DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
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KIRK CALDWELL
MAYOR

GEORGE I. ATTA, FAICP
DIRECTOR

ARTHUR D. CHALLACOMBE
DEPUTY DIRECTOR

2014/ED-9(JY)

December 10, 2014

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

Dear Ms. Wooley:

SUBJECT: Chapter 343. Hawaii Revised Statutes
Draft Environmental Assessment

Project:	Dillingham Ranch Agricultural Subdivision
Applicant:	Dillingham Ranch Aina, LLC
Agent:	Hart Howerton (Daniel Bucko)
Location:	68-540 Farrington Highway - Waialua
Tax Map Key:	6-8-3: 6 and 15
Proposal:	Roadway connection to Farrington Highway and a wastewater treatment plant for an agricultural subdivision on former Dillingham Ranch lands.

We respectfully request publication of the project summary of the Draft Environmental Assessment (DEA) in the next edition of The Environmental Notice on **December 23, 2014**. Enclosed are two hard copies and one electronic copy of the DEA and the Publication Form. The Publication Form, including project summary, was also sent via electronic mail to your office.

Should you have any questions, please contact Joette Yago of our Urban Design Branch at 768-8034 or via email at jyago@honolulu.gov.

Very truly yours,

For George I. Atta, FAICP
Director

Enclosure: DEA, two hard copies and one disk
One copy of OEQC Publication Form

cc: Daniel Bucko, AICP

Doc 1197353

APPLICANT ACTIONS
SECTION 343-5(C), HRS
PUBLICATION FORM (JANUARY 2013 REVISION)

Project Name: **Dillingham Ranch Agricultural Subdivision**
Island: **Oahu**
District: **Waialua**
TMK: **6-8-3: 6 and 15**
Permits: Building and Grading Permits, Department of Planning and Permitting, City and County of Honolulu
Approval of Construction Plans & Specifications, Department of Transportation, State of Hawaii
Permit to Perform Work Upon State Highways, Department of Transportation, State of Hawaii
Notice of Intent for General Permit for Treatment Works, Department of Health, Wastewater Branch, State of Hawaii

Approving Agency:
Department of Planning and Permitting
Land Use Permits Division
City and County of Honolulu
650 South King Street, 7th Floor
Honolulu, Hawaii 96813
Contact: Joette Yago, Urban Design Branch
808-768-8034

Applicant:
Dillingham Ranch Aina, LLC
9701 Wilshire Boulevard, Suite 700
Beverly Hills, California 90212
Contact: Clifford Smith, Vice President
310-887-3438

Consultant:
Hart Howerton
1 Union Street, Third Floor
San Francisco, California 94111
Contact: Daniel Bucko, AICP
415-439-2282

Status (check one only):

_**X**_DEA-AFNSI — Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov; a 30-day comment period ensues upon publication in the periodic bulletin.

__FEA-FONSI — Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqchawaii@doh.hawaii.gov; no comment period ensues upon publication in the periodic bulletin.

__FEA-EISPN — Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov; a 30-day consultation period ensues upon publication in the periodic bulletin.

__Act 172-12 EISPN — Submit the approving agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqchawaii@doh.hawaii.gov. NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.

__DEIS — The applicant simultaneously transmits to both the OEQC and the approving agency, a hard copy of the DEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may send both the summary and PDF to oeqc@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.

__FEIS	The applicant simultaneously transmits to both the OEQC and the approving agency, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqc@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__ Section 11-200-23 Determination	The approving agency simultaneous transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the applicant. No comment period ensues upon publication in the periodic bulletin.
__Statutory hammer Acceptance	The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it failed to timely make a determination on the acceptance or nonacceptance of the applicant's FEIS under Section 343-5(c), HRS, and that the applicant's FEIS is deemed accepted as a matter of law.
__Section 11-200-27 Determination	The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.
__Withdrawal (explain)	

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

Dillingham Ranch Aina, LLC proposes an Agricultural Subdivision on approximately 934 acres of the 2,742-acre Dillingham Ranch. The proposed agricultural subdivision includes 91 lots for sale each with a minimum size of 5.0 acres. Each subdivided lot will host agricultural activities including orchard crops, pasturage, or ranch activities. Two subdivided lots will be for an agricultural cluster with approximately 15 farm dwellings. The future operation of the Working Ranch will be focused on a new core activity of cultivation and marketing high quality orchard crops, primarily for the Oahu market. The proposed agricultural feasibility plan and subdivision will be a continuation of agricultural uses on the Dillingham Ranch dating back to the 1900s.

Subdivision lot owners will be able to build a farm dwelling and non-agricultural accessory uses with a development area not to exceed 5,000 square feet on a single lot per the Land Use Ordinance. New roads will be developed to access the subdivided lots and agricultural operations. The remaining acreage of 1,808 acres will be resubdivided into seven bulk parcels. Additional bulk lots will serve the pasturage and equestrian operations, agricultural and ranch operations, and protected open space.

Dillingham Ranch Aina, LLC requests a review of the submitted Draft Environmental Assessment (DEA) and anticipated finding of no significant impact (FONSI). The "trigger" projects associated with the Agricultural Subdivision are Connection to Farrington Highway and a Wastewater Treatment Plant to serve the Agricultural Subdivision.

Connection to Farrington Highway and Wastewater Treatment Plant Improvements Dillingham Ranch Agricultural Subdivision

Volume I: Draft Environmental Assessment

Waialua, Island of O'ahu,
Hawai'i Tax Map Key: 6-8-003: 015, 6-8-003:006

October 6, 2014

Prepared Pursuant to:

Chapter 343, Hawaii Revised Statutes,
and Title 11, Chapter 200,
Hawaii Administrative Rules

Prepared for:

Dillingham Ranch 'Aina, LLC
9701 Wilshire Boulevard, Suite 700
Beverly Hills, California 90212

Prepared by:

Sherwood Design Engineers
58 Maiden Lane, Third Floor
San Francisco, CA 94108

Hart Howerton
1 Union Street, Third Floor
San Francisco, CA 94111

Connection to Farrington Highway and Wastewater Treatment Plant Improvements Dillingham Ranch Agricultural Subdivision

Volume I: Draft Environmental Assessment

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Hawai'i Tax Map Key: 6-8-003: 015, 6-8-003:006

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San Francisco, CA 94108

Hart Howerton
1 Union Street, Third Floor
San Francisco, CA 94111

TABLE OF CONTENTS

LIST OF FIGURES

FIGURES REFERENCED FROM OTHER DOCUMENTS

Archaeological Inventory Survey of the Mauka Lands, Dillingham Ranch Agricultural Subdivision (Volume II: Appendix D)

Traffic Assessment, Proposed Dillingham Ranch Agricultural Subdivision

(Volume II: Appendix E)

Agriculture Feasibility Report, Dillingham Ranch Subdivision

(Volume II: Appendix F)

VOLUME II: APPENDICES

Project Summary	
Project:	Connection to Farrington Highway and Wastewater Treatment Plant Improvements, Dillingham Ranch Agricultural Subdivision
Proposing Agency/ Applicant:	Dillingham Ranch 'Aina, LLC 9701 Wilshire Boulevard, Suite 700 Beverly Hills, California 90212 Contact: Clifford Smith, Vice President
Accepting Authority:	Department of Planning and Permitting Land Use Permits Division City and County of Honolulu 650 South King Street #7 Honolulu, Hawaii 96813 Contact: Jamie Pierson, Chief of Land Use Approval, Urban Design Branch
TMK:	**Connection to Farrington Highway**: TMK 6-8-003: Parcel 015 and along Farrington Highway, F.A.P. No. 35-A (1) **Waste Water Treatment Plant**: TMK 6-8-003: Parcel 006
Location:	Waialua, Island of O'ahu, Hawai'i
Project Area:	**Connection to Farrington Highway**: Less than 1-acre required for grading, drainage, and pavement installation. **Wastewater Treatment Plant**: Approximately 0.1 acre required for 20' x 20' control building, four underground treatment tanks, and four underground vaults for chlorine disinfection system. 7.9 acres for subsurface effluent disposal system.

Document Preparer:	Sherwood Design Engineers 58 Maiden Lane, Third Floor San Francisco, CA 94108 Contact: John Leys, Principal Civil Engineer Hart Howerton 1 Union Street, Third Floor San Francisco, CA 94111 Contact: Daniel Bucko, AICP
County Zoning:	AG-1, Restricted Agricultural District AG-2, General Agricultural District
State Land Use:	Agricultural
Existing Land Use:	**Connection to Farrington Highway**: The proposed area of use serves as current access from Farrington Highway to Dillingham Ranch operations. **Wastewater Treatment Plant**: The proposed area of use is currently pasture.
Proposed Action:	**Connection to Farrington Highway:** Improvements consisting of grading, drainage, installation of pavement, and signage will provide entry to the planned Dillingham Ranch Subdivision. **Wastewater Treatment Plant:** Improvements include installation of control building and subsurface tanks, vaults, and subsurface disposal system to provide wastewater treatment to the Agricultural Subdivision.

Permits that May be Required:	Building and Grading Permits, Department of Planning and Permitting, City and County of Honolulu Approval of Construction Plans & Specifications, Department Transportation, State of Hawai'i Permit to Perform Work Upon State Highways Department of Transportation, State of Hawai'i Notice of Intent for General Permit for Treatment Works, Department of Health, Wastewater Branch, State of Hawai'i

Section 1: Project Description

1.1 Project Purpose

Dillingham Ranch 'Aina, LLC (DRA) proposes two projects as follows as part of the Dillingham Ranch Agricultural Subdivision:

1. A Connection to Farrington Highway, a State Department of Transportation (DOT), Highways Division, facility in the Waialua District of O'ahu. The Connection to Farrington Highway will be located at the current westerly access road to Dillingham Ranch and provide access to the proposed agricultural subdivision and future agricultural cluster. The roadway will carry traffic in the south and northbound approaches from the agricultural subdivision to Farrington Highway.
2. A wastewater treatment plant (WTP) to serve the 91 agricultural subdivision lots and future agricultural cluster of 15 farm dwellings. The WTP will be located on the Dillingham Ranch property *makai* (towards the ocean) of the existing Cane Haul Road.

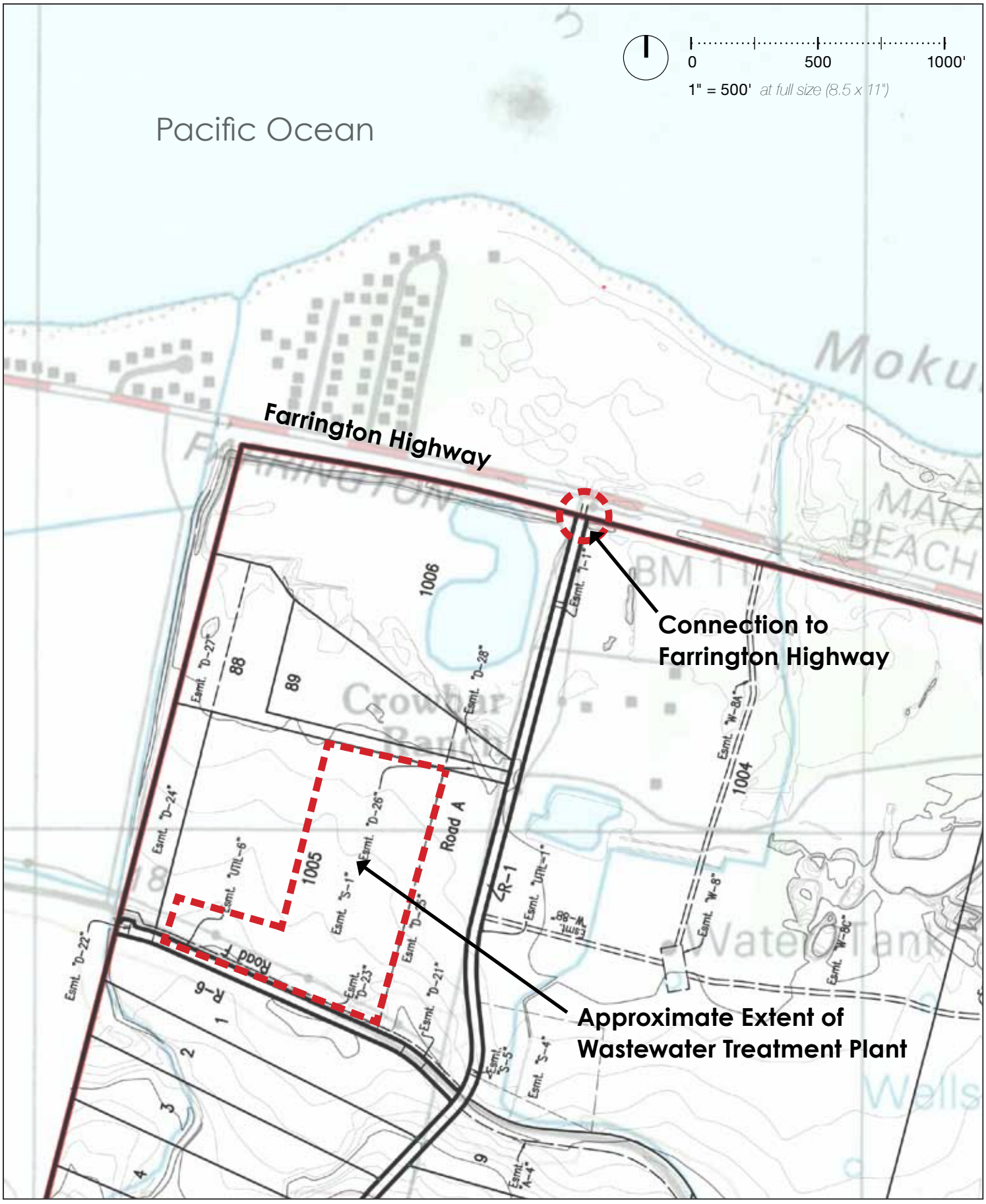
The location of both projects is shown in **Figure 1, Project Location**.

1.2 Purpose for Preparation of an Environmental Assessment

The purpose of this Draft Environmental Assessment (DEA) is to inform interested parties of the proposed projects and to disclose information relating to the potential for adverse environmental impacts.

In this DEA the existing environmental setting is described along with potential impacts of the projects and recommended mitigation measures if any. The environmental setting includes the physical environment, such as topography, flora/fauna, scenic and visual resources, historic and archeological resources, and flood hazards. Public facility impacts are also described including access, traffic and roadways, and police, fire, and ambulance services.

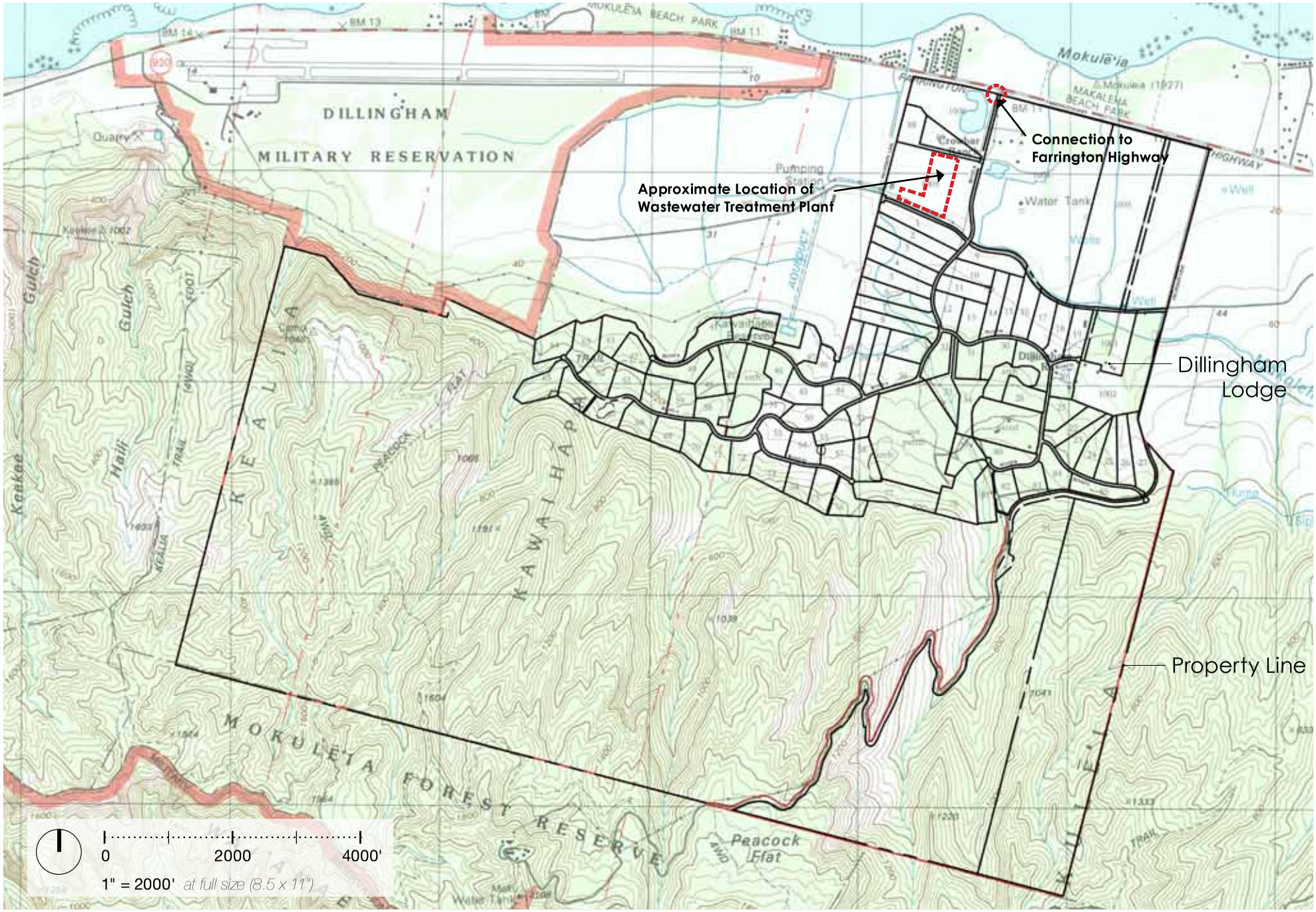
Additional information is provided concerning the potential for secondary impacts associated with the Agricultural Subdivision. The proposed Connection to Farrington Highway and WTP, with its connection to a 91 lot 937.7 acre proposed subdivision and future Agricultural Cluster of approximately 124.7 acres, within the approximately 2,722.4 acre Dillingham Ranch, has the potential for beneficial and/or adverse environmental impacts that are secondary to the proposed projects. This expanded discussion includes Agricultural Feasibility, Rockfall Potential, proposed Wastewater Systems, and proposed Water System. The proposed Agricultural Subdivision is shown in **Figure 2**.

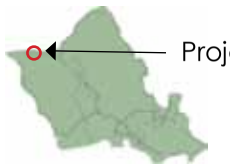


Project Location

DILLINGHAM 1897 RANCH
NORTH SHORE, OAHU

Figure 1
Project Location





DILLINGHAM 1897 RANCH
NORTH SHORE, OAHU

Figure 2

Proposed Agricultural Subdivision

Technical reports were prepared by experts for many of the areas of discipline covered in this DEA. These reports are summarized in **Volume I** for the purposes of assessing impacts and recommending potential mitigation measures. The full reports are contained in **Volume II: Appendices**.

This DEA complies with Chapter 343, Section 343-5, Hawaii Revised Statutes (HRS), which states that:

"(a) an environmental assessment shall be required for actions that:

(1) propose the use of state or county lands or the use of state or county funds, other than funds to be used for feasibility or planning studies for possible future programs or projects which the agency has not approved, adopted, or funded, or funds to be used for the acquisition of unimproved real property; provided that the agency shall consider environmental factors and available alternatives in its feasibility or planning studies…..; (and additionally)

(9) Propose any:

(A) Wastewater treatment unit, except an individual wastewater system or a wastewater treatment unit serving fewer than fifty single-family dwellings or the equivalent:"

The proposed project's use of the DOT right-of-way and the proposed WTP serves as a trigger for the preparation of an DEA in accordance with Section 343-5, HRS. According to Section 343-5:

"(c) Whenever an applicant proposes an action specified by subsection (a) that requires approval of an agency and that is not a specific type of action declared exempt under section 343-6, the agency initially receiving and agreeing to process the request for approval shall prepare an environmental assessment of the proposed action at the earliest practicable time to determine whether an environmental impact statement shall be required. The final approving agency for the request for approval is not required to be the accepting authority."

Project Entitlement History Related to the 2014 DEA

In 2008 DRA proposed an agricultural subdivision for Dillingham Ranch which subsequently received Tentative Map Approval by the Department of Planning and Permitting, City and County of Honolulu, on April 18, 2008. The Final Environmental Assessment received a Finding of No Significant Impact (FONSI) determination from the State Department of Transportation (accepting agency) on November 17, 2008. The Tentative Map Approval subsequently expired in 2010.

The current tentative map application for an Agricultural Subdivision is very similar to the 2008 map application in terms of the proposed project, project area, and likely impacts. Differences to note in the current tentative map application from the 2008 map application include:

1. An additional "trigger" project in the form of a Wastewater Treatment Plant to serve the Agricultural Subdivision,
2. An increase in minimum 5.0 acre agricultural subdivision lots from 77 to 91 (see **Figure 3, Additional Agricultural Subdivision Area, 2008 v. 2014**)
3. Some reconfiguration in the subdivision of bulk lots,
4. Two bulk lots which are assigned to a future Agricultural Cluster,
5. Some reconfiguration of roads and access, and an
6. Agricultural Feasibility Plan, which includes orchards and field crops in addition to horse pasturage and cattle ranching.

Much of the information contained in several of the supporting reports and documents prepared in 2007 and 2008 for the prior Agricultural Subdivision application have been determined as relevant for the 2014 application. Additional area added to the proposal subdivision in 2014 (see **Figure 3**) have been studied and the findings have been incorporated into updated or new reports and documents. Reports and documents that surveyed the same areas of the site for the 2008 map application have been updated for the 2014 application on a case-by-case basis. Discussion of the relevancy of prior surveys and reports and the necessary updates are discussed in the summaries in this report and in the complete technical reports which are found in the Appendices.

Status of Proposed 2014 Agricultural Subdivision

On August 29, 2014 the Draft Tentative Map and supporting documentation was submitted to the Department of Planning and Permitting, City & County of Honolulu, for review and tentative approval. (see **Volume II: Appendix A** for letters and documentation related to the map application).

1.3 Organization of the Report

Volume I is organized into nine sections and appendices as follows:

Section 1: Project Description

Section 2: Environmental Setting, Potential Impacts and Mitigation Measures

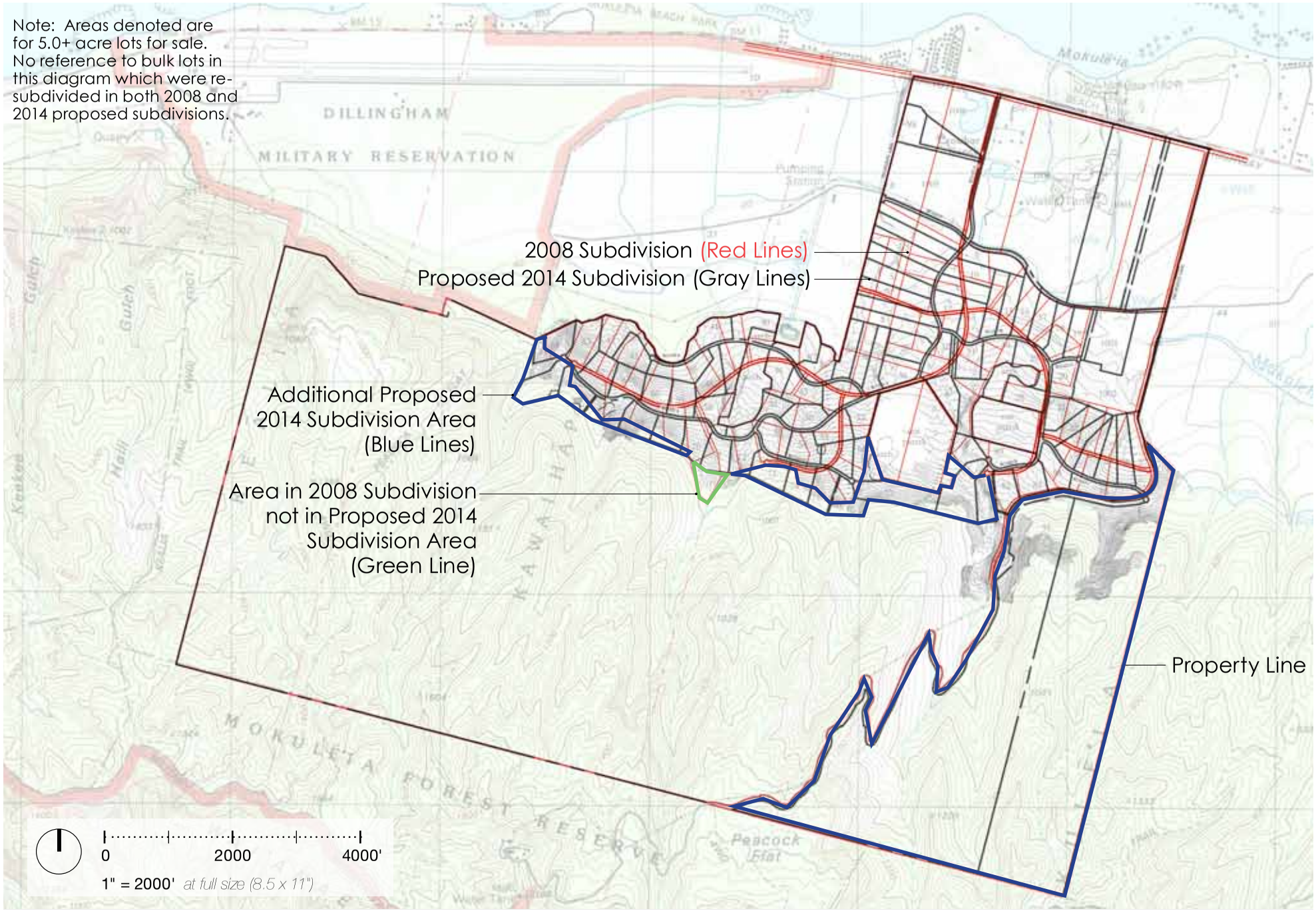
Section 3: Project Alternatives

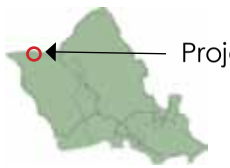
Section 4: Relationship to State and City & County Land Use Plans and Policies

Section 5: Permits and Approvals That May be Required

Section 6: Cultural Impact Assessment Evaluation

Section 7: Agencies, Organizations and Individuals Consulted





DILLINGHAM 1897 RANCH
NORTH SHORE, OAHU

Figure 3

Additional Proposed Subdivision Area

Section 8: Summary of Impacts and Significance Evaluation

Section 9: Findings

References

1.4 Project Description

1.4.1 Project Locations and Site Characteristics

The proposed projects are located in Mokule'ia, Waialua, along the northern coastline of O'ahu (See **Figure 1, Project Location**).

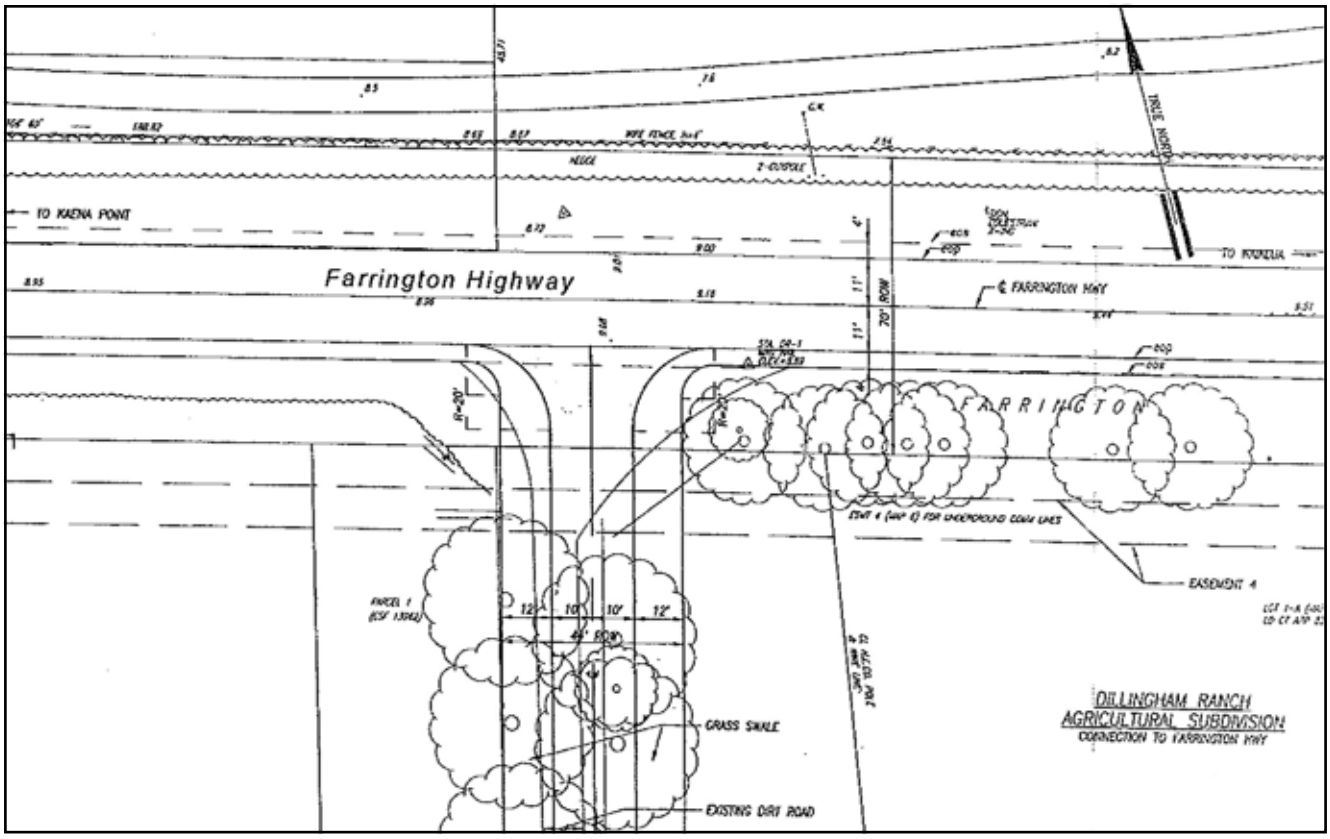
Connection to Farrington Highway

The location of the subject connection along the Farrington Highway (F.A.P. 35A(1)) is approximately 750 to 800 feet from the beach shoreline. The access roadway serving the planned Dillingham Ranch Agricultural Subdivision is located at street address, 68-540 Farrington Highway, Waialua, O'ahu, Hawai'i 96791. The Hawai'I Tax Map Key is: 6-8-003: 015. The proposed Connection to Farrington Highway improvements will involve use of less than approximately 1 acre of land. A portion of the Connection to Farrington Highway will be within the DOT, Highways Division, right -of-way, while the entirety of the access roadway and subdivision is owned by Dillingham Ranch 'Aina, LLC. The proposed Connection to Farrington Highway is shown in **Figure 4**.

The lands *mauka* (towards the mountains) of the proposed Connection to Farrington Highway are in agricultural uses that include ranching, limited diversified agricultural crops, and related pasturage and corral uses. The land on the makai side of the subject intersection is privately owned vacant land that is currently used as a polo field. There are no agricultural activities at the planned Connection to Farrington Highway.

Wastewater Treatment Plant (WTP)

The location of the WTP is west of the project access Road A and *makai* of the existing Cane Haul Road. The WTP will serve approximately 91 lots and the future 15 agricultural cluster farm dwellings which all lie *mauka* of Cane Haul Road. The WTP is composed of a subsurface Cyclical Biological Treatment Unit (CBT) and the Primary Subsurface Effluent Disposal System which receives effluent from the treatment unit. The effluent disposal system will occupy approximately 7.9 acres. A possible alternative to the 7.9 acre effluent disposal system would be to disinfect the effluent from the CBT unit with ultraviolet and chlorine disinfection and



0 50 100'

1" = 50' *at full size (8.5 x 11")*

Figure 4

Project Location

DILLINGHAM 1897 RANCH
NORTH SHORE, OAHU

Proposed
Connection to
Farrington Highway

discharge the effluent through a subsurface irrigation system. This alternative would still require a backup subsurface effluent disposal system of approximately 4 acres. The proposed location of these facilities is shown in **Figure 5.**

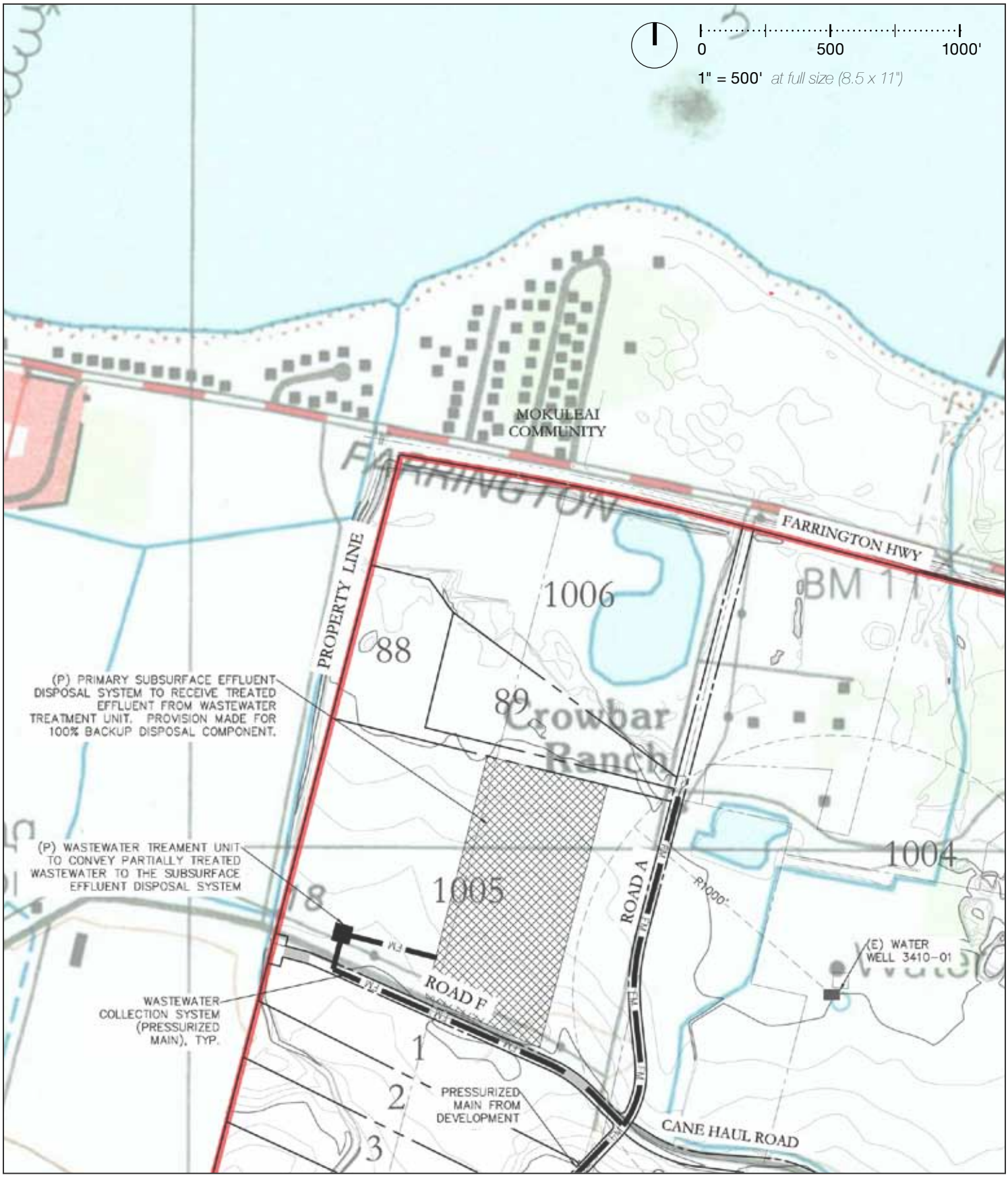
Lands makai and east of the area of the proposed WTP also include ranching, limited diversified agricultural crops, related pasturage and corral uses, and two 5.0+ acre agricultural subdivision lots. Lands on the western side of the WTP are additional ranch pasture and beyond the property line are lands in agricultural use by adjacent private owner. Mauka of the WTP is the majority of the Dillingham Ranch Agricultural Subdivision.

