001	Two historic site complexes, (50-80-08-5593 historic irrigation system and 50-80-09-2268 Waiāhole Ditch System)
Tulchin and Hammatt 2004	Archaeological Inventory Survey	86-Acre Proposed Pālehua Community Association (PCA) Common Areas Parcels, Makakilo (TMK: 9-2-03: 78 por. and 79)	4 historic properties identified: a complex of concrete and iron structures associated with industrial rock quarry operations (Site 50-80-12-6680); three boulder mounds believed to be related to land clearing or ditch construction by the O‘ahu Sugar Co. (Site 50-80-12-6681); a small terrace believed to function as a historic water diversion feature (Site 50-80-12-6682); and a remnant portion of the Waiāhole Ditch (Site 50-80-09-2268).
Tulchin and Hammatt 2005	Archaeological Inventory Survey	71-Acre Proposed Pālehua East B Project, Makakilo, (TMK: 9-2-03: 76 and 78)	Three historic properties identified: SIHP No. 50-80-12-6666 (pre-Contact agricultural alignment and mound), SIHP No. -6667 (plantation-era stacked basalt boulder walls and a ditch), and SIHP No. -6668 (single alignment of upright basalt boulders and a small, low terrace).

Reference	Type of Investigation	General Location	Findings
Tulchin and Hammatt 2007	Archaeological Literature Review and Field Inspection	Approximately 790-Acre Parcel at Palehua, Honouliuli Ahupua‘a, (TMK: [1] 9-2-003:002 por. and 005 por.)	Confirmed the area to be rich in archaeological remains. Because the lands within the project area were almost exclusively used for ranching purposes from historic times until the present, much of the pre-Contact landscape remains intact and relatively undisturbed. Archaeological features included: pre-Contact indigenous Hawaiian habitation and associated agricultural and ceremonial features; historic ranching and related features; and historic quarrying and related features.
Tulchin, Shideler and Hammatt 2007	Archaeological Literature Review	Approximately 4,600-Acre Property at the Honouliuli Forest Reserve Honouliuli Ahupua‘a, (TMK: [1] 9-2-004:001 por., 005 por.; 9-2-005:013 por., 016, 018)	Because the lands within the project area were almost exclusively used for ranching and forestry purposes from the mid 1800s until the present, much of the pre-Contact landscape remains intact and relatively undisturbed. Archaeological features representing distinct periods of land use are likely to be identified in the project area, including: pre-Contact indigenous Hawaiian habitation and associated agricultural and ceremonial features; historic homestead and ranching related features; historic agricultural features; and historic military-related features.
Tulchin and Hammatt 2008	Archaeological Literature Review and Field Inspection	Approximately 809 Acres of Kahe Ranch Land, Honouliuli Ahupua‘a, (TMK: [1] 9-2-003: 004, 009, 029, 084 por., & 085)	Identifies 10 archaeological sites within the study area. Archaeological features representing distinct periods of land use were observed, including: pre-Contact indigenous Hawaiian habitation; historic ranching; and historic railroad operations.

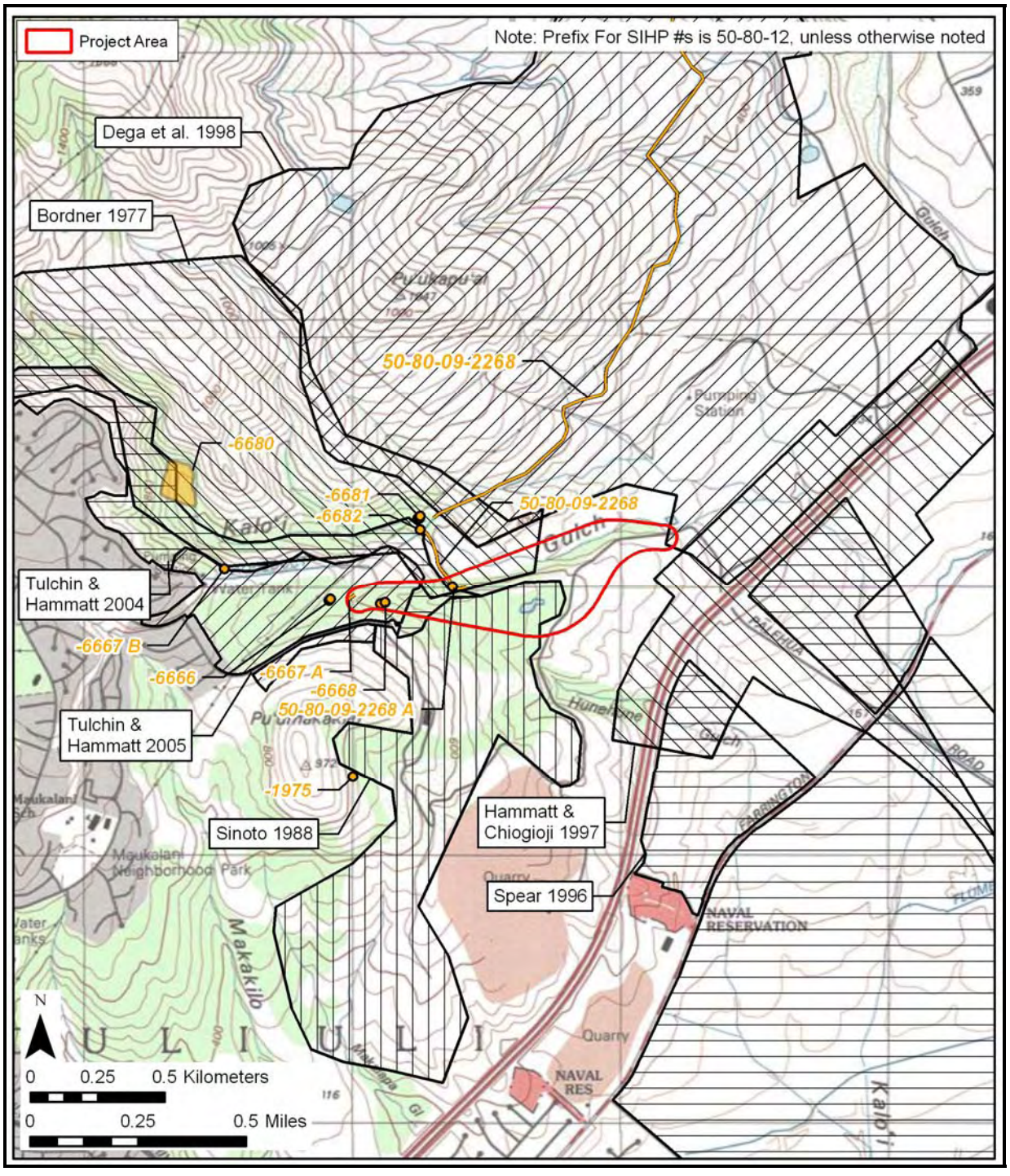


Figure 18. Map showing previous archaeological studies conducted in vicinity

> habitation area focused mainly on the gathering of specialized goods, such as wild forest plants from the upper elevations and the quarrying of lithic material within the lower elevations. (Hammatt et al. 1991:106)

Two archaeological studies were made in the upland Pālehua area, *mauka* of Makakilo. An archaeological inventory survey of the proposed KAIM radio tower (Hammatt 1992), located northwest of the current project area, identified no archaeological remains. An archaeological assessment for the proposed Ministry of Transportation Satellite Multi-Ranging Station project site (Borthwick 1997), which abuts the western perimeter of the Air Force Solar Observatory facility, identified no archaeological remains.

Relatively few archaeological sites have been located by archaeological studies made in the vicinity of the current project area (Figure 17). Archaeological studies associated with the proposed Makakilo Golf Course (Sinoto 1988) and the Makakilo D and D-1 Development Parcels (Nakamura et al. 1993) were conducted in the vicinity of the current project area. Archaeological reconnaissance of the Makakilo Golf Course property included lands along the southern and eastern slopes of Pu‘u Makakilo. Severe erosion was noted throughout the property. A single archaeological feature, a low stacked basalt boulder wall (50-80-12-1975), was identified (Sinoto 1988). Archaeological inventory survey of the Makakilo D and D-1 Development Parcels included lands on the southern and western slopes of Pu‘u Makakilo, adjacent to the golf course property. A single historic property, a cement irrigation flume (50-80-12-4664), was located in the southern portion of the project area near the H-1 Freeway (Nakamura et al. 1993).

An archaeological inventory survey for the proposed UH West O‘ahu campus was conducted by Dega et al. (1998). The survey area included 991 acres in the vicinity of Pu‘u Kapu‘ai, north of the current project area. No traditional Hawaiian sites were located. The project area was noted to have undergone extensive land modification associated with commercial agriculture. Two historic site complexes (5593, irrigation system & 2268, Waiāhole Ditch System) were documented. Identified features included flumes, aqueducts, ditches, pumps, and other irrigation infrastructure. It was noted that the Waiāhole Ditch crossed through the project area and “exits the property to the west near Kaloi Gulch” (Dega et al. 1998:17).

Kalo‘i Gulch, including current project area, was surveyed as a potential landfill location (Bordner 1977b). The archaeological reconnaissance survey included lands within Kalo‘i Gulch and its smaller tributaries from the *makai* end of the gulch up to the 1,400 ft elevation. It was noted that lands at the base of the gulch, *makai* of an historic quarry, were extensively modified by bulldozing. In the *mauka* portion of the project area, three sites, possibly prehistoric, were identified (Table 2). The three sites (50-80-12-2600, -2601, -2602) consisted of low stacked basalt boulder walls located along the north side of the Kalo‘i Stream channel.

Within the “Makaīwa Hills” project area, habitation sites were found to be clustered in higher elevations above 1000 ft., and in lower elevations below 500 ft (Hammatt et al. 1991). The higher elevations would contain ample forest subsistence resources for gathering on both a continual basis, as well as during times of famine and drought. The lower elevations would be in close proximity to the shoreline and bountiful coastal resources.

An archaeological inventory survey for the proposed UH West O‘ahu campus was conducted by Dega et al. (1998). The survey area included 991 acres in the vicinity of Pu‘u Kapu‘ai, just east of the current study area. No pre-Contact Hawaiian sites were located. The project area was extensively modified by commercial agriculture. Two historic site complexes (SIHP No. 50-80-08-5593: historic irrigation system, SIHP No. 50-80-09-2268: Waiāhole Ditch System) were documented. Identified features included flumes, aqueducts, ditches, pumps, and other irrigation infrastructure. It was noted that the Waiāhole Ditch crossed through the project area and “exits the property to the west near Kaloi Gulch” (Dega et al. 1998:17).

Tulchin and Hammatt (2004) conducted an inventory survey of the approximately 86-acre proposed Pālehua Community Association (PCA) Common Areas on the northwestern side of Makakilo. The study area abuts the northern boundary of the current study area. Historic sites located during the inventory survey included: a complex of concrete and iron structures associated with industrial rock quarry operations (SIHP No. 50-80-12-6680); three boulder mounds believed to be related to land clearing or ditch construction by the O‘ahu Sugar Co. (SIHP No. 50-80-12-6681); a small terrace believed to function as an historic water diversion feature (SIHP No. 50-80-12-6682); and a remnant portion of the Waiāhole Ditch (SIHP No. 50-80-09-2268). No pre-Contact historic properties were identified.

Tulchin and Hammatt (2004) undertook a field inspection of four locations just west of the current study area. Three small stone features were identified: an *ahu*, a stone terrace, and a small C-shape. An archaeological inventory survey was recommended should any construction activities be proposed for those parcels of land.

Tulchin and Hammatt (2005) conducted an inventory of a 71-acre parcel located just south of the current study area. Three historic properties were identified: SIHP No. 50-80-12-6666, a pre-Contact agricultural alignment and mound; SIHP No. 50-80-12-6667, Plantation-era stacked basalt boulder walls and a ditch; and SIHP No. 50-80-12-6668, two pre-Contact agricultural features consisting of a single alignment of upright basalt boulders and a small, low terrace.

3.4 Background Summary and Predictive Model

Historical background research of Honouliuli Ahupua‘a indicated that pre-Contact settlement was centered around the rich cultivated lands of Honouliuli ‘Ili for extensive wetland taro cultivation and abundant coastal resources. The extensive limestone plain would also include recurrent use habitations for fishermen and gatherers, and sometimes gardeners. The upland dry forest areas would be used for hunting and gathering of forest resources, but likely not for widespread permanent settlement. In the intermediate area between the limestone plain and the upland forests, in the vicinity of the current study area, indigenous Hawaiian activities would have been limited to dry land agriculture within gulches or near springs, and *mauka* to *makai* trails and associated temporary shelters.

Within the “Makaīwa Hills” project area, which abuts the western boundary of the current study area, pre-Contact habitation sites were found to be clustered in higher elevations above 1000 ft., and in lower elevations below 500 ft (Hammatt et al. 1991). The higher elevations, in which the current study area is located, would contain ample forest subsistence resources for gathering on both a continual basis, as well as during times of famine and drought.

In Von Holt’s (1985) accounts of discovering spring water within the study area, it is noted that Kalo‘i had “been a place of which the Hawaiians had known” and the area “had been quite heavily populated before the smallpox epidemic of 1840” (Von Holt 1985:138-140).

By 1920, the lands of Honouliuli were used primarily for commercial sugar cane cultivation and ranching (Frierson 1972:18). Much of the *mauka* lands in western Honouliuli, including ridges and deep gulches, were unsuitable for commercial sugar cultivation and remained pasture land for grazing livestock. Historic maps indicate a lack of any significant development within the study area into the 1940s suggesting that the lands within the study area were unsuitable for commercial sugar cane cultivation and were utilized as pasture land for grazing livestock. Modest constructions in the area included Pālehua Road, allowing access to the uplands of western Honouliuli, as well as plantation irrigation infrastructure that runs through the current study area (see Figure 14). Also of note are the presence an unidentified enclosure within the northwest corner of the study area and a trail running roughly northwest by southeast through the middle of the study area leading to tunnels and a tank within the northern portion of the study area. This trail is likely the Pālehua Trail along which Von Holt located and tapped various springs to supply water to his herds of cattle. The tunnels located along the northern end of this trail are likely water tunnels excavated into the hillside in order to secure water.

Previous archaeological research in the vicinity of the study area has identified numerous pre-Contact sites including: habitation structures (temporary and permanent) and agricultural features (terrace and mounds). Of particular interest are three pre-Contact sites (SIHP No. -2600, -2601, & -2602) located within Kalo‘i Gulch, in the northern portion of the study area. All three sites were determined to related to erosion control and water management and suggest that in the past water was fairly abundant within the study area. This coincides with Von Holt’s (1985) accounts of discovering spring water within the study area, and that Kalo‘i had “been a place of which the Hawaiians had known”.

Historic archaeological sites identified in the vicinity of the study area include Plantation Era infrastructure (ditches, flumes, clearing mounds, etc.) related to the Ewa Plantation Co. and Oahu Sugar Co., walls and fences attributed to the Campbell Ranch, and industrial quarry infrastructure (rock crusher, concrete platforms and structures, etc.).

Based on background research expected finds during the field inspection of the study area are likely to include both pre-Contact and historic archaeological sites. Pre-Contact archaeological sites may include: dry land agricultural sites, including planting mounds and terraces in the vicinity of springs or drainage gulches; habitation sites, including enclosures and platforms; trail markers (*ahu)*; religious sites (*heiau*), including enclosures, terraces, platforms, and/or upright stones located on prominent hills or other significant locations. Historic archaeological sites may include: ranch related structures, including walls, fences, maintained springs, and water tunnels; irrigation infrastructure, including ditches and flumes related to the Ewa Plantation Co. and Oahu Sugar Co., or industrial quarry infrastructure.

Section 4 Results of Fieldwork

A pedestrian inspection of the project area was conducted between January 31 and February 1, 2008 by four Cultural Surveys Hawai‘i staff archaeologists, under the general direction of Hallett H. Hammatt, Ph.D. In general, lands within the project area appeared to have undergone significant erosion of topsoil. The relatively flat portions of the project area exhibited substantial land modification in the form of machine graded dirt roads, bulldozed clearings, excavated ditches, and remnants of landscaping irrigation lines associated with the abandoned golf course located in the southern portion of the project area (see Figure 7, Figure 8, Figure 9 and Figure 10). A remnant of a paved portion of Pālehua Road, which runs east to west through the project area, was also observed. The drainage utility infrastructure of the Makakilo Drive area was designed to send water from the upland residential areas down slope into the lowland areas of the project area. As the pedestrian inspection of the project area was made following a period of unusually heavy precipitation, it was unclear whether the water observed in the marshy areas and flowing into the gulch originated upslope as runoff or through a storm drain outlet from the residential area to the west. Although streambed formation at lower elevations within the project area may have originated from erosion caused by spring-fed natural channeling, no springs or other naturally occurring water sources were observed within the course of this investigation.

4.1 Survey Findings

Two (2) new historic sites (SIHP Nos. 50-80-12-6950 and 50-80-12-6951) were discovered on survey and documented with written descriptions, graphic illustrations, and photographs. These sites functioned to feed sugar cane fields as well as control water flow coming from those cane fields to areas of lower elevation. Channels and ditches observed were constructed during historic times, and their purpose was to minimize the impact of erosion as well as prevent mud and debris from entering the existing water supply structures associated with the Waiāhole Ditch System, which supplied the region with the much needed water for irrigation in the sugar industry.

Besides the newly identified sites observed on survey, two (2) new features associated with the SIHP No. 50-80-09-2268 (Waiāhole Ditch System) were also observed and documented, further extending the geographical context in which SIHP No. -2268 is referenced. The newly recognized features are labeled SIHP No. -2268, Feature A and SIHP No. -2268, Feature B (Figure 19 and Figure 20).

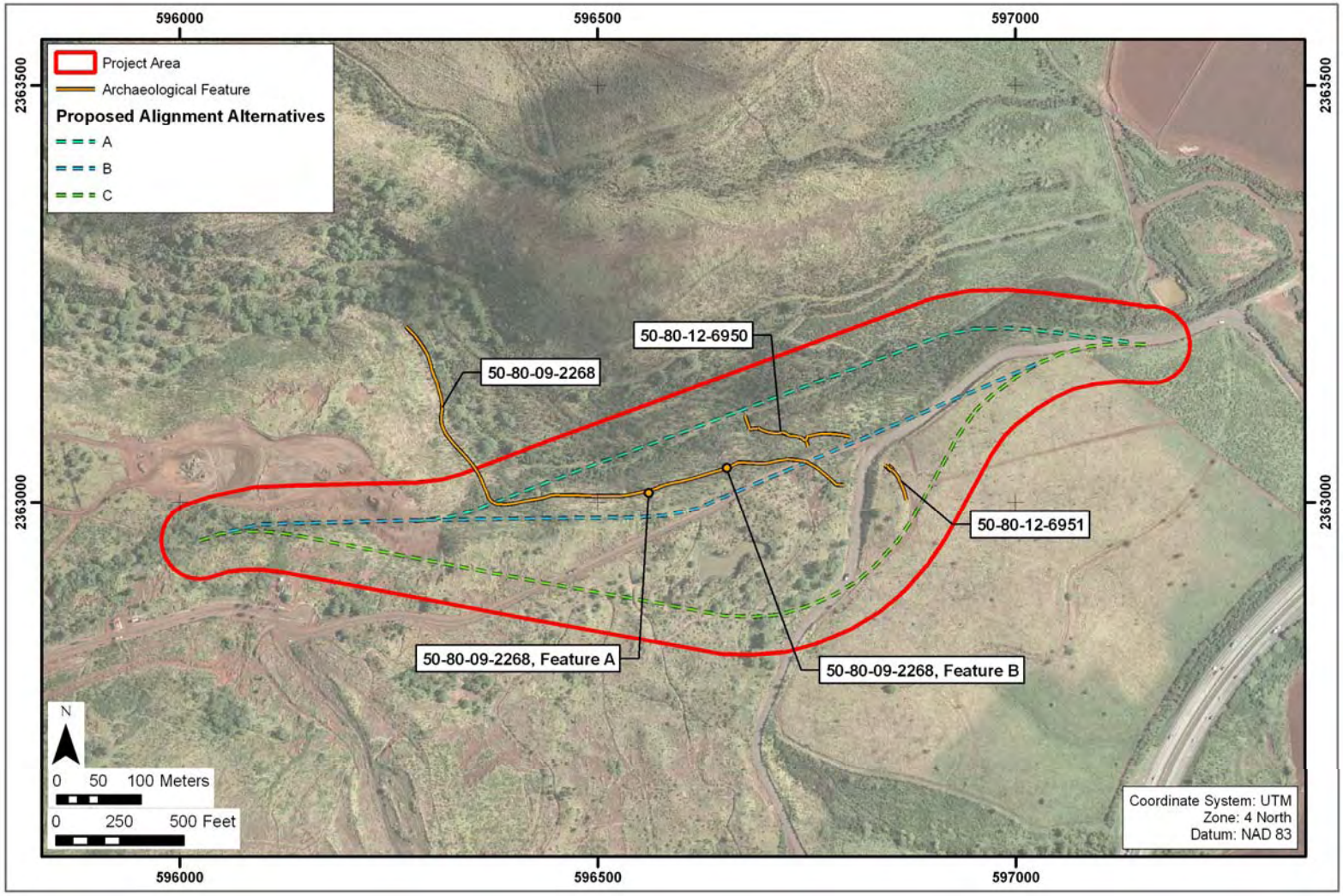


Figure 19. Aerial photograph showing the locations of historic properties identified in the project area, in relation to the three proposed Makakilo Drive Extension alignment alternatives

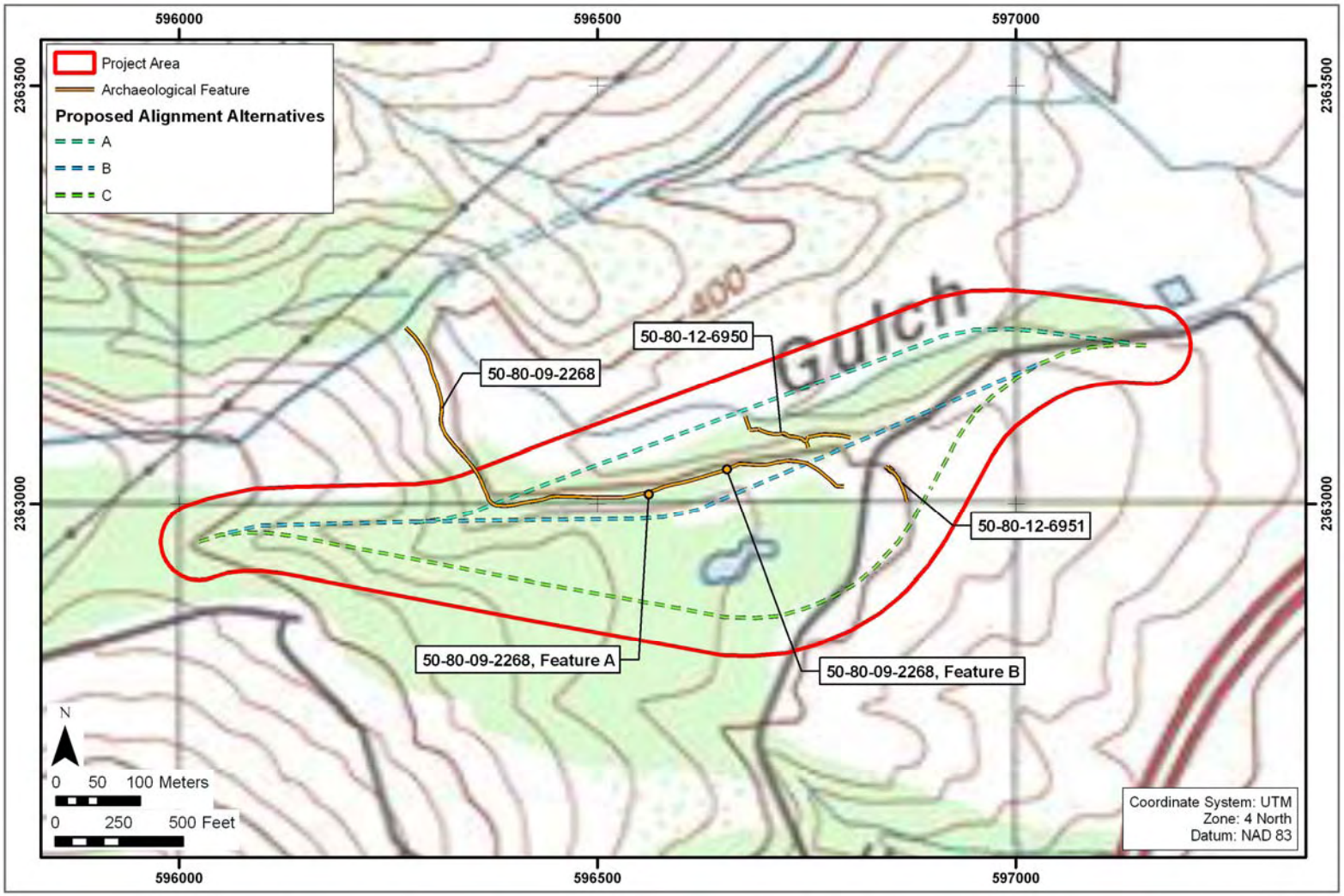


Figure 20. USGS 7.5 minute series Ewa quadrangle topographic map showing the locations of historic properties identified in the project area, in relation to the three proposed Makakilo Drive Extension alignment alternatives

4.2 Site Descriptions

4.2.1 SIHP No.: 50-80-12-6950

Site Type: Modified Drainage Ditch

Function: Water Control

Features: 3

Age: Historic

Site -6950 is a reinforced drainage ditch that was built to divert water to either cross Kalo‘i Stream entirely or to flow into Kalo‘i Stream through an iron pipe. As water flowed downhill it was channeled east to west along the contour of the north-facing, southern slope, near the center of the project area, through this modified drainage ditch. The features observed in this site functioned to control the flow of water towards the base of Kalo‘i Gulch. A total of three (3) features (i.e. Features A-C) were observed on survey, covering an area of approximately 100 square meters (Figure 21).

Feature A is located in the westernmost portion of Site -6950. It consists of a long iron pipe and a pre-fabricated cement ditch, which is located slightly upslope from the pipe. A single foundation was constructed to support the iron pipe spanning the approximately three to four meters across an underlying stream. The pipe was probably used to feed fields at the base of Kalo‘i Gulch.

Feature B is a series of freestanding rock walls, which are labeled as Retaining Walls 1 through 3, forming a channel for water flowing down from the cane fields above. Retaining Wall 1 is five meters east of the pre-fabricated cement ditch; Retaining Wall 2 is approximately twenty-five meters east of Retaining Wall 1; Retaining Wall 3 is located approximately fifteen meters east of Retaining Wall 2.

Feature C, located on the eastern side of Site -6950, is a graded path, and is probably a filled ditch. It is lined on both sides with barbed wire supported by wooden fence posts, and abuts a mound of soil and stones. Water coming from Feature C flowed east to west and merged with water coming from the “Modified Drainage Channel” at the “Mound of Soil and Stones,” near the center of Site -6950.

SIHP No. 50-80-12-6950 is not associated with the irrigation supply function of SIHP No. 50-80-09-2268 (Waiāhole Ditch System), but considering the volume of water Site -6950 was designed to sustain and the relative natural aridity of the region, drainage of the large amounts of water required for sugar cane cultivation is a very likely function for this site. Without such safeguards against the impact of erosion from running water, the landscape of the area could have been impacted in ways that would have adversely affected the efficiency and productivity of this area for agriculture. Two objectives are apparent in the engineered modification of the area: to feed water to the cane fields, and to maintain the physical landscape.

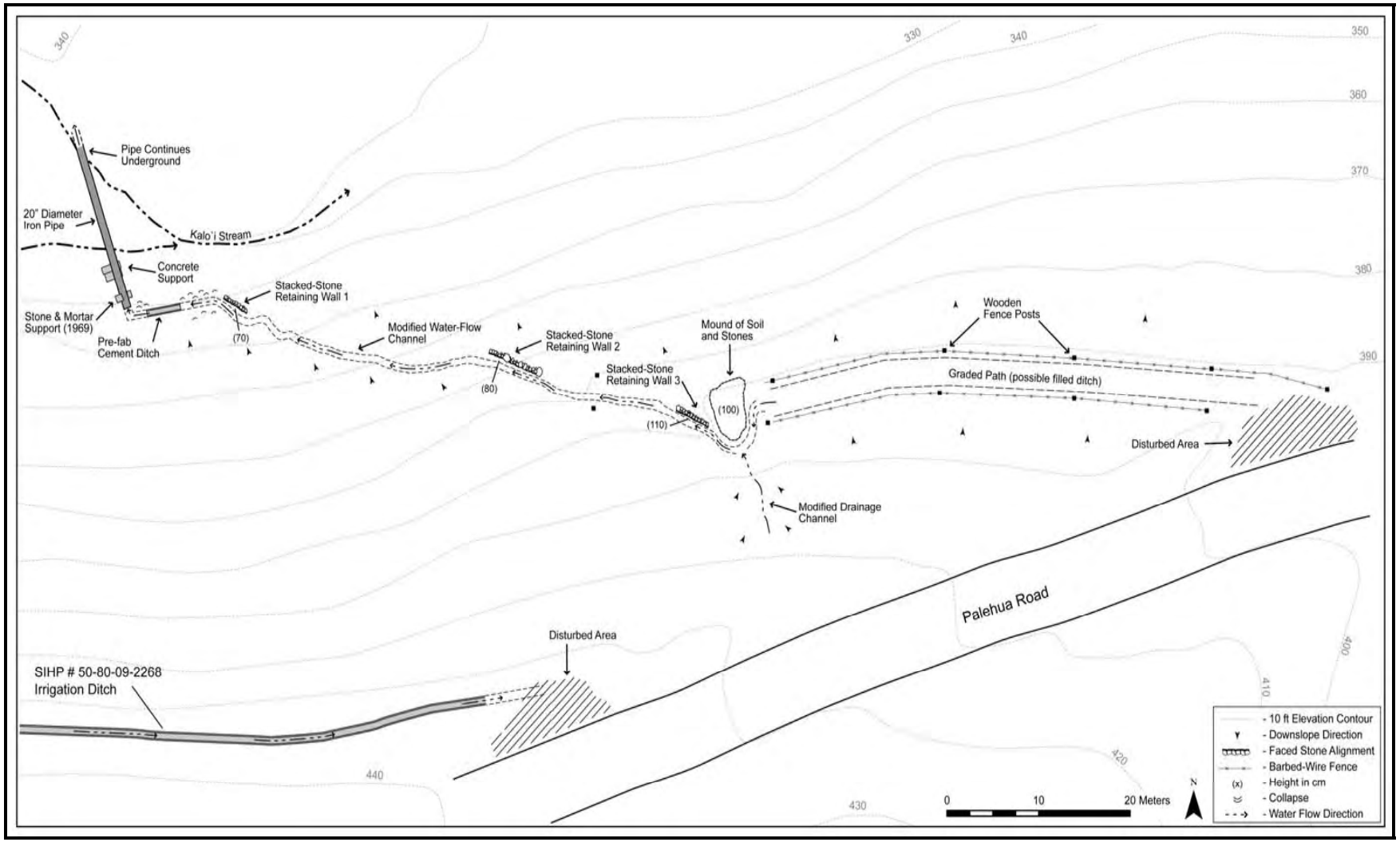


Figure 21. Plan view of SIHP No. 50-80-12-6950.

4.2.1.1 Feature A

Feature A consists of two parts: a 20-inch diameter iron pipe (Figure 22), and a U-shaped, prefabricated ditch constructed of cement boards, with a flat bottom and vertical sides (Figure 23). The iron pipe slopes upward, north to south, at an approximately 10 degree slope (Figure 24). The higher, southern end of the pipe is reinforced with a stone and mortar platform that catches water flowing downhill from the prefabricated cement ditch. The exposed portion of the pipe measures approximately 15 meters, end to end, and continues for an indeterminate length underground (Figure 25). Inscribed atop the partially overarching stone and mortar support of this foundation is “969” and “y 12, 1969.” The missing portion of this support arch would have revealed the month as well as the year “1969,” of which only the “y” remains (Figure 26), if it had not collapsed. The U-shaped prefabricated cement ditch slopes slightly uphill for approximately 3 meters towards Retaining Wall 1 of Feature B before ending the extent of Feature A.



Figure 22. North view of 20-inch iron pipe, Feature A, SIHP No. 50-80-12-6950.



Figure 23. Southern end of 20-inch pipe, where a pre-fabricated ditch faces the iron pipe.



Figure 24. West view of 20-inch iron pipe crossing streambed at the base of Kalo‘i Gulch



Figure 25. South view of northernmost section of iron pipe, where pipe goes underground



Figure 26. Inscription of part of a date on a stone and mortar support

4.2.1.2 Feature B

Feature B consists of three separate sections of a partially collapsed rock wall expanse that once retained water flow to cause a diversion down slope into Feature A. Retaining Wall 1, the rock wall section closest to Feature A, begins approximately 5 meters east of Feature A (Figure 27). Retaining Wall 2 begins approximately 25 meters east of Retaining Wall 1, through a modified channel (Figure 28). Retaining Wall 3 begins approximately 15 meters east of Retaining Wall 2. The bend in the channel is where Feature B, the “Modified Drainage Channel,” and the “Mound of Soil and Stones” meet and merge with Feature C (see Figure 21).

Remnants of the freestanding rock wall were chosen to be documented based on the amount of collapse sustained, but a substantial amount of the overall structure was observed to have once been intact between the designated sections as well. Retaining Wall 1 measures approximately 2.50 meters long, approximately 50 centimeters tall, and stacked 3-4 courses high (see Figure 27). Between Retaining Wall 1 and Retaining Wall 2 is part of a modified channel measuring approximately 25 meters long and ranging between one and two meters wide (see Figure 28). Retaining Wall 2 is approximately seven meters long, 40 to 50 centimeters tall, and stacked 3-4 courses high (Figure 29). Retaining Wall 3 is the most intact section in Feature B. In this section a curve in its horizontal shape turns the ditch slightly south to abut the “Mound of Soil and Stones” (see Figure 21), before merging with Feature C. Retaining Wall 3 measures approximately 5 meters long, 50 centimeters tall, stacked 5-6 courses high (Figure 30 and Figure 31).



Figure 27 East view of Retaining Wall 1.



Figure 28 East view of ditch, between Retaining Wall 1 and Retaining Wall 2.



Figure 29 NE view of Retaining Wall 2.



Figure 30. East view of Retaining Wall 3, showing curve to the south, upslope.



Figure 31. NE view of Retaining Wall 3.

4.2.1.3 Feature C

Feature C is a graded path with some characteristics of a filled ditch. It is lined on either side with barbed wire and intermittent wood posts (see Figure 21). The level area and the proximity to other water and erosion control features in the area suggest that this area could have been a ditch either used concurrently or prior to the construction of Feature B (Figure 32).



Figure 32. East view of Feature C, showing degree of overgrowth of surrounding vegetation

4.2.2 SIHP No.: 50-80-12-6951

Site Type: Irrigation Reservoir

Function: Water Control

Age: Historic

SIHP No. -6951 is a series of remnant portions of a sugar cane irrigation reservoir that once fed into the O‘ahu Sugar Company’s plantation lot number 29 (Figure 33). This structure is parallel to the eastern base of a mound approximately 3 meters above the average surrounding ground surface, which is bound on its north side by Old Pālehua Road, on its east and south sides by O‘ahu Sugar Company’s plantation lot number 29 (see Figure 13), and on its west side by Quarry Road. Site -6951 consists of remnant reservoir ditching infrastructure. The ditch structure ranges in width between 190 and 90 centimeters. As water was collected in the reservoir it was distributed into the cane fields below, transporting water from higher elevations down slope to the eastward and southward fields (Figure 34). Excess moisture that flowed further north continued into features associated with SIHP No. 50-80-12-6950 as well as the newly discovered and documented features associated with SIHP No. 50-80-09-2268 (Waiāhole Ditch System), proceeding to the floodplain at the base of Kalo‘i gulch (see Figure 20 and Figure 21).

Included in this site is an irrigation valve in the northern section of Site -6951 (Figure 35). Across 1.9 meters of ditch from this valve is a freestanding stone and mortar wall. The western side of the ditch is a retaining wall, constructed with stacked stone, five to six courses high (Figure 36). Freestanding rock walls were constructed abutting the slope of the mound, on the west side of the ditch to retain the earthen mound to the west and to minimize the effects of erosion to the overall structure. In contrast, stone and mortar walls were constructed to contain flowing water in areas of the structure where water was either constantly moving or stagnant.

Approximately 6 meters south of the north end of the freestanding stone and mortar wall are six (6) sections of railroad tracks lying parallel to each other, crossing the ditch. Each measuring approximately 1.5 meters, and loosely placed across the rim of the ditch. These rails are rusted and weathered, and no indication of age was observed. It is unknown why they were placed here, but they could have served as a clandestine or long-term walkway for pedestrian access to either side of the ditch, perhaps for use when the reservoir was fully functional.

Two (2) channels were observed branching off of the main ditch and proceeding east into the fields down slope (Figure 37 and Figure 38). The channel and gate near the center of the reservoir ditch is in relatively good condition, the other ditch further south is in remnant condition. The channels functioned as conduits designed to feed water into O‘ahu Sugar Company’s lot #29.

Freestanding rock walls were constructed abutting the slope of the mound on the west side of the ditch to retain an earthen mound and to minimize the effects of erosion to the overall structure. In contrast, stone and mortar walls were constructed to contain flowing water in areas of the structure where water was either in motion or stagnancy. Water came into the reservoir from the west, through the Waiāhole Ditch System and was dispersed into the fields through this reservoir system of channels and gates (see Figure 13).

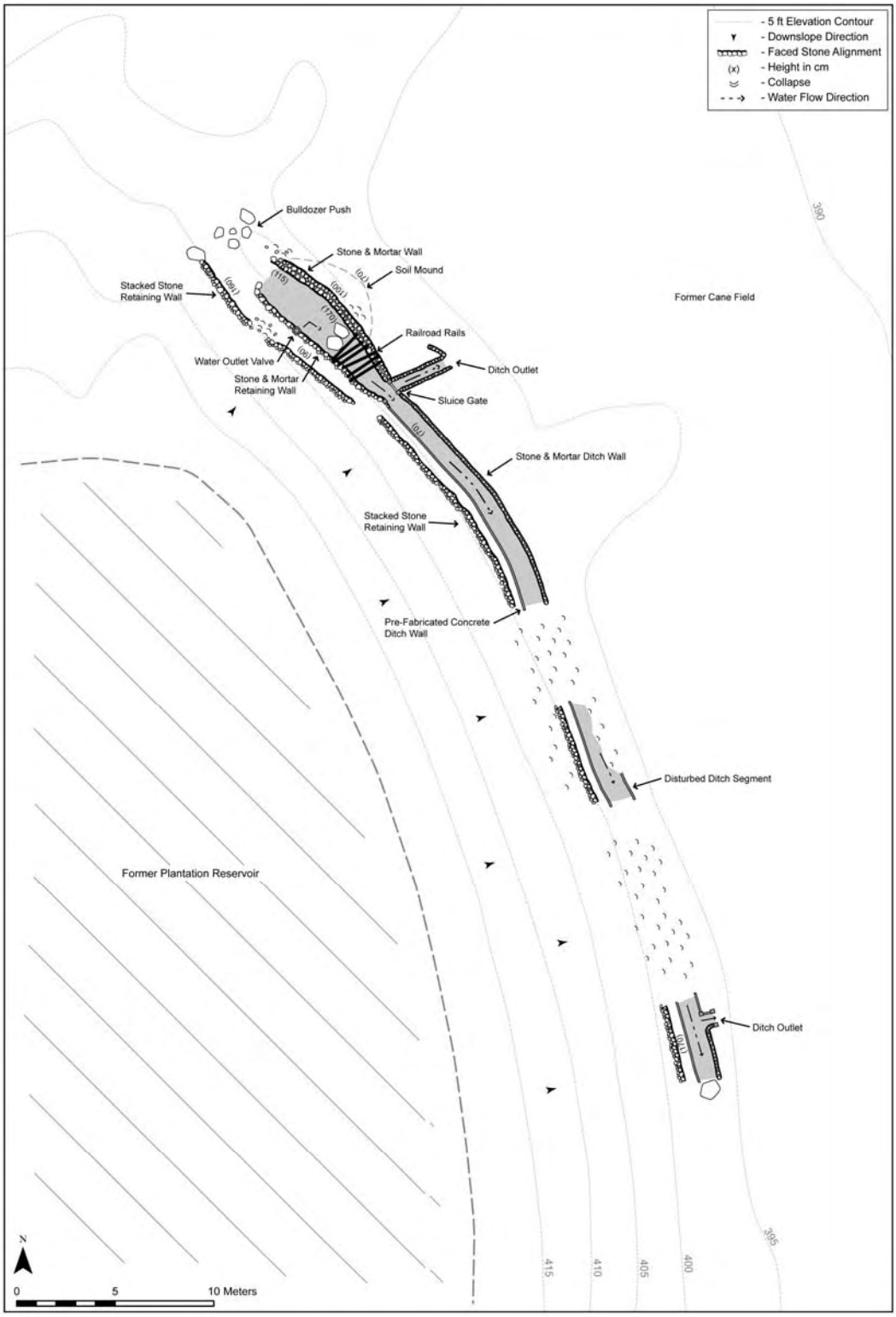


Figure 33. State Site 50-80-12-6951



Figure 34. East view of O‘ahu Sugar Company's lot #29



Figure 35. Valve observed as part of Site -6951



Figure 36. South view of length of reservoir ditch



Figure 37. East view of central outflow ditch and gate



Figure 38. West view of collapsed outflow ditch, south of central outflow ditch and gate

4.2.3 SIHP No.: 50-80-08-2268

Site Type: Improved Ditch

Function: Agricultural (Plantation Era)

Features: 2

Age: Historic

Two newly documented features associated with SIHP No. -2268 were observed on survey, adding to the existing site description (found in Tulchin and Hammatt 2004: 52). The improved ditch functions in transporting water from the extensive Waiāhole Ditch irrigation network to the northeast, to SIHP No. 50-80-12-6951 of the current project area. The two features include an intact metal flume and a remnant wooden flume, respectively labeled features A and B (see Figure 20 and Figure 21). Both have been determined to be connected in function to SIHP No. -2268 because of their geographic locations and functional purpose in relation to the design of the drainage infrastructure associated with the Waiāhole Ditch System.

4.2.3.1 Feature A

Feature Type: Metal Flume Bridge

Function: Drainage, Water Control

Condition: Good

Feature A is a metal flume that is comparable in construction and function to the flume bridge inventoried in previous studies in the region relating to SIHP No. -2268 (Tulchin and Hammatt 2004: 52). It functions to catch and divert water flowing down from a natural drainage feature (Figure 39). The southern end of the metal flume connects to a drainage landing with a constructed stone and mortar support and retaining wall that served the dual purpose of keeping water in on its southeastern side and to prevent erosion on the opposite side of the wall (Figure 40). The northern end of the metal flume is supported with a soil berm, which is further reinforced with a stacked stone retaining wall. As the path of water flow continues down slope, northward, there are remnants of a wooden extension of this flume that transported water the rest of the way before flowing downhill, towards the floodplain of Kalo‘i Gulch (Figure 41). The central part of the flume bridge is constructed with three (3) riveted sections of U-shaped sheets of iron, which are supported lengthwise by wooden support beams and crossed with wooden cross beams (Figure 42 & Figure 43).

The function of Feature A is to enable water flowing downhill to cross over an irrigation ditch section of Site -2268. The size and structural integrity of the structure is indicative of the high volume of water once expected to stream through this area (Figure 44 & Figure 45).



Figure 39. South view of Natural drainage area that flows into metal flume, Feature A, SIHP No. -2268



Figure 40. North view of landing area and cut basalt stone and mortar retaining wall



Figure 41. South View of wooden extension of metal flume, Feature A, Site -2268



Figure 42. East view of Feature A

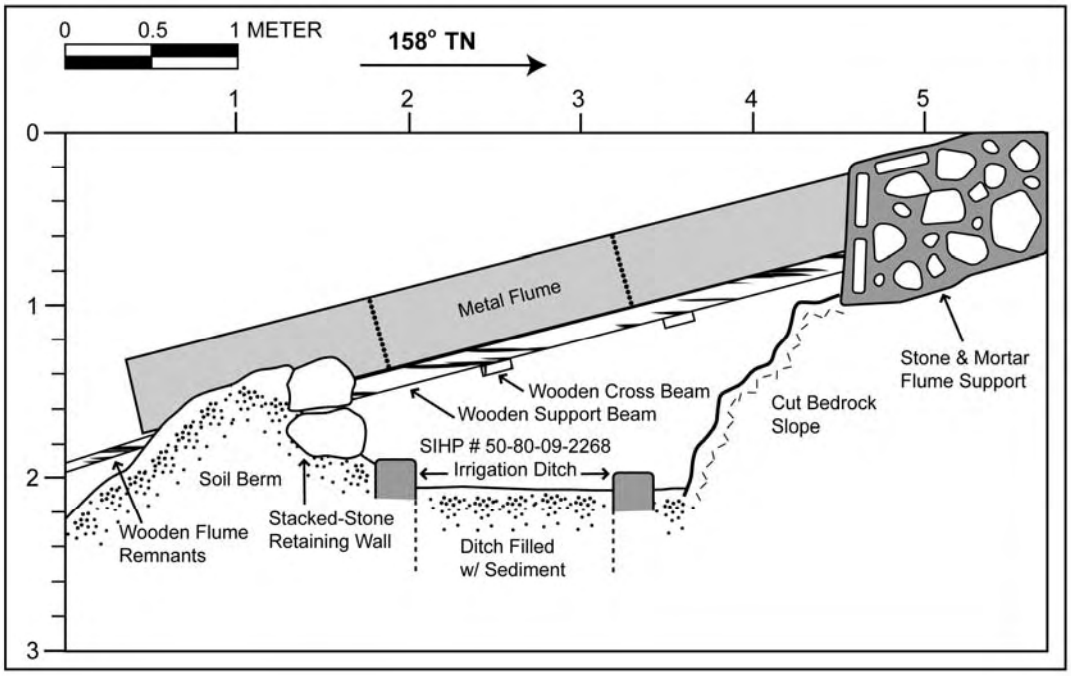


Figure 43. East view of Feature A



Figure 44. North view of metal flume, Feature A, Site -2268

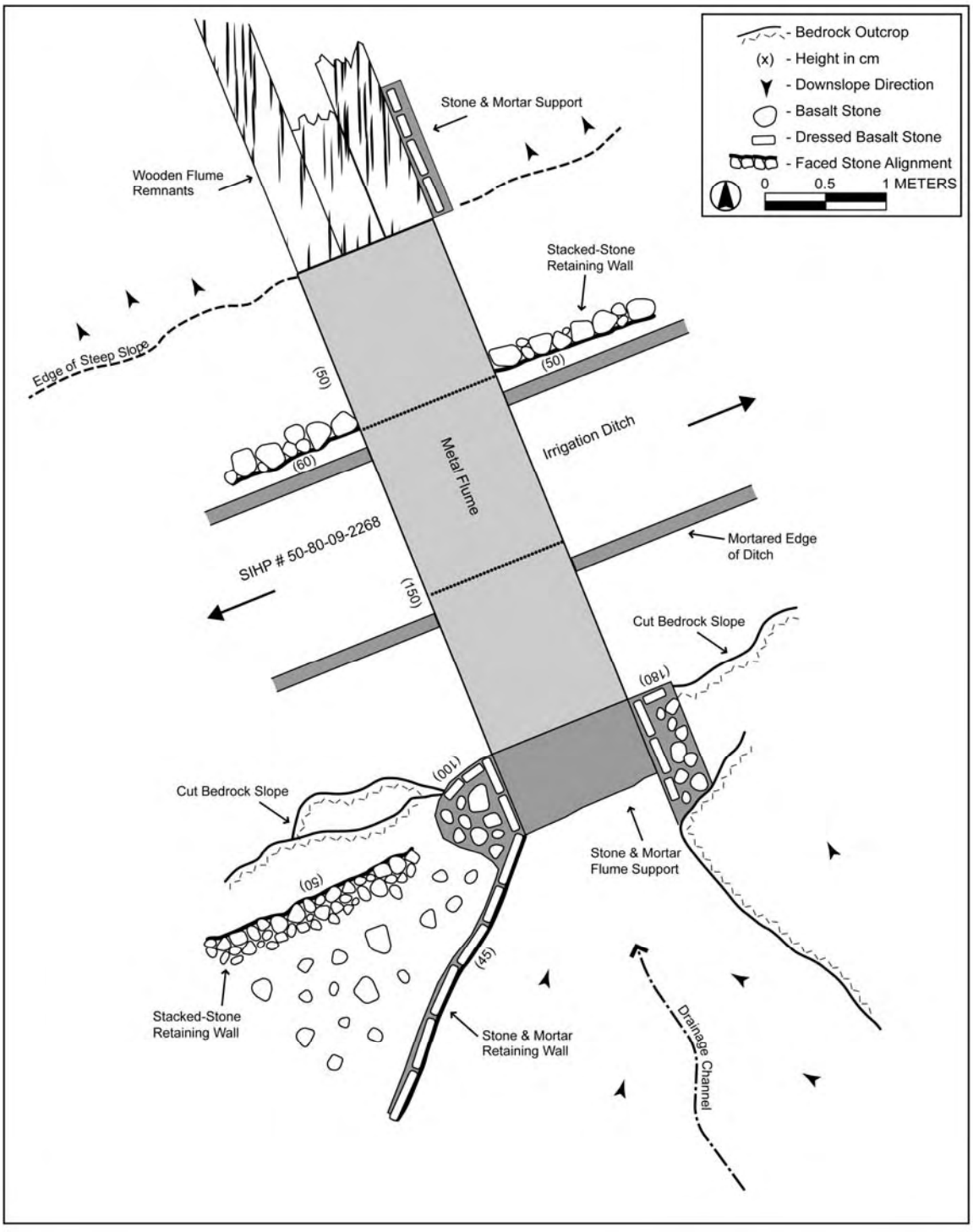


Figure 45. Plan view of Feature A, SIHP No. -2268

4.2.3.2 Feature B

Feature Type: Wooden Flume Bridge

Function: Drainage, Water Control

Condition: Remnant

Feature B of SIHP No. -2268 is a wooden flume that was constructed to control water flow down slope from a modified natural drainage channel, and to cause it to cross over a ditch related to the Waiāhole Ditch System. Remnants of this wooden flume extends from its southern end to the northwest for approximately four meters, where the steep terrain of the area drops into the ravine floor, towards Kalo‘i Stream. Remnants of this feature reveal that it was constructed in a U-shape, with a flat bottom and vertical sides (Figure 46).

