

COUNTY OF HAWAI‘I PLANNING DEPARTMENT
BACKGROUND REPORT

HAWAII ISLAND COMMUNITY DEVELOPMENT CORPORATION
STATE LAND USE DISTRICT BOUNDARY AMENDMENT APPLICATION
(PL-SLU-2024-000011)
CHANGE OF ZONE APPLICATION (PL-REZ-2024-000066)
PLANNED UNIT DEVELOPMENT APPLICATION (PL-PUD-2024-000004)

HAWAII ISLAND COMMUNITY DEVELOPMENT CORPORATION has submitted applications for a State Land Use District Boundary Amendment from an Agricultural to an Urban District, a Change of Zone from an Agricultural-1 Acre (A-1a) zoning district to a Single-Family Residential-10,000 square feet (RS-10) zoning district and for a Planned Unit Development (PUD) Permit to allow various exceptions from Chapter 23 (Subdivision) of the Hawai‘i County Code in order to develop an affordable 43-lot, single-family residential subdivision on a 14.321-acre portion of a larger 237.5-acre parcel of land. The subject property is located at the southwest corner of the intersection of Kawaihae Road and Waiula Drive, Kawaihae 2nd-Lanikepu, Waimea, South Kohala, Hawai‘i, TMK: (3) 6-2-001:075 (por.)

PROPOSED ACTION

1. **Applicant’s Request:** The applicant proposes to develop a 43-lot, 100% affordable, single-family residential subdivision, with a minimum of 10,000 square foot lots on 14.321 acres of land. The proposed project will occur on two, non-contiguous areas as follows: 1) a 13.005-acre section that will support 39 lots (hereinafter ‘Project Lot 1’); and 2) a 1.316-acre section that will support 4 lots (hereinafter ‘Project Lot 2’). The requested PUD exceptions would allow project roadways within Project Lot 1 to be developed with paved shoulders, swales, and driving lanes equal to the width of proposed roadway rights-of-ways with no curbs, gutters and sidewalks provided. Please note, the original application included cross sections for proposed 40-, 50-, and 60-foot-wide roadway improvements, however, the applicant subsequently updated planned roadway design for the proposed 50- and 66-foot-wide roadways to meet DPW roadway

requirements outlined in Sheet R-18. Street Cross-sections without Sidewalk of the DPW standard details manual (see highlighted section of Figure 6a. R-18 Roadway Sections of the PUD application). Despite the preceding, the modified sub-pavement and pavement treatment will be the same for all roadways. The following three entitlements are needed to develop the proposed project:

1. The applicant is requesting to amend the State Land Use Boundary designation from an Agricultural to an Urban district. The State Land Use Urban district includes lands that are now in urban use and have a sufficient reserve area for foreseeable urban growth. Activities and uses within urban lands are controlled by ordinances or regulations of the County that the urban district is situated (**Planning Department Exhibit 1 – State Land Use Urban District, HRS 205-2 (a)(1) and (c)**).
2. Additionally, the applicant proposes to change the zoning district from an Agricultural-1 acre (A-1a) to a Single-Family Residential-10,000 square feet (RS-10) zoning for a 14.321-acre portion of a larger 237.5-acre parcel of land. The proposed RS-10 zoning would allow a maximum density of 62 lots. (**Planning Department Exhibit 2 - Zoning Code Requirements for Single-Family Residential Districts**).
3. Finally, the applicant is requesting a Planned Unit Development (PUD) permit to allow for the following exceptions to the Subdivision Code to facilitate the development of a 43-lot, affordable single-family residential subdivision consisting of self-help and turnkey housing units:

Exceptions Requested from Subdivision Code (HCC Chapter 23)

- **Minimum Right-of-Way and Pavement Widths (HCC §23-41).** Request that the requirement that cul-de-sac and dead-end streets have a minimum right-of-way width of 50 feet be waived to allow a four-lot subdivision (Project Lot 2) to be served by two dead end streets with 40-foot-wide rights-of-way and a length not to exceed 150 feet with no cul-de-sac or hammerhead turnaround. (See Figure 5. Schematic Site Plan of the PUD application)

- **Justification:** This exception would allow a smaller and more appropriate access for the limited number of lots served. It would also be sufficient for a fire truck to reverse and exit the site if they are called on in the event of a fire. Allowing this and the County accepting dedication of project roadways would reduce costs and provide for assured maintenance of the access ways.
- **Grades and Curves (HCC §23-50).** Request relief from the requirement for a minor street to have a 300-foot minimum horizontal curve. (See Figure 5. Schematic Site Plan of the PUD application)
 - **Justification:** The allowance of a 200-foot horizontal curve radius (as shown on the site plan for the 50-foot-wide minor street) conforms to guidelines provided in AASHTO standards, which provide for 200-foot horizontal curves at 25 miles per hour. The 200-foot horizontal curve allows the reverse curve road alignment to fit within the site constraints and to create the best lot configuration. Utilizing a 300-foot horizontal curve would reduce the useable depth of the lots between the two cul-de-sacs due to the steep slopes in the rear portion of these lots. The 200-foot horizontal curve is planned just before a stop sign so cars will either be slowing to a stop or traffic turning into the street will be slowly accelerating after turning into the street. Providing a smaller radius curve will discourage speeding and function as a traffic calming measure. This is important in a neighborhood where children will be present.
- **Requirements for Dedicable Streets (HCC §23-86).** Request relief from the requirement to construct project roadways to County dedicable standards, including the requirement to build the roadways to standards within the Subdivision Code as well as roadway specifications on file with the Department of Public Works (DPW). Specifically, the applicant is requesting relief from required right-of-way width, the installation of curbs, gutters, sidewalks and standard drainage facilities, and relief from requirements on roadway pavement thickness. These include the installation of

6-inch base course of four inches of compacted crusher run base with filler and two inches of asphalt concrete without the installation of a 6-inch sub-base material. (See Figure 6. Roadway Sections of the PUD application)

- **Justification:** The proposed road section with 2-inches of asphalt, which was the county standard until recently, will substantially reduce costs as compared with 3-inches of asphalt. Eliminating the crushed rock sub-base should also reduce costs while allowing the road section to perform satisfactorily according to a Geotechnical Study conducted for the project by Kokua Geotech LLC in June 2024 submitted with the application.
- **Requirements for sidewalks (HCC §23-89).** Request relief from the requirements for sidewalks for project roadways. Instead, the applicant proposes to install paved swales and shoulder equal to the right-of-way width to provide pedestrian access. (See highlighted sections of Figure 6. Roadway Sections and Figure 6a. R-18 Standard Details of the PUD application)
 - **Justification:** Utilizing paved shoulders and swales as pedestrian paths will reduce costs as compared to providing curbs, gutters and sidewalks. Also, if a curb, gutter and sidewalk section is used, seepage pits would not be possible given the county standard detail for intake structures above the drywells where curbs and gutters are present. This would necessitate use of deep drywells which would conflict with the State Department of Health (DOH) prohibition of injection wells within one-quarter mile of a water well.
- **Curbs and Gutters (HCC §23-91).** Request to have the Planning Director determine that the construction of curbs and gutters are not necessary for roadways within the project area.
 - **Justification:** Instead of curbs and gutters, the applicant proposes to provide paved swales and shoulders consistent with details depicted in the highlighted sections of Figure 6. Roadway Sections and Figure 6a. R-18 Standard Details of the PUD application. Paved swales and shoulders would result in

substantially less cost for the eventual buyer of the lots as compared to curbs, gutters and sidewalks and would provide the same level of drainage capacity.

- **Drainage, Flood, and Erosion Mitigation Measures (HCC §23-92).** Request to allow the use of seepage pits in lieu of drywells for stormwater disposal. Under this request, drainage would be handled by swales that feed into seepage pits throughout the project area rather than standard drywells. (See Figure 7. Seepage Pit Details of the PUD application)
 - **Justification:** Due to the proposed 43-lot subdivision's proximity to proposed water wells slated for development by a third party, standard drywells would not be permitted by State Department of Health (DOH) Underground Injection Control (UIC) requirements which state, *"Any new injection well, other than subclass D injection wells, shall be sited beyond an area which extends at least one-quarter mile from any part of a drinking water source."* Should drywells be initially installed then followed by the development of the water wells, the drywells would have to be modified and additional seepage pits installed. This process would be expensive and reduce the overall affordability of the proposed project; thus, it would be prudent to proactively plan for the impact of the water well development now by installing the required drainage using seepage pits rather than drywells.

Internal roadways and drainage systems will be built to non-dedicable standards, and the applicant proposes to dedicate these roadways and drainage systems to the County once constructed.

2. **Purpose of the Request:** The requested land use entitlement changes are necessary to facilitate the 43-lot subdivision that will provide building sites for the HICDC self-help and turnkey housing program for low to moderate income households all of which will be in the County of Hawai'i's affordable housing guidelines. HICDC's intent is to provide as many self-help homes as possible given federal funding limitations. Turnkey homes would be suitable for households unable to provide the required self-help labor or due to

their incomes being above 80% of the area median income which is the upper limit for the self-help program. Turnkey homes will be sold at prices affordable to households up to 140% of the area median income.

According to the applicant, the purpose for the requested PUD permit is to allow the development of an affordable single-family residential subdivision on a sloping undulating site while seeking to preserve the basic landforms, moderate grading, and minimize certain development costs where possible. The planned development sites residential uses on gently sloping portions of the larger site and leaves undeveloped the steeper slopes that intervene. A result of this approach is the need for longer and more costly access roads which traverse the steeper portions of the site. These site factors and the desire to fit into the landscape work toward increasing costs. To achieve the desired affordability other design approaches are proposed to reduce costs that do not affect the functionality of the project.

3. **Project Timetable and Cost:** Should the proposed entitlements be approved in 2024; the applicant will promptly file the subdivision application with the Planning Department. Anticipated completion of the subdivision is expected within 5 years from the date of approval of the land use entitlements, or by the end of 2029. According to the applicant, the project is estimated to cost \$20 million.
4. **Landowner:** Hawaii Island Community Development Corporation.
5. **Supportive Information:** The applicant has submitted the attached in support of the request (**Planning Department Exhibit 3 - State Land Use District Boundary Amendment/Change of Zone Application & Planning Department Exhibit 4 - Planned Unit Development Application**)

BACKGROUND INFORMATION

6. **February 22, 1994:** Effective date of Change of Zone Ordinance No. 94 20, which rezoned 458.286 acres of land (including the entirety of the subject property) from Unplanned to Agricultural-1 acre (A-1a).
7. **November 13, 2014:** Approval date of Subdivision No. 10-000999-Revised(2) which

created the subject 237.5-acre parcel.

STATE, COUNTY & COMMUNITY PLANS

8. **State Land Use District:** Agricultural.
9. **General Plan LUPAG Map Designation:** Rural, which includes existing subdivisions in the State Land Use Agricultural and Rural districts that have a significant residential component. Typical lot sizes vary from 9,000-square feet to two acres. These subdivisions may contain small farms, wooded areas, and open fields as well as residences. Allowable uses within these areas, with appropriate zoning, may include commercial facilities that serve the residential and agricultural uses in the area, and community and public facilities. The Rural designation does not necessarily mean that these areas should be further subdivided to smaller lots. Most lack the infrastructure necessary to allow further subdivision.
10. **County Zoning:** Agricultural-1 Acre.
11. **South Kohala Community Development Plan (SKCDP):** The SKCDP was adopted by Ordinance No. 08 159 on December 1, 2008. The subject property is not situated within any town or community plan area and has no special designations in the SKCDP.
12. **Special Management Area (SMA):** The subject property is not situated within the SMA and is located approximately 3.6 miles from the nearest shoreline.

DESCRIPTION OF PROPERTY AND SURROUNDING AREA

13. **Subject Property:** The subject, 237.5-acre parcel is irregularly shaped with an undulating terrain, gently sloping from north to south. The property is vacant of any structures or improvements. The 14.321-acre project area consists of two non-contiguous areas of 13.005 acres and 1.316 acres respectively situated near Waiula Drive. These areas were selected to take advantage of relatively flat terrain for ease of subdivision development. Within the larger parcel, there are three, approximately 10,000 square foot lots owned by Bridge Aina Le‘a Hawai‘i LLC that are designated for the development of water wells, including one lot situated approximately 300 feet southeast of the project area. The subject property was donated to the applicant in 2024 for the purpose of

developing affordable housing.

14. **Surrounding Land Uses/Zoning:** The Waimea Landmark Estates Subdivision, zoned Agricultural-3 Acres (A-3a), is located across Kawaihae Road to the north. Properties to the east consist of the Kanehoa and Anekona Estates subdivisions, with lands zoned Agricultural-5 Acres (A-5a) and Residential and Agricultural-2 acres (RA-2a). Directly to the south is an approximately 8,500-acre, State-owned parcel zoned Agricultural-5 Acres (A-5a) and to the west is a vacant parcel, also owned by the applicant and similarly zoned Agricultural-1 Acre (A-1a). It should be noted that immediately to the east of the proposed project area are two affordable housing developments, the Ouli Cottages project, consisting of 33 multiple-family, rental housing units built in 1995 and the Ouli Self Help Housing project, consisting of 40 lots developed between 1999 and 2004. These properties are on lands that were reclassified from Agricultural to an Urban in 1994 and received relief from Hawai'i County zoning requirements in 1994 from the County Council as part of a HRS 201E affordable housing program (which is now called the HRS 201H program), thus, they are still zoned Agricultural-1 Acre (A-1a).
15. **U.S.D.A. Soil Survey:** Pu'u Pa extremely stony very fine sandy loam, 6 to 20 % slopes (PVD). Permeability is rapid, runoff is medium, and the erosion hazard is moderate. Roots penetrate to the fragmental A'a lava. This soil type is used for pasture.
16. **Land Study Bureau Soil Rating:** Soils within the project site are classified as "E" or "Very Poor" for agricultural productivity.
17. **Agricultural Lands of Importance to the State of Hawai'i (ALISH):** Unclassified.
18. **Flood Zone:** The project area is situated within Flood Zone "X," which is determined by FEMA to be an area of minimal flood hazard.
19. **Unexploded Ordinance:** The project area falls within the former Waikoloa Maneuver Area, historically used for World War II military training. A survey by the Army Corps of Engineers found no significant munitions of explosive concern in the project area, though one rifle grenade was discovered and determined to be non-hazardous. The site has been mostly cleared, but further remediation is ongoing. A final report with a

Remedial Design and Action Plan, including monitoring protocols, is expected to be produced by the US Army Corps of Engineers. This clearance is essential, especially for areas where USDA funding for self-help housing requires full remediation prior to construction.

20. **Flora/Fauna Resources:** The applicant included a professional floral or faunal survey entitled, “*Biological Survey of the Ouli Lands, TMKs 6-2-1: 74 and 75 South Kohala District, Island of Hawai‘i*” prepared by Geometrician Associated LLC in August 2023 as Appendix A of the application. This study covered 257.338 acres of land, including the proposed project area. The survey found that the area is dominated by non-native plant species such as buffel grass, fountain grass, and koa haole shrubs, with limited presence of native plants like ‘uhaloa, ‘ilima, and sandalwood. No rare, threatened, or endangered plant species were identified during the survey, and the habitat is considered unsuitable for such species. The presence of invasive species like tree tobacco, which supports the endangered Blackburn’s sphinx moth, requires careful management to prevent its spread. The area lacks critical habitats for native flora, although some isolated native plants were noted at low coverage levels.

In terms of wildlife, the survey recorded 14 bird species, most of which were non-native, except for a single pueo (Hawaiian short-eared owl) sighting. Feral mammals such as cats, goats, and cattle were observed, all of which are detrimental to the native ecosystem. Although the endangered Hawaiian hoary bat may use the area for seasonal foraging and roosting, no sightings were confirmed during the survey. Invertebrate species like the endangered, yellow-faced bee are unlikely to inhabit the property due to insufficient habitat conditions. Recommended mitigation measures include controlling invasive species, protecting native fauna during critical breeding seasons, and shielding outdoor lighting to prevent disorientation of seabirds.