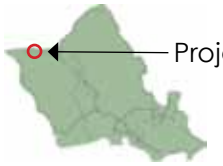
1.4.2 Proposed Agricultural Subdivision

The 10 bulk parcels that presently comprise the Ranch (net of the two land locked parcels that are owned by Coastalview Properties, LLC) will be consolidated and resubdivided to create seven reconfigured bulk parcels and 91 agricultural lots as depicted on the subdivision map (see **Figure 2, page 3**).

The proposed program for the Dillingham Ranch agricultural subdivision includes 91 lots for sale each with a minimum size of 5.0 acres. Most of the proposed lots and farm dwellings will be situated mauka of the Cane Haul Road with the exception of lots 88 and 89 which lie about 200 feet mauka of Farrington Highway. Each subdivided for sale lot will host agricultural activity including orchard crops, pasturage, or ranch activities. Subdivision lot owners will be able to build a farm dwelling and non-agricultural accessory uses within a development area not to exceed 5000 square feet on a single lot respecting setbacks and height limits established
in the City and County of Honolulu Land Use Ordinance. (City and County of Honolulu, Land Use Ordinance, Chapter 21, 1990/2014). New roads will be developed to access the subdivided lots and agricultural operations.

Additional subdivided bulk lots will serve the Agricultural Cluster, pasturage and equestrian operations, agricultural and ranch operations, and protected open space. Parcels 1001 to 1007 will be used for various agricultural activities and support facilities as shown in the Table on page 11:





DILLINGHAM 1897 RANCH
NORTH SHORE, OAHU

Figure 5

Proposed Wastewater Treatment Plant

Parcel	Description	Area	Use	Ownership
1001	Dillingham House	14.7	Meetings/Events	HOA
1002 1003	Ag Cluster Farm Dwellings Ag Cluster	26.1 98.6	Housing/Orchard/Floral Crops Mango/Coconut Trees	CPR Housing Unit Owners (Ag Cluster)
1004	Pasture	126.4	Equestrian/Paddocks	DRA
1005	WTP - Leach Field and Pasture	31.7	Pasture (sub surface leach field)	DRA
1006	Artificial Lake	22	Scenic Amenity	HOA
1007	Grazing and Open Space	1439.9	Cattle Production, Protected Areas	DRA

The Agricultural Cluster will be employed in Parcel 1003 to maximize use of the Prime rated soils for mango production. The farm housing units will be located mauka of the Cane Haul Road on Parcel 1002. The two parcels would be linked by a Joint Development Agreement and treated as a single project.

Proposed agricultural operations are summarized in **Section 2.3.1** and the full Agricultural Feasibility Report is found in **Volume II: Appendix F**.

1.4.2 Proposed Project Construction Activities

Connection to Farrington Highway Improvements

The proposed improvements will consist of limited grading, paving, and installation of traffic signage designating the location as a connection to Farrington Highway from the planned subdivision access roadway (**see Figure 4, Proposed Connection to Farrington Highway Project**). The access roadway will be a 44-ft. right-of-way. The right-of-way will include two - 10 foot paved travel lanes, 2 foot paved shoulders on either side of the travel lanes, and 10 foot landscaped areas adjacent to the shoulders.

The access roadway is planned as a two-lane roadway carrying traffic in both the northbound and southbound directions. A single lane will be provided on the northbound approach that will be shared by traffic making left and right turns onto the highway and a single lane will be provided in the southbound direction into the subdivision.

A stop sign will be used to control the northbound approach to the intersection. The intersection will be designed with adequate sight distance for drivers at the stop sign and clearly visible to drivers on the highway. As required, warning signs will be posted on Farrington Highway to improve driver awareness of the new intersection and to alert oncoming traffic to drivers making southbound turns into the Dillingham Ranch Agricultural Subdivision.

Wastewater Treatment Plant (WTP) Improvements

The proposed Wastewater Treatment Plant improvements will consist of site grading, a concrete pad, installation a low pressure pipe network, installation of a centralized wastewater treatment works, and construction of either a centralized subsurface effluent disposal system and/or a disinfection system combined with an R-2 recycled water dispersal system. Additionally there is a small (20' x 20') control building which will house the blowers, monitoring equipment, and control panels.

The low pressure pipe network will be approximately 3-inches in diameter and will discharge into the centralized wastewater treatment works. The centralized treatment works will be a Cyclical Biological Treatment unit (CBT), which will be located below ground with manholes for access. The CBT unit will treat the wastewater to exceed the Department of Health's minimum standards and discharge the treated effluent into an approximate 4 acre centralized subsurface effluent disposal system. A second 4 acre centralized subsurface effluent disposal system will be co-located to capture 100% redundancy of the wastewater disposal.

If the recycled water alternative is used there will be both fine filtration and Ultraviolet and Chlorine disinfection after the CBT unit, followed by a pumped subsurface irrigation system. With this alternative there will still be approximately 4 acres of a centralized subsurface effluent disposal system as a backup.

Agricultural Subdivision

The proposed Connection to Farrington Highway and WTP are designed to support the proposed Agricultural Subdivision. All lots as identified within the subdivision will be developed in accordance with applicable regulations of the State and City & County of Honolulu. This will include provision of the required

infrastructure and utilities including access roads and connection with major public roadways, water, wastewater, power, drainage and solid waste collection.

1.4.3 Project Schedule and Cost

Construction of the proposed projects is anticipated to occur following tentative map approval and procuring grading and building permits from the City and County of Honolulu.

Connection to Farrington Highway Improvements

The Connection to Farrington Highway project duration is anticipated at less than approximately 6 months. The preliminary construction cost estimate for the project is approximately $250,000.

Wastewater Treatment Plant

The WTP will be constructed concurrently with road and utility improvements in the subdivision. The project duration is anticipated at less than approximately 18 months. The preliminary construction cost for the wastewater treatment facility is estimated at approximately $6,200,000.

Agricultural Subdivision

The entire Dillingham Ranch Agricultural Subdivision construction will be implemented in phases over the course of approximately 5 to 7 years. The construction cost for the entire development, including the wastewater treatment facility, is estimated at approximately $30,000,000. All costs associated with the design and construction of the proposed projects will be financed by DRA.

Section 2: Environmental Setting, Potential Impacts and Mitigation Measures

2.1 Physical Environment

2.1.1 Climate

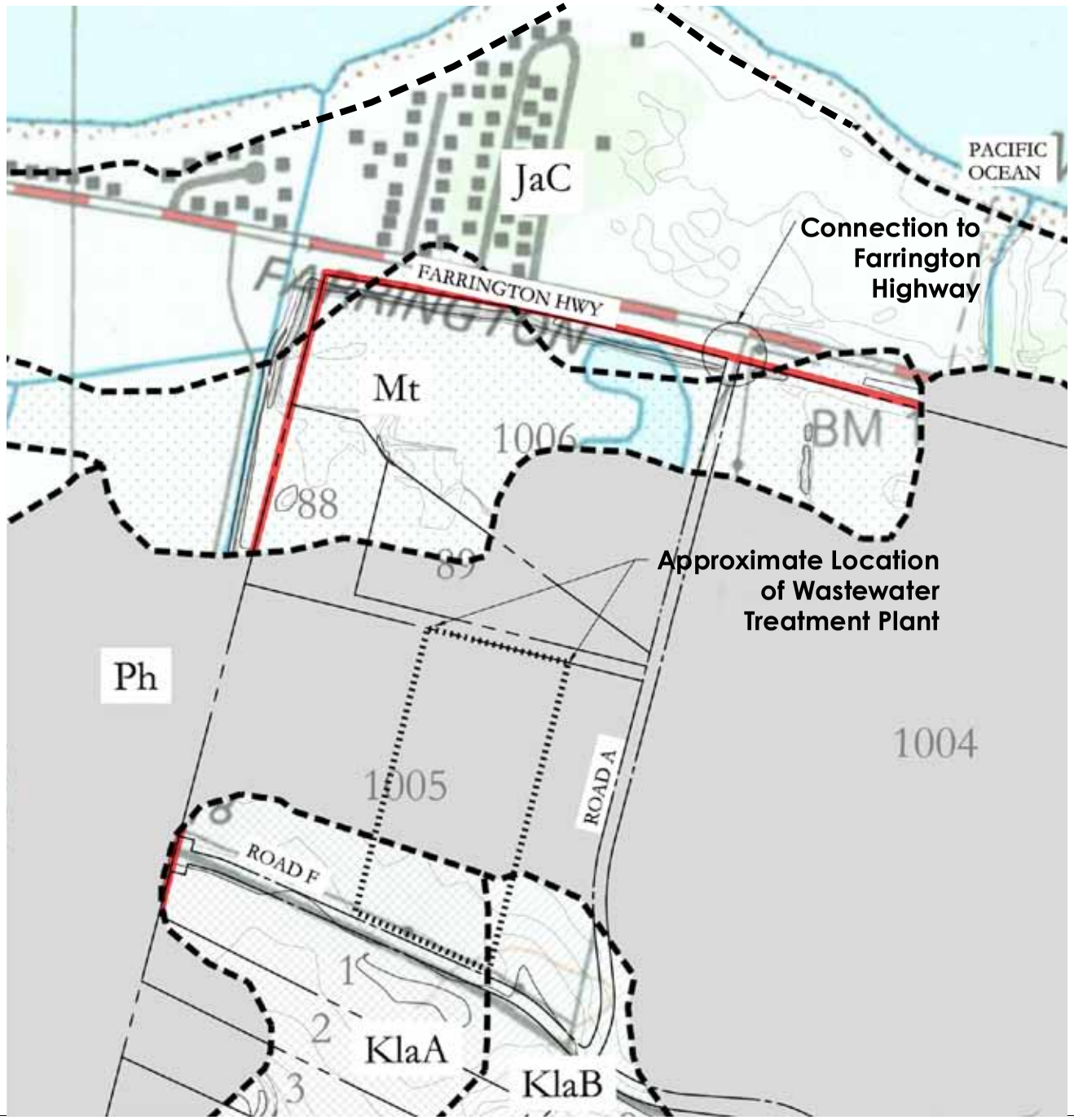
The project site is located along the north shore of O'ahu. Temperatures along the north shore and statewide are moderate and equable throughout most of the year. This reflects the small seasonal variation in the energy received from the sun and the tempering effect of the surrounding Pacific Ocean. The mean annual temperature recorded at Waialua, O'ahu, ranges from between the mid-60s and high 80s, with occasional reaches into the +90 degree Fahrenheit (F) range.

Rainfall for the area ranges in excess of 30 inches per year. Rainfall is highest during the winter months from November through February when typically more than 50% of the annual rainfall occurs. The driest months are June, July and August which average about one inch of rain per month or less. Trade winds are generally from the northeast, except during the winter months when storms are usually accompanied by south or western winds.

2.1.2 Topography and Soils

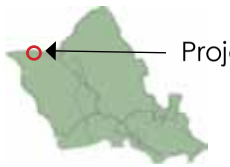
According to the Soil Conservation Service (SCS), the project site consists of the Ka'ena-Waialua Soil Association which is normally found on coastal plains and talus slopes and in drainage ways. Characteristics include deep, neatly level and gently sloping surfaces, with poorly drained to excessively drained soils that have a fine textured to coarse textured subsoil or underlying material. See **Figure 6, Project Soils**.

Information on the soil type is obtained from the Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai State of Hawaii, as prepared by the U.S. Department of Agriculture, 1972. According to the Soil Survey, the soil association at the Connection to Farrington Highway location is classified as Jaucas sand, 0 to 15 percent slopes (JaC). The slope range of this soil is 0 to 15 percent, but in most places the slope does not exceed 7 percent. In a representative profile the soil is single grain, pale brown to very pale brown, sandy, and more than 60 inches deep. In many places the surface layer is dark brown as a result of the accumulation of organic matter and alluvium. The soil is neutral to moderately alkaline throughout the profile. Permeability is rapid, and runoff is very slow to slow.



0 500 1000'

1" = 500' *at full size (8.5 x 11")*



DILLINGHAM 1897 RANCH
NORTH SHORE, OAHU

Figure 6
Project Soils

According to the Soil Survey, the soils at the WTP location are classified as KlaB, KlaA and Ph. KlaA and KlaB, known as Kawaihapai stony clay loam, range in slope from 0 to 2% for KlaA and 2 to 6% for KlaB. The Kawaihapai soil series consists of well drained soils that formed in alluvium derived from basic igneous rock in humid uplands. Kawaihapai soils are in drainage ways and on alluvial fans on the coastal plains and generally have slopes of 0 to 15 percent. Ph soils, known as Pearl Harbor Clay, consist of very poorly drained soils on nearly level coastal plains on the island of Oahu.

These soils developed in alluvium overlaying organic material. In a representative profile the surface layer is very dark gray, mottled clay about 12 inches thick. The subsoil, about 19 inches thick, is very dark grayish-brown, mottled clay that has angular and subangular blocky structure. The substratum is muck or peat.

Generally for these soil types the hazard for water erosion is slight, but wind erosion is a severe hazard where vegetation has been removed. Workability is slightly difficult because the soil is loose and lacks stability for use of equipment (DOA, Soil Survey, 1972).

Potential Impacts and Mitigation Measures

Connection to Farrington Highway

The proposed Connection to Farrington Highway will involve minor grading, backfill, and paving to accomplish the planned improvements. Excavated materials will be reused on-site for backfill as required. Imported fill is not anticipated to be required. However, if imported fill is used it will be limited to the use of clean and uncontaminated material. Any graded or excavated material that cannot be reused will be disposed of at an approved waste facility in accordance with State and City & County of Honolulu regulations.

Areas that are paved are not expected to constitute an erosion hazard. Areas that are exposed as a result of earthwork will be properly handled using management, structural, and vegetative practices as required to ensure against loss of sediment during periods of rainfall or inclement weather. Management practices will include only excavating the area required to accomplish the installation of the Connection to Farrington Highway; maintaining open areas with appropriate storm water controls to prevent the commingling of runoff with exposed soils and excavated material; and securing the job site following the end of each work day. Structural controls will include the use of berms, silt screens, and PVC or similar covers for exposed soils, excavated materials, or any construction related stockpile sites susceptible to contact with rainfall or runoff. Vegetative practices will include the use of grassing or other vegetative materials to stabilize areas of exposed soils upon completion of work.

Other measures and practices will be followed as required in accordance with applicable State and City & County of Honolulu standards for grading and related construction activities.

Wastewater Treatment Plant

The wastewater treatment plant (WTP) will involve grading, soil excavation, and backfilling. Due to the low permeability of the clay soils in the vicinity of the subsurface effluent disposal system the clay will be excavated and either mixed with or replaced with imported sand from a different portion of the site in order to produce a soil with acceptable percolation rates. Excess soil from the excavation will be used to mound the area of the WTP above the 100-year flood elevation. Any graded or excavated material that cannot be reused will be disposed of at an approved waste facility in accordance with State and City & County of Honolulu regulations.

Areas that are exposed as a result of earthwork will be properly handled using management, structural, and vegetative practices as required to ensure against loss of sediment during periods of rainfall or inclement weather. Management practices will include maintaining open areas with appropriate storm water controls to prevent the commingling of runoff with exposed soils and excavated material; and securing the job site following the end of each work day. Structural controls will include the use of berms, silt screens, and PVC or similar covers for exposed soils, excavated materials, or any construction related stockpile sites susceptible to contact with rainfall or runoff. Vegetative practices will include the use of grassing or other vegetative materials to stabilize areas of exposed soils upon completion of work.

Other measures and practices will be followed as required in accordance with applicable State and City & County of Honolulu standards for grading and related construction activities.

2.1.3 Surface Water and Groundwater

The overall project site watershed is bounded to the south by the uppermost mountain ridgeline of the Mokuleia Forest Reserve. Drainage from the ridgeline is directed makai through the Reserve and on to the Dillingham Ranch site through existing stream channels that run either entirely through the project site or through the site and adjacent lands to the west that abut Farrington Highway. Flows carried by all of these channels are ultimately conveyed to the Pacific Ocean after crossing under Farrington Highway through existing bridges and culverts.

There are seven major intermittent stream channels that begin their courses on the upper slopes of the Waianae Mountains and drain through the site, conveying runoff to the coastline. The largest of these is the only named channel, Makaleha Stream. This stream originates east of the site, cuts across the easterly Ranch

boundary in the vicinity of the Cane Haul Road, continues east for approximately 1000 feet, and then flows north to an existing culvert of unknown size underneath Farrington Highway before discharging to the ocean.

Another channel runs through the middle of the project, and is actually comprised of three channels that converge into a single stream just before the uplands give way to the flat lowlands covering the north end of the site. This natural channel meanders across gently rolling terrain until crossing Cane Haul Road, where it enters a graded section that parallels the property's westerly property line to a 12 foot x 8 foot culvert under Farrington Highway. A short section of channel then carries the stream to its ocean outfall.

The three remaining major channels cross the southwestern portion of the Ranch from south to north. At the northerly Ranch boundary, the channels flow onto the neighboring agricultural parcels located between north end of the Ranch and Dillingham Airfield. At the edge of the airfield, it appears all three channels converge on a culvert that runs under the east end of the airfield runway, and then through a second culvert under Farrington Highway to the ocean.

One man-made water body is on the site. A pond created by a past owner's sand mining and removal of material is located between access Road A, Farrington Highway, and the western property line. The pond is filled with groundwater and run-off from upland portions of the site. It has since become a decorative feature of the nearby equestrian facility.

Potential Impacts and Mitigation Measures

Connection to Farrington Highway

No adverse impact to perennial or intermittent streams, the pond, or the groundwater in the vicinity of the project is anticipated. Construction activities associated with the Connection to Farrington Highway are not located near any streams which would require mitigation measures to otherwise minimize, reduce, or eliminate the potential for adverse effects.

The closest edge of the man-made pond is located approximately 230 feet from the planned Connection to Farrington Highway. Although runoff from the project site is not expected to affect the up gradient location of the pond relative to the Connection to Farrington Highway, the contractor will manage all work activities to prevent and reduce erosion from the job site. Construction related fugitive dust, which could be carried by wind blowing toward the pond, will be controlled by regular wetting of the work area as required. Only enough water will be used for dust control to suppress the dust from becoming airborne.

Wastewater Treatment Plant

No adverse impact to perennial or intermittent streams, the pond, or the groundwater in the vicinity of the project is anticipated. Construction activities associated with the wastewater treatment plant will have proper erosion control devices in place to prevent transport of soil and silt out of the project site.

Once operational, the wastewater treatment plant will discharge effluent into a subsurface treatment field. All effluent will be treated to a higher quality then the standards set by the Department of Health. The effluent will eventually migrate into the groundwater aquifer, once it has passed through all of the treatment processes and filtered through the soil.

The closest edge of the man-made pond is located approximately 275 feet from the planned wastewater treatment plant. The contractor shall manage all work activities to prevent and reduce erosion from the job site using Best Management Practices.

2.1.4 Flora - Botanical Survey

A terrestrial vegetation survey of the site was conducted on January 4, 8 and 17, 2008 by AECOS Consultants, Inc. The purpose of this survey was to examine the area of the proposed Connection to Farrington Highway, and to provide information on the surrounding agricultural subdivision. An updated survey was conducted on June 30, July 1 and 7, 2014 by LeGrande Biological Surveys, Inc. to address additional upland areas of the subdivision (see **Figure 3**) and to determine if there were any substantial changes from the 2008 findings. A summary of the 2008 and 2014 surveys and findings are provided in the following discussion and the full 2014 report is found in **Volume II: Appendix B.**

Introduction

This report includes the findings of a plant inventory conducted within the subject property for the proposed Dillingham Ranch Agricultural Subdivision located in Mokuleia on the Island of Oʻahu, Hawaiʻi. The purpose of the survey was to inventory the plant species present within the project area, with special attention to Listed, Proposed, and Candidate Endangered Species, critical habitats, and Species of Special Concern.

Site Description

The project area included in the survey includes the current Dillingham Ranch property mauka of Farrington Highway from an elevation of a few feet above sea level up to approximately 400-foot elevation. The lower portion of the property is characterized by flat alluvial plains rising into sloping lands and terminating at the steep slope faces at the upper elevations. The majority of the planned subdivision and roadways are located in

the upper areas of the property mauka of the managed land or areas that are currently utilized for plantation and ranching activities. At least four intermittent streams run through the project area. All have dry rocky streambeds and several have constructed channels for either flood control or road crossings. Photographs of the project area are found in **Appendix B** (in Appendix A of the Botanical Report)**.**

Background

Dillingham Ranch has been surveyed in the past numerous times for botanical resources. The most recent being a 1991 study by Whistler and the 2008 (Guinther) survey carried out by AECOS Consultants, Inc. The survey areas for both the 1991 and 2008 surveys were predominantly the same apart from an upland (mauka) section that was included in the 2014 survey.

Both Whistler and Guinther describe similar vegetation types. The differences mainly consist of the expansion of Guinea Grassland into the lower elevation areas, most likely due to the contraction of ranching into the lower managed lands of the ranch allowing the Guinea grass and other weedy species to expand into the historically open grazed areas observed by Whistler in 1991. The present study found much of the vegetation types similar in area to the 2008 study. Therefore, the main focus of the 2014 survey was to document any significant changes in vegetation types or areas of expansion and search for additional native or rare species that may still be extant within the ranch boundaries.

Methods of Study

The field study was conducted by biologist Maya LeGrande and a field assistant (LeGrande Biological Surveys). Prior to conducting fieldwork, the biologists reviewed existing scientific literature, older environmental impact assessments and statements, biological survey reports, topographic maps and images. Field data was collected on June 30, July 1 and 7, 2014 between 6:15am and 5:00pm. Prior to conducting fieldwork, the biologists reviewed the U.S. Fish and Wildlife database (USFWS 2014) in order to determine if any Threatened or Endangered taxa are known to reside within the study area or in close proximity.

Plants were inventoried during a pedestrian survey along the proposed alternative alignments as well as the proposed area of impact. Notes were collected on plant associations and plant distribution, disturbances, topography, substrate types, exposure, drainage, and related factors.

Survey Results

Vegetation

We observed a total of 170 plant species within the survey area. These species are listed in **Appendix B** (Appendix B of the Botanical Report). One hundred and sixty-five (165) of the 170 species observed, or over 97%, are alien to Hawai'i. Six taxa are native (four indigenous and two endemic). The majority of the study area is dominated by an overgrown forest of invasive tree species with a weedy understory. None of the plant species are listed as threatened and endangered species, or a species of concern (U.S. Fish and Wildlife Service, 2014) within the study area.

Managed Lands

The lower elevation areas of the subject property are currently utilized for ungulate (horse and cow) pastures as well as tree plantation and house lots. Pastures are dominated by grassy fields with various species of trees scattered throughout the area. Tree species include, Christmas berry (*Schinus terebinthifolius*), Chinese banyan (*Ficus macrocarpa*), monkey pod (*Samanea saman*), milo (*Thespesia populnea*), ironwood (*Casuarina oppositifolia*), coconut (*Cocos nucifera*), kiawe (*Prosopis pallida*), koa haole (*Leucaena leucocephala*), Java plum (*Syzygium cuminnii*), and autograph trees (*Clusia rosea*). Grass species include Guinea grass (*Panicum maximum*), kikiyu (*Pennisetum clandestinum*), buffelgrass (*Cenchrus ciliaris*), and swollen fingergrass (*Chloris barbata*). Other weedy species observed included Spanish needle (*Bidens pilosa*), Chinese violet (*Asystasia gangetica*), false ragweed (*Parthenium hysterophorus*). The indigenous *uhaloa* (*Waltheria indica*) was observed frequently along roadsides.

The tree plantation is dominated by coconut and other species of ornamental palms including; fish tail palm (*Caryota mitis*), royal palm (*Roystonia* sp.), and manila palm (*Veitchia merrillii*). Several overgrown areas are located near the Highway and project boundary mainly around the drainage canal areas. Guinea grass dominates the thick vegetation while species such as sourbush (*Pluchea carolinensis*), red mangrove (*Rhizophora mangle*), and milo were observed growing on the banks of the canals.

There are several water features on the property. The largest pond (presumably manmade) is located in the northwest corner of the property near the highway. The vegetation around the perimeter of the pond was surveyed. The vegetation growing on inaccessible islands within the pond were surveyed from afar. Large trees include ironwood, Java plum, monkey pod, Christmas berry, opiuma (*Pithecellobium dulce*), and kiawe (*Prosopis pallida*). Weedy species along the banks included; Guinea grass, *Sidastrum micranthum*, molasses grass (*Melinus minultiflora*), lion's ear (*Leonotis nepetifolia*), spiny amaranth (*Amaranthus spinosus*), sourbush, indian fleabane (*Pluchea indica*), castor bean (*Ricinus communis*), and slender mimosa (*Desmanthus pernambucanus*).

Panicum Grassland

This vegetation type dominates the naturalized areas outside of the managed lands. Guinea grass is by far the most abundant species throughout the survey area. It grows in large clumps up to 12 feet in height. Other species mixed in with the thick bunch grass include castor bean, *Sidastrum micranthum*, cherry tomato (*Solanum lycopersicum* var. *cerasiforme*), lion's ear, spiny amaranth, cocklebur (*Xanthium strumarium* var. *canadense*), and glycine (*Neonotonia whightii*). The grassland extends into bordering vegetation types especially into Kiawe woodland, Koa Haole Scrub, and Riparian forest becoming more of an understory with shorter grass heights and sparser distribution of grass bunches.

In areas where there is active grazing by cattle, especially in the upper elevations of the south-eastern corner of the property, weedy species such as klu (*Acacia farnesiana*), lion's ear, silver oak, and bunches of grazed Guinea grass are dominant. A few short statured wiliwili (*Erythrina sandwicensis*) trees were also located in the same area.

Kiawe Woodland

Sections of the upper western portion of the property are dominated by kiawe trees with juvenile kiawe plants mixed with the guinea grass understory. Other plants in the understory include false mallow (*Malvastrum coromandelianum*), *S. micranthum*, *popolo* (*Solanum americanum*), and ivy gourd (*Coccinea grandis*). Other tree species observed growing in this vegetation type were; silver oak (*Grevillea robusta*), Java plum, African tulip (*Spathodea campanulata*), and monkey pod. Clusters of macadamia (*Macadamia ternifolia*) trees were observed growing in the kiawe woodland scattered around the lower elevation sections of this vegetation type. Several native wiliwili trees were also observed.

Koa Haole Forest

The species are consistent throughout this vegetation type with the dominant tree species including, koa haole, autograph, monkeypod (*Samanea saman*), kiawe, Chinese banyan, Java plum, and Christmas berry. Understory plants include, Guinea grass, mock orange (*Murraya paniculata*), *Achyranthes aspera*, and khaki weed (*Alternanthera pungens*). In the western section of the project area in the upper elevations, this vegetation type also harbors a few remnant native plants including a handful of alahee (*Psydrax ordorata*) and a few wiliwili trees.

Riparian Forest

The forests surrounding the intermittent streams appear to have shrunk since both the 1991 survey as well as the 2008 survey. Most of the vegetation along the banks of the streams and gulches in the project area are

barely discernable from the previously mentioned vegetation types. A few areas where denser stands of Java plum, kiawe, koa haole, and *Kukui* (*Aleurites moluccana*) trees are apparent along the stream banks characterize the riparian causeway. Guinea grass is the predominant understory plant. In areas where bare boulders are exposed a few plants of the native *'ilie'e* (*Plumbago zeylanica*) were observed.

Discussion and Recommendations

The results of our fieldwork represent a one-time snapshot of the plants inhabiting the survey area. However, when considered together with the results of historical surveys, we can compile a reasonably accurate description of the environment and vegetation of the project area.

Native plant habitat within the proposed project area has been highly modified by human activities, such as agricultural activities, road building, residential construction, and the intentional and accidental introduction of alien species. The overwhelming abundance of non-native plant species throughout the project area is in direct correlation to disturbance over the last several hundred years. A concerted effort was made to locate native plants within the survey area. Whistler reported finding *Lipochaeta lobata* (no variety distinction was noted) during his 1991 survey of the Dillingham Ranch. We searched extensively for this taxa, especially in areas with rocky outcroppings, but no individuals were located. The only other endemic taxa observed during the survey besides wiliwili was a few dried vines of kupala (*Sicyos pachycarpus*). The liana is more abundant after the rainy season when new growth is apparent festooning stands of koa haole.

Wetland areas are all located near the highway either in constructed ponds or drainage canals. The areas around the current ponds are not expected to be modified by the proposed development. If the plan changes to include areas around the wetlands (ponds/canals), a wetland delineation may be needed.

We have the following recommendations in regards to the flora of the Dillingham Ranch Agricultural Subdivision:

- During construction, clearing of vegetation should be mitigated by controlling erosion and runoff, especially during rainy season by implementing known engineering practices.
- The remaining native wiliwili trees should be preserved as much as possible within the development areas. Encouraging use of the species, as ornamentals in the subdivision would help to encourage this now rare dryland tree species to persist in one of its native habitats.

- Management/eradication of the false ragweed (Parthenium hysterophorus) may be in the best interest of the ranch as it can reduce carrying capacity of pastures by 90% and can cause allergic reactions in humans and livestock, especially horses, due to its allelopathic compounds (Smith, 2002).

Potential Impacts and Mitigation Measures

Connection to Farrington Highway

No adverse impact to native or threatened and endangered species or a species of concern is anticipated with construction activities associated with the improvements. The Connection to Farrington Highway improvements are located in areas of non-native grasses and trees and only minimal disturbance of this existing fauna is anticipated during construction.

Wastewater Treatment Plant

No adverse impact to native or threatened and endangered species, or a species of concern are anticipated with construction activities associated with the WTP. The WTP improvements are located in areas of existing non-native pasturage grasses and after grading and construction of the subsurface leach fields this area will be seeded and grassed to return to non-native grasses.

2.1.5 Fauna and Avifauna Assessment

An avifauna and feral mammal survey of the site was conducted on June 30 and July 7, 2014 by Phil Bruner, Ph.D. A survey was conducted by Dr. Bruner of the 2008 subdivision plan area on January 4 and 10, 2008. The purpose of the field surveys were:

1. To document what species of birds and mammals currently occur on and near the property, with special attention to any native or migratory species.
2. Note any natural resources important to native and migratory species.

In addition, pertinent published and unpublished sources of information on the fauna in this region of Oahu are also provided to supplement the field data. A summary of the findings of the survey are provided in the following and the full report is in **Volume II: Appendix C**.

Site Description

The following habitats occur on this property: pasture/ranch land, residential, second growth alien forest, ephemeral stream drainages/irrigation ditches, and ponds. The topography is relatively flat except for the upper (mauka) portions of the property.

Results and Discussion

Native Land Birds

No native land birds were observed on the field survey. The only possible species that might on occasion forage in this area is the Short-eared Owl or Hawaiian Owl known as Pueo in Hawaiian (*Asio flammeus sandwichensis*). This species is listed as endangered by the State of Hawaii on the island of Oahu. They range over a wide variety of habitats including forest (both native and second growth) as well as agricultural/ranch lands. They nest on the ground in areas of tall grass (Pratt et al. 1987, Hawaii Audubon Society 2005). The introduced Barn Owl (*Tyto alba*) is often mistakenly reported as a Pueo by those unfamiliar with the difference in appearance between these two species. Barn Owls forage at night whereas Pueo are active at dawn or dusk and occasionally at midday.

Native Waterbirds

Five Black-crowned Night Heron or `Auku'u (*Nycticorax nycticorax hoactli*) were seen foraging around the edge of the large pond near the entry road to the property. `Auku'u are the only native waterbird that is not listed as endangered or threatened. The endangered Hawaiian Coot or `Alae Ke'oke'o (*Fulica alai*), Common Moorhen or `Alae `ula (*Gallinula chloropus sanvicensis*), Hawaiian Duck or Koloa (*Anas wyvilliana*), and Black-necked Stilt or Ae'o (*Himantopus mexicanus knudseni*) were recorded on the survey. Forty three Coot including both adults and juveniles were observed on the large pond. Three active Coot nests with incubating adults were also seen. Seven Common Moorhen were observed foraging along with one adult incubating eggs. Five of the seven Moorhen were using the small pond closer to the ranch office. One pair of Black-necked Stilt was observed foraging on the edge of the large pond. This species was not recorded on the 2008 avifaunal survey (Bruner 2008). Three Hawaiian Duck were observed on the large pond. This endangered species was extirpated from Oahu and subsequently reintroduced from Kauai. Since their reintroductions to Oahu, feral Mallard Ducks (Anas platyrhynchos) have bred with Koloa so that today most if not all Koloa are hybrids of these two species. A Northern Pintail Duck (*Anas acuta*) was recorded on the 1992 survey but not in 2008 or 2014. This is a common winter migrant to Hawaii. It breeds in Alaska and Canada. Domestic ducks of mixed parentage were common around both ponds.