It is supported on its higher, southern end by a stone and mortar support, which was constructed atop cut bedrock shaped to accommodate this flume as it carried water over the underlying irrigation ditch, a small portion of Site -2268 (Figure 47). Abutting the stone and mortar support on its southern side is a wooden forming support that retained the stone and mortar portion of this side of the flume. A soil berm supports its northern end, from which water was made to flow down onto a steep slope (Figure 48).



Figure 46. South view of Feature B, SIHP No. -2268, showing its northern end

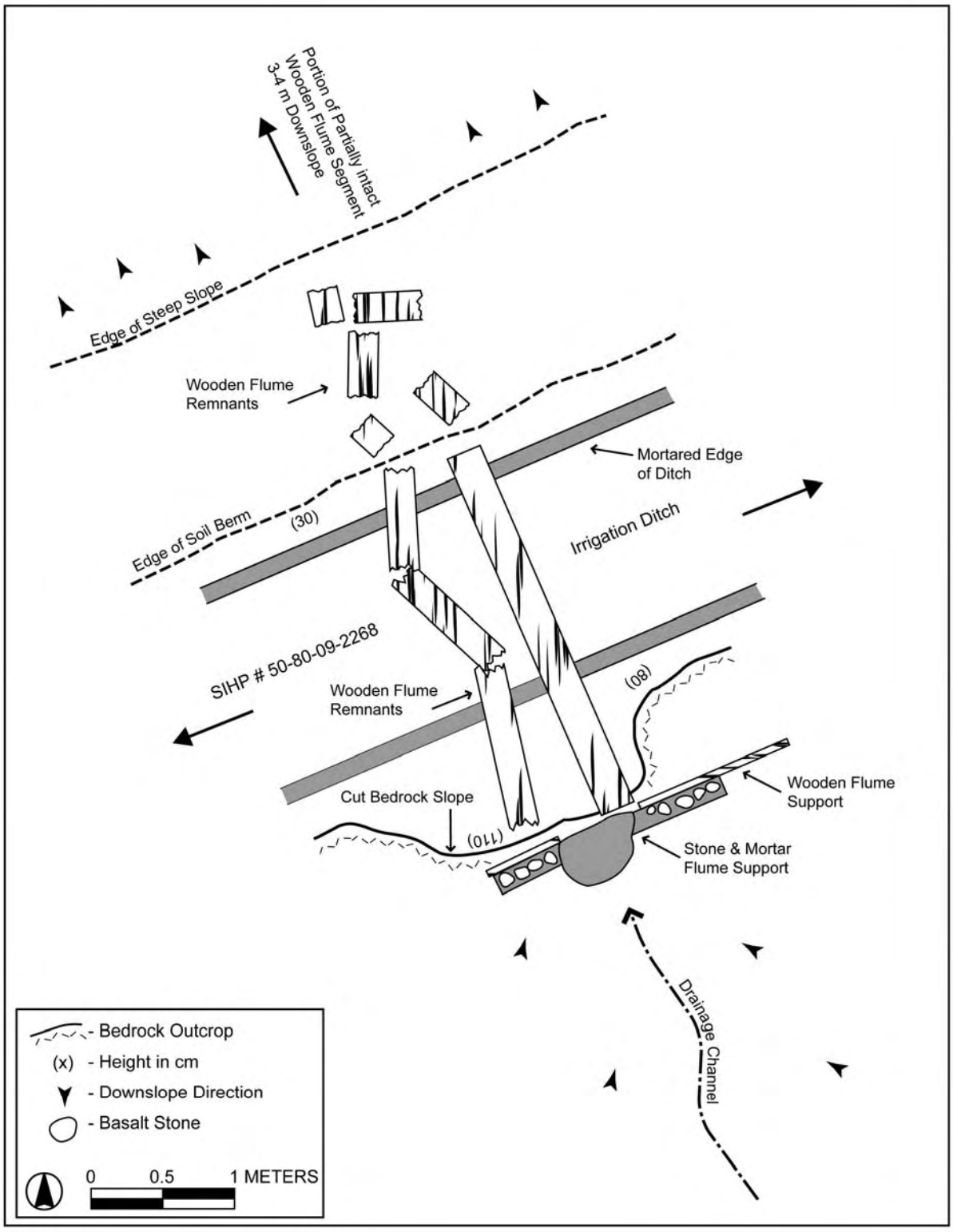


Figure 47. Plan view of Feature B, SIHP No. -2268



Figure 48. South view of Feature B, SIHP No. -2268

Section 5 Summary and Interpretation

The approximately 62-acre proposed Makakilo Drive Extension Project study area is located in western Honouliuli Ahupua‘a at approximately 400-600 ft. elevation along the southern foothills of the Wai‘anae Range. Background research indicates that pre-Contact settlement within Honouliuli Ahupua‘a would have been centered on the rich cultivated lands of Honouliuli *‘ili*. In the intermediate area between the limestone plain and the upland forests, in the vicinity of the current project area, traditional Hawaiian activities would have been limited to dry land agriculture within gulches or near springs, and *mauka* to *makai* transportation routes (i.e. trails) and associated temporary shelters. Historic land use within the project area has included ranching, modifications related to commercial sugar plantation irrigation, and industrial rock quarry operations. Findings by previous archaeological investigations in the immediate vicinity of the project area (i.e. Kalo‘i Gulch, Makakilo Golf Course, Makakilo D and D-1, and U.H. West O‘ahu) were generally limited to historic ranching and commercial sugar plantation infrastructure, including irrigation ditches, aqueducts, and flumes, and stone walls.

The project area is in dry, leeward O‘ahu, with no seasonal or perennial streams in the vicinity. At present, Kalo‘i Stream is an intermittent stream, limited to the channeling flood waters during periods of heavy precipitation. However, historical documentation indicated abundant spring water in the area. Kalo‘i spring was described in the 1890s as having standing water even in dry weather (Von Holt 1985). Additional springs were located in the vicinity by Von Holt, including a paved well, known to Hawaiians as the “Hidden Spring.” It was also noted that the Kalo‘i Gulch area was populated in pre-Contact times, though the population was wiped out by the smallpox epidemic of the mid-1800s (Von Holt 1985). No evidence of traditional Hawaiian agriculture or habitation was located within the project area.

Two new sites have been given SIHP numbers for their archaeological significance: SIHP No. 50-80-12-6950 is a reinforced drainage ditch utilized to divert water flowing down slope; and SIHP No. 50-80-12-6951 is an irrigation reservoir that fed water into the sugar cane fields on its east and south sides, into Oahu Sugar Company’s lot #29 (see Figure 13). All plantation-era archaeological sites observed in the region are probably interrelated in function: excessive water that flowed from cane fields fed from Site -6951 was likely diverted by the structures of Site -6950 to minimize the effects of erosion on the landscape, then proceeded to the base of the gulch.

Previously identified historic sites located during the inventory survey include two newly documented features associated with SIHP No. 50-80-09-2268, a metal flume bridge, a wooden flume bridge, and stone and mortar walls (see Figures 20 and 21).

The limited nature of findings by the current study, despite the historic accounts of a substantial population of Hawaiians in the vicinity of Kalo‘i Gulch and Spring, may be due to the extensive land modification within the project area by historic ranching, commercial sugar plantation endeavors, and industrial rock quarrying operations. It is plausible that the settlement in the area was generally restricted to areas near the mouth of Kalo‘i Gulch, with only limited use of the surrounding areas, including the current project area.

Section 6 Significance Assessments

During the survey of the 62-acre Makakilo Drive Extension Project study area, two (2) new sites related to the Oahu Sugar Company's sugar cane cultivation and irrigation were recorded. 50-80-12-6950 consists of three (3) features that cooperatively functioned to divert water through engineered channeling to lower ground; 50-80-12-6951 is a remnant reservoir of irrigation infrastructure that fed into cane fields upslope from Site -6950. Both sites are associated with water control and plantation irrigation. In addition, two (2) new features associated with SIHP No. 50-80-09-2268 (Waiāhole Ditch System) were discovered on survey and documented. No surface remains were found in the vicinity of the sites and the only surface remains found within the project area was modern refuse and evidence of bulldozing and rock quarrying industry.

6.1 Significance Assessments

Sites are evaluated for significance according to the broad criteria established for the National and State Registers. The five criteria are:

A Site reflects major trends or events in the history of the state or nation.
B Site is associated with the lives of persons significant in our past.
C Site is an excellent example of a site type.
D Site may be likely to yield information important in prehistory or history.
E Site has cultural significance; probable religious structures and/or burials present.

Sites 50-80-12-6950 and 50-80-12-6951 are significant under the Criterion D for the information that has or can be obtained from them. The Waiāhole Ditch, SIHP No. 50-80-09-2268 continues to be significant under criteria A, C, and D.

Table 2. Significance Assessments and Recommendations for All Identified Archaeological Sites Located within the Project Area.

SIHP No.	Type	Function	Significance	Work Accomplished	Recommendation
50-80-12-6950	Water Drainage	Water Control	D	L, M, P, D	No Further Work
50-80-12-6951	Irrigation Reservoir	Water Control	D	L, M, P, D	No Further Work
50-80-09-2268, Feature A	Flume Bridge	Drainage, Water Control	A, C, D	L, M, P, D	No Further Work
50-80-09-2268, Feature B	Flume Bridge	Drainage, Water Control	A, C, D	L, M, P, D	No Further Work

L=Located with a GPS, M. = Mapped, P = Photographed, D=Described, T=Tested

Section 7 Project Effect and Mitigation Recommendations

7.1 Project Effect

The specific effect of the proposed project on the historic properties present in the subject project area depends on which "Alignment Alternative" is ultimately chosen (see Figures 1, 2 and 49). In response, at least in part, to archaeological concerns a new, presently-preferred, alignment (Figure 49) avoids adverse impact to archaeological sites.

In accordance with HAR 13-13-284, the determination of effect for this project for the presently preferred alignment is recommended as "No historic properties affected."

7.2 Mitigation Recommendations

CSH has recommended consideration of an alignment alternative that avoids most or all of SIHP No. 50-80-09-2268, a portion of the Waiāhole Ditch System, which is, by far, the most significant historic property located in the subject project area. The Waiāhole Ditch System is eligible for the State Register of Historic Places on the basis of three criteria that recognize its widespread importance to the history of O‘ahu and the State, in general. If impact to SIHP No. 50-80-09-2268 is anticipated (which is not the case at present) then timely consultation with the State Historic Preservation Division regarding possible mitigation (which might include Historic American Engineering Record documentation) is recommended.

In a Chapter 6E-42 review (dated November 11, 2008; Log No: 2008.2057, Doc No: 0811LM11) of a previous draft of this study the SHPD commented

> The sections of SIHP #-2268, the Waiāhole Ditch System, that are eligible for the National and State registers should undergo photographic documentation of National Register Standards. If you have any questions about the photographic documentation needed to fulfill National Register Standards please contact our Architecture Branch Astrid Liverman or Susan Tasaki at (808) 692-8015.

It is understood that this requirement would be operative if there were to be a project-related adverse impact to the Waiāhole Ditch System. The presently preferred alignment (Figure 49) would appear not to have an adverse impact to the Waiāhole Ditch System.

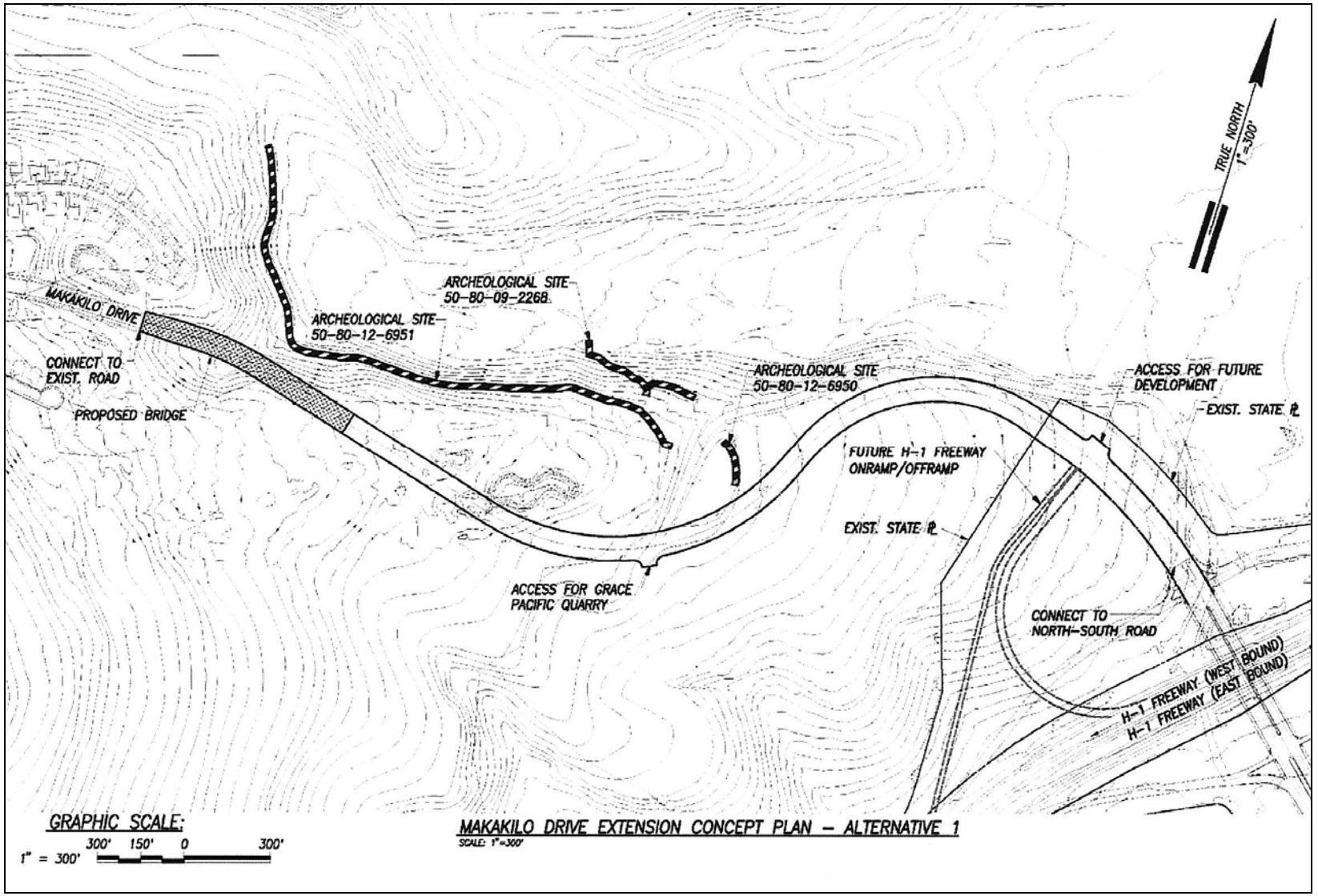


Figure 49. Preferred Alternative Plan

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APPENDIX D

Botanical Resources Assessment, LeGrande Biological Surveys, Inc.,

March 2008

BOTANICAL RESOURCES ASSESSMENT FOR THE MAKAKILO DRIVE EXTENSION HONOULIULI, OAHU, HAWAII

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INTRODUCTION

This report includes the findings of a botanical study conducted for the proposed Makakilo Drive Extension, Honouliuli, Oahu. LeGrande Biological Surveys Inc. carried out a botanical field survey of the above location on the 15th of February 2008 for R.M. Towill Corporation. The primary objectives of the field studies were to:

1) provide a general description of the vegetation on the project site;
2) inventory the flora; and
3) search for threatened and endangered species as well as species of concern

Federal and State of Hawaii listed species status follows U.S. Fish and Wildlife (USFWS) (1999a and 1999b, 2004) and Federal Register (2002).

GENERAL SITE DESCRIPTION

The area proposed for the Makakilo Drive Extension is located on a dry leeward slope at the southern end of the Waianae Mountain range in Honouliuli. The survey area includes a gradual sloping plateau and existing roadway that lies to the south of Kalo`i Gulch and to the north of Pu`umakakilo. The survey area is a rectangular section including the existing Palehua Road from the H-1 Highway to a gravel road that follows the southern edge of Kalo`i Gulch up to the cul-de-sac of Pueonani Street. The highest elevation is at the Pueonani cul-de-sac at approximately 184 meters and gradually slopes to the junction at the H-1 Highway at an elevation of 70 meters.

SURVEY METHODS

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

A walk-through survey method was used. The existing roadway was surveyed as well as up to 250 meters buffer on either side of the roadway (north and south). A section of the steep upper slope of Kalo`i Gulch was included in the survey area from 90 to 130 meters in elevation. Notes were made on plant associations and distribution, disturbances, topography, substrate types, exposure, drainage, etc. Plant identifications were made in the field; plants that could not be positively identified were collected for later determination in the herbarium, and for comparison with the recent taxonomic literature.

DESCRIPTION OF THE VEGETATION

The site proposed for the road extension is dominated by a non-native guinea grass (*Panicum maximum*)/Koa haole (*Leucaena leucocephala*) matrix with a small pocket of native `A`ali`i Lowland Shrubland. There are a total of 60 plant species observed within the survey site. 55 are alien (introduced), four are indigenous (native to the Hawaiian

Islands and elsewhere), and one endemic (native only to the Hawaiian Islands). Therefore, over 91% of the plant species observed are alien. An inventory of all the plants observed within the survey area is presented in the species list at the end of the report.

The lower section of the survey area is dominated by monotypic stands of guinea grass with scattered koa haole shrubs, large sections of land have been cleared or graded as roadway and quarry work is presently active in the area. As the survey area gains elevation short weedy species dominate the roadside such as buffelgrass, coat buttons (*Tridax procumbens*), spiny amaranth (*Amaranthus spinosa*), false mallow (*Malvastrum coromandelianum*), boerhavia (*Boerhavia coccinea*), manienie grass (*Cynodon dactylon*), and slender mimosa (*Desmanthus pernambucans*); with a taller shrubby plant matrix characterizing the upper slopes of Kalo`i Gulch. Some of the larger shrubs include sourbush (*pluchea carolinensis*), tree tobacco (*Nicotiana glauca*), klu (*Acacia farnesiana*), Formosa koa (*Acacia confusa*) and koa haole. Vines such as ivy-leaved morning glory (*Ipomoea cairica*) and hairy merremia (*Merremia aegyptia*) were locally abundant growing along the gravel roadway near the upper elevations of the survey area.

There were several large trees observed during the survey including, pepper tree (*Schinus molle*), kiawe (*Prosopis pallida*), monkeypod (*Samanea saman*), and yellow elder (*Tecoma stans*).

A small degraded `A`ali`i shrubland is located at the upper elevations of the survey area. A pocket on the upper slope of Kalo`i Gulch, to the north of the existing gravel roadway, from an elevation of 184 meters down to about 155 meters harbors several hundred `a`ali`i plants as well as an estimated 40 to 50 `iliahialo`e or coastal sandalwood (*Santalum ellipticum*) trees. A Bishop Museum plant survey was conducted in 2004 for 155 acres in the Makakilo area, including sections of the Kalo'i gulch and portions of the present survey area. Over 90 *Santalum ellipticum* plants were located and tagged during the 2004 survey. A large section of the *Santalum* population has since been cleared for housing development along the present Pueonani Street.

Other native plant species observed were mainly scattered along the edges of the existing gravel roadway at the upper elevations of the survey area. They include `ilima (*Sida fallax*), `uhaloa (*Waltheria indica*), and popolo (*Solanum americanum*).

Several native Blackburn's Blue butterflies (*Udara blackburni*) were observed flitting among the `a`ali`i and sandalwood flowers. It is a relatively small butterfly with light green on the underside and blue on the topside of the wings. Its range is declining due to habitat loss. Butterflies tend to be host specific, unlike moths that are considered generalists and can adapt to vegetation changes more readily. *U. blackburni* prefers `a`li`i and koa (*Acacia koa*), but also appears to utilize other native shrubs and trees in its habitat, including Santalum. The Balckburn butterfly is one of only two native Hawaiian butterflies the other is the Kamehameha butterfly (*Vanessa tameamea*).

DISCUSSION AND RECOMMENDATIONS

None of the plants observed on the project site is a federally listed threatened or endangered species or a species of concern (U.S. Fish and Wildlife Service, 1999a, 1999b, 2004; Wagner et. al., 1999). The majority of the plants observed during the survey are non-native, dominated by a non-native guinea grass (*Panicum maximum*)/Koa haole (*Leucaena leucocephala*) matrix with a small pocket of native `A`ali`i Lowland Shrubland. The `iliahialo`e (*Santalum ellipticum*) population found at the upper elevations of the survey area is significant, the species as a whole is declining due to urbanization throughout its home range.

The landscape manager, Sidney Aki (Grace Pacific) mentioned that several sandalwood plants were removed for transplanting prior to building the recent housing on Pueonani Street. Present status and location of these plants is not known. Sandalwood has proven to be a difficult species to transplant or grow from seed, as it needs a symbiotic microorganism in order to germinate. During the 2004 survey, sandalwood seed predation was noted and very few fruit were collected with viable seeds. During the present survey, the fruit again appeared to have been chewed open and the seeds were gone, mice are the most likely culprit.

Avoiding and or minimizing alteration of the extant sandalwood trees and `a`ali`i shrubs during the construction of the Makakilo Drive Extension would give the plants the best chance of future survival as well as retain native habitat for the native Blackburn butterfly.

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PLANTS SPECIES LIST – MAKAKILO DRIVE EXTENSION, Oahu, Hawaii

The following checklist is an inventory of all the plant species observed within the survey area for the proposed Makakilo Drive Extension. The plant names are arranged alphabetically by family and then by species into each of two groups: Monocots, and Dicots. The taxonomy and nomenclature of the flowering plants (Monocots and Dicots) are in accordance with Wagner *et al*. (1990), Wagner and Herbst (1999) and Staples and Herbst (2005). Recent name changes are those recorded in the Hawaii Biological Survey series (Evehuis and Eldredge, eds., 1999-2002).

For each species, the following name is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name(s), when known.
3. Biogeographic status. The following symbols are used:

   E: endemic: native, occurring only in the Hawaiian Archipelago

   I: indigenous: native, occurring naturally in the Hawaiian archipelago but also outside of Hawaii

   X: introduced or alien- all those plants brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact, that is Cook's arrival in the islands in 1778.

   X?: questionably introduced- probably introduced, possibly indigenous

MAKAKILO DRIVE EXTENSION
PLANT SPECIES LIST
FEBRUARY 2008

SCIENTIFIC NAME	COMMON NAME	STATUS
MONOCOTS		
COMMELINACEAE		
Commelina benghalensis L.	Hairy honohono, dayflower	X
POACEAE		
Cenchrus ciliaris L.	Buffelgrass	X
Chloris barbata (L.) Sw.	Swollen fingergrass	X
Cynodon dactylon (L.) Pers	manienie	X
Digitaria insularis (L.) Mez ex Ekman	sourgrass	X
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	X
Melinus repens (Willd.) Zizka	Natal redtop	X
Panicum maximum L.	Guinea grass	X
Setaria parviflora (Poir.) Kerguelen	Yellow foxtail	X
DICOTS		
AMARANTHACEAE		
Alternanthera pungens Kunth	Khaki weed	X
Amaranthus spinosus L.	Spiny amaranth	X
ANACARDIACEAE		
Schinus molle L.	Pepper tree	X
Schinus terebinthifolius Raddi	Christmas berry	X
ASTERACEAE		
Ageratum conyzoides L.	Maile honohono	X
Bidens pilosa L.	Spanish needle	X
Conyza bonariensis (L.) Cronq.	Hairy horseweed	X
Emilia fosbergii Nicolson	Red pualele	X
Pluchea carolinensis (Jacq.) G. Don	sourbush	X
Pluchea indica (L.) Less.	Indian fleabane	X
Sonchus oleraceus L.	pualele	X
Tridax procumbens (L.)	Coat buttons	X
Verbesina encelioides (Cav.) Benth. & Hook	Golden crown-beard	X
Xanthium strumarium L. var. *canadense* (Miller)	kikania	X
BIGNONIACEAE		
Tecoma stans (L.) Juss. Ex Kunth	Yellow elder	X

SCIENTIFIC NAME	COMMON NAME	STATUS
CONVOLVULACEAE		
Ipomoea cairica (L.) Sweet	Ivy-leaved morning glory	X?
Ipomoea obscura (L.) Ker Gawl.		X
Merremia aegyptia (L.) Urb.	Hairy merremia	X
CUCURBITACEAE		
Coccinea grandis (L.) Voigt	Ivy gourd	X
EUPHORBIACEAE		
Chamaesyce hirta (L.) Millsp.	hairy spurge, garden spurge	X
Euphorbia heterophylla L.	kaliko	X
Ricinus communis L.	Castor bean	X
FABACEAE		
Acacia confusa Merr.	Formosa koa	X
Acacia farnesiana (L.) Willd.	Klu, aroma	X
Chamaecrista nictitans (L.) Moench	Partridge pea	X
Crotalaria incana L.	Fuzzy rattlepod	X
Crotalaria pallida Aiton	Smooth rattlepod	X
Desmanthus pernambucanus (L.) Thell.	Slender or virgate mimosa	X
Indigofera hendecaphylla Jacq.	Creeping indigo	X
Leucaena leucocephala (Lam.) de Wit	Koa haole	X
Macroptilium lathyroides (L.) Urb.	Wild bean, cow pea	X
Prosopis pallida (Humb. & Bonpl. Ex Willd.) Kunth	Kiawe, algaroba	X
Samanea saman (Jacq.) Merr.	monkeypod	X
LAMIACEAE		
Hyptis pectinata (L.) Poit.	Comb hyptis	X
Leonotis nepetifolia (L.) R.Br.	Lion’s ear	X
Ocimum gratissimum L.		X
MALVACEAE		
Abutilon grandifolium (Willd.) Sweet	Hairy abutilon	X
Malva parviflora L.	Cheese weed	X
Malvastrum coromandelianum (L.) Garcke	False mallow	X
Sida fallax Walp.	`ilima	I
Sida ciliaris L.		X
Sida rhombifolia L.		X

SCIENTIFIC NAME	COMMON NAME	STATUS
NYCTAGINACEAE		
Boerhavia coccinea Mill.		X
SANTALACEAE		
Santalum ellipticum Gaudich.	`iliahialo`e. coast sandalwood	E
SAPINDACEAE		
Dodonaea viscosa Jacq.	`a`ali`i	I
SOLANACEAE		
Nicotiana glauca R.C. Graham	Tree tobacco	X
Solanum americanum Mill.	Glossy nightshade, popolo	I
Solanum lycopersicum L. var. *cerasiforme* (Dunal) Spooner, G.J. Anderson & R.K. Jansen	Cherry tomato	X
STERCULIACEAE		
Waltheria indica L.	`uhaloa	I
VERBENACEAE		
Lantana camara L.	lantana	X
Stachytarpheta jamaicensis (L.) Vahl	Jamaican vervain	X

APPENDIX E

Avifauna and Feral Mammal Survey, Phillip Bruner, February 2008

AVIFAUNAL AND FERAL MAMMAL SURVEY OF

MAKAKILO DRIVE EXPANSION PROJECT, OAHU

Prepared for:

RM Towill Corporation

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20 February 2008

INTRODUCTION

This report provides the findings of a one day (12 February 2008) field survey of property involved in the proposed Makakilo Drive Expansion Project, Oahu. References to pertinent published and unpublished sources are also noted to provide a broader perspective of the species known from this region on Oahu. The goals of the field survey were to:

1- Document the species of birds and mammals on or near the property.

2- Note any features of the site or nearby lands that contain habitat of importance to native or migratory birds.

SITE DESCRIPTION

The property is currently covered in second growth alien vegetation. Kiawe (*Prosopis pallida*) and Koa Haole (*Leucaena leucocephala*) are the predominant trees on the site. No natural wetlands occur on the property but a large, lined, drainage catchment occurs just makai of a partially paved road that runs down the length of the proposed project site. Residential property occurs on the mauka end of the road alignment and industrial activity lies downslope.

METHODS OF THE SURVEY

A morning (0800-1100 hrs) walking survey examined the entire proposed expansion road alignment as well as a buffer zone of nearby surrounding lands. All species observed were noted and a tally of the total number of individuals of each species were recorded in order to estimate their relative abundance. Data on mammals were obtained by visual observations only. No trapping of mammals to determine their presence or relative abundance was attempted. The length and nature of this survey did not warrant trapping. Weather during the survey was clear and calm.

Scientific and common names used in this report follow Pyle (2002), Honacki et al. (1982), and Pratt (1999). These sources give names currently found in the scientific literature.

RESULTS

Native land Birds:

No native land birds were observed on the survey. The only potential species that might forage in this region is the Hawaiian Owl or Pueo (*Asio flammeus sandwichensis*). This bird is listed by the State of Hawaii as endangered on the island of Oahu. They nest on the ground in tall grass and forage over a variety of habitats including but not limited

to: forests, grasslands and agricultural lands (Hawaii Audubon Society 2005). My most recent sighting of Pueo in this region of Oahu was at Barbers Point in 2005.

Native Waterbirds:

Two endangered Hawaiian Duck or Koloa (*Anas wyvilliana*) were observed at the drainage catchment. This species will utilize any sizeable body of water including: coastal ponds, mountain streams, irrigation ditches and reservoirs (Pratt et al. 1987, Hawaii Audubon Society 2005). No other native waterbirds were recorded. The endangered Hawaiian or Black-necked Stilt (*Himantopus mexicanus knudseni*) could also forage at the drainage catchment.

Migratory Birds:

The only migratory bird recorded was the Pacific Golden-Plover or Kolea (*Pluvialis fulva*). Two Kolea were also observed at the drainage catchment. This species is the most abundant migrant in Hawaii. It is not listed as threatened or endangered. Kolea prefer open habitat such as lawns and cleared agricultural fields for foraging. Extensive, longterm studies have document many details of their life history (Johnson et al. 1981, 1989, 1993, 2001).

Alien Birds:

Sixteen species of alien (introduced, non-native) birds were recorded on the survey. Table One gives the names and relative abundance of these species. The array of alien species at this site is typical of what would be expected in this area (Pratt et al. 1987, Hawaii Audubon Society 2005, Bruner 1989a, 1989b,1991a, 1991b, 1991c, 1993, 1995, 2002, 2003, 2005, 2007). None of these introduced birds are listed as threatened or endangered.

Mammals:

The only mammal observed on the survey was the Small Indian Mongoose (*Herpestes auropunctatus*). Feral cats (*Felis catus*), rats (*Rattus rattus spp.*) and House Mouse (*Mus musculus*) likely also occur in this area. The only native land mammal in Hawaii is the endangered Hawaiian Hoary Bat (*Lasiurus cinereus semotus*). This species is infrequently recorded on Oahu but is more common on Kauai and the Big Island (Tomich 1986, Kepler and Scott 1990). They roost solitarily in trees and forage for flying insects in a wide variety of native and non-native habitats including urban areas. None was seen on this survey. I do not know of any documented observations of bats at this location.

EXECUTIVE SUMMARY

The field survey examined the entire property proposed for the Makakilo Drive Expansion Project and a buffer zone of nearby adjacent lands. The array of introduced birds and mammals recorded was typical for this area. No native land birds were found but the endangered Hawaii Duck was recorded on the site. The endangered (State of Hawaii, Oahu only) Hawaiian Owl or Pueo does forage in the undeveloped areas of West Oahu. I have seen this species as recently as 2005 on Barbers Point property. Pacific Golden-Plover (the most abundant migratory shorebird) was observed on the property. They typically establish foraging territories on lawns and other open lands during their winter (August – April) stay in Hawaii. They are not listed as endangered or threatened. This property does not contain any unusual or unique habitat for birds and mammals. The drainage catchment is likely an ephemeral water resource for waterbirds and shorebirds. The development of this site should have no measurable effect on the populations of alien birds and mammals in West Oahu. If more of the site is converted to roadside lawns then a few more Pacific golden-Plover might winter on the property.

TABLE ONE

Alien birds recorded on a field survey of the proposed Makakilo Drive Expansion Project site in West Oahu. Data were obtained on 12 February 2008. Relative abundance estimates are based on totals obtained on the walking survey. Abundant (A) =20+, Common (C) =10-19, Uncommon (U) =5-9, Rare (R) =Number which follows is the toal recorded.

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE
Cattle Egret	*Bubulcus ibis*	U
Gray Francolin	*Francolinus pondicerianus*	U
Black Francolin	*Francolinus francolinus*	U
Ring-necked Pheasant	*Phasianus colchicus*	R=1
Spotted Dove	*Streptopelia chinensis*	C
Zebra Dove	*Geopelia striata*	A
Red-vented Bulbul	*Pycnonotus caffer*	C
Japanese White-eye	*Zosterops japonicus*	A
Common Myna	*Acridoteres tristis*	C
Red-crested Cardinal	*Paroaria coronata*	U
Northern Cardinal	*Cardinalis cardinalis*	R=3
House Finch	*Carpodacus mexicanus*	R=2
Common Waxbill	*Estridla astrild*	A
Red Avadavat	*Amandava amandava*	R=2
Nutmeg Mannikin	*Lonchura punctulata*	R=4
Chestnut Mannikin	*Lonchura atricapilla*	U

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APPENDIX F

Cultural Impact Assessment, Cultural Surveys Hawai'i, July 2008

Cultural Impact Assessment for the Approximately 23-acre Makakilo Drive Extension Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu Island TMK: [1] 9-2-002:006, 9-2-003:079

Prepared for

R.M. Towill Corporation

Prepared by

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(Job Code: HONOULIULI 9)

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Management Summary

Reference	Cultural Impact Assessment for the Makakilo Drive Extension Project, Honouliuli Ahupua‘a, ‘Ewa District, Island of O‘ahu, TMK: (1) 9-2-002:006, 9-2-003:079 (Gollin and Hammatt 2008)
Date	July 2008
Project Number(s)	Cultural Surveys Hawai‘i (CSH) Job Code: HONOULIULI 9 (see also companion document CSH Job Code HONOULIULI 8, an archaeological inventory survey report)
Project Location	The project area consists of portions of TMK: (1) 9-2-002:006 and 9-2-003:079. The project area is generally bound on the west by the Makakilo Drive, on the south by Quarry Road, which connects Old Pālehua Road to the Grace Pacific Makakilo Quarry, on the east by Interstate highway H-1, and on the north by the Kalo‘i Gulch floodplain. The project area is depicted on the USGS 7.5 minute series ‘Ewa quadrangle topographic map (Figure 1)
Land Jurisdiction	Private, D.R. Horton – Schuler Homes LLC, Castle & Cooke Homes Hawaii, Inc.
Agencies	State of Hawai‘i Department of Health, Office of Environmental Quality Control (DOH / OEQC), and State Historic Preservation Division, Department of Land and Natural Resources (SHPD/DLNR)
Project Description	Plans are to develop the project area into a roadway to connect the northeast end of Makakilo Drive to Interstate highway H-1.
Project Acreage	Approximately 23 acres
Area of Potential Effect (APE)	For the purposes of this Cultural Impact Assessment (CIA), the APE is defined by the approximately 23-acre project area footprint. However, since the proposed project is directly associated with enabling the proposed expansion of development in Makakilo, this CIA also assesses the cumulative impacts of this expansion of the greater Makakilo development area.
Document Purpose	The project requires compliance with the State of Hawai‘i environmental review process [Hawai‘i Revised Statutes (HRS) Chapter 343], which requires consideration of a proposed project’s effect on cultural practices and resources. At the request of R.M. Towill Corporation, CSH is undertaking this CIA. Through document research and (ongoing) cultural consultation efforts this report provides information pertinent to the assessment of the proposed project’s impacts to cultural practices (per the OEQC’s Guidelines for Assessing Cultural Impacts). The document is intended to support the project’s environmental review and may also serve to support the project’s historic preservation review under HRS Chapter 6E-42 and Hawai‘i Administrative Rules Chapter 13-284.

Community Consultation	Hawaiian organizations, agencies and community members were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the project area and the vicinity. The organizations consulted included the SHPD, the Office of Hawaiian Affairs (OHA), the O‘ahu Island Burial Council (OIBC), Hui Mālama I Nā Kūpuna ‘O Hawai‘i Nei, ‘Ahahui Siwila Hawai‘i o Kapolei Hawaiian Civic Club and the Makakilo/Kapolei Neighborhood Board.
Results of Background Research	Background research yields the following relevant information: (1) The project area is located in the Kalo‘i Gulch floodplain, which includes the Kalo‘i Stream channel. Kalo‘i, which translates as “the taro patch,” was a well-known place of Native Hawaiian activity from before the historic era. Given the physiographic location and characteristics of the project area, it is unlikely to have ever been a place of permanent Hawaiian settlement; however, the presence of several small fresh-water springs in the general gulch system, as described in historic accounts, suggests Hawaiians used at least portions of the project area as gardening sites. (2) The project area also contains remnants of one or more old Hawaiian trails. (3) Given its location within Honouliuli Ahupua‘a, the project area is generally associated with a wide variety and extensive number of *mo‘olelo* (oral histories), including legends, mythological accounts, stories, parables and sayings; these include, for example, the exploits of gods and demi-gods such as Kāne, Kanaloa, Māui, Kamapua‘a (the pig god), Maunauna (the shark deity), Ka‘ahupāhau, and the hero Palila. There are several references associated with Honouliuli to chiefly lineages and to the ruling chiefs Hilo-a-Lakapu and Kūali‘i. (4) The project area is also closely associated with commercial sugar cane agriculture on O‘ahu; in particular, the project area retains archaeological features related to water-management and transport facilities, including the famous Waiāhole Ditch.
Results of Community Consultation	Twenty-three community contacts (government agency or community organization representatives, or individuals such as long-time area residents and cultural practitioners) were contacted for the purposes of this Cultural Impact Assessment. 14 did not respond; four provided referrals to other individuals; and five participated in formal “talk story” interviews. Community consultation yielded the following cultural concerns: (1) Several participants are very concerned about one or more trails crossing through the subject project area; at least one of the trails is perceived to be an old Hawaiian trail dating from early historic or perhaps even pre-Contact times. Mr. Shad Kane, in particular,

	stressed that this trail—part of which is depicted in Figure 24—should not be sacrificed or physically compromised to make way for the proposed project. (2) Several participants talked about a wide variety of "ghost stories" and unexplained phenomena either experienced personally or related by others in old stories dealing with the general vicinity of the project area, and extending to much of the entire *ahupua‘a* of Honouliuli. (3) Some participants stressed the importance of not losing any additional Hawaiian features of the landscape, such as trails, to development in and around the project area, which has experienced substantial losses in historic and more recent times. (4) One participant talked about the cultural significance of *wiliwili* trees (*Erythrina sandwicensis*), which are closely associated with "*ao kuewa*," a kind of Hawaiian purgatory.
Recommendations	Based on all available information, including background research and community consultation, CSH recommends the following measures, which, if addressed in a good faith manner, will help mitigate potentially adverse effects of the proposed project: (1) The old Hawaiian trail depicted in Figure 24 of this report, and described by several participants in this CIA, should be preserved in its entirety and protected from potential harm during project construction. Preservation and protection of this trail may require a formal preservation plan with additional fieldwork directed towards obtaining accurate GPS data to adequately mark and flag the feature during construction. (2) All Native Hawaiian trees, including *wiliwili* and ‘*iliahi* (sandalwood, *Santalum ellipticum*) should be preserved within the project area in perpetuity and protected from harm during construction. (3) Cultural monitoring of the two aforementioned items (i.e., trail and native tree protection) should be conducted by qualified and interested individuals or organizations such as the participants in the "talk story" interviews included above. (4) Consultation with the organizations, agencies and individuals listed in this CIA should continue throughout the project, including any future alterations or updated proposals.

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Section 1 Introduction

1.1 Project Background

At the request of R. M. Towill Corporation, Cultural Surveys Hawai‘i, Inc. (CSH) prepared this Cultural Impact Assessment (CIA) for the approximately 23-acre Makakilo Drive Extension Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu (TMK [1] 9-2-002: 006 & 9-2-003:079). The project area is approximately 3,300 feet long by 300 feet wide (i.e., approximately 23 acres), extending from the end of the existing Makakilo Drive to the proposed North-South Road interchange with Interstate H-1. The project area consists of the south-southeastern portion of the Kalo‘i Gulch floodplain. Kalo‘i Stream channel runs from the central portion of the project area to the northeast. The southern face of Kalo‘i Gulch is at the central portion of the project area, and the base of the northeastern slope of Pu‘umakakilo is at the southwestern portion of the project area. Old Pālehua Road enters the project area from its eastern side, splits into Quarry Road heading south, and continues to the southwest section of the project area. Old Pālehua Road is poorly maintained and in substandard condition compared with the Quarry Road section. As the well-maintained part of Old Pālehua Road runs from the easternmost section of the project area, it continues south-southwest, where it becomes Quarry Road. There are three alignment alternatives for proposed roadways within the project area, one of which will be constructed upon determination by planners and developers (Figures 1, 2 and 3). The project area is depicted on the 1998 USGS 7.5-Minute Series Topographic Map, ‘Ewa Quadrangle.

The project area is privately owned by D.R. Horton – Schuler Homes LLC, Castle & Cooke Homes Hawaii, Inc. Minimally, land-disturbing activities will include grubbing and grading and excavations for subsurface utilities and associated infrastructure improvements.

1.2 Document Purpose

The project requires compliance with the State of Hawai‘i environmental review process [Hawai‘i Revised Statutes (HRS) Chapter 343], which requires consideration of a proposed project’s effect on cultural practices. At the request of R.M. Towill Corporation, CSH is conducting this CIA. Through document research and (ongoing) cultural consultation efforts this interim report document provides preliminary information pertinent to the assessment of the proposed project’s impacts to cultural practices and resources (per the OEQC’s Guidelines for Assessing Cultural Impacts). The document is intended to support the project’s environmental review and may also serve to support the project’s historic preservation review under HRS Chapter 6E-42 and Hawai‘i Administrative Rules (HAR) Chapter 13-284.

1.3 Archaeological Inventory Survey

An archaeological inventory survey has recently been conducted at the subject project area by CSH (Tulchin et al. 2008), following the procedures described in HAR Chapter 13-276, in accordance with the historic preservation review process for privately-owned and -funded projects (i.e., HAR Chapter 13-284). Two (2) new historic sites [State Inventory of Historic Properties (SIHP) Nos. 50-80-12-6950 and 50-80-12-6951] were recorded during the recent survey by CSH: SIHP No. 6950 is a drainage ditch associated with the historic-era commercial

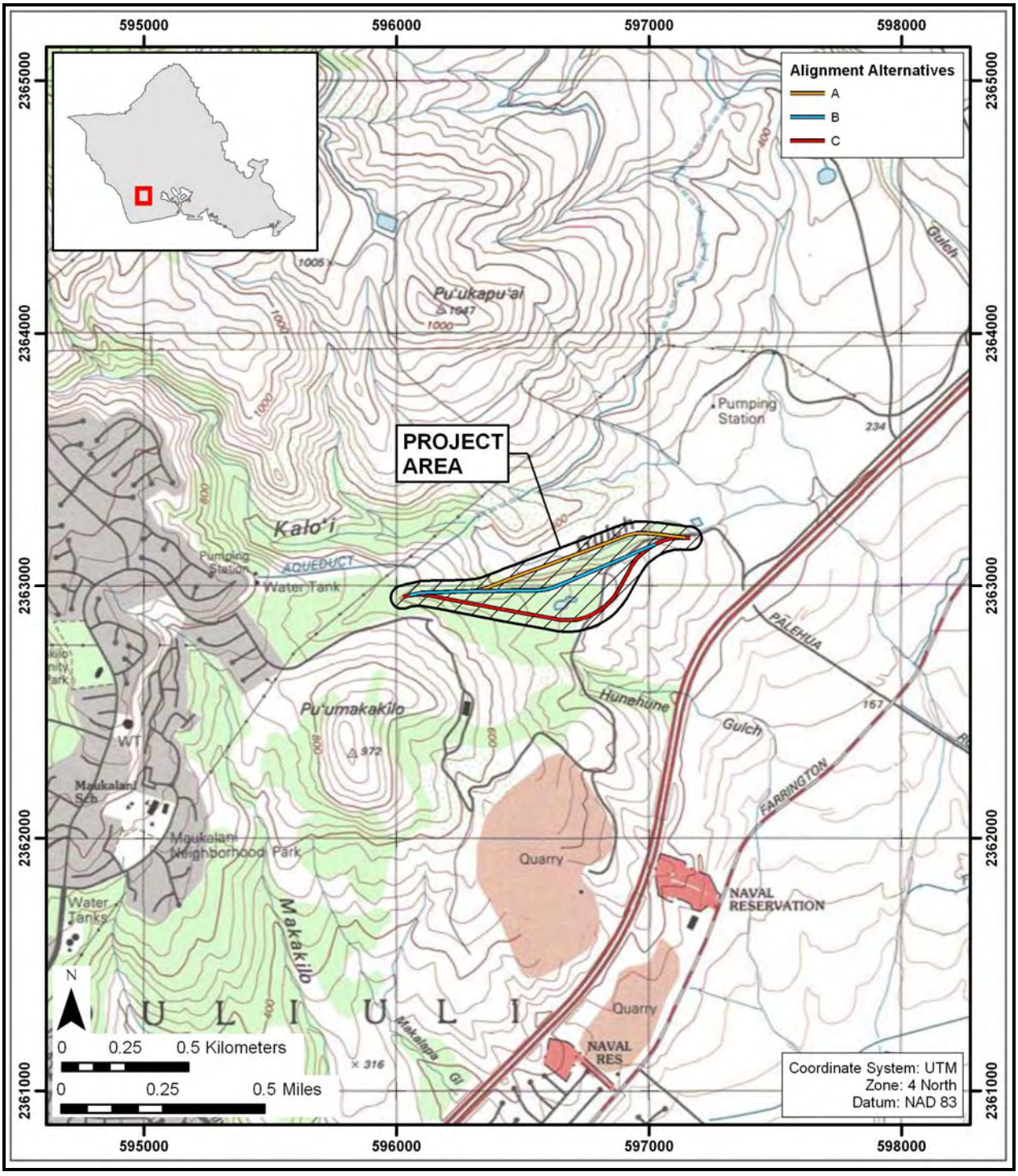


Figure 1. USGS 7.5 minute series topographic map, ‘Ewa Quadrangle (1998), showing the location of the project area

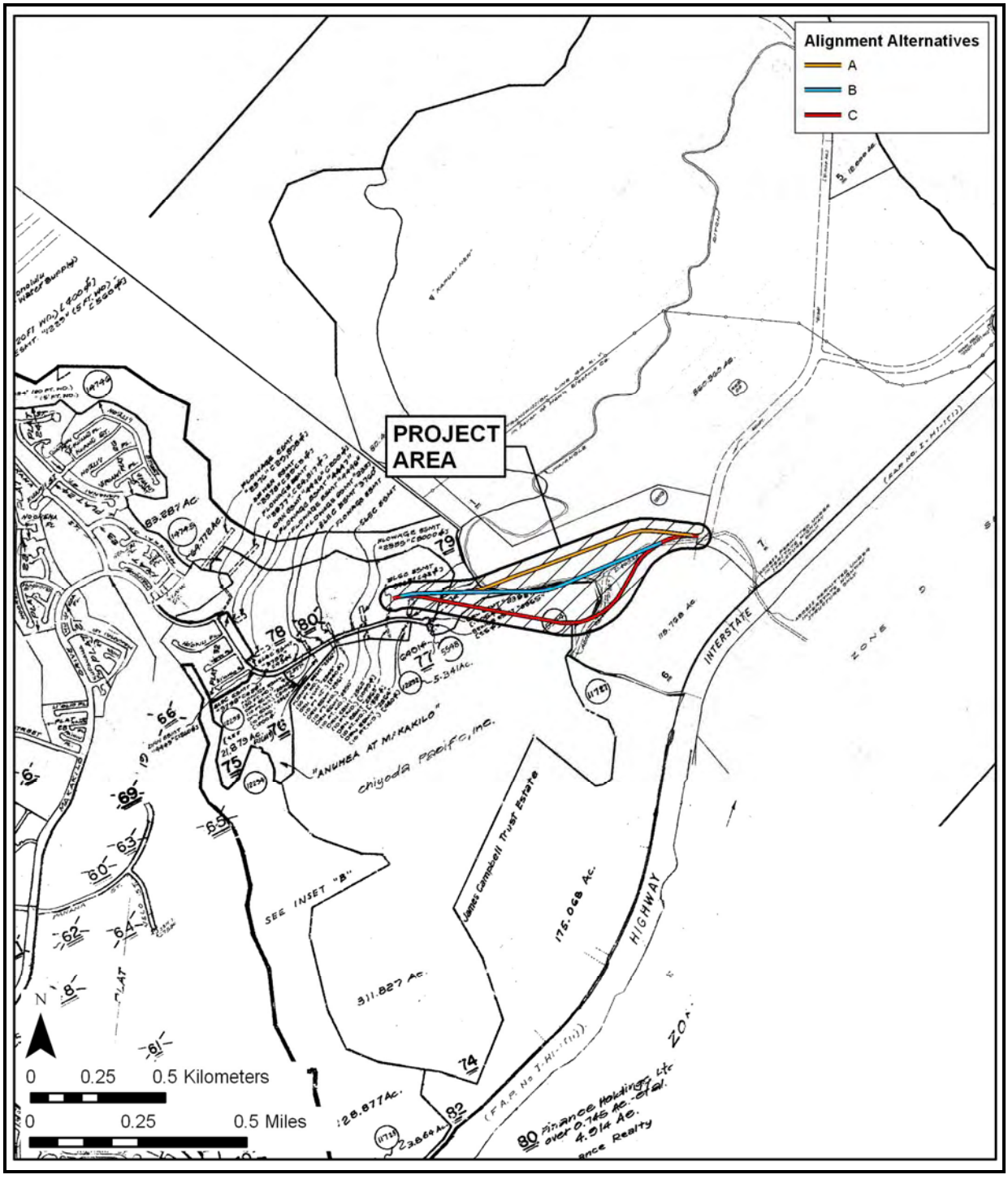


Figure 2. Tax Map Key of project area

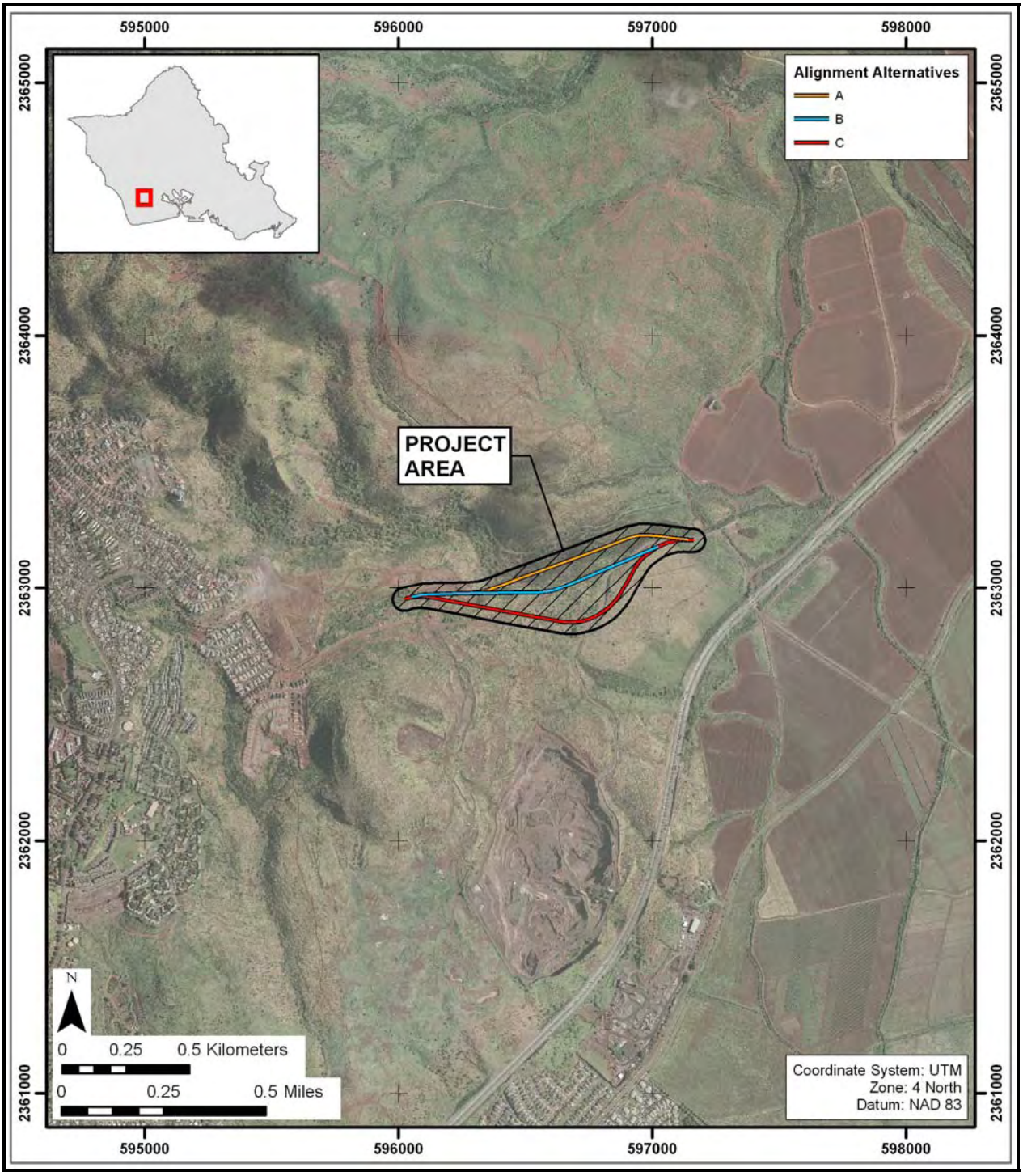


Figure 3. Aerial view of project area, including proposed roadway alternatives

sugar cane industry. SIHP No. 6951 is a small reservoir associated with the historic-era commercial sugar cane industry. In addition to these historic properties, two (2) newly identified features associated with the previously documented SIHP No. 50-80-09-2268 (Waiāhole Ditch System) were also recorded. More detailed results and implications of these finds are discussed in this report.