21. **Archaeological/Cultural/Historical Resources:** An Archaeological Inventory Survey (AIS) entitled, “*Archaeological Inventory Survey of TMK: (3) 6-2-001: 075 portion, Ouli Auhupua’a, South Kohala District, Island of Hawai‘i*” (see Appendix B of the

SLUBA/Change of Zone Application), was produced by Ogden Environmental and Energy Services, Co., Inc. in 1990, revised in 1993 and approved by SHPD in 1994. The AIS was originally created for the evaluation of the Waikoloa Maneuver Area, a 91,000-acre area used for military training exercises during World War II, which includes the proposed project area. The AIS identified a total of 75 sites within the 91,000-acre area. These included sites related to military training, ranching, historic period use, and traditional Hawaiian use. Nine (9) of these sites were recommended for further work, including 2 historic sites and a burial site located more than ½ mile away from the project area. A preservation plan and a burial treatment plan for the sites were approved by the State Historic Preservation Division in 2001 and 2003 respectively. The applicant submitted a study entitled, “*Cultural Impact Assessment TMK: (3) 6-2-001: 075 portion, Ōuli Ahupua‘a, South Kohala District, Island of Hawai‘i*” prepared by Kulaiwi Archeology, LLC and dated July 2024 (see Appendix C of the SLUBA/Change of Zone Application). The study investigated the potential impacts of development on cultural and historical resources, relying on archival research, previous archaeological studies, and oral histories. The assessment revealed that, while traditional Hawaiian activities were primarily shoreline-based and seasonal, upland areas served as transit zones, with trails historically maintained by local families for access to coastal resources. The area, known as a dry and arid land (‘Āina kaha), was later influenced by the sandalwood trade and, more substantially, by 19th-century ranching activities connected to Parker Ranch, as well as World War II military training in the Waikoloa Maneuver Area. Despite these historical activities, the CIA identified no significant cultural practices or traditional resources directly within the project’s Area of Potential Effect (APE). It concluded that the proposed development would not interfere with known cultural resources, as the land itself had no direct ties to ongoing Hawaiian practices, though standard protocols would apply if any cultural resources were inadvertently discovered during construction.

22. **Public Access:** There is no known public access to the mountains or the shoreline that traverses the property.

23. **Traffic:** Section 25-2-46 (d) (1) of the concurrency provision in the Zoning Code requires a Traffic Impact Analysis Report (TIAR) as part of any rezoning application in situations where the project can generate 50 or more peak hour trips. Given the number of lots (43) proposed by the applicant, this requirement was not triggered. Despite the preceding, the applicant did submit a TIAR, prepared by the Traffic Management Consultant (TMC) in January 2024 (see Appendix D of the SLUBA/Change of Zone Application). The TIAR provides analysis on existing and future traffic conditions, focusing on peak hour traffic volumes and the projected impact of the proposed development on two intersections: 1) Kawaihae Road and Waiula Drive; and 2) the proposed intersection of the internal roadway system and Waiula Drive. According to the TIAR, presently, Kawaihae Road, a two-lane arterial highway, experiences over 600 vehicles per hour (vph) during the morning peak and around 700 vph during the evening peak, while Waiula Drive, a local road, carries about 40 vph in the morning and 50 vph in the evening. The intersection of Kawaihae Road and Waiula Drive operates at Level of Service (LOS) “B” during peak hours, with the westbound left turn from Kawaihae Road into Waiula Drive functioning at LOS “A”. The proposed housing project is anticipated to generate 35 additional trips during the AM peak and 45 during the PM peak. By 2028, Waiula Drive is expected to maintain its current LOS “B” rating, and the left-turn movement from Kawaihae Road will continue to operate at LOS “A”. However, by 2043, Waiula Drive’s LOS is projected to degrade to LOS “C” during peak hours, which is well above the LOS “E” and “F” that the Zoning Code deems unacceptable, thus no significant traffic mitigation is recommended, as the project is not expected to significantly affect overall traffic operations.

UTILITIES AND SERVICES

24. **Roadway Access:** Proposed access to the subject properties is from Waiula Drive, a County-owned and maintained, two-lane roadway with 50-foot-wide pavement (12-foot-wide travel lane and 13-foot-wide paved shoulders) within a 50-foot-wide right-of-way. There is a secondary emergency access through a gate at the eastern terminus of Waiula

Drive at the Anekona Subdivision, which connects to Kanehoa Street. This road offers an additional route to Kawaihae Road for emergencies. The gate can be opened by the Fire Department or Civil Defense during emergencies. Internal roadways will be built to non-dedicable standards as outlined in the PUD request above and the applicant proposes to dedicate the roadways to the County once constructed.

According to the Department of Public Works-Engineering Division (DPW), all road connections and construction within Waiula Drive shall conform to Chapter 22, County Streets, of the Hawai'i County Code. Additionally, DPW recommends that the applicant provide improvements to project street frontages, including but not limited to concrete sidewalks, drainage improvements, and any required utility relocation, meeting with the requirements of the Americans with Disabilities Act. Finally, DPW supports some of the deviations from the subdivision code requested in the PUD application (grades and curves, alternative pavement design/thickness, and shallow drainage facilities) but does not support relief from minimum right-of-way and pavement widths, and relief from the requirements of curbs, gutters, and sidewalks. If these exceptions are granted, DPW is not willing to accept dedication of the roadways as they would not meet dedicable roadway standards.

25. **Water:** Water will be available for the proposed 43-lot subdivision from the Department of Water Supply's (DWS) transmission system coming down Kawaihae Road and connecting to Waiula Drive. The 8-inch line within the Waiula Drive right-of-way is looped with the DWS system in the Anekona Subdivision. According to the applicant and the Department of Water Supply (DWS), the project currently has 35 water commitments and an additional 8 water commitments will be made available to support the proposed 100% affordable housing project. (**Planning Department Exhibit 5 - October 22, 2024**
Email from Keith Kato and Planning Department Exhibit 6 - December 22, 2023
Memo from DWS)
26. **Wastewater:** As there is no County sewer line in this area, each lot resulting from the proposed subdivision will be serviced by individual wastewater systems meeting with the

requirements and approval of the State Department of Health in conjunction with the building permit process.

27. **Solid Waste:** There are no municipal waste collection services in the County. Solid waste will either be handled by commercial haulers or individual lot owners who will dispose of the refuse at authorized transfer stations or landfill sites.
28. **Utilities and Services:** Electrical, telephone and internet services are available to the project site. Police and medical services are located in Waimea, approximately 7.5 miles away. There is a volunteer fire station located at the top of Waiula Drive, adjacent to the project site. The nearest manned fire and emergency services stations are also in Waimea and near the South Kohala resort area, approximately 7.5 and 9.4 miles away, respectively.

AGENCY COMMENTS

29. **Department of Public Works-Engineering Division: (Planning Department Exhibit 7 - September 12, 2024 memo for the Change of Zone & SLUBA, Planning Department Exhibit 8 - September 12, 2024 memo for the PUD and Planning Department Exhibit 9 – November 1, 2024 memo for the PUD)**
30. **State Department of Health: (Planning Department Exhibit 10 – August 26, 2024 Memo for the SLUBA & Change of Zone & Planning Department Exhibit 11 – August 26, 2024 Memo for PUD)**
31. **State Office of Planning and Sustainable Development: (Planning Department Exhibit 12 – September 12, 2024 letter)**

AGENCIES - NO COMMENTS OR CONCERNS

32. Police Department.

AGENCIES – NO RESPONSE

33. Department of Public Works-Traffic Division, Department of Environmental Management, Fire Department, Office of Housing and Community Development, State Department of Transportation, State Land Use Commission, State Department of

Agriculture, State Department of Land and Natural Resources, South Kohala Traffic
Safety Committee.

PUBLIC COMMENTS

34. None at the date of this publication.

2023 Hawaii Revised Statutes

Title 13. Planning and Economic Development

205. Land Use Commission

205-2 Districting and classification of lands.

Universal Citation: HI Rev Stat § 205-2 (2023)

[◀ Previous](#)

[Next ▶](#)

§205-2 Districting and classification of lands. (a) There shall be four major land use districts in which all lands in the State shall be placed: urban, rural, agricultural, and conservation. The land use commission shall group contiguous land areas suitable for inclusion in one of these four major districts. The commission shall set standards for determining the boundaries of each district, provided that:

- (1) In the establishment of boundaries of urban districts those lands that are now in urban use and a sufficient reserve area for foreseeable urban growth shall be included;
- (2) In the establishment of boundaries for rural districts, areas of land composed primarily of small farms mixed with very low density residential lots, which may be shown by a minimum density of not more than one house per one-half acre and a minimum lot size of not less than one-half acre shall be included, except as herein provided;

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

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

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

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

In addition, urban districts shall include geothermal resources exploration and geothermal resources development, as defined under section 182-1, as permissible uses.

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

In addition to the uses listed in this subsection, rural districts shall include geothermal resources exploration and geothermal resources development, as defined under section

182-1, and construction and operation of wireless communication antenna, as defined under section 205-4.5(a)(18), as permissible uses.

(d) Agricultural districts shall include:

(1) Activities or uses as characterized by the cultivation of crops, crops for bioenergy, orchards, forage, and forestry;

(2) Farming activities or uses related to animal husbandry and game and fish propagation;

(3) Aquaculture, which means the production of aquatic plant and animal life within ponds and other bodies of water;

(4) Wind-generated energy production for public, private, and commercial use;

(5) Biofuel production, as described in section 205-4.5(a)(16), for public, private, and commercial use;

(6) Solar energy facilities; provided that:

(A) This paragraph shall apply only to land with soil classified by the land study bureau's detailed land classification as overall (master) productivity rating class B, C, D, or E; and

(B) Solar energy facilities placed within land with soil classified as overall productivity rating class B or C shall not occupy more than ten per cent of the acreage of the parcel, or twenty acres of land, whichever is lesser, unless a special use permit is granted pursuant to section 205-6;

(7) Bona fide agricultural services and uses that support the agricultural activities of the fee or leasehold owner of the property and accessory to any of the above activities, regardless of whether conducted on the same premises as the agricultural activities to which they are accessory, including farm dwellings as defined in section 205-4.5(a)(4), employee housing, farm buildings, mills, storage facilities, processing facilities, photovoltaic, biogas, and other small-scale renewable energy systems producing energy solely for use in the agricultural activities of the fee or leasehold owner of the property, agricultural-energy facilities as defined in section 205-4.5(a)(17), vehicle and equipment storage areas, and plantation community subdivisions as defined in section 205-4.5(a)(12);

(8) Wind machines and wind farms;

(9) Small-scale meteorological, air quality, noise, and other scientific and environmental data collection and monitoring facilities occupying less than one-half acre of land; provided that these facilities shall not be used as or equipped for use as living quarters or dwellings;

(10) Agricultural parks;

(11) Agricultural tourism conducted on a working farm, or a farming operation as defined in section 165-2, for the enjoyment, education, or involvement of visitors; provided that the agricultural tourism activity is accessory and secondary to the principal agricultural use and does not interfere with surrounding farm operations; and provided further that this paragraph shall apply only to a county that has adopted ordinances regulating agricultural tourism under section 205-5;

(12) Agricultural tourism activities, including overnight accommodations of twenty-one days or less, for any one stay within a county; provided that this paragraph shall apply only to a county that includes at least three islands and has adopted ordinances regulating agricultural tourism activities pursuant to section 205-5; provided further that the agricultural tourism activities coexist with a bona fide agricultural activity. For the purposes of this paragraph, "bona fide agricultural activity" means a farming operation as defined in section 165-2;

(13) Open area recreational facilities;

(14) Geothermal resources exploration and geothermal resources development, as defined under section 182-1;

(15) Agricultural-based commercial operations registered in Hawaii, including:

(A) A roadside stand that is not an enclosed structure, owned and operated by a producer for the display and sale of agricultural products grown in Hawaii and value-added products that were produced using agricultural products grown in Hawaii;

(B) Retail activities in an enclosed structure owned and operated by a producer for the display and sale of agricultural products grown in Hawaii, value-added products that were produced using agricultural products grown in Hawaii, logo items related to the producer's agricultural operations, and other food items;

(C) A retail food establishment owned and operated by a producer and permitted under chapter 11-50, Hawaii administrative rules, that prepares and serves food at retail using products grown in Hawaii and value-added products that were produced using agricultural products grown in Hawaii;

(D) A farmers' market, which is an outdoor market limited to producers selling agricultural products grown in Hawaii and value-added products that were produced using agricultural products grown in Hawaii; and

(E) A food hub, which is a facility that may contain a commercial kitchen and provides for the storage, processing, distribution, and sale of agricultural products grown in Hawaii and value-added products that were produced using agricultural products grown in Hawaii.

The owner of an agricultural-based commercial operation shall certify, upon request of an officer or agent charged with enforcement of this chapter under section 205-12, that the agricultural products displayed or sold by the operation meet the requirements of this paragraph;

(16) Hydroelectric facilities as described in section 205-4.5(a)(23); and

(17) Composting and co-composting operations; provided that operations that process their own green waste and do not require permits from the department of health shall use the finished composting product only on the operation's own premises to minimize the potential spread of invasive species.

Agricultural districts shall not include golf courses and golf driving ranges, except as provided in section 205-4.5(d). Agricultural districts include areas that are not used for, or that are not suited to, agricultural and ancillary activities by reason of topography, soils, and other related characteristics.

(e) Conservation districts shall include areas necessary for protecting watersheds and water sources; preserving scenic and historic areas; providing park lands, wilderness, and beach reserves; conserving indigenous or endemic plants, fish, and wildlife, including those which are threatened or endangered; preventing floods and soil erosion; forestry; open space areas whose existing openness, natural condition, or present state of use, if retained, would enhance the present or potential value of abutting or surrounding communities, or would maintain or enhance the conservation of natural or scenic resources; areas of value for recreational purposes; other related activities; and other permitted uses not detrimental to a multiple use conservation concept. Conservation

districts shall also include areas for geothermal resources exploration and geothermal resources development, as defined under section 182-1. [L 1963, c 205, pt of §2; Supp, §98H-2; HRS §205-2; am L 1969, c 182, §5; am L 1975, c 193, §3; am L 1977, c 140, §1 and c 163, §1; am L 1980, c 24, §2; am L 1985, c 298, §2; am L 1987, c 82, §3; am L 1989, c 5, §2; am L 1991, c 191, §1 and c 281, §2; am L 1995, c 69, §8; am L 2005, c 205, §2; am L 2006, c 237, §3 and c 250, §1; am L 2007, c 159, §2; am L 2008, c 31, §2 and c 145, §2; am L 2011, c 217, §2; am L 2012, c 97, §6, c 113, §2, c 167, §1, and c 329, §3; am L 2014, c 55, §2; am L 2015, c 228, §2; am L 2016, c 173, §2; am L 2017, c 12, §15 and c 129, §2; am L 2018, c 49, §3; am L 2022, c 131, §2]

Note

The 2018 amendment applies to permit applications filed with the State or county after December 31, 2018. L 2018, c 49, §6(2).

Cross References

Districts, generally, see chapter 4.

Attorney General Opinions

Uses within agricultural districts. Att. Gen. Op. 62-33, 62-38.

Dwellings permissible under this section are further defined by regulations established under §205-7. Att. Gen. Op. 75-8.

Law Journals and Reviews

Avoiding the Next Hokuli`a: The Debate over Hawai`i's Agricultural Subdivisions. 27 UH L. Rev. 441 (2005).

Case Notes

Cited: 134 H. 187, 339 P.3d 685 (2014).

◀ Previous

Next ▶

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Section 25-4-68. Grounds for approval or denial.