Seabirds

No seabirds were observed on this survey. The Great Frigatebird or `Iwa (*Fregata minor palmerstoni*) and White-tailed Tropicbird or Koa'ekea (*Phaethon lepturus dorotheae*) were recorded on the 2008 avifaunal survey. Wedge-tailed Shearwater (*Puffinus pacificus*) and Laysan Albatross (*Phoebastria immutabilis*) nest at the nearby Kaena Point Natural Area Reserve.

Migratory Shorebirds

No migratory shorebirds were recorded on this survey due to the fact that they depart Hawaii for their arctic/subarctic nesting grounds at the end of April and don't return until August/September. The 2008 avifaunal survey was conducted in January and recorded the three most common migratory shorebirds that come to Hawaii: Pacific Golden-Plover or Kolea (*Pluvialis fulva*), Ruddy Turnstone or Akekeke (*Arenaria interpres*) and Wandering Tattler or Ulili (*Heteroscelus incanus*). All of these migratory shorebirds are protected by the Migratory Bird Treaty Act. They are not listed as threatened or endangered.

Alien (Introduced) Birds

A total of 22 alien species were recorded on this survey compared with 26 species in 2008 and 17 species in 1992. Table One gives the names of these species and their occurrence on each of the three (1992, 2008, 2014) surveys. The array of alien birds is typical of this type of habitat, in this region of Oahu (Bruner 1982, 1986, 1991, 1992, 1993, 2003, 2008, Pratt et al. 1987, Hawaii Audubon Society 2005).

Feral Mammals

The only feral mammals observed on the survey were pigs (*Sus scrofa*), cats (*Felis catus*), and Small Indian Mongoose (*Herpestes auropunctatus*). Roof Rat (*Rattus rattus*) and House Mouse (*Mus musculus*) likely occur in this area. The endangered Hawaiian Hoary Bat or Ope'ape'a (*Lasiurus cinereus semotus*) was not observed. Ope'ape'a are infrequently reported on Oahu. They are not restricted to native forest but can be seen foraging for flying insects in urban and agricultural areas as well as over bays and ponds. They roost solitarily in trees (Tomich 1986, Kepler and Scott 1990).

Executive Summary

This property has been altered from its natural state by years of agricultural and ranching activity. Four endangered waterbirds (Hawaiian Coot, Common Moorhen, Hawaiian Duck) and one non-endangered waterbird (Black-crowned Night Heron) were found on this survey. No indigenous seabirds were observed. The endangered Hawaiian Owl was not seen but could occur in this area. The number of alien (introduced)

birds (22 species) was similar to the list acquired in 2008. Feral mammals recorded included cats and pigs. The endangered Hawaiian Hoary Bat was not observed. This species is infrequently seen on Oahu. The grazed pastures are important foraging habitat for migratory shorebirds (Pacific Golden-Plovers and Ruddy Turnstones) during the months of late August through early May. None were seen on this survey due to the time of year. The three surveys of this property (1992, 2008, 2014) reflect little change in the array of birds and mammals at this location. The most important habitat feature on the property, are the ponds. The four endangered waterbirds are endangered because of the loss of wetlands statewide. Even relatively small ponds, such as those on this property are important to the continual existence of these unique Hawaiian waterbirds. The proposed development should have little or no significant effect on the current alien bird populations.

Potential Impacts and Mitigation Measures

Connection to Farrington Highway

A number of common, exotic introduced, and rare native, threatened and endangered species were identified in the course of the survey. Most if not all of the species identified as rare, threatened or endangered do not readily utilize the immediate area of the proposed improvements site for habitat or for foraging based on the regular presence of humans and the transit of vehicles along the Farrington Highway and existing Dillingham Ranch property access road.

The closest point of concern would be the area of the pond, which is located approximately 240 feet from the proposed Connection to Farrington Highway. Existing mitigation is provided to some extent by a row of mature ironwood trees and brush vegetation that serve to isolate the area of the pond from the intersection. As required, the contractor will control dust and debris migrating from the project site and affecting the pond. Noise will be temporarily generated during construction activities. However, during this period all internal combustion powered equipment will be muffled and work will be limited to daytime hours. No night work will be required. Upon completion of work, the area will return to preconstruction noise levels.

Seabirds that have been observed transiting the area are not expected to be adversely affected. No night work is required that would constitute a source of additional lighting that could affect foraging activities. The proposed development should have little or no significant effect on the current alien bird populations. No adverse impacts to bird populations area anticipated due the location of the Connection to Farrington Highway.

Wastewater Treatment Plant

A number of common, exotic introduced, and rare native, threatened and endangered species were identified in the course of the survey. Most if not all of the species identified as rare, threatened or endangered do not readily utilize the immediate area of the proposed WTP site for habitat or for foraging based on the regular presence of humans and horses.

As required, the contractor will control dust and debris migrating from the project site. Noise will be temporarily generated during construction activities. However, during this period all internal combustion powered equipment will be muffled and work will be limited to daytime hours. No night work will be required. Upon completion of work, the area will return to preconstruction noise levels.

Seabirds that have been observed transiting the area are not expected to be adversely affected. No night work is required that would constitute a source of additional lighting that could affect foraging activities. The proposed project should have little or no significant effect on the current alien bird populations.

No adverse impacts to bird populations' area anticipated due the location of the WTP.

2.1.6 Scenic and Visual Resources

Existing views from the Connection to Farrington Highway project site primarily consist of the Farrington Highway. Makai of the intersection across the highway there are views of an existing grassed polo field, ironwood trees and brush vegetation beyond the field. Limited views of the shoreline and ocean can be seen in the distance. Mauka views along the highway include paddocks and corrals at the nearby Dillingham Ranch (Crowbar Ranch), an equestrian facility that provides stable and exercise facilities. Other mauka views are of the Dillingham Ranch property and the Wai'anae Mountains beyond.

Existing views from the WTP existing site are primarily of equestrian and ranch lands within Dillingham Ranch. Makai and east of the proposed site are existing pasturage. Mauka are uplands which are fenced for cattle grazing. West of the proposed site are adjacent agricultural fields and further distant, the Dillingham Airfield. Views from the WTP to adjoining properties and views of the WTP from adjoining properties are largely obscured by vegetation along the western property line.

Potential Impacts and Mitigation Measures

Connection to Farrington Highway

No adverse impacts to visual resources of the project site are expected. The visual qualities of the site will be retained and preserved largely intact. The only changes expected will be of the improvements consisting of an improved roadway, a stop sign and signage to alert motorists to the presence of the intersection. As required, vegetative controls will be used to stabilize open areas of soil to reduce erosion hazards. However, no views are expected to be impeded or otherwise negatively altered.

Wastewater Treatment Plant

No adverse impacts to visual resources of the project site are expected. The WTP occupies an area west of the entry Road A approximately 1400 to 2000 feet mauka of Farrington Highway. The WTP facility will have a small building (20' x 20') containing above ground facilities. This structure is not inherently of visual concern but can be screened with tree and shrub vegetation. The subsurface portion of the WTP consists of tanks, vaults, and effluent disposal areas. These will not be visible following construction. There may be some minor mounding of soil (around 12") above the subsurface piping which will be revegetated with grasses. During construction vegetative controls will be used to stabilize open areas of soil to reduce erosion hazards. However, no views are expected to be impeded or otherwise negatively altered.

2.1.7 Historic and Archaeological Resources

Background

Three archeological inventory surveys have been conducted on the Dillingham Ranch property over the past 23 years and have been utilized to evaluate the impacts of the two primary projects and secondary impacts of the proposed Agricultural Subdivision. The three inventories provide a complete survey of the areas of the proposed Agricultural Subdivision. All three investigations are summarized in this section and addressed more completely in the full report in **Volume II: Appendix D.**

1992 and 2007 Archeological Inventory Survey

An area of 861 acres was previously studied in 1992 and 2007 and is shown in **Figure 5 (from Tulchin and Hammatt, 2007 report)**. The proposed project site of the Connection to Farrington Highway was included as part of a prior archaeological inventory survey of 787 acres of the Dillingham Ranch property proposed for development. The report was conducted by ERC Environmental and Energy Services Company (ERCE) and detailed in Archaeological Inventory Survey and Evaluation. Mokule'ia, Waialua District O'ahu (TMK 6-8-03 and 6-8-02) (Drolet and Shilz, 1992). This initial report investigated the area of land

extending from the Farrington Highway to the uplands as identified in **Figure 5**. The Drolet and Shilz report was reviewed and accepted by the State Historic Preservation Division (SHPD) in 1992 (Log No. 5155, Doc No. 0682t).

The area of the 1991 inventory survey conducted by ERCE also encompasses the area of the currently proposed WTP project. There are no archeological sites identified within or nearby the proposed area of the WTP.

A second archaeological inventory survey was subsequently undertaken in 2007 by **Cultural Surveys Hawai'i** to add approximately 78 acres to ensure sufficient archaeological review of the Dillingham Ranch property planned for an agricultural subdivision. This second report, Archaeological Inventory Survey of an Approximately 75-Acre Portion of the Proposed 861-Acre Dillingham Ranch Development Project Waialua District, Island of O'ahu (Tulchin and Hammatt, 2007) was also reviewed and accepted for review by the SHPD in 2007 (Log No. 2007.2421, Doc No. 0712LM03). The area of investigation is identified in **Figure 5**.

On January 23, 2008, the SHPD completed its review of the archaeological inventory survey and issued its determination that "no historic properties will be affected". The SHPD specifically noted in its determination that because the proposed action for the Dillingham Ranch Agricultural Subdivision involves a "paper transaction" for a proposed zone change, that no ground disturbing activities would occur. However, in order to ensure that construction of the proposed agricultural subdivision is consistent with the goal of maintaining preservation of the archaeological and cultural resources of the property, protocols similar to those in place for construction of the Connection to Farrington Highway and WTP will be applied to the project when it is constructed (see **Potential Impacts and Mitigation Measures**, this section).

The third survey, conducted in 2014 by International Archaeology, LLC, addressed 85.3 additional acres to complete the inventory for all areas within the proposed Agricultural Subdivision. The findings of the 1991 and 2007 inventories are summarized in this section along with the 2014 survey. The complete 2014 report by International Archaeology, LLC is contained in **Volume II: Appendix D**.

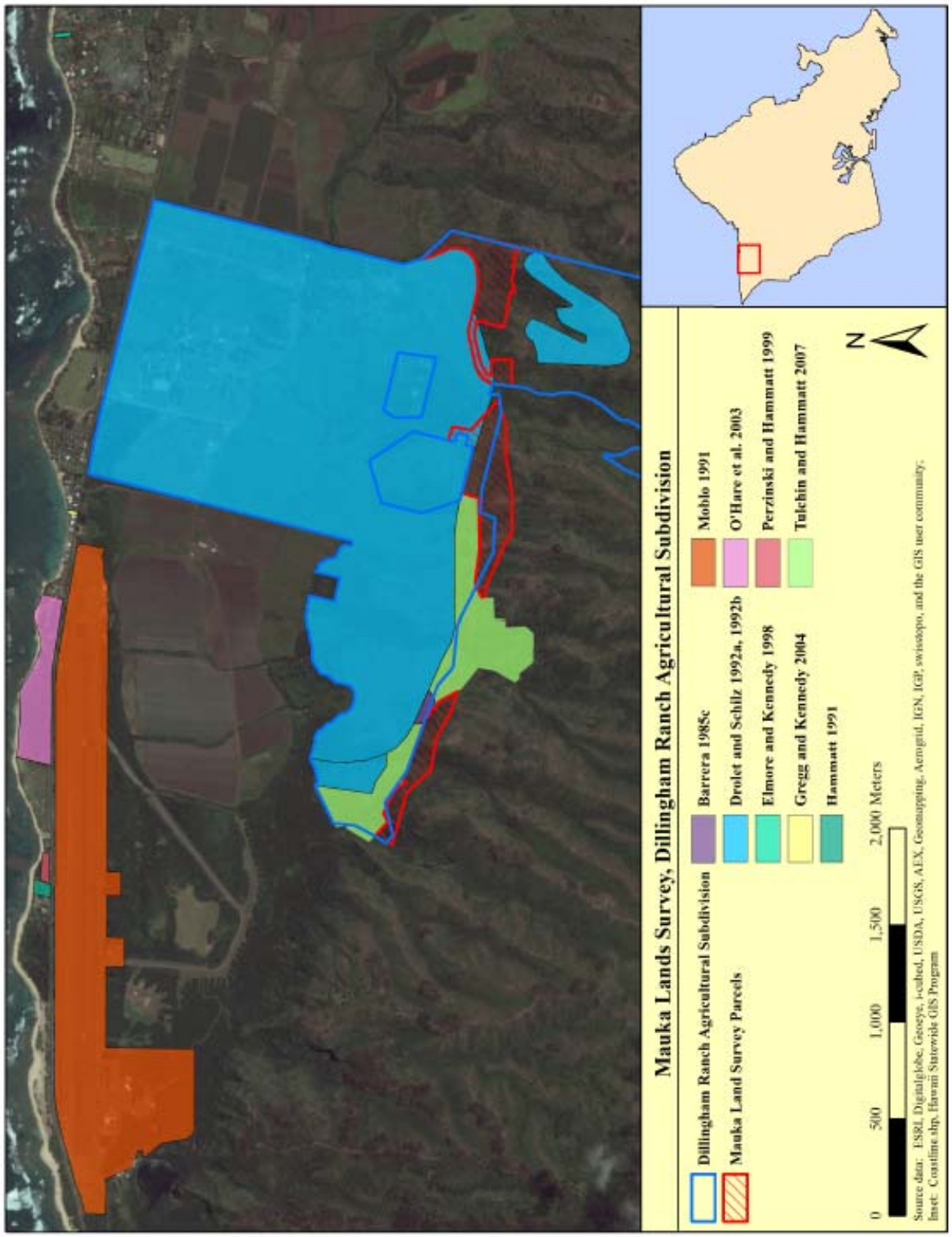


Figure 5. Locations of previous archaeological investigations within approximately 2 km of the current survey parcels.

History of Project Vicinity

Cultural Surveys Hawai'i, Inc., provided a summary of the history of the project area in the Tulchin and Hammatt, 2007, report identified above. A summary is provided in the following:

Traditional Accounts
The district of Waialua is rich in legends, stories, proverbs, and myths. Waialua is literally translated as "two waters" (Clark 2002) and may refer to the two large stream drainages (Anahulu and Hclcmano-Poamoho-Kaukonahua) that were once used to irrigate extensive taro fields in the ahupua'a of Kamananui, Pa'ala'a, and I<awailoa, the more populous ahupua'a on the eastern side of the district. The ahupua'a of Kealia, Kawaihiipai, and Mokule'ia, on the western side of the district, were more arid, and were not as 'veil-watered. However, these western lands were famed for their warm climate, cooling breezes, plant resources, and especially, marine resources.

Early Historic Period
A picture of pre-contact Hawai'i is painted by the recorded accounts of early foreign explorers. After the death of Captain James Cook on the Island of Hawai'i, the crew of the Resolution continued to sail toward O'ahu under the leadership of Captain Charles Clerke.

Clerke describes the highly populated and lush northwest coast of O'ahu after anchoring in Waimea Bay:

> *I stood into a Bay just to the Wtward [Westward] of this point the Eastern Shore of which was by far the most beautiful Country we have yet seen among these Isles, here was a fine expanse of Low Land bounteously cloath'd with Verdure, on which were situate many large Villages and extensive plantations; at the Water side it terminated in a fine sloping, sand Beach...This Bay, its Geographical situation consider'd is by no means a bad Roadsted, being sheltered from the NEbN [Northeast by North} SEterly [Southeasterly] to SWbW [Southwest by West] with a good depth of Water and a fine firm sandy Bottom; it lays on the NW [Northwest] side of this Island of Wouahoo [O'abu]… surrounded by a fine pleasant fertile Country. (Beaglehole 1967:569).*

Economic Changes
About A.D. 1720-1740, the island of O'ahu was united under the high chief Kuali'i after a series of battles with the chiefs of Kona and 'Ewa. Kuali'i continued his wars of conquest by carrying out raids on the islands of Moloka'i and Hawai'i. This began a time period of intra-island and inter-island wars, referred to as the Conquest Period, which culminated in the conquest of O'ahu by the Hawai'i Island chief, Kamehameha, in A.D. 1795 (Sahlins 1992:36). In 1804, the Hawaii chiefs who supported Kamehameha occupied O'ahu, taking control of the lands of the former ruling chiefs. In 1806, Kamehameha traveled around the island of O'ahu to encourage people to rebuild their war-ravaged agricultural fields and fishponds by his own example.

Kamehameha died in 1819, and his son Liholiho and wife Ka'ahumanu shared the duties of ruling the new kingdom. He selected his younger brother Kauikeaouli to be his chief during his absence during a trip to England and heir in the event that he did not return. Both Liholiho and his wife died in 1824 while in England, and Kauikeaouli, later known as Kamehameha III, became the king at the age of nine, with a guardian Kahalai'a as his kahu (personal attendant). This took place during the Sandalwood Period (A.D. 1812-1830), when the ali'i (high chiefs) made enormous demands upon the common people to gather sandalwood in the upland forests.

Kauikeaouli's assumption of control was marked by the selection of a group of young chiefs and children of important persons, of resident foreigners, and of commoners, to become his favorites, friends, members of his household, and soldiers and sailors to form his bodyguard. This general period ended in the exhaustion of sandalwood on the islands. Trade continued with visiting whaling

ships during the Whaling Period (A.D. 1830-1848) for provisions, but this did not generate the same profits for the ali'i as did the early sandalwood trade. (Sahlins 1992: 108).

Between 1830 and 1850, the demands of the ali'i on the maka'ainana (common people) were severe. The missionary, John Emerson, commenting on the burdensome taxes on the people, wrote that the ruling chiefs "get hungry often and send a vessel to Waialua for food quite as often as it is welcomed by the people" (MsL: 10 Feb 1834, cited in Sahlins 1992:145).

Population Decline

In the pre-contact period, villages in the Waialua District were concentrated along the coast and the well-watered valleys of the ahupua'a on the eastern side of the district. The population of these ahupua'a had been estimated at 6,000 to 8,000 people before Western Contact (Sahlins 1992:20).

The first missionary census of the district, in 1831-32, recorded 2,640 people in Waialua, probably down 20-30 percent from the first decade of the century. The population continued to decline in the first part of the nineteenth century, and by 1848, the population was down to 1,616 persons. Much of this decline was due to a high death rate from newly introduced diseases, such as smallpox, typhus, and venereal diseases.

Mid- to late-1800s

In 1850, a law was passed that allowed foreigners to buy land fee-simple. Two descendants of missionaries, William Emerson and John T. Gulick, were the first foreigners to buy land in Mokule'ia and Kawaihapai. Over the next few years, Emerson continued to buy land from the original grantees or later owners until he owned a total of 2,605 acres in Waialua (Alameida 1993:xii).

In 1852, the first Chinese were brought to the islands to work in the sugar cane fields. Some of these Chinese later moved to Waialua to begin rice cultivation. A market for rice in California had developed as increasing numbers of Chinese laborers immigrated there since the mid-19th century. Similarly, as Chinese immigration to the islands also accelerated, a domestic market for rice developed.

By 1876 there was still a considerable amount of former taro land available for rice farming. The great demand for rice land brought disused taro patches into requisition- especially because water rights attached to them ...(Coulter and Chun 1937: 11).

1900s

By the early 1900s, sugarcane plantations and large ranches came to dominate the lands of western Waialua. Cattle were known to have grazed on the lowlands of Waialua as early as the 1840s (Sahlins 1992:148). In 1897, B.F. Dillingham purchased the Kawailoa Ranch in Mokule'ia. The ranch included over 2,000 head of cattle and over a hundred horses and mules on 10,000-acres of land (Yardley 1981:193). Dillingham also leased additional property in Mokule'ia, including the Gaspar Silva Ranch, the James Gay Estate, and other lands in the area that he could secure. Dillingham's plan was to later sublease or sell the land at a profit, as the lands had potential for being developed into large-scale sugar plantations. He anticipated the land would become valuable once extensive irrigation systems were in place, and when the O'ahu Railway and Land Co. (O.R. & L.) railroad was constructed around Ka'ena Point and along the north shore to Kahuku.

By 1898, the O.R. & L railroad was constructed through the Waialua District. Soon thereafter, Dillingham began selling off or subleasing much of his lands in western Waialua. However, Dillingham retained as his personal ranch "a great strip of mountainside and beaches with flat land in between and a homestead in the middle" (Yardley 1981:206). This land would remain ranch land, with sugar plantations located to the cast and west. The Dillingham Ranch was developed into a horse ranch,

including stables, pastures, equestrian areas, and a polo field, along with a large, wood framed house for the Dillingham family (Yardley 1981:193- 194).

By 1946, Robert P. Patterson, Secretary of War of the United States, executed a "Declaration of Taking," which stated that the land of Mokule'ia, Auku'u, Kawaihapai, Kealia, and Ka'ena, Waialua, O'ahu, Territory of Hawaii; Mokule'ia Ranch and Land Company, Limited, et al. "is taken ...to provide for a military airfield, an ordnance storage area, and related military purposes incident thereto. The said land has been selected by me for acquisition by the United States for use in connection with such purposes, and for such other uses as may be authorized by Congress or by Executive Order, and is [r]equired for immediate use." Several of the native Hawaiian families, who had retained their small plots of land through the 19th and early 20th centuries, now lost lands through this confiscation (Alameida 1993: 113).

Modern Land Use

With the announcement of the Oahu Railway and Land Company's decision to discontinue service in 1947, the Waialua Agricultural Company began to switch to truck transportation. The change was slowly made, until the last railroad line was closed in 1952. Subsequent historic maps and aerial photographs indicate a general lack of development in the area through the 1970s. Lands in the makai (northern) portion of the project area consisted of improved pasture and ranch activity areas, including the Dillingham family residence and other smaller residences. Lands in the mauka (southern) foothills portion of the 861-acre Dillingham Ranch project area generally appeared to be unimproved pasture areas.

The lands occupied by the Crowbar Ranch, Campbell Ranch, and Dillingham Ranch were later consolidated under the control of the Mokule'ia Land Company. At present, the project area, again known as the Dillingham Ranch, is an active horse and cattle ranch. Much of the level coastal plain portion of the project area is used for equestrian stables and activity areas. The sloping foothills of the project area are used as pasture for grazing cattle. The Dillingham residence remains on the property, as well as a coconut and palm tree farm.

2014 Archeological Inventory Survey

Introduction

At the request of Dillingham Ranch Aina, LLC, International Archaeology, LLC, (IA) completed an archaeological inventory survey of 85.3 acres (34.5 hectares) for the proposed Dillingham Ranch agricultural subdivision. This area represents the additional area added to the agricultural subdivision not directly surveyed in the Tulchin and Hammatt (2007) and Drolet and Schilz (1992a, 1992b) reports. The project acreage surveyed in 2014 is divided between three areas that will largely be used for pasturage but also residential development: an eastern parcel (30.1 acres), a central parcel (38.2 acres), and a western parcel (17 acres) (see **Figure 1**). The large approximately 390-acre southern extension of the subdivision (immediately south of the eastern survey parcel)

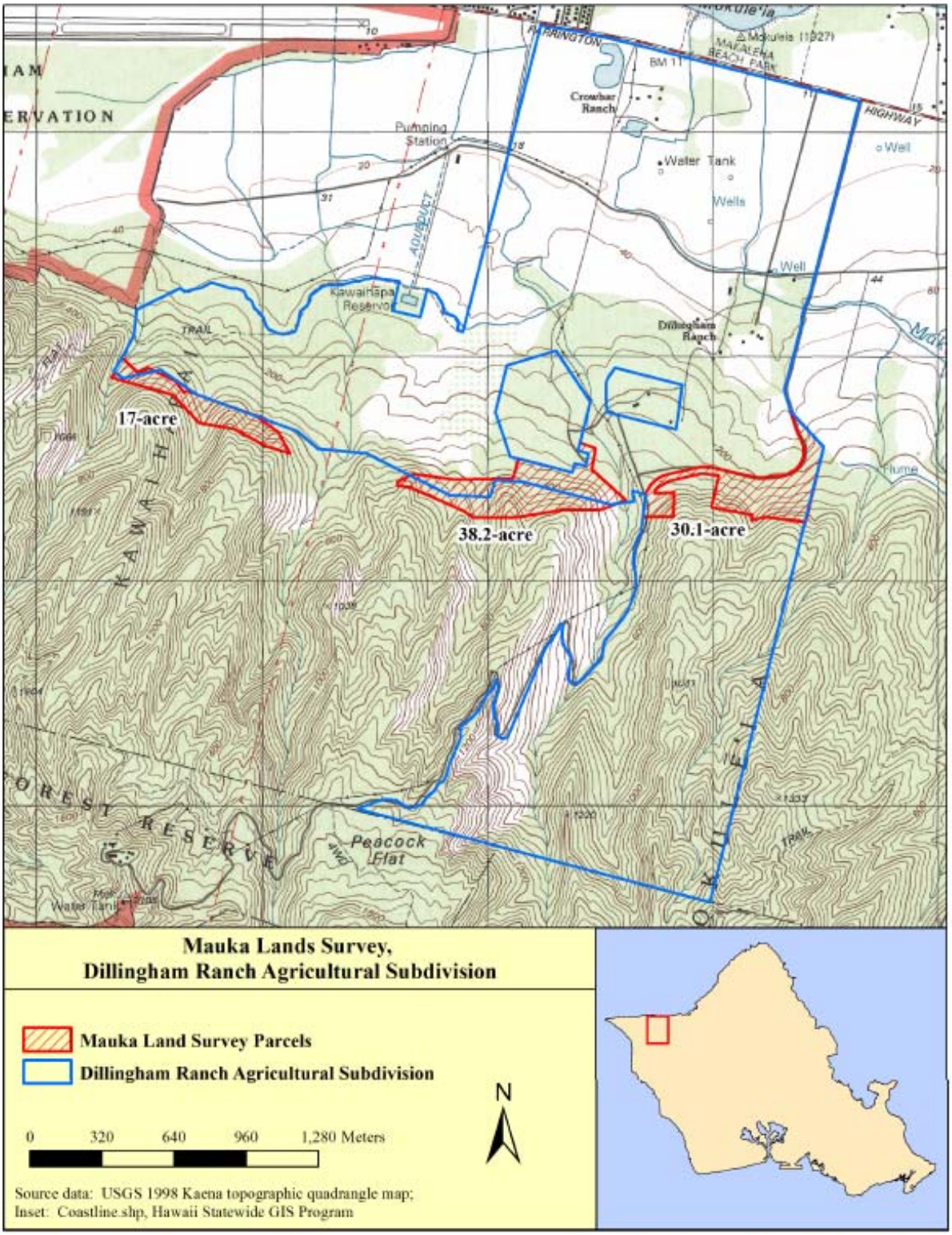


Figure 1. The locations of the three *mauka* survey parcels and the proposed Dillingham Ranch Agricultural Subdivision.

will not be subject to development, but will continue to be used to graze cattle. This survey supplements an earlier survey for the subdivision completed by Tulchin and Hammatt (2007), which in turn followed up on a survey conducted by Drolet and Schilz (1992a, 1992b). The project was conducted in compliance with Hawaii Revised Statute (HRS) 6E-42 and Hawaii Administrative Rules (HAR) §13-276 and 13-284.

Previous Archeology

The geographical coverage of archaeological research within the western *ahupua'a* of Waialua is variable, with Dillingham Ranch standing out as the most intensively investigated area. Two general patterns have been documented by these investigations. One, pre-Contact and post-Contact burials are fairly common along the coastline with interments in calcareous Jaucas sand deposits. Minimally, the remains of 32 individuals have been recovered from the shoreline from Kawaihāpai to Mokulēʻia to Ahupuaʻa. Two, surface architecture documenting traditional habitation, agriculture, and ceremonial activities is limited to the foothills and lower slopes of the Waiʻanae Range. It can be assumed that surface structures once extended across the lower coastal flat, but that they were destroyed by historical agricultural activities. Post-Contact structures, primarily cattle and boundary walls have a similar distribution.

The chronology of pre-Contact occupation is poorly developed with a handful of radiocarbon determinations obtained from deposits excavated in the area. Most of these determinations provide calibrated ages from the 17th to 20th centuries, with a pair calibrating between the 13th to 16th centuries; a single date is anomalously old with a calibrated age between the 8th and 11th centuries. All of these determinations were obtained from unidentified wood charcoal and therefore may provide spuriously old calibrated ages (that is, the samples include an unquantified degree of inbuilt age). Similarly, artifact and midden collections are practically nonexistent for this area. This is in contrast to the ethno-historical record of extensive sweet potato and taro cultivation (Handy 1940:85; Handy and Handy 1972:467), and presumably a large population.

Table 5 presents details on the previous archaeological investigations completed within approximately 2 kilometers (km) of the current survey parcels. **Figure 5 (repeated from Page 31)** displays the locations of most of these projects. **Table 6** presents a listing of the 38 previously documented sites within the same area, with **Figure 6** displaying their locations. Note that locations for McAllister's Sites 190-196 are approximations. A few additional projects conducted at a greater distance that resulted in no findings are not tabulated or displayed (Barrera 1985a, 1985b; Carter 1979; Kennedy 1990).

Table 5. Previous Archaeological Investigations within Approximately 2 km of the Current Survey Areas.

Report Author	Results	Location
Barrera (1985c)	Reconnaissance survey; no sites	Proposed well location, adjoining to the north of the current western survey parcel
Barrera (1986)	Reconnaissance survey; two sites recorded: a wall and an enclosure/paddock (re-located by Drolet and Schilz [1992a, 1992b] and designated Sites 50-80-03-4439 and 4785, respectively)	Dillingham Ranch property; surrounding, and possibly overlapping, the current project area
Drolet and Schilz (1992a)	Inventory survey of 840 acres of Dillingham Ranch; 15 sites documenting prehistoric and historic habitation and agriculture (Sites 50-80-03-4772 to 4786	Immediately north of the current survey parcels; slightly overlaps the northern extent of the present central survey area and the western extent of the eastern survey area
Drolet and Schilz (1992b)	Inventory survey of 55 acres (divided into 50 and 5 acre parcels); four sites recorded documenting prehistoric and historic agriculture and land boundaries (Sites 50-80-03-4439 to 4442)	The 50 acre parcel is ~150-650 m south of the current eastern survey parcel; the 5 acre parcel is ~150-450 m north of the current western survey parcel

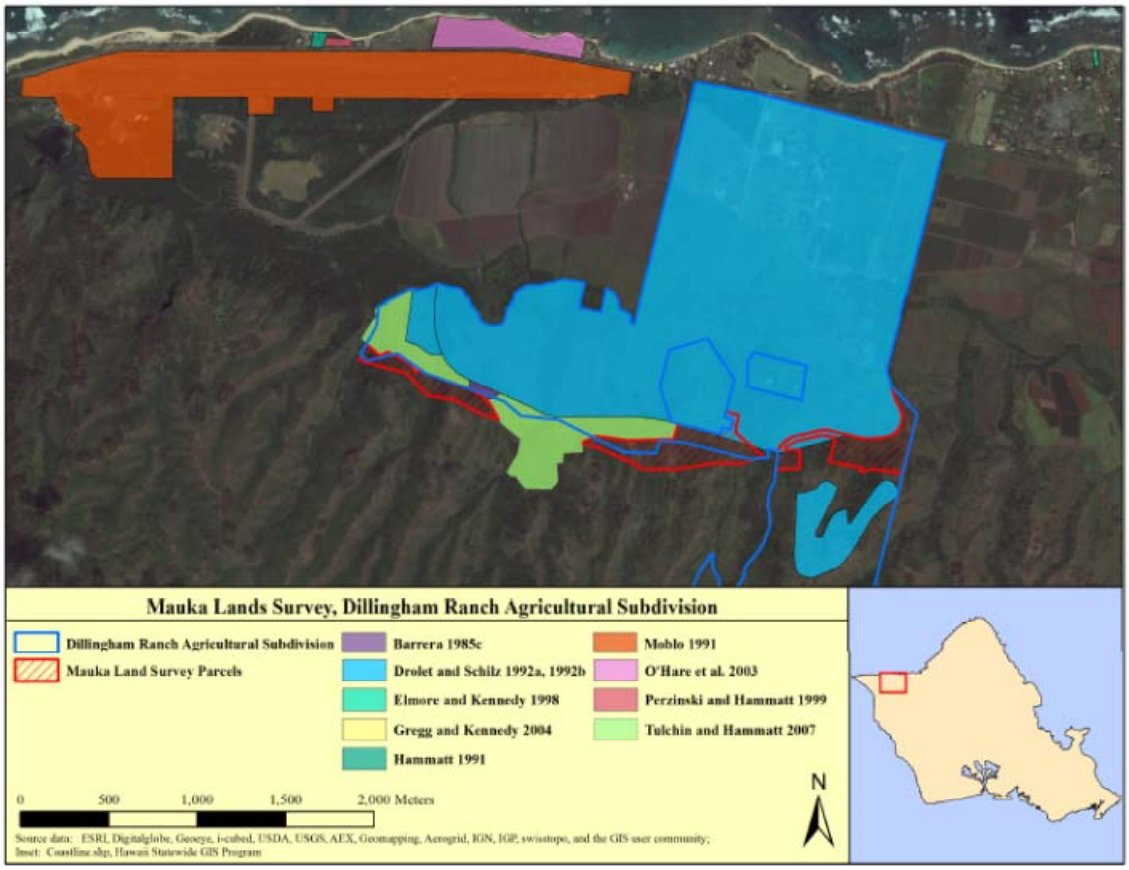


Figure 5. Locations of previous archaeological investigations within approximately 2 km of the current survey parcels.

Table 5. Previous Archaeological Investigations within Approximately 2 km of the Current Survey Areas (continued).