1.4 Scope of Work

The scope of work for this CIA includes:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. A review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Consultation and interviews with knowledgeable parties regarding traditional cultural practices at or near the parcel; present uses of the parcel; and / or other (non-Hawaiian) practices, uses, or traditions associated with the parcel.
4. Preparation of a report summarizing the results of these research activities.

1.5 Environmental Setting

1.5.1 Natural Environment

Located in the dry, leeward area of O‘ahu, the project area receives an average of approximately 28 in. (600 mm) of annual rainfall (Giambelluca et al. 1986). Elevations within the project area range from approximately 300–410 meters (m) (984–1345 feet) (ft) above mean annual sea level. The land surface within the majority of the Kalo‘i Gulch portion of the project area ranges from moderately sloping to very steep, with many vertical rock cliffs. The western boundary of the project area is east of the extent of residential Makakilo. The southeastern boundary of the project area is at the southern end of Kalo‘i Gulch, where the steep gulch slope gives way to the flat ‘Ewa plain. The southern portion of Kalo‘i Gulch is very wide, characterized by a broad, flat base and moderately sloping walls. The gulch becomes increasingly narrow and steep to the northwest. The base of Kalo‘i Gulch includes a dry streambed at the time of the recent archaeological fieldwork by CSH, although the high waterline indicated significant flooding during periods of heavy precipitation. The base of the gulch was also observed to have undergone significant deposition of both alluvial and colluvial sediments, as indicated by the channeling of floodwaters through 1–3 m (3.3–9.8 ft) of sediment down to the natural bedrock stream channel.

Soils within the project area (Figure 4) consist predominantly of Mahana-Badland Complex (MBL) and Rock Land (rRK) (Foote et al. 1972). Soils of the Mahana Series are described as “well-drained soils…developed in volcanic ash” (Foote et al. 1972:86). Mahana-Badland Complex consists of Mahana soils and Badland, or “steep or very steep, nearly barren land,

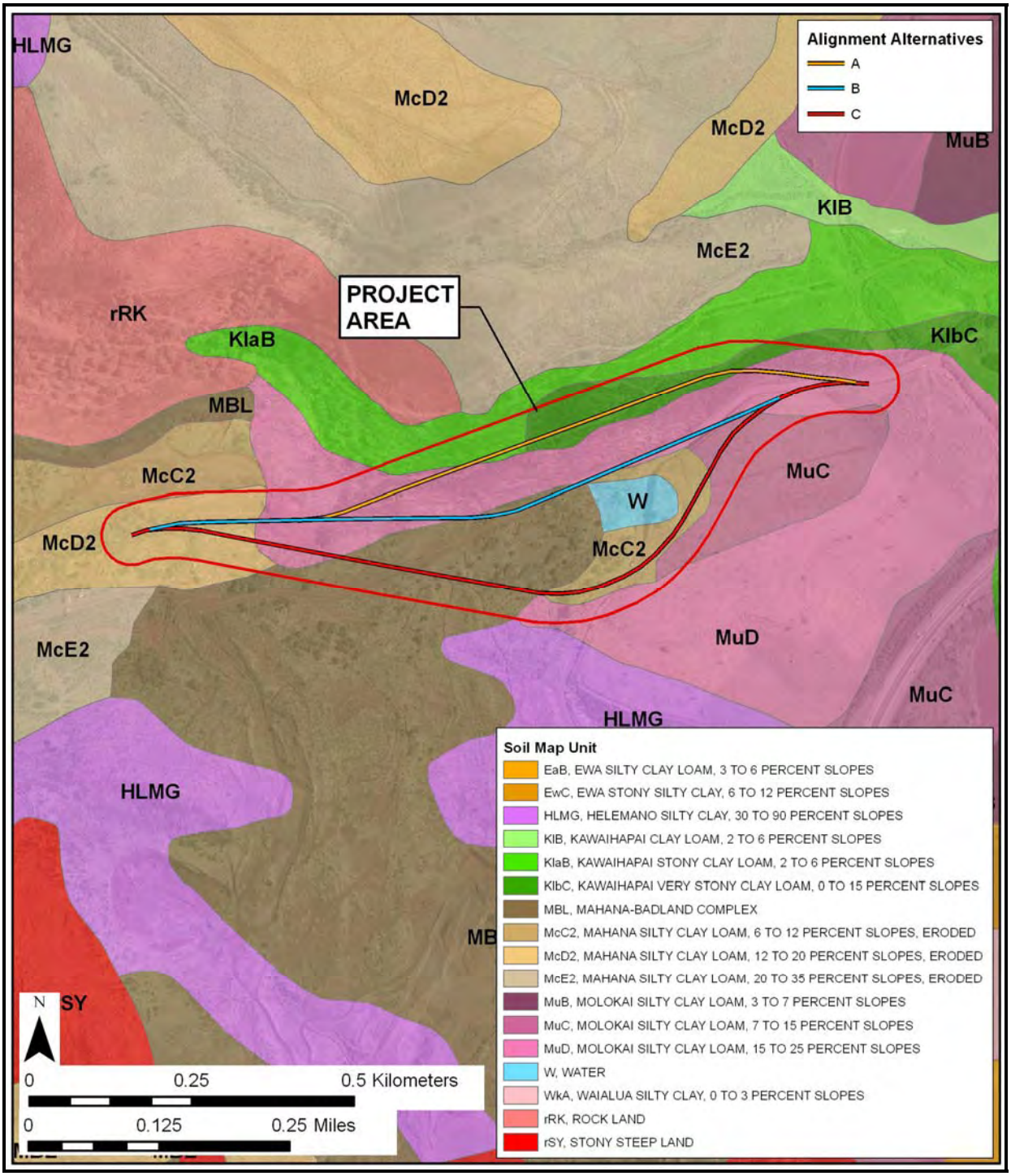


Figure 4. Soils of the project area (Foote et al. 1972)

ordinarily not stony" (Foote et al. 1972:28). Rock Land "is made up of areas where exposed rock covers 25 to 90 percent of the surface" (Foote et al. 1972:119). In addition, an area of Helemano Silty Clay (HLMG) is located within the project area, near the base of Kalo‘i Gulch. Soils of the Helemano Series are described as "well-drained soils on alluvial fans and colluvial slopes on the sides of gulches" (Foote et al. 1972:40).

Vegetation covers approximately 85–95% of the ground surface within the project area (Figure 5). Heavy precipitation in the weeks preceding the pedestrian inspection of the project area made for unusually dense exotic grass cover in the normally dry southern Wai‘anae Range. In addition to the predominantly exotic grass cover, *‘Ilima* (*Sida fallax*), *‘A‘ali‘i* (*Dodonaea viscose*), *‘Iliahi* (*Santalum* spp.) (See Figure 5), *Lama* (*Diospyros sandwicensis*), *Koa Haole* (*Leucaena leucocephala*), *Kiawe* (*Prosopis pallida*), Lantana (*Lantana camara*), Silk Oak (*Grevillea robusta*), *Wiliwili* (*Erythrina sandwicensis*), and *Kukui* (*Aleurites moluccana*) were also observed.

It is important to highlight the presence of mature healthy *Wiliwili* and *‘Iliahi* (sandalwood) trees, both of which are rarely seen in developed and populated areas in O‘ahu. Both of these trees are culturally significant to Kānaka Maoli (Native Hawaiians), a topic that is considered in more depth further in the report.

1.5.2 Built Environment

During the post-Contact period, the project area was primarily used for pastureland and for sugar cane irrigation and cultivation. Currently, the project area is used for diversified agricultural activities, pastureland, seed cultivation, as well as a thruway for traffic to and from Makakilo Rock Quarry, which is approximately 400 m (1312 ft) south of the project area. New increments of the Makakilo suburban development abut the west end of the project area with the present east end of Makakilo Drive virtually hanging over the back of Kalo‘i Gulch (Figure 6).

The southern portion of the project area includes the remnants of an abandoned golf course, the construction of which was discontinued in the early 1990s. Landscaping and irrigation systems associated with the construction of the golf course remain in disrepair (Figures 7 to 10). Utility manholes without lids were observed during survey, making it particularly dangerous for pedestrian access in this portion of the project area. There are low-density residential areas to the west of the project area, and Interstate H-1 to the east and south (see Figure 3).



Figure 5. General view of project area with *‘Iliahi* (sandalwood) tree in foreground



Figure 6. East view of northern portion of project area, Interstate H-1 shown in background, and portion of Makakilo Drive that will connect to Interstate H-1 in foreground



Figure 7. West view of artificial pond in southwestern portion of project area



Figure 8. Southeast view of intersection of golf cart paths in southern portion of project area



Figure 9. Southwest view of irrigation and control box in south-central portion of project area



Figure 10. North view of artificial pond in south-central portion of project area

Section 2 Methods

Historical documents, maps and existing archaeological information pertaining to the sites in the vicinity of this project were researched at the CSH library. Information on Land Commission Awards was accessed through Waihona ‘Aina Corporation’s Māhele Data Base (www.waihona.com). The SHPD, Office of Hawaiian Affairs (OHA), O‘ahu Island Burial Council (OIBC), and other community and cultural organizations in the Kapolei/Makakilo area were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the project area and the surrounding vicinity. The names of potential community contacts were also provided by colleagues at CSH and from the authors’ familiarity with people who live in or around the project area. The cultural specialist conducting research on this assessment employed snowball and judgment sampling methods, an informed consent process and semi-structured interviews according to standard ethnographic methods (as suggested by Bernard 2005). Some of the prospective community contacts were not available to be interviewed as part of this project. A discussion of the consultation process can be found in Section 6 on Community Consultation. Please refer to Table 2, Section 6 for a complete list of individuals and organizations contacted.

Section 3 Traditional Background

Honouliuli Ahupua‘a, as a traditional land unit, had tremendous and varied resources available for exploitation by early Hawaiians. Within Honouliuli Ahupua‘a, not only is there a long coastline fronting the normally calm waters of leeward O‘ahu, but there are also four miles of waterfront along the west side of the West Loch of Pearl Harbor. The “karstic desert” and marginal characterization of the limestone plain, which is the most readily visible terrain, does not do justice to the *ahupua‘a* as a whole. The following available resources contribute to the richness of this land unit:

1. 12 miles of coastline with continuous shallow fringing reef, which offers rich marine resources.

2. Four miles of frontage on the waters of West Loch (west side of Pearl Harbor, or Pu‘uloa) that offered extensive fisheries (mullet, *awa*, shellfish) as well as frontage suitable for development of fishponds (e.g., Laulaunui).

3. The lower portion of Honouliuli Valley in the ‘Ewa plain offered rich level alluvial soils with plentiful water for irrigation from the stream as well as abundant springs. This irrigable land would have stretched well up the valley.

4. A broad limestone plain which, because of innumerable limestone sinkholes, offered a nesting home for a large population of avifauna. This resource may have been one of the early attractions to human settlement.

5. An extensive upland forest zone extending as much as 12 miles inland from the edge of the coastal plain. As Handy and Handy (1972:469) have pointed out, the forest was much more distant from the lowlands here than on the windward coast, but it was much more extensive. Much of the upper reaches of the *ahupua‘a* contained biologically-diverse forest with *kukui*, *‘ōhia*, *‘iliahi* (sandalwood), *hau*, *tī*, banana, etc.

The political and cultural center of the *ahupua‘a* is understood to have been the relatively dense settlement and rich lands for irrigated taro cultivation at the *‘ili* of Honouliuli located where Honouliuli Stream empties into the north portion of West Loch (east of the present study area). The name of the *ahupua‘a*, translated as “dark bay” (Pukui et al. 1974:51) may refer to the nature of the waters of West Loch at the mouth of Honouliuli Stream. Early accounts and maps indicate a large settlement at the *‘ili* of Honouliuli and it may well be that the political power of this village was so great that it was able to extend its jurisdiction well to the northwest into an area which might have been anticipated to fall under the dominion of the Wai‘anae ruling chiefs.

3.1 Mythological and Traditional Accounts

The traditions of Honouliuli Ahupua‘a have been complied and summarized numerous times by Sterling and Summers (1978), Hammatt and Folk (1981), Kelly (1991), Charvet-Pond and Davis (1992), Maly and Rosendahl (1993), and Tuggle and Tuggle (1997). Some of the themes of these traditions include connections with Kahiki (i.e., Tahiti, thought to be one of the primary

sources of major migrations to Hawai‘i in pre-Contact times) and the special character and relationship of the places known as Pu‘uokapolei and Kualaka‘i.

Honouliuli, O‘ahu is associated with a number of legendary accounts. Many of these concern the actions of gods or demi-gods such as Kāne, Kanaloa, Māui, Kamapua‘a, the pig god, Maunauna, the shark deity, Ka‘ahupāhau, and the hero Palila. There are several references to chiefly lineages and to the ruling chiefs Hilo-a-Lakapu and Kūali‘i. Ko ‘Olina is reported to have been a vacationing place for Kākuhihewa.

3.1.1 The Naming of Honouliuli (Legend of Lepeamo‘a)

In the legend of Lepeamo‘a, the chicken-girl of Pālama, Honouliuli is the name of the husband of the chiefess Kapālama and grandfather of Lepeamo‘a (Thrum 1923:164-184). “Her grandfather gave his name, Honouliuli to a land district west of Honolulu...” (Thrum 1923:170). Westervelt (1916:209) gives an almost identical account. Other place names of Honouliuli are shown in Figure 11.

3.1.2 The Pele Family at Honouliuli

Kapolei (literally “beloved Kapo”), specifically the 166-foot high cone of that name, is understood to have been named in reference to one of the volcano goddess Pele’s sisters, Kapo (Pukui et al. 1974:89). Pōhākea Pass is understood as one of the resting places of another of Pele’s sisters, Hi‘iaka, as she was returning from Kaua‘i with Pele’s lover Lohiau (Fornander 1919 Vol. V: 188 note 6). A considerable number of *mele* (songs) and *pule* (prayers) are ascribed to Hi‘iaka as she stood at the summit of Pōhākea (*Aluna au a Pōhākea, Kū au, nānā ia Puna*, in Emerson 1915:162-168). From this vantage point Hi‘iaka could see, through her powers of vision, that her beloved *lehua* groves and friend Hopoe at Puna, Hawai‘i Island had been blasted by her jealous sister Pele. She could also see that in her canoe, off the coast of Wai‘anae, Lohiau was seducing her traveling companion Wahine‘ōma‘o! A spring located at Kualaka‘i near Barbers Point was named Hoaka-lei (*lei* reflection) because Hi‘iaka picked *lehua* flowers here to make a *lei* and saw her reflection in the water.

3.1.3 Keahumoa, Residence of Māui’s Grandfather (Legend of Māui’s Flying Expedition)

In the Legend of Māui’s Flying Expedition (Thrum 1923:252-259), Māui-kupua looks toward Pōhākea Pass and sees his wife, Kumulama, being carried away by chief Pe‘ape‘amakawalu. After failing to recover her, Māui returns and tells his problems to his mother, Hina. Hina instructs her son to go to Keahumoa and visit his grandfather Kuolokele, who lives there in a large hut. The hump-backed Kuolokele returns home with a load of potato leaves and Māui cures him by striking him in the back with a stone (which Kuolokele throws to Waipahu where it remains). Kuolokele has Māui gather *kī* (or *tī, Cordyline terminalus*) leaves, *‘ie‘ie* (*Freycinetia arborea*) vines and bird feathers from which the old man fabricates a “bird-ship” (*moku-manu*) which Māui uses to defeat Pe‘ape‘amakawalu and recover his wife. They return to Kuolokele’s house where they feast and Māui eats Pe‘ape‘amakawalu’s eyeballs.

3.1.4 Kāne and Kanaloa and the Boundaries of ‘Ewa (Simeon Nawaa account)

It seems likely that the boundary between the districts of ‘Ewa and Wai‘anae, which is today also the western boundary of Honouliuli Ahupua‘a, has often been contested between the Wai‘anae and ‘Ewa people:

> When Kāne and Kanaloa were surveying the islands they came to Oah‘u and when they reached Red Hill saw below them the broad plains of what is now ‘Ewa. To mark boundaries of land they would throw a stone and where the stone fell would be the boundary line...They hurled the stone as far as the Wai‘anae Range and it landed somewhere in the Waimānalo section...Eventually the stone was found at Pili o Kahe. This is a spot where two small hills of the Wai‘anae Range come down parallel on the boundary between Honouliuli and Nanakuli (Ewa and Wai‘anae). The ancient Hawaiians said the hill on the ‘Ewa side was the male and the hill on the Wai‘anae side was female. The stone was found on the Wai‘anae side hill and the place is known as Pili o Kahe (Pili = to cling to, Kahe = to flow). The name refers, therefore, to the female or Wai‘anae side hill. And that is where the boundary between the two districts runs. (Simeon Nawaa in Sterling and Summers 1978:1)

3.1.5 Kamapua‘a

Kamapua‘a, the pig god, is associated with Honouliuli:

> Kamapua‘a subsequently conquered most of the island of O‘ahu, and, installing his grandmother [Kamaunuaniho] as queen, took her to Puuokapolei, the lesser of the two hillocks forming the southeastern spur of the Wai‘anae Mountain Range, and made her establish her court there. This was to compel the people who were to pay tribute to bring all the necessities of life from a distance, to show his absolute power over all. (Nakuina 1904:50)

Emma Nakuina goes on to note: “A very short time ago [prior to 1904] the foundations of Kamaunuaniho’s house could still be seen at Puuokapolei” (Nakuina 1904:50). Another account (*Ka Loea Kālai‘āina* January 13, 1900) speaks of Kekeleaiku, the older brother of Kamapua‘a, who also was said to have lived on Pu‘uokapolei.

3.1.6 Home of the Shark-Goddess Ka‘ahupāhau (Legend of Ka‘ehuikimanōo Pu’uloa)

In the Legend of Ka‘ehuikimanōo Pu‘uloa (Thrum 1923:293-306), the Big Island shark god, Ka‘ehuiki travels to visit the famous shark deity Ka‘ahupāhau “reaching Honouliuli, the royal residence.” Ka‘ahupāhau is said to have lived in a royal cave at Honouliuli (Thrum 1923:302).

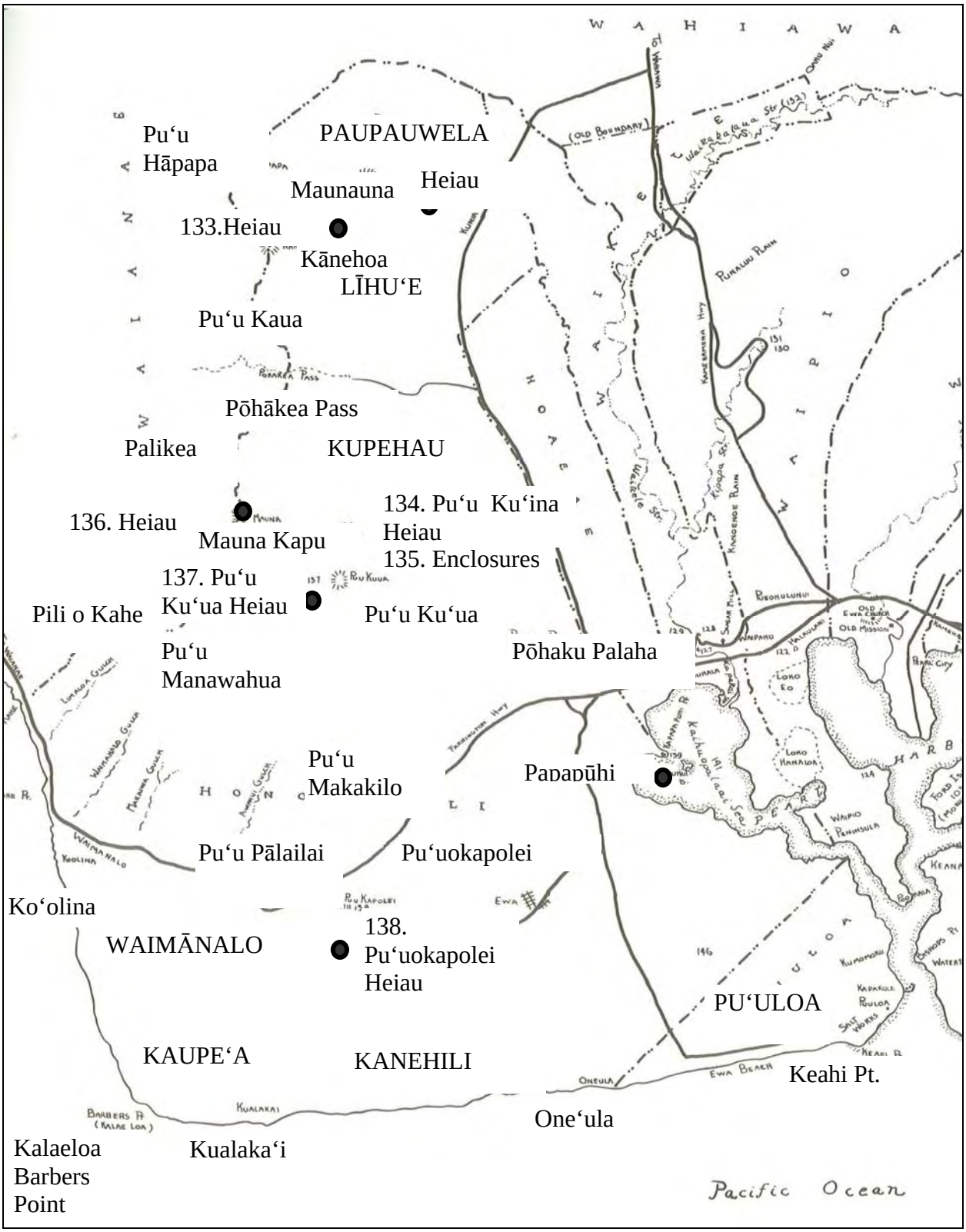

Pu‘u Hāpapa
PAUPAUWELA
Maunauna
Heiau
133.Heiau
Kānehoa
LĪHU‘E
Pu‘u Kaua
Pōhākea Pass
Palikea
KUPEHAU
136. Heiau
Mauna Kapu
134. Pu‘u Ku‘ina Heiau
135. Enclosures
137. Pu‘u Ku‘ua Heiau
Pili o Kahe
Pu‘u Ku‘ua
Pu‘u Manawahua
Pōhaku Palaha
Pu‘u Makakilo
Papapūhi
Pu‘u Pālailai
Pu‘uokapolei
Ko‘olina
WAIMĀNALO
138. Pu‘uokapolei Heiau
PU‘ULOA
KAUPE‘A
KANEHILI
Keahi Pt.
One‘ula
Kualaka‘i
Kalaeloa Barbers Point
Pacific Ocean

Figure 11. Place names of Honouliuli (adapted from Sterling and Summers 1978)

3.1.7 The Frightened Populace of Honouliuli *(He Ka‘ao no Palila*)

In the Legend of Palila, the *kupua*, or demigod hero, of Kaua‘i, lands at Ka‘ena point with his fabulous war club (*lā‘au pālau*), which required eighty men to carry, and crosses into Honouliuli through the Pōhākea Pass. He descends to the plain of Keahumoa:

> Kū kēia i laila nānā i ke kū ka ea o ka lepo i nā kānaka, e pahu aku ana kēia i ka lā‘au pālau aia nei i kai o Honouliuli, kū ka ea o ka lepo o ka honua, me he ōla‘i la, maka‘u nā kānaka holo a hiki i Waikele…
>
> At this place he stood and looked at the dust as it ascended to the sky caused by the people who had gathered there; he then pushed his war club toward Honouliuli. When the people heard something roar like an earthquake they were afraid and they all ran to Waikele ... (Fornander 1917 Vol. V 136-153)

3.1.8 Two Old Women Who Turned To Stone *(Ka Loea Kālai‘āina*)

The Hawaiian language newspaper *Ka Loea Kālai‘āina* relates that near Pu‘uokapolei, on the plain of Pu‘ukaua, on the *mauka* side of the road, there was a large rock. The legend is as follows:

> There were two supernatural old women or rather peculiar women with strange powers and Pu‘ukaua belonged to them. While they were down fishing at Kualaka‘i [near Barbers Point] in the evening, they caught these things, ‘a‘ama crabs, pipipi shellfish, and whatever they could get with their hands. As they were returning to the plain from the shore and thinking of getting home while it was yet dark, they failed for they met a one-eyed person [bad omen]. It became light as they came near to the plain, so that passing people were distinguishable. They were still below the road and became frightened lest men see them. They began to run - running, leaping, falling, sprawling, rising up and running on, without a thought of the ‘a‘ama crabs and seaweeds that dropped on the way, so long as they would reach the upper side of the road. They did not go far for by then it was broad daylight. One woman said to the other, “Let us hide lest people see us,” and so they hid. Their bodies turned into stone and that is one of the famous things on this plain to this day, the stone body. This is the end of these strange women. When one visits the plain, it will do no harm to glance on the upper side of the road and see them standing on the plain. (Ka Loea Kālai‘āina, January 13, 1900)

3.1.9 The Strife of Nāmakaokapāo‘o and Puali‘i (*Ka‘ao no* Nāmakaokapāo‘o)

In the Legend of Nāmakaokapāo‘o the brave boy, Nāmakaokapāo‘o, and his mother, Pōka‘ī, appear to have been living near the coast but were quite destitute (*‘ilihune loa*). His mother met Puali‘i when he came from Līhu‘e to fish at Honouliuli and the family went to live on the plains of Keahumoa (*ke kula o Keahumoa*). Puali‘i kept sweet potato patches (*māla ‘uala*) and fished for *ulua*. Following a dispute over sweet potatoes, Nāmakaokapāo‘o defeated his step-father, Puali‘i and:

> Lālau aku la o Nāmakaokapāo‘o i ke po‘o o Puali‘i a kiola aku la i kai o Waipouli, he ana ma kahakai o Honouliuli, o kona loa, ‘elima mile ka loa…
>
> Nāmakaokapāo‘o picked up Puali‘i’s head and threw it towards Waipouli, a cave situated on the beach at Honouliuli (a distance of about five miles)... (Fornander 1917 Vol. V 274-277)

3.1.10 The Story of Kaihuopala‘ai Pond, Honouliuli (*Ka‘ao no Maikohā)*

In the Legend of Maikohā, a sister of Maikohā (a deified hairy man who became the god of tapa makers) named Kaihuopala‘ai, journeys to O‘ahu:

> ‘Ike aku la o Kaihuopala‘ai i ka maikai o Kapapaapuhi, he kāne e noho ana ma Honouliuli ma ‘Ewa. Moe iho la lāua, a noho iho la o Kaihuopala‘ai i laila a hiki i kēia lā. ‘Oia kēlā loko kai e ho‘opuni ia nei i ka ‘anae, nona nā i‘a he nui loa, a hiki i kēia kākau ana.
>
> Kaihuopala‘ai saw a goodly man by the name of Kapapaapuhi who was living at Honouliuli, ‘Ewa; she fell in love with him and they were united, so Kaihuopala‘ai has remained in ‘Ewa to this day. She was changed into that fishpond in which mullet are kept and fattened, and that fishpond is used for that purpose to this day [1919]. (Fornander 1917 Vol. V 270-271)

3.1.11 The Traveling Mullet of Honouliuli (Fish Stories)

The story of (Ka)Ihuopala‘ai is also associated with the tradition of the *‘anae-holo* or traveling mullet (Thrum 1907:270-272):

> The home of the ‘anae-holo is at Honouliuli, Pearl Harbor, at a place called Ihuopala‘ai. They make periodical journeys around to the opposite side of the island, starting from Pu‘uloa and going to windward, passing successively Kumumanu, Kalihi, Kou, Kālia, Waikīkī, Ka‘alāwai, and so on, around to the Ko‘olau side, ending at Lā‘ie, and then returning by the same course to their starting point.(Thrum 1907:271)

In Thrum’s account, Ihuopala‘ai is a male who possesses a Kū‘ula, or fish god, which supplied the large mullet known as *‘anae*. His sister lived in Lā‘ie and there came a time when there were no fish. She sent her husband to visit Ihuopala‘ai who was kind enough to send the fish following his brother-in-law on his trip back to Lā‘ie.

This story is associated with a poetical saying documented by Mark Pukui about Honouliuli:

> *Ka i‘a hali a ka makani*
>
> The fish fetched by the wind (Pukui 1983: # 1330)

Pukui explains “The *‘anaeholo*, a fish that travels from Honouliuli, where it breeds, to Kaipāpa‘u on the windward side of O‘ahu. It then turns about and returns to its original home. It is driven closer to shore when the wind is strong.” Whether this saying was used in contexts other than in reference to mullet is unclear.

3.1.12 Honouliuli and the Head of Hilo-a-Lakapu (Legend of the Sacred Spear-point)

In the Legend of the Sacred Spear-point (Kalākaua 1888:209-225) is a reference to the Hawai‘i Island chief Hilo-a-Lakapu. Following his unsuccessful raid against O‘ahu “he was slain at Waimano, and his head was placed upon a pole near Honouliuli for the birds to feed upon”(Kalākaua 1888:224).

3.1.13 The Strife at Honouliuli from which Kūali‘i unites Hawai‘i nei (Mo‘olelo o Kūali‘i)

The celebrated chief, Kūali‘i, is said to have led an army of twelve thousand *(‘ekolu mano*) against the chiefs of Ko‘olauloa with an army of twelve hundred *(‘ekolu lau*) upon the plains of Keahumoa (Fornander 1917 Vol. IV 364-401). Perhaps because the odds were so skewed the battle was called off and the *ali‘i* (chiefs) of Ko‘olau ceded (*ha‘awi a‘e*) the districts of Ko‘olauloa, Ko‘olaupoko, Waialua and Wai‘anae to Kūali‘i. When the *ali‘i* of Kaua‘i heard of this victory at Honouliuli they gave Kaua‘i to Kūali‘i as well and thus he became possessed of all the islands (*a lilo a‘e la nā moku a pau ia Kūali‘i mai Hawai‘i a Ni‘ihau*). The strife at Honouliuli was the occasion of the recitation of a song for Kūali‘i by a certain Kapa‘ahulani (*Ka Pule Ana a Kapa‘ahulani*) that makes passing reference in word play to the blue *poi*, which appeases the hunger of Honouliuli (*Uliuli ka poi e piha nei - o Honouliuli*).

3.1.14 The Last Days of Kahahana and Honouliuli (The Land is the Sea’s)

In the tradition of the prophecy of the *kahuna* Ka‘opulupulu, Moke Manu relates that the deposed O‘ahu chief Kahahana fled for his life:

> Upon the arrival here at O‘ahu of Kahekili, Kahahana fled, with his wife Kekuapoi, and friend Alapa‘i, and hid in the shrubbery of the hills. They went to Āliamanu, Moanalua, to a place called Kinimakalehua; then moved along to Keanapua‘a, and Kepo‘okala, at the lochs of Pu‘uloa, and from there to upper Waipi‘o; thence to Wahiawā, Helemano, and on to Līhu‘e; thence they came to Po‘ohilo, at Honouliuli, where they first showed themselves to the people and submitted themselves to their care. (Thrum 1907:203-214)
>
> Through treachery, Kahahana was induced to leave Po‘ohilo, Honouliuli and was killed on the plains of Hō‘ae‘ae [the *ahupua‘a* between Honouliuli and Waikele] (Thrum 1907:213-214).

3.1.15 Pu‘uokapolei and the Reckoning of the Seasons (Kamakau)

Samuel Kamakau relates:

> …the people of O‘ahu reckoned from the time when the sun set over Pu‘uokapolei until it set in the hollow of Mahinaona and called this period Kau [summer], and when it moved south again from Pu‘uokapolei and it grew cold and the time came when young sprouts started, the season was called from their germination (‘ōilo) the season of Ho‘oilo [winter, rainy, season]. (Kamakau 1870:23)

3.1.16 Honouliuli in the Poetry of Halemano (Ka‘ao no Halemano)

In the Legend of Halemano, the romantic O‘ahu anti-hero, he chants a love song with a reference to Honouliuli:

> Huli a‘e la Ka‘ala kau i luna, Waiho wale kai o Pōka‘ī, Nānā wale ke aloha i Honouliuli, Kokolo kēhau he makani no Līhu‘e…
>
> Search is made to the top of Ka‘ala, the lower end of Pōka‘ī is plainly seen. Love looks in from Honouliuli, The dew comes creeping, it is like the wind of Līhu‘e... (Fornander 1917 Vol. V 252)

3.2 Legends and Traditional Places in Upland Honouliuli

3.2.1 Kahalaopuna at Pōhākea Pass

One of the most popular legends of O‘ahu is that of Kahalaopuna (or Kaha), a young woman of Mānoa who is slandered by others and then killed by her betrothed, Kauhi, a chief from Ko‘olau, O‘ahu. While the numerous accounts (e.g., Day 1906:1-11; Fornander 1919 Vol. V: 188-193; Kalākaua 1888:511-522; Nakuina 1904:41-45; Patton 1932:41-49; Skinner 1971:220-223; Thrum 1907:118-132) vary in details they typically have Kahalaopuna slain and then revived repeatedly with the aid of a protective owl spirit. Kauhi forces her to hike west from Mānoa through the uplands until they get to Pōhākea Pass through the southern Wai‘anae Range in north Honouliuli. At Pōhākea Pass, Kauhi beats her with a stick until she is very dead ("*Ia hahau ana a Kauhi i ka lā‘au, make loa o Kahalaopuna*"). Her spirit (‘*uhane*) flies up into a *lehua* tree and chants for someone to go notify her parents of her fate. Upon hearing the news her parents fetch Kahalaopuna back to Mānoa and she is restored to life.

3.2.2 Mo‘o at Maunauna (*Kuokoa*)

Moses Manu in recounting the Legend of Keaomelemele makes a reference to a *mo‘o* (supernatural water spirit) named Maunauna who lived above Līhu‘e (presumably at the landform of that name in extreme northern Honouliuli) and who was regarded as a bad lizard (*Kuokoa* April 25, 1885).

3.2.3 Paupauwela and Līhu‘e

Paupauwela, also spelled Popouwela (derivation unknown), is the name of the land area in the extreme *mauka* section of Honouliuli Ahupua‘a. The land area of Līhu‘e is just *makai* of this land, and extends into the *ahupua‘a* of Waipi‘o (adjacent to the eastern border of Honouliuli). Both place names are mentioned in a chant recorded by Abraham Fornander, which was composed as a *mele* for the O‘ahu king, Kūali‘i, as he was preparing to battle Kuiaia, the chief of Wai‘anae:

Where? Where is the battle field	Ihea, ihea la ke kahua,
Where the warrior is to fight?	Paio ai o ke koa-a?
On the field of Kalena,	I kai i kahua i Kalena,
At Manini, at Hanini,	I Manini, i Hanini

Where was poured the water of the god	I ninia i ka wai akua,
By your work at Malamanui;	I ko hana i Malamanui
On the heights of Kapapa, at Paupauwela,	Ka luna o Kapapa, i Paupauwela,
Where they lean and rest;	I ka hilinai i ke kalele,
At the hala trees of indolent Halahalanui,	Ka hala o Halahalanui maauea,
At the ohia grove of Pule-e	E kula ohia ke Pule-e,
The god of Lono, of Makalii	Ke ‘kua o Lono o Makalii
The fragrant branch of the Ukulonoku,	Ka lala aalao Ukulonoku,
Mayhap from Kona, from Lihue,	No Kona paha, no Lihue.
For the day at Maunauna	No ka la i Maunauna,
For the water at Paupauwela.	No ka wai i Paupauwela.
Red is the water of Paupauwela,	Ula ka wai i Paupauwela,
From the slain at Malamani,	Ke kilau o Malamani,
The slain on the ridge at Kapapa.	Ka moo kilau I Kapapa.

(Fornander 1917, Vol. IV, Part 2:384-386).

The icy winds of Honouliuli are also noted in a *mele* for the high king Kūali‘i. In this *mele*, the cold winds of Kumomoku and Leleiwe, near Pu‘uloa in Honouliuli are compared unfavorably to the god Kū.

Not like these are thou, Ku	Aole i like Ku.
[Nor] the rain that brings the land breeze,	Ia ua hoohali kehau,
Like a vessel of water poured out.	Mehe ipu wai ninia la,
Nor to the mountain breeze of Kumomoku,	Na hau o Kumomoku;
[The] land breeze coming round to Leleiwi.	Kekee na hau o Leleiwi,
Truly, have you not known?	Oi ole ka oe i ike
The mountain breezes, that double up your back,	I ka hau kuapuu.
[That make you] sit crooked and cramped at Kaimohala,	Kekee noho kee, o Kaimohala,
The Kanehili at Kaupea?	O Kanehili i Kaupea-la
Not like these are thou, Ku.	Aole i like Ku.

(Fornander 1917, Vol. IV, Part II:390-391)

3.2.4 Hill of Maunauna

The hill Maunauna lies between the lands Paupauwela and Līhu‘e. One translation of Maunauna is “mountain sent [on errands].” Two servant *mo‘o* who lived here had no keepers to supply their needs” (Pukui et al. 1974:149). It was at Maunauna, according to one tradition, that the forces of the chiefs Kūali‘i and Kuiaia of Wai‘anae met to do battle, which was averted when a *mele* honoring the god Kū was chanted (see previous section). (Fornander 1917, Vol IV, Part 2:348). In the Legend of Ke-ao-melemele, a woman named Paliuli traveled in this area.

> In a very short time she [Paliuli] walked over the plain of ‘Ewa; ‘Ewa that is known as the land of the silent fish [pearl oysters]…She went on to the plain of Punalu‘u and turned to gaze at Maunauna point and the plain of Lihue. (Manu 1885, translation in Sterling and Summers 1978:21)

Certain place names in the uplands, including Maunauna, are also mentioned in the story of Lo-lae’s Lament. The place of Lolale’s residence is given in King Kalākaua’s version of this story (Kalākaua 1888:232): “There lived there at that time in Lihue, in the district of ‘Ewa, on the island of O‘ahu, a chief named Lo-lale, son of Kalona-iki, and brother of Piliwale, the *alii-nui*, or nominal sovereign, of the island, whose court was established at Waialua.”

In this story, Lolale was a chief of O‘ahu who asked his friend Kalamakua to find him a bride (Kalākaua 1888:228-246; Skinner 1971:217-219). Kalamakua traveled to Maui and chose Kelea, the chief’s sister, and returned with her to O‘ahu; during this time the two grew close. Kelea lived with Lolale for a while, but he was a silent type that was often away from home playing sports and walking in the woodlands. Longing for Kalamakua, Kelea decided to leave her husband, Lolale voiced no “spoken bitterness;” however, after she left, he sang this lament:

> Farewell, my partner of the lowland plains,
>
> On the waters of Pohakeo, above Kanehoa,
>
> On the dark mountain spur of Mauna-una!
>
> O, Lihue, she is gone!
>
> Sniff the sweet scent of the grass,
>
> The sweet scent of the wild vines
>
> That are twisted by Waikoloa,
>
> By the winds of Waiopua,
>
> My flower!
>
> As if a mote were in my eye.
>
> The pupil of my eye is troubled.
>
> Dimness covers my eyes. Woe is me!
>
> (Kalākaua 1990:224-245)

3.3 Pre-Contact and Early History

Various Hawaiian legends and early historical accounts indicate that the *ahupua‘a* of Honouliuli was once widely inhabited by pre-Contact Hawaiian populations, including the Hawaiian *ali‘i*. This substantial population was supported by the plentiful marine and estuarine resources available at the coast, along which several sites interpreted as permanent habitations were located. Other attractive subsistence-related features of the *ahupua‘a* included irrigated lowlands suitable for wetland taro cultivation (Hammatt and Shideler 1990), as well as the lower forest area of the mountain slopes for the procurement of forest goods.

Exploitation of the forest resources along the slopes of the Wai‘anae Range - as suggested by Handy and Handy - probably acted as a viable subsistence alternative during times of famine:

> ...The length or depth of the valleys and the gradual slope of the ridges made the inhabited lowlands much more distant from the *‘wao*, or upland jungle, than was the case on the windward coast. Yet the *‘wao* here was more extensive, giving greater opportunity to forage for wild foods during famine time. (Handy and Handy 1972:469-470)

These upper valley slopes may have also been a significant resource for opportunistic quarrying of basalt for the manufacturing of stone tools. This is evidenced in part by the existence of a probable quarrying site (50-80-12-4322) in Makaīwa Gulch at 152 m (500 ft.) elevation, west of the current study area (Hammatt et al. 1991)

The Hawaiian *ali‘i* were also attracted to the region. One historical account of particular interest refers to an *ali‘i* residing in Ko ‘Olina, southwest of the current study area:

> Ko ‘Olina is in Waimānalo near the boundary of ‘Ewa and Wai‘anae. This was a vacationing place for chief Kakuhihewa and the priest Napuaikamao was the caretaker of the place. Remember Reader; this Koolina is not situated in the Waimānalo on the Koolau side of the island but the Waimānalo in ‘Ewa. It is a lovely and delightful place and the chief; Kakuhihewa loved this home of his. (Sterling and Summers 1978:41)

John Papa ‘Ī‘ī describes a network of Leeward O‘ahu trails (Figure 12), which in later historic times encircled and crossed the Wai‘anae Range, allowing passage from West Loch to the Honouliuli lowlands, past Pu‘u Kapolei and Waimānalo Gulch to the Wai‘anae coast and onward circumscribing the shoreline of O‘ahu (‘Ī‘ī 1959:96-98).

Other early historical accounts of the general region typically refer to the more populated areas of the ‘Ewa district, where missions and schools were established and subsistence resources were perceived to be greater. However, the presence of archaeological sites along the coral plains and coast of southwest Honouliuli Ahupua‘a, indicate that prehistoric and early historic populations also adapted to less inviting areas, despite the environmental hardships.