The director shall approve an application for recognition of a de minimis structure position discrepancy unless:

- (a) The discrepancy is greater than the difference as allowed by the de minimis structure position discrepancy definition, or
- (b) The director finds that the improvement was placed with knowledge that it would violate the minimum yard or open space requirements; or
- (c) The improvement could be moved, or the discrepancy otherwise corrected, without significant expense, difficulty, or hardship to the applicant.

(2002, ord 02-70, sec 3.)

Section 25-4-69. Recognition of de minimis structure position discrepancy.

If the director accepts the application for recognition of de minimis structure position discrepancy, the director shall notify the applicant in writing that the discrepancy is not a violation of the zoning code and that it may remain in place without a variance.

(2002, ord 02-70, sec 3.)

Section 25-4-70. Disclosure.

A de minimis structure position discrepancy shall be disclosed by the owner to subsequent purchasers of the property in question.

(2002, ord 02-70, sec 3.)

Section 25-4-71. Appeals.

The director's decision with respect to a de minimis structure position discrepancy is appealable to the board of appeals.

(2002, ord 02-70, sec 3.)

Article 5. Zoning District Regulations.**Division 1. RS, Single-Family Residential Districts.****Section 25-5-1. Purpose and applicability.**

The RS (single-family residential) district provides for lower or low and medium density residential use, for urban and suburban family life. It applies to areas having facilities, and to carry out the above stated purpose.

(1996, ord 96-160, sec 2; ratified April 6, 1999.)

Section 25-5-2. Designation of RS districts.

Each RS (single-family residential) district shall be designated on the zoning map by the symbol "RS" followed by a number which specifies the required minimum building site area in thousands of square feet.

(1996, ord 96-160, sec 2; ratified April 6, 1999.)

Section 25-5-3. Permitted uses.

- (a) The following uses shall be permitted in the RS district:
- (1) Adult day care homes.
 - (2) Apiaries.
 - (3) Cemeteries and mausoleums, as permitted under chapter 6, article 1 of this Code.
 - (4) Community buildings, as permitted under section 25-4-11.
 - (5) Crop production.
 - (6) Dwellings, single-family.
 - (7) Family child care homes.
 - (8) Group living facilities.
 - (9) Home occupations, as permitted under section 25-4-13.
 - (10) Meeting facilities.
 - (11) Model homes, as permitted under section 25-4-8.
 - (12) Neighborhood parks, playgrounds, tennis courts, swimming pools, and similar neighborhood recreational areas and uses.
 - (13) Public uses and structures, as permitted under section 25-4-11.
 - (14) Short-term vacation rentals situated in the general plan resort and resort node areas.
 - (15) Temporary real estate offices, as permitted under section 25-4-8.
 - (16) Utility substations, as permitted under section 25-4-11.
- (b) In addition to those uses permitted under subsection (a) above, the following uses may be permitted in the RS district, provided that a use permit is issued for each use:
- (1) Bed and breakfast establishments as permitted under section 25-4-7.
 - (2) Care homes.
 - (3) Churches, temples and synagogues.
 - (4) Crematoriums, funeral homes, funeral services, and mortuaries.
 - (5) Day care centers.
 - (6) Golf courses and related golf course uses, including golf driving ranges, golf maintenance buildings and golf club houses, provided that the property is within the state land use urban or rural district. Golf courses and golf driving ranges shall not be permitted within the state land use agricultural district unless approved by the County before July 1, 2005.
 - (7) Hospitals, sanitariums, old age, convalescent, nursing and rest homes.
 - (8) Medical clinics.
 - (9) Schools.
 - (10) Telecommunication antennas and towers.
 - (11) Yacht harbors and boating facilities.
- (c) Buildings and uses normally considered directly accessory to the uses permitted in this section shall also be permitted in the RS district.
- (1996, ord 96-160, sec 2; ratified April 6, 1999; am 2012, ord 12-28, sec 3; am 2014, ord 14-86, sec 3; am 2018, ord 18-114, sec 5; am 2019, ord 19-100, sec 3; am 2021, ord 21-26, sec 5; am 2024, ord 24-65, secs 7 and 10.)

Section 25-5-4. Height limit.

The height limit in the RS district shall be thirty-five feet.
(1996, ord 96-160, sec 2; ratified April 6, 1999.)

Section 25-5-5. Minimum building site area.

The minimum building site area in the RS district shall be seven thousand five hundred square feet.

(1996, ord 96-160, sec 2; ratified April 6, 1999.)

Section 25-5-6. Minimum building site average width.

Each building site in the RS district shall have a minimum average width of sixty feet, plus two feet for each five hundred square feet of required building site area in excess of seven thousand five hundred square feet, except that no building site shall be required to have an average width of more than one hundred fifty feet.

(1996, ord 96-160, sec 2; ratified April 6, 1999.)

Section 25-5-7. Minimum yards.

The minimum yards in the RS district shall be as follows:

- (1) On a building site with a required area of seven thousand five hundred square feet to and including nine thousand nine hundred ninety-nine square feet:
 - (A) Front and rear yards, fifteen feet; and
 - (B) Side yards, eight feet.
- (2) On a building site with a required area of ten thousand square feet to and including nineteen thousand nine hundred ninety-nine square feet:
 - (A) Front and rear yards, twenty feet; and
 - (B) Side yards, ten feet.
- (3) On a building site with a required area of twenty thousand square feet or more:
 - (A) Front and rear yards, twenty-five feet; and
 - (B) Side yards, fifteen feet.

(1996, ord 96-160, sec 2; ratified April 6, 1999; am 1997, ord 97-88, sec 1.)

Section 25-5-8. Other regulations.

- (a) There may be more than one single-family dwelling on each building site in an RS district provided there is not less than the required minimum building site area for each dwelling.
- (b) One guest house, in addition to a single-family dwelling, may be located on any building site in the RS district.
- (c) An ohana dwelling may be located on any building site in the RS district, as permitted under article 6, division 3 of this chapter.
- (d) If a legal building site in the RS district has less area or average width than is required, then the yard requirements for the building site shall be the same as in the RS district having the largest requirements for which the building site can comply.
- (e) Exceptions to the regulations for the RS district regarding heights, building site areas, building site average widths and yards, may be approved by the commission within a planned unit development, or by the director within a cluster plan development.

(1996, ord 96-160, sec 2; ratified April 6, 1999; am 2015, ord 15-33, sec 3.)

STATE LAND USE BOUNDARY AMENDMENT APPLICATION
(15 ACRES OR FEWER)

COUNTY OF HAWAII
PLANNING COMMISSION
(Type or legibly print the requested information)

PETITIONER(S): Hawaii Island Community Development Corporation

PETITIONER(S) SIGNATURE: Keith Kato
DATE: 2024.07.12

ADDRESS: 100 Pauahi Street #201 Hilo, Hawaii 96720

LIST PETITIONER(S) INTEREST (if not owner):

PHONE: (Bus.) 808-319-2422 (Res.) (Email)

REQUEST: Agricultural TO Urban
(Existing SLU Classification) (Proposed SLU Classification)

TAX MAP KEY: (3) 6-2-001: 075 portion

SIZE OF PROPERTY OR AFFECTED AREA(S) TO BE RECLASSIFIED: 14.366 acres

LANDOWNER(S): Hawaii Island Community Development Corporation

FEE SIMPLE LANDOWNER(S) WRITTEN AUTHORIZATION
(may be provided by letter with the below statement included):

Keith Kato
DATE:
DATE:

AGENT:

AGENT ADDRESS:

PHONE: (Bus.) 808-319-2422 (Res.) (Email)

Please indicate to whom original correspondence and copies should be sent.

ORIGINAL: Applicant HICDC COPIES:

CHANGE OF ZONE APPLICATION

COUNTY OF HAWAII PLANNING DEPARTMENT

(Type or legibly print the requested information)

APPLICANT: Hawaii Island Community Development Corporation

APPLICANT'S SIGNATURE: Keith Kato Digitally signed by Keith Kato
Date: 2024.07.12 10:32:18 -10'00' DATE: July 15, 2024

ADDRESS: 100 Pauahi Street suite 201 Hilo, Hawaii 96720

LIST APPLICANT'S INTEREST IF NOT OWNER: _____

LIST PRINCIPAL(S) INCLUDING NAMES OF MAIN OFFICERS: _____

PHONE:(Bus.) 808-319-2422 (Res.) _____ (Fax) _____

LANDOWNER(S): Hawaii Island Community Development Corporation

LANDOWNER SIGNATURE(S): Keith Kato Digitally signed by Keith Kato
Date: 2024.07.12 10:32:34 -10'00' DATE: July 15, 2024

(May be by letter)

LANDOWNER(S) ADDRESS: 100 Pauahi Street Suite 201 Hilo, Hawaii 96720

REQUEST Agriculture -1 acre (A-1a) to Single Family Residential – 10,000 Square Feet (RS-10)
(Existing zoning) (Proposed Zoning)

TAX MAP KEY: (3) 6-2-001: 075

STREET ADDRESS OF PROPERTY: _____

SIZE OF PROPERTY OR AFFECTED AREA(S) TO BE REZONED: 14.366 acres

AGENT: _____

ADDRESS: _____

TELEPHONE:(Bus.) _____ (Res.) _____ (Fax) _____

Please indicate to whom original correspondence and copies should be sent.

ORIGINAL: Applicant _____ COPIES: _____

ATTACHMENT

Residential Rezoning

PLANNING DEPARTMENT
COUNTY OF HAWAII

APPLICATION FOR CHANGE OF ZONE

1. If your request is approved, do you intend to subdivide the subject land in accordance with the approved change of zone?

Yes

If yes, please answer the rest of question 1 and then to question 3.

- a. How many acres of the requested area do you intend to subdivide?

All

- b. Into what lot sizes?

10,000+ SF

- c. If your request is approved, approximately how long after the date of approval do you expect to submit your subdivision plans to the Planning Department for preliminary approval?

1 Month

- d. Do you intend to build houses on the newly created lots?

Yes

If yes, please answer the following questions:

on how many of those lots?

All

At what approximate price range?

House

TBD

Lots

TBD

Total

TBD*

*Affordable to households up to
120% of AMI

Approximately how long, after approval of the subdivision, would the first house be available for occupancy?

1 year

If you intend to subdivide, please submit a preliminary schematic subdivision plan together with your change of zone application form.

2. If you have no firm plans of subdividing the subject area, do you intend to:
- a. Sell or lease the land to someone who has firm plans? _____
 - b. Sell or lease the land to someone who has tentative plans? _____
 - c. Sell or lease the land to someone who has no plans? _____
 - d. Keep it? _____
 - e. other (please state)
 - f. If you intend to do either a, b, or c, please elaborate on the kind of plans the other party has. Please, also, include in your answer approximately how soon after approval of your rezoning do you expect to transfer the subject land to another party.

-
3. Do you think that your request and your further plans for the land will alleviate the local housing situation?

Yes

How?

Providing affordable housing

-
4. Are there any buildings on the subject area?

No

If so, what kind?

what do you intend to do with those buildings if your request is approved?

5. Is the subject land currently being used for any agricultural activity?

Grazing

If so, please list the kinds of products grown and on how many square feet or acres of land per product.

6. To your knowledge, has there been any flooding and/or drainage problem on the subject area?

No

If so, please describe the problem.

7. Do you think that the roads leading to the subject area need improvement?

No

If so, what kind?

Is the road adequate for the proposed traffic volume or bad?

Yes

8. What sort of governmental assistance and/or improvements do you feel will be needed in the subject area when developed?

	<u>yes</u>	<u>No</u>
a. Schools	<u> </u>	<u> X </u>
b. Roads	<u> </u>	<u> X </u>
c. Sewer	<u> </u>	<u> X </u>
d. Drainage	<u> </u>	<u> X </u>
e. police Protection	<u> </u>	<u> X </u>

	<u>Yes</u>	No
f. Fire Protection	_____	<u>X</u>
g. Recreational Facilities	_____	<u>X</u>
h. Public Utilities	_____	<u>X</u>
i. other	_____	_____

For those checked "yes," please elaborate what type or kinds of improvements and/or assistance are needed.

Signature: **Keith Kato** Digitally signed by Keith Kato
Date: 2024.02.07
16:33:08 -10'00'

Address: 100 Pauahi Street #201 Hilo, HI 96720

Telephone: 808-319-2422

Date: _____

OULI AFFORDABLE HOUSING APPLICATIONS: SLU, ZONING Background and Environmental Report

Identify Applicant and Landowner

The subject property is a 14.366 acre portion of tax map key 6-2-1: 75 owned by the Hawaii Island Community Development Corporation (HICDC) who is also the applicant for the State Land Use Boundary Amendment, Change of Zone, and Planned Unit Development Permit applications.

Location

The subject site is located in South Kohala, on the south side of the Waimea-Kawaihae Road, approximately midway between Waimea town and the Queen Kaahumanu Highway. The site is accessed off of Waiula Drive whose intersection with the Waimea-Kawaihae Road is approximately 3.5 miles east of the Queen Kaahumanu Highway-Waimea Kawaihae Road intersection. The site is a 14.366 acre portion of tax map key: 6-2-1: 75 and adjacent to the Ouli self help housing project and the Ouli Cottages rental project.

The site is located in reasonable proximity to the resort employment centers along the South Kohala Coast as well as Waimea Town and the West Hawaii region in general.

Nature of the Request – Affordable Self Help and Turnkey Housing

The requests are to amend the State Land Use District Urban boundary and to change the Zoned District to Single Family Residential – 10,000 square feet per unit and the Planned Unit Development permit.

The creation of this 43 lot subdivision will provide building sites for the HICDC self help and turnkey housing program for low to moderate income households all of which will be in the County of Hawaii's affordable housing guidelines. HICDC's intent is to provide as many self help homes as possible given federal funding limitations. Turnkey homes would be suitable for households unable to provide the required self help labor or due to their incomes being above 80% of the area median income which is the upper limit for the self help program. Turnkey homes will be sold at prices affordable to households up to 140% of the area median income.

The HICDC Self Help Affordable Housing Program assists eligible households to obtain a home financed by the U.S. Government. Once eligible, a low-interest loan is secured for the household and households are grouped to create a self-help project in which all households contribute labor toward the construction of all homes in the project. Specialty trade work including plumbing and electrical is conducted by licensed contractors while the remaining work (approximately 65%) is constructed by the households with training and guidance from construction supervisors.

Households are permitted to occupy their respective homes once all homes in the project are completed. While not a perfect fit for everyone, the Self Help Affordable Housing Program can be a benefit to those that have the desire for homeownership and are willing and able to contribute the required labor hours.

To become eligible, at a minimum, a household must meet income eligibility requirements, maintain stable employment sufficient to repay a mortgage, possess acceptable credit and meet weekly labor hour requirements of 40 hours per weekend.

HICDC develops the lots, evaluates participant eligibility, processes loan applications, manages house plan design, procures specialty work, trains and supervises self help builders during construction. HICDC also manages subcontractors and receipt and payment of loan funds through project completion.

To date, HICDC has completed 400 self help homes on the island and over 400 senior rental units all for low income households. In addition, HICDC currently has a 100 unit family rental project under construction in North Kona.

Site Characteristics

The site is a portion of TMK: 6-2-1: 75 and is situated off of Waiula Drive. Access to the site would be via an access road connecting to Waiula Drive which in turn connects to the Waimea-Kawaihae Road. The terrain is undulating, rocky with thin soils. Rainfall in the vicinity average 8-19 inches per year. Typical vegetation where it exists is buffel grass, ekoa and scattered trees.

Surrounding Land Use

The location has reasonable proximity to commercial and governmental services in Waimea Town, as well as educational and religious institutions situated there. Similar affordable housing land uses exist in close proximity to the subject site and use the same access road – Waiula Drive. Toward the east are situated the large lot Kanehoa and Anekona subdivisions which are comprised of 90 lots ranging in size from 2.0 to 6.1 acres. To the north across the Waimea-Kawaihae Road is the Waimea Landmark Estates subdivision with 29 lots ranging in size from 2.2 to 7.8 acres in size. To the south lies the remainder of TMK: 6-2-1: 75, the Keanuio mano and Waikoloa Streams and the lands of Lalamilo. To the west is vacant land and the Mauna Kea development.