Report Author	Results	Location
Elmore and Kennedy (1998); see also Kapeliela (1998)	Burial recovery; minimum number of individuals (MNI) of seven (Site 50-80-03-5599); six individuals presumed to date to the pre-Contact period, seventh individual dates to the post-Contact period based on glass beads associated with the burial	Approximately 2.2 km northeast of the current eastern survey parcel; along the coastline
Gregg and Kennedy (2004)	Burial recovery; single individual, exposed during construction (Site 50-80-03-6708); probably disturbed by prior construction; presumed to be Hawaiian	Coastal Mokulēʻia Ahupuaʻa, approximately 2 km north of the present survey parcels
Hammatt (1991)	Subsurface testing; no sites	
Kapeliela (1996)	Burial recovery; recovery of two human cranial fragments that had eroded from the active dune/beach face (Site 50-80-03-5467)	Approximately 2 km northeast of the current eastern survey parcel; along the coastline
Kennedy (1987)	Literature review for approximately 2,800 acres within Mokulēʻia; two day reconnaissance in selected areas	Dillingham Ranch property
McAllister (1933)	Reconnaissance-level survey (island-wide); notes six sites (Sites 190-196 [now prefixed by 50-80-03-]): three *koʻa* (fishing shrines) (Sites 50-80-03-0190, 0193, and 0195), one *heiau* (Site 50-80-03-0191), springs (Site 50-80-03-0192); one possible *heiau* (Site 50-80-03-0194); and a "village" (Site 50-80-03-0196); two (Sites 190 and 193) were no longer present with three others partially dismantled or otherwise disturbed (Sites 191, 195, and 196)	The placement of these sites is very rough, relying on the hand-drawn Waialua map included in Sterling and Summers (1978). Sites 190, 193, and 195 are 1.7-2 km north of the survey parcels along the shoreline; Site 191 is approximately 500-600 m to the northwest of the western survey parcel; Site 192 may be immediately north of, or within, the western parcel; Site 194 may be approximately 700 m to the north of the central parcel; Site 196 may be immediately east of the eastern parcel
Mitchell (1987)	Reconnaissance survey on horseback across Dillingham Ranch; six sites were recorded (no SIHP numbers provided at the time), consisting of stone walls (Sites 1 and 2; Site 1 later designated Site 50-80-03-4439), a wall and platform (Site 3; later designated Sites 50-80-03-4785 and 4786), springs (McAllister's Site 192), a wall and "rock structures" (Site 5; later designated Sites 50-80-03-4772 to 4777); and terracing (Site 6; possibly Site 50-80-03-0416)	Sites 1 (50-80-03-4439) and Site 2 are approximately 400-600 m to the south; the remaining sites are 200 m or more to the north
Moblo (1991)	Literature review and reconnaissance survey for Dillingham Airfield; multiple masonry surface structures noted that appear to be historical, but the reconnaissance area overlaps Site 50-80-03-0416	Approximately 1.5 km to the north and northwest from the present western survey parcel

Table 5. Previous Archaeological Investigations within Approximately 2 km of the Current Survey Areas (continued).

Report Author	Results	Location
O'Hare et al. (2003)	Inventory survey; one site (Site 50-80-03-6638), a buried cultural deposit and terrace were documented; three ^{14}C dates were obtained (590±70 BP [Beta-183530], 100±60 BP [Beta-183401], 140±30 BP [Beta-183402])	Approximately 1.9 km to the north of the current western survey parcel; along the coastline
Perzinski and Hammatt (1999)	Archaeological monitoring and burial recovery; single individual exposed during construction (Site 50-80-03-5766); no burial pit or associated cultural deposit, with the exception of one possible post mold	Approximately 1.7 km to the north of the western survey parcel
Pietrusewsky (1988); see also Bath and Pietrusewsky (1987)	Burial recovery; MNI of 21 (Site 50-80-03-3747)	Approximately 2 km to the north along the coast
Rosendahl (1977)	Reconnaissance survey of 64.22 acres of Dillingham Military Reservation; recorded one site—a complex of agricultural terraces (Site 50-80-03-0416), and discusses two others that could not be re-located (Site 50-80-03-0191 [*heiau*]) or is presumed to have been destroyed (Site 50-80-03-9535 [*ko'a*])	Site 416, at its closest, is approximately 150 m north of the western survey parcel
Thrum (1908:41)	Listing of *heiau*; "Paweu" Heiau, possibly McAllister's Site 191	If it is Site 191, it is approximately 500-600 m to the northwest of the western survey parcel
Tulchin and Hammatt (2007)	Inventory survey of 78 acres; five late pre-Contact/early post-Contact sites documenting habitation and agriculture/ranching recorded (Sites 50-80-03-0416, 6884 to 6888); two ^{14}C determinations (160±40 BP [Beta-220909], 140±30 BP [Beta-221342])	Adjoins the northern boundary of the current western survey parcel and the western half of the northern boundary of the central survey parcel; includes the land between these two survey parcels

Table 6. Archaeological Sites Previously Recorded within Dillingham Ranch and Surrounding Areas (Within Approximately 2 Kilometers).

Site No. (Prefix 50-80-03-)	Name/Description	Function	Period	Reference
190	Pu'u o Hekili; form unknown	Religious (*ko'a*)	Pre-Contact	McAllister (1933:128)
191	Kawailoa; two terraces, one wall	Religious (*heiau*)	Pre-Contact	McAllister (1933:128); possibly Thrum (1908:41)
192	"Hidden Waters"; unmodified springs	Springs	Traditional; Mythological	McAllister (1933:129)
193	Kuakea; form unknown	Religious (*ko'a*)	Pre-Contact	McAllister (1933:129)
194	Wall, large rocks	Religious (possible *heiau*)	Pre-Contact	McAllister (1933:129)
195	Apparently rectangular structure, uncertain if it was an enclosure or platform	Religious (*ko'a*)	Pre-Contact	McAllister (1933:129)
196	"Village" comprised of multiple "house sites" and terraces	Habitation	Traditional	McAllister (1933:129)
416	Terraces, walls, mounds	Agriculture	Traditional; Beta-221342, 140±30 BP	Handy (1940:85); Rosendahl 1977; Tulchin and Hammatt (2007); possibly Mitchell (1987)
3747	Human skeletal remains (minimum 21 individuals)	Burial	Pre-Contact	Bath and Pietrusewsky (1987); Pietrusewsky (1988)
4439	Wall	Boundary	Traditional	Barrera (1986); Drolet and Schiltz (1992b); Mitchell (1987)
4440	Wall	Boundary	Traditional	Drolet and Schiltz (1992b)
4441	Wall	Agriculture/ Ranching	Post-Contact	Drolet and Schiltz (1992b)
4442	Terrace	Agriculture	Unknown	Drolet and Schiltz (1992b)
4772	Enclosure (Settlement Cluster 1)	Possibly religious (possible *heiau*)	Traditional	Drolet and Schilz (1992a); Mitchell (1987)
4773	2 enclosures, 1 platform (Settlement Cluster 1)	Habitation and agriculture	Traditional	Drolet and Schilz (1992a); Mitchell (1987)
4774	Platform (Settlement Cluster 1)	Habitation	Traditional	Drolet and Schilz (1992a); Mitchell (1987)

Table 6. Archaeological Sites Previously Recorded within Dillingham Ranch and Surrounding Areas (Within Approximately 2 Kilometers) (continued).

Site No. (Prefix 50-80-03-)	Name/Description	Function	Period	Reference
4775	Enclosure (Settlement Cluster 1)	Habitation	Traditional	Drolet and Schilz (1992a); Mitchell (1987)
4776	3 enclosures, 3 terraces, 2 walls, 1 clearing, 1 alignment, 1 mound (Settlement Cluster 1)	Agriculture, habitation, religious	Traditional	Drolet and Schilz (1992a); Mitchell (1987)
4777	2 walls (Settlement Cluster 1)	Boundary	Traditional/ Historic	Drolet and Schilz (1992a); Mitchell (1987)
4778	2 enclosures (Settlement Cluster 2)	Agriculture	Traditional	Drolet and Schilz (1992a)
4779	Terraces, platforms, and enclosures (Settlement Cluster 2)	Habitation and agriculture	Traditional	Drolet and Schilz (1992a)
4780	4 terraces, 1 enclosure (Settlement Cluster 2)	Agriculture	Traditional	Drolet and Schilz (1992a)
4781	Terrace (Settlement Cluster 2)	Agriculture	Traditional	Drolet and Schilz (1992a)
4782	3 enclosures, 2 terraces, 1 mound (Settlement Cluster 3)	Agriculture	Traditional	Drolet and Schilz (1992a)
4783	1 water channel, 1 wall	Agriculture	Post-Contact	Drolet and Schilz (1992a)
4784	Ditch	Agriculture	Unknown	Drolet and Schilz (1992a)
4785	Enclosure/paddock	Agriculture/ Ranching	Post-Contact	Barrera (1985); Drolet and Schilz (1992a); Mitchell (1987)
4786	Platform	Religious	Pre-Contact	Drolet and Schilz (1992a); Mitchell (1987)
5599	Human skeletal remains	Burial	Pre- and Post-Contact	Elmore and Kennedy (1998)
5766	Human remains	Burial	Traditional	Perzinski and Hammatt (1999)
6638	Buried cultural deposit	Habitation	Pre-Contact	O'Hare et al. (2003)
6708	Human skeletal remains	Burial	Traditional	Gregg and Kennedy (2004)
6884	Walls	Agriculture/ Ranching	Post-Contact	Tulchin and Hammatt (2007)
6885	3 terraces, 1 retaining wall	Agriculture	Traditional	Tulchin and Hammatt (2007)
6886	3 terraces, 3 mounds, 1 retaining wall	Agriculture	Traditional	Tulchin and Hammatt (2007)
6887	Overhang shelter	Temporary habitation	Traditional; Beta-220909, 160±40 BP	Tulchin and Hammatt (2007)
6888	5 mounds, 1terrace	Agriculture	Traditional	Tulchin and Hammatt (2007)
"Site 2"	Wall	Military	Historic	Mitchell (1987)

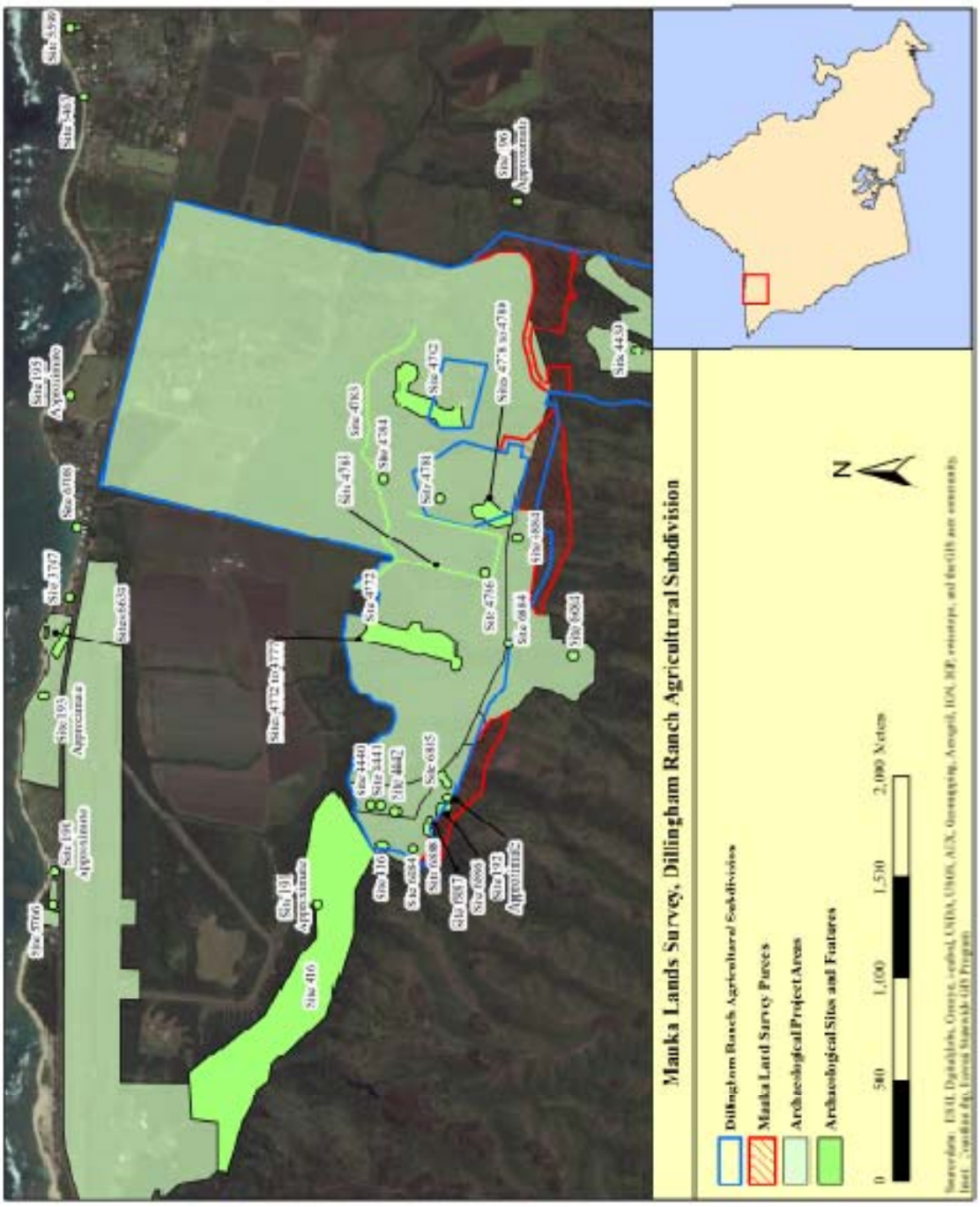


Figure 6. Previously identified archaeological sites within approximately 2 km of the current survey parcels.

No sites have been previously documented within the eastern survey parcel (see **Figure 6**). McAllister's (1933:129) Site 196—"portions of house sites, isolated sections of terracing"—may be immediately to the east, however the placement of this site is an approximation following Sterling and Summers (1978:Waialua map). A possible land boundary wall (Site 4439) recorded by Mitchell (1987) and Drolet and Schilz (1992b) is about 375 m to the south (*mauka*).

No sites have been previously recorded within the central survey parcel (see **Figure 6**). Tulchin and Hammatt (2007) recorded three sections of historical ranching walls (Site 6884, Feas. A, C, and D) to the north and east of the current survey parcel. Drolet and Schilz's (1992a) Settlement Clusters 2 (Sites 4778-4780) and 3 (Site 4782) are located approximately 100 m to the north. These site clusters, along with Settlement Cluster 1, are interpreted as remnants of the same, formerly continuous, traditional Hawaiian agricultural landscape. Drolet and Schilz (1992a) are equivocal on assigning a definitive pre- or post-Contact age, suggesting that at least some of the structures pre-date Contact but that the complex likely continued in use during the early post-Contact decades. The clusters include agricultural and temporary habitation enclosures, platforms, and terraces.

Although it has not been conclusive determined, McAllister's (1933:129) Site 192 may fall within the western survey parcel. The unmodified springs—named Ulunui, Koheiki, Ulehulu, and Waiakaaiea (names provide by Hookala)—are described by McAllister (1933:129) as "four hidden waters upon which Hiiaka called when she was refused water by the old inhabitants." As with all of McAllister's (1933) sites in the area, locations are approximate. Tulchin and Hammatt (2007) recorded three small traditional agricultural complexes (Sites 6885, 6886, and 6888) and one temporary overhang shelter (Site 6887) immediately to the north of the current western survey parcel. A single radiocarbon determination obtained from unidentified charcoal recovered from a hearth at Site 6887 is 160±40 BP (Beta-220909). Although the features comprising Site 6886 do not extend into the western parcel, the site boundary with a buffer does intrude approximately 15 m into the present survey area. The agricultural complexes include terraces and mounds. A historical cattle wall (Site 6884, Fea. B) was also documented slightly further to the north, and approximately 200 m to the north is a component of Site 416 (agricultural terraces, walls, and mounds) recorded by Tulchin and Hammatt (2007). A single radiocarbon determination has been obtained from unidentified charcoal recovered from excavations at Site 416, providing an uncalibrated age of 140±30 BP (Beta-221342).

Summary of Previous Archeological Investigations and Expectations for the Present Project Area

Previous archaeological investigations in the foothills of the Waiʻanae Range around the current project areas have documented traditional irrigated and dryland agricultural infrastructure, temporary habitation structures, and later historical cattle ranching/boundary walls. Similar structures would be anticipated for the current project. A series of natural springs of cultural and mythological importance were indicated to be in the general

area by a consultant of McAllister's during the early 20th century. The locations of these springs have not been conclusively determined. Due to the apparent lack of modification (e.g., stacked stone) and detailed descriptions, confirming any particular natural spring as one of the four named in McAllister (1933:129) will be challenging.

Methods of Study

This section presents the research questions that guided the inventory survey and the field methods that were employed.

Research Questions

Three general research questions guided fieldwork.

1) Is there surface architecture and/or evidence for subsurface deposits present?

2) What is the evidence of land use or water management upland of previously recorded agricultural/habitation sites?

3) What is the evidence for ranching or agriculture on the steeper upland slopes?

Fieldwork Methods

The *mauka* lands project areas vary significantly in both slope and vegetation. Small segments of the eastern and central survey areas had slopes of 6-10% with dense grasses while the majority had slopes of 40-75% with dense grasses, bushes, and trees. The westernmost section is comprised of very steep slopes and cliffs with deeply incised gullies. This section varied from dense grass to forest. Survey area boundaries were identified using natural landmarks and a Geographic Information System (GIS) shapefile of the project areas loaded into a professional grade Global Positioning System (GPS) unit.

A systematic pedestrian survey was conducted with parallel transect lines spaced 5-10 m apart, depending on the density of vegetation and the topography. Survey transect lines were oriented roughly east-west, except for a section of the eastern survey area where transects were oriented roughly north-south to take advantage of the topography. The more widely spaced transects were common in the western survey area where cliffs and very steep slopes required wider spacing to balance safety considerations with coverage (see Photos 3-4).

Feature descriptions and assessments documented feature type, construction methods, functional interpretations, and age estimates. Feature locations were recorded with Trimble Pro-XT and Pro-XH units using the North American Datum 1983, Zone 4 North (NAD 83 Zone 4N). Features were photographed with a digital camera, and plan view maps and profile drawings were completed.

Three 30 by 30 centimeter (cm) shovel test pits (STP) were excavated at two features of ambiguous function. One STP was placed flush with the upslope base of a cattle wall to identify if the wall was also used as an

agricultural terrace and, if so, to obtain charcoal for radiocarbon dating. The other two STPs were placed in a rockshelter to identify any cultural deposits. Excavated sediment was screened using 1/8-inch mesh, soil descriptions were completed, and stratigraphic profiles were drawn.

Fieldwork Results

The pedestrian survey of the three *mauka* parcels for the proposed Dillingham Ranch Agricultural Subdivision resulted in the identification of one archaeological site, Site 50-80-03-7653 (see **Figure 7**). Site 7653 is comprised of four discontinuous dry-laid ranching walls (Features 1-4), which are similar in construction and location to Site 6884, which was previously documented by Tulchin and Hammatt (2007). In addition to the ranching walls, two unmodified seeps were noted within the western survey parcel. These seeps have not been designated as new archaeological sites because of the lack of modification, however, they may be part of McAllister's (1933) Site 192.

Pedestrian Survey: Site 50-80-03-7653

Site 7653 consists of dry-stacked stone walls that in places incorporate large colluvial boulders and outcrops. Wall segments may parallel the slope contours (generally east-west) or run cross contour (generally north-south). Slope erosion and collapse has affected numerous portions of these walls, but the remaining segments are consistent with the extensive 19th/early 20th century ranching infrastructure in this area. These walls, and the components of Site 6884, likely once formed an integrated enclosure/exclosure system for the ranch. **Table 7** provides the UTM coordinates for the ends of the wall segments.

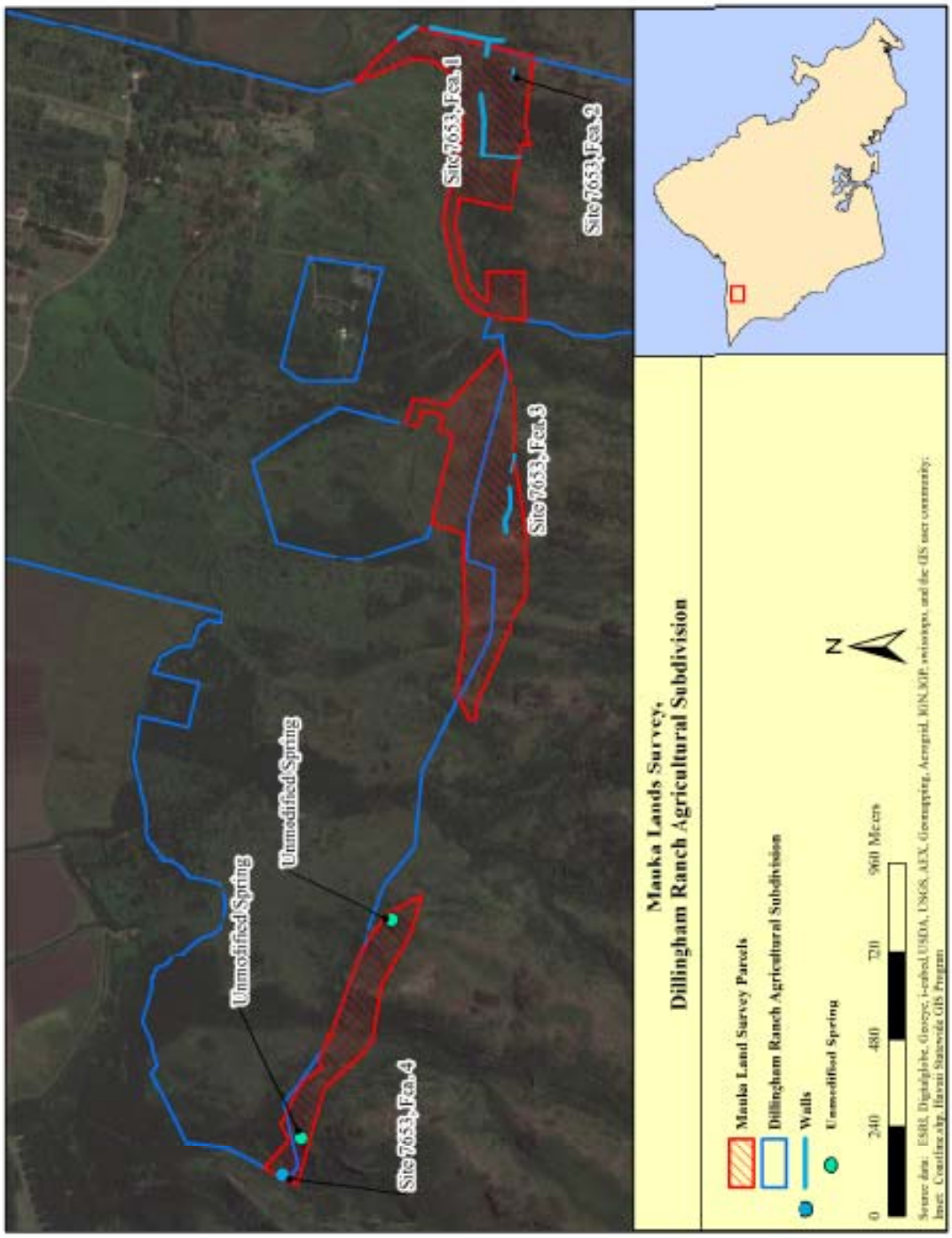


Figure 7. Archaeological features and unmodified springs identified during the current survey.

Table 7. UTM Coordinates for Site 7653 Features.

Fea.	Easting	Northing	Location
1	586140.969	2384300.246	South terminus, western north-south wall segment
1	586147.646	2384407.08	Vertex: North terminus, western north-south wall segment/west terminus of western east-west wall segment
1	586312.667	2384410.577	East terminus of western east-west wall segment
1	586418.547	2384395.633	West terminus of eastern east-west wall segment
1	586459.882	2384388.002	Vertex: East terminus of eastern east-west wall segment/midpoint of southern segment of eastern north-south segment
1	586457.338	2384351.119	South terminus of southern segment of eastern north-south wall

Table 7 continued on following page.

Table 7. UTM Coordinates for Site 7653 Features (continued).

Fea.	Easting	Northing	Location
1	586479.913	2384478.302	North terminus of southern segment of eastern north-south wall
1	586481.503	2384486.569	South terminus of central segment of eastern north-south wall
1	586493.267	2384543.484	North terminus of central segment of eastern north-south wall
1	586498.037	2384582.911	South terminus of northern segment of eastern north-south wall
1	586463.061	2384631.241	North terminus of northern segment of eastern north-south wall
2	586352.094	2384319.959	West terminus
2	586380.71	2384318.369	East terminus
3	585118.992	2384343.308	West terminus of west segment
3	585146.368	2384345.522	East terminus of west segment
3	585152.205	2384345.119	West terminus of central segment
3	585236.546	2384333.042	East terminus of central segment
3	585281.031	2384325.393	West terminus of east segment
4	585324.912	2384315.529	East terminus of east segment
4	583360.179	2384944.022	Center

Feature 1 is a series of adjoining, or once continuous, dry-stacked stone walls located within the eastern survey parcel (see Fig. 7; Photo 5). The longest segment is oriented east-west and extends 312 m with an 80 m wide break where a single track dirt road breaches the wall. At the western end of this segment the wall makes a nearly 90-degree turn south and continues for at least 106 m intersecting the southern boundary of the survey parcel. The wall appears to have originally continued further to the south but it is now completely collapsed in this area. At the eastern end of the east-west segment there is another right angle intersection with a north-south oriented wall segment. This component is largely beyond the survey parcel, although a 50 m portion of it falls within the survey parcel along its northeast edge. The north-south wall segment extends across at least 295 m and is parallel to the current TMK boundary, although offset by approximately 20 m. These core filled wall segments are constructed with multiple courses of basalt cobbles and small boulders. The maximum wall height is 1.2 m and the average width is 0.7 m. There are several sections where the wall has collapsed or has been breached.

Feature 2 is a shorter dry-stacked stone wall located in the eastern survey parcel (see Fig. 7; Photo 6). This wall is 28 m long and is parallel to the east-west segment of Feature E. The core filled wall is constructed with multiple courses of basalt cobbles and small boulders. The maximum height of the wall is 0.6 m and the average width is 0.7m.

Feature 3 is a stacked stone wall located in the central survey parcel (see Fig 7; Photo 7). The dry stacked wall runs east-west in three sections across ridge tops and a shallow hanging valley. The total length of the wall is 210 m, including two breaches of 6 m and 45 m. Portions of the wall have been heavily damaged by erosion and have collapsed. A segment of the wall extends outside the project area on the bluff top running south from the project area for a minimum of 30 m. The maximum wall height is 1.6 m, the maximum width is 1 m with an average width of 0.7 m.

Feature 4 is a stacked stone wall located in a steeply sided gully at the western edge of the western survey parcel (see Fig. 7; Photo 8). The small L-shaped feature was built by infilling the gaps between large colluvial boulders with stacked stone courses. The northeastern portion of the wall is 7.9 m long and 0.7-0.9 m high, while the western portion of the wall, which runs parallel to the main stream bed, is 7.8 m long and 1.35-1.85 m high.

Photo 5. Portion of the east-west segment of Feature 1. View southwest

Photo 6. Portion of Feature 2. View southwest.

Photo 7. Portion of Feature 3. View West.

Photo 8. Portion of Feature 4. View southwest.

Site 7653 is evaluated as significant under Criterion d of the Hawai'i Register of Historic Places (have yielded, or likely to yield information important for research on prehistory or history): the site provides information about historical ranching activities and land divisions. Documentation of construction characteristics of the walls and their locations (which were recorded using GPS units) is recommended as sufficient site recording.

Unmodified Springs

Two natural springs/seeps were identified within the project area (see Fig. 9; Photos 11-12). These seeps are unmodified but are located in the general location of Site 192.

Photo 11. Unmodified spring on the eastern slope of Kapuhi Valley, western survey parcel. View southeast.

Photo 12. Unmodified spring, eastern portion of western survey parcel. View southwest.

Subsurface Testing

Three shovel test pits (STP) were excavated to test for a cultural deposit within a small rockshelter and to test for an agricultural deposit behind (upslope of) a rock wall. Two 30 cm by 30 cm STPs were excavated into the floor of a rockshelter that had a portion of a cattle wall (Site 7653, Feature 3) blocking the downslope opening (Fig. 10; see Photos 13-14). A third 30 cm by 30 cm STP was excavated at the upslope edge of the cattle wall (Site 7653, Feature 3) 38 m east of the rockshelter (Photo 15).

Table 8 provides the soil descriptions and depositional information for the STPs. There was little variation in the soils exposed in the excavations, with a single stratum overlying bedrock in each STP. The slopes of the area are steep and active colluvial deposition of sediments, gravels, and boulders was documented by the excavations and is visible on the surface. No surface or subsurface artifacts or cultural layers were identified in the rockshelter or ranch wall area. Additionally, the sediment and soil build up along the upslope side of the wall is the result of colluvial deposition, and there is no evidence for planting and cultivation.

Table 8. Soil Descriptions and Interpretations of Deposition for Strata Exposed in STP 1-3.

Layer	Depth (cm bs)	Sedimentary Description	Depositional History
I (STP 1, 2)	0-24	Dark brown (7.5YR 3/2) silty clay; 15% rounded granules and pebbles; very few micro to fine roots; moderate very fine to fine crumb structure; slightly hard consistency; slightly undulating lower boundary at bedrock; no cultural material	Colluvial soil, formed by erosion of the slope and rockshelter
I (STP 3)	0-30	Dark brown (7.5YR 3/2) silty clay loam; few rounded granules and pebbles; few micro roots; weak very fine crumb structure; soft consistency; slightly undulating lower boundary at bedrock; no cultural material	Colluvial soil, formed by erosion of the slope

Consultation

On May 24, 2014, Dillingham Ranch Aina and IA presented the preliminary findings of the inventory survey to members of the Mokuleʻia community. Community members in attendance included Mr. Thomas T. Shirai, Jr., a lineal descendant of the area, Mr. Mike Dailey, a resident of Mokuleʻia, and Mr. Stewart Ring, Secretary of the Mokuleʻia Community Association. The meeting was facilitated by Mr. Bob Miyasato on behalf of Dillingham Ranch Aina, LLC. Also present was Mr. Calvin Oda of North Shore Pineapple Company to present the ranch agriculture plan. The community expressed support for the proposed project and asked about several of the historic walls and the small rock shelter identified by IA. The springs located on the bluffs behind Kawaihpai Airfield were of particular interest to Mr. Shirai. He expressed a desire to preserve and protect these seeps due to their potential link to prehistoric and historic farming in the area. The community members expressed their concern for monitoring of all subsurface disturbances to protect any burials that may be encountered.

Mr. Shirai also provided a personal perspective on the history of the area. He is a member of the Kawaih pai Ahupuaʻa Ohana, and the lineal descendent (great-great-grand nephew) of Anton Kaʻoʻo, *hula* master from Waialua. His ancestors lived mainly in Kaʻena and Kawaih pai Ahupuaʻa. The following is information provided by Mr. Shirai at the consultation meeting:

> Waialua/Mokuleʻia area has many legends attached to the land regarding its importance in Oʻahu legends and history. The island of Oʻahu was fished out of the ocean by Maui from Kaʻena Point. This adds to the many legends that surround Kaʻena Point, and is important because Kaʻena Point is not part of Waiʻanae, it is part of Waialua (according to land grants documented by Rev. Emerson).
>
> Waialua/Mokuleʻia is also important because it is possibly the oldest populated place on Oʻahu. Dates from archaeological investigations at Camp Mokuleʻia suggest the area was occupied from AD 700-1000 and stories corroborate that it is an older settlement than Waimea Valley.

> Waialua/Mokuleʻia was a breadbasket of Oʻahu with rich farmland and rich ocean resources.
>
> The rich farmlands were watered from several springs in the coastal cliffs and deeper into the mountains. Hidden Springs [Site 192] is an important place for Kawaih pai because the springs watered farms at the base of the cliffs. A second important spring is Kaiʻana which is at Peacock Flats (also known as Kamaʻi) and feeds local streams. Waiʻu Spring (Breast Milk Spring) is at the base of the cliffs behind Dillingham Airfield. This spring produces milky water. The *ahupuaʻa* of Kawaih pai is named from these springs. The name Kawaih pai means "exalted or blessed waters," but "***hupai***" actually means pregnant or carry in this case suggesting the land was pregnant with or carries blessed waters.
>
> The farmlands and rich ocean waters (including Papaloa reef flat) of the area were famous even before the field system was imposed and many Mokuleʻia plant cultivars exist because of the rich farmland and long history of the area.
>
> Several legends and stories about the strength and importance of the land. One includes an Apu *haku* (stone) within the central survey area located at the edge of the stream was pushed by a bulldozer into the stream bed. The operator died and the bulldozer could not be restarted. The next day the *Apu haku* was back in place.

Summary

Pedestrian survey of the three parcels resulted in the identification of four historical ranch walls, which are designated Site 50-80-03-7653. The wall segments are remnants of what appears to have been a much more extensive system of ranching walls that likely originally connected at various points. The extant portions are approximately 8 to 300 m long, ranged from 0.6-1.85 m high and 0.7-1.6 m wide. The dry-stacked walls are constructed with multiple courses of basalt boulders and cobbles. Preservation ranges from poor to fair.

No subsurface cultural deposits were identified in the STPs, and there were not surface indications for buried deposits (e.g., surface artifact or midden scatters). The steep terrain ensures active colluvial deposition and erosion.

The historical walls identified by the survey along with historical records confirm that the area was used for ranching activities during the 19th and 20th centuries. Two unmodified springs were identified at the base of cliffs in the western survey parcel, and these may have been perennial water sources for agricultural/habitation sites down slope (and beyond the current survey parcels). However, no water channels, collection basins, or other modifications were identified at or near these springs.

As noted above, several portions of historic ranch walls (Site 7653) are present in the survey areas, and similar walls (Site 6884) were recorded at comparable elevations by Tulchin and Hammatt (2007). These walls indicate that cattle were ranging widely through the steep slopes in the *mauka* areas of Dillingham Ranch. No evidence of agriculture (e.g., terracing, modified slopes) was identified on the steeper upland slopes. The steep grade, stony deposits, and associated active colluvial environments make it unlikely that agriculture would have been practical in these areas.

Potential Impacts and Mitigation Measures

Connection to Farrington Highway and WTP

The proposed Connection to Farrington Highway project is located along the Farrington Highway and serves as an existing developed vehicular entry to the Dillingham Ranch. The proposed WTP is located mauka of the Farrington Highway just makai of Cane Haul Road. Although no archaeological sites were identified in the immediate project area of the Connection to Farrington Highway or WTP, it is always possible that iwi or other cultural remains may be uncovered by earthwork or grading to construct the planned Connection to Farrington Highway. Should this occur, work will be temporarily halted and the SHPD immediately notified at (808) 692-815 for further instructions. Work will only be resumed upon appropriate notification to do so by the SHPD.

Agricultural Subdivision

Mapped archeological areas within the agricultural subdivision will be protected. All identified archeological sites will be protected by a 50 foot buffer. No grading or construction activities can occur within this buffer. Two Archeological parcels (A-1 and A-2) have been established to protect clusters of mapped archeological sites in addition to the mapped sites. The full report in **Volume II: Appendix D** should be consulted for complete details about protection and monitoring of existing archeological sites.