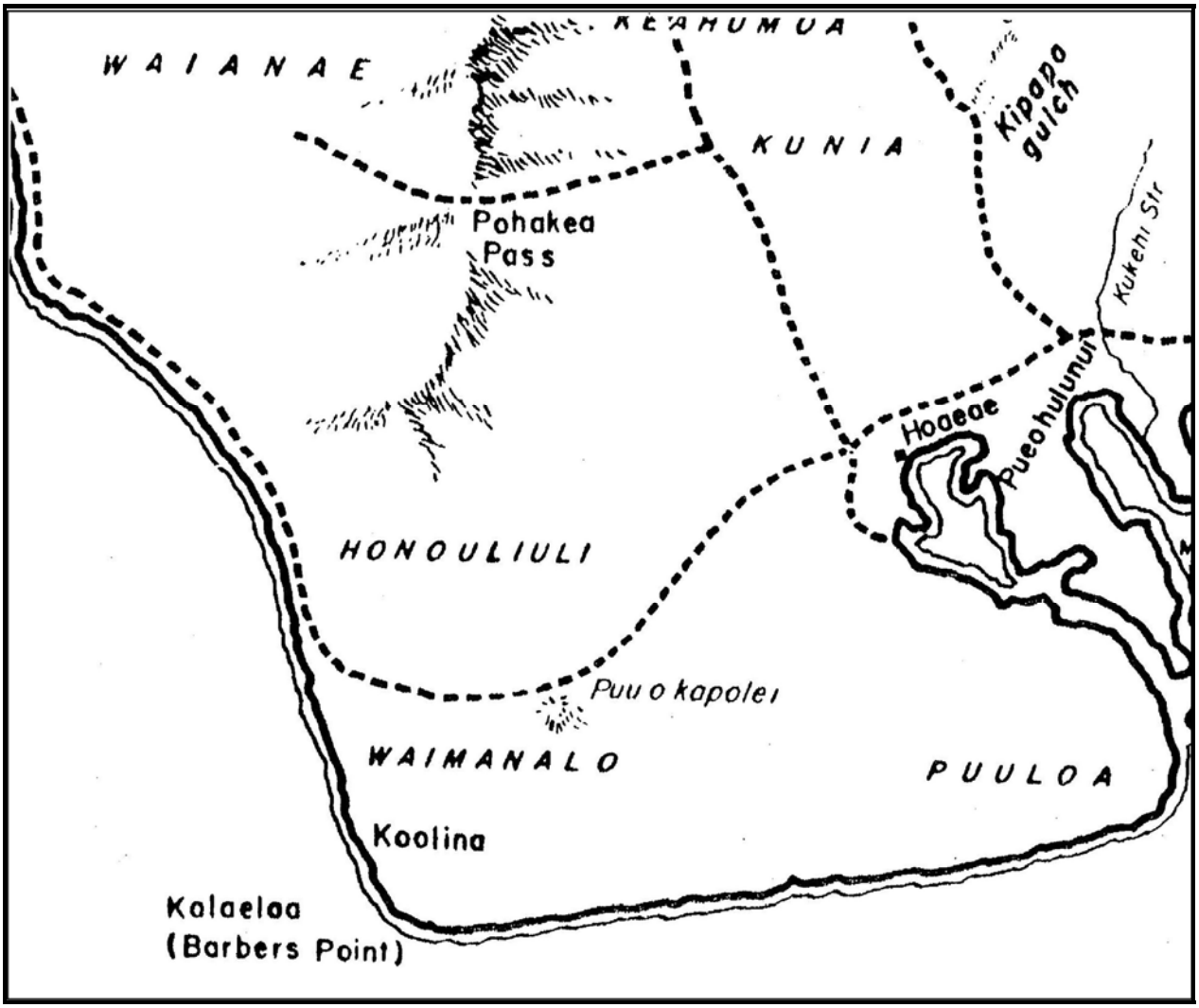


Figure 12. Trails of Leeward O‘ahu as described by John Papa ‘Ī‘ī (1959:96)

HonouliuliSubsequent to western contact in the area, the landscape of the ‘Ewa plains and Wai‘anae slopes was adversely affected by the removal of the sandalwood and other trees, and the introduction of domesticated animals and new vegetation. Goats, sheep and cattle were brought to the Hawaiian Islands by Vancouver in the early 1790s, and allowed to graze freely about the land for some time after. L.A. Henke reports the existence of a longhorn cattle ranch in Wai‘anae by at least 1840 (Frierson 1972:10). During this time, perhaps as early as 1790, exotic plant species were introduced to the area. These typically included vegetation best suited to a terrain disturbed by the logging of sandalwood forest and eroded by animal grazing. The following dates of introduced vegetation are given by R. Smith and outlined by Frierson (1972:10-11):

1. “early,” circa 1790:
   Prickly pear cactus, *Opuntia tuna*

Haole koa, Leucaena leucocephala
Guava, *Psidium guajava*

2. 1835-1840:
   Burmuda [sic] grass, *Cynodon dactylon*
   Wire grass, *Eleusine indica*
3. 1858:
   Lantana, *Lantana camara*

The *kiawe* tree (*Prosopis pallida*) was also introduced during this period, either in 1828 or 1837 (Frierson 1972:11).

3.4 Honouliuli Settlement Patterns

Archaeological and traditional sources show a general pattern of three main areas of settlement within Honouliuli Ahupua‘a: a coastal zone, the Honouliuli taro lands, and inland settlement at Pu‘u Ku‘ua.

3.4.1 The Coastal Zone - Kalaeloa (Barbers Point), Ko‘olina (West Beach)

3.4.1.1 Kalaeloa (Barbers Point)

Archaeological research at Barbers Point has focused on the areas in and around the Deep Draft Harbor (Barrera 1975; Davis and Griffin 1978; Hammatt and Folk 1981; McDermott et al. 2000). Series of small clustered shelters, enclosures and platforms show limited but recurrent use at the shoreline zone for marine-oriented exploitation. This settlement covers much of the shoreline, with more concentrated features around small marshes and wet sinks. Immediately behind the shoreline, under a linear dune deposit is a buried cultural layer believed to contain some of the earliest habitation evidence in the area.

The attraction of the area to early Hawaiians may have been the plentiful and easily exploited bird population. Particular evidence for taking of petrel occurs at SIHP No. -2763 (Hammatt and Folk 1981). Initial heavy exploitation of nesting seabirds and other species, in conjunction with habitat destruction, may have contributed to some avian extinctions.

There is some indication of limited agriculture in mulched sinkholes and limited soil areas. Considering rainfall, this activity would have been limited, but probably involved tree crops and roots (sweet potatoes). The archaeological content of the sites indicates a major focus on marine resources.

Davis and Griffin (1978) distinguish functional classes of sites based on surface area size, and argue that the Barbers Point settlement consists of functionally integrated, multi-household residence groups. Density contours of midden (by weight) and artifacts (by numbers) plotted for residence sites by Hammatt and Folk (1981) generally indicate narrowly defined spatial foci of discard, possibly indicating continuous use, or at least with no refurbishing or additions to the structures over time (Hammatt and Folk 1981). The focus is small habitation sites, typically lacking the full range of features found in large permanent residence complexes such as high platforms, complex enclosures, and conspicuous ceremonial sites.

3.4.1.2 Ko‘Olina (West Beach)

There are three available studies on the Ko‘Olina project area (Davis et al. 1986a; Davis et al. 1986b; Davis and Haun 1987). These studies document approximately 180 component features at 48 sites and site complexes consisting of habitation sites, gardening areas, and human burials. Chronologically, the occupation covers the entire span of Hawaiian settlement in what Davis and Haun describe as “one of the longest local sequences in Hawaiian prehistory” (Davis and Haun 1987:37). The earliest part of the sequence relates to the discovery of an inland marsh and early dates were also obtained for the beachfront site and an inland rock shelter.

3.4.2 Honouliuli Taro Lands

Centered around the west side of Pearl Harbor at Honouliuli Stream and its broad outlet into the West Loch are the rich irrigated lands of the *‘ili* of Honouliuli, which give the *ahupua‘a* its name. The major archaeological reference to this area is Dicks et al. (1987), who documented remnants of a once widespread wetland system (*lo‘i* and fishponds), as well as dry-land cultivation of the adjacent slopes.

According to Carol Silva’s “Historic Research Relative to the Land of Honouliuli” (in Dicks et al. 1987), the Honouliuli area bordering West Loch was clearly a major population center, a logical response to the abundance of fish and shellfish resources in close proximity to a wide expanse of well-irrigated bottomland suitable for wetland taro cultivation. The earliest detailed map by Malden (from 1825) shows all the roads of southwest O‘ahu coalescing and descending the *pali* (cliff) as they funnel into the area of Honouliuli Village. Dicks et al (1987:78-79) conclude, on the basis of 19 carbon isotope dates and 3 volcanic glass dates, that “agricultural use of the area spans over 1,000 years.” Undoubtedly, Honouliuli was a locus of habitation for thousands of Hawaiians. Prehistoric population estimates are a matter of some debate, but it is worth pointing out that in the earliest mission census (Schmitt 1973:19) in 1831-1832, the land (*‘āina*) of Honouliuli contained 1026 men, women, and children. It is not clear whether this population relates to Honouliuli Village or Honouliuli Ahupua‘a, but the village probably contained the vast majority of the district’s population. The nature of the reported population structure for Honouliuli (less than 20% children under 12 years of age) and the fact that the population decreased more than 15% in the next 4 years (Schmitt 1973:22) suggests that the prehistoric population of Honouliuli Village may well have been significantly greater than it was in 1831-1832. A conservative estimate would be that tens of thousands of Hawaiians lived and died at Honouliuli Village.

3.4.3 Pu‘u Ku‘ua: Inland Settlement

Documentation of inland settlement in Honouliuli Ahupua‘a is more problematic in that there are relatively few documented archaeological sources. However, it is probable that the area around Pu‘u Ku‘ua, on the east side of the Wai‘anae Ridge, seven miles inland of the coast, was a Hawaiian place of some importance.

In 1899, the Hawaiian Newspaper “Ka Loea Kalaiaina” relates a story of Pu‘u Ku‘ua as “a place where chiefs lived in ancient times” and a “battle field,” “thickly populated.” The article summarizes:

1) This place was entirely deserted and left uninhabited and it seems that this happened before the coming of righteousness to Hawai‘i Nei. Not an inhabitant is left.

2) The descendants of the people of this place were so mixed that they were all of one class. Here the gods became tired and returned to Kahiki (Sterling and Summers 1978:33).

McAllister recorded three sites in this area, two *heiau* (134 - Pu‘u Kuina, and 137 -Pu‘u Ku‘ua, both destroyed) and a series of enclosures in Kukuilua which he calls “*kuleana* sites” (McAllister 1933). On the opposite side of the Wai‘anae range, along the trail to Pōhākea Pass, Cordy (2002) states “Kākuhihewa was said to have built (or rebuilt) Nīoi‘ula, a *po‘okanaka* [sacrificial] *heiau* (1,300 sq. m.) in Hālona in upper Lualualei, along the trail to Pōhākea Pass leading into ‘Ewa, circa A.D. 1640-1660” (Cordy 2002:36). There is no direct archaeological evidence available to the authors’ knowledge that intensive Hawaiian settlement occurred here, but it is considered as a place of high probability, based on the above indications. John Papa ‘Ī‘ī (1959) described a journey that Liholiho took which led him and an entourage through inland Honouliuli and over Pōhākea Pass. Geographically, the area receives sufficient quantities of water and would have had abundant locally available forest resources.

3.4.4 Summary

Based on the above summary of areas of Honouliuli settlement, the following general considerations are made to place the study area in the context of the *ahupua‘a* pattern.

1. There are three areas of Hawaiian settlement in the *ahupua‘a*; two are well documented and the inland settlement in the vicinity of Pu‘u Ku‘ua is less clear.
    a. The extensive limestone plain with recurrent use habitations for fishermen and gatherers, and sometime gardeners;
    b. The rich cultivated lands of Honouliuli ‘Ili for extensive wetland taro and clearly the *ahupua‘a* population center;
    c. The uplands around Pu‘u Ku‘ua for probable agriculture and forest resource utilization.
2. Honouliuli is designed as a unit to contain all the geographic elements of a typical Hawaiian valley *ahupua‘a*, except they are arranged geomorphically in an atypical relationship. The *ahupua‘a* is not organized around a single drainage network but shares the west portions of Waikele drainage in its upper reaches. A typical and highly advantageous characteristic for human subsistence is included in a vast coastline and fringing reef, an extensive limestone plain, which would support only limited agriculture, but would be excellent for bird catching in early times. The richest forestland for foraging for wood, birds, feathers, etc. would have been the east slope of the Wai‘anae Range. The *mauka/makai* route would have been up Honouliuli Gulch or up the Makakilo ridge, paralleling the coast from Honouliuli Gulch to Kahe. The most convenient route to *mauka* lands, even from the western end of the coast near Kahe Point, would have been *mauka* only to the base of the hills and then either up the Makakilo Ridge or northeast to a trail to Pu‘u Ku‘ua and Pōhākea Pass. The *makai* slope is the dry side of the ridgeline. Here, streams would respond to rainfall quickly but drain quickly leaving little available

water for even short-term use. However, abundant springs may have provided adequate water for localized dryland cultivation.

3. The *makai* slope of the Wai‘anae Range (i.e., *mauka* of Ko‘Olina) was not a major thoroughfare. We can see some very limited evidence of part-time agriculture in and around gulches and two foci of sparse habitation with the first limited to *makai* portions of gulches and lava flats. This habitation is considered a *mauka* component or continuation of the Ko‘Olina coastal settlement rather than an independent focus. The second focus, separated from the first by a barren zone, is generally above the 800-foot elevation. This *mauka* habitat, which could have been supported by seasonal dryland planting and forest foraging, may be the lower portion of a thinly scattered but widespread zone of settlement. This zone stretches eastward and northeast along the east Wai‘anae Range slopes and may increase in intensity along the more watered lands forming the *mauka* western boundary of Honouliuli.
4. The central place of the *ahupua‘a* of Honouliuli in terms of population, as well as cultivated foods, was the *‘ili* of Honouliuli, near the West Loch of Pearl Harbor. There is good reason to assume, given the lack of intensive agricultural resources in other locations during prehistoric times, that all other habitation zones were economically and socially co-dependent.
5. There is to date no archaeological evidence of high status residence in Honouliuli. Large residential structures are not present along the seashore where they would be expected. The late prehistoric occurrence of chiefs’ houses is not apparent, perhaps because the ocean shoreline, although rich in marine resources, is uninviting for sport and unsuitable for fishponds. The chiefly focus of ‘Ewa District was Waipi‘o. Whatever activities of this class occurred in Honouliuli would have been in or near the rich lands fronting West Loch (the *‘ili* of Honouliuli) but to date there is no direct archaeological evidence of this. Concerning status associations with Honouliuli it is interesting to note the connection of the Pu‘u Ku‘ua settlement with pariah (*kauwā*), or “slaves,” the lowest class of Hawaiians (Sterling and Summers 1978:33).

Section 4 Historical Background

4.1 Mid to late 19th Century

During the Māhele of 1848, 99 individual land claims in the *ahupua‘a* of Honouliuli were registered and awarded by King Kamehameha III. No claims were made for land within the current study area or vicinity. The vast majority of the Land Commission Awards (LCA) were located near the Pu‘uloa Salt Works and the taro lands of the *‘ili* of Honouliuli. The largest award (Royal Patent 6071, LCA 11216, *‘Āpana* 8) granted in Honouliuli Ahupua‘a was to Miriam Ke‘ahi-Kuni Kekau‘onohi on January 1848. Kekau‘onohi acquired a deed to all unclaimed land within the *ahupua‘a*, including a total of 43,250 acres. Samuel Kamakau (1961:208-209) relates the following about Kekau‘onohi as a child:

> Kamehameha’s granddaughter, Ke-ahi-Kuni Kekau-‘onohi...was also a tabu chiefess in whose presence the other chiefesses had to prostrate and uncover themselves, and Kamehameha would lie face upward while she sat on his chest.

Kekau‘onohi was one of Liholiho’s (Kamehameha II’s) wives, and after his death, she lived with her half-brother, Luanu‘u Kahala‘i‘a, who was governor of Kaua‘i (Kamakau 1961:20). Subsequently, Kekau‘onohi ran away with Queen Ka‘ahumanu’s stepson, Keli‘i-ahonui, and became the wife of Chief Levi Ha‘alelea. Upon her death on June 2, 1851, all her property was passed on to her husband and his heirs. When Ha‘alelea died, the property went to his surviving wife, who in turn leased it to James Dowsett and John Meek in 1871 for ranching operations.

In 1877, James Campbell purchased most of Honouliuli Ahupua‘a for $95,000. He then drove off 32,347 head of cattle belonging to Dowsett, Meek and James Robinson and constructed a fence around his property (Bordner and Silva 1983:C-12). In 1879, Campbell brought in a well driller from California to search the ‘Ewa plains for water, and a significant untapped source was discovered. Following this discovery, plantation developers and ranchers drilled numerous wells in search of the valuable resource. By 1881, the Campbell property of Honouliuli prospered as a cattle ranch with “abundant pasturage of various kinds” (Briggs in Haun and Kelly 1984:45). Within 10 years of the first drilled well in ‘Ewa, the addition of a series of artesian wells throughout the island was supplying most of Honolulu’s water needs.

In 1889, Campbell leased his property to Benjamin Dillingham, who subsequently formed the O‘ahu Railway & Land Co. (O.R. & L) in 1890. To attract business to his new railroad, Dillingham subleased all land below 200 feet elevation to William Castle who in turn sublet the area to the ‘Ewa Plantation Company for sugar cane cultivation (Frierson 1972:15). Dillingham’s Honouliuli lands above 200 feet elevation that was suitable for sugar cane cultivation were sublet to the O‘ahu Sugar Co.

‘Ewa Plantation Co. was incorporated in 1890 and continued in full operation up into modern times. The plantation grew quickly with the abundant artesian water. As a means to generate soil deposition on the coral plain and increase arable land in the lowlands, the ‘Ewa Plantation Co. installed ditches running from the lower slopes of the mountain range to the lowlands and then plowed the slopes vertically just before the rainy season to induce erosion (Frierson 1972:17).

The O‘ahu Sugar Co. was incorporated in 1897, and included lands in the foothills above the ‘Ewa plain and Pearl Harbor. Prior to commercial sugar cultivation, the lands occupied by the O‘ahu Sugar Co. were described as being “of near desert proportion until water was supplied from drilled artesian wells and the Waiāhole Water project” (Conde and Best 1973:313). O‘ahu Sugar took over ‘Ewa Plantation lands in 1970 and continued operations into the 1990s.

Dillingham’s *mauka* lands in western Honouliuli that were unsuitable for commercial sugar production remained pasture for grazing livestock. From 1890 to 1892 the Ranch Department of the O.R. & L. Co. tapped plantation flumes and searched for alternative sources of water. Ida von Holt leaves this account of her husband Harry’s (Superintendent of the O.R. & L Ranch Dept.) search for water in the foothills of the Wai‘anae Range:

> One of those places is on the old trail to Pālehua, and had evidently been a place of which the Hawaiians had known, for its name is Kalo‘i (the taro patch), and even in dry weather water would be standing in the holes made by the cattle, as they tried to get a drop or two. (Von Holt 1985:136)

The spring depicted in this account may have been located during an inventory survey of the adjacent Pālehua East B project area (Tulchin and Hammatt 2005). The spring was located along the upper slopes of the southern face of Kalo‘i Gulch. A second account is given of the discovery of spring water in an area over the ridge on the north side of Kalo‘i Gulch:

> Shouting to the men to come over with their picks and shovels, he [Harry von Holt] soon got them busy clearing away lots of small stones and earth. Almost at once they could see that there were evidences of a paved well, and at about three feet down they came upon a huge flat rock, as large around as two men could span with their arms. Digging the rock loose and lifting it to one side, what was their astonishment to find a clear bubbling spring! (Von Holt 1985:138)

Following the discovery, two old Hawaiians began to ask Von Holt about the spring:

> Finally he [Harry von Holt] got them to explain that the spring, called “Waihuna” (Hidden Spring) had been one of the principal sources of water for all that country, which was quite heavily populated before the smallpox epidemic of 1840…A powerful Kahuna living at the spring had hidden it before he died of the smallpox, and had put a curse on the one who disturbed the stone, that he or she would surely die before a year was out. (Von Holt 1985:138-140)

4.2 Early 1900s to Present

Much of the *mauka* lands in western Honouliuli, including ridges and deep gulches, were unsuitable for commercial sugar cultivation and remained pastureland for grazing livestock. By 1920, however, many of the lands of Honouliuli were used for commercial sugar cane cultivation (Frierson 1972:18). By 1919 a reservoir had been established just south of Pālehua Road in the central portion of the project area (Figure 13). In the late 1920s, the main residential communities were at the northeast edge of the ‘Ewa Plain. The largest community was still at Honouliuli Village. ‘Ewa was primarily a plantation town, focused around the sugar mill, with a public school as well as a Japanese school. Additional settlement was in Waipahu, centered on the Waipahu sugar mill, operated by the O‘ahu Sugar Company. A 1925 Oahu Sugar Company

plantation map shows Field 29 covering the northeast portion of the project area northeast of the reservoir (Figure 14). A 1927/28 map (Figure 15) shows an irrigation ditch following the contour of Kalo‘i Gulch within the project area.

Historic maps of the Makakilo area indicate a lack of any other significant development in the area into the 1940s. Major land use changes came to western Honouliuli when the U.S. Military began development in the area. Military installations were constructed both near the coast, as well as in the foothills and upland areas. Barbers Point Military Reservation (a.k.a. Battery Barbers Point from 1937-1944), located at Barbers Point Beach, was used beginning in 1921 as a training area for firing 155 mm guns (Payette 2003). Also in the vicinity were Camp Malakole Military Reservation (a.k.a. Honouliuli Military Reservation), used from 1939, and Gilbert Military Reservation, used from 1922-1944. Barbers Point NAS, in operation from 1942 into the 1990s, was the largest and most significant base built in the area. It housed numerous naval and defense organizations, including maritime surveillance and anti-submarine warfare aircraft squadrons, a U.S. Coast Guard Air Station, and the U.S. Pacific Fleet.

Fort Barrette (a.k.a. Kapolei Military Reservation and Battery Hatch), located atop Pu‘u Kapolei, was in use from 1931 to 1948 for housing four 3-inch anti-aircraft batteries (Payette 2003). In the 1950s, the site was used as a NIKE missile base. Pālailai Military Reservation, located atop Pu‘u Pālailai in Makakilo, was in service from 1921, housing Battery Pālailai and Fire Control Station B (Payette 2003). Fire Control Station A was located atop Pu‘u Makakilo. From 1942 to 1945 the Pu‘u Makakilo Training Area, including lands in and around Pu‘u Makakilo, was used for military training during WWII.

Maps from the war years indicate little further development in the vicinity of the present project area (Figure 16). A new water-catchment ditch appears to be shown extending south from the reservoir in the central portion of the project area following the land contour.

Historic USGS maps of the area indicate the presence of an industrial quarry located within Kalo‘i Gulch, half a mile northwest (outside) of the current study area. The quarry first appears on the 1953 USGS topographic map. The exact date in which the quarry was initially constructed could not be determined, although research of historic maps indicated construction between 1943 and 1952. In 2004, CSH conducted an archaeological inventory survey of a property in which the quarry was observed and documented SIHP No. 50-80-12-6680.

The 1956 map (Figure 17) also shows an irrigation ditch entering the northwest portion of the project area, arcing around the back of Kalo‘i Gulch, and extending to the reservoir in the central portion of the project area. Whether this ditch was in fact older and was simply not shown on earlier maps is unclear. A 1977 aerial photograph (Figure 18) shows sugar cane fields still dominating the east portion of the project area.

In response to increased demand for housing, spurred by the increased development at Barbers Point NAS, the Estate of James Campbell set aside land in the foothills of the southern Wai‘anae Range in 1960 for the development of the residential community of Makakilo. Development began just *mauka* of the H-1 Freeway and continued *mauka*, with ranch lands being incrementally replaced by subdivision construction. At present, former ranching pasturelands are continually being replaced by residential houselots.

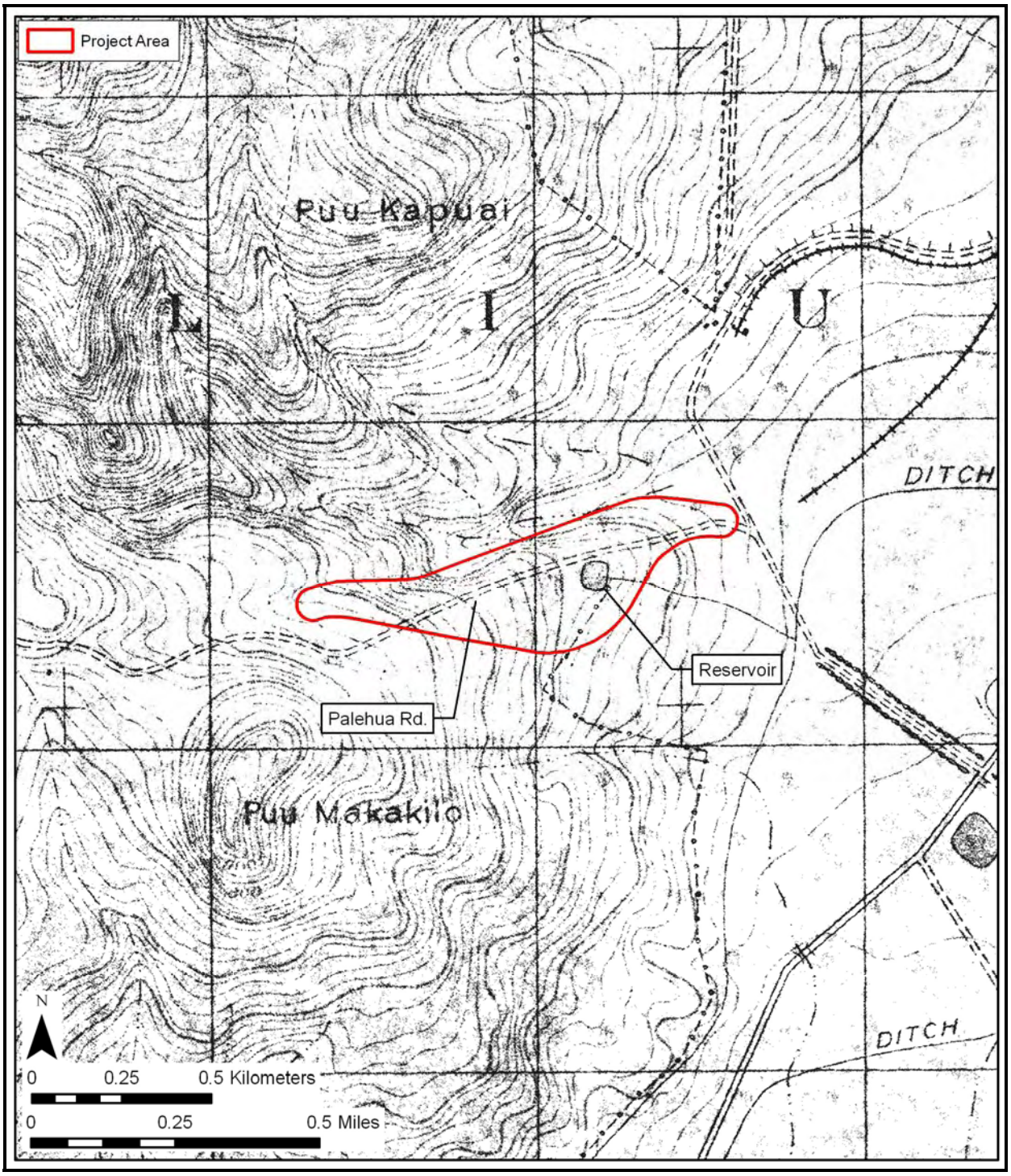


Figure 13. 1919 Fire Control Nanakuli Quad map showing section of Pālehua Road bisecting the project area, as well as a reservoir associated with plantation irrigation system

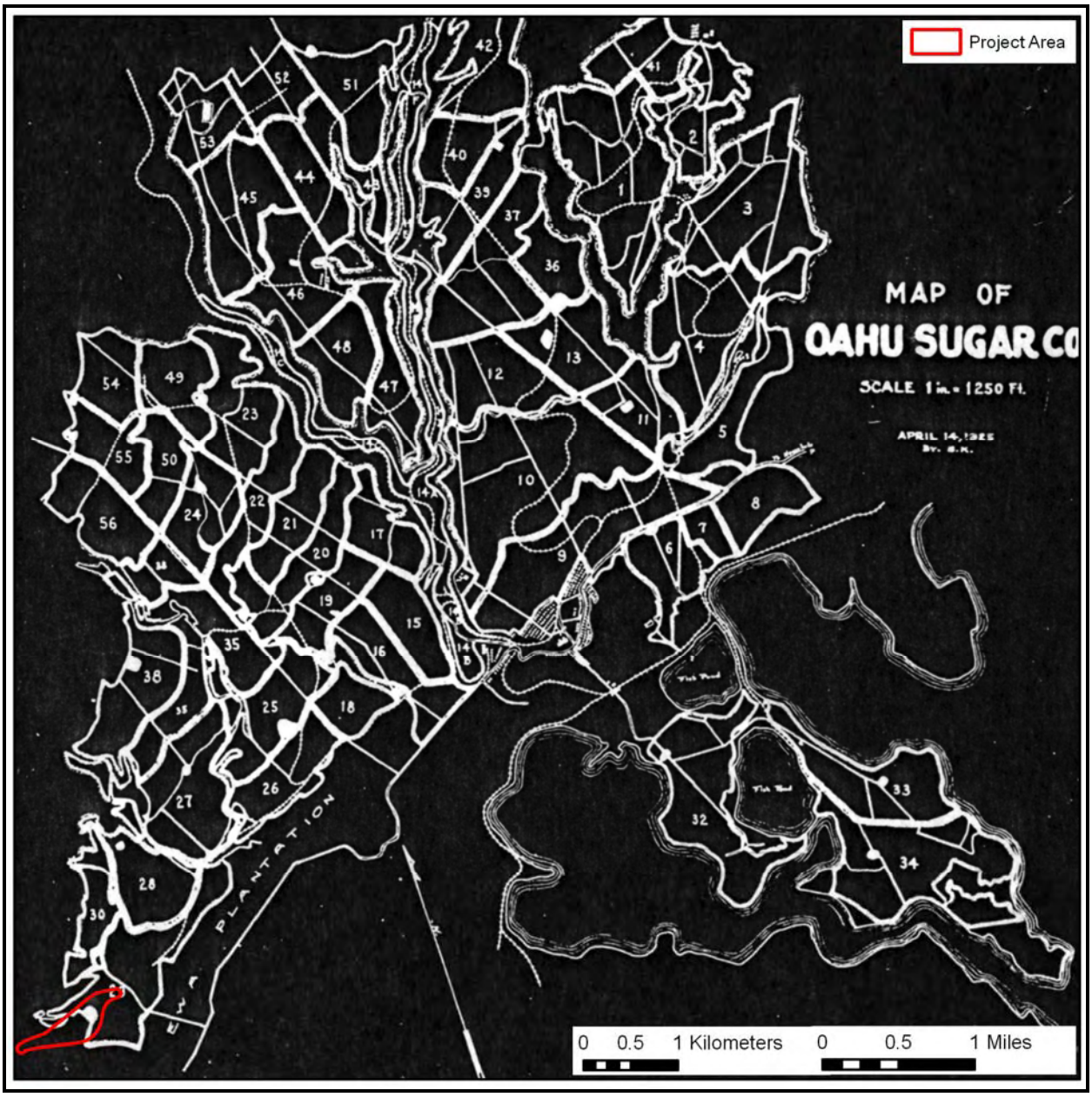


Figure 14. 1925 Oahu Sugar Company plantation map showing project area (red) with Field 29 covering northeast portion of the project area

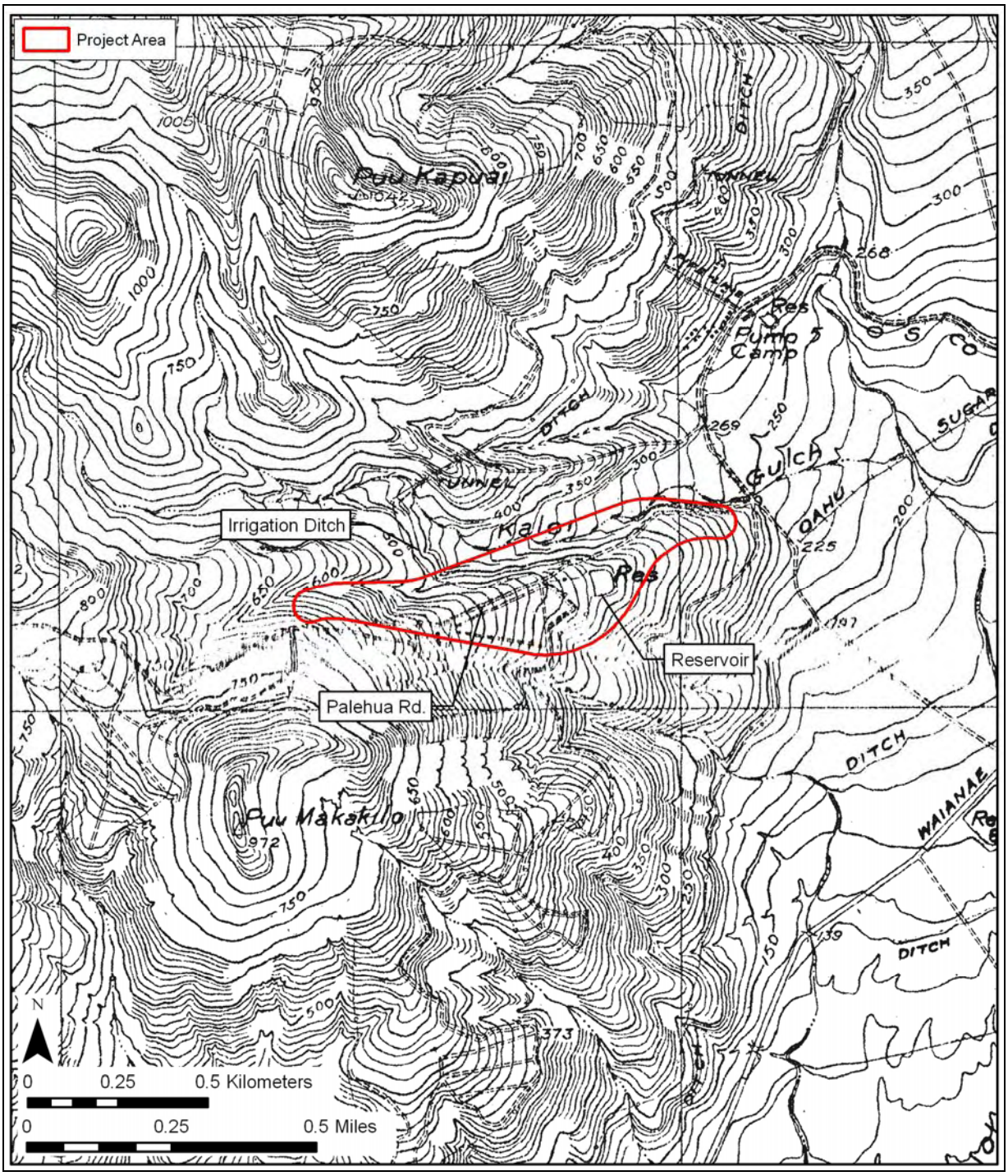


Figure 15. 1927/1928 U.S. Geological Survey Wai‘anae Quad Map showing project area

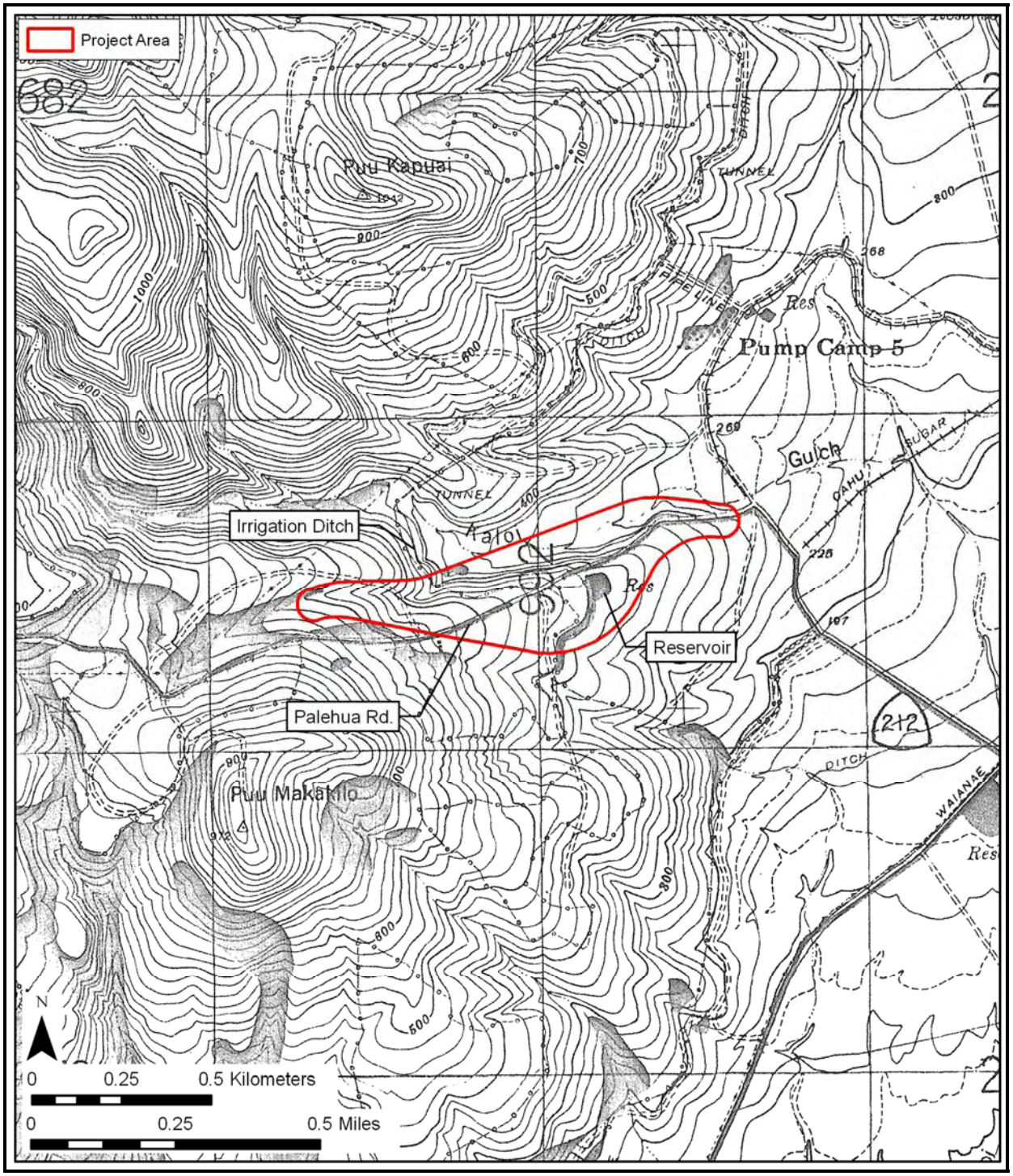


Figure 16. 1943 War Department Map of Waipahu and surrounding areas

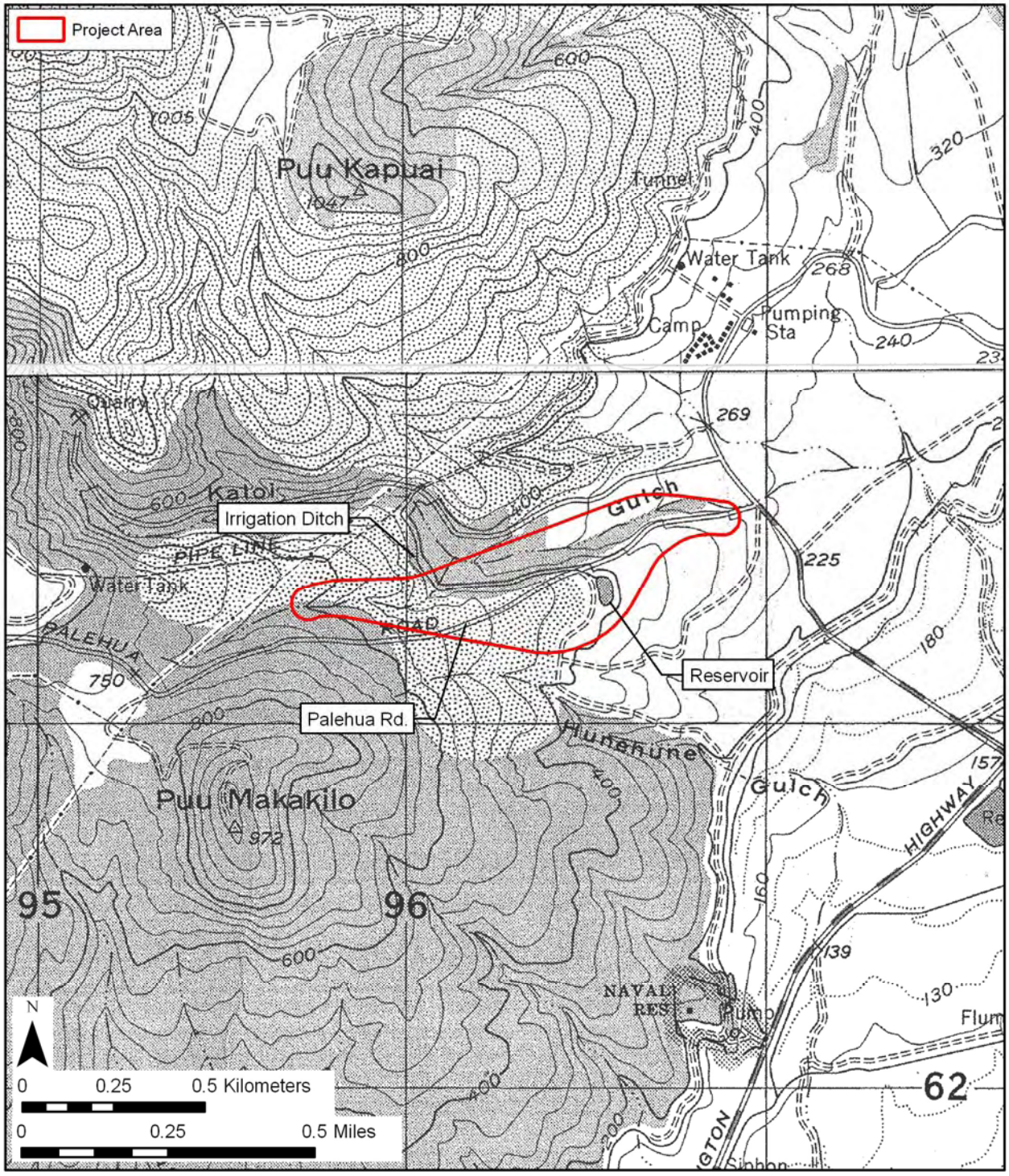


Figure 17. 1956 U. S. Geological survey map showing project area

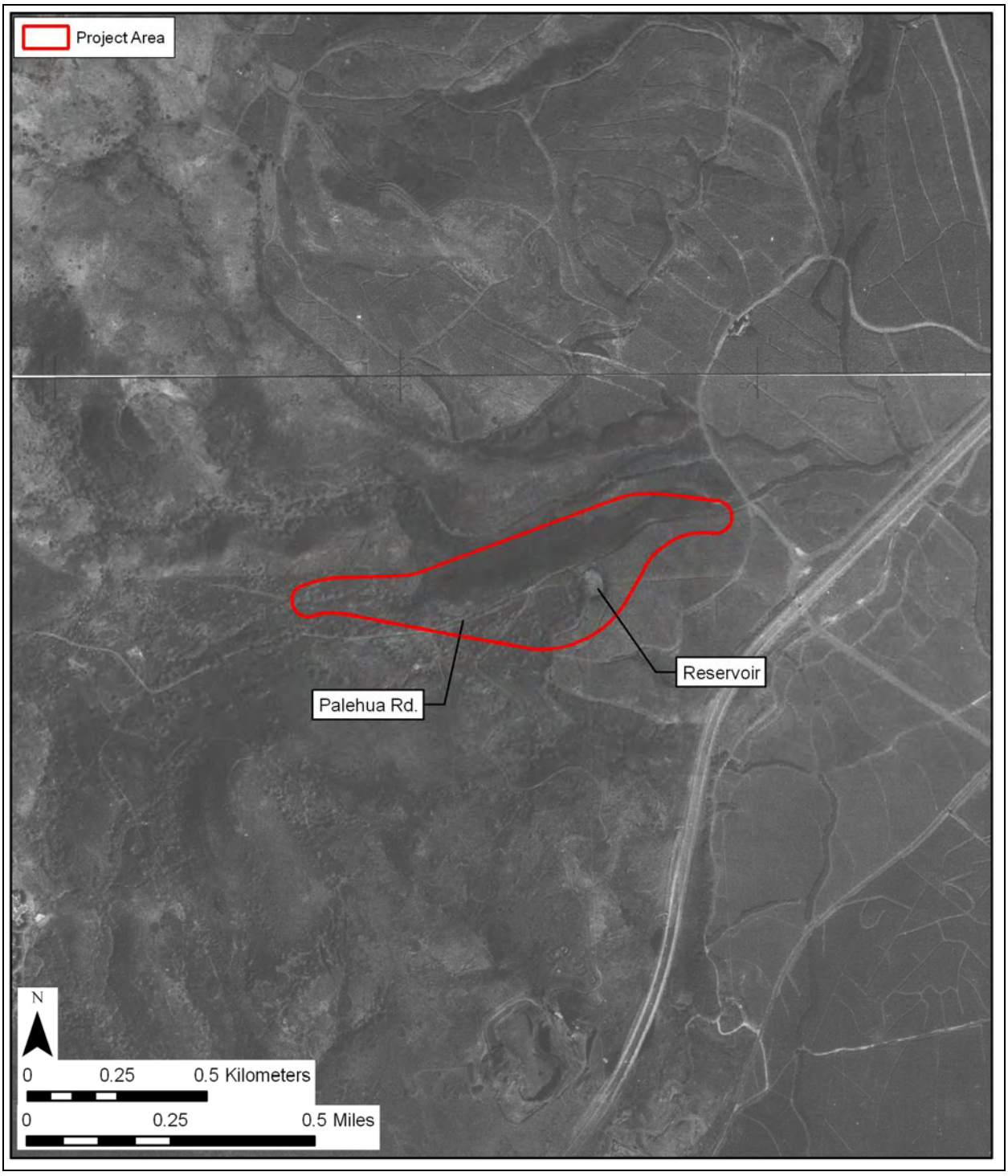


Figure 18. 1977 aerial photograph showing project area

Section 5 Archaeological Research

The coral plains of ‘Ewa have been the focus of more than 50 archaeological studies over the last two decades. The Kalaeloa (Barbers Point) area is one of the most studied places in Polynesia. However, relatively little research has been conducted along the southern slopes of the Wai‘anae Range (Table 1).

The earliest attempt to record archaeological remains in Honouliuli Ahupua‘a was made by Thrum (1906) who described a *heiau* located on Pu‘u Kapolei, approximately 2 miles (3.2 km) south of the current project area. Pu‘u Kapolei Heiau is described as “Ewa-size and class unknown, its walls thrown down for fencing” (Thrum 1906:46).

In his surface survey of 1930, archaeologist J. Gilbert McAllister recorded the specific locations of important sites, and the general locations of less important sites (at least at Honouliuli). Archaeological investigations by McAllister along the southern slopes of the Wai‘anae Range identified a number of sites that are of interest.

McAllister documents Pu‘u Kapolei Heiau as Site 138 and notes:

> The stones from the heiau supplied the rock crusher that was located on the side of this elevation, which is about 100 feet away on the seaside. There was formerly a large rock shelter on the seaside where Kamapua‘a (the pig-god) is said to have lived with his grandmother (Kamaunuahihio). (McAllister 1933:108)

McAllister’s Site 136 is located near Mauna Kapu, northwest of the current project area, and is described as a small platform on the ridge dividing the ‘Ewa and Wai‘anae districts. The 4 to 6 square foot platform was constructed of coral and basalt stones, and was believed to be an altar (McAllister 1933:107). It is noted to have been destroyed by the time of Sterling and Summers’ work in the late 1950s (Sterling and Summers 1978:32).

McAllister’s Site 137 is at Pu‘u Ku‘ua, a prominent landmark 1.8 miles (2.9 km) north of the current project area. Pu‘u Ku‘ua Heiau is described by McAllister as:

> (Destroyed) The heiau was located on the ridge overlooking Nanakuli as well as Honouliuli at the approximate height of 1800 feet. Most of the stones of the heiau were used for a cattle pen located on the seaside of the site. The portion of the heiau that has not been cleared for pineapple has been planted in ironwoods. (McAllister 1933:32)

The presence of Pu‘u Ku‘ua Heiau provides some archaeological evidence of the Pu‘u Ku‘ua settlement described in the Hawaiian Newspaper “*Ka Loea Kalaiaina.*”

None of these sites are in the immediate vicinity of the current project area. However, it is important to recognize that the presence of extant or former archaeological remains demonstrates Hawaiian use of these *mauka* lands.

Recent archaeological investigations in the southern Wai‘anae Range have generally been focused on deep gulch areas for potential landfill locations, lower slopes for residential development, and mountain peaks for antennae or satellite tracking infrastructure.

Table 1. Previous Archaeological Investigations in the Uplands of Honouliuli Ahupua‘a

Reference	Type of Investigation	General Location	Findings
Bordner 1977a	Archaeological Reconnaissance	Proposed Makaīwa Gulch Landfill Site	No archaeological sites identified
Sinoto 1988	Archaeological Reconnaissance	Makakilo Golf Course	Low stacked boulder wall (SIHP No. 50-80-12-1975)
Spear 1996	Archaeolocial Reconnaisssnce	East Kapolei, TMK: 9-1-16: 17	No sites were discovered within project area.
Dega et al. 1998	Archaeological Inventory Survey	UH West O‘ahu, TMK: 9-2-002: 001 & 9-2-002: 001	Two historic site complexes, (SIHP No. 50-80-08-5593, historic irrigation system and SIHP No. 50-80-09-2268, Waiāhole Ditch System)
Tulchin and Hammatt 2004	Archaeological Inventory Survey	86-Acre Proposed Pālehua Community Association (TMK: 9-2-03: 78 por. and 79)	4 historic properties identified: a complex of structures associated with industrial rock quarry operations (Site 50-80-12-6680); three boulder mounds believed to be related to land clearing or ditch construction by the O‘ahu Sugar Co. (Site 50-80-12-6681); a small terrace believed to function as a historic water diversion feature (Site 50-80-12-6682); and a remnant portion of the Waiāhole Ditch (Site 50-80-09-2268).
Tulchin and Hammatt 2005	Archaeological Inventory Survey	71-Acre Pālehua East B, Makakilo, (TMK: 9-2-03:76 & 78)	3 historic properties identified: SIHP Nos. 50-80-12-6666 (pre-Contact agricultural alignment and mound), -6667 (plantation-era walls and ditch), and -6668 (single alignment of upright basalt boulders and a small, low terrace).