County and State Plans

The County of Hawaii General Plan adopted in 2005 designates the site as Rural which is described as follows:

Rural: This category includes existing subdivisions in the State Land Use Agricultural and Rural districts that have a significant residential component. Typical lot sizes vary from 9,000-square feet to two acres. These subdivisions may contain small farms, wooded areas, and open fields as well as residences. Allowable uses within these areas, with appropriate zoning, may include commercial facilities that serve the residential and agricultural uses in the area, and community and public facilities. The Rural designation does not necessarily mean that these areas should be further subdivided to smaller lots. Most lack the infrastructure necessary to allow further subdivision.

The proposed residential use would be compatible with the General Plan Rural designation as it would be a small scale residential development that will have adequate infrastructure to support its use. It would also be set in close proximity with the 40 home Ouli self help housing project developed in 1999-2004 and the 33 unit Ouli Cottages project completed in 1995.

The South Kohala Community Development Plan (2008)

The South Kohala CDP states:

GENERAL POLICY NO. 3: PROVIDE AFFORDABLE AND WORKFORCE HOUSING RESOURCES FOR LOW AND MODERATE INCOME INDIVIDUALS, FAMILIES, AND FOR THOSE RESIDENTS OF SOUTH KOHALA WITH SPECIAL NEEDS

Related sub-policies are:

- 3.1** The County shall establish policies and programs for the implementation of affordable and workforce housing projects in those areas of the island where such projects are most needed, including Waimea and Waikoloa Village.
- 3.2** The South Kohala Community shall organize one or more community-based, non-profit entities that can partner with the County Office of Housing and Community Development and with other non-profit organizations and for-profit contractors and developers to provide affordable housing units.
- 3.3** The County shall work toward the development of housing for senior citizens and assisted living facilities in South Kohala.
- 3.4** The County shall provide more opportunities for low income housing and transitional shelters.

From the South Kohala CDP: "During the CDP process, Waimea residents have said: "Please find a way to provide affordable housing so that our children can live in the town where they grew up." There is also a need for affordable housing for many of the key employees that work in Waimea, including teachers and hospital workers. An effective affordable housing program that would build affordable for sale homes and provide affordable rentals could be developed using a non-profit, locally-based housing corporation and the "land trust" model."

The proposed self help housing project for low income households would implement General Policy No. 3 and sub-policies relating to the development of workforce and affordable housing where such projects are most needed and implemented by a non-profit entity.

The State Land Use District for the subject site is presently Agriculture as are much of the surrounding lands. Although productivity of the land is marginal due to the scarcity of water and soil it was likely placed in the Agricultural District along with thousands of acres of land that were not deemed Urban, Rural, or Conservation at the time of the initial adoption of the State Land Use Districts in the early 1960's. A review of the ArcGIS Hub State of Hawaii Land Use District Boundaries Map does not show any subsequent boundary amendments for the subject property.

More recently, two parcels in close proximity to the subject site were reclassified from Agricultural to Urban to allow the development of the Ouli Cottages rental project owned by the County of Hawaii (TMK: 6-2-15: 45), and the Ouli Self Help Housing subdivision (TMK: 6-2-15: 01-40). The requested District Boundary Amendment would follow a similar path, i.e., redistricting to Urban followed by development of affordable housing. It should be noted that scattered Rural District Boundary Amendments have been approved in the Kanehoa and Anekona subdivisions.

A volunteer fire station on TMK: 6-2-15: 43 was approved by a Special Permit. This 3.132 acre site is owned by HICDC and leased to the County of Hawaii on a 99-year lease set to expire in 2113.

The County Zoning for the subject site is Agricultural – 1 Acre. This zoning was approved in 1994 by Ordinance 94-20 which designated 458 acres of land as A-1a. The A-1a zoning was requested by a prior landowner to allow the development of a golf course residential community. Subsequent to this the two affordable housing projects previously mentioned were developed, however, the golf course residential community was not developed.

Special Management Area (SMA) and Chapter 205A Coastal Zone Management

The subject sites are not located within the County special Management Area (SMA) and as such no SMA Use Permit would be required.

The objective of the Coastal Zone Management program as outlined in Chapter 205A is to protect the coastal waters and resources. The subject sites are situated 3.8 miles from the coast. The Waikoloa Stream and the intermittent Keanuiomano Stream lie to the south of the project site and those drainage ways do not include the proposed development sites. The project would have no impact to the region's recreational resources, significant archeological resources, scenic resources, nor impact the coastal ecosystem. The project will, however, stabilize the economy by providing workforce housing at affordable prices.

ENVIRONMENTAL SETTING

Topography, Soils and Climate

The property spans elevations of 1410 to 1460 feet above mean sea level. The surface geology is soil-mantled lava flows from Mauna Kea dated at 70,000-250,000 years before the present (Wolfe and Morris 1996). Soil is classified within the Hapuna-Waikui-Lalamilo complex, 0 to 20 percent slopes, a well-drained soil formed on ash layers above 'a'a flows with very or extremely cobbly medial silt loam in the top layers. The climate in the area is warm and semi-arid, with an average annual rainfall of about 8-19 inches, increasing in the mauka direction, and a mean annual air temperature of approximately 69.5 to 70.5 degrees Fahrenheit, increasing in the makai direction (Giambelluca et al 2014). The sunny skies and clean atmospheric conditions of this rain shadow area in the lee of the Kohala and Mauna Kea volcanoes leads to high temperatures, high solar radiation, high evapotranspiration and low rainfall, conditions that can be challenging for plant growth.

ALISH Designation/ Land Study Bureau

The Land Study Bureau classification for the subject site is "E" which is the lowest class in this system. The site is not identified as Important Agricultural Land by the ALISH report.

Lava Hazard Zone

The subject properties are located in Zone 8 which is a portion of Mauna Kea of which only a few percent of Zone 8 has been covered by lava in the past 10,000 years.

Flood Analysis

The subject site has been designated by US Army Corp of Engineers as FIRM Zone X as no development occurred in this area when the FIRM Maps were adopted. A drainage study will be completed for DPW review and approval as part of the subdivision process.

Flora Fauna

A survey of the site and surrounding area was conducted in 2023 by Ron Terry, PhD. and botanist Jen Lawson – see Appendix B. The report references tables and figures which can be found in Appendix A of the report and are not included here for brevity. The following are excerpts from the report:

As is typical elsewhere in the region, the vegetation on the property is dominated by buffel grass, fountain grass, alien herbs (especially rattlepod [*Crotalaria* spp.] and partridge pea [*Chamaecrista nictitans*]) and koa haole shrubs (Figures 3a-d). In the makai portion, kiawe is sparse but important in terms of biomass and for being the only true tree. A relatively diverse array of native herbs are omnipresent but at low cover levels. In rough order of prevalence they are ‘uhaloa, ‘ilima, pa‘ū o Hi‘iaka (*Jacquemontia ovalifolia*), ‘akia, pili grass, iliahi or sandalwood (only present at the extreme mauka of Parcel 75) and ‘a‘ali‘i (Figures 3e-g).

The bordering Waiulaula Gulch was not addressed in the field survey but is heavily covered with shrubs and trees, almost all non-native. It provides a sometimes lush and well-watered habitat for birds in the region. Other highly intermittent gulches run through the survey area and in places exhibit rudimentary riparian vegetation in the form of lines of koa haole shrubs (Figures 3h-i). The fringes of yards contain escapes from cultivation.

Flora and Rare, Threatened or Endangered Plants

All plant species found on the property during the survey are listed in Table 1. Of the 59 species detected, five were indigenous (native to the Hawaiian Islands and elsewhere) and three were endemic (found only in the Hawaiian Islands). All native plant species we found are common in the region, on the Big Island, and throughout the State. No rare, threatened or endangered plant species were found on the property. Owing to the substrate and location, the property is not a likely location for RTE plants. It should be noted that the non-native tree tobacco (*Nicotiana glauca*), which provides habitat for an endangered native insect, was found in one location, in a non-disturbed site, indicating that it could spread if it becomes established (Figure 3j). The implications for this are discussed below.

Birds

Table 2 lists the 14 species of birds detected during the survey. With one exception, a single sighting of a pueo, no native birds were detected. The most abundant birds were spotted doves (*Streptopelia chinensis*) and chestnut-bellied sand grouse (*Pterocles exustus*). A variety of other birds were seen with low frequency. Additional surveys at different seasons and different times of the day would undoubtedly reveal a few more species of birds. Aside from the Pacific golden-plover or kolea (*Pluvialis fulva*), a common endemic migratory bird that winters in

Hawai‘i in a variety of habitats including the grasslands of South Kohala, it is unlikely that any other native bird species would be regularly present on the property.

Mammals, Reptiles, and Amphibians

No surveys were conducted for the native, endangered Hawaiian hoary bat, for the reasons discussed above. It must be presumed to seasonally forage and perhaps roost in some of the trees and tallest shrubs on the property.

During the survey we observed feral cats (*Felis catus*), wild goats (*Capra h. hircus*), mouflon or mouflon-sheep hybrids (*Ovis* spp.) and cattle (*Bos taurus*). It is likely that small Indian mongooses (*Herpestes a. auropunctatus*), mice (*Mus* spp.), rats (*Rattus* spp.) and domestic dogs, (*Canis f. familiaris*) are also occasionally present on the property. None of these alien mammals have conservation value and all are deleterious to native flora and fauna.

There are no native terrestrial reptiles or amphibians in Hawai‘i. We did not observe any, although it is likely that one or more species of geckoes (Family: Gekkonidae) and perhaps other lizards are present.

Invertebrates

As discussed above, one individual of tree tobacco, which is associated with larvae and eggs of the endangered Blackburn’s sphinx moth, was seen at UTM 210421 m East, 2215438 m North. On this soil type, it is unlikely for tree tobacco to spread quickly. However, resource agencies agree that for properties undergoing development, it is important to identify and control it so that it does not become unwanted habitat (there is abundant protected habitat elsewhere).

Although some of the habitat requirements for the endangered anthracine yellow-faced bee are present – e.g., ‘ilima – other normally critical elements including the crushed coral and suite of native coastal species including tree heliotrope, naupaka ‘akoko, naio, maiapilo and various native species in the Boraginaceae, Nyctaginaceae and Convolvulaceae families that truly promote this endangered invertebrate are not present on the property. It appears unlikely that the property supports this native bee.

Archeological Report

An Archeological Inventory Survey was conducted by Ogden Environmental (Schliz 1994) and approved by the State Historic Preservation Division of DLNR. The survey report’s findings were that there were no significant sites within the proposed rezoning area. Two sites and a burial were identified near the western boundary of the adjacent site and deemed to be worthy of preservation. These sites are more than half a mile from the proposed development areas and should not be impacted by the development. The Schliz 1994 report is included in Appendix of this application.

Cultural Resources

The Cultural Impact Assessment TMK: (3) 6-2-001: 075 portion, Ouli Ahupua’a, South Kohala District, Island of Hawaii prepared by Kulaiwi Archeology, LLC July 2024 concluded:

The objective of this assessment is to identify any culturally significant resources or traditional cultural practices that will be affected as a result of the proposed undertaking. Direct effects within the study area and indirect effects within the vicinity of the proposed undertaking were considered. The study relied upon archival research that focused on historical documents, previous archaeological studies, and previous oral history interviews of former residents of the area (Maly and Maly 2003). These interviews documented Hawaiian cultural practices in the second half of the 20th Century that were generally seasonal and shore-based, predominantly concerned with obtaining marine resources. Some of the residents interviewed lived in the uplands and walked the trails to the shore, which was in part why the trails were considered so significant and why each family participated in their upkeep. Nearly all of the Hawaiians interviewed by Maly (Maly and Maly 2003) spoke of the bountiful marine resources that were the focus of traditional subsistence activity along the coast.

Historic documentary research identified many traditional or legendary references to 'Ōuli and the surrounding vicinity. This area, known traditionally as the *'āina kaha* or "arid shore land" was also within the area that was severely impacted by warring chiefs of Hawai'i and Maui. Though no direct remnants of the sandalwood trade having occurred within the project area have been identified, it is likely that this activity took place within the general vicinity.

The historic use of the 'Ōuli was likely restricted to ranching associated with the massive Parker Ranch. The APE is also located within the former 91,000-acre Waikoloa Maneuver Area and was apparently used for World War II era military exercises including the use of live ammunition and other explosives. The archaeological work conducted by Schilz (1994) identified only two sites within the boundaries of the APE (see **Figure 10**). Sites 14712 and 14727 are both associated with World War II era military training activities. Seven pre-contact sites were documented in the general area, consisting of overhang shelters (Sites 14741, 14750, and 14751), a complex of two C-shapes (Site 14726), a complex comprised of two enclosures (Site 14687), a cluster of two cairns and a midden deposit (Site 14679), and a burial lava tube (Site 14752). However, none of these sites are located within the APE. Direct effects to significant cultural resources within the proposed APE have been mitigated through the documentation by Schilz (1994). No known cultural resources, such as culturally significant sites, flora or fauna, or cultural practices or places will be directly affected as a result of the proposed project. No evidence of customary native Hawaiian rights being conducted in the APE has been identified. Traditional cultural practices and properties may have been present in 'Ōuli Ahupua'a; however, the proposed development within the APE should not interfere or have a negative impact on them.

Unexploded Ordinance (UXO)

The Army Corps of Engineers is conducting a survey of the Waikoloa Maneuver Area which generally extends from Waimea to the coast and from the lower reaches of the Kohala Mountains to the North Kona district line. This area encompasses the subject property which has been designed as Area O. This site was surveyed using transects 125 feet apart and which identified anomalies, however, no Munitions of Explosive Concern were found and the site was determined to be Cleared. However, more recent technology is being employed and the area has been resampled. One rifle grenade was found but it was determined not to be a Munition of Explosive Concern. The consultant's report is due in October 2024 and will produce a Remedial Design which will need to be followed by a Remedial Action plan, construction monitoring and long term monitoring. These

processes will be undertaken as required. The site may need to receive its clearance prior to house construction depending on the requirements of the USDA financing program that supports self help housing.

Noise, Air Quality and Dust

The project site is protected from traffic noise from the Waimea-Kawaihae Road by a natural hills that run parallel to the road. This effectively reduces if not eliminates the noise from the road. During construction noise will be generated by equipment used for both the infrastructure construction and the subsequent building of houses. However, these impacts will be temporary and will not pose a long term issue for the site.

Currently air borne dust is common as the prevailing winds travel over sparsely vegetated land picking up dust. This is common throughout this region where dry lightly vegetated land is exposed to strong winds. During the grading of the site and to a lesser extent during construction of the infrastructure there is potential for fugitive dust to be generated and picked up by the prevailing winds. To mitigate this appropriate watering and monitoring of the site will be conducted by the contractor.

Access and Traffic Impacts

Access to the site is off of Waiula Drive which connects to the Waimea-Kawaihae Road. No other access onto or passing through the site exists. A TIAR was conducted by The Traffic Management Consultant. Excerpts from the report are included below, however, some of the diagrams and tables have been excluded for brevity. The full report is in Appendix D.

I. Existing Conditions

A. Roadways

Kawaihae Road (Route 19) is a State of Hawai'i arterial highway between Waimea and Kawaihae Harbor. Kawaihae Road is a two-way, two-lane highway, in the vicinity of the project site. The posted speed limit on Kawaihae Road is 45 miles per hour (mph).

Waiula Drive is a two-way, two-lane local road, which provides access to a residential neighborhood. The west leg of Waiula Drive is stop-controlled at its Tee-intersection with Kawaihae Road. The west leg of Waiula Drive terminates about 0.4 mile east of Kawaihae Road. The posted speed limit on Waiula Drive is 25 mph.