A similar precautionary approach as described above with the Connection to Farrington Highway and WTP will be applied to work activities for the proposed agricultural subdivision. All work will be coordinated with the SHPD, including the temporary cessation of earthworking activities in the event that any undocumented inadvertent cultural or archaeological deposits are discovered by the construction contractor. The SHPD will be immediately notified and work may only be resumed upon proper notification to do so by the SHPD.

2.1.8 Beach Erosion and Sand Transport

The Connection to Farrington Highway project site is located within the Dillingham Ranch property and State DOT, Farrington Highway, right-of-way. This location is not subject to natural shoreline processes involving the seasonal and tidal movement of sand. Beach erosion as a result of the projects is not anticipated or expected based on the project location, the limited nature of work, and preventative measures that will be taken by the contractor to ensure against erosion of soils from the project sites.

Potential Impacts and Mitigation Measures

The proposed Connection to Farrington Highway and WTP projects have no potential impacts that would affect beach erosion or sand transport.

2.1.9 Noise

Existing sources of noise in the Connection to Farrington Highway and WTP project areas are limited to surf, motor vehicles traveling along Farrington Highway, aircraft from the nearby Dillingham Air Field, wind thru trees, and avifauna and human associated activities in the area (primarily equestrian activities and grounds keeping associated with the equestrian facilities). Most, if not all of these sources of noise are limited and do not ordinarily constitute an acoustic nuisance. The Connection to Farrington Highway construction will cause a small increase in traffic at the intersection which will cause a minor increase in vehicular noise. The WTP will include above and below ground motorized equipment. All of the subsurface equipment will be housed within closed tanks and vaults and will not produce noise that is detectable beyond the immediate vicinity. Above ground there will be blower motors within an equipment building. The noise produced by these motors is limited and will not be detectable away from the building. Due to the distance of the WTP from the nearest residences and activity centers there should be no noise impacts to the surrounding community.

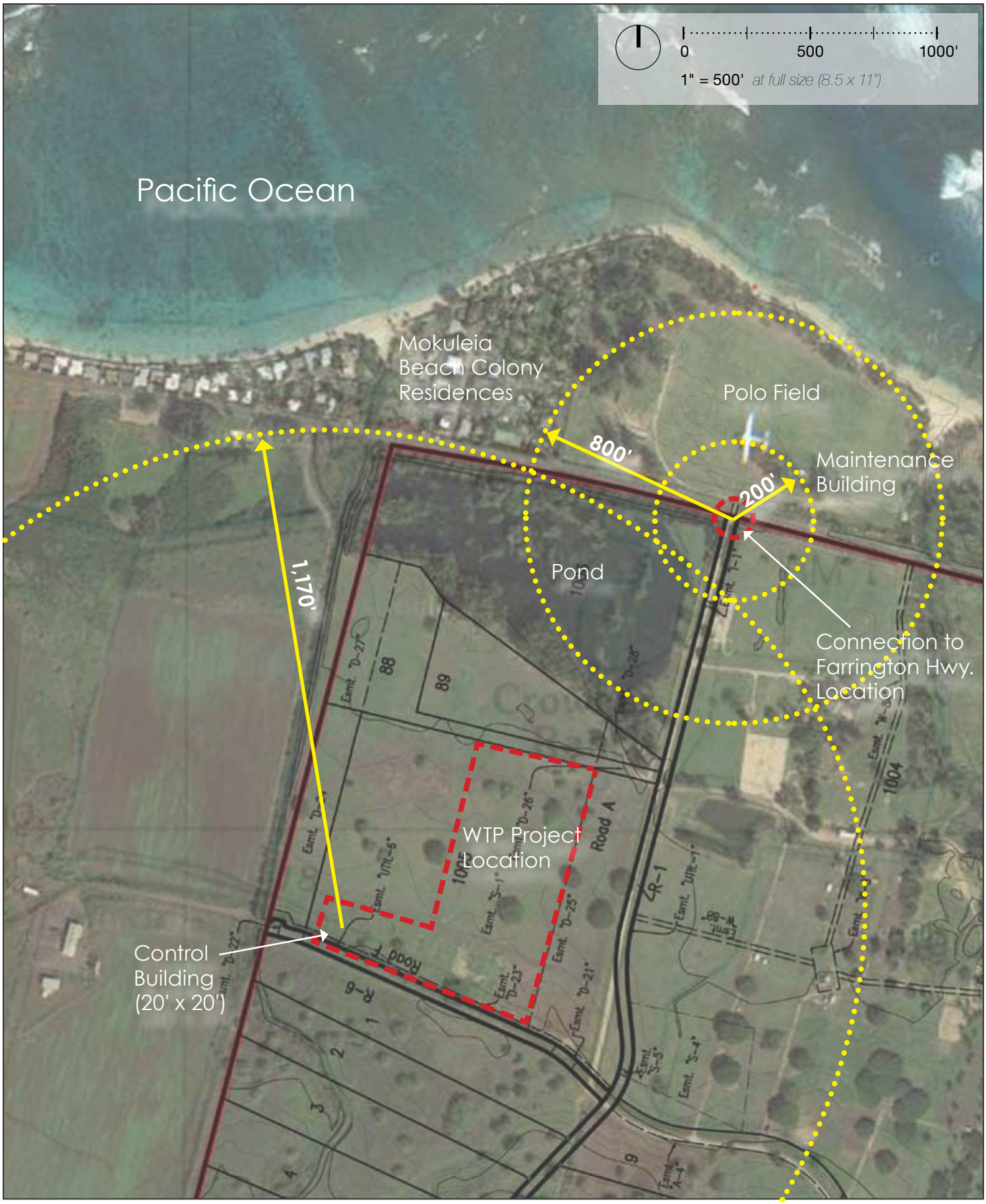
Potential Impacts and Mitigation Measures

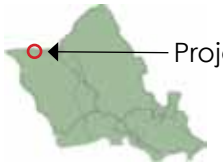
Connection to Farrington Highway

Construction of the proposed project will introduce increased noise in the area immediately surrounding the project site from work crews and the operation of construction equipment. The construction equipment is expected to include, but not be limited to, a compactor, grader, bulldozer, concrete mixer and delivery trucks, and powered hand tools.

The project area is located within a rural, country setting. The closest residences and structures to the T-Intersecton site arc identified in **Figure 7**, **Proximity of Residences/Structures**. According to **Figure 7**, the closest residences include private homes and the Mokule'ia Beach Colony at a distance of approximately 800+ linear feet. A maintenance building for upkeep of a polo field is located across the Farrington Highway at a distance of approximately 320 linear feet as shown.

The small scope and scale of the work suggests that there is limited potential for construction related noise to adversely affect residences. Mitigative measures to minimize or reduce potential noise impacts will include limiting construction activities to daylight working hours from about 8:00 am to 4:00 pm and inspecting all combustion powered machinery to ensure the equipment is properly muffled.





DILLINGHAM 1897 RANCH
NORTH SHORE, OAHU

Figure 7

Proximity of
Residences/Structures

Wastewater Treatment Plant

Construction of the proposed WTP will introduce increased noise in the area immediately surrounding the project site from work crews and the operation of construction equipment. The construction equipment is expected to include, but not be limited to, a compactor, grader, trencher, bulldozer, concrete mixer and delivery trucks, and powered hand tools.

The project area is located within a rural, country setting. The closest residences and structures to the WTP include private homes and the Mokule'ia Beach Colony at a distance of approximately 2000 linear feet and greater. A maintenance building for upkeep of a polo field is located across the Farrington Highway at a distance of approximately 2000 linear feet as shown in **Figure 7**. Secondarily, the proposed WTP is further screened from residences and buildings across Farrington Highway by the row of Ironwood trees and other vegetation surrounding the artificial lake and along the western property line of the Dillingham site.

The long distance of construction work related to the WTP suggests that there is limited potential for construction related noise to adversely affect existing residences. The distance and existing vegetation that separates the project site from residences should effectively mitigate construction noise. Mitigative measures to minimize or reduce potential noise impacts will include limiting construction activities to daylight working hours from about 8:00 am to 5:00 pm and inspecting all combustion powered machinery to ensure the equipment is properly muffled.

2.1.10 Air Quality

No information on air quality was collected. Construction activities are expected to have little or no impact since the project will be of limited duration and where engine exhausts may be a source of potential air pollution, all internal combustion equipment will be governed in accordance with applicable state and county regulations.

Potential Impacts and Mitigation Measures

Connection to Farrington Highway

During construction, fugitive dust may be generated which can constitute a nuisance to traffic along the Farrington Highway. Residences in the area of the project are not anticipated to be affected. The prevailing northeast trade winds should direct any fugitive dust towards the undeveloped hillsides and ravines of the Dillingham Ranch property. Should infrequent Kona winds occur, any construction related fugitive dust would be directed across the polo field or the City's undeveloped Makaleha Beach Park property.

To reduce the incidence of fugitive dust the construction contractor will regularly wet disturbed soil areas or areas that are susceptible to the generation of dust.

Wastewater Treatment Plant

During construction, fugitive dust may be generated. Due to the distance of the project site from Farrington Highway and local residences air quality impacts of construction are not anticipated. The prevailing northeast trade winds should direct any fugitive dust towards the undeveloped hillsides and ravines of the Dillingham Ranch property. Should infrequent Kona winds occur, any construction related fugitive dust would be directed across adjacent pasture on the Dillingham Ranch property.

To reduce the incidence of fugitive dust the construction contractor will regularly wet disturbed soil areas or areas that are susceptible to the generation of dust.

2.1.11 Flood Hazard

The two projects are located within the area shown on Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) number 15003C0085F, dated September 30, 2004. Both projects are within the zone designated as (AE) which is a high flood risk zone which has a 1% annual chance of flooding (see **Figure 8**, FEMA FIRM Map).

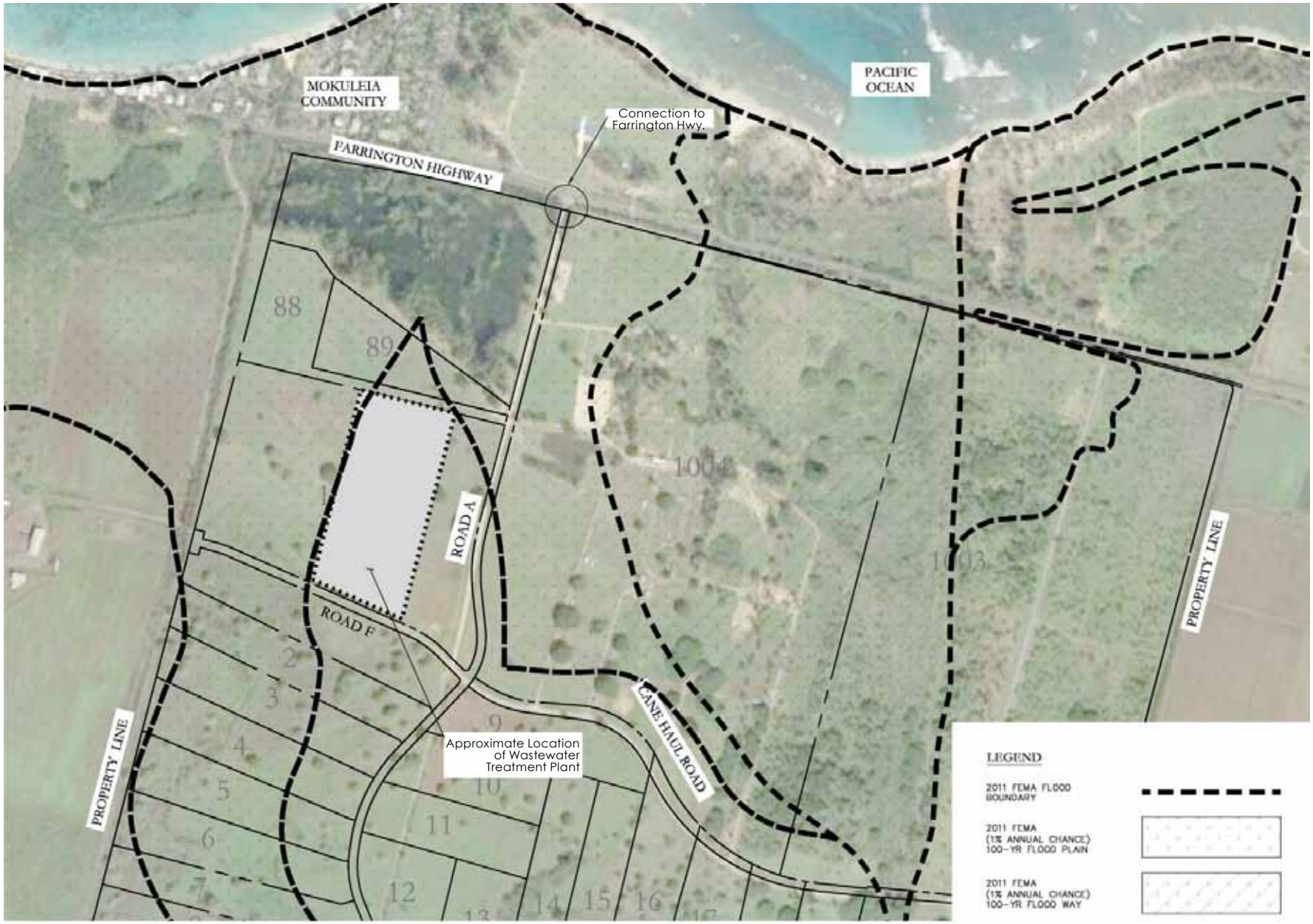
Potential Impacts and Mitigation Measures

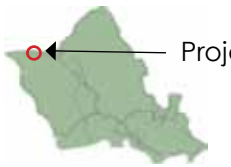
Connection to Farrington Highway

Although the proposed project will be located within Flood Zone AE, no habitable structures are proposed within the zone and therefore there is no unreasonable risk to life or property. The intersection, being at the same grade as the existing road to which it connects, will not impact flood patterns in the area. The intersection will form part of the Farrington Highway and as such will be subject to the same levels of State and local flood protection. No further mitigation measures are planned or proposed.

Wastewater Treatment Plant

The WTP is partially located within Flood Zone AE, therefore the disposal system will be raised to avoid inundation during large flood events. To mitigate the impact of the reduced flood storage volume within the flood plain, compensatory storage will be created within Bulk Lot 1005. With this mitigation in place, the WTP is not anticipated to be prone to flooding, nor to have a significant impact on flood patterns in the area.





DILLINGHAM 1897 RANCH
NORTH SHORE, OAHU

Figure 8
FEMA Flood Zones

2.2 Public Facilities

2.2.1 Access

The proposed projects will not affect public shoreline access. The proposed Connection to Farrington Highway is located along the existing Farrington Highway and will provide for improvements to an existing point of entry to the Dillingham Ranch property.

2.2.2 Traffic and Roadways

At the bequest of the Dillingham Ranch Aina a traffic analysis was conducted by Dr. Julian Ng. A summary of this analysis with potential impacts and mitigations is provided below. The complete report is contained in **Appendix E**.

Executive Summary

While the proposed subdivision could result in a relatively large proportional increase in traffic volumes due to existing volumes being so low, a conservative analysis has shown that a simple connection to the highway will provide adequate capacity to minimize any delay or interruption to highway traffic. The project is not expected to have a significant impact to traffic conditions on Farrington Highway. The estimated peak hour volumes at the intersection of the project access road and the highway do not meet the guidelines for consideration of adding a separate left turn lane.

The intersection should be designed with adequate sight distance for drivers at a stop sign on the connecting street. The intersection should be clearly visible for drivers on the highway, and if necessary, warning signs on the highway should be considered to improve driver awareness of the new intersection.

Introduction

The proposed subdivision potentially could increase traffic volumes on Farrington Highway in the Mokuleia area. As illustrated herein, however, the existing highway will be able to handle the increases in traffic. Additional lanes at the proposed connection to the highway would not be warranted due to the low volumes. The property, adjacent to and east of Dillingham Airfield and south (mauka) of Farrington Highway, will be subdivided to create opportunities for the addition of up to 110 dwelling units.

Vehicular access will be provided by a dedicated project roadway that intersects Farrington Highway as the stem of a "T"-intersection. Traffic on the project roadway's northbound approach to the intersection will be

controlled by a "STOP" sign. The project roadway, a two-lane roadway carrying traffic in both the northbound and southbound directions, will have a single lane on the northbound approach that will be shared by traffic making left turns and right turns onto the highway. Left turns into the project roadway will be made through gaps in the opposing traffic on the highway. The posted speed limit on the highway near this connection is 35 miles per hour.

Existing Traffic Conditions

Traffic volumes on Farrington Highway are based on the latest available count data from a 48-hour traffic count taken by the State Highways Division on Farrington Highway at Kapalaau Bridge near the project site in March 2013; the daily totals and peak hour volumes from this count are shown in **Table 1**.

Table 1 – Existing Traffic on Farrington Highway

	24-hour total		AM Peak Hour		PM Peak Hour	
	Tuesday, March 12, 2013	Wednesday, March 13, 2013	Tuesday, March 12, 2013	Wednesday, March 13, 2013	Tuesday, March 12, 2013	Wednesday, March 13, 2013
Westbound	1,225	1,192	114	119	93	94
Eastbound	1,234	1,208	65	103	119	108
Total	2,459	2,400	179	222	212	202
Peak Hour			7:45-8:45 AM	7:45-8:45 AM	4:15-5:15 PM	3:45-4:45 PM

Source: State of Hawaii, Department of Transportation, Highways Division, Highways Planning Survey Section: Count data for Station B72093000215 (Farrington Highway at Kapalaau Bridge).

The traffic volumes are fairly constant during the day, as illustrated in **Figure 2**.

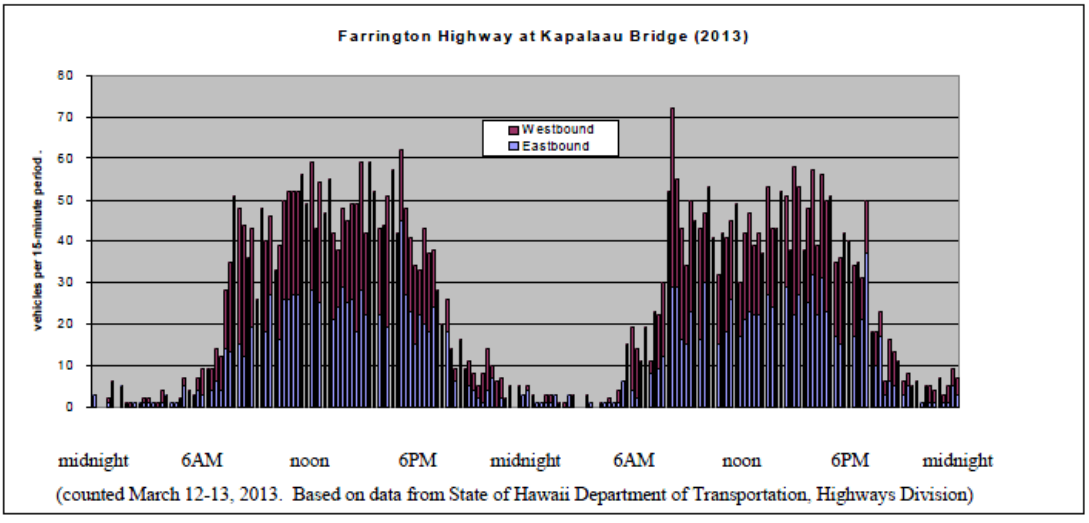


Figure 2 – Existing Highway Traffic

Project Impact and Peak Hour Intersection Conditions

The traffic impact of the proposed subdivision was evaluated for 110 dwelling units and one "lodge" lot. Agricultural use will typically generate only small volumes of traffic during peak hours; however, in order to determine the potential traffic impact, peak hour traffic volumes generated by the dwelling units were estimated using trip rates for suburban detached (single-family) dwellings from the Institute of Transportation Engineers. Use of these rates assumes that all residents commute regularly to work, school, shopping, and other activities. For the lodge, maintenance personnel could generate traffic during the peak hours; the typical weekday peak hour traffic generated by the lodge lot was estimated for five employees using the rates listed for hotels. Table 2 shows the estimates of peak hour traffic generation.

Table 2 – Traffic Generation

	AM Peak Hour		PM Peak Hour	
	Trip rate	% entering	Trip rate	% entering
factors per detached dwelling *	0.75	25%	1.00	63%
factors per lodge employee *	0.69	60%	0.80	54%
Project Traffic estimates	entering	exiting	entering	exiting
110 dwelling units	21	62	69	41
5 employees	2	2	3	2
Total site-generated traffic	23	64	72	43
* Source: Institute of Transportation Engineers, *Trip Generation, 9th Edition.*				

Because the existing traffic volumes are low, the potential impact to traffic volumes from the project will not be unnoticeable if typical suburban use of the lots were to occur. However, as shown below, even with the addition of project traffic and allowances for other traffic in the area to increase, the existing highway facilities would continue to serve peak hour traffic volumes adequately.

The project peak hour traffic volumes were assumed to occur during the same hour as the peak volumes on the highway. For the purpose of analyzing the proposed connection to the highway, the site-generated traffic shown in Table 2 was distributed 5% to and from the west and 95% to and from the east. The highway traffic movements are assumed to be through movements on the highway across the intersection created by the proposed access road. In addition, the existing peak hour volumes were factored to account for possible increases in traffic due to other non-project causes; while an increase of 50% is not expected (and can not be justified based on any known reason), such an increase was used to illustrate possible future conditions at the proposed connection to the highway. This increase could result in 20 years if an average annual increase in

peak hour volumes of 2.05% were to occur (or over 25 years at an average annual increase of 1.63%). The traffic estimates at this location are shown in Figure 3.

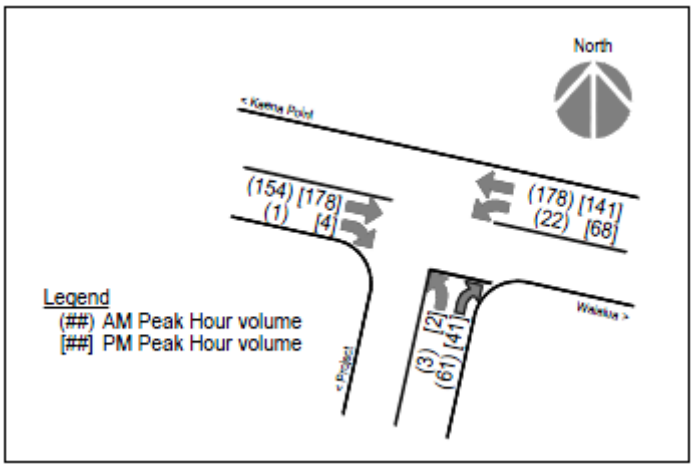


Figure 3 – Traffic Assignments

The procedure for unsignalized intersections described in the *Highway Capacity Manual*[1] *(HCM)* was used to analyze the intersection and acceptable conditions at the intersection were found, as summarized in Table 3. The analysis estimates average delays based on traffic volumes, these delays are described by "Levels of Service" for the controlled movements at the intersection; the *HCM* defines the Level of Service (LOS) for unsignalized intersections as follows (Level of Service D or better is considered acceptable):

LOS	General Description of Delay	Average Delay (seconds per vehicle)
A	Little or no delay	≤ 10
B	Short traffic delays	> 10 and ≤ 15
C	Average traffic delays	> 15 and ≤ 25
D	Long traffic delays	> 25 and ≤ 35
E	Very long traffic delays	> 35 and ≤ 50
F	Very long traffic delays	>50

[1] Transportation Research Board, National Research Council, *Highway Capacity Manual,* Washington, D.C., 2000.

Table 3 – Intersection Levels of Service (2030)

	Westbound left turns from highway		Northbound approach (shared lane at stop sign)	
Peak Hour	AM	PM	AM	PM
Volume/capacity ratio	0.02	0.06	0.09	0.06
95th percentile queue	0.05	0.18	0.28	0.19
Average Delay (seconds)	7.7	7.9	9.9	9.9
Level of Service	A	A	A	A

The level of service analyses show that left turns from the highway can be made with minimal delays and queuing on the highway is not expected. Nevertheless, the need for a separate left turn lane on the highway was also evaluated. The "green book" design manual published by the American Association of State Highway and Transportation Officials (AASHTO) provides a table showing conditions under which a separate left turn lane should be considered on two-lane highways.

The AASHTO table is used to determine the advancing volume at which a separate turning lane should be considered. As shown in Table 4, the estimates of the advancing volume are less than the volumes at which a separate left turn lane should be considered.

Table 4 – Evaluation for Consideration of a Separate Left Turn Lane

	AM Peak Hour	PM Peak Hour
Proportion left turns (from Figure 3)	10%	30%
Opposing volume (eastbound, from Figure 3)	155	182
For an opposing volume of	200	200
Advancing volume above which a separate turn lane should be considered, for an operating speed of 40 miles per hour *	470	305
Advancing volume for consideration **	220	227
Consider separate left turn lane?	not necessary	not necessary

* Table 9-23 of *A Policy on Geometric Design of Highways and Streets (2011)*, from American Association of State Highways and Transportation Officials, Washington, D.C.

** the larger of the advancing (westbound) volume shown in Figure 3 or the volume that would apply to attain the stated proportion of left turns

The analyses have shown that a simple connection to the highway with a stop sign controlling the side street will adequately serve future traffic volumes at the intersection. A single approach lane on the minor street that is shared by left and right turns would be adequate. A separate left turn lane on the highway is not warranted and will not be needed.

Potential Impacts and Mitigation Measures

Connection to Farrington Highway

The proposed subdivision could result in a relatively large proportional increase in traffic volumes (because existing volumes are so low) but a simple connection to the highway will provide adequate capacity to minimize delays. The project is not expected to have a significant impact to traffic conditions on Farrington Highway. The estimated peak hour volumes at the intersection of the project access road and the highway do not meet the guidelines for consideration of adding a separate left turn lane.

The Connection to Farrington Highway should be designed with adequate sight distance for drivers at the stop sign on the side street. The intersection should be clearly visible for drivers on the highway; if necessary, warning signs on the highway should be considered to improve driver awareness of the new intersection.

Wastewater Treatment Plant

The WTP will not increase traffic volumes thus no impact is anticipated on Farrington Highway.

2.2.3 Police, Fire and Ambulance Service

The project site is readily accessible for police and fire service based on its location along Farrington Highway. Police services are provided for the area from the Wahiawa Police Station. Fire protection is provided by the Waialua Fire Station No. 14, located in Hale'iwa. If additional fire fighting service is required, the Sunset Beach Fire Station No. 11, would be called on to respond. Ambulance service is provided by the City & County of Honolulu facilities at the Waialua and Wahiawa Fire Stations.

Potential Impacts and Mitigation Measures

Connection to Farrington Highway

The proposed project in itself is not expected to generate any new demand for police, fire or ambulance service. During construction, however, these services may be temporarily required but are not expected to result in the requirement for new personnel or construction of new police, fire or ambulance facilities.

Wastewater Treatment Plant

The proposed project in itself is not expected to generate any new demand for police, fire or ambulance service. During construction, however, these services may be temporarily required but are not expected to

result in the requirement for new personnel or construction of new police, fire or ambulance facilities. No impacts are foreseen and no mitigation measures are proposed.

2.3 Additional Information Concerning the Potential for Secondary Impacts

2.3.1 Agricultural Feasibility Report

Background

This Agricultural Feasibility Report ("Report") has been prepared in compliance with the provisions of Section 1-115 of the Subdivision Rules & Regulations ("Subdivision Rules") which contains additional conditions for the subdivision of agricultural land in the City & County of Honolulu ("City"). Specifically, Section 1-115 requires that agricultural subdivisions show that the subdivision will provide feasible agricultural use . . . and that covenants and restrictions will exist to require that the subdivided properties will be put to agricultural use in conformity with applicable Federal, State and City laws and regulations.

The full Report is contained in **Volume II: Appendix F**. **Volume 1** of the Report provides an overview of the properties that comprise the Dillingham Ranch and the agricultural operation that are presently conducted on the property. Subsequent sections of the Report detail the Regulatory Environment and Agricultural Considerations before introducing the Subdivision Concept and a discussion of the Supporting Infrastructure. The Report provides a frame of reference as to the Agriculture Concept which is based on a restructuring of present agricultural operations to focus on a core activity of cultivating selected orchard crops for the local marketplace.

Volume 2 of the Report presents the Agriculture Plan for the commercial production of mango, avocado and citrus to replace imported produce with a reliable supply of high quality, locally grown produce. Volume 2 documents relevant growing site conditions for the selection of the fruit crops and selects the crops based on market potential, suitability for cultivation at the Ranch and crop specific agricultural requirements. **Volume 2** also includes the Preliminary Farm Management Plan for the screening and selection of the best mango, avocado and citrus cultivars to meet to meet production and fruit quality considerations for the production of tree fruit crops at the Ranch. In addition, the Preliminary Farm Management Plan discusses the production and sales and marketing plans, crop specific agricultural practices, important pests and diseases, harvesting and storage.

Introduction

Dillingham Ranch (the "Ranch") is situated on 2,721 acres of land in Mokuleia, Oahu, Hawaii. The Ranch has been engaged in cattle production since the early 1900s unlike the adjacent properties which cultivated sugarcane. Dillingham Ranch Aina, LLC ("DRA"), the sole owner, plans to restore the Ranch as the heart of the Mokuleia community.

As part of the transition, agricultural operations of the "Working Ranch" will be refocused on the cultivating selected orchard crops targeted for the Oahu market. Analysis of agricultural data for the State of Hawaii indicates that thousands of pounds of mango, avocado and citrus is imported from the continental United States, Central America and South America. The cultivation of selected, high quality orchard crops is designed to put underutilized portions of the Ranch into active production, with minimal transportation costs creating a price differential over out-of-state imports.

In order for orchard crops to be cultivated and harvested efficiently, 28 five-acre "Orchard Lots" (total 160 acres) and a 95 acre agricultural field that is part of an Agricultural Cluster Development would participate in a cooperative venture with the Working Ranch. This would enable the Working Ranch to coordinate farming activities to assure the regular rotation of irrigation, controlled application of fertilizers/pesticides/herbicides and timely harvesting to maximize yields of fresh, marketable produce. Managing the orchard crops on a coordinated, commercial basis will be essential to assure the efficiencies required to minimize production costs and surplus inventories.

As part of the foregoing, a unique "Ag Cluster" concept has been discussed with the Department of Planning & Permitting ("DPP") which would maximize the cultivation on a 95 acre parcel with highly productive soils. To enable this, the Ag Cluster would employ a "Joint Development Agreement" to link two parcels and permit placement of the related farm housing units on the adjacent property closer to subdivision infrastructure and utilities. The concept has received favorable consideration by DPP as cluster developments are encouraged by the Land Use Ordinance.

In keeping with the historical aspects of the Ranch, cattle production will remain a significant activity and the present herd (66 head) will be increased over time to 220 to 250 head to gain operating economies. While the increase in the herd size is intended to bolster cattle production, this is also part of a prudent program of land stewardship to reduce excessive vegetation to minimize the potential for uncontrolled wild fires. Related benefits include the protection of critical habitats, enhanced watershed management and buffering of the forest reserve owned by the State of Hawaii ("State"). In addition to grazing cattle in the mauka areas of the

Ranch, 16 subdivided lots ("Grazing Lots") in the upper tier of a new agricultural subdivision planned for the property will participate in a cooperative venture for cattle production with the Working Ranch.

Equestrian activities have long been identified with the Ranch and will be expanded through upgrading training facilities, individual and semi-private paddocks and irrigated open pasture areas for the boarding of horses. The "managed pasture" areas in the makai portion of The Flats will provide enhanced opportunities for equestrian activities such as dressage, quarter horse competitions, a Mokuleia Derby and Pony Club events.

A total of 48 five acre lots (the "Pasture (Flex) Lots") will be available to individuals wishing to pursue other ag activities not involving participation in cooperative ventures with the Working Ranch. However, all subdivided lots in the "Agricultural Subdivision" will be subject to recorded agricultural covenants requiring the land be used for bona fide agricultural activities. While revenue from the individual activities on the Pasture Lots will accrue solely to the owners, the Ranch may benefit through related services such as lot maintenance and irrigation management.

Non-agricultural activities, such as rental of the historic Dillingham House for special functions, photo shoots and filming, are anticipated to remain part of the Ranch but revenue will likely remain level. Future agribusiness activities are planned to encompass site tours, farm-to-table crops and fresh herbs, an enhanced "roadside stand" for marketing of products grown on the Ranch and an outdoor restaurant featuring a menu incorporating produce, meat, fish and other products from the "breadbasket of Mokuleia."

The foregoing activities, particularly the cultivation of orchard crops, will generate operating revenues to enhance the long-term viability of the Ranch. However, these agricultural ventures are dependent on improvements to the existing facilities. DRA recognizes that current operations do not justify capital investment in infrastructure improvements and plans to generate capital through the subdivision and sale of agricultural lots in a new Agricultural Subdivision to fund the necessary upgrades. The new infrastructure systems will also service the existing Ranch facilities and provide the basis for restructuring the operations of the Working Ranch.

Adjacent land uses include lands to the east of the Ranch historically owned by Castle & Cooke, Inc. and leased to its agricultural arm, Waialua Sugar Plantation, for the cultivation of sugarcane (see **Figure 3**). Sugar operations were terminated in the late-1980s due to cheaper production costs in other States and foreign countries. Most of the lands have been purchased by Pioneer Hi-Bred International for their seed corn operation which can grow 2 to 3 crops per year in Hawaii.

Figure 3: Adjacent Land Uses (Prior to 1990)

Lands to the west of the Ranch are still owned by Castle & Cooke, Inc. and are leased to Larry Jeffs. The property is cultivated in bananas and other crops. Further west is the Dillingham Airfield which is administered by the Airports Division of the State Department of Transportation.

Regulatory Environment

State Land Use: The Ranch is located within the State Land Use Agricultural District (see **Figure 4**). Chapter 205 of the Hawaii Revised Statues ("HRS") limits use of agricultural land to the "Permitted Uses" identified in Section 205-4.5.