Reference	Type of Investigation	General Location	Findings
Tulchin and Hammatt 2007	Archaeological Literature Review and Field Inspection	~790-Acre Parcel at Pālehua, Honouliuli Ahupua‘a, (TMK: [1] 9-2-003:002 por. and 005 por.)	Confirmed the area to be rich in archaeological remains. Because the lands within the project area were almost exclusively used for ranching purposes from historic times until the present, much of the pre-Contact landscape remains intact and relatively undisturbed. Archaeological features included: pre-Contact indigenous Hawaiian habitation and associated agricultural and ceremonial features; historic ranching and related features; and historic quarrying and related features.
Tulchin, Shideler and Hammatt 2007	Archaeological Literature Review	~4,600-Acre Property at the Honouliuli Forest Reserve Honouliuli (TMK: 9-2-004:001 por., 005 por.; 9-2-005:013 por., 016, 018)	Because the lands within the project area were almost exclusively used for ranching and forestry purposes from the mid 1800s until the present, much of the pre-Contact landscape remains intact and relatively undisturbed. Archaeological features representing distinct periods of land use are likely to be identified in the project area, including: pre-Contact indigenous Hawaiian habitation and associated agricultural and ceremonial features; historic homestead and ranching related features; historic agricultural features; and historic military-related features.
Tulchin and Hammatt 2008	Archaeological Literature Review and Field Inspection	~809 Acres of Kahe Ranch Land Honouliuli (TMK: 9-2-003: 004, 009, 029, 084 por., & 085)	Identifies 10 archaeological sites within the study area. Archaeological features representing distinct periods of land use were observed, including: pre-Contact indigenous Hawaiian habitation; historic ranching; and historic railroad operations.

An archaeological inventory survey of the “Makaīwa Hills” development project located several traditional as well as post-Contact archaeological sites (Hammatt et al. 1991). The project area included a 1,915-acre parcel in Honouliuli Ahupua‘a, located between the town of Makakilo and Waimanalo Gulch, and bounded to the south by Farrington Highway and to the north by Pālehua Road (southwest of the current project area). Thirty-four sites were located, including prehistoric habitation structures (temporary and permanent), agricultural features (terrace and mounds), rock shelters, petroglyphs, *ahu* (stone markers), and various sugar cane cultivation infrastructures.

Within the “Makaīwa Hills” project area, habitation sites were found clustered in higher elevations above 1000 ft, and in lower elevations below 500 ft (Hammatt et al. 1991). Especially in pre-Contact times, the higher elevations were an important source of many varied forest resources, including both foodstuffs and other key items (e.g., wood, stone, medicinal plants, bird feathers). The lower elevations were in close proximity to the shoreline and its bountiful coastal resources.

> In sum, this site type and patterning sample suggests that prehistoric and historic Hawaiian populations utilized the present study area as a recurrent and temporary habitation area focused mainly on the gathering of specialized goods, such as wild forest plants from the upper elevations and the quarrying of lithic material within the lower elevations. (Hammatt et al. 1991:106)

Two archaeological studies were made in the upland Pālehua area, *mauka* of Makakilo. An archaeological inventory survey of the proposed KAIM radio tower (Hammatt 1992), located northwest of the current project area, identified no archaeological remains. An archaeological assessment for the proposed Ministry of Transportation Satellite Multi-Ranging Station project site (Borthwick 1997), which abuts the western perimeter of the Air Force Solar Observatory facility, identified no archaeological remains.

Relatively few archaeological sites have been located by archaeological studies made in the vicinity of the current project area (Figure 19). Archaeological studies associated with the proposed Makakilo Golf Course (Sinoto 1988) and the Makakilo D and D-1 Development Parcels (Nakamura et al. 1993) were conducted in the vicinity of the current project area. Archaeological reconnaissance of the Makakilo Golf Course property included lands along the southern and eastern slopes of Pu‘u Makakilo. Severe erosion was noted throughout the property. A single archaeological feature, a low-stacked basalt boulder wall (SIHP No. 50-80-12-1975), was identified (Sinoto 1988). Archaeological inventory survey of the Makakilo D and D-1 Development Parcels included lands on the southern and western slopes of Pu‘u Makakilo, adjacent to the golf course property. A single historic property, a cement irrigation flume (SIHP No. 50-80-12-4664), was located in the southern portion of the project area near the H-1 Freeway (Nakamura et al. 1993).

An archaeological inventory survey for the proposed UH West O‘ahu campus was conducted by Dega et al. (1998). The survey area included 991 acres in the vicinity of Pu‘u Kapu‘ai, north of the current project area. No traditional Hawaiian sites were located. The project area was noted to have undergone extensive land modification associated with commercial agriculture. Two historic site complexes (SIHP Nos. 50-80-12-5593, irrigation system, and 50-80-09-2268, Waiāhole Ditch System) were documented. Identified features included flumes, aqueducts,

ditches, pumps, and other irrigation infrastructure. It was noted that the Waiāhole Ditch crossed through the project area and “exits the property to the west near Kalo‘i Gulch” (Dega et al. 1998:17).

Kalo‘i Gulch, including current project area, was surveyed as a potential landfill location (Bordner 1977b). The archaeological reconnaissance survey included lands within Kalo‘i Gulch and its smaller tributaries from the *makai* end of the gulch up to the 1,400 ft elevation. It was noted that bulldozing extensively modified the lands at the base of the gulch, *makai* of an historic quarry. In the *mauka* portion of the project area, three possibly prehistoric sites were identified (SIHP Nos. 50-80-12-2600, -2601, and -2602), including low-stacked basalt boulder walls located along the north side of the Kalo‘i Stream channel.

Tulchin and Hammatt (2004) conducted an archaeological inventory survey of the approximately 86-acre proposed Pālehua Community Association Common Areas on the northwestern side of Makakilo. The study area abuts the northern boundary of the current study area. Historic properties located during the inventory survey included: a complex of concrete and iron structures associated with industrial rock quarry operations (SIHP No. 50-80-12-6680); three boulder mounds believed to be related to land clearing or ditch construction by the O‘ahu Sugar Co. (SIHP No. 50-80-12-6681); a small terrace believed to function as an historic water diversion feature (SIHP No. 50-80-12-6682); and a remnant portion of the Waiāhole Ditch (SIHP No. 50-80-09-2268). No pre-Contact historic properties were identified.

Tulchin and Hammatt (2004) undertook a field inspection of four locations just west of the current study area. Three small stone features were identified: an *ahu*, a stone terrace, and a small C-shape. An archaeological inventory survey was recommended should any construction activities be proposed for those parcels of land.

Tulchin and Hammatt (2005) conducted an inventory of a 71-acre parcel located just south of the current study area. Three historic properties were identified: SIHP No. 50-80-12-6666, a pre-Contact agricultural alignment and mound; SIHP No. 50-80-12-6667, a plantation-era stacked basalt boulder walls and a ditch; and SIHP No. 50-80-12-6668, two pre-Contact agricultural features consisting of a single alignment of upright basalt boulders and a small, low terrace.

5.1 Results from the Project Area

Two new historic properties (SIHP Nos. 50-80-12-6950 and 50-80-12-6951) were identified during a recent archaeological inventory survey of the current project area by CSH. These sites functioned to water sugar cane fields as well as control water flow coming from those cane fields to areas of lower elevation. Channels and ditches observed were constructed during historic times, and their purpose was to minimize the impact of erosion as well as prevent mud and debris from entering the existing water supply structures associated with the Waiāhole Ditch System, which supplied the region with the much needed water for irrigation in the sugar industry.

Besides the newly identified sites observed on survey, two new features associated with SIHP No. 50-80-09-2268 (Waiāhole Ditch System) were also identified, further extending the documented geographic extent of this site (Figures 20 and 21).

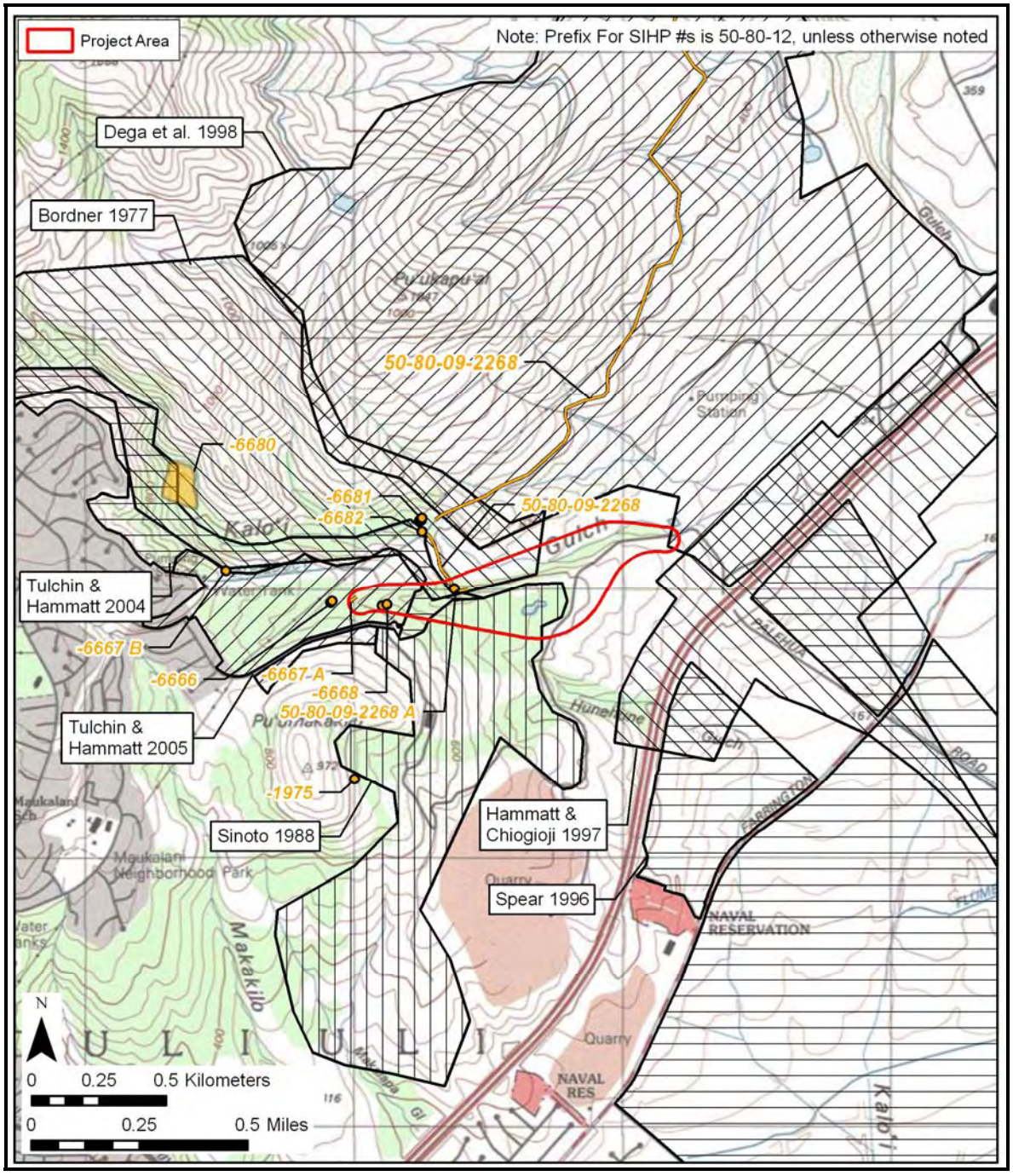


Figure 19. Map showing previous archaeological studies conducted in vicinity

5.2 Background Summary

Historical background research of Honouliuli Ahupua‘a shows that pre-Contact settlement was centered on the rich cultivated lands of Honouliuli ‘Ili for extensive wetland taro cultivation and abundant coastal resources. The upland dry forest areas were used for hunting and gathering of forest resources, but likely not for widespread permanent settlement. In the intermediate area between the limestone plain and the upland forests—in the vicinity of the current study area—indigenous Hawaiian activities were limited to dryland agriculture within gulches or near springs, and *mauka* to *makai* trails and associated temporary shelters.

Within the “Makaīwa Hills” project area, which abuts the western boundary of the current study area, pre-Contact habitation sites were clustered in higher elevations above 1000 ft, and in lower elevations below 500 ft (Hammatt et al. 1991). The higher elevations, in which the current study area is located, contained ample forest subsistence resources for gathering on both a continual basis, as well as during times of famine and drought. In Von Holt’s (1985) accounts of discovering spring water within the study area, it is noted that Kalo‘i had “been a place of which the Hawaiians had known” and the area “had been quite heavily populated before the smallpox epidemic of 1840” (Von Holt 1985:138-140).

By 1920, the lands of Honouliuli were used primarily for commercial sugar cane cultivation and ranching (Frierson 1972:18). Much of the *mauka* lands in western Honouliuli, including ridges and deep gulches, were unsuitable for commercial sugar cultivation and remained pasture land for grazing livestock. Historic maps indicate a lack of any significant development within the study area into the 1940s suggesting these lands were unsuitable for commercial sugar cane cultivation. Modest constructions in the area included Pālehua Road, allowing access to the uplands of western Honouliuli, as well as plantation irrigation infrastructure that runs through the current study area (see Figure 9). Also of note are the presence an unidentified enclosure within the northwest corner of the study area and a trail running roughly northwest by southeast through the middle of the study area leading to tunnels and a tank within the northern portion of the study area. This trail is likely the Pālehua Trail along which Von Holt located and tapped various springs to supply water to his herds of cattle. The tunnels located along the northern end of this trail are likely water tunnels excavated into the hillside in order to secure water.

Previous archaeological research in the vicinity of the study area has identified numerous pre-Contact sites including: habitation structures (temporary and permanent) and agricultural features (terrace and mounds). Of particular interest are three pre-Contact sites (SIHP No. 50-80-12-2600, -2601, and -2602) located within Kalo‘i Gulch, in the northern portion of the study area. All three sites were determined to related to erosion control and water management and suggest that in the past water was fairly abundant within the study area. This is consistent with Von Holt’s (1985) accounts of discovering spring water within the study area. Other archaeological sites in the vicinity of the study area include plantation-era infrastructure related to the ‘Ewa Plantation Co. and O‘ahu Sugar Co., walls and fences attributed to the Campbell Ranch, and industrial quarry infrastructure.

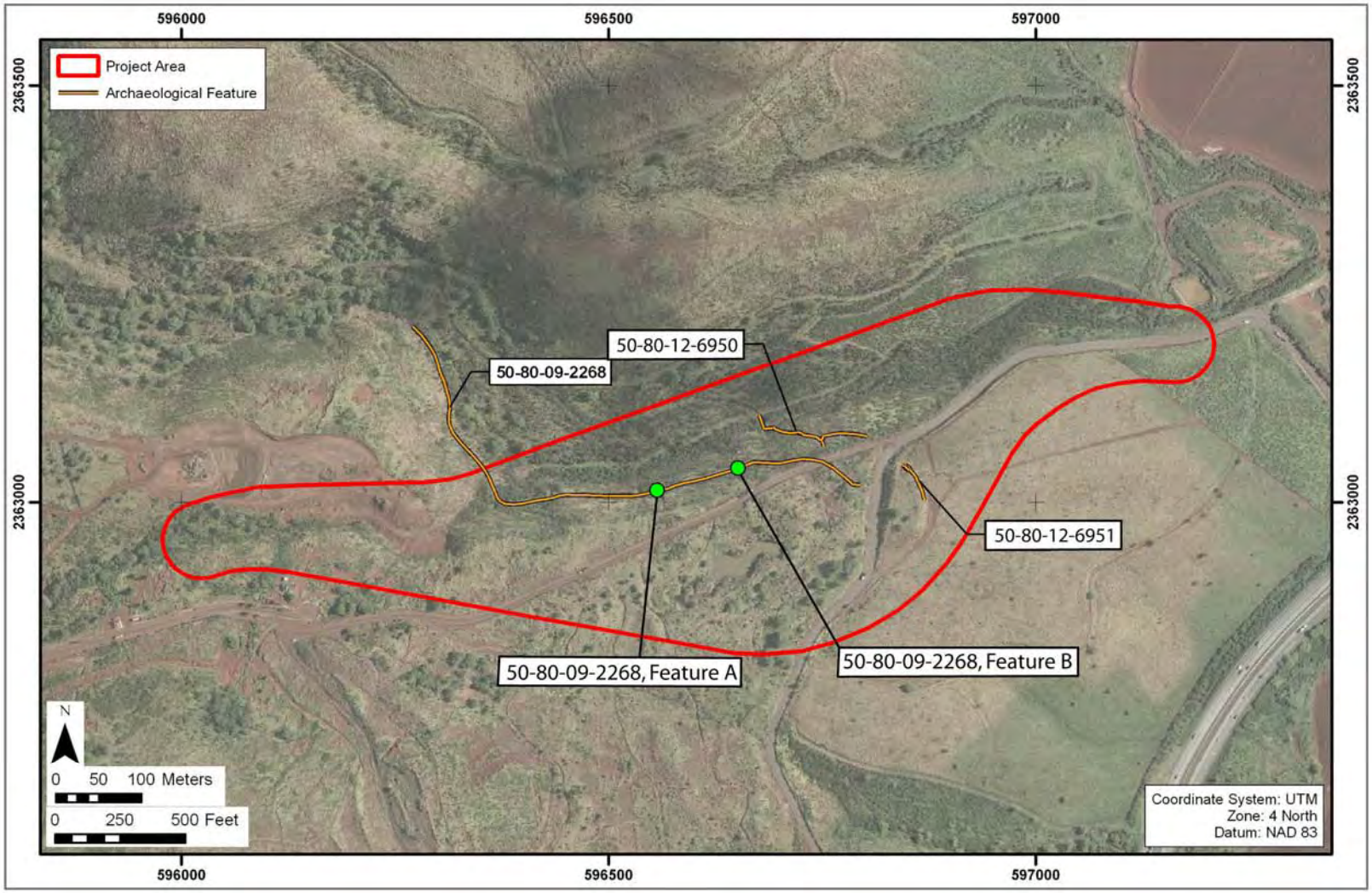


Figure 20. Aerial site map, showing assigned SIHP numbers

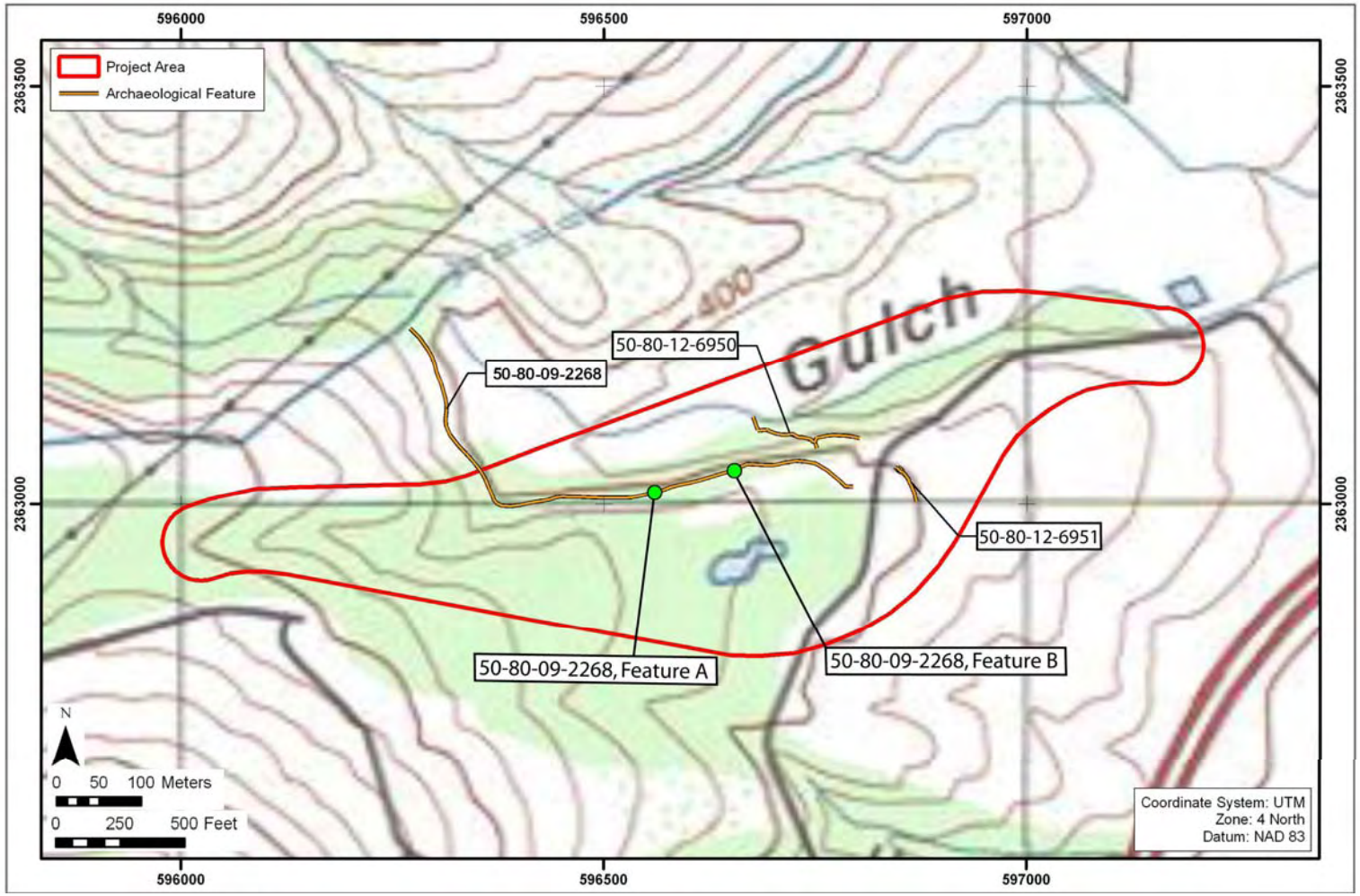


Figure 21. USGS 7.5 minute series ‘Ewa quadrangle topographic map of project area showing assigned SIHP numbers

Section 6 Community Consultation

Throughout the course of this assessment, an effort was made to contact and consult with Hawaiian cultural organizations, government agencies, and individuals who might have knowledge of and/or concerns about traditional cultural practices specifically related to the project area. This effort was made by letter, e-mail, telephone and in person. In the majority of cases, letters with a detailed description of the proposed action—including project acreage, a conceptual plan provided by R.M.Towill Corporation, a map and an aerial photograph of the project area—was mailed with the following text:

> At the request of R.M. Towill Corporation, Cultural Surveys Hawai‘i, Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the proposed 23-acre Makakilo Drive Extension project at Makakilo, Honouliuli Ahupua‘a, ‘Ewa District, on the Island of O‘ahu, TMK (1) 9-2-002:006, 9-2-003:079.
>
> The project area is approximately 3,300 feet long by 300 feet wide extending from the end of the existing Makakilo Drive to the proposed North-South Road interchange with Interstate H1 and will be a 4-lane facility. The project area consists of the south-southeastern portion of the Kalo’i Gulch floodplain. Kalo’i Stream channel runs from the central portion of the project area to the northeast. The southern face of Kalo‘i Gulch is at the central portion of the project area, and the base of the northeast slope of Pu‘umakakilo is at the southwestern portion of the project area. See attached USGS maps and the aerial photograph of project.
>
> The purpose of this cultural study is to assess potential impacts to cultural practices as a result of proposed development in Honouliuli. We are seeking your *kōkua* and guidance regarding the following aspects of our study:
>
> - **General history and present and past land use of the project area.**
> - **Knowledge of cultural sites which may be impacted by future development of the project area - for example, historic sites, archaeological sites, and burials.**
> - **Knowledge of traditional gathering practices in the project area, both past and ongoing.**
> - **Cultural associations of the project area, such as legends and traditional uses.**
> - **Referrals of *kūpuna* or elders and *kama‘āina* who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua‘a* lands.**
> - **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.**

Several (3-9) attempts were made to contact individuals, organizations, and agencies apposite to the CIA for Honouliuli. The results of all consultations are presented in Table 3.**Error! Reference source not found.**. Excerpts from more extensive interviews and statements specifically related to Honouliuli and its environs are presented in Section 7 below.

Table 2. Results of Community Consultation

Name	Affiliation	Comments
Ailā, William	Hui Mālama I Nā Kūpuna o Hawai‘i Nei	Made referral to Shad Kane.
Alaka‘i, Robert	‘Ahahui Siwila Hawai‘i O Kapolei Hawaiian Civic Club	See Section 7 below for response.
Ayau, Edward Halealoha	Hui Mālama I Nā Kūpuna o Hawai‘i Nei	Will forward community outreach information to other members.
Ching, Baron	Hawaiian Cultural Practitioner	Made referral to Shad Kane.
Clark, Melvin Kauwila	Hawaiian Cultural Practitioner	No response
Eaton, Arlene	Hale o Na‘auao	See Section 7 below for response
Golojuch, Michael	Makakilo/Kapolei Neighborhood Board (MKNB)	No response
Holt, Ruth	Hawaiian Cultural Practitioner	No response
Kane, Shad	‘Ahahui Siwila Hawai‘i O Kapolei Hawaiian Civic Club	See Section 7 below for response
Keala, Jane	‘Ahahui Siwila Hawai‘i O Kapolei Hawaiian Civic Club	No response
Makaiwi, Martha	MKNB	No response
Matanane, Eric	Wahipana O ‘Ewa	No response
McKeague, Kawika	O‘ahu Island Burial Council, ‘Ewa	No response
McQuivey, Jace	Chair, O‘ahu Island Burial Council	No response
Nahulu-Mahelona, Moani	Kapolei High School, Hawaiian Studies Department	No response
Nāmu‘o, Clyde	Administrator, Office of Hawaiian Affairs	See Figure 22 below
Nunes, Keoni	Hawaiian Cultural Practitioner	See Section 7 below for response
Paik, Linda Kaleo	State Historic Preservation Division	Made referral to Shad Kane and Nettie Tiffany
Philpotts, Douglas McD	Hawaiian Cultural Practitioner	See Section 7 below for response
Tiffany, Nettie	Kahu Lanikuhonua	No response
Timson, Maeda	MKNB	No response
Yamamoto, George	MKNB	No response
Young, Helen	Hawaiian Cultural Practitioner	No response

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

HRD08/3635

June 12, 2008

Brian Kawika Cruz, Cultural Impact Assessment Specialist
Cultural Surveys Hawai'i, Inc.
P.O. Box 1114
Kailua, Hawai'i 96734

Re: Cultural Impact Assessment
Makakilo Drive Extension project
Makakilo, Honouliuli Ahupua'a, 'Ewa District, Island of O'ahu
Tax Map Key: (1) 9-2-002:006 and 9-2-003:079

Aloha e Mr. Cruz,

The Office of Hawaiian Affairs is in receipt of your letter initiating consultation ahead of a cultural impact assessment for the proposed Makakilo Drive Extension project. Based on the information contained within your letter, the 23-acre project will consist of constructing an approximately 3,300 feet long by 300 feet wide four lane road which will extend from the end of the existing Makakilo Drive to the proposed North-South Road interchange with Interstate H-1.

The past and present uses of the subject parcel are unclear. OHA requests that your firm conduct a thorough review of all archaeological reports and cultural studies related to the larger area which will be subject to the cultural impact assessment. OHA believes there is a possibility that your firm has previously conducted interviews with individuals who have knowledge of cultural sites and traditional practices within the proposed project area.

In the event a comprehensive archaeological inventory survey for the project area is conducted and submitted to the Department of Land and Natural Resources- Historic Preservation Division for review and approval, OHA should be allowed the opportunity to comment on the criteria assigned to any cultural or archaeological sites identified within the archaeological inventory survey pursuant to §13-284-6(c), Hawaii Administrative Rules.

Brian Kawika Cruz, Cultural Impact Assessment Specialist
Cultural Surveys Hawai'i, Inc.
June 12, 2008
Page 2

Thank you for initiating consultation at this early stage of the consultation process. We look forward to the opportunity to review the completed cultural impact assessment. Should you have any questions please contact Keola Lindsey, Lead Advocate-Culture at 594-1904 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Administrator

Figure 22. Office of Hawaiian Affairs Response Letter, June 12, 2008

Section 7 Summaries of Kama‘āina “Talk Story” Interviews

Kama‘āina and *kūpuna* (elders) with knowledge of Honouliuli Ahupua‘a and the area within the vicinity of the proposed Makakilo Drive Expansion project participated in “talk-story” sessions for this assessment. The approach of CSH to cultural impact studies affords community contacts an opportunity to review transcriptions and/or interview notes and to make any corrections, deletions or additions to the substance of their testimony.

CSH employs snowball sampling, an informed consent process and semi-structured interviews (cf. Bernard 2005). A total of 23 individuals were contacted for this CIA (see Table 2, above); 14 did not respond; four provided referrals to other individuals; and five participated in formal “talk story” interviews. To assist in discussion of natural and cultural resources and any cultural practices specific to the project area, CSH initiated the “talk-story” sessions with questions from the five broad categories: Resource Gathering Practices, Marine and Freshwater Resources, Burials, Trails and Historic Properties. Presented below are brief backgrounds of participants’ “talk-story” sessions and their comments and concerns about the proposed project area.

7.1 Arlene Eaton

Arlene Eaton was born November 11, 1927 in Kapālama on the island of O‘ahu. Her *tūtū* (beloved relative, in this case, an aunty) Malia Kealoha in the Pu‘uloa and Honouliuli Ahupua‘a raised her.

Arlene Eaton was interviewed by CSH at McDonald’s Restaurant in ‘Ewa Beach on April 25, 2008. Mrs. Eaton, who is now 81 years old, kindly shared her memories and knowledge of Honouliuli Ahupua‘a and the project area.

The lower plains of Honouliuli Ahupua‘a contain innumerable limestone sinkholes. When Mrs. Eaton (AE) was asked about the events of December 7, 1941, she shared this story about both that tragic Sunday morning and a sinkhole cave in which her family took shelter:

> CSH: Do you remember the events of December 7, 1941? Were you at home at the time?
>
> AE: Yes, we didn’t know what it was. And so I said to *tūtū* [Grandma] in Hawaiian, “How come? What’s all that smoke up there?” She told me to stay inside. Near our *hale* [house)], we had a cove made out of coral, rock, natural. So we went in there and sat down. We watched all the things that were going on. I didn’t know what was going on.
>
> CSH: Did you hear the sounds of the bombs?
>
> AE: Oh, yes, terrible. You could hear the machines. You could hear the explosions. Even fragments of things would fly into our area. Again, we didn’t know what it was. Tūtū told me to go in the cove. So that nothing would come through to hurt us. It was dark so you could see the things going on…
>
> CSH: It was early in the morning time before the sun came up?

AE: Oh yeah, early in the morning. You know, you could hear the planes. I said to my grandfather, “I wonder what’s going on?” So he went to look outside because we used to take care of the ranch outside. All the *paniolo* (cowboys) outside were talking. I wasn’t supposed to be listening, but I could hear my grandfather say to them to take care of the animals then go in the cave. There were different caves. I was in one with my grandfather and my *tūtū* was in another cave with the men. We were watching the thing that was going on. It was only later we found out what was happening. We didn’t have a *ka‘a* [car]. The only time we had one was when my mom and dad would come down with the car. We had an Oakland. Do you know what an Oakland is? It looks like a Ford Model-T.

CSH: The hand crank kind?

AE: Yeah. So after that was all over my father took me to take me with him to *kula* [school]. But they were using the school as a hospital. In one of my classes, one of my good friends was a Japanese. She lived up the road from us in Kalihi right above School Street. I asked for her but no one knew where she was. Whenever we were going home, there was only one road to Honouliuli. When you get to the old Fort Weaver Road, no more street- you have to make your own. In that area, that’s where they put the Japanese, they were all prisoners. And my dad would go in there to get fresh water from the artesian well. Campbell asked that man to start the well. That’s where we got the water from. So he told me, “Come, your friend is in there.” There was all this iron with sharp things…

CSH: Barbed wire?

AE: Yes… I ran up to her and then she came to me. Even when I talk about it now… I asked her, “Fusae, what are you doing here?” And we hugged each other. Then I realized that my dad told me that we were at war with the Japanese. But I said, “And Fusae is not in Japan, she’s in Hawai‘i.” I always thought to her to be Hawaiian because she’s like me. But my Daddy said they put her in with her mother and the rest of them. I don’t how he did it, but my dad got them out.

CSH: Really? Wow!

AE: Yes, like I said, I lived in two worlds. Mom and Dad had maids in their houses. It never dawned on me about all of this because I was still young yet. Because she worked for us and he cleaned the yard and they stayed in a cottage in the back.

CSH: Did they have to stay in hiding?

AE: No, not in our area. They were not allowed to go out unless Dad took them. They needed a pass of some sort from what I understand. Our place was big- over 20,000 feet with the house and everything - so it was enough for them to play around in.

CSH: Were you able to maintain a friendship with them?

AE: Oh yes, of course. Like I said, they all passed away. Mother and Dad and Fusae.

CSH: What were their names?

AE: Kitamura. Fusae Kitamura. That I’ll never forget. She always would correct me because I only speak Hawaiian. She went to Japanese school and I like the bags they have. Japanese bag- all one thing, made out of a rice bag. I think that it had something a little sturdier on the inside. I said, “I want that bag.” She said, “No, you have to go to Japanese school.” I said, “Ok!” I never even told my mom. When she went, I followed here. Even now I remember how to say, “*Kita kita fune ga kita*- coming, coming, the boat is coming.” I’ll never forget that. Then she asked me, “What did you learn?” I said, “*Kita kita fune ga kita*, now give me that bag.” So I got the bag. I always remember that. When I got home, my mom was so upset. Then I showed my mom the bag and she said, “Don’t do that again.”

Honouliuli Ahupua‘a is well known for ghost sightings and spooky stories. Kaupe’a, an area located in the southwestern portion of Honouliuli Ahupua‘a, has been referred to as “*ao kuewa”* or a “barren or desolate place” for the island of O’ahu. Individuals who were unsuccessful in *leina ka ‘uhane* (leap into afterlife) due to disrespect to his or her *‘aumākua* (family deities) or parents, were banned to dwell at “*ao kuewa,”* a place in limbo between the living and the afterlife. In a Christian sense there are three places in the afterlife, heaven, hell and limbo or purgatory. From a Hawaiian cultural perspective, purgatory is “*ao kuewa.”* Mrs. Eaton shared this story about her *tūtū* and her encounter with the wandering spirits of Kaupe‘a:

AE: One day, she (*tūtū*) was sitting down and this handsome man came up to her. And he said, “Beautiful, the *kai* [ocean]. You come from here?” “She says, *‘ae* [yes] I come from here.” “You want to go to the ocean?” She didn’t know him but because he was handsome, she went with him. They were swimming and he was nice to her. They were bodysurfing. When she was done, she wanted to thank him because he gave her a push on the wave and turned around. But he wasn’t there. She came inside and sat down and she felt sad. While she was sitting there, an old man comes by.

“*E hele ana i ke kai? Maika‘i?*” [Did you go to the sea? Good?]

“*‘Ae* [Yes],” I said.

“Why you *‘uwe* [crying]? Why you crying for?” She told him a handsome man came and took her out but when she turned around, he was gone. The man told her, “Because this man is not a handsome man. He’s a *kupua* [ghost or supernatural being]”. Spooky yeah? “You better go home.” But she said she never forgot that. Whenever they talk about *kupua* she said to mind your own business. She says she would think about someday meeting a handsome man (this was before she met Tūtū, Grandpa). She said later on when she did meet Tūtū [Grandpa], she couldn’t believe it: that was her handsome man. You know, they never got married; they never knew what it was to be married. Not until later, families like my mother and father would come down and tell them to get married. They would ask, “What is that to get married? We already promised each other.”

Hāpu‘u (*Cibotium splendens)*, an indigenous tree fern (Figure 23) found in Hawai‘i and other Pacific islands, can reach a height of 35 to 40 feet. The tree fern has a thick, false trunk with a stem in the center and aerial roots on the outside. The following is a story Mrs. Eaton shared about her Tūtū being caught in a rainstorm and the shelter of the *hāpu’u* tree.

> AE: My *mo‘opuna* (grandchild) called me- she teaches and is going to graduate from UH this year. Her brother Makana needed a story about *hāpu‘u* for a project.
>
> “Why didn’t you go library?”
>
> “We looked, nothing.”
>
> I gave her a story about my Tūtū when she was young about *hāpu‘u*. This boy took it down and took it to *kula* [school] and he got an A+. People don’t understand that this area we had all this *hāpu‘u*. We had all these different kinds of plants that people never thought of. They think it’s too dry. My Tūtū was born and raised here. She never left this area. Not even to go on a canoe or anywhere else. She stayed here. I remember her telling me, it was raining. The wetlands were a forest. She had gone to get *kalo* [taro]. Then it started pouring. She saw the *hāpu‘u*. She imagined it to be big enough for her to get under but she realized “*Auwē* [oh no]! I can’t go under here, the rain will come through!” It was too rainy for her to get home and the only thing there was the *hāpu‘u*. Pretty soon she *oli* [chant] and *kāhea* [to call out] and asked for a place she could go under. One *hāpu‘u* opened its branches and another one opened over the little one and it covered right over her just like an umbrella. It rained and she sat under there. It was all *pau* [finished]; she was ready to go home. She went like that [motions hugging the *hāpu‘u*]. When she got home, my great grandmother said to her, “How come you not wet?” She said, “I gotta tell you something!” She said the story all over again. She said she’d never forget.
>
> I told my *mo‘opuna* he could add anything he wanted but don’t exaggerate but what I said was the truth. It’s such a small little thing, but imagine what had been in the forest.



Figure 23. Hāpu‘u Tree fern (*Cibotium Splendens)*

7.2 Shad Kane

Shad Kane, member of ‘Ahahui Siwila Hawai’i O Kapolei Hawaiian Civic Club, was interviewed by CSH at his home in Makakilo on April 24, 2008. As a Hawaiian cultural practitioner, Mr. Kane kindly shared his knowledge about the cultural significance of Kalo‘i Gulch and the area surrounding the Makakilo Drive Extension Project.

Mr. Kane (SK), a retired officer in the Honolulu Police Department, talked about numerous mysterious accidents that happened in and around the project area in Honouliuli Ahupua‘a:

> SK: I was an administrative lieutenant with the Honolulu Police Department from 1997 to 2000, when I retired. My job was to read reports. I had a lot of police reports I had to read. But the ones that I found really interesting were the accidents, all the fatal accidents between Makakilo and Waimanalo Gulch. And what was common in all the reports that I read, was that they mostly happen at night. The report shows they were simply driving around at night, and what’s hard to understand is that they just turned off the road. And in those few cases when someone survived, they all say they saw someone on the road. And that’s why they turned. Whether they saw someone or not, we don’t know. But they’re driving at night, no traffic and suddenly turn off the road and hit a pole or something.

Within the project area is an ancient Hawaiian trail (Figure 24) that runs from the bottom of Kalo‘i Gulch up towards the connection point of Makakilo Drive. The trail runs adjacent to the proposed project route below the Wai‘anae side ridgeline of Kalo‘i Gulch. Part of the trail has been destroyed in previous development projects. The remaining portion is a major concern for community members we interviewed:

> SK: The thing in my mind that’s most important is that Hawaiian Trail. Because this is it, this is the end of it. We actually have given it away for past projects for people to have beautiful homes. There’s only one piece of the trail left. It’s right there where Makakilo Drive ends. So, hopefully they don’t destroy what’s left. The scary part is that the Makakilo Drive extension will have to cross over the gulch to get to the ridge. This crossing will be right over the trail. You can actually still see the trail. It’s dry season now so you can see the trail easier. This Hawaiian trail is higher up on the ridge. So the trail is very close to their proposed routes for Makakilo Drive. The biggest impact that I see is going to be on the trail.



Figure 24. Hawaiian Trail extending from the bottom-right to the upper-left in Kalo‘i Gulch

7.3 Robert Alaka‘i

Robert Alaka‘i, cultural practitioner and member of Nakoa O Pālehua, was interviewed by CSH at the home of Shad Kane in Makakilo on April 24, 2008. Although he was present during the interview with Shad Kane, he did offer his insight regarding the project area and the *ahupua‘a* of Honouliuli.

When the subject of Huaka‘i Pō (Procession of the Night Marchers) in Honouliuli Ahupua‘a was mentioned in the interview with Shad Kane, Mr. Alaka‘i (RA) talked about something he experienced in the Kalo‘i area:

> RA: I am speaking from personal experience. You know right where the bridge is where they are hooking up the North/South Road [to the H1 Freeway]; I was coming home with my family at night. It was raining. I was driving in the extreme right lane. When I got to the bridge, a coral leaped about this big [his hands indicating the size of a basketball], came flying from the side of the road and hit my car, my front tire. But my car never shake, never do nothing…just kept on going. And when I got home, I turned on all the lights and I crawled underneath the car…I look what’s going on? Is there anything? You know the jeep in the back of me in this lane [indicating the left lane], when the thing hit, the coral went

> all over the road. And the Jeep in the back went slow down and then he kind of kept his distance till I got home. The next morning, in the papers, had one *wahine* [woman] coming home…hit that bridge…right there…die. So there’s something there. Right on that bridge, in that path, that’s where the rock came from…right in that area. So there’s something there. And you know, you can just look at…in this area, if you look at the highway, there’s certain spots on the highway has real high fatality rates.

Mr. Alaka‘i also expressed his concern for the remains of an ancient Hawaiian trail located in Kalo‘i Gulch.

7.4 Douglas ‘McD’ Philpotts

Douglas McDonald Philpotts (McD) is a long-time resident of the *ahupua‘a* of Honouliuli. His current residence in upper Makakilo has been his family’s home since 1970. He is a cultural practitioner in the art of Hawaiian woodworking. McD was previously interviewed by CSH for the Waimanalo Gulch Landfill Expansion Project in 2007 and again for the Makakilo Drive Expansion Project in June of 2008.

According to Bushnell (1993), at the time of the arrival of the first foreigners in 1778, the Hawaiian population was approximately 300,000. By the year 1820, when the first missionaries landed, the population was estimated at 150,000. Outbreaks of diseases, infections and other illnesses contributed greatly to the depopulation of the Native Hawaiians. By the time of the overthrow (or occupation, according to some) of the Hawaiian Kingdom in 1893, the Native Hawaiian population was reduced by 87 percent to about 40,000. McD shared the following statements about the native Hawaiian population in Honouliuli Ahupua‘a:

> McD: The fact that this community had the limited resources they did, is really part of this place and the story of the Hawaiians that lived here. This *ahupua‘a* was the most cooperative existence. We study the *ahupua‘a* of Kamehameha School’s resource book and posters and stuff like that. We see our cultural *ahupua‘a* cooperative system in Honouliuli. The *kahuna lāpa‘au*, you know everybody was a specialist, a *kahuna* [priest or specialist] of some sort…and they all brought in food and the farmer…but here it was critical. Just see the distance between Kalo‘i Gulch and where the *kalo* or the forest resources were. Or where the fish was coming from down at Lanikohunua. You couldn’t farm and fish in the same day. So you needed everybody doing their job so when the missionaries came up here and put their school in the *pa* [stone or walled enclosure] and spread the smallpox germ around, this whole thing came crashing down because everybody needed each other. They couldn’t run and hide and let the plague go by. So as soon as the medicine man is sick…*auwē* [an expression of grief]. As soon as the *kahuna* can’t get his people together, he can’t solve it. At a certain point, there may be 5 to 10 percent of the population left. Honouliuli was the major population center for the surrounding area. If the population had survived the massive outbreaks of diseases, or even if the surrounding communities had survived or were more intact, we would have so much more mo‘olelo to give us all the clues to this. I really feel we got to put together every little drop from the

> physical evidence to looking at the alignments, looking at chants and things that have been recorded, newspaper clippings that mention this place in relationship to all the places around our state and it gives you an idea of the importance of this place. It makes you want to go farther. This community went out in a flash. So that whole oral tradition of passing it on it just wiped out right there.

Mr. McD Philpotts also expressed his concern for the remains of an ancient Hawaiian trail located in Kalo‘i Gulch that travels upwards to where he lives now. As a child, McD would walk along this trail from Old Farrington Highway to the uplands of Pālehua to get home from school.

7.5 Keoni Nunes

Keoni Nunes is one of Hawai‘i’s leading experts on Hawaiian culture, customs and *kakau* (tattooing). He is a *kahuna ka kakau* (expert tattooist) who was raised on the leeward side of O‘ahu.

In the beginning of our interview with Keoni Nunes, he began describing his knowledge on the southwest portion of Honouliuli Ahupua‘a called Kaupe‘a. Referred to as “*ao kuewa,*” or purgatory, Kaupe‘a is synonymous with ghostly tales and strange occurrences:

> KN: This area, Pu‘uokapolei, that’s where they built the archery place. And they built a military establishment at Pu‘ukapolei and that was significant because of the stories of Kamapua‘a, who is the Hawaiian pig god. Prior to that this whole plain area was known as Kaupe‘a. Kaupe‘a was known as the “desolate and barren” area. There were a lot of *wiliwili* trees. And this area, at one point in time, in essence, was the Hawaiian equivalent of purgatory.
>
> CSH: Yes, it’s called *ao kuewa* (realm of homeless spirits). Kaupe‘a was O‘ahu’s *ao kuewa*, with it’s partner, *Leina ka ‘Uhane* [a place where spirits leaped into the nether world; literally, leap of the soul] located at Ka‘ena Point.
>
> KN: It was said that the *‘uhane* [spirit] would reside in the *wiliwili* trees. They ate moths and stuff. At one point in time, everything was cleared. It was really interesting because where they have Nānākai Hale and Honokai Hale [modern residential developments] …when they first built it up, they started re-planting *wiliwili* trees. People started to wonder why there was such a high amount of accidents in the area. So I was told by one of my *kūpuna* [elders] in Wai‘anae, Jay Landis, from what he understood, some of the relatives of Kamokila Campbell are still there. I think Aunty Lei Fernandez called some *kahu* [priest] to come out to do a blessing. And after the blessing, the accidents subsided. But I don’t know the whole story for that.
>
> CSH: So the place with the accidents happened with the new set of *wiliwili* trees or the original?
>
> KN: The new *wiliwili* trees. This whole area was cleared for development. There was a lot of sugarcane here at one time. The rail for the sugarcane was here also. So the original *wiliwili* that was here was pretty much destroyed. But *wiliwili* continued to grow up in the gullies and the gulches. Not so much in the plains

area, but near Honokai Hale they started planting *wiliwili*. And it started re-attracting all that kind ghosts over there. One of the reasons why Kaupe‘a was an area in which the souls dwelled is because you probably find many burials in that area. There are a lot of small cave sites in the area. So I believe there are many burials in the Kaupe‘a area, more on the *makai* [towards the ocean] side. As far as I understand, the people who didn’t live their lives well, ended up in the Kaupe‘a. But the journey to *Leina ka ‘Uhane* took a year. That’s why traditionally it was a year after a person’s death, there was a ceremony. I think they still practice that now but not so much anymore. The thought was that it took a year after you died to get to *Leina ka ‘Uhane*. A year after the year that you died, you’re let into Pō. What was told to me was that the Night Marchers had *kuleana* [responsibilities], or things they had to do in that existence. One time I took a friend of mine named Grant out there, we went out there and we went to look for some wood. We entered this area; it was really interesting because the wind was blowing a little bit. We entered this area in which everything was still, like we were in a bubble. We could see the wind blowing around this area, and right in this area, where we were, nothing was blowing. We couldn’t hear the wind. It became really quiet. We were right *mauka* [upland] of Pōhā Cave. I said, “Hmmm, it could be because the Night Marchers are getting ready to march.” And he just freaked out. And it was early enough in the evening so it would’ve been conducive to the Night Marcher procession. So we just left quickly. And he just bolted. I was laughing.

Section 8 Cultural Landscape of the Project Area

Specific aspects of traditional Hawaiian culture as they may relate to the project area in the broader context of the encompassing Honouliuli Ahupua‘a landscape are discussed below. Excerpts from the previous section (Kama‘āina “Talk Story” Interviews) are incorporated throughout this section where applicable.

8.1 Agriculture and Gathering of Plant Resources

The project area is located in Kalo‘i Gulch in the uplands of Honouliuli Ahupua‘a. Various Hawaiian legends and early historical accounts indicate that the *ahupua‘a* of Honouliuli was once widely inhabited by pre-Contact Hawaiian populations, including the Hawaiian *ali‘i* Attractive subsistence-related features of the *ahupua‘a* included irrigated lowlands suitable for wetland taro cultivation (Hammatt and Shideler 1990), as well as the lower forest area of the mountain slopes for the procurement of forest goods. Dicks et al (1987:78-79) conclude, on the basis of 19 carbon isotope dates and 3 volcanic glass dates, that “agricultural use of the area spans over 1,000 years.” Undoubtedly, Honouliuli was a locus of habitation for thousands of Hawaiians.

The area is associated with *‘iliahi alo‘e*, or sandalwood trees (*Santalum ellipticum*), endemic to the Hawaiian Islands. The open, drier forest and woodland area in the upper Honouliuli Ahupua‘a region is the ideal place for *‘iliahi alo‘e* to grow. During Kamehameha the Great’s reign (on O‘ahu) in the early 1800s, various foreign traders and native chiefs knew the commercial value of Hawaiian sandalwood as an export item. Before the introduction of Hawaiian sandalwood into the Canton market, most of the wood sold in China was white sandalwood (*Santalum album*), which was imported from India and the East Indies. Around the end of the 18th century, the supply of this Asian white sandalwood was becoming insufficient to meet market demands in China. This shortage resulted in an increasing market value of acceptable sandalwood from a variety of source areas, including Hawai‘i. As the islands emerged as a major source of raw material, the remote archipelago soon became known in China as “Tahn Heung Sahn” or “the Sandalwood Mountains” (Kepler 1983). The great burden of harvesting the sandalwood necessary to pay for the debts Kamehameha I (and many other chiefs) had incurred was principally laid upon the common Hawaiian people. The King “ordered men to go out in the mountains to cut sandalwood,” and then to transport this heavy harvest “...to the landings” (Kuykendall 1938). In an interview with Shad Kane, he points out that many of those sandalwood trees came from the *ahupua‘a* of Honouliuli.