B. Existing Peak Hour Traffic Volumes

1. Field Investigation and Data Collection

Turning movement traffic count surveys were conducted on September 12-13, 2023 during the peak periods of traffic at the intersection of Kawaihae Road and Waiula Drive. The traffic count surveys included vehicle-type classification, bicycles, and pedestrians.

2. Existing AM Peak Hour Traffic Analysis

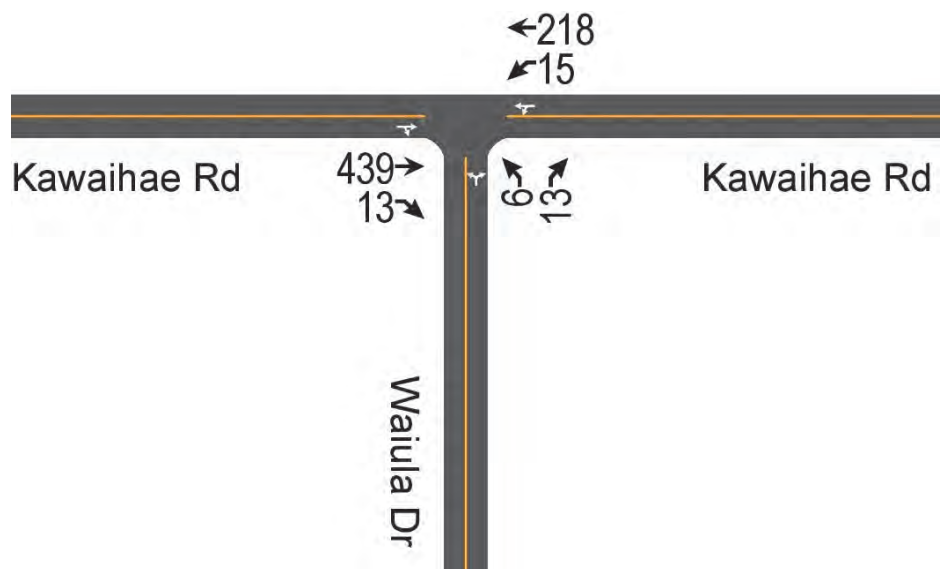
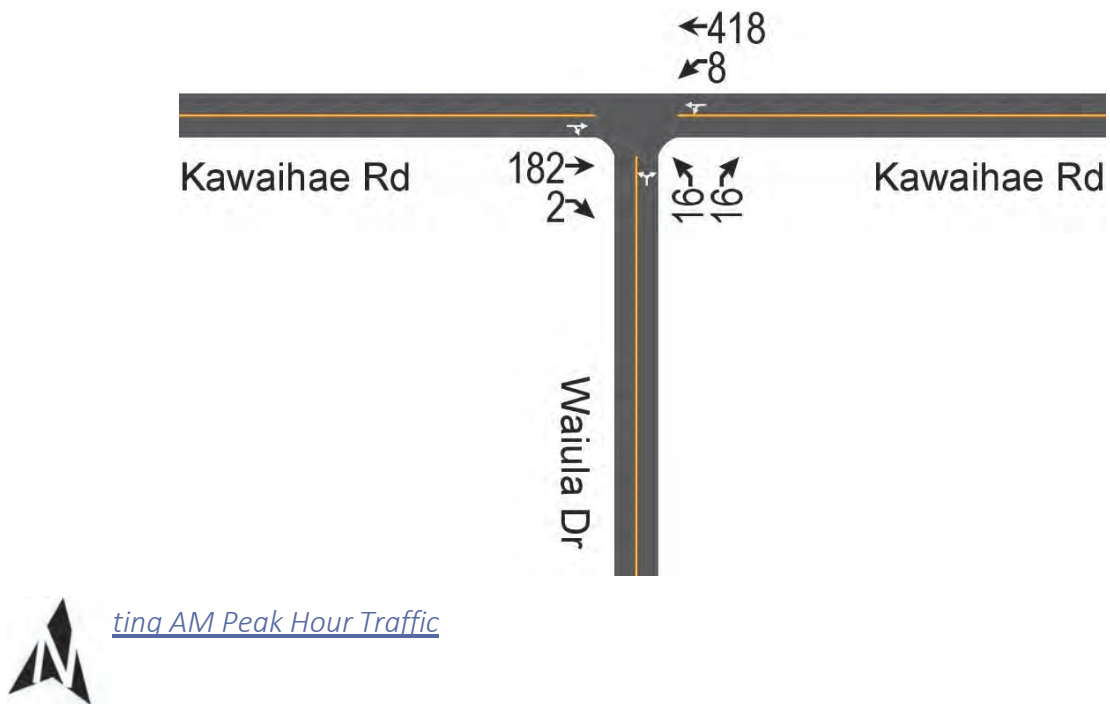
The existing AM peak hour of traffic in the study area occurred from 7:00 AM to 8:00 AM. Kawaihae Road carried over 600 vehicles per hour (vph), total for both directions, during the existing AM peak hour of traffic. The existing AM peak direction of traffic on Kawaihae Road was in the westbound direction with a 70-30 split. Waiula Drive carried about 40 vph, total for both directions. No pedestrians crossed the intersection of Kawaihae Road and Waiula Drive, while two (2) bicycles entered the study intersection, during the existing AM peak hour of traffic.

Waiula Drive operated at LOS “B”, during the existing AM peak hour of traffic. The left-turn movement from westbound Kawaihae Road into Waiula Drive operated at LOS “A”.

3. Existing PM Peak Hour Traffic Analysis

The existing PM peak hour of traffic in the study area occurred from 4:00 PM to 5:00 PM. During the existing PM peak hour of traffic, Kawaihae Road carried about 700 vph, total for both directions. The existing PM peak direction of traffic on Kawaihae Road was in the eastbound direction with a 66-34 split. Waiula Drive carried about 50 vph, total for both directions. No pedestrians crossed the intersection of Kawaihae Road and Waiula Drive, and zero (0) bicycles entered the intersection of Kawaihae Road and Waiula Drive, during the existing PM peak hour of traffic.

During the existing PM peak hour of traffic, Waiula Drive continued to operate at LOS “B” at Kawaihae Road. The left-turn movement from westbound Kawaihae Road into Waiula Drive operated at LOS “A”. The existing AM and PM peak hour traffic data are depicted in Figure 3.



Existing PM Peak Hour Traffic

Figure 3. Existing Peak Hour Traffic

II. Future Traffic Conditions

A. Background Growth in Traffic

The Transportation Plan for the District of Hawai'i (TPDH) was prepared for the State of Hawai'i Department of Transportation (DOT), in cooperation with the County of Hawai'i Department of Public Works and Planning Department. The TPDH developed long-range travel forecasts for Hawai'i Island based upon future socio-economic conditions.

The TPDH projected an annual growth rate of about 2.0 percent in vehicle trips in South Kohala. For the purpose of this traffic impact analysis, an annual average growth factor of 2.0 percent was uniformly applied to the existing (Year 2023) peak hour traffic to estimate the Year 2028 peak hour traffic demands without the proposed project.

B. Year 2028 Peak Hour Traffic Without Project

During the Year 2028 AM and PM peak hours of traffic without the proposed project, the intersection of Kawaihae Road and Waiula Drive is expected to operate at the same Levels of Service as during the existing AM and PM peak hours of traffic. The Year 2028 peak hour traffic volumes without the proposed project are depicted in Figure 4.

III. Traffic Impact Analysis

A. Trip Generation Characteristics

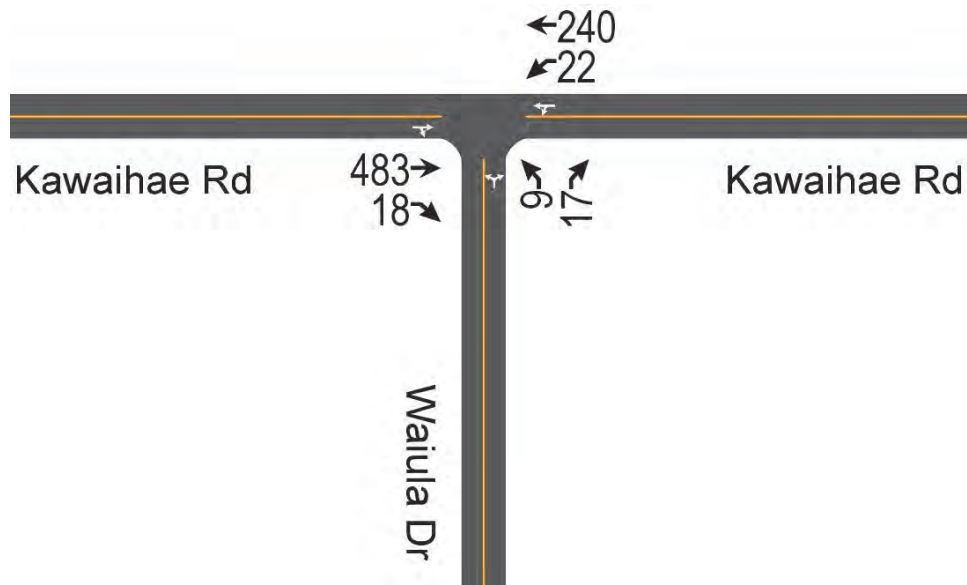
The trip generation characteristics for Ouli Single Family Housing were based upon the ITE trip generation methodology for single family detached housing. The ITE trip generation rates were used to derive the vehicle trips per hour (vph) per dwelling unit (DU), during the weekday AM and PM peak hours of adjacent street traffic.

The proposed project is expected to generate totals of 35 vph and 45 vph, during the AM and PM peak hours of traffic, respectively. The trip generation characteristics in vehicle trips per hour for the proposed project is summarized in Table 2.

Table 2. Trip Generation Characteristics							
Land Use (ITE Code)	DU	AM Peak Hour (vph)			PM Peak Hour (vph)		
		Enter	Exit	Total	Enter	Exit	Total
Single Family Housing (223)	43	9	26	35	28	17	45



Year 2028 AM Peak Hour Traffic Without Project



Year 2028 PM Peak Hour Traffic Without Project

Figure 4. Year 2028 Peak Hour Volumes Without Project

B. *Year 2028 Peak Hour Traffic With Project*

1. *Site Traffic Assignment*

The peak hour site-generated traffic assignments, depicted in Figure 5, were based upon the existing traffic circulation patterns.

2. *Year 2028 Peak Hour Traffic Analysis With Project*

Waiula Drive is expected to continue to operate at LOS “B” at Kawaihae Road, during the Year 2028 AM and PM peak hours of traffic with the proposed project. The left-turn movement on westbound Kawaihae Road into Waiula Drive is expected to continue to operate at LOS “A”. Figure 6 depicts the Year 2028 AM and PM peak hour traffic with the proposed project.

IV. *Long-Range Traffic Analysis*

A. *Future Growth in Traffic*

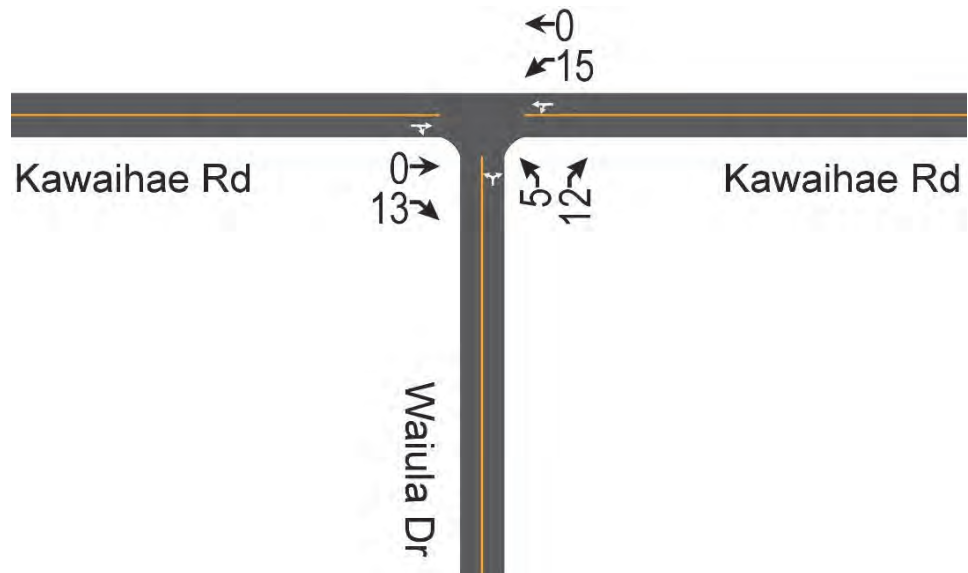
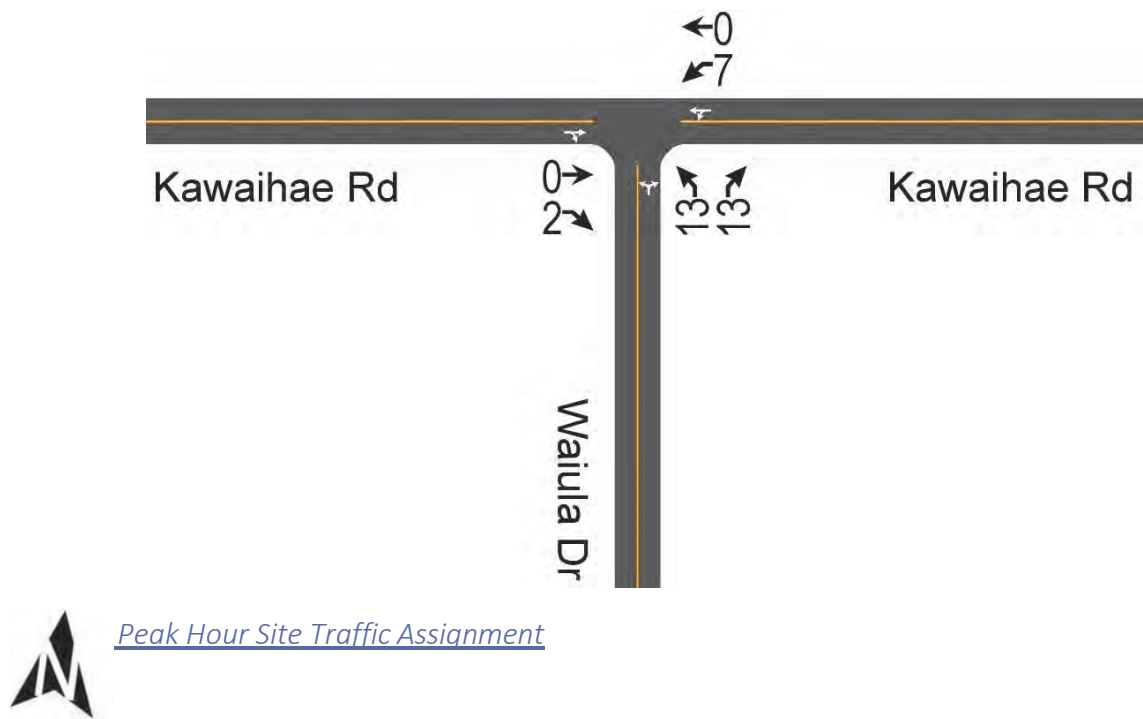
The proposed project is expected to be fully built out and occupied by the Year 2028. The trip generation is assumed to remain constant beyond the Year 2028. However, the Hawai'i County “Concurrency Requirements” requires the analysis of the ten-year (2033) and twenty-year (2044) traffic projections for future growth of traffic in the project area, which are beyond the development time frame of the proposed project. The TPDH average annual growth rate of 2.0 percent vehicle trips generated in the South Kohala region was extrapolated to estimate the Years 2033 and 2043 AM and PM peak hour traffic without the proposed project. The peak hour site traffic assignments were added to the traffic forecasts for the Years 2033 and 2043 peak hour traffic with the proposed project.