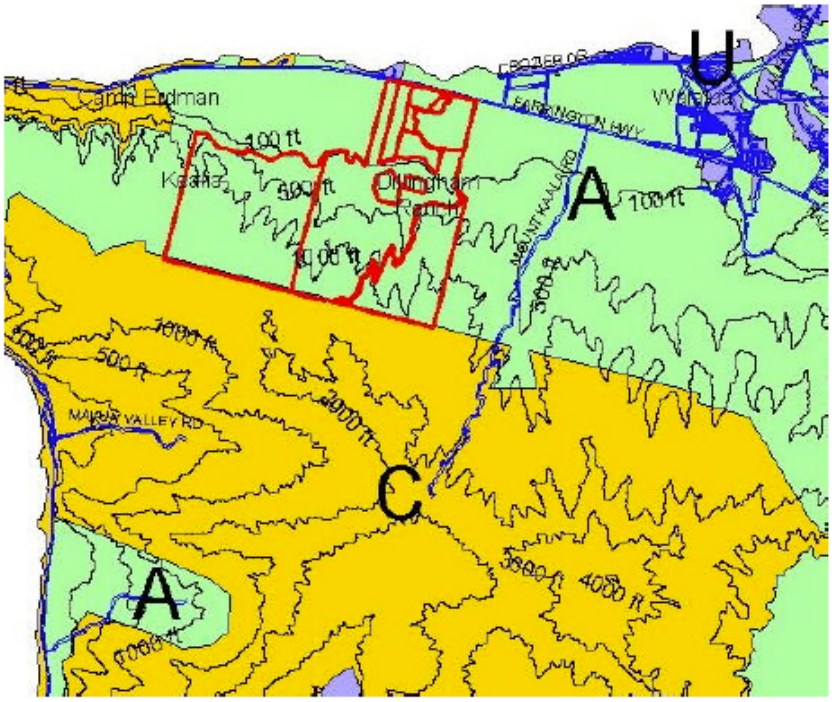


Figure 4 – State Land Use

County Zoning: The parcels comprising the Ranch are zoned AG-1 Restricted Agriculture or AG-2 General Agriculture. AG-1 zoned lands are located in about 100 acres of land the central and eastern portions of The Flats on fertile soil deposited by the Makaleha Stream (see **Figure 5**). The remainder of the Ranch is zoned AG-2.

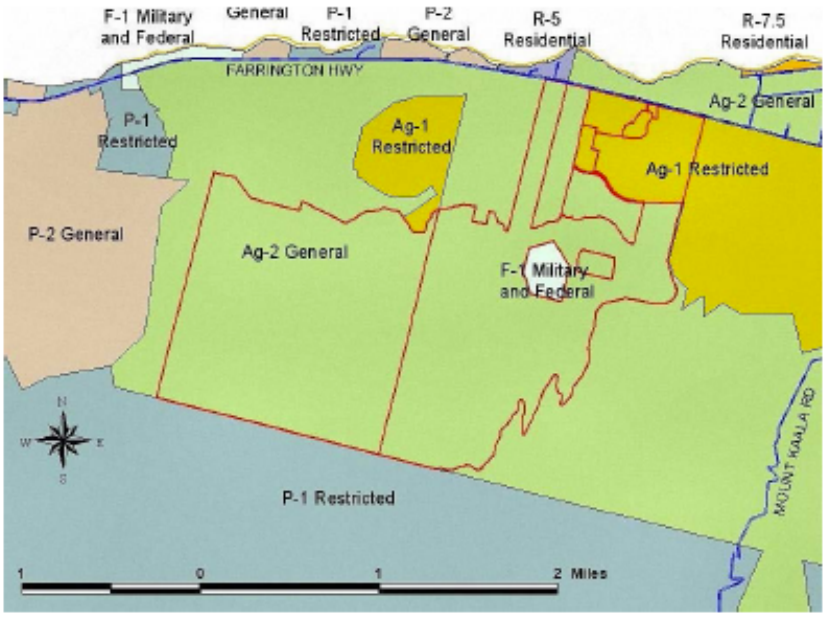


Figure 5 - Zoning

AG-1 – The intent of the Restricted Agricultural District is to preserve and protect important agriculture lands the production of food, feed, forage, fiber corps and horticultural plants. Minimum Lot Size is 5 acres.

AG-2 – The intent of the General Agricultural District is to protect and preserve agricultural activities on smaller parcels of land. Minimum Lot Size is 2 acres.

Subdivision Concept

The 10 bulk parcels that presently comprise the Ranch (net of the two parcels that are owned by Coastalview Properties, LLC) will be consolidated and resubdivided to create 8 reconfigured bulk parcels and 91 five acre agricultural lots as depicted on the proposed subdivision map (see **Figure 2**).

Bulk Parcels: Parcels 1001 to 1007 will be used for various agricultural activities and support facilities as follows:

Parcel	Description	Area	Use	Ownership
1001	Dillingham House	14	Meetings/Events	HOA
1002 1003	Ag Cluster Farm Homes Orchard Field	25 95	Housing/Floral Crops Mango/Coconut Trees	CPR Housing Unit Owners (Ag Cluster)
1004	Pasture	126	Equestrian/Paddocks	DRA
1005	WWTP-Leach Field	14	Pasture (sub surface leach field)	DRA
1006	Artificial Lake	22	Scenic Amenity	HOA
1007 & 1008	Grazing	1906	Cattle Production	DRA

Agricultural Cluster Development: The innovative "Ag Cluster" concept will be employed in Parcel 1003 to maximize use of the Prime rated soils for mango production. The farm housing units will be located mauka of the Cane Haul Road on Parcel 1002. The two parcels would be linked by a Joint Development Agreement and treated as a single project:

- **Ag Field**: Each of the 15 farm housing units will have an undivided, fractionalized interest in the ag field equal to 6.3 acres (95 acres/15 housing units = 6.3 acres/housing unit). This exceeds the 5 acre Minimum Lot Size for the AG-1 zoning.

- **Farm Housing**: A condominium property regime will be used to create 15 "CPR Units" on Parcel 1002. Each CPR Unit would have a maximum land area of 5,000 SF in compliance with DPP's Building Polygon that restricts the land area for a dwelling and related amenities in the Agriculture Districts (Appendix B).

The remaining land area within Parcel 1002, net of the 15 CPR Units, would allow for vehicular circulation, utilities, drainage and landscaping. The cultivation of ornamentals and flowering plants is also contemplated on Parcel 1002 in the area to the east of the Dillingham House. No additional CPR Units will be created and both Parcels 1002 and 1003 will be subjected to recorded covenants restricting use of land to bona fide agricultural activities.

Subdivided Agricultural Lots – All of the lots in the Agricultural Subdivision will be subject to recorded covenants restricting use of the land to bona fide agricultural activities. In addition, the 5,000 SF Building Polygon will be applicable to each dwelling to be constructed on a 5 acre agricultural lot.

Lot Type	Lot Numbers	Description	Area	Use
Orchard Lot	1-19, 29-32, 35-39	Cooperative Fruit Production w/Ranch	160 ac	Mango, Avocado, Citrus, Other Fruits
Pasture (Flex) Lot	20-28, 33-34, 40-64, 78-89	Pasture & Individual Farm Operations	287 ac	Alternative Ag Activities
Grazing Lot	65-77, 90-92	Cooperative Cattle Production w/Ranch	72 ac	Grazing – Rotating w/Mauka Lands

Orchard Lots – Orchard Lots will participate in a cooperative venture with the Working Ranch in the commercial production and marketing of high quality mango, avocado and citrus fruits. A detailed Agriculture Plan covering the selected orchard crops is presented in Volume 2 of this Report.

Grazing Lots – Lots located adjacent to The Mauka Lands will participate in a cooperative venture with the Working Ranch on cattle production. Regular rotation for uniform grazing will be done in The Mauka Lands and on the Grazing Lots. The natural pasture on the Grazing Lots will not be irrigated, except for a 10,000 SF area immediately around the Building Polygon.

Pasture (Flex) Lots – The remaining 48 lots are intended to provide flexibility for purchasers desiring to pursue individual agricultural activities, ranging from the pasturing of personal horses or the cultivation of various crops including ornamental plants, landscape material. Water for domestic use and irrigation will be available to each Pasture Lot, but irrigation will be coordinated on a rotating basis as to assure adequate pressure for domestic uses.

Support Infrastructure

Water

Existing Water Sources - Four wells with water allocations from the State Commission on Water Resource Management ("CWRM") are located within the Ranch:

Well No.	Location	Resignation	Allocation	Status
3410-01	Makai	Potable	500,000 GPD	Active
3410-03	Makai	Agriculture	1,500,000 GPD	Active
3310-01	Mauka	Potable-Ag	1,250,000 GPD	Capped
3310-02	Mauka	Potable-Ag	850,000 GPD	Capped

Projected Water Demand - The estimated demand (in gallons) for the new Agricultural Community and the restructured operations of the Working Ranch are as follows:

Irrigation - Parcels & Lots:		
• Zone 1- Well 3410-03	1,638,196	
• Zone 2 – New System	999,267	
Sub-Total	2,637,463	
Livestock:		
• Cattle - 250 head	18,750	
• Horses -100	7,500	
Sub-Total	**26,250**	
Domestic Use:		
• Farm Dwellings – Lots	69,000	
• Individual Crops/Landscape	103,050	
• Ag Cluster Dwellings	7,500	
• Dillingham House	2,000	
Sub-Total	**181,550**	
Mokuleia Community (NSWC)		133,596
	TOTAL	**2,951,149**

Future Irrigation System – Well 3410-03 will be the source of irrigation water for the agricultural operations on The Flats and the Orchard Lots in the lower elevations of The Foothills. The ag water distribution system upgrades, including "typical" on lot layouts, are discussed in Volume 2.

New Water System - Subdivision of the Ranch property will require development of a completely new water system to service the subdivided agricultural lots. The New Water System will also provide fire flow and irrigation for farms located on the Pasture Lots. This will require drilling two new sources of potable water. A draft of the Water Master Plan is attached hereto as Appendix C.

The New Water System will be designed and constructed with the pump capacity, storage and distribution network sized to meet the standards of the Honolulu Board of Water Supply ("BWS"). Except for water line connections that must run through certain lots to minimize potential stagnation issues, all water mains will be

located within the roadway network for the subdivision. Laterals will be extended from the mains into each Lot, with backflow (anti-syphon) valves to prevent contamination of the potable water supply.

North Shore Water Company - The NSWC has expressed an interest in possibly purchasing water in bulk from the New Water System in order to provide a more reliable source of domestic water and fire flow protection for the Mokuleia community. Well 3410-01 is old and the well shaft has been recased twice. The placement of sleeves inside of the original casing has constricted the diameter and pumping capacity of the well. The distribution network for the New Water System could extend a 12" main close to the intersection of Road A and Farrington Highway to provide the NSWC with a potential to connect at some in the future.

Infrastructure Maintenance

The infrastructure systems constructed to service the Agricultural Subdivision and the Ag Cluster (collectively the "Agricultural Community") will be privately owned and maintained. Accordingly, it is anticipated that two legal entities will need to be created to manage the affairs of each:

- **Homeowners Association ("HOA") for the Agricultural Community**: Owners of Lots in the Agricultural Subdivision and CPR Units in the Ag Cluster would be members of the HOA, with the obligation to pay Maintenance Fees, Special Assessments and Specific Assessments to be determined by the size of their Lot or CPR Unit relative to the aggregate area of all Lots and CPR Units or such other allocation as may be appropriate.

- **CPR Unit Owners Sub-Association ("UOS") for the Ag Cluster:** Due to the unique nature of the Ag Cluster, Unit Owners would have additional rights, and obligations related solely to the Ag Cluster. One of these would be to act as an independent body in regard to the affairs of the Sub-Association as long as such actions did not adversely impact the HOA. The UOS would have a separate Board of Directors composed of CPR Unit Owners that would handle matters related to the Ag Cluster's internal roadways, water distribution system, wastewater collection system, electrical systems, trash disposal and grounds maintenance similar to a townhouse development.

Entity	Membership	Governance	Infrastructure
HOA	Lot Owners and CPR Unit Owners	Agricultural Community	Agricultural Subdivision
UOS	CPR Unit Owners	Ag Cluster	Internal to Ag Cluster

A Master Association with the Ranch is not anticipated as overlapping use of infrastructure with the Agricultural Community is anticipated to be minimal. For example, Road A may incur some use by the crew

for the Working Ranch, but this would be nominal as there are semi-improved and service roads that access the working areas of the property. Other services provided by the Ranch, such as the coordination activity on cooperative ventures would be handled on a contractual basis that would not require a Master Association.

After the completion of construction, it is anticipated that infrastructure systems will be transferred to public and private utility companies. An obvious example is HECO, which would take ownership of the electrical distribution system within the roadway network in order to directly service customers. Hawaiian Telcom or Oceanic/Time-Warner would be candidates for phone/CATV/internet/broadband service. Considerations as to the transfer of ownership for the water and wastewater systems are undetermined, but each will generate revenue through user fees and service charges.

With the revenue generating infrastructure systems dedicated or conveyed, the remaining improvements that the HOA would be responsible for maintaining will be the roadway network, its related drainage system and the culvert crossings over the streams that cross the property. A Declaration of Covenants, Conditions & Restrictions ("DCC&Rs) would establish the structure of the HOA, delineate the basis for maintenance of the roadway infrastructure, lot grading, rockfall mitigation, drainage modification, location of building pads, landscaping, grounds maintenance, dumping of greenwaste and numerous other salient items.

Agriculture Concept

The future operation of the Working Ranch will be focused on a new core activity of cultivation and marketing high quality orchard crops, primarily for the Oahu market. In addition, traditional Ranch activities, cattle production and the stabling of horses, would be expanded as supporting infrastructure becomes available as part of the development of the Agricultural Community.

Orchard Crops: Approximately 255 acres on The Flats and in the lower portion of The Foothills will be cultivated for orchard crops. Selected varieties of mango will be grown on 95 acres in the eastern corner of The Flats. A portion of this area is presently the coconut tree farm, which will be incrementally phased out as the field is converted to mango production. The analysis and selection process for the mango varieties is detailed in Volume 2.

A variety of premium quality avocado has been identified for cultivation in the lower elevations of The Foothills. The selection process centered on high quality avocado for the local market and varieties that would extend the harvest period is detailed on Volume 2.

While not as extensive in terms of cultivated area as mango or avocado, selected citrus trees have been identified for cultivation in The Foothills. Located in higher elevations, cooler temperatures would promote flowering for pollination. Part of the selection strategy for limes is the blight that is impacting lime production in East Coast areas, potentially leading to shortages and higher prices.

Initial planting of orchard crops will be done incrementally to permit cultivation by an on-site nursery after the initial stock of trees is purchased. This would also permit field crew size, farm equipment, supplies and a production facility to come on line sequentially through the grow-in period. As the fields mature, projected annual revenues would reach (see Volume 2):

- Mango $754,992
- Avocado $160,494
- Citrus. $57,648

Cattle Production: Presently there are 64 heifers and 2 bulls that are grazed in paddocks in The Foothills. Subject to funding, plans call for the addition of 100 new heifers over the next two to three years, in addition to 25 young cows presently in the herd. The eventual target is to have a mix of 220 to 250 heifers and bulls.

Horse Boarding: In 2013, the stabling of 75 horses generated revenue of $205,800. With improvements to the paddocks and training facilities, 100 houses could increase annual revenues to roughly $275,000 at the present boarding charges. It is too premature to project additional revenue from equestrian related activities.

Coconut Trees: The existing field stock trees are starting to reach heights in excess of 25' – 30', which exceeds the desired range for transplanting. With a limited market for palm trees, it is anticipated that the existing fields will be systematically converted to the cultivation of mango trees, starting with the area to the east of the access road to the Dillingham House. The next area to be placed in mango cultivation will likely be to the west of the Makaleha Stream channel.

The field between the Makaleha Stream channel and the access road will be retained to maintain a supply of field stock coconut trees until time for conversion to mango production. Annual revenue is not anticipated to significantly increase from the $3,100 in 2013 as there are no major resort and golf course developments on the horizon.

Other Ag Activities: The generation of income from other ag related activities on the Ranch, such as farm-to-table produce, specialty crops and agribusiness tours has future potential but are dependent upon establishing the orchard crops as a draw. Ag related enterprises ventures such as a roadside stand and a restaurant utilizing products grown on site and in the area are likewise future endeavors.

A service activity that has more immediate potential is a working relationship with Waialua High School to provide on the job training for students as the cultivation of orchard crops is initiated. The employment of students would also be valuable during harvest seasons for mango and avocado which will stretch over eight months of the year.

Non-Ag Activities: The rental of the Ranch for film and photo shoots is anticipated to continue but is an unpredictable source of revenue. On the other hand, rental of the Dillingham House for large special functions is anticipated to remain a steady source of income at about the $60,000 generated in 2013. Approval to modify the lawn area for outdoor events has been received approval from the City so that construction activity on the Ag Cluster will not shut down these events. Unfortunately, a significant increase is unlikely as the conditions of the Special Use Permit limits large, catered events to two per month.

Summary

Volume 1 (see **Volume II: Appendix F)** presents an overview of the Dillingham Ranch, its setting in the Mokuleia community and the current agricultural operations of the Working Ranch. The long-term ability of cattle production, horse stab boarding and coconut tree sales to support the Ranch is poor and a transition from present operations to agricultural activities that have more market potential and sustained revenue potential is essential for the long-term viability of the Ranch.

The challenge related to restructuring operation is securing the capital necessary to replace and upgrade deteriorated infrastructure support the expanded operations. Current revenues are too low to entice investment capital, so DRA proposes to develop an Agricultural Community in The Foothills of the Ranch. The proceeds from the sale of lots and units in the project would be used, in part, to pay off the financing used to construct the subdivision infrastructure. The same infrastructure, particularly water, would be sized to provide the basis for transforming the operations of the Working Ranch.

Based on the foregoing it was recognized that the restructuring of the agricultural activities for the Ranch would be predicated upon a real estate aspect. As such, an investigation of the Regulatory Environment was conducted with respect to both the agriculture and real estate components. Examination of relevant statutes, ordinance, codes and regulatory documents confirmed that the property has the appropriate State land use designation, City zoning and that the project would be in compliance with the provisions of Chapter205, HRS, and the Land Use Ordinance. This Report has been prepared in compliance with Section 1-115 of the Subdivision Rules relative to demonstrating viable agricultural use. The proposed is outside of the Rural

Growth Boundary of the North Shore Sustainable Communities Plan in an area designated for the preservation of agriculture. Special interest was taken to the fact that large portions of The Flats are subject to occasional flooding from severe winter storms, but no habitable structures are planned within the floodway and cultivation of agricultural crops is permitted in Zone AEF, Zone AE and Zone A. The Ranch is located on the mauka of Farrington Highway and is not within the Special Management Area.

Review of Agricultural Considerations indicates that the best soils for cultivation are located in the makai areas the property. The Soil Suitability designation, Land Study Bureau ("LSB") productivity rating and the Agricultural Lands of Importance to the State of Hawaii ("ALISH") classification all confirm that highly productive soils on The Flats which transitions into less productive soils in The Foothills and The Mauka Lands. DRA has located the Agricultural Subdivision up in The Foothills to preserve the prime soils for agricultural activities.

Assessment of the existing infrastructure on the Ranch indicates that all of these systems are inadequate for the proposed development. New water, wastewater, roadway and electrical systems will need to be constructed to support the new Agricultural Community (drainage improvements are minimal). Preliminary engineering for the respective systems indicate that the required improvements can secure the required permitted and be constructed pursuant to existing codes and regulations. Of equal importance is the fact that an adequate supply of water can be provided to support the restructuring of Ranch operations.

Volume 2 (Volume II: Appendix F) presents a plan for the cultivation of selected orchard crops and the efficient production of high quality fruit on a commercial basis. This will become the core activity for the agricultural operation which is critical to the long-term viability of the Ranch.

Potential for Secondary Impacts

The proposed agricultural feasibility plan and subdivision will constitute the continuation of agricultural uses on the Dillingham Ranch dating back to the 1900s. The agriculture plan is proposing to convert some existing agricultural lands currently used for unirrigated pasture to irrigated pasture and orchard crops. There is also limited organic farm to table crops and nursery for landscape plants. Additionally grazing of cattle will continue on the upland portions of the property.

The potential for adverse secondary impacts associated with the continued and expanded agricultural use of property and the proposed Connection to Farrington Highway to support access to the property are not anticipated. The conversion will include typical agricultural activities on existing agricultural lands. A soil conservation plan will need to be developed at a later date. However, orchard and pasture crops have low

impacts due to very limited land preparation. Organic and conventional pesticides may be used but environmental impacts are considered during registration. Therefore, potential impacts are considered as acceptable as long as use instructions and restrictions are followed.

As required, all continued activities involving upgrades to the infrastructure and facilities of the Dillingham Ranch and subdivision will be in accordance with State and County laws and regulations.

2.3.2 Rockfall Potential Evaluation

Background and Purpose

In April through June 2014, Geolabs conducted an evaluation of the hillsides and potential rockfall hazard conditions at the Dillingham Ranch Agricultural Subdivision project site. The Geolabs report (Geolabs, Inc., August 6, 2014) summarized the findings based on a review of the existing site conditions and their engineering and statistical analyses of the potential rockfall processes anticipated at the project site. The findings and recommendations presented herein are based on the subdivision layout. The findings and recommendations are subject to the limitations noted at the end of the full Geolabs report contained in **Volume II: Appendix G**.

The findings and recommendations presented in the Geolabs, Inc., August 6, 2014 report shall rescind and supersede the previous Geolabs report dated February 15, 2008, and titled *Rockfall Potential and Hillside Slope Evaluation, Dillingham Ranch Mokuleia Development, TMK: 6-8-002: 006, 6-8-003: 006, 015, 019, 030, 031, 033, 035 and 040, Mokuleia, Oahu, Hawaii* in its entirety. For all Plates referred to in this summary see **Volume II: Appendix G.**

Project Considerations

The project site resides along the foot of the northerly facing Waianae Mountain Range. In accordance with the City and County of Honolulu Subdivision Rules and Regulations, Sections 2-201(c)(7) and 2-201(d), Geolabs conducted a geological and geotechnical engineering evaluation of the existing hillsides, natural hazards, and potential rockfall hazard conditions, which could affect the proposed subdivision development in the future. (Geolabs, Inc., 2014).

Of the proposed 91 agricultural lots, 11 mauka lots appear to have some risk associated with potential rockfall encroachment from the adjacent high mountain slopes. The 11 mauka lots are along the upslope side (southern perimeter) of the subdivision development adjacent to steep undeveloped mountain ridge terrain containing weathered basaltic rock outcrops. (Geolabs, Inc., 2014).

In general, it is desired to utilize a localized scheme of segmental rockfall impact barrier fences and rockfall catchment ditches to reduce the potential hazard at the designated home sites and associated access driveways. The proposed system also serves to protect the adjacent down slope subdivision roadways that may be impacted by potential rockfall passing through the affected lots. Where the current rockfall simulation analysis indicates nil or less than 10 percent probable rockfall encroachment at the designated home sites, protective mitigation measures are not required. The recommended rockfall mitigation improvements would be constructed within the affected lots and would be encompassed by appropriate access and maintenance easements. (Geolabs, Inc., 2014).

Land area upslope of the designated building area within the lots will remain in a natural condition for ranching and grazing purpose with no provision for rockfall protection. Lot owners must be advised that activities conducted upslope from the rockfall protection improvements are exposed to potential rockfall. Thus, restrictions for development of additional dwellings are required upslope from the proposed rockfall mitigation improvements to prevent building additional dwelling structures in unprotected areas of the lot. (Geolabs, Inc., 2014).

The combined use of rockfall catchment ditches and rockfall impact barriers serves the intended purpose of reducing the adverse visual impact of the above ground steel impact barrier structures reaching about 10 to 14 feet above the existing ground surface and traversing across the lower portion of the lot. Based on Geolabs' analyses, appropriately dimensioned rockfall catchment ditches can be used as an alternative to rockfall impact barrier fencing for effective rockfall control in certain slope gradient and topographic terrain settings where the use of more visually intrusive above-ground interception structures is undesirable from a visual and lot development point-of-view. (Geolabs, Inc., 2014).

Potential Rockfall Hazard Conditions

The findings are based on field information collected during site reconnaissance and engineering and statistical evaluations of the potential rockfall conditions using computer slope modeling and rockfall simulation trials to evaluate where potential hazardous conditions may be present and whether rockfall catchment systems may be effective in reducing the potential for hazardous rockfall conditions to encroach upon subdivision development. (Geolabs, Inc., 2014).

General Findings

Some broad trends in the rockfall hazard potential and level of rockfall hazard risk with respect to the lots along the southern development boundary were identified. In general, the potential for rockfall activity to

encroach upon the development increases from east to west across the southern development boundary. This is based on the following general observations:

1. Upslope mountain ridges (rockfall source region) gradually steepen toward the west.
2. Foothill pediment slopes (probable rockfall run-out region encompassed by the lots) gradually steepen towards the west.
3. The distribution and relief of source rock outcrops increases toward the west.
4. The distribution of existing surface boulders increases toward the west.

The existing ground surfaces within the proposed lots along the upslope development boundary are composed of mixed clayey and silty soils containing an appreciable volume of basaltic cobbles and boulders. Surface boulders ranging between 3 and 12 feet in dimension were observed in generally stable ground settings within the project site interior. The larger surface boulders were generally encountered at the upper elevations of the western end of the project site. Most of the surface boulders encountered are partly embedded or have settled in stable slope settings. The boulders are believed to represent erosional remnants of older regional colluvial fan deposits that had accumulated a very long time ago. However, the distribution of non-embedded surface boulders (potentially more recent fallen rock) appears to increase toward the southwestern corner of the project site, in the vicinity of Lot Nos. 65 through 69. The greater distribution of existing surface boulders towards the southwestern corner of the development (vicinity of Lot Nos. 65 through 69) appears to correlate with the observed increased occurrence of proximal upslope rock outcroppings consisting of higher relief and fractured rock formation. (Geolabs, Inc., 2014).

Mauka Lots Recommended for Potential Rockfall Mitigation

Based on evaluation of potential rockfall and slope hazard conditions with respect to the proposed Dillingham Ranch Agricultural Subdivision development and designated home (dwelling) site locations, 11 mauka lots and their associated designated home sites are exposed to moderate or greater risk for potential rockfall hazard conditions. These 11 lots require the provision of an appropriate rockfall catchment structure(s) to reduce the potential for rockfall encroachment at the designated home sites and associated private access driveways on the lower elevation portion of the lots. These lots are identified as Lot Nos. 65, 66, 67, 68, 69, 74, 76, 77, 78, 90 and 91. In addition, portions of proposed subdivision Road "A" and proposed subdivision Road "D" are exposed to some potential falling rock hazards from the adjacent upslopes. Road "A" spanning between Lot Nos. 65 through 69 and Road "D" spanning between Lot Nos. 73 and 74 require the provision of an appropriate rockfall catchment structure(s) to reduce the potential for

falling rock encroachment along these sections of the subdivision roadways. The 11 affected mauka lots reside along the foothill pediment of alternating ridge and valley topography associated with the Waianae Mountain Range. In general, the areas of potential rockfall hazard are fronting the ridgeline noses and terminal slopes of the upland mountain ridges. These affected lots and roadways are along and adjacent to the southern development boundary as shown on the Site Plan, Plate 2. (Geolabs, Inc., 2014).

Mauka Subdivision Areas Not Requiring Rockfall Mitigation

The designated home sites and access driveways at five other mauka oriented lots (identified as Lot Nos. 70, 71, 72, 73, and 75) are not exposed to potential rockfall hazard conditions due to their further downslope location and appreciable area of natural terrain buffer between potential rockfall source regions and the designated home site development areas. In addition portions of Roads "A" and "D" between Lot Nos. 70 and 72 and fronting Lot Nos. 75 and 76 are not exposed to potential rockfall hazard conditions due to favorable upslope terrain and limited rockfall source area. These limited risk lots and portions of roadways reside along flatter terrain comprising the lower elevation flanking mountain slopes and further removed from the upland potential rockfall source regions as shown on the Site Plan, Plate 2. Although structural rockfall mitigation improvements are not necessary to protect the designated home sites at these lots, the lots are subject to restriction of the home site location as shown on the Conceptual Rockfall Mitigation Plans, Plates 4.1 through 4.4. Home sites should not be developed upslope from the designated location that was evaluated in this study. Additional rockfall hazard analysis will be required if the home site and driveway locations are shifted to locations other than shown on the Conceptual Rockfall Mitigation Plan. (Geolabs, Inc., 2014).

Existing DLNR Access Road

A portion of the existing Department of Land and Natural Resources (DLNR) access road bounding proposed Lot Nos. 82 through 85 may be exposed to some potential for rockfall encroachment from the adjacent high mountain slopes southerly of the roadway. An appropriate rockfall catchment structure(s) should be provided to protect the roadway and the far upper elevation portions of Lot Nos. 82 through 85 (adjacent to the existing DLNR roadway) from potential falling rock hazards. Based on evaluation, only the extreme upper elevation portions of Lot Nos. 82 through 85 adjacent to the existing DLNR roadway may experience limited potential for falling rock encroachment. Therefore, a rockfall catchment structure constructed upslope from the DLNR roadway and subdivision lots serves as an effective rockfall hazard control for the roadway and the adjacent lots. Based on observations, most of the land area encompassing Lots 82 through 85 have minimal exposure to potential rockfall from the high mountain slopes due to flatter terrain and appreciable distance from the upland potential rockfall source regions. Through slope modeling

and potential rockfall simulation, very limited potential for rockfall encroachment below the existing DLNR roadway corridor in the vicinity of Lot Nos. 82 through 85 is anticipated. (Geolabs, Inc., 2014).

Other Subdivision Lots

The remaining lots in the proposed subdivision (Lot Nos. 1 through 64) do not appear to be exposed to potential falling rock hazards generally due to the long distances away from the upland potential rockfall source regions. In addition, existing surface boulders within the lots appear in generally stable settings on lower gradient terrain; thus limiting the potential for rock movement initiation. However, new development on sloping subdivision lots, including excavation, site grading, and possible excavation of new cut slopes, should be investigated and designed by a geotechnical engineer retained by the lot owner. Geotechnical engineering consultation is recommended so that potential rockfall hazard conditions are not created by future lot development, in the event buried rocky materials are encountered in deeper excavations and new cut slope exposures. (Geolabs, Inc., 2014).

The Site Plan, Plate 2 shows the location of the subdivision lots and roadways with respect to the existing topography and the identified potential rockfall source regions comprising the adjacent mountain slopes. (Geolabs, Inc., 2014).

Discussion and Recommendations

Site reconnaissance and literature review was performed to aid in the evaluation of the existing project site conditions with respect to natural hazards such as rockfall potential, hill slope stability, and debris flow/flash flood potential. In addition to reconnaissance and literature review, computer simulation and statistical analysis of potential rockfall activity was performed using the Colorado Rockfall Simulation Program Version 4 (CRSP) (Geolabs, Inc., 2014).

Phase I Conceptual Rockfall Mitigation Scheme

11 mauka lots are believed to be exposed to potential rockfall hazards from steep mountain slopes adjacent to the subdivision boundary. The 11 lots include Lot Nos. 65 through 69, 74, 76 through 78, and 90, 91. For these lots, Geolabs recommends constructing appropriate rockfall control structures such as rockfall impact barrier fencing on the hillside just above the designated home sites to reduce the potential for rockfall encroachment at the dwelling site. (Geolabs, Inc., 2014).

To protect the private driveways accessing the home sites and the downslope subdivision roadways exposed to potential falling rock, rockfall catchment ditches are proposed as a lower visual site impact alternative to provide effective rockfall interception for the affected driveways and portions of the subdivision roadways. (Geolabs, Inc., 2014).

The segments of rockfall impact barrier constructed within the lot interiors would generally consist of medium-high to high design capacity (range of about 184 to 738 foot-ton capacity, depending on location) rockfall impact barrier fencing constructed on a graded bench about 50 to 100 feet upslope from the designated home (dwelling) site. The design height of the rockfall impact barriers may range between about 9 and 14 feet above the existing grade, depending on location. A typical schematic, section, and plan-view layout for the recommended medium-high capacity impact barriers are provided on Plates 5.1 through 5.3. (Geolabs, Inc., 2014).

In addition, to the recommended segments of medium-high capacity barrier fencing designed to protect the designated dwelling sites at affected lots, a system of continuous-length low energy capacity rockfall impact barrier fencing is recommended spanning along the upslope side of the existing DLNR roadway as shown on the Conceptual Rockfall Mitigation Plan – 4 (Plate 4.4). The purpose of this structure is to provide rockfall interception and protection primarily for the existing DLNR roadway and secondarily for the upslope portions of Lot Nos. 82 through 85, thus negating the requirement for designated home sites at these lots. A typical schematic and sections for the recommended low capacity barrier system is provided on Plates 6.1 through 6.3. (Geolabs, Inc., 2014).

Rockfall Impact Barrier Description

Rockfall impact barriers are used worldwide as an effective rockfall mitigation protection system. Rockfall impact barriers are commonly constructed on hillsides where the protection of down slope areas from varied and widespread sources of falling rock is necessary. Rockfall impact barriers are considered to be a viable rockfall protection measure where a specific and limited source of potential rockfall cannot be readily identified and stabilized, or where the source area may encompass disturbance-sensitive land that makes other mitigation measures impractical to implement. (Geolabs, Inc., 2014).

Rockfall impact barriers are specially designed fences consisting of steel support beams linked by wire rope (cable) or steel wire ring nets, which are designed to flex and absorb rockfall impact energy. Upon boulder impact, the net may deflect up to 20 feet in the downslope direction. The nets and beams are supported by drilled and grouted ground anchors at specified intervals. The barrier height is typically constructed 8 to 14 feet above ground level and powder coated black in coloration to blend with the outdoor environment. Rockfall barrier fences require periodic inspection and possible maintenance to remove accumulated boulder debris and replace worn components such as brake elements and netting. Portions of the barrier may require repair or replacement following a very large impact where severe deformation of the system is experienced.

Ultimately, the rockfall barrier will require replacement of components affected by natural environmental degradation such as corrosion. (Geolabs, Inc., 2014).

It is estimated that the effective life of the steel barrier system in the semi-arid near coastal setting such as Mokuleia as being about 30 to 40 years, at which time replacement of components such as nets, ground anchors and support beams may be required to maintain the desired level of protection. Stainless steel components and special surface coatings are available to increase resistance to corrosion but at a significant extra cost; therefore, galvanized steel with additional proprietary zinc coatings on some components is preferred. The selection of a rockfall protection system manufacturer and product should take into account the material component certifications and net efficiency approvals held by the manufacturer. Installation contractors should closely follow the manufacturer's recommended installation sequence. (Geolabs, Inc., 2014).

A schematic detail of a typical medium-high energy capacity rockfall impact barrier is presented on Plate 5.1 and a schematic detail for a typical low energy capacity barrier is presented on Plate 6.1. (Geolabs, Inc., 2014).