8.2 Aquaculture, Marine and Fresh Water Resources

Within Honouliuli Ahupua‘a, not only is there a 12-mile-long coastline fronting the normally calm waters of leeward O‘ahu, but there are also four miles of waterfront along the west side of the West Loch of Pearl Harbor that offered extensive fisheries (mullet, *awa*, shellfish) as well as frontage suitable for development of fishponds and salt pans. In an interview with Arlene Eaton in May 2008, she described the coastal areas of Honouliuli and West Loch as rich *limu* (seaweed) gathering places. She says many types of *limu* could be harvested in the shallow waters off the ‘Ewa coastline, including the popular *limu kohu* and *limu manauea* or *ogo*. These

two types of *limu* are commonly use in *poke*, a local Hawaiian raw-fish dish that is a favorite delicacy for many island residents.

Mrs. Eaton also described the coastal landscape of the ‘Ewa plains as filled with numerous saltpans. She says some saltpans were as far inland as a mile to two miles. Salt harvesting was one of Honouliuli Ahupua‘a’s most important resource-gathering activities. Mrs. Eaton remembers as a child, whaling ships would dock at Pearl Harbor and the shipmen would come to Honouliuli and take the salt from the saltpans. She mentioned that when they left for their ship, the saltpans would all be destroyed and the salt gone.

Historic accounts of a Mr. Harry von Holt (Superintendent of the O.R. & L Ranch Department in the 1890s) describe his efforts to find water in the foothills of the Wai‘anae Range. Part of this search led to the description of the Pālehua Trail, along which were noted several small fresh-water springs that doubtless were known to local Native Hawaiians at that time. One or more of these small springs may have been located in the project area.

8.3 Historic Properties

As described in Section 3, there are numerous sites in Honouliuli Ahupua‘a of historic and cultural significance. The most famous of these sites is Pearl Harbor, which borders Honouliuli Ahupua‘a to the west. Mrs. Arlene Eaton, who was raised on the shores of Pearl Harbor in Pu‘uloa, recalled the events of December 7th, 1941 when the Japanese attacked Pearl Harbor. She and her family took shelter in one of the many sinkholes located throughout the ‘Ewa plains landscape. From a cave along the shores of west Pearl Harbor, they had a front row seat of the bombing of Pearl Harbor by the Japanese.

In Section 3 (Figure 11, Place names of Honouliuli, adapted from Sterling and Summers 1978), several *heiau* existed in the *ahupua‘a* of Honouliuli. Many of these *heiau* have been destroyed. Pālehua Heiau, located above Pu’u Makakilo, remains preserved and cared for until this day. Cared for by Nā Koa o Pālehua (The Warriors of Pālehua), the *heiau* continues to represent a significant cultural resource to many Hawaiian cultural practitioners. Pālehua literally translates to “*lehua* flower enclosure”(Pukui et al. 1974). Kawika McKeague, Vice Chair of the OIBC, gives an alternate meaning: “I disagree with Pukui; I don’t believe it’s only meaning is the *lehua* enclosure; I see two other words prominent- *pale* and *hua*, the idea that this place is where the *hua* is protected or perhaps in another meaning one is protected by *hua*, by jealousy.” According to the hawaiiwarrior.com website, *lehua* is another term for warrior based on a Chief’s lament after a battle. The *lehua* blossom is bright red and after one battle the field was covered with fallen warriors. The Chief reflected, poetically, on the bloody battlefield as fallen lehua. Pālehua may have been a training ground for warriors, “warrior enclosure.”

8.4 Burials

The coral plains of ‘Ewa have been the focus of more than 50 archaeological studies over the last two decades. The Kalaeloa (Barbers Point) area is one of the most studied places in Polynesia. There are three available studies on the Ko‘Olina project area on the west side of Honouliuli (Davis et al. 1986a; Davis et al. 1986b; Davis and Haun 1987). These studies documented approximately 180 component features at 48 sites and site complexes consisting of

habitation sites, gardening areas, and human burials dating from pre-Contact and early historic times.

No burials were documented at Kalo‘i Gulch during the recent archaeological inventory survey of the project area by CSH. In an interview with Keone Nunes, he believes Kaupe‘a—referring to the entire southwestern portion of Honouliuli, but specifically those portions along the coast—may contain many Hawaiian burials. Kaupe‘a is known as *“ao kuewa,”* a place of purgatory, barren and desolate; a place where the souls would wander around the Wiliwili trees.

8.5 Trails

There are several different references to trails in relation to the current project area. John Papa ‘Ī‘ī’s (1959) well-known descriptions of a network of leeward O‘ahu trails (see Figure 12) has been discussed above (see Section 3.3 Pre-Contact and Early History). ‘Ī‘ī described in general terms several major trail systems that in later historic times encircled and crossed the entire islands. One of these major trails passed from West Loch (western side of Pu‘uloa, or Pearl Harbor) through the Honouliuli lowlands—relatively close to the subject project area and in the general vicinity of the H-1 highway, past Pu‘u Kapolei and onto the Wai‘anae coast, eventually circumscribing the entire shoreline of O‘ahu (‘Ī‘ī 1959:96-98).

Another trail, possibly known as the Pālehua Trail, oriented roughly northwest by southeast and traversing the middle of the project area, appears to date from historic (late 19th century) times, and perhaps represents an earlier pre-Contact Hawaiian trail. Historic accounts of a Mr. Harry von Holt (Superintendent of the O.R. & L Ranch Department in the 1890s) describe his efforts to find water in the foothills of the Wai‘anae Range. Part of this search led to the description of the Pālehua Trail, along which were noted several small fresh-water springs that doubtless were known to local Native Hawaiians at that time.

Finally, several participants described an ancient Hawaiian trail within the project area (see Figure 24) that runs from the bottom of Kalo‘i Gulch up towards the connection point of Makakilo Drive. The trail runs adjacent to the proposed project route below the Wai‘anae side ridgeline of Kalo‘i Gulch. Part of the trail has been destroyed in previous development projects. The remaining portion is a major concern for community members we interviewed. Mr. Shad Kane talked specifically about the cultural and historic significance of this trail, as well as the imminent danger the trail is in due to the proposed project:

> The thing in my mind that’s most important is that Hawaiian Trail. Because this is it, this is the end of it. We actually have given it away for past projects for people to have beautiful homes. There’s only one piece of the trail left. It’s right there where Makakilo Drive ends. So, hopefully they don’t destroy what’s left. The scary part is that the Makakilo Drive extension will have to cross over the gulch to get to the ridge. This crossing will be right over the trail. You can actually still see the trail. It’s dry season now so you can see the trail easier. This Hawaiian trail is higher up on the ridge. So the trail is very close to their proposed routes for Makakilo Drive. The biggest impact that I see is going to be on the trail.

8.6 Wahipana

The term *wahipana* translates literally as “legendary” or “storied place,” and, as demonstrated in Sections 3.1 (Mythological and Traditional Accounts) and 3.2 (Legends and Traditional Places in Upland Honouliuli), Honouliuli Ahupua‘a is home to numerous such accounts. This subsection briefly reiterates several of the most relevant *wahipana* directly associated with the subject project area.

Honouliuli Ahupua‘a is well known for ghost sightings and spooky stories. Several of the participants in the community consultation phase of this project spoke of direct, personal experiences with such phenomena, as well as *mo‘olelo* handed down from others, including their *kūpuna.* It is striking how many different people have different stories or legends to tell about ghost sightings and spooky occurrences in and around the project area and the rest of Honouliuli.

Kaupe’a, an area located in the southwestern portion of Honouliuli Ahupua‘a, is an important part of this rich oral history related to ghostly sighting and happenings. Kaupe‘a has been referred to as “*ao kuewa*” or a “barren or desolate place” for the island of O’ahu. Individuals who were unsuccessful in *leina ka ‘uhane* (leap into afterlife) due to disrespect to his or her *‘aumakua* (family deities) or parents, were banned to dwell at *ao kuewa*, a place in limbo between the living and the afterlife. In a Christian sense there are three places in the afterlife, heaven, hell and limbo or purgatory. From a Hawaiian cultural perspective, purgatory is similar to *ao kuewa,* and Honouliuli is such a place.

Related also to this culturally-shared belief in Honouliuli’s ghostly tradition are *mo‘olelo* dealing with Huaka‘i Pō (Procession of the Night Marchers), a widespread traditional belief about processions or parades of spirits that typically travel down ridgelines from the mountains to the sea, which is the earthly entrance to *pō* (the “otherworld”). One of the participants for this study, Mr. Alaka‘i, spoke about a personal encounter with the “night marchers” in the Kalo‘i area:

> I am speaking from personal experience. You know right where the bridge is where they are hooking up the North/South Road [to the H1 Freeway], I was coming home with my family at night. It was raining. I was driving in the extreme right lane. When I got to the bridge, a coral leaped about this big [his hands indicating the size of a basketball], came flying from the side of the road and hit my car, my front tire. But my car never shake, never do nothing…just kept on going. And when I got home, I turned on all the lights and I crawled underneath the car…I look what’s going on? Is there anything? You know the jeep in the back of me in this lane [indicating the left lane], when the thing hit, the coral went all over the road. And the Jeep in the back went slow down and then he kind of kept his distance till I got home. The next morning, in the papers, had one *wahine* [woman] coming home…hit that bridge…right there…die. So there’s something there. Right on that bridge, in that path, that’s where the rock came from…right in that area. So there’s something there. And you know, you can just look at…in this area, if you look at the highway, there’s certain spots on the highway has real high fatality rates.

Closer to the specific area of the proposed project, Kalo‘i, which translates as “the taro patch,” was a well-known place of Native Hawaiian activity from before the historic era, and represents another important *wahipana.* Given the physiographic location and characteristics of the project area, it is unlikely to have ever been a place of permanent Hawaiian settlement; however, the presence of several small fresh-water springs in the general gulch system, as described in historic accounts, suggests Hawaiians used at least portions of the project area as gardening sites.

Finally, as discussed in some detail above (see Section 8.1.5 Trails), the project area is home to one or more old trails that also constitute important *wahipana* to many Native Hawaiians.

Section 9 Summary and Recommendations

At the request of R. M. Towill Corporation, Cultural Surveys Hawai‘i, Inc. (CSH) prepared this Cultural Impact Assessment (CIA) for the approximately 23-acre Makakilo Drive Extension Project, Honouliuli Ahupua‘a, ‘Ewa District, O‘ahu (TMK [1] 9-2-002: 006 & 9-2-003:079). The project area is approximately 3,300 feet long by 300 feet wide, extending from the end of the existing Makakilo Drive to the proposed North-South Road interchange with Interstate H-1.

Currently three alignment options have been identified by the project proponents; one of these will eventually be selected, in consultation with the community and relevant government agencies. The project area is privately owned by D.R. Horton – Schuler Homes LLC, Castle & Cooke Homes Hawaii, Inc. Minimally, land-disturbing activities will include grubbing and grading and excavations for subsurface utilities and associated infrastructure improvements. This CIA is intended to support the project’s environmental review, in accordance with applicable laws, and may also serve to support the project’s historic preservation review.

A recent archaeological inventory survey of the subject project area by CSH (Tulchin et al. 2008) identified two previously-undocumented historic sites: State Inventory of Historic Properties (SIHP) Nos. 50-80-12-6950, a drainage ditch associated with the historic-era commercial sugar cane industry; and 50-80-12-6951, a small reservoir associated with the historic-era commercial sugar cane industry. In addition to these historic properties, two newly-identified features associated with the previously documented SIHP No. 50-80-09-2268 (Waiāhole Ditch System) were also recorded.

9.1 Results of background Research

Background research yields the following relevant information:

1. The project area is located in the Kalo’i Gulch floodplain, which includes the Kalo‘i Stream channel. Kalo‘i, which translates as “the taro patch,” was a well-known place of Native Hawaiian activity from before the historic era. Given the physiographic location and characteristics of the project area, it is unlikely to have ever been a place of permanent Hawaiian settlement; however, the presence of several small fresh-water springs in the general gulch system, as described in historic accounts, suggests Hawaiians used at least portions of the project area as gardening sites.
2. The project area also contains remnants of one or more old Hawaiian trails.
3. Given its location within Honouliuli Ahupua‘a, the project area is generally associated with a wide variety and extensive number of *mo‘olelo* (oral histories), including legends, mythological accounts, stories, parables and sayings; these include, for example, the exploits of gods and demi-gods such as Kāne, Kanaloa, Māui, Kamapua‘a (the pig god), Maunauna (the shark deity), Ka‘ahupāhau, and the hero Palila. There are several references associated with Honouliuli to chiefly lineages and to the ruling chiefs Hilo-a-Lakapu and Kūali‘i.

4. The project area is also closely associated with commercial sugar cane agriculture on O‘ahu; in particular, the project area retains archaeological features related to water-management and transport facilities, including the famous Waiāhole Ditch.

9.2 Results of Community Consultation

A total of 23 individuals were contacted for this CIA; 14 did not respond; four provided referrals to other individuals; and five participated in formal “talk story” interviews. Community consultation yielded the following cultural concerns:

1. Several participants are very concerned about one or more trails crossing through the subject project area; at least one of the trails is perceived to be an old Hawaiian trail dating from early historic or perhaps even pre-Contact times. Mr. Shad Kane, in particular, stressed that this trail—part of which is depicted in Figure 23—should not be sacrificed or physically compromised to make way for the proposed project.
2. Several participants talked about a wide variety of “ghost stories” and unexplained phenomena either experienced personally or related by others in old stories dealing with the general vicinity of the project area, and extending to much of the entire *ahupua‘a* of Honouliuli.
3. Some participants stressed the importance of not losing any additional Hawaiian features of the landscape, such as trails, to development in and around the project area, which has experienced substantial losses in historic and more recent times.
4. One participant talked about the cultural significance of *wiliwili* trees, which are closely associated with “*ao kuewa*,” a kind of Hawaiian purgatory.

9.3 Recommendations

Based on all available information, including background research and community consultation, CSH recommends the following measures, which, if addressed in a good faith manner, will help mitigate potentially adverse effects of the proposed project:

1. The old Hawaiian trail depicted in Figure 24 of this report, and described by several participants in this CIA, should be preserved in its entirely and protected from potential harm during project construction. Preservation and protection of this trail may require a formal preservation plan with additional fieldwork directed towards obtaining accurate GPS data to adequately mark and flag the feature during construction.
2. All Native Hawaiian trees, including *wiliwili* and *‘iliahi* (sandalwood) should be preserved within the project area in perpetuity, and protected from harm during construction.
3. Cultural monitoring of the two aforementioned items (i.e., trail and native tree protection) should be conducted by qualified and interested individuals or organizations such as the participants in the “talk story” interviews included above.

4. Consultation with the organizations, agencies and individuals listed in this CIA should continue throughout the project, including any future alterations or updated proposals.

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APPENDIX G

Noise Study, D.L. Adams, October 2008

D. L. ADAMS ASSOCIATES, LTD.
Consultants in Acoustics and Performing Arts Technologies

Environmental Noise Assessment Report
Makakilo Drive Extension
Ewa, Oahu, Hawaii

October 2008

DLAA Project No. 08-48

Prepared for:
R.M. Towill Corporation
Honolulu, Hawaii

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1.0 EXECUTIVE SUMMARY

1.1 The Makakilo Drive Extension project proposes to extend Makakilo Drive south (makai) and connect to the H-1 Freeway interchange. The completed project will connect east Makakilo Drive to the H-1 Freeway and the future North/South Road. The existing project site is undeveloped land with vegetation. Makakilo Drive currently dead ends in the newly developed Wai Kalo'i residential neighborhood in Makakilo Heights, makai of Pueonani Street.

1.2 The project area currently experiences noise levels typical of a suburban/rural environment. Noise measurements taken on the existing project property show an average day-night level, L_{dn}, of 50 dBA. These noise levels are well within the threshold of the EPA and HUD exterior noise design goal of $L_{dn} \leq 65$ dBA. Ambient noise levels near the project site will increase with the extension, but will still be within the current EPA and HUD exterior noise design goals.

1.3 During the project construction, the dominant noise sources will likely be earth moving equipment, such as bulldozers and diesel powered trucks. Noise from construction activities will occur on the project site. Noise from construction activities should be short term and must comply with State of Hawaii Community Noise Control Rules and a construction noise permit issued by the Department of Health.

1.4 The results of the vehicular traffic noise analysis show increases in traffic noise levels due to the project for the residents who live adjacent to Makakilo Drive east of Kikaha Street. Since this increase does not substantially exceed existing traffic noise levels and future predicted noise levels are below the FHWA/HDOT maximum noise limit of 67 dBA, the project is not expected to produce a significant traffic noise impact on these residences.

1.5 Makakilo Drive Extension project is expected to ease the traffic burden along (west) Makakilo Drive. Therefore, residences along (west) Makakilo Drive (Location C) should experience decreased vehicular traffic noise levels due to the project.

1.6 Noise levels in the vicinity of the extended Makakilo Drive are expected to increase by a significant amount but will still meet the current EPA design goal as well as the HUD noise criteria for "Acceptable" housing sites.

2.0 PROJECT DESCRIPTION

The Makakilo Drive Extension project proposes to extend Makakilo Drive south (makai) and connect to the H-1 Freeway interchange. The completed project will connect east Makakilo Drive to the H-1 Freeway and the future North/South Road. The existing project site is undeveloped land with vegetation. Makakilo Drive currently dead ends in the newly developed Wai Kalo'i residential neighborhood in Makakilo Heights, makai of Pueonani Street.

3.0 NOISE STANDARDS

Various local and federal agencies have established guidelines and standards for assessing environmental noise impacts and set noise limits as a function of land use. A brief description of common acoustic terminology used in these guidelines and standards is presented in Appendix A.

3.1 State of Hawaii, Community Noise Control

The State of Hawaii Community Noise Control Rule [Reference 1] defines three classes of zoning districts and specifies corresponding maximum permissible sound levels due to *stationary* noise sources such as air-conditioning units, exhaust systems, generators, compressors, pumps, etc. The Community Noise Control Rule does not address most *moving* sources, such as vehicular traffic noise, air traffic noise, or rail traffic noise. However, the Community Noise Control Rule does regulate noise related to agricultural, construction, and industrial activities, which may not be stationary.

The maximum permissible noise levels are enforced by the State Department of Health (DOH) for any location at or beyond the property line and shall not be exceeded for more than 10% of the time during any 20-minute period. The specified noise limits which apply are a function of the zoning and time of day as shown in Figure 1. With respect to mixed zoning districts, the rule specifies that the primary land use designation shall be used to determine the applicable zoning district class and the maximum permissible sound level. In determining the maximum permissible sound level, the background noise level is taken into account by the DOH.

3.2 U.S. Federal Highway Administration (FHWA)

The FHWA defines four land use categories and assigns corresponding maximum hourly equivalent sound levels, $L_{eq(h)}$, for traffic noise exposure [Reference 2], which are listed in Figure 2. For example, Category B, defined as picnic and recreation areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals, has a corresponding maximum exterior L_{eq} of 67dBA and a maximum interior L_{eq} of 52 dBA. These limits are viewed as design goals, and all projects meeting these limits are deemed in conformance with FHWA noise standards. Calculation of traffic noise levels should be conducted using a Federal Highway Administration traffic noise model [Reference 3].

3.3 Hawaii Department of Transportation (HDOT)

The HDOT has adopted FHWA's design goals for traffic noise exposure in its noise analysis and abatement policy [Reference 4]. According to the policy, a traffic noise impact occurs when the predicted traffic noise levels "approach" or exceed FHWA's design goals or when the predicted traffic noise levels "substantially exceed the existing noise levels." The policy also states that "approach" means at least 1 dB less than FHWA's design goals and "substantially exceed the existing noise levels" means an increase of at least 15 dB.

3.4 U.S. Environmental Protection Agency (EPA)

The U.S. EPA has identified a range of yearly day-night equivalent sound levels, L_{dn}, sufficient to protect public health and welfare from the effects of environmental noise [Reference 5]. The EPA has established a goal to reduce exterior environmental noise to an L_{dn} not exceeding 65 dBA and a future goal to further reduce exterior environmental noise to an L_{dn} not exceeding 55 dBA. The EPA has also identified an interior noise level goal of 45 dBA to protect public health from indoor activity interference and annoyance. Additionally, the EPA states that these goals are not intended as regulations as it has no authority to regulate noise levels, but rather they are intended to be viewed as levels below which the general population will not be at risk from any of the identified effects of noise.

3.5 U.S. Department of Housing and Urban Development (HUD)

HUD's environmental noise criteria and standards in 24 CFR 51 [Reference 6] were established for determining housing project site acceptability. These standards are based on day-night equivalent sound levels, L_{dn}, and are not limited to traffic noise exposure. However, for project sites in the vicinity of highways, the L_{dn} may be estimated to be equal to the design hour $L_{eq}(h)$, provided "heavy trucks (vehicles with three or more axles) do not exceed 10 percent of the total traffic flow in vehicles per 24 hours and the traffic flow between 10:00 p.m. and 7:00 a.m. does not exceed 15 percent of the average daily traffic flow in vehicles per 24 hours." For these same conditions, L_{dn}, may also be estimated as 3 dB less than the design hour L_{10}.

HUD site acceptability criteria rank sites as Acceptable, Normally Unacceptable, or Unacceptable. "Acceptable" sites are those where exterior noise levels do not exceed an L_{dn} of 65 dBA. Proposed housing projects on "Acceptable" sites do not require additional noise attenuation other than that provided by customary building techniques. "Normally Unacceptable" sites are those where the L_{dn} is above 65 dBA, but does not exceed 75 dBA. Housing on "Normally Unacceptable" sites requires some form of noise abatement, either at the property line or in the building construction, to ensure the interior noise levels are acceptable. "Unacceptable" sites are those where the L_{dn} is 75 dBA or higher. The term "Unacceptable" does not necessarily mean that housing cannot be built on those sites; however, more elaborate sound attenuation will likely be needed.

HUD's regulations do not contain standards for interior noise levels, rather attenuation requirement to achieve a goal of 45 dBA. This assumes that standard construction of any building will provide sufficient attenuation such that if the exterior L_{dn} is 65 dBA or less (i.e., an "acceptable site"), the interior L_{dn} will be 45 dBA or less.

4.0 EXISTING ACOUSTICAL ENVIRONMENT

Two types of noise measurements were conducted to assess the existing acoustical environment in the vicinity of the project location, as shown in Figure 3. The first noise measurement type consisted of continuous long-term ambient noise level measurements (Location L1). The second type of noise measurement was short-term and included traffic counts (Location S1). The purpose of the short-term noise measurements and corresponding traffic counts were to validate a traffic noise prediction model. All noise measurements were conducted between October 3, 2008 and October 6, 2008.

4.1 Noise Measurement Procedure

Long-Term Noise Measurement Procedure

Continuous, hourly averaged, statistical sound levels were recorded for 3 days. The measurements were taken using a Larson-Davis Laboratories, Model 820, Type-1 Sound Level Meter together with a Larson-Davis, Model 2560 Type-1 Microphone. Calibration was checked before and after the measurements with a Larson-Davis Model CAL200 calibrator. Both the sound level meter and the calibrator have been certified by the manufacturer within the recommended calibration period. The microphone was mounted on a fence, approximately 5 feet above grade. A windscreen covered the microphone during the entire measurement period. The sound level meter was secured in a weather resistant case.

Short-Term Noise Measurement Procedure

An approximate 30-minute equivalent sound level, L_{eq}, was measured. Vehicular traffic counts and traffic mix were documented during the measurement period. The noise measurement was taken using a Larson-Davis Laboratories, Model 824, Type-1 Sound Level Meter together with a Larson-Davis, Model 2541 Type-1 Microphone. Calibration was checked before and after the measurements with a Larson-Davis Model CAL200 calibrator. Both the sound level meter and the calibrator have been certified by the manufacturer within the recommended calibration period. The microphone and sound level meter were mounted on a tripod, approximately 5 feet above grade. A windscreen covered the microphone during the entire measurement period.

4.2 Noise Measurement Locations

Long-Term Noise Measurement Location

Location L1: Positioned along the boundary fence of the Wai Kalo'i at Makakilo residential development near the terminus of the existing Makakilo Drive.

Short-Term Noise Measurement Locations

Location S1: Positioned adjacent to Makakilo Drive, between Kikaha Street and Alahoi Street, approximately 40 feet southwest of the edge-of-pavement.

4.3 Long-Term Noise Measurement Results

The measured ambient sound levels are representative of a quiet suburban/rural environment. The hourly equivalent sound levels, $L_{eq,}$ at Location L1 generally range from 42 to 52 dBA during the day. At night, noise levels drop off and the hourly L_{eq} ranges from 40 to 47 dBA. The average day-night Level, L_{dn}, was calculated from the measured noise levels to be 50 dBA.

The results from the long-term noise measurement are graphically presented in Figure 4, which shows the measured equivalent sound level, L_{eq}, in A-weighted decibels (dBA) as a function of the measurement date and time. Construction activities may have occurred in the vicinity of the measurement location during the noise measurement period

The dominant and secondary noise sources are described below:

Noise Sources

Dominant: Birds, wind

Secondary: Traffic noise from the distant H-1 Freeway, typical suburban noises such as dogs barking, sirens, pedestrians, aircraft flyovers, distant construction noise, etc.

5.0 POTENTIAL NOISE IMPACTS DUE TO THE PROJECT

5.1 Project Construction Noise

Development of the project area will involve excavation, drilling, grading, paving, and other typical construction activities during construction. The various construction phases of the project may generate significant amounts of noise. The residences located near the existing Makakilo Drive terminus may be impacted by the construction noise due to their proximity to the project. The actual noise levels produced during construction will be a function of the methods employed during each stage of the construction process. Typical ranges of construction equipment noise are shown in Figure 5. Earthmoving equipment, e.g., bulldozers and diesel-powered trucks, and drilling rigs will probably be the loudest equipment used during construction.

5.2 Compliance with FHWA/HDOT Noise Limits

A vehicular traffic noise analysis was completed for the existing conditions and the future year (2025) projections using the FHWA Traffic Noise Model Look-up Tables Software Version 2.5 (2004) [Reference 7]. The traffic noise analysis is based on the traffic counts taken along the existing Makakilo Drive and future traffic volumes at the Makakilo Drive/North-South Road/H-1 Freeway

interchange provided by the Traffic Consultant [Reference 8]. This traffic impact analysis report shows predicted traffic volumes for the year 2025 at the North-South Road/H-1 interchange only and did not include existing and future traffic volumes for the existing Makakilo Drive in upper Makakilo. Vehicular traffic noise levels were calculated for 2 locations (Locations A and B) along Makakilo Drive, as shown in Figure 3. The results of the traffic noise analysis are described below and summarized in Table 1.

Noise Prediction Location A:
The extension of Makakilo Drive will provide a continuation of the existing roadway down to the H-1 Freeway interchange and will change the traffic patterns for the residents of Makakilo. Currently, the only access in and out of Makakilo and Makakilo Heights is via (west) Makakilo Drive. The Makakilo Drive extension to the east will provide an alternate route for the existing and future residents of Makakilo Heights and will be the shortest route to the H-1 Freeway and North-South Road for those residents. Therefore, traffic volumes will significantly increase for the residents who live adjacent to Makakilo Drive east of Kikaha Street. Future noise level projections for the existing homes along Makakilo Drive (Location A) are predicted to be below the FHWA/HDOT maximum noise limit of 67 dBA and residences are expected to experience a traffic noise level increase of approximately 6 dB due to the project. Since this increase does not substantially exceed existing traffic noise levels, a noise impact on these existing residences due to vehicular traffic noise is not expected.

Noise Prediction Location B:
A vehicular traffic noise analysis was also completed for the existing and future year projections (with and without the project) at the existing (west) Makakilo Drive. Existing and future traffic volumes for the west Makakilo Drive/H-1 interchange were provided in a separate traffic impact analysis report [Reference 9]. The traffic report shows that the Makakilo Drive Extension project will ease the traffic burden along (west) Makakilo Drive when compared to year 2025 traffic projects without the project. Therefore, residences along (west) Makakilo Drive (Location C) are expected to experience a traffic noise level *decrease* of approximately 2 dB due to the project.

Future Homes along Makakilo Drive:
The future Wai Kalo'i homes located near the terminus of Makakilo Drive currently experience low ambient noise levels due to the lack of major roadways in the area. Once the Makakilo Drive extension is complete, vehicular traffic noise will increase the ambient noise in the area. The traffic noise analysis shows that traffic noise from the future Makakilo Drive extension should be less than 15 dB over existing ambient noise levels at these homes. Therefore, a significant noise impact on these future residences due to vehicular traffic noise is not expected. New homes should be built at least 25 feet from the edge-of-pavement from new road to avoid a noise impact due to traffic noise.

The Makakilo Drive Extension project is a county road, not funded by Federal or State agencies. Therefore, compliance with FHWA and HDOT noise limits is not

required. However, the FHWA/HDOT standards provide a good guide for evaluating noise impacts due to the new road.

5.3 Compliance with HUD and EPA Noise Guidelines

The HUD noise guidelines state an exterior design goal of $L_{dn} \leq 65$. Similarly, the EPA has an existing design goal of $L_{dn} \leq 65$ dBA and a future design goal $L_{dn} \leq 55$ dBA for exterior noise levels. The results from the long-term noise measurements conducted at the proposed project site show a calculated day-night level, L_{dn}, of 50 dBA. Noise levels in the vicinity of the extended roadway are expected to increase significantly but will still meet the current EPA design goal as well as the HUD noise criteria for "Acceptable" housing sites.

It is important to note that the EPA noise guidelines are design goals and are not enforceable regulations. However, these guidelines and design goals are useful tools for assessing the noise environment.

6.0 NOISE IMPACT MITIGATION

6.1 Mitigation of Construction Noise

In cases where construction noise exceeds, or is expected to exceed the State's "maximum permissible" property line noise levels [Reference 1], a permit must be obtained from the State DOH to allow the operation of vehicles, cranes, construction equipment, power tools, etc., which emit noise levels in excess of the "maximum permissible" levels.

In order for the State DOH to issue a construction noise permit, the Contractor must submit a noise permit application to the DOH, which describes the construction activities for the project. Prior to issuing the noise permit, the State DOH may require action by the Contractor to incorporate noise mitigation into the construction plan. The DOH may also require the Contractor to conduct noise monitoring or community meetings inviting the neighboring residents and business owners to discuss construction noise. The Contractor should use reasonable and standard practices to mitigate noise, such as using mufflers on diesel and gasoline engine machines, using properly tuned and balanced machines, etc. However, the State DOH may require additional noise mitigation, such as temporary noise barriers, or time of day usage limits for certain kinds of construction activities.

Specific permit restrictions for construction activities [Reference 1] are:

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

"No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels... before 9:00 a.m. and after 6:00 p.m. on Saturday."

"No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels on Sundays and on holidays."

The use of hoe rams and jack hammers 25 lbs. or larger, high pressure sprayers, chain saws, and pile drivers are restricted to 9:00 a.m. to 5:30 p.m., Monday through Friday. In addition, construction equipment and on-site vehicles or devices whose operations involve the exhausting of gas or air, excluding pile hammers and pneumatic hand tools weighing less than 15 pounds, must be equipped with mufflers [Reference 1].

The DOH noise permit does not limit the noise level generated at the construction site, but rather the times at which noisy construction can take place. Therefore, noise mitigation for construction activities should be addressed using project management, such that the time restrictions within the DOH permit are followed.

6.2 Mitigation of Vehicular Traffic Noise

The traffic noise analysis shows no significant noise impacts to the project or the surrounding community. Therefore, noise mitigation for vehicular traffic noise is not required.

REFERENCES

1. Chapter 46, *Community Noise Control*, Department of Health, State of Hawaii, Administrative Rules, Title 11, September 23, 1996.

2. *Department of Transportation, Federal Highway Administration Procedures for Abatement of Highway Traffic Noise*, Title 23, CFR, Chapter 1, Subchapter J, Part 772, 38 FR 15953, June 19, 1973; Revised at 47 FR 29654, July 8, 1982.

3. *Federal Highway Administration's Traffic Noise Model*, FHWA-RD-77-108; U.S. Department of Transportation, December 1978.

4. *Noise Analysis and Abatement Policy*, Department of Transportation, Highways Division, State of Hawaii, June 1977.

5. *Toward a National Strategy for Noise Control*, U.S. Environmental Protection Agency, April 1977.

6. *Department of Housing and Urban Development Environmental Criteria and Standards*, Title 24 CFR, Part 51, 44 FR 40860, July 12, 1979, Amended by 49 FR 880, January 6, 1984.

7. Federal Highway Administration's Traffic Noise Model Look-up Tables Software, Ver. 2.5; U.S. Department of Transportation, December 17, 2004.

8. *Traffic Projections for Makakilo Drive Extension Memorandum,* Julian Ng, Inc., October, 2008.

9. *North-South Road Corridor Study – Final Interstate Access Modification Request,* Parsons Brinckerhoff Quade & Douglas, Inc., December 2004.

TABLE 1:
Predicted Traffic Noise Levels and Resulting Increases Due to the Project[+]

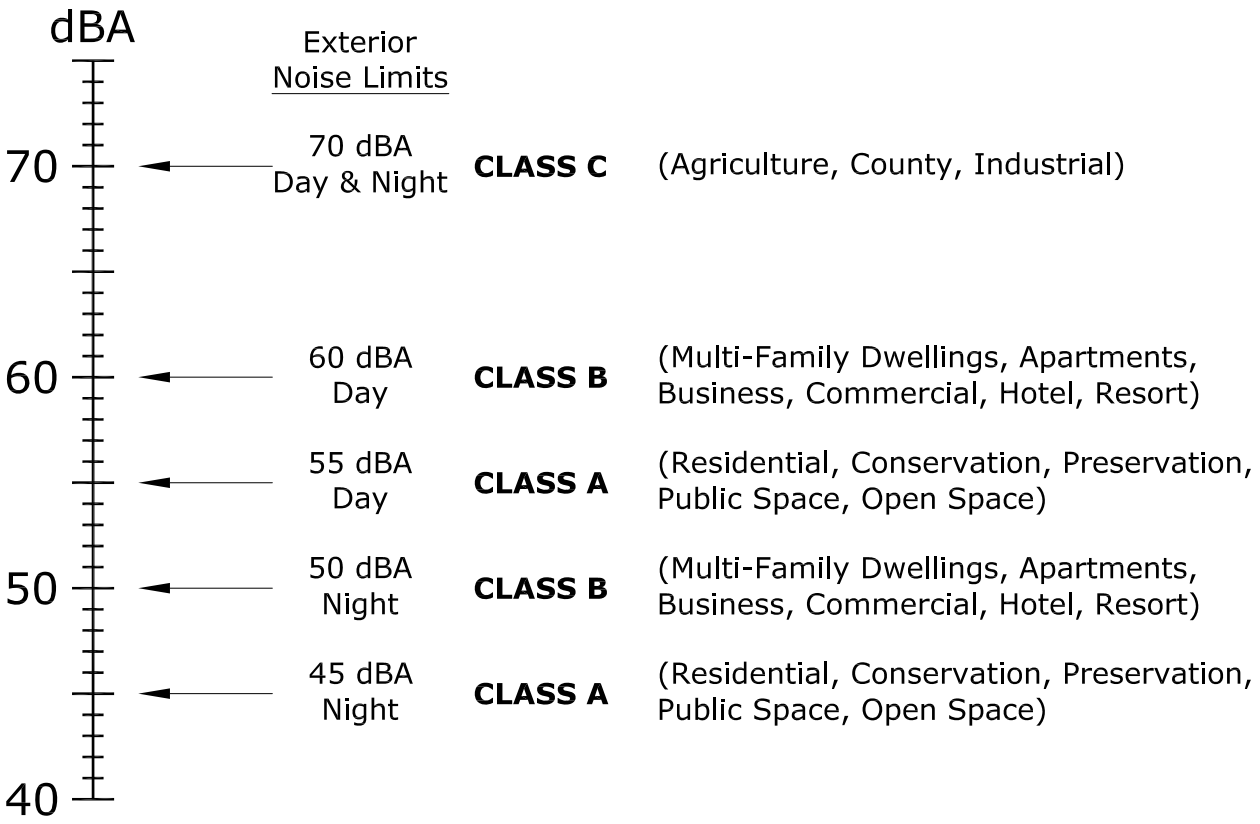
Noise levels shown in the table are based on peak-hour traffic volumes, and are expressed in A-weighted decibels (dBA).

	Location A[*]		Location B[*]	
	AM	**PM**	**AM**	**PM**
Existing (Calculated)	58.2	58.3	65.6	65.8
Future Without Project (2025)	N/A	N/A	68.2	67.5
Future With Project (2025)	64.2	64.5	66.3	65.3
Future Increase Without Project (2025)	N/A	N/A	2.6	1.7
Future Increase With Project (2025)	6.0	6.2	0.7	-0.5
Future Increase Due to Project (2025)	**6.0**	**6.2**	**-1.9**	**-2.2**

[+] The noise level calculations were based on the traffic studies provided for this project [References 8 & 9].

[*] Location A - 25 feet north of (East) Makakilo Drive edge-of-pavement
Location B – 25 feet north east of (West) Makakilo Drive edge of pavement

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



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Hawaii Maximum Permissible Sound Levels for Various Zoning Districts

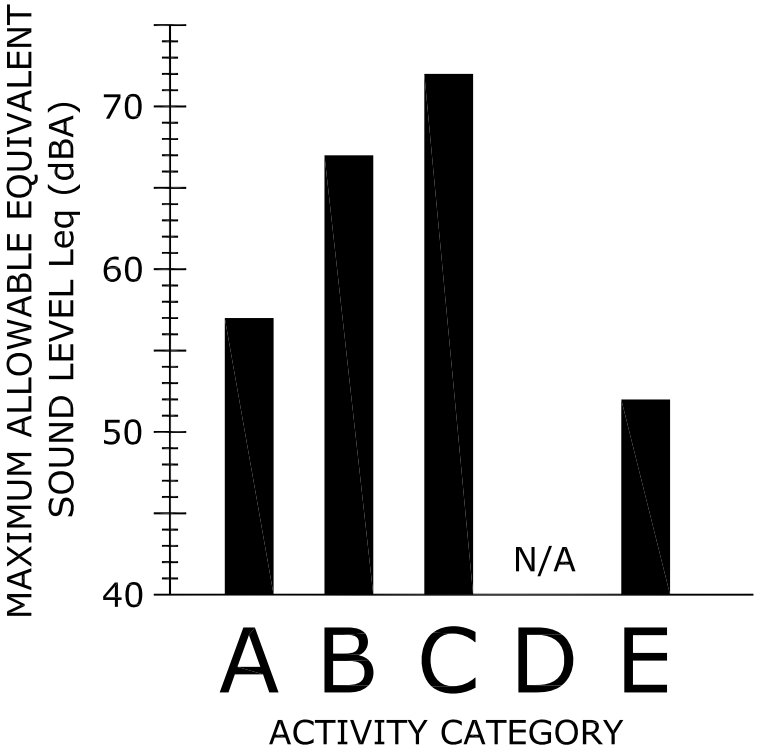
Makakilo Drive Extension

Not to Scale

Figure No 1

Date	Project No.	Drawn By
October 2008	08-48	TRB

ACTIVITY CATEGORY	ACTIVITY CATEGORY DESCRIPTION	MAXIMUM EQUIVALENT SOUND LEVEL $L_{eq(h)}$
A	LANDS ON WHICH SERENITY AND QUIET ARE OF EXTRAORDINARY SIGNIFICANCE AND SERVE AN IMPORTANT PUBLIC NEED AND WHERE THE PRESERVATION OF THOSE QUALITIES IS ESSENTIAL IF THE AREA IS TO CONTINUE TO SERVE ITS INTENDED PURPOSE.	57 dBA (EXTERIOR)
B	PICNIC AREAS, RECREATION AREAS, PLAYGROUNDS, ACTIVE SPORT AREAS, PARKS, RESIDENCES, MOTELS, HOTELS, SCHOOLS, CHURCHES, LIBRARIES, AND HOSPITALS.	67 dBA (EXTERIOR)
C	DEVELOPED LANDS, PROPERTIES, OR ACTIVITIES NOT INCLUDED IN ACTIVITY CATEGORIES A OR B ABOVE.	72 dBA (EXTERIOR)
D	UNDEVELOPED LAND	N/A
E	RESIDENCES, MOTELS, HOTELS, PUBLIC MEETING ROOMS, SCHOOLS, CHURCHES, LIBRARIES, HOSPITALS, AND AUDITORIUMS.	52 dBA (INTERIOR)



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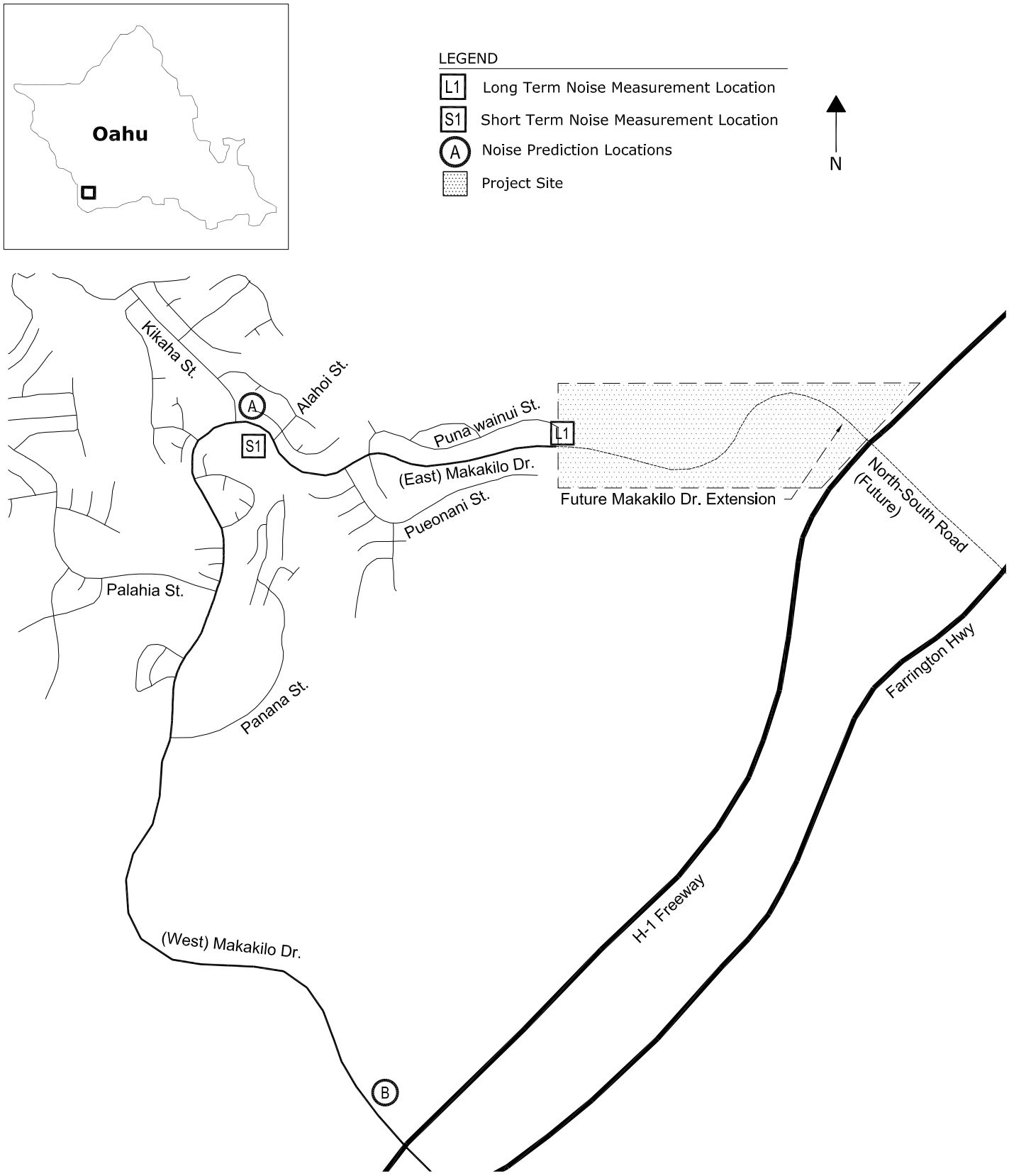
Federal Highways Administration Recommended Equivalent Hourly Sound Levels Based on Land Use

Makakilo Drive Extension

Not to Scale

Figure No 2

Date	Project No.	Drawn By
October 2008	08-48	TRB



Noise Measurement and Prediction Locations

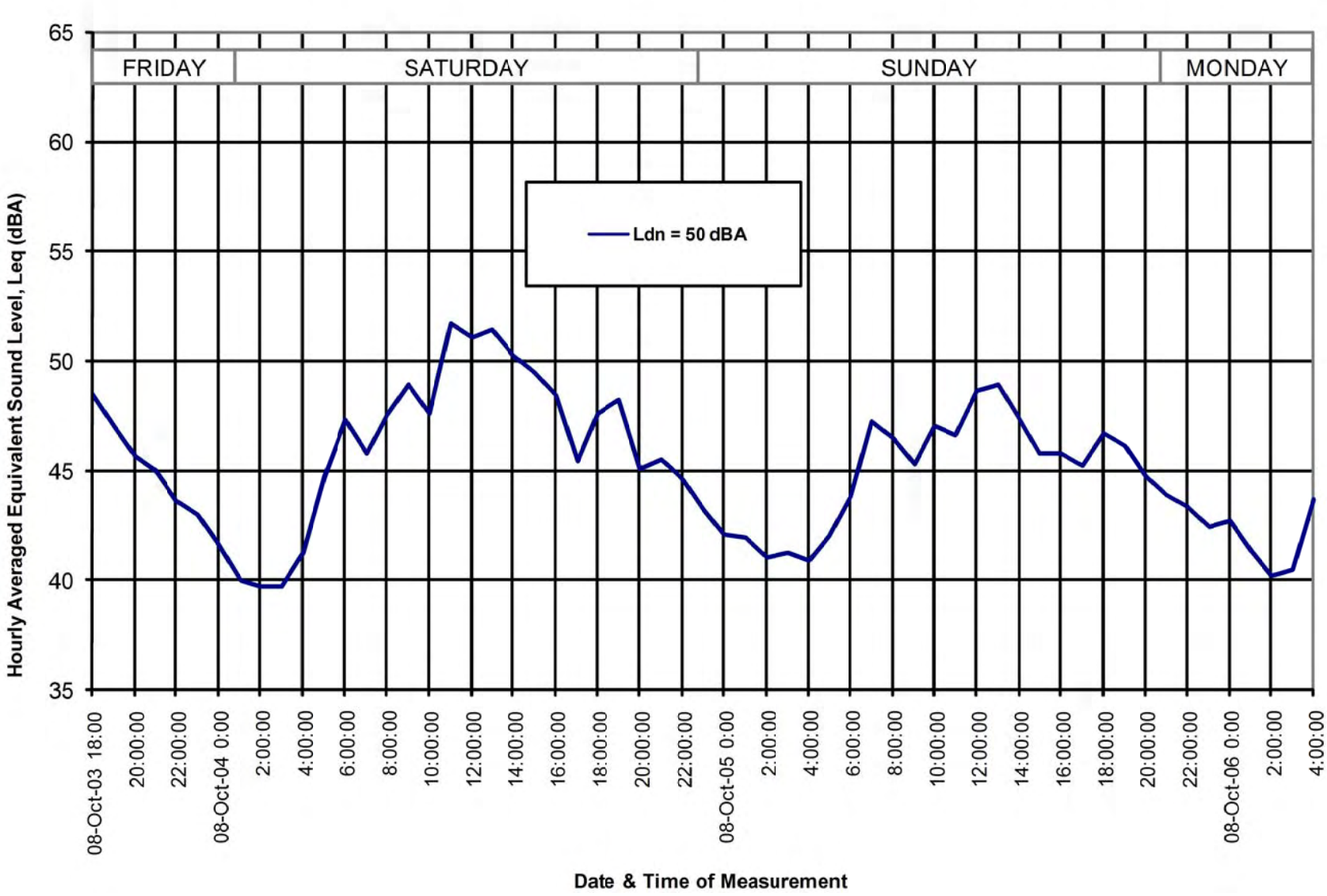
Makakilo Drive Extension

Not to Scale

Figure No 3

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Date	Project No.	Drawn By
October 2008	08-48	KMF



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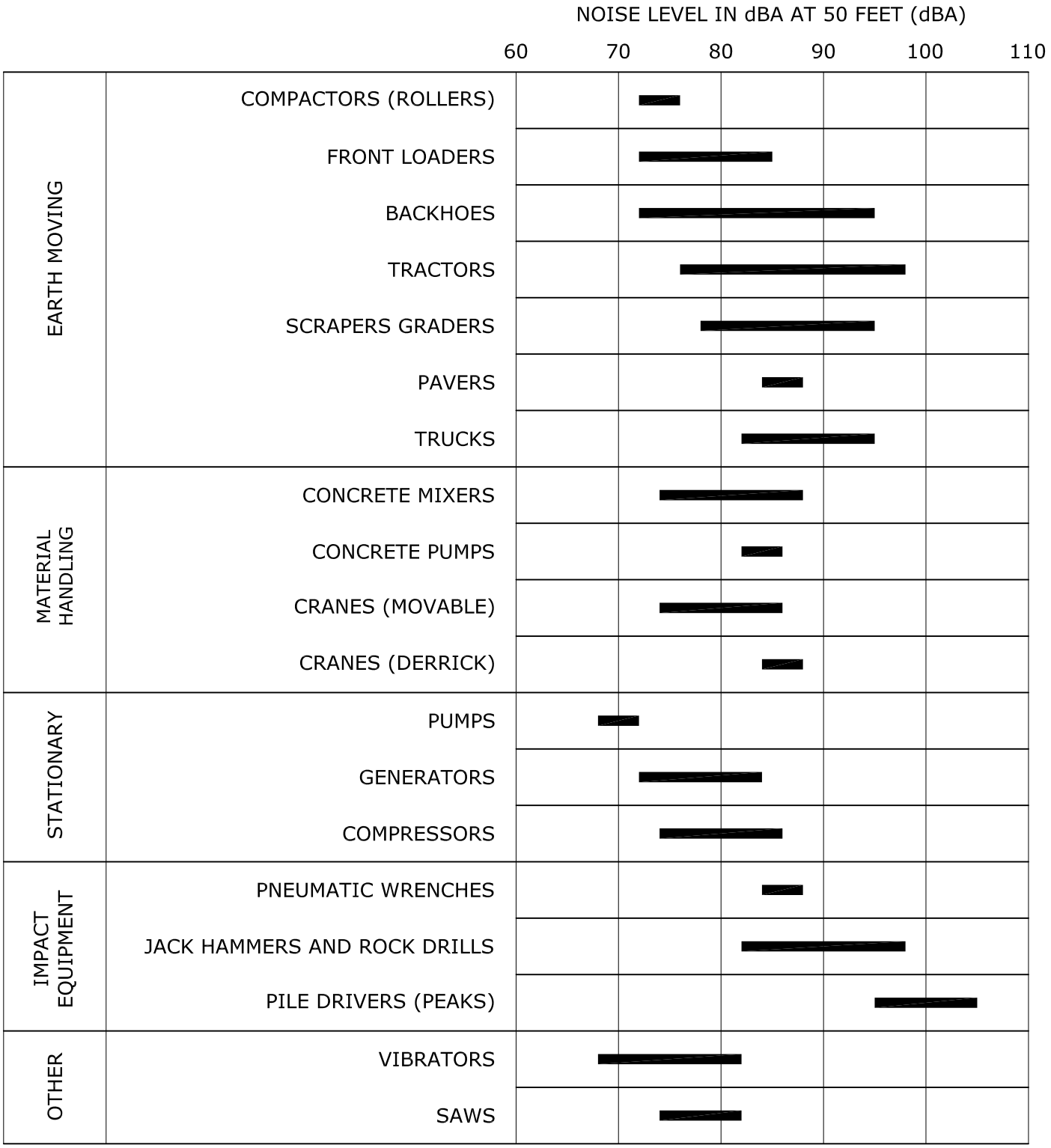
Graph of Long Term Noise Measurements

Makakilo Drive Extension

Not to Scale

Date	Project No.	Drawn By
October 2008	08-48	KMF

Figure No
4



NOTE: BASED ON LIMITED AVAILABLE DATA SAMPLES

Typical Sound Levels from Construction Equipment

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Makakilo Drive

Not to Scale

Date	Project No.	Drawn By
October 2008	08-048	TRB

Figure No 5

APPENDIX A

Acoustic Terminology

Acoustic Terminology

Sound Pressure Level

Sound, or noise, is the term given to variations in air pressure that are capable of being detected by the human ear. Small fluctuations in atmospheric pressure (sound pressure) constitute the physical property measured with a sound pressure level meter. Because the human ear can detect variations in atmospheric pressure over such a large range of magnitudes, sound pressure is expressed on a logarithmic scale in units called decibels (dB). Noise is defined as "unwanted" sound.