B. *Year 2033 Peak Hour Traffic Without Project*

By the Year 2033, the intersection of Kawaihae Road and Waiula Drive is expected to continue to operate at the same Levels of Service as during the existing AM and PM peak hours of traffic. Figure 7 depicts the Year 2033 peak hour traffic volumes without the proposed project.

C. *Year 2033 Peak Hour Traffic With Project*

Waiula Drive is expected to continue to operate at LOS “B”, during the Year 2033 AM and PM peak hours of traffic with the proposed project. The left-turn movement from westbound Kawaihae Road is expected to continue to operate at LOS “A”. The Year 2033 AM and PM peak hour traffic volumes with the proposed project are depicted in Figure 8.



PM Peak Hour Site Traffic Assignment

Figure 5. Peak Hour Site Traffic Assignment

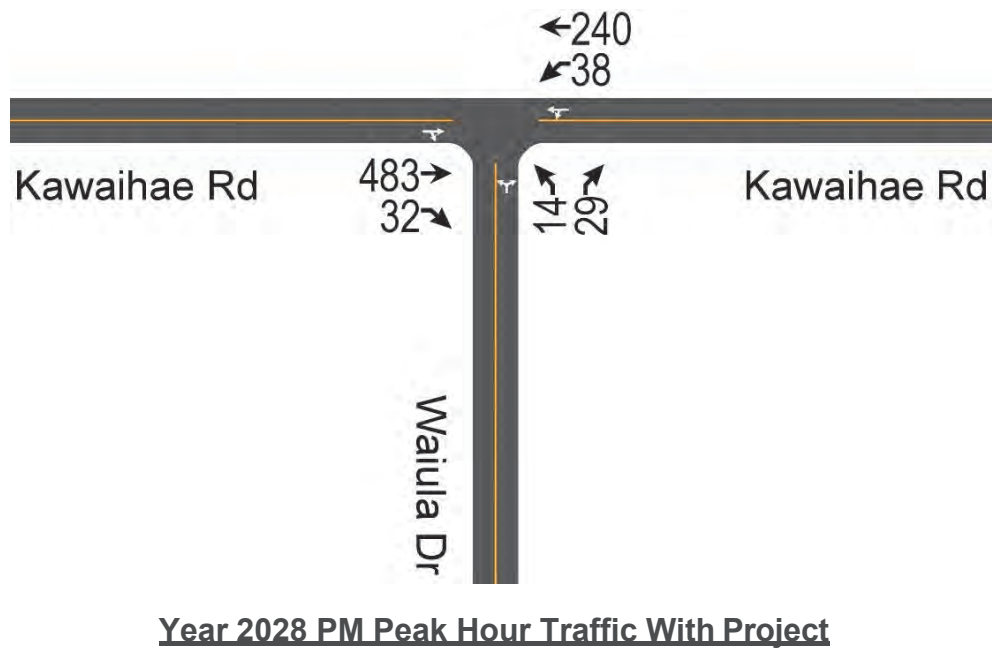
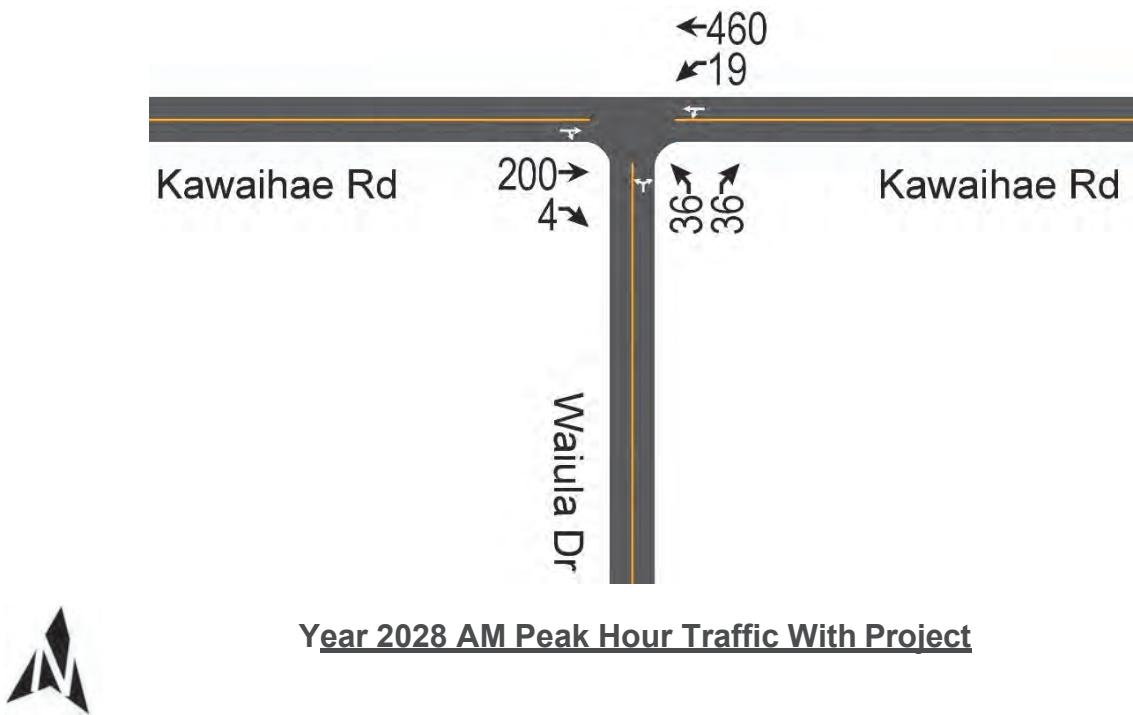
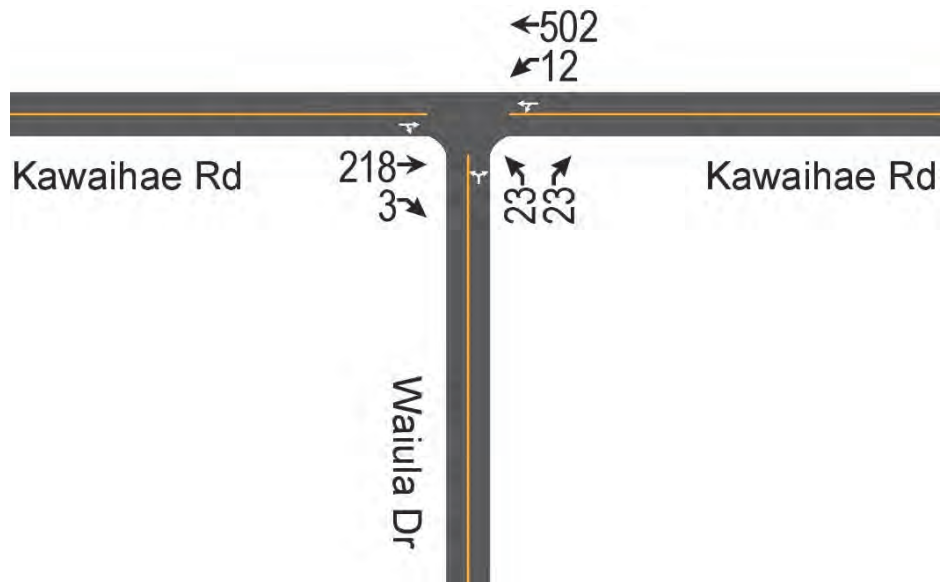
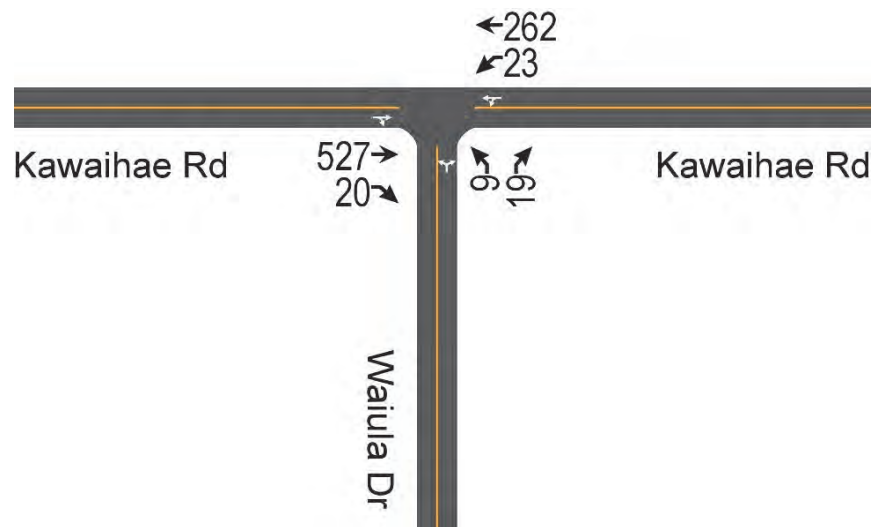


Figure 6. Year 2028 Peak Hour Traffic With Project



Year 2033 AM Peak Hour Traffic Without Project



Year 2033 PM Peak Hour Traffic Without Project

Figure 7. Year 2033 Peak Hour Volumes Without Project

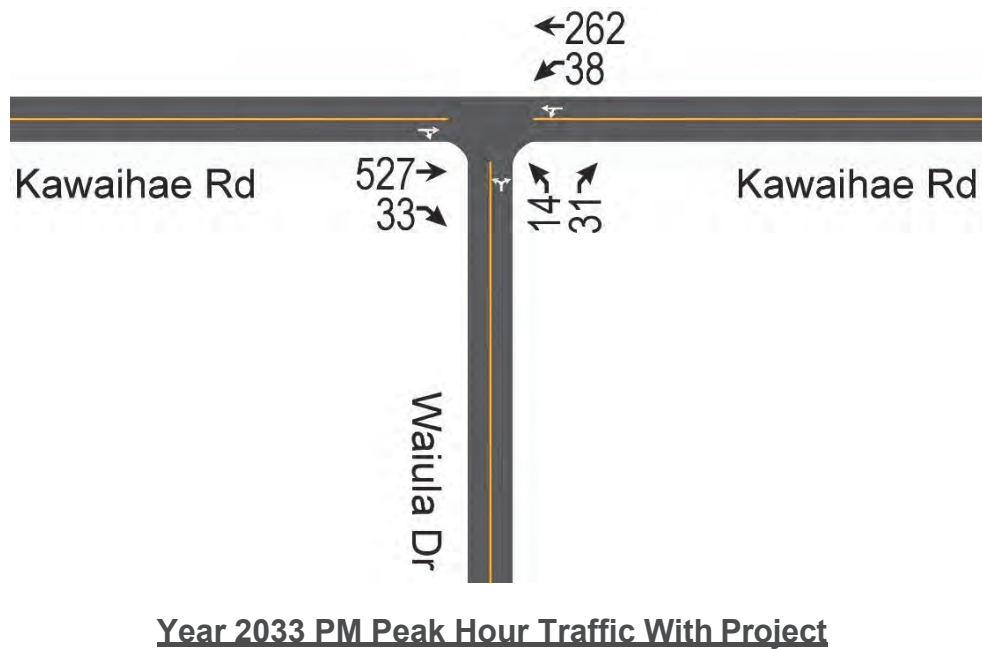
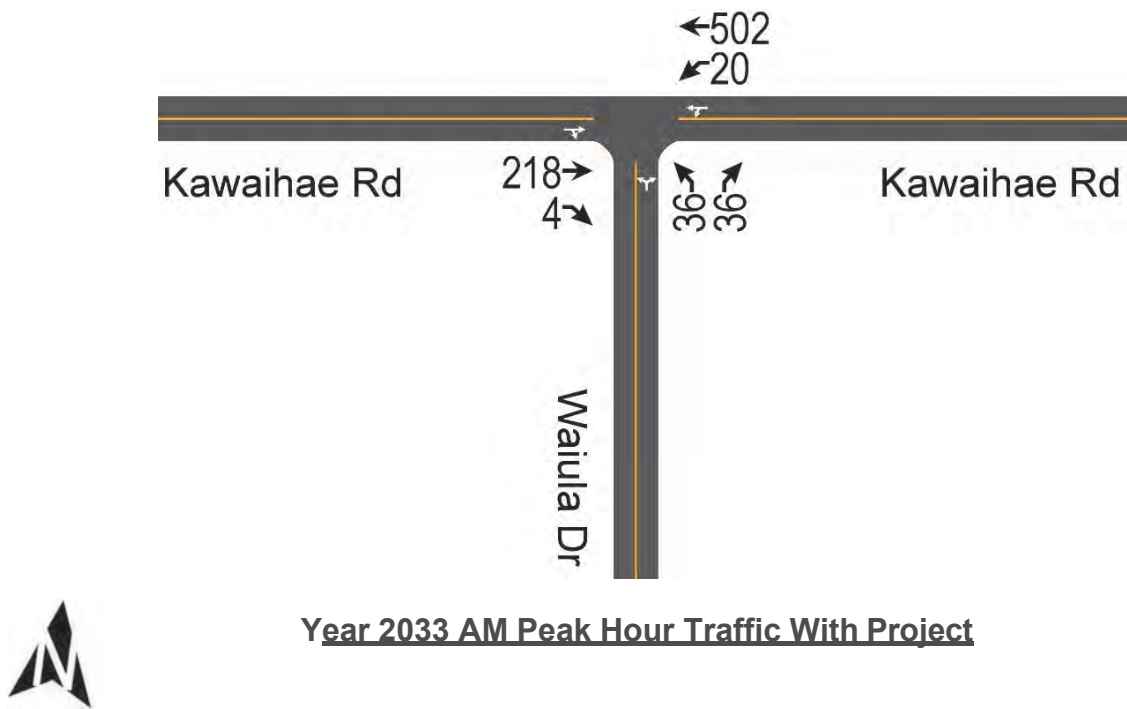


Figure 8. Year 2033 Peak Hour Volumes With Project

D. Year 2043 Peak Hour Traffic Without Project

Waiula Drive is expected to operate at LOS “C”, during the Year 2043 AM and PM peak hours of traffic without the proposed project. The left-turn movement from westbound Kawaihae Road into Waiula Drive is expected to continue to operate at LOS “A”. The Year 2043 AM and PM peak hour traffic volumes without the proposed project are depicted in Figure 9.

E. Year 2043 Peak Hour Traffic With Project

During the Year 2043 AM and PM peak hours of traffic with the proposed project, the intersection of Waiula Drive and Kawaihae Road is expected to operate at the same Levels of Service as during the Year 2043 AM and PM peak hours of traffic without the proposed project. The Year 2043 AM and PM peak hour traffic volumes with the proposed project are depicted in Figure 10.

V. Conclusions

The proposed Ouli Single Family Housing is expected to meet the affordable housing credits, as defined in Hawaiʻi County Code Chapter 11 Section 11-4.b.2. As such, area traffic mitigation is not required in accordance with the Hawaiʻi County Code Chapter 25, Section 25-2-46 “Concurrency Requirements”.

Waiula Drive operated at LOS “B” at Kawaihae Road, during the existing AM and PM peak hours of traffic. Waiula Drive is expected to continue to operate at LOS “B”, during the AM and PM peak hours of traffic through the Year 2033 without and with the proposed project. By the Year 2043, Waiula Drive is expected to operate at LOS “C”, during the AM and PM peak hours of traffic without and with the proposed project.

The proposed project is expected to increase traffic demands at the Kawaihae Road intersection at Waiula Drive by about 5 percent and 6 percent, during the AM and PM peak hours of traffic, respectively. The proposed project is not expected to significantly impact traffic operations at the intersection of Waiula Drive and Kawaihae Road, during the peak hours of traffic. Traffic mitigation measures are not recommended at this time.

Emergency Access

Waiula Drive runs from its intersection with the Waimea-Kawaihae Road in a mauka direction until it meets a gate at the boundary of the Anekona Subdivision. On the mauka side of that gate is Kanehoa Street which connects with the Waimea-Kawaihae Road at two intersections: the Kanehoa Street/Waimea-Kawaihae Road intersection and the Anekona Street/Waimea-Kawaihae Road intersection.