Rockfall Catchment Ditch Description

Rockfall catchment ditches are low maintenance below-grade excavated structures commonly used to intercept falling and rolling boulders to reduce the potential for downslope rockfall encroachment. Rockfall catchment ditches are a feasible and proven rockfall control alternative that is effective in certain low gradient, vegetated soil slope settings where adequate open space is available to develop the structure. The primary attributes for the design of an effective catchment ditch are; 1) location on the slope in relation to the rock source, 2) width and depth dimensions of the ditch, 3) geometric shape/inclination of the side slopes; and, 4) the softer yielding condition of the existing alluvial and colluvial substrate materials. (Geolabs, Inc., 2014).

Based on the CRSP analysis, a minimum 5-foot deep by 10-foot wide ditch structure with 1H:1V side slopes was found to be effective at intercepting at least 90 percent of simulated rolling spherical shaped rock up to about 6 feet in dimension at selected areas of the project site where the existing terrain is conducive to ditch development. The recommended catchment ditches are located on the gentle colluvial soil slopes (boulder roll-out zone) that average about a 3H:1V inclination fronting the steeper slopes containing outcroppings representing the identified potential rockfall source region. The proposed catchment ditches were modeled and found to be effective at intercepting at least 90 percent of simulated falling rock at the locations selected on the alluvial/colluvial slope. (Geolabs, Inc., 2014).

A schematic detail of the proposed catchment ditch constructed in the anticipated typical slope setting is provided on Plate 7. The catchment ditch structure is augmented by an additional 6H:1V buffer slope constructed in the embankment fill on the downslope side of the ditch. (Geolabs, Inc., 2014).

The rockfall catchment ditches must be designed for positive drainage at appropriate discharge locations. In addition, the catchment ditches must be maintained free of excessive debris accumulations that could reduce the effective depth and width of the structure. Although the growth of grass and brush vegetation in the ditch is generally allowable and should not adversely affect the rockfall interception capacity, regular scheduled cutting and removal of vegetation to expose the ditch subgrade prior to scheduled maintenance inspections is recommended. In addition, periodic clearing of possible accumulations of soil and rock debris must be performed to maintain the minimum design characteristics of the ditch. (Geolabs, Inc., 2014).

The following table presents a summary of the recommended conceptual rockfall protection improvements:

SUMMARY: CONCEPTUAL ROCKFALL MITIGATION IMPROVEMENTS			
Site Location	**Approximate Rockfall Impact Barrier Length**	**Approximate Energy Class of Rockfall Impact Barrier Capacity**	**Approximate Catchment Ditch Length**
Lot 65 & Road "A"	105 linear feet	738 ft-ton	None
Lot 66 & Road "A"	165 linear feet	369 ft-ton	440 linear feet
Lot 67 & Road "A"	380 linear feet	369 ft-ton	145 linear feet
Lot 68 & Road "A"	230 linear feet	369 ft-ton	320 linear feet
Lot 69 & Road "A"	250 linear feet	184 ft-ton	250 linear feet
Lot 73 & Road "D"	None	Not applicable	240 linear feet
Lot 74 & Road "D"	290 linear feet	184 ft-ton	None
Lot 76	185 linear feet	37 ft-ton	None
Lot 77	370 linear feet	369 ft-ton	None
Lot 78	255 linear feet	369 ft-ton	None
Lot 90	345 linear feet	184 ft-ton	None
Lot 91	250 linear feet	369 ft-ton	None
DLNR Road	2,068 linear feet	37 ft-ton	None

Potential for Secondary Impacts

The potential for rockfall hazards exists within portions of the planned Dillingham Ranch Agricultural Subdivision. In order to address this hazard the above referenced rockfall analysis and mitigation plan has been prepared by Geolabs, Inc. This plan will use engineered mitigation measures and best practices to reduce or eliminate the potential for significant adverse impacts to human life and property. Neither the construction of the Connection to Farrington Highway or the WTP will create adverse or secondary impacts in regards to rockfall hazards.

2.3.2 Wastewater Systems

Background

The wastewater system for the planned Dillingham Ranch Agricultural Subdivision (DRA) will comply with DOH WWB, Title 11, Chapter 62, which mandates that a centralized wastewater treatment works is required for subdivisions with more than 50 lots. All of the wastewater infrastructure, components of which are located both on private lots and DRA lots, will be maintained by the project's Home Owner's Association.

Existing Wastewater System

There is very little existing development within the project area, the primary exceptions being the Dillingham Lodge, an access road to the Mokuleia Forest Reserve and a handful of private residences. Existing improvements treat wastewater through on-site systems that include a Department of Health permitted aerobic treatment unit and subsurface disposal facility at the Lodge as well as traditional septic systems for the outlying private residences.

All the properties in the area around the DRA contain their own private systems, as no municipal wastewater mains or treatment plants are available within the region.

Proposed Wastewater System

The proposed system will be comprised of an effluent sewer located at each lot for primary treatment prior to conveyance of the clarified effluent through a low pressure pipe network to the centralized wastewater treatment works. The wastewater treatment works will be comprised of a Cyclical Biological Treatment (CBT) Unit. The secondary treated effluent will then be disposed of through either a centralized subsurface effluent disposal system or reused as R-2 recycled water after disinfection. (See **Volume II: Appendix H, Wastewater Masterplan Report** for more details).

The proposed CBT system is designed to provide sufficient wastewater treatment for the planned agricultural subdivision based on the following wastewater flow volumes:

- Wastewater treatment is based on a unit flow of 1,000 gallons per day (GPD) from each dwelling (each contain a maximum of 5 – bedrooms) with additional flow from the lodge and agricultural cluster.
- Total average daily flow for the entire site will be approximately 92,000 GPD and total max daily flow will be approximately 138,000 GPD.

The Effluent Sewer

With an effluent sewer, raw sewage flows from the house to a watertight underground tank. Only the filtered liquid portion is discharged (by either small pump for downhill lots or gravity for uphill lots) to shallow, small-diameter collection lines that follow the contour of the land. Solids remain in the underground tank, for passive, natural treatment, and need be pumped only every 10 to 12 years.

Wastewater Treatment Works - Aerobic Treatment Unit

The Cyclical Biological Treatment unit will treat the domestic wastewater to an effluent level of 10mg/L of Biological Oxygen Demand and Total Suspended Solids, which surpasses the Department of Health effluent concentration requirements of 30mg/L for treatment units. In addition, the pH of the effluent will be within the required limits of 6.0-9.0. The CBT unit will be located just upstream of the proposed subsurface effluent disposal system. See location **Figure 5** on Page 10 of Volume 1**.**

Subsurface Effluent Disposal System

Subsequent to the CBT unit, the effluent will be discharged into a subsurface effluent disposal system where the wastewater will percolate into the soil. A portion of the subsurface effluent disposal system will be within the current 100-year flood plain, therefore the disposal system will be raised to avoid inundation during large flood events. See location on **Figure 5, page 10.**

Percolation tests determined that area designated for subsurface disposal has a substrate with areas of sandy soil, albeit the substrate is not consistent. From the excavation and percolation tests performed, it is clear that coralline sand is present at varying depths below existing grade, but is overlain by silty clay at varying depths. The percolation rates of the coralline sands are approximately 6 to 8.6 minutes per inch. The percolation rates through the clayey soils are unsuitable for subsurface effluent disposal system design as they exceed 60 minutes per inch. The subsurface effluent disposal system will require removal of the clay layer and backfill of an engineered soil that will be designed to give a percolation rate of 6.0 minutes per inch. The Environmental Protection Agency (EPA) recommends wastewater application rates for the sandy soils to be 0.8 gpd/sf,

based on designed soil percolation of 6.0 minutes per inch (USEPA Design Manual for Onsite Wastewater Treatment and Disposal Systems (DPA 625/1-80-012, table 7-2, p.214)).

The subsurface disposal system proposed is a chamber leach field, which is a similar mechanism for disposal of the treated effluent as a traditional leach field; however, the arched chambers allow for more efficient infiltration into the underlying soils via enhanced lateral distribution of the effluent. The chamber systems are comprised of fabricated corrugated arches, which are placed over soil. At full build-out flows of 137,400 gallons they will require 3.95 acres to adequately dispose of the treated effluent. To satisfy the 100% backup requirement of the WWT system, the chamber system will be 7.9 acres.

The subsurface disposal system will be located within Parcel 1005. The chamber leaching beds will be placed with a minimum of 18-inches of cover. The final layout of the beds will be driven by various parameters for adequate setback distance to avoid potential impacts to existing water wells. Specifically, the leach field cannot encroach within 1000-ft of existing Well 3410-10, located in Parcel 1004.

R-2 Recycled Water Reuse as Disposal Alternative

The recycled water system is an alternative to the chamber leach field system design for disposal of the treated wastewater. The recycled water would be used to irrigate adjacent grasslands via subsurface drip irrigation and would be the primary disposal system of the treated effluent. The wastewater treatment works would be enhanced to meet Wastewater Branch's Guidelines for the Treatment and Use of Recycled Water dated May 15, 2002. This enhancement would be the disinfection of the treated wastewater. Note that the effluent meets the Wastewater Branch's requirements of 10 mg/L for both BOD_5 and TSS using the CBT unit. The disinfection of the recycled water would be comprised of UV disinfection or chlorination. Although the entire effluent design flow would be disposed of primarily using subsurface drip irrigation, the chamber system would be provided to meet the 100% backup requirement (3.95 acres on Parcel 1005). The implementation of the system would reduce the over-excavation and placement of engineered soils.

Per the Wastewater Branch guidelines, the recycled water will be treated to R-2 standards, limiting its use at the development to subsurface irrigation for pastures and grasslands.

Potential for Secondary Impacts and Mitigations

The potential for adverse environmental effects from the wastewater treatment system are very low. Storage within the system has been sized for 100% redundancy to account for power outages and system shutdowns. Additionally, the system is designed to treat the effluent to 3 times the required discharge limits, which further reduces the chance of groundwater contamination. Since the subsurface disposal system is not an injection

well and effluent is treated effluent in a chamber system, water quality improves as it percolates into the ground.

Although effluent quality could degrade to unacceptable concentrations over time without proper maintenance of the wastewater treatment system, this impact will not occur if the proper manufacturer's maintenance schedule is followed.

Impacts to groundwater could occur if the effluent is disposed of in an improper manner. These impacts will not occur if the system is installed and operated according to typical standards and practices.

Accidental discharge of untreated wastewater could occur if there is a break in the collection system piping. Mitigation of this impact involves subsurface identification tape indicating a buried low pressure main and placement of isolation valves across the system to stop the flow in case of a break.
The Connection to Farrington Highway will have no adverse impacts on the wastewater treatment and disposal system.

2.3.4 Water System

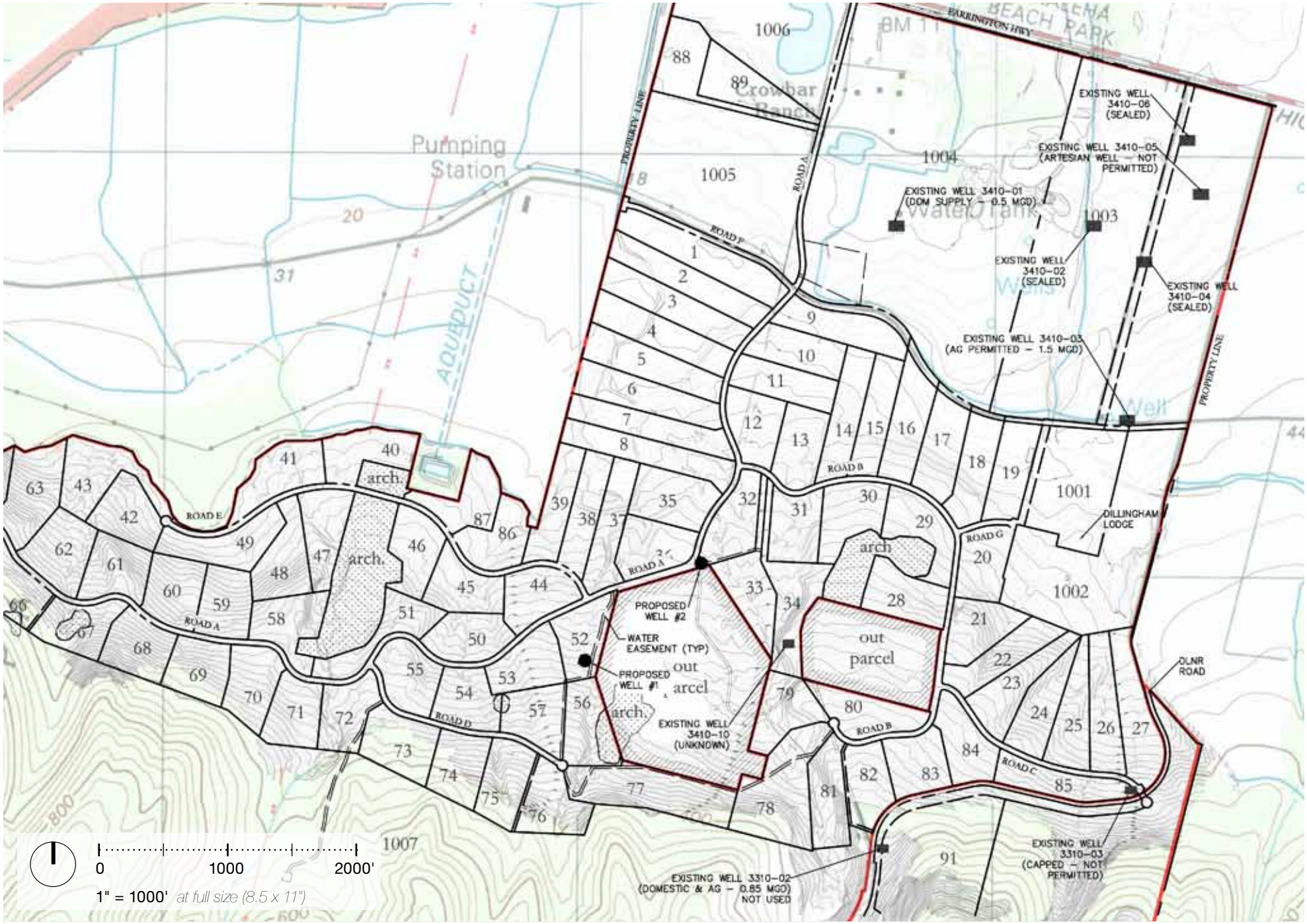
Background

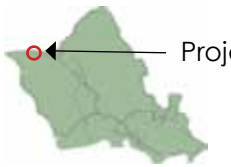
The North Shore Water Company (NSWC) provides water for most private users west of the Dillingham Ranch Aina (DRA) property. In order to provide adequate water service to the planned agricultural subdivision and other private users it is necessary to upgrade the existing NSWC water system identified as Public Water System (PWS) No. 326.

Existing Water Infrastructure

Existing domestic water utilities and appurtenances are managed by the North Shore Water Company. There are a total of 10 existing wells within the Dillingham Ranch property. Six wells are located in the lowlands encompassed by proposed parcels 1003, 1004, and 1005 while the remaining four are situated mauka of the Cane Haul Road.

The following list provides a brief description of each well by geographic location (See **Figure 9** for existing and proposed well locations):





DILLINGHAM 1897 RANCH
NORTH SHORE, OAHU

Figure 9

Location of Existing and Proposed Wells

Makai Wells (North of Cane Haul Road):

Well #3410-01 (Permitted for 0.5 MGD)

This well was constructed over 100 years ago (dating prior to 1911) and has 4 pumps; two 3 HP, one 7.5 HP, and one 15 HP. Corrosion and age have played a substantial factor in the condition of this structure. Consequently #3410-01 had to be re-cased from its original 10 inch casing down to 6 inches. Well 3410-01 is owned by the North Shore Water Company, LLC, which is subject to oversight by the Public Utilities Commission. It currently serves the Mokuleia Community through an agreement with the Ranch.

Well #3410-02 (Sealed)

Well #3410-03 (Permitted for 1.5 MGD Agricultural Use Only)

This well was constructed over 80 years ago (dating prior to 1934). #3410-03 has a historical casing diameter of 10 inches, although this may now be smaller. It should be noted that #3410-03 is an agricultural use only well with a permit for 1.5 MGD.

Well #3410-04 (Sealed)

Well #3410-05 (Sealed)

Well #3410-06 (Sealed)

Mauka Wells (South of Cane Haul Road)

Well #3410-10 (Not Permitted for Use)

The casing for this well is at ground level and subject to contamination. It will be sealed with cement in accordance with local requirements.

Well #3310-01 (Permitted for 1.25 MGD):

Situated at 470 feet, this is the highest elevation existing well on site. #3310-01 was drilled in 1980 and pump tested the same year for 25 hours at a rate of 885 GPM. The well is fitted with a 12 inch casing and has a water use permit of 1.25 MGD.

Well #3310-02 (Permitted for 0.85 MGD):

#3310-02 is situated at 367 feet and represents the second highest elevation well on site. This well was drilled in 1980 and pump tested for 45 hours at 1400 GPM. #3310-02 has a 14 inch case and is permitted for 0.85 MGD.

Well #3310-03 (Not Permitted for Use)

Proposed Water System

Most of the proposed water network will be placed within the roadway corridors through the site, although some dedicated utility easements through individual parcels will be required for access to tanks and to link distribution pipelines.

The water distribution system is divided into three pressure service zones. Two new water tanks will provide a combination of fire suppression and operational storage while maintaining required minimum distribution pressures. Tank 1 serves Pressure Zone 1 while Tank 2 serves Pressure Zones 2 and 3. Pressure reducing valves at the points of connection between Zones 2 and 3 will be used to prevent pressures within Zone 2 from exceeding the design maximum.

Pressure reducing valves will also connect Zones 1 and 2, to provide a back-up water supply for Zone 1 in the event the tank runs low during emergencies or other supply problems.

The DRA's irrigation demands include two zones, Growing Zones One and Two. Growing Zone One is the lower zone and is not supplied by the Ranch's domestic water system. Growing Zone One contains 28 orchard lots, 3 pasture lots, the Agricultural Cluster Parcel, managed pastures, the Lodge, agricultural cluster dwellings, and the Lake surroundings. Growing Zone One will be supplied by the existing Ranch-owned Well #3410-03. This well has been permitted to pump 1.5 MGD and is the current supply source for the main ranch areas. Growing Zone Two will be supplied by the development's domestic water system and contains 45 pasture lots and 15 grazing lots. The water needed to irrigate personal landscape on all 91 residential parcels of the project will be provided by the development's proposed domestic water system as well.

Two new wells will be drilled to supply all domestic demands for the project site and the Mokuleia community. Both wells will pump to Tank 1, where the water will be chlorinated, and booster pumps will then draw from this tank to supply Tank 2. This water will either flow through a dedicated line to Tank 2, or it will be injected directly into the Zone 2/3 distribution system, which in turn will fill Tank 2 when Zone 3 demands are lower than the pumping rates. Additional system modeling will need to be performed to determine if the latter option would potentially inhibit the circulation required to maintain acceptable water quality (see **Volume II: Appendix I, Water System Master Plan).**

Methodology

A. Design Parameters

The proposed water layout abides by the Board of Water Supply's Water System Standards (WSS) 2002. In particular, Division 100 of the manual provides requirements for fire and domestic flow demands, peak factors, and pipe sizing amongst other guidelines. These parameters were instrumental in determining many of the water system factors such as the elevation and storage capacity of the water tank and the placement of pressure reducing valves (PRVs).

i. Fireflow Parameters

Fireflow parameters are outlined in Table 100-19 of the Water System Standards. The proposed homes for the agricultural subdivision are designated under the "agriculture" type land use. Therefore these structures must meet a fire flow demand of 1,000 gallons per minute (gpm) for 30 minutes as stipulated in the manual. Multifamily units, such as occurs within the Mokuleia Community (Camp Mokuleia), and the Dillingham Lodge are categorized under "commercial structures" and require 2,000 gpm for 2 hours.

ii. Domestic Design Parameters

Interior domestic water demand is assumed at 500 gpd per single family dwelling. This design parameter is used for the 91 dwellings on the agricultural lots as well as the 15 single family dwellings for the Agricultural Cluster located on Lot 1002. The existing Dillingham Lodge is a commercial facility with an average demand of 2,000 gpd. The Mokuleia Community is estimated to have an average demand of 133,600 gpd, based upon historical records submitted to the Commission of Water Resource Management.

iii. Irrigation Design Parameters

The irrigation demands can be characterized as either agricultural/pastoral (managed by the HOA) or personal (managed by the home owner). The domestic water system will be the supply of irrigation water for agricultural/pastoral demands on lots in the upper pressure zones (Pressure Zones 2&3, which is coincident with Growing Zone Two), as well as for all private landscaping on all proposed lots within both service zones. A separate water system, strictly agricultural and utilizing existing Ranch infrastructure, will be utilized for agricultural demands on lots in the lower pressure zone (Pressure Zone 1, which is coincident with Growing Zone One as defined in the Agricultural Feasibility Report). Except to provide water for cattle and horses, lots designated for grazing will not be irrigated.

Because agricultural uses will be supplied by the domestic system within Pressure Zones 2 & 3 (Growing Zone 2), non-landscape irrigation demands will at all times be subject to water availability within the system. In the event that supplies within the storage tanks fall to predetermined minimum thresholds (due to a power failure for example) the irrigation system will not be used.

Potential for Secondary Impacts

Through the installation of new groundwater sources and the increased extraction of water from an aquifer there is the potential for secondary impacts. These potential impacts include salt water intrusion caused by lowering of the groundwater table near the shoreline, and groundwater contamination due to poor maintenance of proposed and existing wells. These impacts are unlikely to occur if established protocols and regulations are followed. These include analysis of the aquifer capacity prior to well startup, pumping regulations set by the Board of Water Supply (BWS), and water well maintenance requirements, also set by the BWS. Additionally, since all of the wells are set beyond the 1977 "no-pass" line, which was established by the Board of Water Supply to restrict underground injection of wastewater, there is an added level of groundwater protection.

The Connection to Farrington Highway will have no adverse impacts on the water supply system.

The Wastewater Treatment Facility is outside the influence of all of the water supply wells and will not be using wastewater injection as a disposal method. Because of this there should be no adverse impacts on the water supply.

Section 3: Project Alternatives

3.1 Introduction

Based on the contents of an environmental assessment set forth in HAR, Title 11, Chapter 200, Environmental Impact Statement Rules, three alternatives to the proposed projects were considered: (1) the No Action and Delayed Action Alternative; (2) an Alternative Location for the Connection to Farrington Highway and WTP; and (3) the Preferred Alternative. The alternatives were considered for both the Connection to Farrington Highway Improvements and Wastewater Treatment Plant.

3.2 Alternatives to the Proposed Projects

3.2.1 No Action and Delayed Action

No Action Alternative

The No Action Alternative would involve no further action to develop the project. Inasmuch as the Connection to Farrington Highway would support access to the proposed Dillingham Ranch Agricultural Subdivision, the proposed project is a necessary requirement of the City & County of Honolulu Subdivision Standards and the State Department of Transportation, for providing a safe point of entry and exit from Farrington Highway. While the No Action Alternative would avoid the expenditure of resources for design and construction of the facility, it would fail to provide for the required traffic improvements. The WTP also supports the proposed Dillingham Ranch Agricultural Subdivision, a necessary requirement of City & County of Honolulu and State of Hawaii to provide safe and effective wastewater treatment for new homes. While the No Action Alternative would avoid the expenditure of resources for design and construction of the WTP facility, it would fail to provide the required wastewater treatment of the planned subdivision.

For this reason, the No Action Alternative is not considered a viable option.

Delayed Action Alternative

The Delayed Action Alternative differs from taking no action in that the proposed project would be undertaken, but at a later point in time. Delayed action to construct the Connection to Farrington Highway or the WTP would adversely affect the completion of the agricultural subdivision. Because the projects are intended to support the proposed agricultural subdivision with access to the Farrington Highway and the treatment of wastewater in compliance with City & County and State requirements, the delayed action alternative would similarly fail to accomplish the purpose of the project.

For this reason, the Delayed Action Alternative is also not considered a viable option.

3.2.2 Alternative Location for the Connection to Farrington Highway and WTP

The planned location for the projects are based on existing and future proposed land uses of the Dillingham Ranch 'Āina property.

Connection to Farrington Highway

The Connection to Farrington Highway improvements will be located on an existing access road that presently serves the Dillingham Ranch providing access to the equestrian facilities, administrative offices, and field offices and facilities used to manage the property. This configuration provides a rational and efficient means of entry to the planned agricultural subdivision based on existing uses that will not have to be immediately relocated, demolished, or otherwise removed. An alternative location for the Connection to Farrington Highway may be possible along other portions of the Dillingham Ranch property, but is considered an optimal approach given existing land uses that include diversified agriculture, a pond, equestrian and corral facilities, and maintenance facilities. Thus, while an alternative location is possible, major disruption to existing land uses and operations would result while the planned Connection to Farrington Highway improvements would require essentially the same construction effort.

Wastewater Treatment Plant

The location of the WTP is dependent on the location of homes that the facility serves, suitable soils and adequate land area for effluent disposal, State and City & County regulations that regulate its location, and other factors related to accessibility, adjacent facilities and land uses. Due to these factors an alternative location may violate one or more of the factors that determined the most favorable location. For example, borings and percolation tests were conducted in various areas of the lowland areas of Dillingham Ranch to determine the best soils for effluent disposal. Only those soils that passed the percolation test with sufficient contiguous area to accommodate the system design would accommodate the WTP location. The proposed location of the WTP, as shown in Figure X, precluded alternative locations that did not have suitable soils, were in floodway zones, and/or too close to existing wells.

3.2.3 Preferred Alternative

Connection to Farrington Highway

The preferred alternative involves the design and construction of the Connection to Farrington Highway at its present location at the intersection with the Farrington Highway. Factors that support this decision include:

- Area residents are already aware of this entry to the Dillingham Ranch property. Directly adjacent to the existing entry is a clearly marked crosswalk crossing Farrington Highway, and horse crossing signage posted in both directions along the highway.

- The proposed location will minimize disruption to the existing operations of the Dillingham Ranch. While the planned agricultural subdivision is anticipated to require future changes in land that is used by the Dillingham Ranch, these changes will be more easily made with the integration of a planned intersection improvement with existing and future land uses.

- The traffic assessment conducted for the proposed project indicates there will be limited and minimal traffic impacts associated with the Connection to Farrington Highway. No major impacts to local or transiting motorists to the area are anticipated or expected.

- Sufficient measures and practices to address the potential for adverse environmental impacts have been considered and can be implemented for the project. With the implementation of the mitigation measures as described in this document, no adverse environmental impacts are anticipated or expected.

Wastewater Treatment Plant

The preferred location of the WTP, as shown in **Figure 5, page 10**, is based on a combination of physical, aesthetic, and regulatory factors. The low elevation of the preferred site is required to facilitate flow and reduce pumping needs throughout the system. Additionally, the relative levelness of the preferred location allows for an even application area of the treated effluent throughout the subsurface discharge field. Having the WTP in the preferred location allows for screening of the facility so that the above ground facilities are not visible from the road or nearby residences.

There are many regulatory factors that have also driven the preferred location of the WTP. The first of these is that subsurface disposal of treated wastewater is not allowed within 1000' of a water production well. Secondarily, the disposal system is required to be located inland from the "no pass line" set by the DOH. Additionally, the percolation rate of the soils have to meet set flow rates for disposal to be acceptable. Based on soil testing done around the site, this preferred location is the most suitable that also meets the other requirements.

Based on the above factors, the preferred location of the WTP, as shown in **Figure 5**, is the most suitable.

Section 4: Relationship to State and City & County Land Use Plans and Policies

4.1 Hawai'i State Plan and Functional Plans

4.1.1 Hawai'i State Plan

The Hawai'i State Plan, Chapter 226, Hawai'i Revised Statutes (HRS), serves as a written guide for the future long range development of the State. The Plan identifies statewide goals, objectives, policies, and priorities.

The proposed project is consistent with the following provisions of the State Plan:

Section 226-7 Objective and policies for the economy-agriculture.

(a) Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives: (2) Continued growth and development of diversified agriculture throughout the State.

(b) To achieve the agriculture objectives, it shall be the policy of this State to:

(5) enhance agricultural growth by providing public incentives and encouraging private initiatives.

The proposed intersection project involves the construction of transportation improvements and WTP by a private party to serve a planned agricultural subdivision. The planned subdivision will allow for new diversified agricultural activities and in so doing, would contribute to its continued growth and development, maintaining consistency with the State Plan.

Section 226-15 Objectives and policies for facility systems--solid and liquid wastes

Planning for the State's facility systems with regard to solid and liquid wastes shall be directed towards the achievement of the following objectives:

(1) Maintenance of basic public health and sanitation standards relating to treatment and disposal of solid and liquid wastes.

(2) Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility, and other areas.

(b) To achieve solid and liquid waste objectives, it shall be the policy of this State to:

(1) Encourage the adequate development of sewerage facilities that complement planned growth.

(2) Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic.

(3) Promote research to develop more efficient and economical treatment and

disposal of solid and liquid wastes.

The proposed WTP satisfies the objectives of the Hawaii State Plan. The proposed facility is designed to exceed all State and City and County wastewater treatment standards.

Section 226-17 Objectives and policies for facility systems-transportation.

(b) To achieve the transportation objectives, it shall be the policy of this State to:

(3) Encourage a reasonable distribution of financial responsibilities for transportation among participating governmental and private parties.

The proposed Connection to Farrington Highway will be entirely financed by a private party who will be responsible for the cost of design and construction. In this regard, the proposed project will address the State Plan objective of encouraging the reasonable distribution of financial responsibility for ensuring completion of the project by the private sector.

4.1.2 State Functional Plans

The State Functional Plans are designed to implement the broader goals, objectives, and policies of the State Plan through specific actions identified as Implementing Actions (IA). While the proposed project is not specifically identified as an IA, the project maintains consistency with the Transportation and Agricultural Functional Plans through the following:

State Transportation Functional Plan

Objective I.F: Improving and enhancing transportation safety

Objective III.A: Expansion of revenue bases for transportation improvements.

Policy III.A.2. Pursue private sector participation in the financing of transportation systems, developments and projects.

The proposed project involves the design and construction of a privately financed connection to Farrington Highway that will serve an agricultural subdivision. The project will comply with State and City & County of Honolulu requirements to meet safety of the driving public.

State Agricultural Functional Plan

Objective B: Achievement of an orderly agricultural marketing system through product promotion and industry organization.

Policy B(2): Encourage the development of Hawai'i's agricultural industries.

Although the proposed project does not directly involve the promotion of the agricultural industry, it represents an important supporting feature and expansion of agricultural activities that will facilitate the development of an agricultural subdivision. The subdivision in turn, will provide for greater opportunities for the growth of diversified agriculture.

4.2 State Land Use District

The project site and the surrounding land use are within the State Agricultural District. The use of the Farrington Highway and the proposed Connection to Farrington Highway project and construction of a WTP to serve the proposed agricultural subdivision is consistent with this land use designation. **See Figure 10, State Land Use District**.

4.3 General Plan

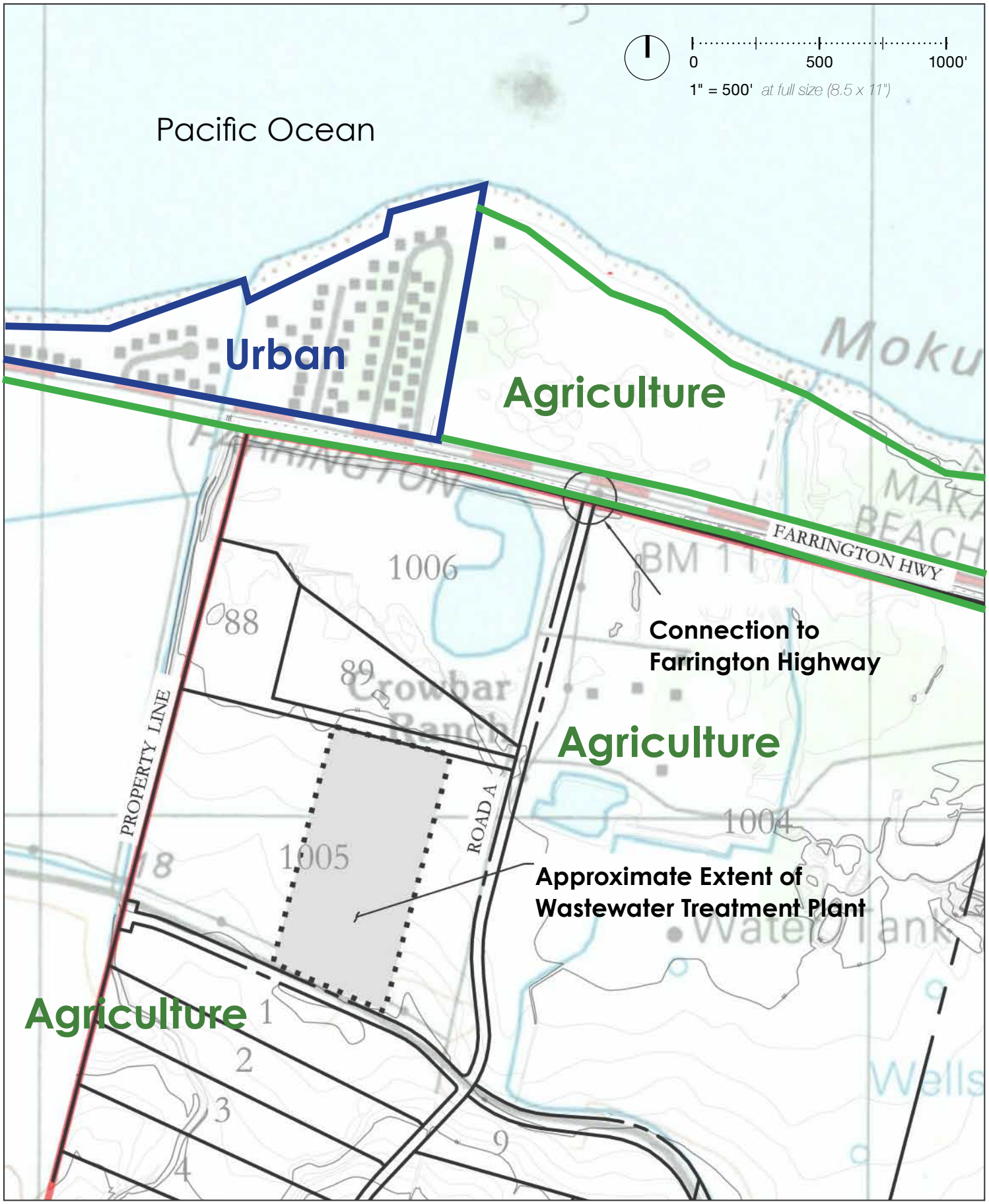
The current edition of the General Plan for the City & County of Honolulu was adopted in 1977, revised in 1992, and was last updated in October 2006. The Plan is a comprehensive statement of objectives and policies for the future development of Honolulu. The proposed project is consistent with the following objectives and policies of the City and County of Honolulu's General Plan:

Transportation & Utilities

The objectives and policies for transportation related improvements are stated in Section 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 tl1e poor, the elderly, and the physically handicapped; and offer a variety of attractive and convenient modes of travel.*
>
> ***Policy 5:*** *Improve roads in existing communities to reduce congestion and eliminate unsafe conditions.*

The planned Connection to Farrington Highway will constitute an improvement and upgrade over existing conditions by providing new paving, striping and signage. These improvements will be in accordance with the requirements of the City & County of Honolulu, and State DOT, that promote the safe and efficient transportation of residents and users along this segment of the Farrington Highway.