Technically, sound pressure level (SPL) is defined as:

$$SPL = 20 \log (P/P_{ref}) \text{ dB}$$

where P is the sound pressure fluctuation (above or below atmospheric pressure) and P_{ref} is the reference pressure, 20 μPa, which is approximately the lowest sound pressure that can be detected by the human ear. For example:

If P = 20 μPa, then SPL = 0 dB
If P = 200 μPa, then SPL = 20 dB
If P = 2000 μPa, then SPL = 40 dB

The sound pressure level that results from a combination of noise sources is not the arithmetic sum of the individual sound sources, but rather the logarithmic sum. For example, two sound levels of 50 dB produce a combined sound level of 53 dB, not 100 dB. Two sound levels of 40 and 50 dB produce a combined level of 50.4 dB.

Human sensitivity to changes in sound pressure level is highly individualized. Sensitivity to sound depends on frequency content, time of occurrence, duration, and psychological factors such as emotions and expectations. However, in general, a change of 1 or 2 dB in the level of sound is difficult for most people to detect. A 3 dB change is commonly taken as the smallest perceptible change and a 6 dB change corresponds to a noticeable change in loudness. A 10 dB increase or decrease in sound level corresponds to an approximate doubling or halving of loudness, respectively.

A-Weighted Sound Level

Studies have shown conclusively that at equal sound pressure levels, people are generally more sensitive to certain higher frequency sounds (such as made by speech, horns, and whistles) than most lower frequency sounds (such as made by motors and engines)[1] at the same level. To address this preferential response to frequency, the A-weighted scale was developed. The A-weighted scale adjusts the sound level in each frequency band in much the same manner that the

[1] D.W. Robinson and R.S. Dadson, "A Re-Determination of the Equal-Loudness Relations for Pure Tones," *British Journal of Applied Physics*, vol. 7, pp. 166 - 181, 1956. (Adopted by the International Standards Organization as Recommendation R-226.

human auditory system does. Thus the A-weighted sound level (read as "dBA") becomes a single number that defines the level of a sound and has some correlation with the sensitivity of the human ear to that sound. Different sounds with the same A-weighted sound level are perceived as being equally loud. The A-weighted noise level is commonly used today in environmental noise analysis and in noise regulations. Typical values of the A-weighted sound level of various noise sources are shown in Figure A-1.

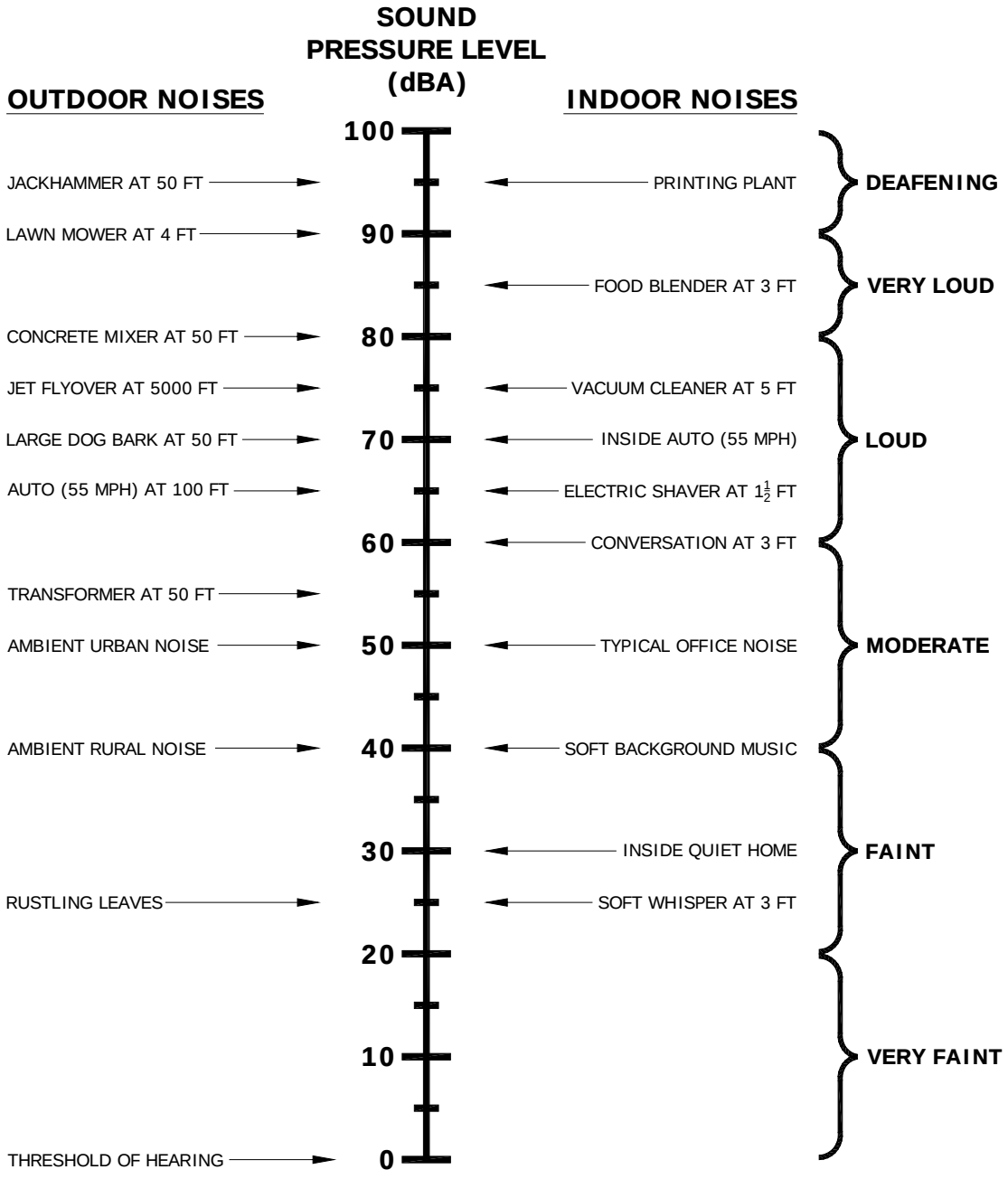


Figure A-1. Common Outdoor/Indoor Sound Levels

Equivalent Sound Level

The Equivalent Sound Level (L_{eq}) is a type of average which represents the steady level that, integrated over a time period, would produce the same energy as the actual signal. The actual *instantaneous* noise levels typically fluctuate above and below the measured L_{eq} during the measurement period. The A-weighted L_{eq} is a common index for measuring environmental noise. A graphical description of the equivalent sound level is shown in Figure A-2.

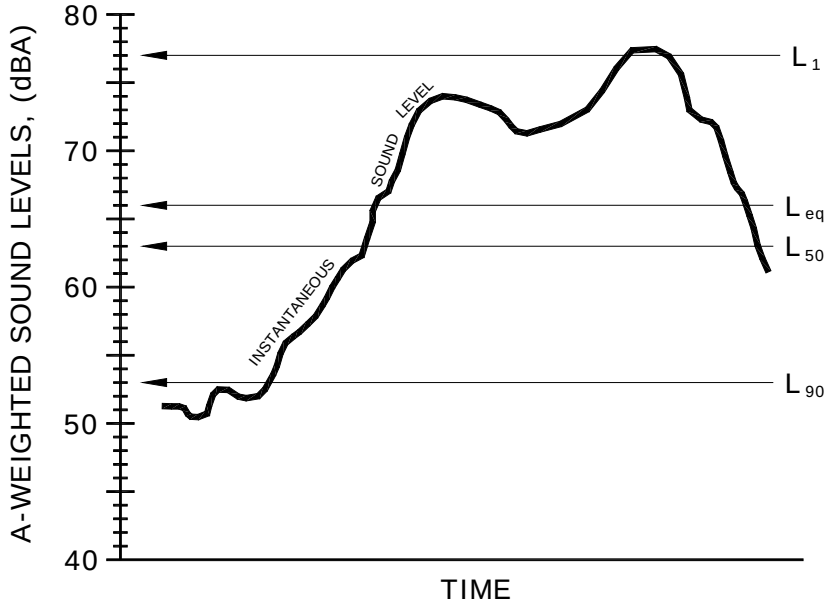


Figure A-2. Example Graph of Equivalent and Statistical Sound Levels

Statistical Sound Level

The sound levels of long-term noise producing activities such as traffic movement, aircraft operations, etc., can vary considerably with time. In order to obtain a single number rating of such a noise source, a statistically-based method of expressing sound or noise levels has been developed. It is known as the Exceedence Level, L_n. The L_n represents the sound level that is exceeded for n% of the measurement time period. For example, L_{10} = 60 dBA indicates that for the duration of the measurement period, the sound level exceeded 60 dBA 10% of the time. Typically, in noise regulations and standards, the specified time period is one hour. Commonly used Exceedence Levels include L_{01}, L_{10}, L_{50}, and L_{90}, which are widely used to assess community and environmental noise. A graphical description of the equivalent sound level is shown in Figure A-2.

Day-Night Equivalent Sound Level

The Day-Night Equivalent Sound Level, L_{dn}, is the Equivalent Sound Level, L_{eq}, measured over a 24-hour period. However, a 10 dB penalty is added to the noise levels recorded between 10 p.m. and 7 a.m. to account for people's higher sensitivity to noise at night when the background noise level is typically lower. The L_{dn} is a commonly used noise descriptor in assessing land use compatibility, and is widely used by federal and local agencies and standards organizations.

APPENDIX H

Social Impact Assessment, October 2008

SOCIO-ECONOMIC ASSESSMENT

MAKAKILO DRIVE EXTENSION PROJECT

(Makakilo Drive to North-South Road Interchange)

'Ewa, O'ahu

October 2008

Department of Transportation Services

City and County of Honolulu

R.M. Towill Corporation

Honolulu, Hawai'i

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SOCIO-ECONOMIC ASSESSMENT
MAKAKILO DRIVE EXTENSION PROJECT
(Makakilo Drive to North-South Road Interchange)
ʻEwa, Oʻahu
October 2008

A. INTRODUCTION

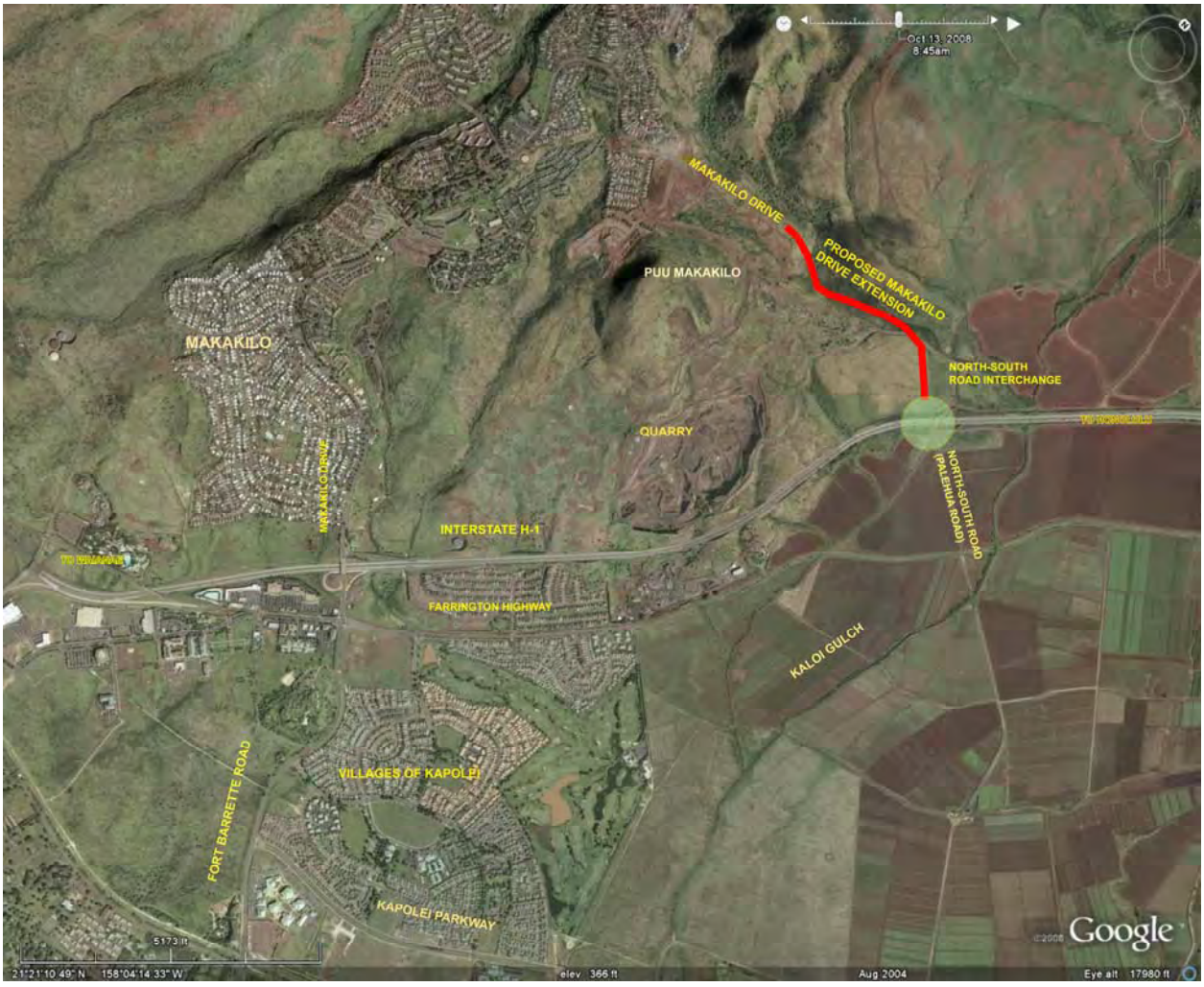
The Department of Transportation Services (DTS), City and County of Honolulu, proposes the development of a 4-lane, median separated roadway that connects the end of the existing Makakilo Drive to the proposed North-South Road interchange currently under construction. The interchange construction is scheduled for completion by Fall 2009. The Makakilo Drive extension, however, will not be completed to 2014. The proposed roadway will provide an alternative means for existing Makakilo residents to access from and to the Interstate H-1.

The purpose of the project is to provide greater accessibility and an alternative means for commuters to access the Makakilo community and its facilities and services. The project will benefit area commuters by decreasing the volume of traffic at the Kapolei-Makakilo Interchange by diverting in-bound and out-bound traffic from the interchange. Diverting traffic at the Kapolei-Makakilo Interchange will improve the level of service at the interchange. The development of this new roadway, however, will not change the volume of traffic on Interstate H-1. This project further implements the ʻEwa Development Plan and the Oʻahu Metropolitan Planning Organization (OMPO) Oʻahu Regional Transportation Plan (ORTP).

B. PROJECT LOCATION

The Makakilo Drive Extension Project area is located in the ʻEwa District of the Island of Oʻahu. The roadway extension project proposes to connect the existing Makakilo Drive with the North-South Road Interchange at Interstate H-1 (see Figure 1, Location Map). The portion of the roadway within the Makakilo Community starts at the recently completed Castle and Cooke Homes Hawaiʻi subdivision. The Interstate H-1 connection is at the new North-South Road Interchange.

Figure 1. Project Location Map



E. PROJECT DESCRIPTION

The preferred alignment of the project is shown in Figure 1. The roadway is approximately 4,300 feet long and includes a 700 feet elevated (bridge) section at the connection with Makakilo Drive. The roadway cross-section is 78 feet and is shown in Figure 2, Typical Section. The roadway will feature a 4-lane median separated travelways with sidewalks, bike lanes, streetlights, and a landscaping strip.

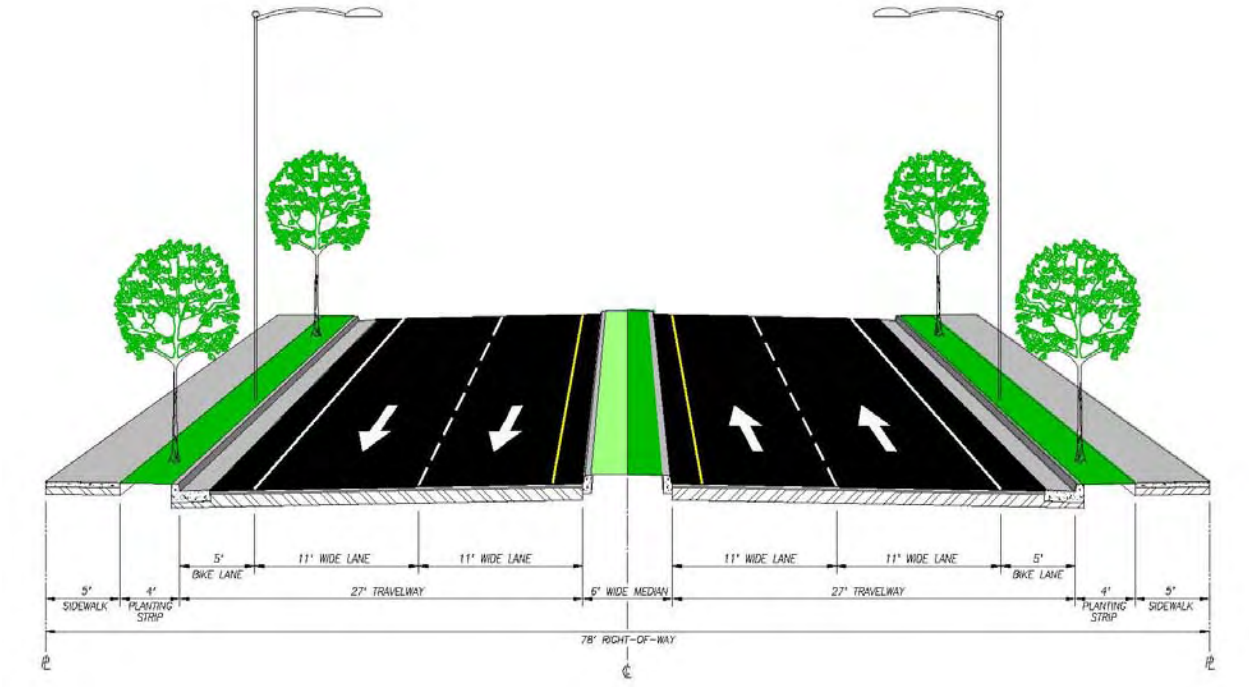


Figure 2. Typical Road Section

D. COMMUNITY OVERVIEW

The ʻEwa area was designated to be the second growth center on Oʻahu. The Oʻahu General Plan (2002, amended) designated the area as Oʻahu's second city. Planning for the area is shown in Figure 3, ʻEwa Development Plan (may 2000, revised), below. The ʻEwa plan includes the major populated areas of Makakilo, Kapolei, ʻEwa and ʻEwa Beach, and Honokai Hale. The development district also includes all of Kalealoa and Campbell Industrial Park. It is anticipated that approximately 13% or Oʻahu's population will reside in this region.

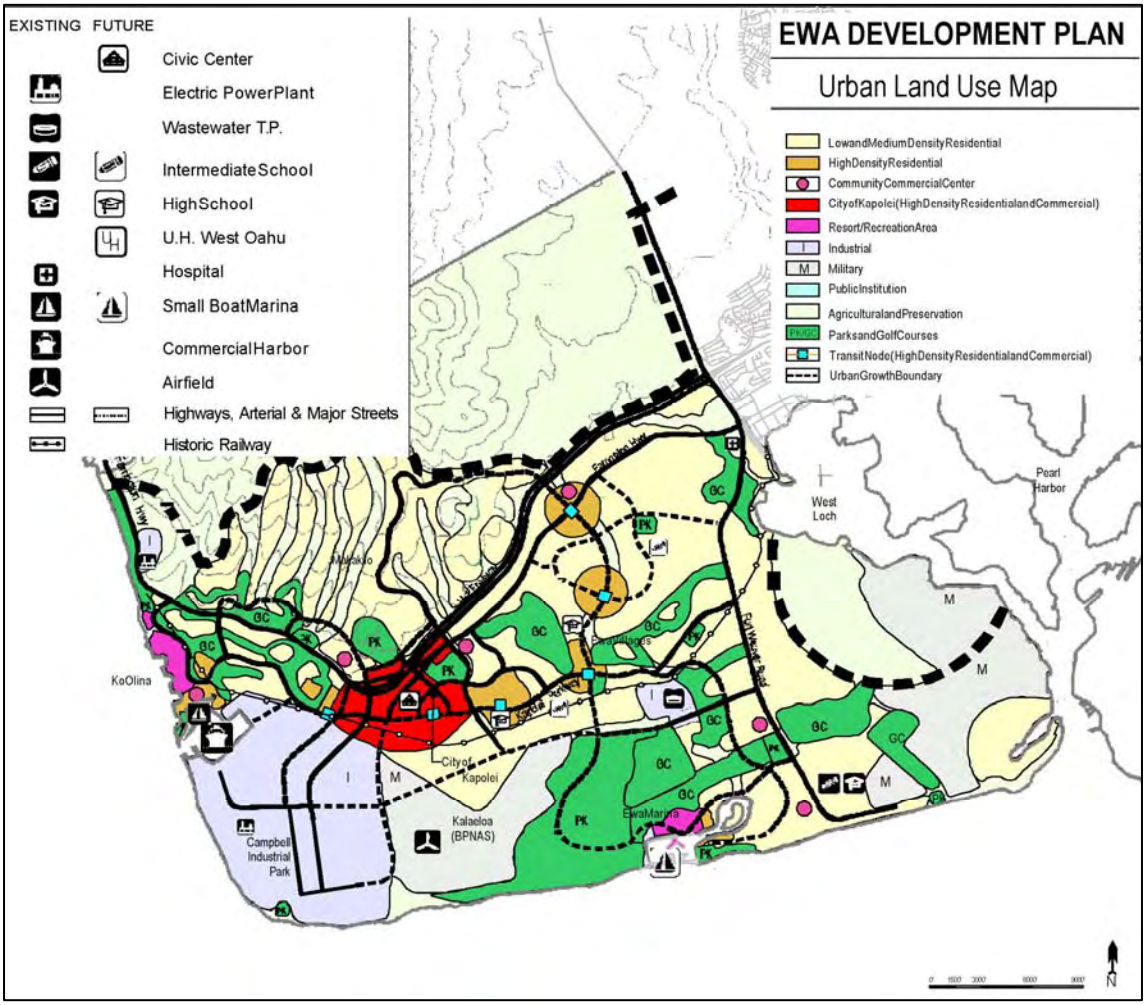
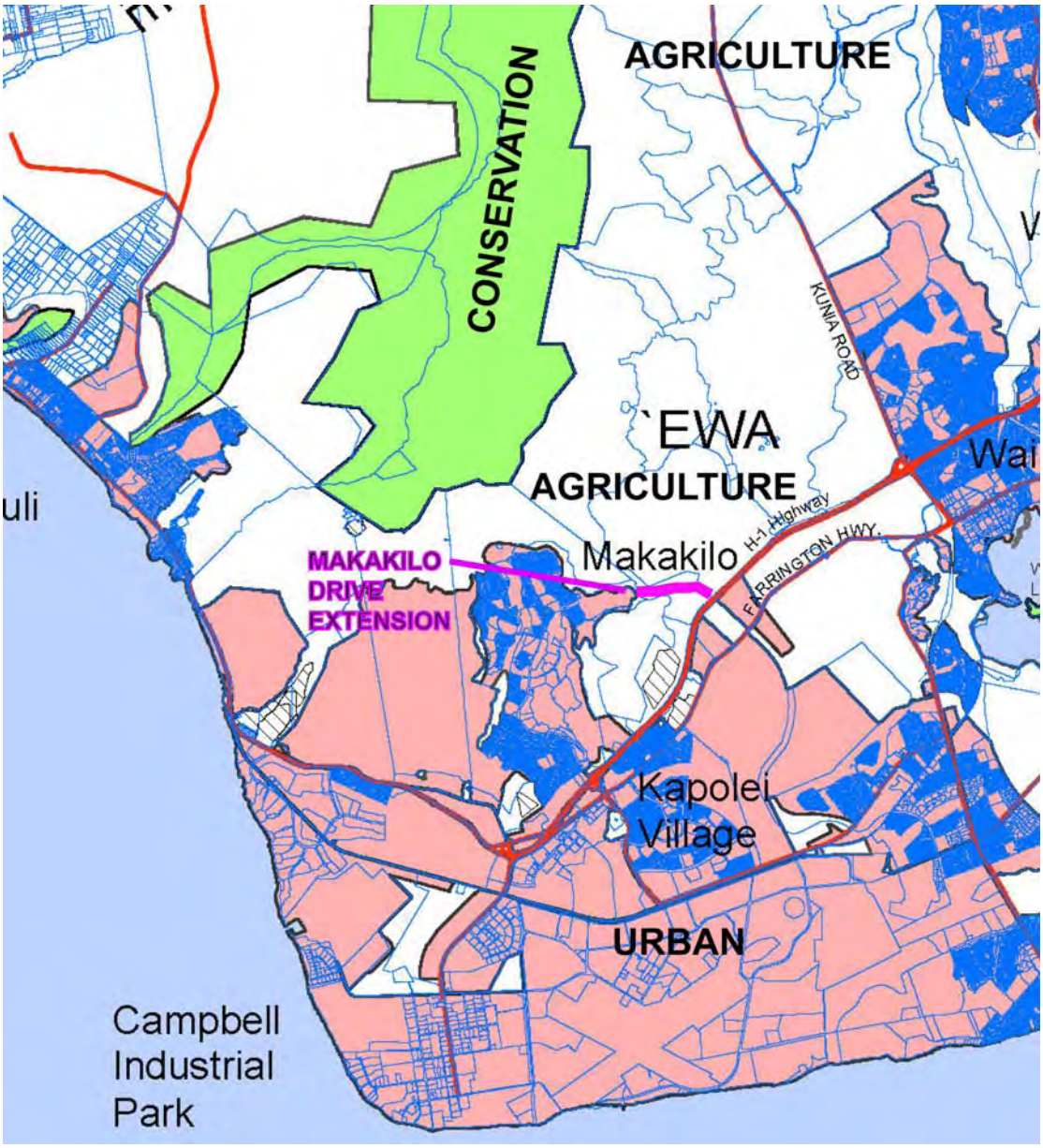


Figure 3. ʻEwa Development Plan, Land Use Map (May 2000)

D. STATE LAND USE

Chapter 205, Hawai'i Revised Statutes (HRS), relating to the Land Use Commission, establishes the four (4) major land use districts in which all lands in the State are placed: Urban, Rural, Agricultural, and Conservation. Criteria for these land use designations are cited below. The proposed roadway will traverse land that is designated as Agriculture (see Figure 23). The proposed roadway plan does not require changing



existing State Land Use designations as the current State land use designations are compatible and allowed with the current land use designations.

E. GENERAL PLAN (2002, amended)

The proposed roadway conforms to the following objectives and policies of the Honolulu General Plan in the following areas: Population, Natural Environment, Transportation and Utilities, and Physical Development and Urban Design. Applicable policies and objectives are discussed below.

1. Population: Objective C

To establish a pattern of population distribution that will allow the people of Oahu to live and work in harmony.

Policy 1. *Facilitate the full development of the primary urban center.*

Policy 2. *Encourage development within the secondary urban center at Kapolei and the Ewa and Central Oahu urban-fringe areas to relieve developmental pressures in the remaining urban-fringe and rural areas and to meet housing needs not readily provided in the primary urban center.*

Policy 3. *Manage physical growth and development in the urban-fringe and rural areas so that:*

a. An undesirable spreading of development is prevented; and

b. Their population densities are consistent with the character of development and environmental qualities desired for such areas.

Policy 4 (Amended, Resolution 02-205, CD1). *Direct growth according to Policies 1, 2, and 3 above by providing land development capacity and needed infrastructure to seek a 2025 distribution of Oahu's residential population as follows:*

Table 1

Distribution of Residential Population – ISLANDWIDE (O'ahu General Plan, 2002)

LOCATION POPULATION	% SHARE OF 2025
Primary Urban Center	46.0%
'Ewa	13.0%
Central O'ahu	17.0%
East Honolulu	5.3%
Koolaupoko	11.6%
Koolauloa	1.4%
North Shore	1.7%
Waianae	4.0%
TOTAL	100.0%

2. Natural Environment:

Objective A: To protect and preserve the natural environment.

Policy 1: Protect Oahu's natural environment, especially the shoreline, valleys, and ridges, from incompatible development.

Objective B: To preserve and enhance the natural monuments and scenic views of Oahu for the benefit of both residents and visitors.

Policy 2: Protect Oahu's scenic views, especially those seen from highly developed and heavily traveled areas.

Policy 3: Locate roads, highways, and other public facilities and utilities in areas where they will least obstruct important views of the mountains and the sea.

3. Transportation & Utilities

Objective A: To create a transportation system which will enable people and goods to move safely, efficiently, and at a reasonable cost; serve all people, including the poor, the elderly, and the physically handicapped; and offer a variety of attractive and convenient modes of travel.

Policy 4: Improve transportation facilities and services in the Ewa corridor and in the trans-Ko'olau corridors to meet the needs of Ewa and Windward communities.

4 Physical Development and Urban Design

Objective C: To develop a secondary urban center in Ewa with its nucleus in the Kapolei area.

Policy 1: Allocate funds from the City and County's capital-improvement program for public projects that are needed to facilitate development of the secondary urban center at Kapolei

F. ʻEWA AND THE MAKAKILO-KAPOLEI REGION

The Makakilo community represents approximately 1.5 percent (13,322 persons) of the entire population of Oʻahu (see Table 2) in 2000; and 52.9 percent (25,158 persons) of the area represented by the Makakilo-Kapolei-Honokai Hale Neighborhood Board No. 34 in 2000.

Table 3 show that the Neighborhood Board No. 34 area having the following demographic characteristics:

- 3,946 households
- 3.37 persons per household
- 66.6 percent of the homes are owner occupied
- Race Distribution
    - White 45.2%
    - Black 4%
    - American Indian 2.3%
    - Asian 55.6%
    - Native Hawaiian 28.4%
    - Other 5.2%

Table 4 show that Neighborhood Board No. 34 area having the following characteristics:

- 3.4 % of the population is unemployed (2000)
- 89% of workers in the area commute (drive) to work
- 5.8% use public transport to commute to work
- $64,560 median household income (1999)

Table 2. Population of Counties in Hawai‘i – 1831 – 2000

Table 1.01-- POPULATION OF COUNTIES: 1831 TO 2000

Census date	Total population		City & County of Honolulu	Hawaii County	Kauai County	Maui County 2/
	Number	Percent change 1/				
1900: June 1	154,001	9.4	58,504	46,843	20,734	27,920
1910: April 15	191,874	2.2	81,993	55,382	23,952	30,547
1920: January 1	255,881	3.0	123,496	64,895	29,438	38,052
1930: April 1	368,300	3.6	202,887	73,325	35,942	56,146
1940: April 1	422,770	1.4	257,696	73,276	35,818	55,980
1950: April 1	499,794	1.7	353,020	68,350	29,905	48,519
1960: April 1	632,772	2.4	500,409	61,332	28,176	42,855
1970: April 1	769,913	2.0	630,528	63,468	29,761	46,156
1980: April 1	964,691	2.3	762,565	92,053	39,082	70,991
1990: April 1	1,108,229	1.4	836,231	120,317	51,177	100,504
2000: April 1	1,211,537	0.9	876,156	148,677	58,463	128,241

1/ Annual rate since the preceding census, based on the formula for continuous compounding.

2/ Maui County including Kalawao County.

3/ Total population also reported as 129,814.

4/ Total population also reported as 108,393 and 108,568.

Source: Robert C. Schmitt, *Historical Statistics of Hawaii* (University Press of Hawaii, 1977), pp. 11-14; U.S. Bureau of the Census, *1980 Census of Population*, PC80-1-A13 (October 1981), table 2, and *1990 Census of Population and Housing*, 1990 CPH-1-13 (August 1991), table 2; and U.S. Census Bureau, Census 2000 Redistricting Data (P.L. 94-171) Summary File (March 19, 2001).

Table 3. General Demographics Characteristics – 2000

'Ewa (Makakilo, Makaiwa Hills, and Kunia)

Subject	Number	Percent
Total Population	**13,322**	**100.0**
SEX AND AGE		
Male	6,698	50.3
Female	6,624	49.7
Under 5 years	1,137	8.5
5 - 17 years	2,922	21.9
18 - 64 years	8,452	63.4
65 years and over	811	6.1
Median age (years)	32.5	-
RACE		
One Race	9,424	70.7
White	3,216	24.1
Black or African American	337	2.5
American Indian and Alaska Native	26	0.2
Asian	4,282	32.1
Native Hawaiian and other Pacific Islander	1,361	10.2
Other	202	1.5
Two or more races	3,898	29.3
Race alone or in combination with other races:		
White	6,017	45.2
Black or African American	539	4.0
American Indian and Alaska Native	303	2.3
Asian	7,404	55.6
Native Hawaiian and other Pacific Islander	3,781	28.4
Other	737	5.5
RELATIONSHIP		
Total population	**13,322**	**100.0**
In households	13,290	99.8
Householder	3,946	29.6
Spouse	2,603	19.5
Child	4,569	34.3
Grandchild	553	4.2
Parent	195	1.5
Other relatives	702	5.3
Nonrelatives	722	5.4
In Group Quarters	32	0.2
In nursing homes	-	0.0

Subject	Number	Percent
HOUSEHOLD BY TYPE		
Total households	**3,946**	**100.0**
Family households (families)	3,268	82.8
With own children under 18 years	1,744	44.2
Married-couple family	2,603	66.0
With own children under 18 years	1,380	35.0
Female householder, no husband present	449	11.4
With own children under 18 years	244	6.2
Non-families	678	17.2
Living with nonrelatives	238	6.0
Living alone and 65 years and over	56	1.4
Households with individuals under 18 years	2,031	51.5
Households with individuals 65 years and over	598	15.2
Average persons per household	3.37	-
Average persons per family	3.76	-
Median age of householder	44.3	-
Owner	48.0	-
Renter	36.9	-
HOUSING OCCUPANCY AND TENURE		
Total Housing Units	**4,173**	**100.0**
Occupied units	3,946	94.6
By owner	2,780	66.6
By renter	1,166	27.9
Vacant units	227	5.4
Other than for sale or for rent	100	2.4
Available housing vacancy rate (%)	3.1	-
Homeowner vacancy rate (%)	1.8	-
Rental vacancy rate (%)	6.1	-
Homeownership rate (%)	70.5	-

Source: 2000 Census SF1 File; Planning Division, Honolulu Department of Planning and Permitting January 2002

Table 4. Selected Economic Characteristics – Makakilo, Kapolei, and Honokai Hale 2000

Subject	Number	Percent
EMPLOYMENT STATUS		
Population 16 years and over	**17,726**	**100.0**
In labor force	13,302	75.0
Civilian labor force	12,383	69.9
Employed	11,776	66.4
Unemployed	607	3.4
% of civilian labor force	4.9	-
Armed Forces	919	5.2
Not in labor force	4,424	25.0
Females 16 years and over	**8,910**	**100.0**
In labor force	6,335	71.1
Civilian labor force	6,226	69.9
Employed	5,949	66.8
Own children under 6 years	**2,645**	**100.0**
All parents in family in labor force	1,906	72.1
COMMUTING TO WORK		
Workers 16 years and over	**12,402**	**100.0**
Car, truck, or van -- drove alone	8,282	66.8
Car, truck, or van -- carpooled	2,847	23.0
Public transportation (including taxicab)	721	5.8
Walked	151	1.2
Other means	140	1.1
Worked at home	261	2.1
Mean travel time to work (minutes)[1]	35.3	-
Employed civilian population 16 years and over	**11,776**	**100.0**
OCCUPATION		
Management, professional, and related occupations	3,635	30.9
Service occupations	2,048	17.4
Sales and office occupations	3,736	31.7
Farming, fishing, and forestry occupations	23	0.2
Construction, extraction, and maintenance occupations	1,294	11.0
Production, transportation, and material moving occupations	1,038	8.8
INDUSTRY		
Agriculture, forestry, fishing and hunting, and mining	58	0.5
Construction	911	7.7
Manufacturing	497	4.2
Wholesale trade	331	2.8
Retail trade	1,519	12.9
Transportation and warehousing, and utilities	923	7.8
Information	324	2.8
Finance, insurance, real estate, and rental and leasing	1,084	9.2
Professional, scientific, management, administrative, and waste management services	1,120	9.5
Educational, health and social services	2,018	17.1
Arts, entertainment, recreation, accommodation and food services	1,183	10.0
Other services (except public administration)	439	3.7
Public administration	1,369	11.6

Subject	Number	Percent
CLASS OF WORKER		
Private wage and salary workers	8,508	72.2
Government workers	2,767	23.5
Self-employed workers in own not incorporated business	477	4.1
Unpaid family workers	24	0.2
INCOME IN 1999		
Households	**7,313**	**100.0**
Less than $10,000	168	2.3
$10,000 to $14,999	77	1.1
$15,000 to $24,999	402	5.5
$25,000 to $34,999	656	9.0
$35,000 to $49,999	1,119	15.3
$50,000 to $74,999	2,140	29.3
$75,000 to $99,999	1,430	19.6
$100,000 to $149,999	1,019	13.9
$150,000 to $199,999	196	2.7
$200,000 or more	104	1.4
Median household income ($)	64,560	-
With earnings	6,947	95.0
Mean earnings ($)	65,936	-
With Social Security income	1,114	15.2
Mean Social Security income ($)	10,420	-
With Supplemental Security income	177	2.4
Mean Supplemental Security income ($)	6,860	-
With public assistance income	422	5.8
Mean public assistance income ($)	4,775	-
With retirement income	1,267	17.3
Mean retirement income ($)	19,160	-
Families	**6,280**	**100.0**
Less than $10,000	162	2.6
$10,000 to $14,999	76	1.2
$15,000 to $24,999	306	4.9
$25,000 to $34,999	529	8.4
$35,000 to $49,999	926	14.7
$50,000 to $74,999	1,859	29.6
$75,000 to $99,999	1,296	20.6
$100,000 to $149,999	850	13.5
$150,000 to $199,999	186	3.0
$200,000 or more	88	1.4
Median family income ($)	65,528	-
Per capita income ($)[1]	20,619	-
	Number below poverty level	**Percent below poverty level**
POVERTY STATUS IN 1999		
Families	**268**	**4.3**
With related children under 18 years	236	5.8
With related children under 5 years	129.0	7.2
Families with female householder, no husband present	**159**	**20.4**
With related children under 18 years	159	31.2
With related children under 5 years	75	32.8
Individuals	**1,190**	**4.7**
18 years and over	620	3.6
65 years and over	31	2.1

G. Potential Impacts and Mitigation

The proposed roadway will not have a direct impact the demographics of the area in the near term. As the land surrounding the roadway is developed as depicted on the ʻEwa Development, it is anticipated that the population will increase. Project planned for the area include: the University of Hawaiʻi West Oʻahu Campus, Department of Hawaiian Home Lands, and Makaiwa Hills.

The planned roadway may have the secondary impact of making the area much more desirable to live because of the increased access into the community. Further, as the population increases there will likely be additional demand for professional and retail services in the area. This will further add to the economic growth to the area as an employment center.

APPENDIX I

Agency and Community Consultation

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU

KAPOLEI HALE • 1000 ULUOHIA STREET, SUITE 309 • KAPOLEI, HAWAII 96707
TELEPHONE: (808) 768-3003 • FAX: (808) 768-7053 • INTERNET: www.honolulu.gov

MUFI HANNEMANN
MAYOR

LESTER K.C. CHANG
DIRECTOR

GAIL Y. HARAGUCHI
DEPUTY DIRECTOR

December 11, 2008

TO: WAYNE YOSHIOKA, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

ATTENTION: BRIAN SUZUKI, AICP

FROM: LESTER K. C. CHANG, DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT
MAKAKILO DRIVE EXTENSION

Thank you for the opportunity to review and comment on the Draft Environmental Assessment for the Makakilo Drive Extension.

The Department of Parks and Recreation has no comment and as this project will not impact any program or facility of the department you are invited to remove us as a consulted party from the balance of the EIS process.

Should you have any questions, please contact Mr. John Reid, Planner, at 768-3017.

LESTER K. C. CHANG
Director

LKCC:jr
(289185)

cc: Office of Environmental Quality Control
Mr. Chester Koga, R. M. Towill Corporation

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 523-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP12/08-291732R

January 26, 2009

MEMORANDUM

TO: LESTER K.C. CHANG, DIRECTOR
DEPARTMENT OF PARKS AND RECREATION

FROM: WAYNE Y. YOSHIOKA, ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)
MAKAKILO DRIVE EXTENSION

This is to acknowledge your letter of December 11, 2008. Thank you for taking the time to review the Draft EA for the subject project. Please contact Brian Suzuki at 768-8349 if you have additional comments or questions.

WAYNE Y. YOSHIOKA
Acting Director

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

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

MUFI HANNEMANN
MAYOR

BOISSE P. CORREA
CHIEF

PAUL D. PUTZULU
KARL A. GODSEY
DEPUTY CHIEFS

OUR REFERENCE BS-DK

December 9, 2008

TO: WAYNE Y. YOSHIOKA, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

ATTENTION: BRIAN SUZUKI, AICP

FROM: BOISSE P. CORREA, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT
MAKAKILO DRIVE EXTENSION
TMKS: (1) 9-2-002: 01, 06, 07, AND 08 AND 9-2-003: 74

Thank you for the opportunity to review and comment on the subject project.

This project should have no adverse impact on the facilities or operations of the Honolulu Police Department.

If there are any questions, please call Major Michael Moses of District 8 at 692-4253 or Mr. Brandon Stone of the Executive Bureau at 529-3644.

BOISSE P. CORREA
Chief of Police

By
DEBORA A. TANDAL
Assistant Chief of Police
Support Services Bureau

cc: OEQC
Mr. Chester Koga,
R.M. Towill Corporation

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
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MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP12/08-291119R

January 28, 2009

MEMORANDUM

TO: BOISSE P. CORREA, CHIEF OF POLICE
HONOLULU POLICE DEPARTMENT

FROM: WAYNE Y. YOSHIOKA, ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)
MAKAKILO DRIVE EXTENSION

This is to acknowledge your letter of December 9, 2008. Thank you for taking the time to review the Draft EA for the subject project. Please contact Brian Suzuki at 768-8349 if you have additional comments or questions.

WAYNE Y. YOSHIOKA
Acting Director

BOARD OF WATER SUPPLY

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

December 3, 2008

MUFI HANNEMANN, Mayor

RANDALL Y. S. CHUNG, Chairman
SAMUEL T. HATA
ALLY J. PARK
ROBERT K. CUNDIFF
MARC C. TILKER

CRAIG I. NISHIMURA, Ex-Officio
BRENNON T. MORIOKA, Ex-Officio

CLIFFORD P. LUM
Manager and Chief Engineer

DEAN A. NAKANO
Deputy Manager and Chief Engineer

TO: BRIAN SUZUKI, AICP
DEPARTMENT OF TRANSPORTATION SERVICES

FROM: KEITH S. SHIDA, PROGRAM ADMINISTRATOR
CUSTOMER CARE DIVISION

SUBJECT: YOUR LETTER REGARDING THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE MAKAKILO DRIVE EXTENSION, TMK: 9-2-002:1,6,7,8; 9-2-003:074

Thank you for the opportunity to comment on the proposed Makakilo Drive Extension.

The construction drawings should be submitted for our review and approval.

If you have any questions, please contact Robert Chun at 748-5443.

cc: Office of Environmental Quality Control
Mr. Chester Koga, R.M. Towill Corporation

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
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MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP12/08-290192R

January 26, 2009

MEMORANDUM

TO: KEITH S. SHIDA, PROGRAM ADMINISTRATOR
BOARD OF WATER SUPPLY

FROM: WAYNE Y. YOSHIOKA, ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)
MAKAKILO DRIVE EXTENSION

This is to acknowledge your letter of December 3, 2008. Thank you for taking the time to review the Draft EA for the subject project. Please contact Brian Suzuki at 768-8349 if you have additional comments or questions.

WAYNE Y. YOSHIOKA
Acting Director

DEPARTMENT OF FACILITY MAINTENANCE

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

MUFI HANNEMANN
MAYOR

CRAIG I. NISHIMURA, P.E.
DIRECTOR AND CHIEF ENGINEER

GEORGE "KEOKI" MIYAMOTO
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 08-1176

December 22, 2008

MEMORANDUM

TO: WAYNE Y. YOSHIOKA, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

ATTENTION: BRIAN SUZUKI, AICP
TRANSPORTATION PLANNING DIVISION

FROM: CRAIG I. NISHIMURA, P.E.
DIRECTOR AND CHIEF ENGINEER
DEPARTMENT OF FACILITY MAINTENANCE

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (DEA)
MAKAKILO DRIVE EXTENSION

Thank you for the opportunity to review and comment on the subject DEA dated November 23, 2008 for the proposed extension of Makakilo Drive to the North-South Road interchange.

We request that the narrow 6-foot wide grassed median with chain link fence down the middle of the median, proposed in the preferred plan, be eliminated and the planter strips between the concrete curb and sidewalk on both sides of the roadway be increased in width. The narrow median with chain link fence will be difficult and hazardous for our crews to maintain. The grass between the median curb and fence will have to be cut manually with our crews working close to traffic in both directions. Furthermore, wider planter strips will provide greater space for the planted street trees to mature and grow without damaging the adjacent sidewalk and curb.

If it is determined that a barrier between the opposite lanes of traffic is required, we request that the cross-section Alternate 5 be selected with the construction of a concrete Jersey barrier down the middle of the roadway. The concrete barrier will require minimal maintenance with less traffic exposure for our crews.

Should you have any questions, please call Charles Pignataro of the Division of Road Maintenance, at 768-3697.

c: Office of Environmental Quality Control
R.M. Towill Corporation, Attn: Chester Koga

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 523-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP12/08-293191R

January 26, 2009

MEMORANDUM

TO: JEOFFREY CUDIAMAT, ACTING DIRECTOR
DEPARTMENT OF FACILITY MAINTENANCE

FROM: WAYNE Y. YOSHIOKA, ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)
MAKAKILO DRIVE EXTENSION

This is to acknowledge your letter of December 22, 2008. Thank you for taking the time to review the Draft EA for the subject project. Please contact Brian Suzuki at 768-8349 if you have additional comments or questions.