The gate is a locked gate which is opened during emergencies. The volunteer Fire Station is located adjacent to the gate. Keys to the gate are held by the Fire Department and Civil Defense.

Utilities

Water will be available for this 43 lot subdivision from the Department of Water Supply's transmission system coming down the Waima-Kawaihae Road and connecting to Waiula Drive. The 8-inch line within the Waiula Drive right of way is looped with the DWS system in the Anekona Subdivision.

Telephone, CATV and Internet access is available along the Waiula Drive and will be extended to the 43 lot subdivision.

Given that there is no sewage treatment plant in the vicinity the 43 lot subdivision will include septic systems meeting with the requirements of the Department of Health.

Public Safety Facilities

A volunteer fire station is located at the top of Waiula Drive. This 3 acre site is on a long term lease to the County of Hawaii by the Hawaii Island Community Development Corporation who holds the fee title. The nearest manned fire and emergency stations are in Waimea and near the South Kohala Resort on the Queen Kaahumanu Highway located approximately 7.5 miles and 9.4 miles, respectively, from the subject site.

As the closest Police station is located in Waimea 7.5 miles away, while sub-station is co-located with the Fire Department on the Queen Kaahumanu Highway 9.4 miles away.

Public Parks

Public Beach Parks in the area include Spencer Beach Park and the Hapuna Beach Park 4.5 and 6.5 miles away. Other recreation areas in the vicinity include the Spencer Kalani Schutte Park and the Waimea Community Park.

Educational Facilities

Public education for this area is provided by the Waimea Elementary and Intermediate Schools, and Honokaa High School. Private schools in the region include Hawaii Prep Academy, Parker School, and the Kanu O Ka Aina Charter School.

LAND USE PLANNING ANALYSIS**County of Hawaii General Plan**

The County of Hawai'i General Plan is the policy document for the long-range comprehensive development of the island of Hawai'i. The General Plan Land Use Pattern Allocation Guide (LUPAG) map classifies the Project Site and immediately surrounding area as Rural.

Rural: This category includes existing subdivisions in the State Land Use Agricultural and Rural districts that have a significant residential component. Typical lot sizes vary from 9,000-square feet to two acres. These subdivisions may contain small farms, wooded areas, and open fields as well as residences. Allowable uses within these areas, with appropriate zoning, may include commercial facilities that serve the residential and agricultural uses in the area, and community and public facilities. The Rural designation does not necessarily mean that these areas should be further subdivided to smaller lots. Most lack the infrastructure necessary to allow further subdivision.

The proposed residential use would be compatible with the General Plan Rural designation as it would be a small scale residential development that will have adequate infrastructure to support its use. It would also be set in close proximity with the 40 home Ouli self help housing project developed in 1999-2004 and the 33 unit Ouli Cottages project completed in 1995.

The RS-10 zoning would also be consistent with the goals, policies, and standards of the Housing and Land Use Elements of the General Plan. Specifically, the more pertinent ones follow:

Housing

Goals

- *Attain a diversity of socio-economic housing mix throughout the different parts of the County.*
- *Maintain a housing supply which allows a variety of choice*
- *Develop better places to live in Hawaii County by creating viable communities with decent housing and suitable living environments for our people*
- *Improve and maintain the quality and affordability of the existing housing stock*
- *Seek sufficient production of new affordable rental and fee- simple housing in the County in a variety of sizes to satisfactorily accommodate the needs and desires of families and individuals.*

Policies

- *Increase rental opportunities and choices in terms of quality, cost, amenity, style and size of housing, especially for low and moderate income households.*

Land Use Element (Residential)

Goals

- 0 *To provide for residential developments that maximizes convenience for its occupants.*
- 0 *To provide for suitable living environments which accommodate the physical, social and economic needs of the island residents.*

Policies

0 *Appropriately zoned lands shall be allocated as the demand for multiple residential dwellings increases. These areas shall be allocated with respect to places of employment, shopping facilities, educational, recreational and cultural facilities, and public facilities and utilities.*

Standards

0 *Areas shall be protected from incompatible uses by transition zones.*

0 *Provide adequate access to arterial streets, shopping facilities, schools, employment centers, and other services.*

0 *Development shall not be permitted in natural hazard areas unless proper on-site improvements are provided.*

0 *Development shall be located in areas where public utilities can be economically provided at a level of adequate to meet the demand for the concentrated service.*

Discussion

The requested RS-10 zoning is consistent with the goals, policies, and standards of the General Plan document. For one, it will provide limited short-term **economic** opportunities largely through the construction of any improvements required for the residential development. Relatedly, longer-term opportunities could be created largely in providing the social support (housing) needed to sustain a strong economy. Furthermore, the project should add sustained revenues to the County and State coffers.

The project intends to be **energy** conscious through the use and/or encouragement of solar energy and design features to take advantage of wind patterns.

Maintaining and improving the quality of the **environment** is important to the success of this project. The General Plan identifies five (5) areas of environmental concerns - air pollution, water quality, soil pollution, solid waste disposal, and noise pollution. As proposed, the project would not be violative of any of those objectives.

Aside from vehicular transmission, air pollution associated with the project should be negligible. All wastewater systems would be disposed off in a State approved septic system. This should be sufficient to address any potential groundwater or coastal water impacts.

If required, a solid waste management plan could be prepared and implemented. Being a residential project, it should not be a noisy one.

Further, while the site has some on-site developmental constraints, they are not insurmountable. For the most part, the site is designated "X" on the FIRM map. A drainage

system will be designed in a manner to protect the property as well as to minimize the volume of surface runoff generated by this development.

There are no known archaeological or cultural features on the subject site requiring preservation. Furthermore, if there are inadvertent archaeological features found on the site, work will stop and the State DLNR and County Planning Department will be consulted before further activities occur within the affected area.

As this is a residential project, it will directly fulfill the goals and objectives - as noted above - of the **housing element**. Specifically, the more pertinent goals are:

- Attain a diversity of socio-economic housing mix throughout the different parts of the County
- Maintain a housing supply which allows a variety of choice
- Improve and maintain the quality and affordability of the existing housing stock
- Seek sufficient production of affordable rental and fee-simple housing in the County in a variety of sizes to satisfactorily accommodate the needs and desires of families and individuals

The General Plan also emphasizes that developments be mindful of an area's **natural beauty**. In this situation, the project will be developed in a manner where it blends with the existing terrain and enhances the natural environment through the introduction of landscaping.

Although the project site is over 3 miles from the ocean, it is also separated by other developments from the ocean. As such, the usual **coastal resources** concern would not be pronounced. There will be no interference with shoreline access.

There will be little impact to **public facilities**. The public school and medical complexes are situated in the area. County water is already available for the project. All on-site improvements will be constructed by the Applicant. Traffic impact based on a traffic report and as will be discussed later in this report, noted that the LOS would still continue at the acceptable levels (A, B, or C).

Finally, in terms of the **Land Use element**, the pertinent goals, policies, and standards of the General Plan note the following:

Designate and allocate land uses in appropriate proportions and mix and in keeping with the social, cultural and physical environments of the County

The County shall encourage the development and maintenance of communities meeting the needs of its residents in balance with the physical and social environment

Zoning requests shall be reviewed with respect to General Plan designation, district goals, regional plans, State Land Use District, compatibility with adjacent zoned uses, availability of public services and utilities, access, and public need

The county shall encourage the development and maintenance of communities meeting the needs of its residents in balance with the physical and social environment

In view of the foregoing goals and policies, it is noted that the requested zoning would be consistent with the Rural designation of the LUPAG map. It would also be compatible with the surrounding area and uses.

The soil of the site is classified "E" extremely poor. While it does have some theoretical agricultural potential, the site's proximity poor soil and water conditions uses renders it unfeasible for intensive agricultural uses

The property has no severe topographic or geologic problems that would render the land unusable for the proposed subdivision and activity.

STATE LAND USE DISTRICT

Conformance with State Land Use Urban District Standards:

1) It shall include lands characterized by “city-like” concentrations of people, structures, streets, urban level of services and other related land uses;

It shall take into consideration the following specific factors:

(a) Proximity to centers of trading and employment except where the development would generate new centers of trading and employment;

(b) Availability of basic services such as schools, parks, wastewater systems, solid waste disposal, drainage, water, transportation systems, public utilities, and police and fire protection; and

(c) Sufficient reserve areas for foreseeable urban growth;

As is provided for in the County General Plan’s Rural designation there may be concentrations of homes at urban densities. Within these areas urban levels of infrastructure are provided. Related services are available in reasonable proximity as are employment centers, education facilities, and police and fire protection.

(2) It shall include lands with satisfactory topography, drainage, and reasonably free from the danger of any flood, tsunami, unstable soil condition, and other adverse environmental effects;

The subject property has satisfactory topography and a flood study has determined that it is outside of the 500 year flood way. The soil is suitable for urban level of development consisting largely of rock and thin soils. With its elevation at 1400 feet above sea level it is protected from tsunamis.

(a) Land contiguous with existing urban areas shall be given more consideration than non-contiguous land, and particularly when indicated for future urban use on state or county general plans;

In the immediate vicinity there are two similar urban designations that have been developed for affordable housing. Collectively they are forming a cluster that is consistent with the intent of the County General Plan.

(c) It shall include lands in appropriate locations for new urban concentrations and shall give consideration to areas of urban growth as shown on the state and county general plans;

The site would be an appropriate location for urban growth given the existing development in the area and the regional need for affordable housing. The current General Plan review should consider this situation.

(d) It may include lands which do not conform to the standards:

(A) When surrounded by or adjacent to existing urban development; and

(B) Only when those lands represent a minor portion of this district;

(C) It shall not include lands, the urbanization of which will contribute toward scattered spot urban development, necessitating unreasonable investment in public infrastructure or support services; and

The infrastructure is already in place and any extension will be part of the development itself.

(D) It may include lands with a general slope of twenty per cent or more if the commission finds that those lands are desirable and suitable for urban purposes and that the design and construction controls, as adopted by any federal, state, or county agency, are adequate to protect the public health, welfare and safety, and the public's interests in the aesthetic quality of the landscape. [Eff 10/27/86; am and comp 8/16/97; comp May 08 2000] (Auth: HRS §§205-1, 205-2, 205-7) (Imp: HRS §205-2)

The property involved does not include lands with more than 20 percent slope.

APPENDICES

APPENDIX A – FLORA FAUNA REPORT

APPENDIX B - ARCHEOLOGICAL INVENTORY SURVEY

APPENDIX C – CULTURAL RESOURCES ASSESSMENT

APPENDIX D – TRAFFIC IMPACT ANALYSIS REPORT

APPENDIX E - GEOTECHICAL ENGINEERING EXPLORATION REPORT

***Biological Survey Report
Ouli Lands, TMKs 6-2-1: 74 and 75
South Kohala District, Island of Hawai‘i***

By Ron Terry, Ph.D.
Geometrician Associates, LLC
August 2023

Introduction

This biological survey was prepared for the Hawai‘i Island Community Development Corporation (HICDC) to inventory the existing biological environment, assess the potential for biological impacts from proposed development of affordable housing and associated infrastructure, and devise mitigation measures to avoid or minimize impacts. The land in question (“the property”) consists of TMKs 6-2-1: 74 and 75, totaling 257.338 acres, as shown in Figure 1. The area under consideration in this report is limited to the land on these parcels north of Waiulaula Gulch, which cuts through the edge of the makai half of the property and renders the land south of the gulch difficult to develop.

The objectives of the botanical survey component of this report were to: 1) describe the vegetation; 2) list all species encountered; and 3) determine the likelihood of the presence of rare, threatened or endangered (RTE) plant species and identify the locations of any RTE individuals found.

To begin, I consulted a comprehensive survey of Hawaiian vegetation (Gagne and Cuddihy 1990) and unpublished literature on the flora and fauna of the area to assess the potential for sensitive biological resources and threatened or endangered species. Geometrician Associates has conducted approximately 60 botanical surveys covering tens of thousands of acres in South Kohala and adjacent areas of North Kona and North Kohala, from the shoreline to several miles mauka of Mamalahoa Highway (see partial list in References, below). We have located individuals of eight RTE plant species in this large region. We have also reviewed surveys by others within this area and have compiled a growing database of current and former rare plant occurrences for the region.

I then conducted a walk-through field survey of the property accompanied by botanist Jen Lawson, B.S. on two days in July 2023. Plant species were identified in the field and, as necessary, collected and keyed out in the laboratory. Special attention was given to the possible presence of any federally listed (USFWS 2023) threatened or endangered plant species, although the habitat over most of the properties did not indicate a strong potential for their presence. While ornamental plant spillover from adjacent residential lots was examined, such vegetation is by definition non-natural and was generally not given consideration in the analysis of botanical resources or impacts. These areas were included in the evaluation of animal habitat.

The work also included a faunal survey restricted to a tally of birds and introduced mammals, reptiles, and amphibians observed during the botanical surveys. The field survey also assessed the general value of the various habitat areas for native birds. Although there were no radar or ultrasound observations conducted that might have detected the endangered Hawaiian hoary bat, the general value of the habitat for bats was evaluated. Generally not included in the survey was assessment of invertebrates or aquatic species or habitat, with a few exceptions discussed below.

APPENDIX A

Habitat Factors and Previous Findings

The property spans elevations of 1,300 to 1,556 feet above mean sea level. The surface geology is soil-mantled lava flows from Mauna Kea dated at 70,000-250,000 years before the present (Wolfe and Morris 1996). Soil is classified within the Hapuna-Waikui-Lalamilo complex, 0 to 20 percent slopes, a well-drained soil formed on ash layers above 'a'a flows with very or extremely cobbly medial silt loam in the top layers. The climate in the area is warm and semi-arid, with an average annual rainfall of about 8-19 inches, increasing in the mauka direction, and a mean annual air temperature of approximately 69.5 to 70.5 degrees Fahrenheit, increasing in the makai direction (Giambelluca et al 2014). The sunny skies and clean atmospheric conditions of this rain shadow area in the lee of the Kohala and Mauna Kea volcanoes leads to high temperatures, high solar radiation, high evapotranspiration and low rainfall, conditions that can be challenging for plant growth.

It is difficult to speculate on the pre-human vegetation of the area, since the introduction of hardy grasses, grazing animals and fire have changed the soil and microclimate of the area. Gagne and Cuddihy (1990) described the vegetation in fairly undisturbed areas with similar geology and climate as Lowland Dry Shrubland/Forest, which was formerly dominated by the grasses pili (*Heteropogon contortus*) and kawelu (*Eragrostis variabilis*); herbs and shrubs such as 'uhaloa (*Waltheria indica*), 'ilima (*Sida fallax*), 'aweoweo (*Chenopodium oahuense*), a'ali'i (*Dodonaea viscosa*), iliahi or sandalwood (*Santalum ellipticum*) and 'akia (*Wikstroemia pulcherrima*); and a diverse but fairly sparse cover of native dry-forest trees lama (*Diospyros sandwicensis*), wiliwili (*Erythrina sandwicensis*) and uhiuhi (*Mezoneuron kavaense*).

The general vegetation of the Ouli area has changed dramatically because of alien species. Cattle, donkey, sheep and especially feral goats intensively graze native species in preference to hardy non-native species such as kiawe (*Prosopis pallida*), koa haole (*Leucaena leucocephala*), fountain grass (*Cenchrus setaceus*) and buffel grass (*Cenchrus ciliaris*). These fire-adapted species produce abundant fuel for frequent wildfires, which decimate many natives, although a few, such as a'ali'i, are somewhat adapted to fire. The effects of overgrazing combined with fire produce severe soil erosion during heavy rains and high winds, further degrading the habitat. Invasive insects such as the twig borer and gall wasp destroy sensitive native trees such as uhiuhi and wiliwili. Drainages, cave openings and rock outcrops often support a larger variety and greater density of native plants.