Project Location

DILLINGHAM 1897 RANCH
NORTH SHORE, OAHU

Figure 10
State Land Use District

> ***Objective D****: To maintain transportation and utility systems which will help Oahu continue to be a desirable place to live and visit.*
>
> ***Policy 4:*** *Evaluate the social, economic, and environmental impact of additions to the transportation and utility systems before they are constructed.*

The proposed project is under review of these factors as part of the environmental review process stipulated by Chapter 343, HRS. Based on the analysis undertaken for the subject document, social, economic, and environmental factors will be reviewed and evaluated to ensure that sufficient mitigative measures will be provided prior to the construction of the project.

The proposed wastewater treatment plant will provide a reliable, safe, and environmentally positive means of treating and disposing wastewater. By providing a centralized facility there is less strain on each individual resident to maintain their system, as well as a reduced long term cost to individuals and impact to the environment from having multiple subsurface disposal locations. The proposed project will have a positive social, economic, and environmental impact to the area.

4.4 North Shore Development Plan/Sustainable Communities Plan

The project sites are designated as Agriculture in the North Shore Development Plan Land Use, Open Space, and Public Facilities Maps.

Related to the Connection with Farrington Highway

While the proposed project at its connection with the Farrington Highway (designated a "minor arterial") is not specifically identified, the project is consistent with the **North Shore Development Plan/Sustainable Communities Plan**, Section 4.1.5, General Policies, through the following:

> *"Provide adequate access between residences, jobs, shopping, and recreation areas on the North Shore. Improve access to adjacent areas, especially to Central Oahu."*

The proposed Connection to Farrington Highway will promote adequacy and sufficiency of service to and from the planned Dillingham Ranch Agricultural Subdivision to the Farrington Highway.

> *"Approve new residential and commercial development in the North Shore only if the State Department of Transportation and the City Department of Transportation Services certify that adequate transportation access and services can be provided."*

The proposed Connection to Farrington Highway will address and meet the requirements of the State DOT and the City & County of Honolulu for the construction the intersection. The Connection to Farrington Highway have been further evaluated with respect to capacity and the ability to provide access along Farrington Highway without adverse impacts to existing traffic conditions (Julian Ng, Inc., 2014).

See **Volume I: Appendix A**, relating to conditional letters for the Subdivision Application from DOT, Highways Division.

Related to the Wastewater Treatment Plant

As state in the North Shore Development Plan/Sustainable Communities Plan:

4.3.1 Policies

The following policies apply to wastewater treatment systems on the North Shore

> "Provide adequate public and private wastewater treatment facilities and improve the existing wastewater management services on the North Shore to protect the North Shore's water resources and the health of the community is the highest priority."
>
> "Support alternative wastewater technologies that reflect the community's values and rural character."

4.3.2 Guidelines

> "Identify appropriate areas and technologies for future wastewater facilities that maintain the rural character and are proportionate to future population projections."

The proposed wastewater treatment plant project will use a cyclical biological treatment (CBT) method to create a high quality effluent which surpasses the state and county requirements. The facility will have a small control building and will have limited visual detriment to the rural nature of the area. This CBT system, combined with a new collection system, will provide a safe, reliable, and clean method of wastewater disposal which meets the policies and goals of the North Shore.

4.5 City & County of Honolulu Zoning

The project sites are within the AG-1 Restricted Agricultural District and AG-2, General Agricultural District. See **Figure 11**, Zoning. According to Chapter 21, Land Use Ordinance, Section 21-3.50 Agricultural Districts:

AG-1 Zoning

The intent of the AG-1 restricted agricultural district is to conserve and protect important agricultural lands for the performance of agricultural functions by permitting only those uses which perpetuate the retention of these lands in the production of food, feed, forage, fiber crops and horticultural plants. Only accessory agribusiness activities which meet the above intent shall be permitted in this district. The following guidelines shall be used to identify lands which may be considered for the AG-1 restricted agricultural district:

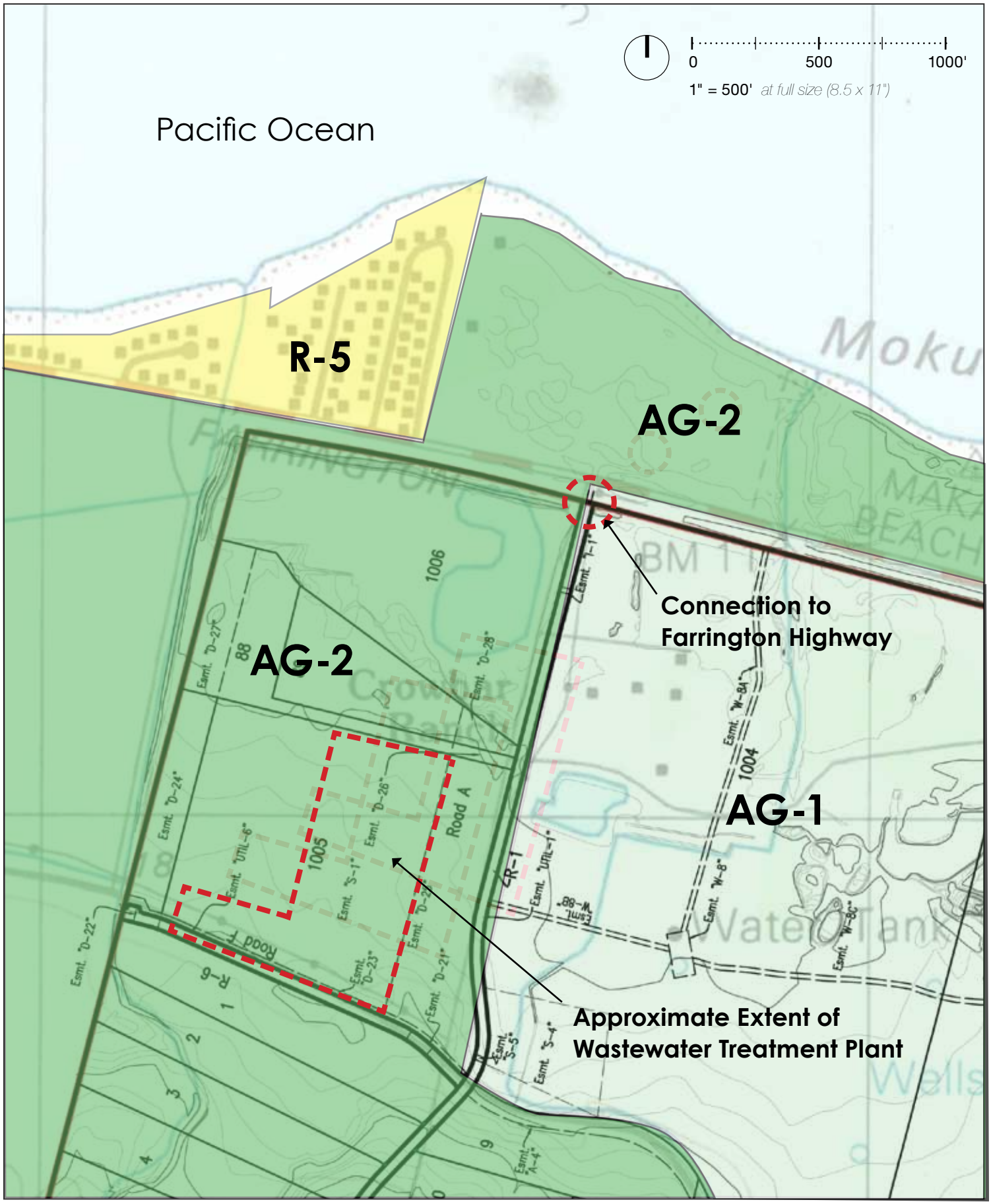
(1) Lands which are within the state designated agricultural district and designated agricultural by adopted city land use policies;
(2) Lands which are predominantly classified as prime or unique under the agricultural lands of importance to the State of Hawaii system; and
(3) Lands where a substantial number of parcels are more than five acres in size.

The proposed WTP lies within the AG-1 zoning district. The project will be designed to exceed State and City and County wastewater standards and support the proposed Dillingham Ranch Agricultural Subdivision. In this regard, the proposed project will help to maintain existing agricultural land uses of the area consistent with the AG-1 zoning of the site.

AG-2 Zoning

The purpose of the agricultural districts is to maintain a strong agricultural economic base, to prevent unnecessary conflicts among incompatible uses, to minimize the cost of providing public improvements and services and to manage the rate and location of physical development consistent with the city's adopted land use policies. To promote the viability and economic feasibility of an existing agricultural operation, accessory agribusiness activities may be permitted on the same site as an adjunct to agricultural uses. These accessory activities must be compatible with the on-site agricultural operation and surrounding land uses;

(d) The intent of the AG-2 general agricultural district is to conserve and protect agricultural activities on smaller parcels of land; and
(e) The following guidelines shall be used to identify lands which may be considered for the AG-2 general agricultural district:



Project Location

DILLINGHAM 1897 RANCH
NORTH SHORE, OAHU

Figure 11
Zoning

(1) Lands which are in the state-designated agricultural or urban district and designated agricultural by adopted city land use policies;
(2) Lands which are predominantly classified as other under the agricultural lands of importance to the State of Hawaii system; and
(3) Lands which are used or are suitable for agricultural purposes and where a substantial number of parcels arc less than five acres in size. (Added by Ord. 99-12; Am. Ord. 02-63).

The proposed intersection project lies within AG-2 zoning district. The project will address the City & County of Honolulu and State DOT requirements for the design of an adequate and sufficient intersection improvement serving the Dillingham Ranch Agricultural Subdivision. In this regard, the proposed project will help to maintain existing agricultural land uses of the area consistent with the AG-2 zoning of the site.

4.6 Special Management Area

The City and County of Honolulu has designated the shoreline and certain inland areas of Oahu as being within the Special Management Area (SMA). SMA areas are designated sensitive environments that should be protected in accordance with the State's Coastal Zone Management policies, as set forth in Chapter 25, Shoreline Management, ROH, and Section 205A, Coastal Zone Management, HRS.

The proposed project sites and the proposed agricultural subdivision is located outside of the designated SMA zone as shown in **Figure 12**, Project Site in Relation to SMA.

4.7 Coastal Zone Management, HRS 205(A)

The State of Hawai'i designates the Coastal Zone Management Program (CZMP) to manage the intent, purpose and provisions of the federal Coastal Zone Management Act, and HRS, Chapter 205(A)-2, as amended, for the areas from the shoreline to the seaward limit of tl1e State's jurisdiction, and any other area which a lead agency may designate for the purpose of administering the CZMP.

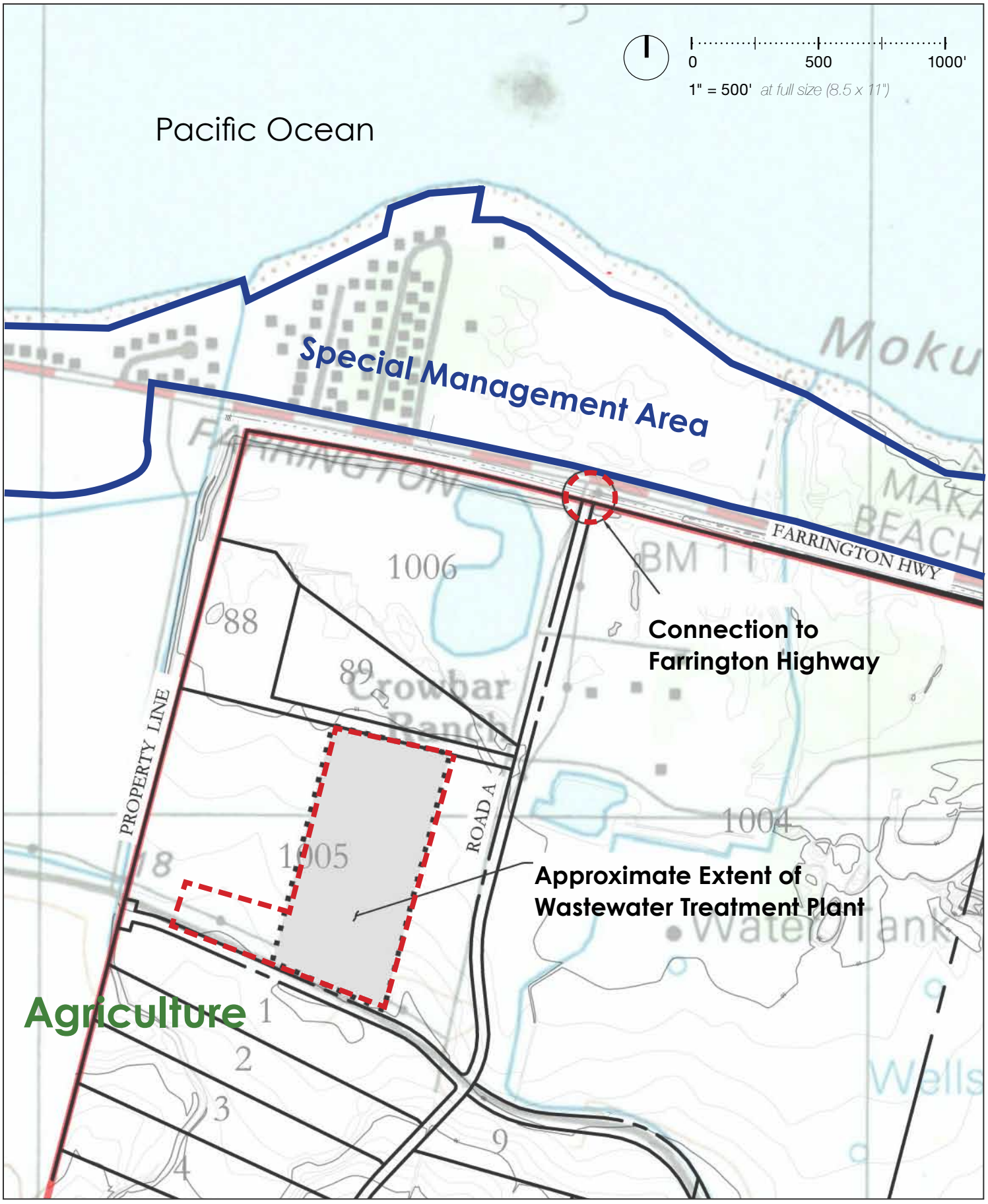
The following is an assessment of the projects with respect to the CZMP objectives and policies set forth in Section 205(A)-2.

1. Recreational resources

Objective: Provide coastal recreational opportunities accessible to the public.

Policies:

(A) Improve coordination and funding of coastal recreational planning and management; and



DILLINGHAM 1897 RANCH
NORTH SHORE, OAHU

Figure 12

Project Sites in
Relation to SMA

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

(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

(ii) Requiring replacement of coastal resources having significant recreational value including, but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;

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

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

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

(vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;

(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of section 46-6.

Discussion:

Recreational and shoreline facilities and public access to the shoreline will not be affected by the project. The proposed project area is located along the Farrington Highway, a State transportation facility.

2. Historic resources

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

Policies:

(A) Identify and analyze significant archaeological resources;

(B) Maximize information retention through preservation of remains and artifacts or salvage

operations; and

(C) Support state goals for protection, restoration, interpretation, and display of historic resources.

Discussion:

No adverse impacts to archaeological or historic resources associated with construction or operation of the proposed projects are expected. See **Section 2.1.6, Historic and Archaeological Resources** of this report. However, in the event that unidentified archaeological remains or deposits are uncovered during construction, work will cease in the immediate area and the State Historic Preservation Office will be contacted. As appropriate, mitigative measures will be proposed and coordinated with State Historic Preservation Division (SHPD), Department of Land and Natural Resources, prior to the resumption of work.

The potential for adverse impacts to cultural practices or resources are not expected as a result of the proposed project. The proposed intersection improvement project site has been utilized for vehicular entry to the Dillingham Ranch property, is located along a developed and designated transportation facility, and is not identified with traditional or cultural gathering practices. The WTP is located in existing pasture areas and is not identified with traditional or cultural gathering practices.

3. Scenic and open space resources

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

Policies:

(A) Identify valued scenic resources in the coastal zone management area;

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

(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

(D) Encourage those developments that are not coastal dependent to locate in inland areas.

Discussion:

The proposed intersection project will involve the use of a stop sign, striping on pavement surfaces, and other signage advising motorists of an intersection ahead. These project requirements are based on vehicular safety considerations and are not expected to adversely affect scenic and open space resources.

The proposed WTP improvements will consist of site grading, a concrete pad, installation a low pressure pipe network, installation of a centralized wastewater treatment works, and construction of either a centralized subsurface effluent disposal system and/or a disinfection system combined with an R-2 recycled water dispersal system. Additionally there is a small (20' x 20') control building which will house the blowers, monitoring equipment, and control panels. The control building will be screened with new vegetation.

The WTP project site is 1400 to 2000 feet mauka of Farrington Highway behind existing trees and shrubs along Farrington Highway. Furthermore, except for the control building and some minor perimeter mounding, the majority of the WTP is subsurface and not visible. The WTP is not expected to adversely affect scenic and open space resources.

4. Coastal ecosystems

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

Policies:

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

(B) Improve the technical basis for natural resource management;

(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

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

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

Discussion:

The proposed projects are not expected to have any adverse effect on coastal ecosystems or resources. The intersection location is in an area that is not subject to coastal processes and will be undertaken in a manner that will minimize or otherwise avert the potential for environmental impacts.

The potential for adverse environmental effects on coastal ecosystems from the wastewater treatment system are very low. Storage within the system has been sized for 100% redundancy to account for power outages and system shutdowns. Additionally, the system is designed to treat the effluent to 3 times the required discharge limits, which further reduces the chance of groundwater contamination. Since the subsurface disposal system is not an injection well and effluent is treated effluent in a chamber system, water quality improves as it percolates into the ground.

5. Economic uses

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

Policies:

(A) Concentrate coastal dependent development in appropriate areas;

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

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

(i) Use of presently designated locations is not feasible;

(ii) Adverse environmental effects are minimized; and

(iii) The development is important to the State's economy.

Discussion:

The proposed projects have been assessed for potential environmental impacts. With the implementation of the mitigation measures identified in this document, no adverse impacts are expected to result.

The proposed projects are consistent with current AG-1 and AG-2 zoning districts, thus they can be considered appropriate development for the area.

While alternative locations for the proposed projects were investigated by the applicant, the proposed locations are considered to be optimal. The planned Connection to Farrington Highway and are consistent with the surrounding agricultural related land uses along the Farrington Highway. Alternative locations were

investigated for the WTP, but the preferred location best meets the system design criteria and minimizes on and off-site impacts.

6. Coastal hazards

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

Policies:

(A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

(B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;

(C) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

(D) Prevent coastal flooding from inland projects.

Discussion:

The subject property is located along Farrington Highway in the Waialua District of O'ahu. According to FEMA FIRM Map No. 15003C0085F, the intersection project site is located in an area designated as Zone AE. See **Figure 8**, FEMA FIRM Map.

The WTP is partially located within Flood Zone AE, therefore the disposal system will be raised to avoid inundation during large flood events. To mitigate the impact of the reduced flood storage volume within the flood plain, compensatory storage will be created within Lot 1005. With this mitigation in place, the sewer treatment plant is not anticipated to be prone to flooding, nor to have a significant impact on flood patterns in the area.

The development of the projects will be in compliance with the requirements of the Federal Flood Insurance Program, the City & County of Honolulu Drainage, Grading and Development standards for Flood Hazard Districts, and the LUO, Section 21-9.10, Flood Hazard Districts.

7. Managing development

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

Policies:

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

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

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

Discussion:

The project site is within the State Agricultural Land Use District. Land uses within this designation are subject to regulation by the City & County of Honolulu. The county's zoning designation for the project sites is AG-1 and AG-2.

All improvement activities will be conducted in compliance with State and County environmental rules and regulations. This EA document is prepared to identify and, where necessary, propose mitigation measures to address the potential for impacts anticipated from the construction and operation of the project. This document will be published for public review in compliance with procedures set forth by the Office of Environmental Quality Control (OEQC), Chapter 343, HRS, and Chapter 11-200, Hawai'i Administrative Rules (HAR).

8. Public participation;

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

Policies:

(A) Promote public involvement in coastal zone management processes;

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

(C) Organize workshops, policy dialogues, and site-specific mitigation to respond to coastal issues and conflicts.

Discussion:

Public involvement in the project will consist of public notice of the proposed action in the OEQC Bulletin. See **Section 8**, Agencies, Organizations, and Individuals Consulted for a list of the agencies, organizations

and individuals that have been or will be consulted for this project. All written public comments will be provided with a written response. Where appropriate, mitigation measures will be developed to address issues and concerns raised during public review of the project.

9. Beach protection;

Objective: Protect beaches for public use and recreation.

Policies:

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

(B) Prohibit construction of private erosion-protection structures seaward of the shoreline, except

(C) when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and

(D) Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion:

The proposed project is not located in proximity to the beach and will have no effect on beach or shoreline processes. See **Section 2.1.7, Beach Erosion and Sand Transport**.

10. Marine resources

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

Policies:

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

(B) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

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

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

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

Discussion:

The proposed project will have no effect on marine resources. The scope and scale of the intersection project will be limited to the installment of pavement surfacing and traffic controls to ensure safety and security of the intersection.

Construction activities associated with the WTP will have proper erosion control devices in place to prevent transport of soil and silt out of the project site. Once operational, the WTP will discharge effluent into a subsurface treatment field. All effluent will be treated to a higher quality then the standards set by the Department of Health. The contractor shall manage all work activities to prevent and reduce erosion from the job site using Best Management Practices.

Section 5: Permits and Approvals that May be Required

5.1 City & County of Honolulu

Department of Planning and Permitting

- Subdivision Approval
- Agricultural Cluster Development Permit
- Grading, Grubbing, and Stockpiling Permit
- Building Permit

5.2 State of Hawai'i

- Department of Transportation: Approval of Construction Plans & Specifications
- Department of Transportation: Permit to Perform Work Upon State Highways
- Department of Health, Wastewater Branch: Notice of Intent for HAR, Chapter 11-62, Appendix B, General Permit for Treatment Works

Section 6: Cultural Impact Assessment Evaluation

6.1 Impacts to Traditional/Cultural Resources

6.1.1 Impacts to Traditional/Cultural Resources due to Proposed Connection to Farrington Highway

The use of the site for traditional or cultural practices is not expected based on the location of the planned improvements next to the existing Farrington Highway and Dillingham Ranch equestrian facility driveway entrance. The modified condition of the project area includes the presence of introduced plant species not normally associated with cultural gathering or use activities. The plants present at the site include ironwood and other introduced tree species, grasses contained within the adjacent equestrian facility and polo field located across the Farrington Highway, and various other low laying weed and grass species located along the roadway.

The developed and paved condition of the area is also not conducive to the presence of wahi pana (storied place) or other sites associated with the gathering of important native species that may include ti, flowering plants, or other species bearing fruit.

6.1.2 Impacts to Traditional/Cultural Resources due to Proposed Wastewater Treatment Plant

The use of the site for traditional or cultural practices is not expected based on the location of the planned WTP on existing pasture that is utilized by the Dillingham Ranch equestrian facility. The proposed facility will preclude future pasturing on the WTP site but will remain as largely introduced grassland species. The pasture condition of the project area includes the presence of introduced plant species not normally associated with cultural gathering or use activities.

The developed condition of the area is also not conducive to the presence of wahi pana (storied place) or other sites associated with the gathering of important native species that may include ti, flowering plants, or other species bearing fruit.

6.1.3 Potential Impacts and Mitigation

The potential for adverse impacts to traditional and cultural practices is not anticipated based on the location and existing use of the project site as an intersection along the Farrington Highway. The location of the WTP is in horse pasture and should have no adverse impact on traditional and cultural practices.

Across the Farrington Highway, the use of an existing polo field may be affected by the temporary generation of noise during construction of the Connection to Farrington Highway. The construction of the WTP is will be several hundred feet from the highway so it is not anticipated that it will create adverse noise makai of the Farrington Highway. However, all work practices will be in accordance with noise regulations of the State and City & County of Honolulu.

As noted in **Section 2.1.6, Historic and Archaeological Resources**, should iwi or other cultural remains may be uncovered by earthwork or grading activities all work will be temporarily halted and the SHPD immediately notified at (808) 692-815 for further instructions. Work will only be allowed to be resumed upon appropriate notification to do so by the SHPD.

Section 7: Agencies, Organizations and Individuals Consulted

The following agencies, organizations, and individuals were/will be contacted regarding the preparation of the Environmental Assessment for this project.

7.1 City & County of Honolulu

- Department of Planning and Permitting
- Department of Environmental Services
- Department of Design and Construction
- Fire Department
- Police Department

7.2 State of Hawai'i

- Department of Health
- Department of Land and Natural Resources - Land Division
- Department of Forestry and Wildlife
- State Historic Preservation Division
- Department of Transportation - Highways Division
- Department of Transportation - Airports Division

7.3 Federal Government

- U.S. Army Corps of Engineers
- U.S. Fish and Wildlife Service
- National Marine Fisheries Service

7.4 Organizations and Individuals

- Mokale'ia Community Association
- North Shore Neighborhood Board No. 27
- Councilman Donovan M. Dela Cruz
- Honolulu City Council

Section 8: Summary of Impacts and Significance Determination

8.1 Short Term Impacts

Short term impacts due to the Connection to Farrington Highway and WTP are expected to be limited and will last for only the duration of construction. The construction contractor will access the project site via Farrington Highway and noise will be generated from construction and related mobilization of equipment.

Construction equipment is expected to include a compactor, grader, bulldozer, trencher, concrete mixer, delivery trucks, and powered hand tools. All equipment will be muffled in accordance with standard engine operating practices. The work will be limited to weekday daylight hours and engine exhausts will be governed in accordance with applicable State and County regulations. Upon construction completion, noise levels will return to ambient levels.

Dust and associated nuisance problems are expected to be slight to insignificant due to the limited scope and scale of the project. Fugitive dust will be controlled with the use of dust screens and/ or regular wetting of the soil by the contractor.

Construction activity will temporarily disturb soils. To minimize soil erosion, silt fences, berms and other applicable erosion control devices will be utilized to prevent construction-related soil and silt from leaving the active work area. If required, exposed soils will be covered with PVC sheet plastic or similar material to prevent inadvertent contact and mixing with storm water.

Upon completion of construction exposed and/or graded soil areas will be immediately seeded with appropriate erosion control or pasturage grasses.

All necessary environmental permit applications and building permit approvals will be secured prior to initiation of construction activities.

8.2 Long Term Impacts

Long term benefits derived from Connection to Farrington Highway include the provision of an intersection improvement that will be constructed in compliance with State and City & County standards. No long term adverse impacts are anticipated. Upon completion, all construction equipment used on-site will be demobilized and all debris and waste materials will be disposed of at an approved refuse facility.

Long term benefits derived from WTP include the provision of a safe and effective facility to treat waste water from the proposed Agricultural Subdivision. The WTP will be constructed in compliance with State and City & County standards. No long term adverse impacts are anticipated. Once operational, the wastewater treatment plant will discharge effluent into a subsurface treatment field. All effluent will be treated to a higher quality then the standards set by the Department of Health. The effluent will eventually migrate into the groundwater aquifer, once it has passed through all of the treatment processes and filtered through the soil.

Upon completion, all construction equipment used on-site will be demobilized and all debris and waste materials will be disposed of at an approved refuse facility.

8.3 Significance Criteria

Based on the significance criteria set forth in HAR, Title 11, Chapter 200, Environmental Impact Statement Rules, the proposed project is not anticipated to result in significant environmental impacts. The findings and reasons supporting the determination for a Finding of No Significant Impact (FONSI) are summarized as:

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

The proposed projects will not result in the adverse loss of natural or cultural resources. There are no threatened or endangered species of plants or wildlife that inhabit the immediate area of the project sites. Given the transportation related use of the Connection to Farrington Highway project site, historic or archaeological sites are not known to be present. The WTP location is also not in the area of any known historic or cultural feature. However, in the unlikely event of a discovery of significant historic or archaeological resources, the SHPD, DLNR, will be immediately notified for appropriate action and treatment.

2. Curtails the range of beneficial uses of the environment

The Connection to Farrington Highway property is currently utilized for transportation related purposes. The proposed use is consistent with the industrial designation of the site and will be contained entirely within the property. The proposed action does not curtail beneficial uses of the environment.

The WTP site is currently utilized as pasturage. The WTP above ground facilities occupy a very small area, under 0.1 acre. The underground portion of the WTP (leach fields) will remain or be revegetated as

pasturage grass. The proposed action does not curtail beneficial uses of the environment and supports the proposed Agricultural Subdivision.

3. Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 343, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders

The proposed project is consistent with the environmental policies, goals and guidelines expressed in HRS, Chapter 343. Potential sources of adverse impacts have been identified and appropriate measures have been developed to either mitigate or minimize potential impacts to negligible levels for both projects.

4. Substantially affects the economic and social welfare of the community or state

The proposed projects will not negatively affect the economic and social welfare of the community or state. The proposed Connection to Farrington Highway improvements will constitute a new facility promoting safety of motorists transiting the Farrington Highway in the area of the project. The construction of the facility will be regulated in accordance with City & County of Honolulu and State regulations. The proposed WTP will provide the safe and effective disposal of effluents produced within the future Agricultural Subdivision. The construction of the facility will be regulated in accordance with City & County of Honolulu and State regulations.

5. Substantially affects public health

For the Connection to Farrington Highway factors affecting public health, including air quality, water quality, and noise levels, are expected to be only minimally affected, or unaffected. The proposed project does not pose a direct threat to public health and safety. Potential impacts will be mitigated in accordance with regulations.

For the WTP factors affecting public health, including air quality, water quality, and noise levels, are expected to be only minimally affected, or unaffected. The proposed project does not pose a direct threat to public health and safety. The WTP is designed to exceed State and local wastewater treatment regulations by 30%. Any potential impacts will be mitigated in accordance with regulations.

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

The Connection to Farrington Highway project is expected to have little to no secondary or indirect impacts such as population changes or effects on public facilities based on the limited scope and scale of the project.

The WTP project is expected to have little to no secondary or indirect impacts such as population changes or effects on public facilities. The WTP will support the increase in population due to the Agricultural Subdivision, but the population increase is consistent with the allowable agricultural zoning for the site.

7. *Involves a substantial degradation of environmental quality*

Impacts to air and water quality, noise levels, natural resources, and land use associated with the planned Connection to Farrington Highway project are anticipated to be minimal. Mitigation measures will be employed as practicable to further minimize potentially detrimental effects to the environment. The proposed project does not involve substantial degradation of environmental quality.

Impacts to air and water quality, noise levels, natural resources, and land use associated with the planned WTP project are anticipated to be minimal. Mitigation measures will be employed as practicable to further minimize potentially detrimental effects to the environment. The proposed project does not involve 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 Connection to Farrington Highway and WTP are in-themselves individually limited projects. The proposed Agricultural Subdivision, exclusive of the Connection to Farrington Highway providing connection of the proposed 91 lot subdivision with the Farrington Highway and WTP providing effluent treatment respectively, could be considered as providing the context for "larger actions". Mitigation measures to address the potential for these "larger actions" due to the greater Agricultural Subdivision have been provided within the Application Process for Tentative Subdivision Map Approval by the Department of Planning and Permitting, City & County of Honolulu. Mitigation measures to address the subdivision are materially provided within this DEA document and include an evaluation of the areas of archaeology, continued agricultural viability, rockfall and slope concerns, drainage and groundwater, water and wastewater, flora, fauna, and traffic for the planned subdivision as well as the planned Connection to Farrington Highway and WTP.

9. Substantially affects a rare, threatened or endangered species

There are no rare, threatened or endangered plants or animal species at the subject project sites. Other project activities associated with the planned subdivision are not located near avifauna located in the area of the pond.

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

On a short-term basis, ambient air and noise conditions may be affected by construction of the proposed Connection to Farrington Highway and WTP, but these are short-term and can be controlled by the mitigation measures as described in this EA. Once the project is completed, air and noise in the projects' vicinity will be allowed to return to preconstruction conditions. The WTP is designed to operate odor free.

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

A small portion of the Connection to Farrington Highway project area is located within an area determined by the Federal Emergency Management Agency to be within the 1-percent annual chance floodplain. The proposed action is not expected to have a significant impact on flood conditions.

The WTP project area is partially located within an area determined by the Federal Emergency Management Agency to be within the 1-percent annual chance floodplain. The WTP project area will be raised in elevation above the 1-percent annual chance floodplain elevation to mitigate any flood potential of the WTP facility. The proposed action is not expected to have a significant impact on flood conditions.

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

Minimal to no impacts to scenic vistas and view planes are expected. The Connection to Farrington Highway project will involve the use of a stop sign and may include other signs advising motorists of an intersection ahead. The use of these signs and striping of the pavement will not adversely affect scenic views or view planes.

The WTP will have a limited amount of facility visible above ground. A small building (20' x 20') housing control equipment will be located approximately 2000 feet mauka of Farrington Highway and are screened by vegetation along the highway and within Dillingham Ranch. The building will not be visible from Farrington Highway. Regardless, this small building will be designed to be unobtrusive. Additionally this structure will be screened with newly planted vegetation.

13. *Requires substantial energy consumption*

Construction and daily activities associated with the proposed Connection to Farrington Highway improvements will not require substantial amounts of energy. Construction and operation of the WTP

will not require substantial amounts of energy. Small amounts of electric energy will be required to operate the WTP pump and chlorination facility.

Section 9: Findings

In accordance with the provisions set forth in HRS, Chapter 343, and the significance criteria in HAR, Section 11-200-12 of Title 11, Chapter 200, it is anticipated that the proposed projects will have no significant adverse impacts, including secondary or cumulative impacts, to water quality, air quality, flora and fauna, scenic and visual resources, existing utilities, noise levels, social welfare, historic and archaeological resources, or wildlife habitat. All anticipated impacts are expected to be temporary in duration and will not adversely impact the environmental quality of the area. An Environmental Impact Statement (EIS) will not be required and a Finding of No Significant Impact (FONSI) will therefore be issued for this project.

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