WAYNE Y. YOSHIOKA
Acting Director

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

MUFI HANNEMANN
MAYOR

KENNETH G. SILVA
FIRE CHIEF

ALVIN K. TOMITA
DEPUTY FIRE CHIEF

December 18, 2008

TO: WAYNE YOSHIOKA, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

ATTN: BRIAN SUZUKI, AICP
REGIONAL PLANNING BRANCH

FROM: KENNETH G. SILVA, FIRE CHIEF

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT
MAKAKILO DRIVE EXTENSION
TAX MAP KEYS: 9-2-002: 001, 006, 007, AND 008
9-2-003: 074

In response to a letter from R.M. Towill Corporation received on December 4, 2008, regarding the above-mentioned subject, the Honolulu Fire Department reviewed the material provided and has no objections to the project.

Should you have any questions, please call Battalion Chief Socrates Bratakos of our Fire Prevention Bureau at 723-7151.

KENNETH G. SILVA
Fire Chief

KGS/KB:bh

cc: Office of Environmental Quality Control
Chester Koga, R.M. Towill Corporation ✓

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
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Phone: (808) 768-8305 • Fax: (808) 523-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP1/09-296568R

January 26, 2009

MEMORANDUM

TO: KENNETH G. SILVA, CHIEF
HONOLULU FIRE DEPARTMENT

FROM: WAYNE Y. YOSHIOKA, ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)
MAKAKILO DRIVE EXTENSION

This is to acknowledge your letter of December 18, 2008. Thank you for taking the time to review the Draft EA for the subject project. Please contact Brian Suzuki at 768-8349 if you have additional comments or questions.

WAYNE Y. YOSHIOKA
Acting Director

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) 523-4567
Web site: www.honolulu.gov

MUFI HANNEMANN
MAYOR

EUGENE C. LEE, P.E.
DIRECTOR

RUSSELL H. TAKARA, P.E.
DEPUTY DIRECTOR

December 23, 2008

Mr. Brian Suzuki, AICP
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, Hawaii 96813

Dear Mr. Suzuki:

Subject: Draft Environmental Assessment
Makakilo Drive Extension

Thank you for giving us the opportunity to review the above Draft Environmental Assessment.

The Department of Design and Construction does not have any comments to offer at this time.

Very truly yours,

Eugene C. Lee, P.E.
Director

ECL:lt (289121)

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
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MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP1/09-296569R

January 26, 2009

MEMORANDUM

TO: RUSSELL TAKARA, P.E., ACTING DIRECTOR
DEPARTMENT OF DESIGN AND CONSTRUCTION

FROM: WAYNE Y. YOSHIOKA, ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)
MAKAKILO DRIVE EXTENSION

This is to acknowledge your letter of December 23, 2008. Thank you for taking the time to review the Draft EA for the subject project. Please contact Brian Suzuki at 768-8349 if you have additional comments or questions.

WAYNE Y. YOSHIOKA
Acting Director

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) 768-8041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

MUFI HANNEMANN
MAYOR

DAVID K. TANOUE
ACTING DIRECTOR

2008/ELOG-2881(mh)

January 12, 2009

MEMORANDUM

TO: WAYNE Y. YOSHIOKA, DIRECTOR
DEPARTMENT OF TRANSPORTATION SERVICES

ATTN: BRIAN SUZUKI, AICP
DEPARTMENT OF TRANSPORTATION SERVICES

FROM: DAVID K. TANOUE, ACTING DIRECTOR
DEPARTMENT OF PLANNING AND PERMITTING

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (DEA)
MAKAKILO DRIVE EXTENSION

In response to your request for comments on the subject DEA, the Department of Planning and Permitting (DPP) has the following comments:

1. The Final Environmental Assessment (FEA) should provide Right-of-Way (ROW) information on the existing Makakilo Drive, including its cross-section, and discuss how and why the proposal is consistent with or modifies the current ROW section.

2. The proposed 78-foot ROW is a modification of the Subdivision Street Standards. The FEA should explain the less-than-standard 4-foot planter strips and the lack of median trees and median landscaping.

3. Page 7, Fig. 3 appears to be inconsistent with Table 2, Alternative 6 (preferred roadway cross-section) with respect to the median barrier. A fence is shown on Fig. 3 but there is no mention of a fence on Table 2. If a fence in the median is the preferred feature, the FEA should explain its intended purpose.

4. All street lights should be fully shielded instead of standard shielded lighting to avoid adverse impacts on avi-fauna and to minimize light pollution. Fully shielded lighting fixtures should eliminate any light being projected above the horizontal plane of the lowest point of the light fixture.

5. The projected implementation schedule on page 19 should be coordinated with the Oahu Metropolitan Planning Organization's Transportation Improvement Program (2008-2011) schedule which indicates construction funding in 2010.

6. If not already required under contract, contractors should be required to repair existing roadways damaged by the movement of construction equipment during construction of the Makakilo Drive extension.

7. Page 22 incorrectly assumes that construction would not disrupt traffic flow on existing streets. Slow moving heavy equipment on Makakilo Drive will interfere with traffic flow as traffic will be required to detour around slower moving construction vehicles carrying heavy loads such as concrete to the construction site.

8. Page 26 Land Use: The FEA should note that Makakilo Quarry located along the western side of the project was granted State Special Use Permit approval to continue operations until 2032.

9. The FEA should reference a future public access for pedestrians/bikes required under State Special Use Permit 73/SP-147. It is intended to connect to either Makakilo Drive Extension and/or Pueonani Street. See attached map.

10. Section 4.9: Discuss whether geological hazards (ex., rockfall) are present. If present, describe potential impacts/mitigation measures.

11. For hazard mitigation (potential for traffic accidents) a traffic signal and storage lane should be considered at the access driveway to Makakilo Quarry for heavy equipment negotiating left turn movements into the quarry from the proposed extension.

12. Check with the developers of the Waikalo`i Subdivision (shown in Figure 22, page 48) if they will require installation of sewer lines within the roadway ROW for their development. To the greatest extent possible, there should be coordination to logically/sequentially construct the transportation and wastewater systems at or around the same time to avoid ripping up and patching the roadway ROW on separate occasions.

13. Section 7.2: Subdivision application and approval are required to create the road Right-of-Way (ROW).

14. Section 7.2.1 (Grading Permit). Revise "Permit required for ground disturbance greater than 15 acres" to "Permit required from DPP."

15. Section 7.2.1 and 7.2.2. Revise wording to reference the specific guidelines and the date of publication, i.e. Section 7.2.1 "Permit required in accordance with Rules Relating to Soil Erosion Standards and Guidelines, April 1999."

16. Section 8.3: Revise last City agency listed to Department of Facility Maintenance. Also, do other City agencies need to be consulted (example, Department of Design and Construction and Department of Parks and Recreation)?

Should you have any questions, please contact Matt Higashida of our staff at 768-8045.

DKT:js

cc: Katherine Puana Kealoha, Esq., Director, Office of Environmental Quality Control
Chester Koga, R.M. Towill Corporation

P:\DivFunction\EA-EIS\2008\Makakilo Drive Extension DEA Comments.doc

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 523-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP1/09-294844R

January 28, 2009

MEMORANDUM

TO: DAVID K. TANOUE, ACTING DIRECTOR
DEPARTMENT OF PLANNING AND PERMITTING

FROM: WAYNE Y. YOSHIOKA, ACTING DIRECTOR

SUBJECT: DRAFT ENVIRONMENTAL ASSESSMENT (EA)
MAKAKILO DRIVE EXTENSION

This is to acknowledge your letter of January 12, 2009. Thank you for taking the time to review the Draft EA for the subject project. We offer the following in response to your comments relating to ocean resources:

1. The Final Environmental Assessment (FEA) should provide Right-of-Way (ROW) information on the existing Makakilo Drive, including its cross-section, and discuss how and why the proposal is consistent with or modifies the current ROW section.

   Response: Information on the existing Makakilo Drive will be added to the roadway description noting that the extension right-of-way is the same as the existing roadway and conforms with County standards.

2. The proposed 78-foot ROW is a modification of the Subdivision Street Standards. The FEA should explain the less-than-standard 4-foot planter strips and the lack of median trees and median landscaping.

   Response: The proposed roadway section was developed in consultation with an advisory group made up of community and agency representatives. Consideration of trees within the median was discussed however, there were several issues with tree plantings including visibility,

street illumination, maintenance, and safety. These issues invariably led to a compromise of a grassed landscaped median with a fence to discourage random pedestrian crossings.

3. Page 7, Fig. 3 appears to be inconsistent with Table 2, Alternative 6 (preferred roadway cross-section) with respect to the median barrier. A fence is shown on Fig. 3 but there is no mention of a fence on Table 2. If a fence in the median is the preferred feature, the FEA should explain its intended purpose.

   Response: The median fence was selected to prevent pedestrians from randomly crossing the roadway where there are no marked crosswalks and necessary signage.

4. All street lights should be fully shielded instead of standard shielded lighting to avoid adverse impacts on avi-fauna and to minimize light pollution. Fully shielded lighting fixtures should eliminate any light being projected above the horizontal plane of the lowest point of the light fixture.

   Response: This requirement will be noted in the Final EA and recommended as part of the final design.

5. The projected implementation schedule on page 19 should be coordinated with the Oahu Metropolitan Planning Organization's Transportation Improvement Program (2008-2011) schedule which indicates construction funding in 2010.

   Response: The department has requested that the OMPO TIP be revised. The department has in fact been notified by the State of Hawaii Department of Transportation (HDOT) that federal funding for the project must be "stretched out" over future years. Further, there is currently no local match funding appropriated for the construction of the project.

6. If not already required under contract, contractors should be required to repair existing roadways damaged by the movement of construction equipment during construction of the Makakilo Drive Extension.

   Response: A contractor has not been selected at this time; however, reference to your comment will be included in the Final EA for incorporation in final design documents.

7. Page 22 incorrectly assumes that construction would not disrupt traffic flow on existing streets. Slow moving heavy equipment on Makakilo Drive will interfere with traffic flow as traffic will be required to detour around slower moving construction vehicles carrying heavy loads such as concrete to the construction site.

   Response: The last paragraph on page 22 has been deleted to correctly represent potential traffic impacts during construction.

8. Page 26 Land Use: The FEA should note that Makakilo Quarry located along the western side of the project was granted State Special Use Permit approval to continue operations until 2032.

   Response: The text will be revised to include the information provided.

9. The FEA should reference a future public access for pedestrians/bikes required under State Special Use Permit 73/SP-147. It is intended to connect to either Makakilo Drive Extension and/or Pueonani Street. See attached map.

   Response: Public (pedestrian) access will be provided along the extension via sidewalks and bicycle lanes.

10. Section 4.9: Discuss whether geological hazards (ex., rockfall) are present. If present, describe potential impacts/mitigation measures.

    Response: Rockfall hazards are not anticipated at this time. During the design phase, this hazard potential will be re-evaluated.

11. For hazard mitigation (potential for traffic accidents) a traffic signal and storage lane should be considered at the access driveway to Makakilo Quarry for heavy equipment negotiating left turn movements into the quarry from the proposed extension.

    Response: Signalization of the proposed access roads is not addressed at this stage of planning because of the lack of information on the proposed plans of the adjoining landowners.

12. Check with the developers of the Waikalo'i Subdivision (shown in Figure 22, page 48) if they will require installation of sewer lines within the roadway ROW for their development. To the greatest extent possible, there should be coordination to logically/sequentially construct the

transportation and wastewater systems at or around the same time to avoid ripping up and patching the roadway ROW on separate occasions.

Response: The Wai Kalo'i Subdivision is already under construction and nearing completion. Some of the homes are being occupied at this writing. Therefore, addition sewer facilities are not required. In addition, the Department of Environmental Services did not indicate or offer any comments on the matter.

13. Section 7.2: Subdivision application and approval are required to create the road Right-of-Way (ROW).

    Response: A subdivision plat will be submitted to DPP during the design phase of the project.

14. Section 7.2.1 (Grading Permit). Revise "Permit required for ground disturbance greater than 15 acres" to "Permit required from DPP."

    Response: Text to be revised.

15. Section 7.2.1 and 7.2.2. Revise wording to reference the specific guidelines and the date of publication, i.e. Section 7.2.1 "Permit required in accordance with Rules Relating to Soil Erosion Standards and Guidelines, April 1999."

    Response: The cited text will be revised as proposed.

16. Section 8.3: Revise last City agency listed to Department of Facility Maintenance. Also, do other City agencies need to be consulted (example, Department of Design and Construction and Department of Parks and Recreation)?

    Response: Section 8.3 will be revised to include the agencies suggested.

Please contact Mr. Brian Suzuki at 768-8349 if you have additional comments or questions.

WAYNE Y. YOSHIOKA
Acting Director

N5

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
DIRECTOR

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

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

IN REPLY REFER TO:

HWY-PA
2.0227

January 7, 2009

Mr. Chester Koga
R. M.Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hawaii 96819

Dear Mr. Koga:

Subject: Makakilo Drive Extension, Ewa District, Oahu, Hawaii

In regards to the draft Environmental Assessment for this project, we have the following comments:

1. As stated throughout the document, "Interstate H-1" should be changed to "Interstate Route H-1." Also, Interstate Route H-1 could be abbreviated as "H-1."

2. The last sentence of the second paragraph on page 2 should be clarified. We recommend, "...will not affect the volume of traffic on H-1 beyond the Kapolei-Makakilo Interchange."

3. The first sentence of the second paragraph, on page 3, should be changed as follows: "State of Hawaii and City and County of..."

4. The third and fourth sentences of the third paragraph, on page 3, may be revised as follows: "The portion of the proposed roadway within the Makakilo Community starts in the mauka area of the recently completed subdivision. The proposed H-1 connection is at the North-South Road Interchange, which is currently under construction.

5. The first paragraph on page 5 should probably be revised for clarification purposes. We suggest: "The project area is currently undeveloped except for access roadways which currently extend between Palehua Road, the Makakilo Community and the quarry as owned by Grace Pacific Corporation. Flora in the area is characterized primarily by introduced plant species. As shown in Figure 1, the two principal landforms in the area are: 1) Puu Makakilo and 2) Kaloi Gulch. The proposed roadway will be located within the Kaloi Gulch drainage area; this dry, intermittent stream bed is oriented in the northwest-southwest direction (refer to Figure 1)."

6. The first sentence of the second paragraph, on page 5, should probably state: "...a 4-lane median divided roadway within a minimum 78-foot right-of-way (ROW) width that..."

7. We recommend the following revisions of the second sentence of the third paragraph, on page 5: "Diverting traffic from the Kapolei-Makakilo Interchange...level of service at this interchange."

8. For the second, third and fourth sentences of the fourth paragraph, on page 5, we recommend the following changes: "...includes a 700-foot long, elevated (bridge) section...The roadway cross-section will have a minimum 78-foot width and...The roadway will feature a 4-lane median-separated travel way with sidewalks..."

9. Figure 2 shows a short distance (approximately 125 feet) between two of the proposed roadway curves. Does this distance conform to AASHTO guidelines? Can the proposed super elevation be transitioned to zero within one-half this distance?

10. For Figure 3, Proposed Roadway Cross-Section, the 6-foot median should include the inside shoulders or the area just within the yellow lines; the inside shoulders may have a one (1) foot width. Also, the "bike lane" should be labeled "shoulder/bikeway"; in addition, according to our standards, the bikeway should have a minimum width of five (5) feet, which is exclusive of the curb apron; the additional length which is needed for the bikeway may be provided by decreasing the width of either the planting strip or sidewalk. We prefer the "shoulder/bikeway" designation because this reduces the exclusive use of this area by bicyclists and lessens the opportunity for "accident" litigation.

11. For item c., of the second paragraph, on page 7, we recommend the following corrections: "...built within a 78-foot right-of-way width.

12. The DEA should also indicate the deficiencies of the proposed (but unaccepted) typical sections of the proposed highway.

13. There are other minor grammatical errors in the DEA which should be corrected. For instance, in the sixth sentence of the second paragraph, on page 26, we recommend the following revision: "Major planned development is proposed south of Interstate Route H-1 and..."

14. This project should also be coordinated with the Environmental Protection Agency in regards to the Southern Oahu Basil Aquifer (SOBA). It should be noted that this project is within the recharge area of this vital aquifer.

15. The project should also discuss the transition of the proposed roadway to the housing area of the Makakilo Subdivision.

16. As discussed on page 72, the Area of Potential Effect (APE) should be determined in consultation with the State Historic Preservation Officer.

17. It should also be indicated on page 73 that consistency with the Coastal Zone Management Act will be determined through coordination with the Office of Planning, of the Department of Business, Economic Development and Tourism.

If you have any questions, please contact Nelson Sagum, at 587-1834.

Very truly yours,

GLENN M. YASUI
Administrator
Highways Division

bc: HWY-PA

NS:th

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 523-4730 • Internet: www.honolulu.gov

MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP1/09-296659R

January 28, 2009

Mr. Glenn M. Yasui, Administrator
Highways Division
State Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Yasui:

Subject: Draft Environmental Assessment (EA), Makakilo Drive Extension

This is to acknowledge your letter of January 9, 2009. Thank you for taking the time to review the Draft EA for the subject project. We offer the following in response to your comments:

1. As stated throughout the document, "Interstate H-1" should be changed to "Interstate Route H-1". Also, Interstate Route H-1 could be abbreviated as "H-1".

   Response: The Final EA will be revised to replace Interstate H-1 with Interstate Route H-1.

2. The last sentence of the second paragraph on page 2 should be clarified. We recommend, ". . . will not affect the volume of traffic on H-1 beyond the Kapolei-Makakilo Interchange."

   Response: The Final EA will be revised to reflect your proposed change.

3. The first sentence of the second paragraph, on page 3, should be changed as follows: "State of Hawaii and City and County of . . . "

   Response: The Final EA will be revised to reflect your proposed change.

4. The third and fourth sentences of the third paragraph, on page 3, may be revised as follows: "The portion of the proposed roadway within the Makakilo Community starts in the mauka area of the recently completed subdivision. The proposed H-1 connection is at the North-South Road Interchange, which is currently under construction."

   Response: The Final EA will be revised to reflect your proposed change.

5. The first paragraph on page 5 should probably be revised for clarification purposes. We suggest: "The project area is currently undeveloped except for access roadways which currently extend between Palehua Road, the Makakilo Community, and the quarry as owned by Grace-Pacific Corporation. Flora in the area is characterized primarily by introduced plant species. As shown in Figure 1, the two principal landforms in the area are: a) Puu Makakilo; and, 2) the Kaloi Gulch. The proposed roadway will be located within the Kaloi Gulch drainage area; this dry, intermittent stream bed is oriented in the northwest-southeast direction (refer to Figure 1)."

   Response: The Final EA will be revised to reflect your proposed change.

6. The first sentence of the second paragraph, on page 5, should probably state: ". . . a 4-lane median divided roadway within a minimum 78-foot right-of-way (ROW) width that . . ."

   Response: The Final EA will be revised to reflect your proposed change.

7. We recommend the following revisions of the second sentence of the third paragraph, on page 5: "Diverting traffic from the Kapolei-Makakilo Interchange . . . level of service at this interchange."

   Response: The Final EA will be revised to reflect your proposed change.

8. For the second, third, and fourth sentences of the fourth paragraph, on page 5, we recommend the following changes: ". . . includes a 700-foot long, elevated (bridge) section . . . The roadway cross-section will have a minimum 78-foot width and . . . The roadway will feature a 4-lane median-separated travelway with sidewalks . . ."

   Response: The Final EA will be revised to reflect your proposed change.

9. Figure shows a short distance (approximately 125 feet) between two of the proposed roadway curves. Does this distance conform with AASHTO guidelines? Can the proposed super elevation be transitioned to zero within one-half this distance?

   Response: The transition to the existing Makakilo Drive will include a transition section to accommodate the new cross-section that includes a median, the four travel lanes, and bike lanes. Note that the County roadway standards require crown-to-crown transition and therefore do not conform to AASHTO. The existing Makakilo Drive has a 50-feet curb-to-curb cross-section, whereas the extension has a curb-to-curb cross-section of 60 feet. The sidewalk and landscape strip will transition to match each other. An existing portion of Makakilo Drive will also include changes to the existing striping from 2-lanes to 4-lanes. Further, no parking will be allowed on the existing Makakilo Drive from the intersection with Pueonani to facilitate the transition. The transition at the North-South Road interchange, on the other hand, will conform to the State highway standards. The median on the extension will end at the Interstate Route H-1 right-of-way. The pedestrian facilities will transition to those planned for the interchange.

10. For Figure 3, Proposed Roadway Cross-Section, the 6-foot median should include the inside shoulders or the area just within the yellow lines; the inside shoulders may have a one (1) foot width. Also, the "bike lane" should be labeled "shoulder/bikeway"; in addition, according to our standards, the bikeway should have a minimum width of five (5) feet, which is exclusive of the curb apron; the additional length which is needed for the bikeway may be provided by decreasing the width of either the planting strip or sidewalk. We prefer the "shoulder/bikeway" designation because this reduces the exclusive use of this area by bicyclists and lessens the opportunity for "accident" litigation.

    Response: The Final EA will be revised to reflect your proposed change.

11. For item c., of the second paragraph, on page 7, we recommend the following corrections: ". . . built within a 78-<u>foot</u> right-of-way <u>width</u>."

    Response: The Final EA will be revised to reflect your proposed change.

12. The DEA should also indicate the deficiencies of the proposed (but unaccepted) typical sections for the proposed highway.

    Response: The 78-feet ROW as originally proposed is the County standard the Department accepts.

13. There are other minor grammatical errors in the DEA which should be corrected. For instance, in the sixth sentence of the second paragraph, on page 26, we recommend the following revision: "Major planned development is proposed south of Interstate Route H-1 and . . ."

    Response: The Final EA will be revised to reflect your proposed change as noted above.

14. This project should also be coordinated with the Environmental Protection Agency in regards to the Southern Oahu Basil Aquifer (SOBA). It should be noted that this project is within the recharge area of this vital aquifer.

    Response: The development of the Makakilo Drive Extension is being coordinated with the development of the North-South Road in that storm water generated by the project will be accommodated by the drainage system developed for the North-South Road. Because the project is within the limits of the South O'ahu Basal Aquifer (SOBA), stormwater will be conveyed to a point outside of the SOBA as prescribed by the regional drainage plan and the Environmental Protection Agency.

15. The project should also discuss the transition of the proposed roadway to the housing area of the Makakilo Subdivision.

    Response: As noted above (item #9), a transition area is planned to accommodate the new roadway cross-section. Of particular note are the median on the extension and the requirement for new striping on the existing Makakilo Drive.

16. As discussed on page 72, the Area of Potential Effect (APE) should be determined in consultation with the State Historic Preservation Officer.

    Response: Delineation of the APE will be shown in the Final EA.

17. It should also be indicated on page 73 that consistency with the Coastal Zone Management Act will be determined through coordination with the Office of Planning, of the Department of Planning, Economic Development and Tourism.

    Response: We will note that the Office of Planning was consulted for this project.

Please contact Mr. Brian Suzuki at 768-8349 if you have additional comments or questions.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

LINDA LINGLE
GOVERNOR OF HAWAII

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 22, 2008

Department of Transportation Services
650 South King Street 3rd Floor
Honolulu, Hawaii 96813

Attention: Mr. Brian Suzuki, AICP

Ladies and Gentlemen:

Subject: Makakilo Drive Extension

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 comment.

Other than the comments from Land Division, Division of Aquatic Resources, Engineering Division, the Department of Land and Natural Resources has no other comments to offer on the subject matter. Should you have any questions, please feel free to call our office at 587-0433. Thank you.

Sincerely,

Charlene E. Unoki
for Morris M. Atta
Administrator

Cc: OEQC
RM Towill Corporation

LINDA LINGLE
GOVERNOR OF HAWAII

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 28, 2008

MEMORANDUM

TO: **DLNR Agencies:**
x Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
x Engineering Division
__Div. of Forestry & Wildlife
__Div. of State Parks
__Commission on Water Resource Management
__~~Office of~~ Conservation & Coastal Lands
x Land Division – ~~Oahu District~~/Keith/Gavin

FROM: Morris M. Atta
SUBJECT: Draft environmental assessment for Makakilo Drive Extension
LOCATION: Ewa, Oahu, TMK: (1) 9-2-2:1, 6, 7, 8; 9-2-3:74
APPLICANT: RM Towill Corporation on behalf of Department of Transportation Services

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 20, 2008.

Only 1 copy of the draft environmental assessment available in Room 220.

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

Attachments

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

Signed: Jimmy Chu
Date: 12/10/08

BL

LINDA LINGLE
GOVERNOR OF HAWAII

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 28, 2008

MEMORANDUM

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

FROM: Morris M. Atta
SUBJECT: Draft environmental assessment for Makakilo Drive Extension
LOCATION: Ewa, Oahu, TMK: (1) 9-2-2:1, 6, 7, 8; 9-2-3:74
APPLICANT: RM Towill Corporation on behalf of Department of Transportation Services

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Only 1 copy of the draft environmental assessment available in Room 220.

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

Attachments

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

Signed:
Date: 12/11/08

DEPT OF LAND & NATURAL RESOURCES STATE OF HAWAII
2008 DEC 11 A 11:50
RECEIVED
LAND DIVISION

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/MMA
REF: DEAforMakakiloDriveExtension
Oahu.008

COMMENTS

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

(X) Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone D, an area where flood hazards are undetermined.

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

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

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

- ( ) Mr. Robert Sumimoto at (808) 523-4254 or Mr. Mario Siu Li at (808) 523-4247 of the City and County of Honolulu, Department of Planning and Permitting.
- ( ) Mr. Kelly Gomes at (808) 961-8327 (Hilo) or Mr. Kiran Emler at (808) 327-3530 (Kona) of the County of Hawaii, Department of Public Works.
- ( ) Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.
- ( ) Mr. Mario Antonio at (808) 241-6620 of the County of Kauai, Department of Public Works.

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

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

( ) Additional Comments: _____

_____

( ) Other: _____

_____

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

Signed: _____
ERIC T. HIRANO, CHIEF ENGINEER

Date: 12/4/08

LINDA LINGLE
GOVERNOR OF HAWAII

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

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LAND DIVISION
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DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

Am
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

November 28, 2008

MEMORANDUM

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

FROM: Morris M. Atta
SUBJECT: Draft environmental assessment for Makakilo Drive Extension
LOCATION: Ewa, Oahu, TMK: (1) 9-2-2:1, 6, 7, 8; 9-2-3:74
APPLICANT: RM Towill Corporation on behalf of Department of Transportation Services

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 20, 2008.

Only 1 copy of the draft environmental assessment available in Room 220.

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

Attachments

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

Signed:
Date: 15 Dec. 08

STATE OF HAWAII
Department of Land and Natural Resources
DIVISION OF AQUATIC RESOURCES

MEMORANDUM

TO: Dan A. Polhemus, Administrator
FROM: Glenn R. Higashi, Aquatic Biologist GRH
SUBJECT: Draft Environmental Assessment for Makakilo Drive Extension
Comments Requested By: Morris M. Atta, Land Division
Date of Request: 11/28/08 Date Received: 11/29/08

Summary of Project

Title: **Draft Environmental Assessment for Makakilo Drive Extension**
Project By: **Department of Transportation Services, City and County of Honolulu**
Location: **Ewa, Oahu – TMK: (1) 9-2-002:1,6,7,8; 9-2-003:74**

Brief Description:

The applicant, RM Towill Corporation on behalf of the City and County of Honolulu, Department of Transportation Services, proposes the development of a 4-lane, median separated roadway that connects the end of the existing Makakilo Drive to the proposed North-South Road Interchange currently under construction. The interchange construction is scheduled for completion by Fall 2009.

The roadway is approximately 4,300 feet long and includes 700 feet elevated (bridge) section at the connection of Makakilo Drive. The roadway cross-section is 78 feet and features a 4-lane median separated travel ways with curbs and gutters, sidewalks, streetlights, landscaping strips, fencing and bike lanes. The proposed roadway will provide a second means for Makakilo residents to access from and to the Interstate H-1.

The project area is currently undeveloped except for access roadways which currently extend between Palehua Road and the Makakilo Community and quarry. The proposed roadway will be within the Kalo'I Gulch drainage area, this dry, intermittent flow Kalo'i Gulch which is oriented in a northwest-southeast direction.

Comments:

The proposed activity is not expected to have any significant impact on the aquatic resource values in this area. Kalo'i Gulch contains Kalo'i Stream which is a non-perennial stream and usually dry in the lower reaches except during heavy rains. The following mitigative measures should be implemented during the construction of roadway and bridge to minimize the potential for erosion, siltation and pollution of the aquatic environment:

1) lands denuded of vegetation should be planted or covered as quickly as possible to prevent erosion;
2) scheduling site work during periods of minimal rainfall; and;
3) prevent petroleum products from mechanical equipment from the falling, blowing or leaching into the aquatic environment.

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

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MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP12/08-292718R

January 26, 2009

Mr. Morris M. Atta, Administrator
State of Hawaii
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Atta:

Subject: Draft Environmental Assessment (EA) Makakilo Drive Extension

This is to acknowledge your letter of December 22, 2008. Thank you for taking the time to review the Draft EA for the subject project. We offer the following in response to your comments:

1. Response to Engineering Division
   We acknowledge that portions of the project are within Zone D as delineated on the Flood Insurance Rate Map. The roadway, however, will not be impacted.

2. Response to Aquatic Resources Division
   In order to minimize the potential for erosion, siltation and pollution of the aquatic environment, we will include your proposed mitigation measures into the Final EA. They include:
   a) land denuded of vegetation should be planted or covered as quickly as possible to prevent erosion,
   b) scheduling site work during periods of minimal rainfall to the extent feasible, and
   c) preventing petroleum products from mechanical equipment from falling, blowing or leaching into the aquatic environment.

Please contact Mr. Brian Suzuki at 768-8349 if you have additional comments or questions.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

LINDA LINGLE
GOVERNOR
THEODORE E. LIU
DIRECTOR
MARK K. ANDERSON
DEPUTY DIRECTOR
ABBEY SETH MAYER
DIRECTOR
OFFICE OF PLANNING

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

OFFICE OF PLANNING

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

Telephone: (808) 587-2846
Fax: (808) 587-2824

P-12377

December 29, 2008

Mr. Brian Suzuki, AICP
City and County of Honolulu
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, Hawai`i 96813

Dear Mr. Suzuki:

Subject: Makakilo Drive Extension
Draft Environmental Assessment
TMK Nos: (1) 9-2-002: parcels 001, 006-008 and 9-2-003: 074
Honouliuli, `Ewa, O`ahu

Thank you for sending the Office of Planning the Draft Environmental Assessment (DEA) for the above referenced proposal to plan, design and construct a 4-lane, divided roadway from the end of the existing Makakilo Drive, connecting to the currently under construction North-South Road Interchange. The proposal anticipates using approximately 14.5 acres of vacant agricultural lands.

The action triggering the environmental assessment is the requested use of State of Hawai`i lands, City and County of Honolulu lands and federal funds. The proposed project does not anticipate any State or County regulatory land use changes.

The Office of Planning wants to insure that the Final Environmental Assessment (FEA) sufficiently covers areas of State concern. I am writing to request that the FEA consider the impacts of the proposed project on the following:

Ocean Resources – The State has an affirmative duty to protect Hawai`i's nearshore waters. Please discuss how storm water generated by the project will be addressed. In particular, the project-generated runoff will impact the Kalo`i Gulch drainage system. Other developments makai of the interchange have had specific limitations placed upon their discharge volumes into the Kalo`i Gulch drainage system. These developments have also been required to participate in a regional drainage planning effort to reduce the quantity and improve the quality of storm water runoff in the system. The FEA should

address the specific limitations, which can be found in both State Land Use Commission conditions and City and County development agreements, and their applicability to the proposed project.

The Office of Planning looks forward to receiving an updated FEA with the potential impacts and mitigation measures for the above issue addressed. If you have any questions, please call Scott Derrickson, AICP in the Land Use Division at 587-2805.

Sincerely,

Abbey Seth Mayer
Director

c: Chester Koga, R.M. Towill Corporation
Katherine Kealoha, OEQC

DEPARTMENT OF TRANSPORTATION SERVICES

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RICHARD F. TORRES
DEPUTY DIRECTOR

TP12/08-293218R

January 26, 2009

Mr. Abbey Seth Mayer, Director
Office of Planning
Department of Business, Economic
Development & Tourism
P.O. Box 2359
Honolulu, Hawaii 96804

Dear Mr. Mayer:

Subject: Draft Environmental Assessment (EA) Makakilo Drive Extension

This is to acknowledge your letter of December 29, 2008. Thank you for taking the time to review the Draft EA for the subject project. We offer the following in response to your comments relating to ocean resources:

Stormwater Run-Off and Regional Drainage
The development of the Makakilo Drive Extension is being coordinated with the development of the North-South Road in that stormwater generated by the project will be accommodated by the drainage system developed for the North-South Road. Because the project is within the limits of the South O'ahu Basal Aquifer (SOBA), stormwater from the roadway will be conveyed to a point outside of the SOBA as prescribed by the regional drainage plan and the Environmental Protection Agency.

Please contact Mr. Brian Suzuki at 768-8349 if you have additional comments or questions.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

TP 293317

United States Department of the Interior

FISH AND WILDLIFE SERVICE

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

In Reply Refer To:
2009-FA-0031
2009-TA-0059

DEC 29 2008

Department of Transportation Services
Hawaii State Government
Attn: Brian Suzuki, AICP
650 South King Street, 3rd Floor
Honolulu, Hawaii 96813

Subject: Draft Environmental Assessment for the Makakilo Drive to North-South Road Interchange, Ewa District, Oahu, Hawaii

Dear Mr. Suzuki:

We have received the above referenced document on November 28, 2008. Unfortunately, we will not be able to provide detailed comments on potential impacts of the proposed action on fish and wildlife resources due to our workload.

We appreciate your concern for fish and wildlife resources and have enclosed a list of standard best management practices for you to consider in relation to your particular proposed action. We recommend that the applicable measures identified in this list be incorporated into the action when it is implemented. In addition, we did note that two federally endangered Hawaiian ducks (*Anas wyvilliana*) were observed onsite during the avifauna surveys. The Draft Environmental Assessment does not adequately address potential direct or indirect project impacts to this species or its habitat. We recommend potential impacts to this endangered species be included in your final document. If the project has unavoidable impacts to this species, we recommend you contact our office regarding how to proceed pursuant to section 7 or 10 of the Endangered Species Act of 1973, as amended [16 U.S.C. 1531 et seq.]. This letter should not be considered a concurrence with your proposed action, and it is possible that we may have other comments or recommendations in the future.

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Thank you for coordinating with us on your proposed action. If you have any questions, please contact Mr. Aaron Nadig at (808) 792-9400.

Sincerely,

Patrick Leonard
for Field Supervisor

Enclosure

U.S. Fish and Wildlife Service
Recommended Standard Best Management Practices

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

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

2. Dredging/filling in the marine environment shall be scheduled to avoid coral spawning and recruitment periods and sea turtle nesting and hatching periods.

3. Dredging and filling activities in the marine/aquatic environment shall be designed to avoid or minimize the loss of beach and special aquatic site (coral reefs, wetlands, streams etc.) habitat, and any ecological functions unavoidably lost as a result of the project shall be replaced.

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

5. No project-related materials (fill, revetment rock, pipe etc.) shall be stockpiled in the water (intertidal zones, reef flats, stream channels, wetlands etc.);

6. All debris removed from the marine/aquatic environment shall be disposed of at an approved upland or ocean dumping site.

7. No contamination (trash or debris disposal, non-native species introductions attraction of non-native pests etc.) of adjacent marine/aquatic environments (reef flats, channels, open ocean, stream channels, wetlands, beaches, forests etc.) shall result from project-related activities. This shall be accomplished by implementing a litter-control plan and developing a Hazard Analysis and Critical Control Point Plan (HACCP – see http://www.haccp-nrm.org/Wizard/default.asp) to prevent attraction and introduction of non-native species.

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

9. Any under-layer fills used in the project shall be protected from erosion with stones (or core-loc units) as soon after placement as practicable.

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

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WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP12/08-293317R

January 26, 2009

Mr. Patrick Leonard, Field Supervisor
Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

Dear Mr. Leonard:

Subject: Draft Environmental Assessment (EA) Makakilo Drive Extension

This is to acknowledge your letter of December 29, 2008. Thank you for taking the time to review the Draft EA for the subject project. We offer the following in response to your comments relating to biological resources:

Standard Best Management Practices (BMP)
The BMPs provided by your office will be included in the Final EA and applied as applicable to the project, particularly those that related to stormwater runoff and the resultant impacts of erosion and siltation.

Impacts to the Hawaiian Duck
The two individual Hawaiian ducks that were observed were in a drainage catchment that is outside of the project limits and will not be impacted by the project. The catchment is usually dry except for periods after rainfall events and is generally not considered a habitat for water fowl. Site monitoring will be proposed to be conducted by the contractor to ascertain if specific mitigation will be required during the construction period, particularly after rainfall events.

Please contact Mr. Brian Suzuki at 768-8349 if you have additional comments or questions.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

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

HRD08/3635C

December 26, 2008

Brian Suzuki
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, Hi 96813

RE: Request for comments on the Draft Environmental Assessment for the Makakilo Drive extension project, 'Ewa, O'ahu, TMK: (1) 9-2-002: 1, 6, 7 and 8, (1) 9-2-003: 74.

Aloha e Brian Suzuki,

The Office of Hawaiian Affairs (OHA) is in receipt of the above-mentioned letter dated November 23, 2008. The Department of Transportation proposes to develop an extension to Makakilo Drive. The proposed roadway will be approximately 4,300 feet long and include a 700-foot elevated bridge section. The road will feature four lanes, a median, sidewalks, bike lanes and landscaping strips. OHA has reviewed the project and offers the following comments.

Page 9 of the Draft Environmental Assessment (DEA) indicates that Alternative 1 was "rejected because of costs and impacts to historic resources." However, Table 1 on the same page indicates that Alternative 1 is the preferred plan. This discrepancy needs to be fixed in the Final EA.

Figure 2 on page 6 indicates that there is an access point at the North-South Road Interchange that is reserved for future development. OHA requests information on what this future development is and whether this future development falls outside of the Urban Growth Boundary, which is discussed in the Draft 'Ewa Development Plan.

OHA will rest upon the assurances of the applicant that the ancient Hawaiian trails of the area, such as Pālehua Trail or the "Hawaiian Trail" Shad Kāne describes in the DEA's Cultural Impact Assessment, will not be impacted by the project.

In addition, OHA recommends that the applicant use native vegetation in its landscaping plans for the project site, particularly the native plants that are currently found in the area, such as 'a'ali'i, 'ilima, popolo and 'uhaloa. We ask that, where possible, the populations of 'iliahialo'e, or coastal sandalwood trees (Santalum ellipticum), be protected. OHA would also like to see the replanting of 'iliahialo'e, either in the landscaping plans or in the general project site, as a large number of them were removed from a nearby area to accommodate a housing development. Landscaping with native plants furthers the traditional Hawaiian concept of mālama 'āina and creates a more Hawaiian sense of place. Moreover, the native plants of this area are best suited for the climate of the region, and as such would not require much additional care.

Thank you for the opportunity to comment. If you have further questions, please contact Sterling Wong by phone at (808) 594-0248 or e-mail him at sterlingw@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Administrator

C: Chester Koga
R.M. Towill Corporation
2024 North King Street, Suite 200
Honolulu, Hi 96819

Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hi 96813

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MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP1/09-296565R

January 28, 2009

Mr. Clyde W. Namu'o, Administrator
Office of Hawaiian Affairs
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

Dear Mr. Namu'o:

Subject: Draft Environmental Assessment (EA) Makakilo Drive Extension

This is to acknowledge your letter of December 26, 2008. Thank you for taking the time to review the Draft EA for the subject project. We offer the following in response to your comments relating to ocean resources:

1. Table 1 – Preferred Plan
   The information contained in Table 1 reflects the preferred Alternative 1. The accompanying text will be revised.

2. Figure 2 – Access Point
   During the course of consultation with the community, landowners and developers, it was noted that the adjoining landowners indicated they desire to develop their properties in the future though no specific plans and timetable were forwarded. The access points are shown on the preferred plan. The intersections will not be developed by the City and must be done by the landowner/developer prior to the development of their respective properties. Lands on the Honolulu-side of the proposed roadway are outside of the current Ewa Development Plan's Urban Growth Boundary.

3. Hawaiian Trail
   The trail identified during the archaeological inventory survey will not be impacted by the proposed roadway alignment as shown on the preferred plan.

4. Use of Native Vegetation for Landscaping
Final design and specification for the roadway landscaping has yet to begin and as a result, your recommendations will be forwarded to the roadway designer for consideration. The Department, as a matter of practice, considers the balancing of scenic value, cultural value and maintenance in choosing landscaping. However, the Department will seriously consider, and wherever possible utilize native plants for landscaping of the roadway.

Please contact Mr. Brian Suzuki at 768-8349 if you have additional comments or questions.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

200 Akamainui Street
Mililani, Hawaii 96789-3999
Tel 808-625-2100
Fax 808-625-5888

OCEANIC TIME WARNER CABLE

December 10, 2008

Mr. Brian Suzuki
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, Hawaii 96813

Subject: Makakilo Drive Extension

Dear Mr. Suzuki,

Thank you for giving Oceanic Time Warner Cable the opportunity to participate in the reviewing process for this project. Oceanic Cable does not have any comments regarding this project at this time. However, Oceanic Time Warner Cable would like to be kept informed as the project progresses.

Sincerely,

Darryl Osato
OSP Engineer

Cc: R. M. Towill Corporation
Attn: Mr. Chester Koga

DEPARTMENT OF TRANSPORTATION SERVICES

CITY AND COUNTY OF HONOLULU

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MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP1/09-296567R

January 26, 2009

Mr. Darryl Osato, OSP Engineer
Oceanic Time Warner
200 Akamainui Street
Mililani, Hawaii 96789

Dear Mr. Osato:

Subject: Draft Environmental Assessment (EA) Makakilo Drive Extension

This is to acknowledge your letter of December 10, 2008. Thank you for taking the time to review the Draft EA for the subject project. Please contact Brian Suzuki at 768-8349 if you have additional comments or questions.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

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SCHULER DIVISION

December 26, 2008

Mr. Brian Suzuki, AICP
Department of Transportation Services
650 South King Street, 3rd Floor
Honolulu, Hawaii 96813

Dear Mr. Suzuki,

Subject: Comments on Draft Environmental Assessment (DEA) for the proposed Makakilo Drive Extension, Ewa, Oahu

Thank you for providing us the opportunity to submit comments on the subject document.

At D.R. Horton-Schuler Division's invitation in October of 2005, community leaders and active residents from ʻEwa, Kapolei and Waipahu came together to share their visions for the future of ʻEwa. Over the following year, the group worked to identify the key aspects of the expected lifestyle for those living in the coming secondary urban center and the shape it should take. They also set out how Hoʻopili would play a role to bring this vision to life, and in the process thoughtfully created the kind of community they wanted to see built to help fulfill the vision to make ʻEwa a robust and healthy urban place.

Through 2007, the group obtained information from government and private transportation officials/experts in an attempt to address what most considered as the biggest challenge to Oahu's continued growth: transportation, particularly issues facing the rapidly developing secondary housing and employment center, the Ewa Plain.

The group prepared the attached Ewa Region Transportation Action Plan specifically focused on the pending update of the Ewa Regional Highway Impact Fee ordinance. The group used the following criteria to identify road improvements that they believed were required to support the anticipated build out in the region:

1. Roads that have regional significance;
2. Roads that are needed to accommodate growth in the region;
3. Roads that will be constructed based on land use patterns in the area by 2020;
4. Roads that provide greater connectivity to major east-west, north-south and mauka-makai routes;
5. Roads that will complement and accommodate access to public transit, including rail transit; and
6. Roads that will complement existing regional roadways already being constructed.

Using the criteria, the group determined that the proposed Makakilo Drive Extension was one of six (6) road improvements deemed to have regional significance and therefore recommended to be added to the update of the Ewa Highways impact fee ordinance.

The DEA mentions that land acquisition would be required in the Project Summary table on page 1; however, the proposed rights of ways and current landowners are not identified. Also, while the tmk maps are listed, maps identifying the specific parcels are not included in the DEA.

As an owner of a parcel that is directly impacted by the proposed alignment, we would request that a more detailed map showing how our property will be impacted by the proposed project be included in the DEA.

As you are aware, the State Department of Transportation is in the process of acquiring approximately 16 acres out of our 115 acre parcel located directly mauka of the H-1 and North South Road interchange. Your proposed project would bisect the remainder of our property. While access is being allowed to Grace Pacific for their existing Quarry operations, how will access be provided to the two parcels being created by bisecting our existing property?

Thank you for the opportunity to provide comments on the DEA. Should you have any questions regarding this matter, please feel free to contact us directly at 521.5661.

Sincerely,



Dean Uchida, Vice President

cc: Chester Koga

DEPARTMENT OF TRANSPORTATION SERVICES

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MUFI HANNEMANN
MAYOR

WAYNE Y. YOSHIOKA
ACTING DIRECTOR

RICHARD F. TORRES
DEPUTY DIRECTOR

TP1/09-296637R

January 27, 2009

Mr. Dean Uchida, Vice President
D.R. Horton, Shuler Division
828 Fort Street Mall, 4th Floor
Honolulu, Hawaii 96813

Dear Mr. Uchida:

Subject: Draft Environmental Assessment (EA) Makakilo Drive Extension

This is to acknowledge your letter of December 26, 2008. Thank you for taking the time to review the Draft EA for the subject project. We offer the following in response to your comments:

1. Ewa Region Transportation Action Plan

   Response: We hereby acknowledge receipt of the Plan prepared by your organization. We believe that the proposed roadway plan meets the objectives of the plan developed by your organization.

2. Using the criteria, the group determined that the proposed Makakilo Drive Extension was one of six (6) road improvements deemed to have regional significance and therefore recommended to be added to the update of the Ewa Highways impact fee ordinance.

   Response: The Ewa Highway Impact Fees will be the subject of a study to be conducted this year (2009). The Makakilo Drive Extension will be one of the projects that will be considered in the study.

3. The DEA mentions that land acquisition would be required in the Project Summary table on page 1; however, the proposed rights of ways and current landowners are not identified. Also, while the TMK maps are listed, maps identifying the specific parcels are not included in the DEA. As an owner of a parcel that is directly impacted by the proposed alignment, we would request that a more detailed map showing how our property will be impacted by the proposed project be included in the DEA.

Response: A map showing the preferred roadway alignment overlain on a currently available tax map will be prepared and included in the Final EA. The approximate land area(s) to be acquired will also be shown in the Final EA. Please note that the areas are approximate and will not be finalized until design is completed.

4. As you are aware, the State Department of Transportation is in the process of acquiring approximately 16 acres out of our 115 acre parcel located directly mauka of the H-1 and North South Road interchange. Your proposed project would bisect the remainder of our property. While access is being allowed to Grace Pacific for their existing Quarry operations, how will access be provided to the two parcels being created by bisecting our existing property?

   Response: Access to the adjoining parcels was discussed but not specifically considered during the planning process. We had invited affected property owners to attend our advisory task force meetings and only UH-West O'ahu and Grace Pacific attended to express their future desires. The access shown on the preferred plan are concepts for access based on topography and preliminary roadway design and not for any specific landowner. Based on these factors and in lieu of any specific development proposals that were received, the access shown is the only proposed access points to the roadway at this time.

Please contact Mr. Brian Suzuki at 768-8349 if you have additional comments or questions.

Very truly yours,

WAYNE Y. YOSHIOKA
Acting Director

Hawaiian Electric Company, Inc. • PO Box 2750 • Honolulu, HI 96840-0001

January 22, 2009

Brian Suzuki, AICP
Department of Transportation Services
City & County of Honolulu
650 S. King Street - Third Floor
Honolulu, HI 96813

Dear Mr. Suzuki:

Re: Makakilo Drive Extension
Ewa, Oahu
TMKs: 9-2-002: Parcels 1, 6, 7, 8 &
9-2-003-74

Thank you for the opportunity to comment on the DEA of the above-referenced project. Hawaiian Electric Company, Inc. (HECO) has no objections. The following comments were received from the Transmission & Distribution Division of our Engineering Department:

(1) HECO currently has overhead lines within the area of the subject project, one of which is the 46kV Makakilo Golf line; and we will require continued access for maintenance purposes. We appreciate your efforts to keep us apprised of the planning process. As the project progresses, please continue to keep us informed. We will be better able to evaluate any effects on our system facilities further along in the project's development. We request that development plans show all affected HECO facilities and address any conflicts between the proposed plans and our existing facilities. Please forward the pre-final development plans to HECO for review. A brief description and environmental analysis of any requirements for relocation or new facilities should be included in the DEA.

(2) Should it become necessary to relocate HECO's facilities, please submit a request in writing and we will work with you so that construction of the project may proceed as smoothly as possible. Please note that there may be costs associated with any relocation work, and that such costs may be borne by the requestor. Because any redesign or relocation of our facilities may cause lengthy delays, upon determination that HECO facilities will need to be relocated or built, HECO should be notified immediately in order to minimize any delays in or impacts on the project schedule.

Our point of contact for this project is Michelle Yoshioka, Transmission & Distribution Division, Engineering Department (543-7082). I suggest dealing directly with her to coordinate HECO's continuing input in this project.

Sincerely,

Kirk S. Tomita
Senior Environmental Scientist

cc: Ms. Katherine P. Kealoha (OEQC)
Mr. Chester Koga (R.M. Towill Corp.)
M. Yoshioka/M. Lum/R. Tamayo