Various plants listed as threatened and endangered species (T&E) by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (16 U.S.C. 1536(a)(2) and (4)) have been detected in certain areas of leeward South Kohala. One guide to the potential location of threatened and endangered species are critical habitat maps. An online mapping tool provided by USFWS (<http://ecos.fws.gov/ecp/report/table/critical-habitat.html> accessed July 2023) depicts no designated or proposed critical habitat for endangered plant (or animal) species on or near the property (Figure 2). The nearest critical habitat is associated with a suite of species found within gulches on the upper and mid-level slopes of the Kohala Mountains, particularly *Achyranthes mutica*, about two miles to the north. Also shown on the map is plant critical habitat for a complex of cinder cone species at or above the 2,500-foot elevation level that are as close as three miles to the east. These include po'e ihi (*Portulaca sclerocarpa*), cindercone isodendron or aupaka (*Isodendron hosakae*), O'ahu cowpea (*Vigna o-wahuensis*), and spreading nehe (*Melanthera venosa*). None of these plants for which critical habitat has been designated are found in drier and hotter parts of South Kohala below 2,000 feet in elevation.

Certain RTE plants have been detected below 2,000 feet in elevation, but none have been found within several miles of the property or in areas with similar characteristics. One patch of red 'ilima (*Abutilon menziesii*) was found about six miles away, makai of Waikoloa Village, but the plant has not been seen since 1991. All known remaining individuals of uhiuhi (*Mezoneuron kavaense*) in South Kohala are concentrated in a small cluster on young Mauna Kea lava flows within the 275-acre Waikoloa Dry Forest Preserve, about seven miles away. A few remaining endangered halapepe (*Pleomele hawaiiensis*) were formerly present at elevations as low as 2,000 feet near lava tube openings in the far south of South Kohala. The mainly coastal rare (but not T&E) plant maiapilo (*Capparis sandwichiana*) is more commonly found in Kona but is also known from the shoreline areas of Waikoloa and slightly inland on recent lava flows. This plant does not appear to extend onto Mauna Kea soil-covered lava flows. The property is poor habitat for rare, threatened or endangered plant species.

T&E fauna in the general area are mobile and thus more likely to be at least occasionally spotted, although habitat for feeding and breeding is fairly restricted. The threatened Hawaiian goose or nēnē (*Branta sandwicensis*) has become very common on many Hawaiian islands and can be found at elevations ranging from sea level to sub-alpine areas above 7,000 feet. Historically, flocks moved between high-elevation feeding habitats and lowland nesting areas. Two listed T&E waterbirds are frequently seen in the natural wetlands as well as golf course water features and fishponds in the resorts makai and may occasionally overfly the property, even though it does not represent habitat for either. These are the endangered Hawaiian stilt or ae'o (*Himantopus mexicanus knudseni*) and Hawaiian coot or 'alae ke'oke'o (*Fulica alai*).

As with all of the island of Hawai'i, several threatened or endangered seabirds may overfly the Kawaihae to Waimea area between the months of May and November, including the endangered Hawaiian petrel (*Pterodroma sandwichensis*), the endangered band-rumped storm petrel (*Oceanodroma castro*) and the threatened Newell's shearwater (*Puffinus auricularis newelli*). These seabirds hunt over the ocean during the day and fly to higher elevations at night to nest. While all may fly over the South Kohala lowlands on their way to and from mountain nesting areas and the open ocean, no suitable nesting habitat for any of them is present. The primary cause of mortality in these seabird species in Hawai'i is thought to be predation by alien mammals at the nesting colonies. Collision with man-made structures is another significant cause. Nocturnally flying seabirds, especially fledglings on their way to and from the sea in the summer and fall, can become disoriented by exterior lighting. Disoriented seabirds may collide with manmade structures and, if not killed outright, become easy targets of predatory mammals including cats and mongooses.

Although not an RTE species, the Hawaiian endemic sub-species of the short-eared owl or pueo (*Asio flammeus sandwichensis*) is a mostly diurnal bird of prey regularly seen within the grasslands of North and South Kohala. The region offers good habitat for pueo. This species is currently widespread in Kohala and does not have special protected status under either the State or federal endangered species statutes on the island of Hawai'i. The pueo is culturally important and is considered an 'aumakua or family-specific spirit for some families.

The endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), the only native Hawaiian land mammal, has been found throughout the kiawe savanna of South Kohala and for that matter in most areas on the island of Hawai'i. Bats may forage for flying insects on a seasonal basis and may roost in trees and large shrubs. Bats are often visible while they are feeding on flying insects near dusk and dawn at various locations around the island of Hawai'i. The presence of these bats can also be verified by ultrasound detectors or radar. If bats are detected during a night's study, this merely indicates that they were present in the area. Determination of bat populations or usage patterns requires much more

sophisticated, long term studies. Conversely, the absence of bat detections does not indicate an absence of bats, which may have been absent for only a night, a week, or a season, or may have simply gone undetected. Hawaiian hoary bats are vulnerable to disturbance during the summer pupping season and require special mitigation measures.

The endangered Blackburn's sphinx moth (*Manduca blackburnii*) has been found at various locations throughout West Hawai'i, including many areas in South Kohala. The adult moth feeds on nectar from native plants including beach morning glory (*Ipomoea pes-caprae*), ilie'e (*Plumbago zeylanica*), and maiapilo. Moth larvae feed upon non-native tree tobacco (*Nicotiana glauca*), which occupies disturbed areas such as open fields and roadway margins, and the native aiea (*Nothocestrum* sp.), which is found in dry to moist forests at elevations ranging from 1,500 to 5,000 feet. There is no aiea in the Ouli area, but tree tobacco is common throughout disturbed sites in North Kona and South Kohala, and it can rapidly spread into adjacent undisturbed areas.

Seven species of the endemic yellow-faced bee (*Hylaeus* spp.) have been listed as endangered because of their vital role as pollinators of native plants, their limited or threatened habitat, and their vulnerability to predators. The bees have been observed on 'ilima and other plants in various areas of the west side of the Island of Hawai'i. One species, the endangered anthracine yellow-faced bee (*Hylaeus anthracinus*), has within modern times been found only within small patches of habitat at five locations on the Island of Hawai'i in coastal and lowland dry ecosystems, including Kealakekua, South Point and O'oma. Additional sites may exist, but it is likely that they too will be small areas.

Survey Results

Vegetation

As is typical elsewhere in the region, the vegetation on the property is dominated by buffel grass, fountain grass, alien herbs (especially rattlepod [*Crotalaria* spp.] and partridge pea [*Chamaecrista nictitans*]) and koa haole shrubs (Figures 3a-d). In the makai portion, kiawe is sparse but important in terms of biomass and for being the only true tree. A relatively diverse array of native herbs are omnipresent but at low cover levels. In rough order of prevalence they are 'uhaloa, 'ilima, pa'u o Hi'iaka (*Jacquemontia ovalifolia*), 'akia, pili grass, iliahi or sandalwood (only present at the extreme mauka of Parcel 75) and 'a'ali'i (Figures 3e-g).

The bordering Waiulaula Gulch was not addressed in the field survey but is heavily covered with shrubs and trees, almost all non-native. It provides a sometimes lush and well-watered habitat for birds in the region. Other highly intermittent gulches run through the survey area and in places exhibit rudimentary riparian vegetation in the form of lines of koa haole shrubs (Figures 3h-i). The fringes of yards contain escapes from cultivation.

Flora and Rare, Threatened or Endangered Plants

All plant species found on the property during the survey are listed in Table 1. Of the 59 species detected, five were indigenous (native to the Hawaiian Islands and elsewhere) and three were endemic (found only in the Hawaiian Islands). All native plant species we found are common in the region, on the Big Island, and throughout the State. No rare, threatened or endangered plant species were found on the property. Owing to the substrate and location, the property is not a likely location for RTE plants. It should be noted that the non-native tree tobacco (*Nicotiana glauca*), which provides habitat

for an endangered native insect, was found in one location, in a non-disturbed site, indicating that it could spread if it becomes established (Figure 3j). The implications for this are discussed below.

Birds

Table 2 lists the 14 species of birds detected during the survey. With one exception, a single sighting of a pueo, no native birds were detected. The most abundant birds were spotted doves (*Streptopelia chinensis*) and chestnut-bellied sand grouse (*Pterocles exustus*). A variety of other birds were seen with low frequency. Additional surveys at different seasons and different times of the day would undoubtedly reveal a few more species of birds. Aside from the Pacific golden-plover or kolea (*Pluvialis fulva*), a common endemic migratory bird that winters in Hawai'i in a variety of habitats including the grasslands of South Kohala, it is unlikely that any other native bird species would be regularly present on the property.

Mammals, Reptiles, and Amphibians

No surveys were conducted for the native, endangered Hawaiian hoary bat, for the reasons discussed above. It must be presumed to seasonally forage and perhaps roost in some of the trees and tallest shrubs on the property.

During the survey we observed feral cats (*Felis catus*), wild goats (*Capra h. hircus*), mouflon or mouflon-sheep hybrids (*Ovis* spp.) and cattle (*Bos taurus*). It is likely that small Indian mongooses (*Herpestes a. auropunctatus*), mice (*Mus* spp.), rats (*Rattus* spp.) and domestic dogs, (*Canis f. familiaris*) are also occasionally present on the property. None of these alien mammals have conservation value and all are deleterious to native flora and fauna.

There are no native terrestrial reptiles or amphibians in Hawai'i. We did not observe any, although it is likely that one or more species of geckoes (Family: Gekkonidae) and perhaps other lizards are present.

Invertebrates

As discussed above, one individual of tree tobacco, which is associated with larvae and eggs of the endangered Blackburn's sphinx moth, was seen at UTM 210421 m East, 2215438 m North. On this soil type, it is unlikely for tree tobacco to spread quickly. However, resource agencies agree that for properties undergoing development, it is important to identify and control it so that it does not become unwanted habitat (there is abundant protected habitat elsewhere).

Although some of the habitat requirements for the endangered anthracine yellow-faced bee are present – e.g., 'ilima – other normally critical elements including the crushed coral and suite of native coastal species including tree heliotrope, naupaka 'akoko, naio, maiapilo and various native species in the Boraginaceae, Nyctaginaceae and Convolvulaceae families that truly promote this endangered invertebrate are not present on the property. It appears unlikely that the property supports this native bee.

Impacts and Mitigation Measures

As discussed above, no threatened or endangered plant species as listed by the U.S. Fish and Wildlife Service appear to be present on the property, nor are there any rare species or uniquely valuable vegetation types. No existing or proposed federally designated critical plant (or animal) habitat is present on the property. There appears to be no potential to adversely affect RTE plant species. The limited concentration of sandalwood plants near the makai edge of the existing affordable housing subdivision, which although not rare are considered valuable native elements, represents a potential resource for seed collection or partial preservation.

As the project will include outdoor lighting, it may attract threatened or endangered seabirds, which may become disoriented by the lighting, resulting in birds being downed. To avoid the potential downing of seabirds, no construction or unshielded equipment maintenance lighting should be permitted after dark between the months of April and October. All additional permanent lighting should be shielded in conformance with Hawai'i County Outdoor Lighting Ordinance (Hawai'i County Code Chapter 9, Article 14), which requires shielding of exterior lights so as to lower the ambient glare caused by unshielded lighting.

Disturbance and cutting of woody vegetation may disrupt bat roosting. As bats use multiple roosts within their home territories, this disturbance from the removal of vegetation is usually minimal. However, during the pupping season, from about June 1 to September 15 each year, female bats carrying pups may be less able to rapidly vacate a roost site when the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage, and very small pups may be unable to flee a tree that is being felled. To minimize impacts we recommend that woody plants taller than 15 feet should not be removed or trimmed during the bat birthing and pup rearing season (June 1 through September 15).

Attention needs to be paid to tree tobacco, the principal current host for the endangered Blackburn's sphinx moth, one individual of which was observed during our surveys. This plant is weedy and extremely fast-growing and spreading. Although moth larvae are easy to spot and protect, it is very difficult to determine if pupae are present in the ground under the plant after larvae have finished their life cycle. Agencies recommended that landowners prevent infestations of tree tobacco. Although it may be advisable to consult DLNR and or USFWS before removing any plants, juvenile plants less than three feet tall are not usually utilized by the larvae and may generally be safely removed. If plants taller than three feet are present, these agencies should be contacted prior to removal, if that is necessary.

Report Limitations

No biological survey of a large area can claim to have detected every species present. Some plant species are cryptic in juvenile or even mature stages of their life cycle. Dry conditions can render almost undetectable plants that extended rainfall may later invigorate and make obvious. Thick brush can obscure even large, healthy specimens. Birds utilize different patches of habitat during different times of the day and seasons, and only long-term study can determine the exact species composition. The findings of this survey must therefore be interpreted with proper caution; in particular, there is no warranty as to the absence of any particular species.

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Figure 1. Property Map



Figure 2. Critical Habitat for Endangered Species

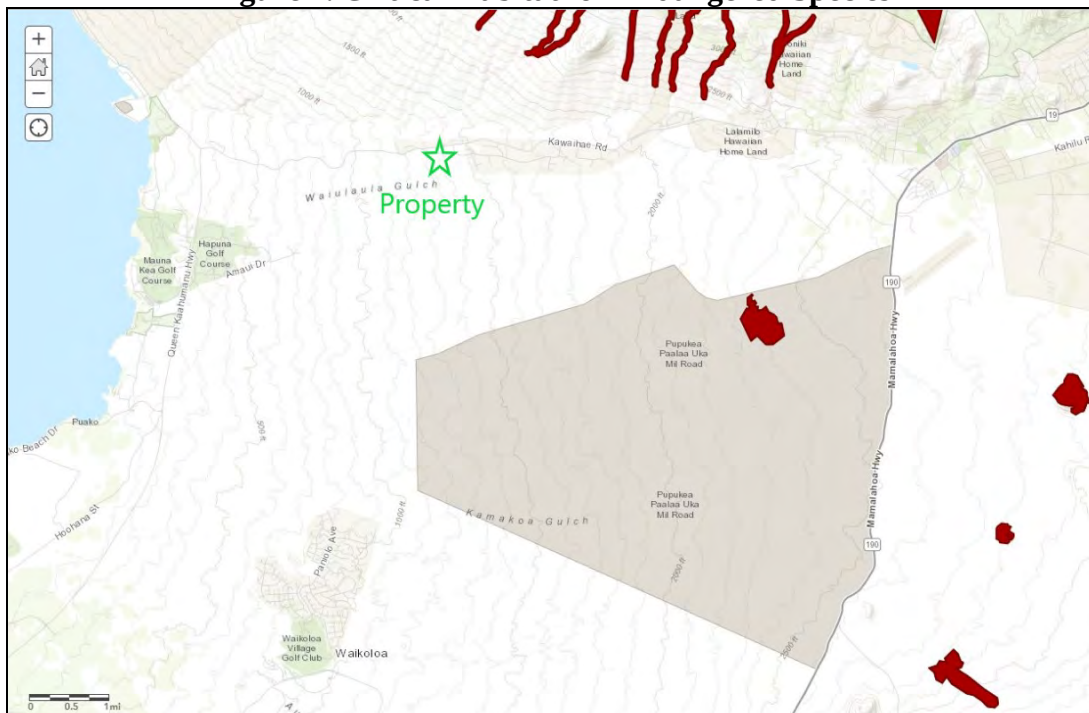


Figure 3. Property Photos



3a. Typical non-native vegetation of buffel grass, fountain grass, koa haole and partridge pea ▲
▼ 3b A few groves of koa haole are present in areas of deeper soil



Figure 3. Property Photos



3c. Kiawe is occasionally present on makai end ▲ ▼ 3d. Views to south across typical vegetation



Figure 3. Property Photos



3e. Native 'uhaloa in foreground and 'akia behind ▲

▼ 3f. Native pa'ū o Hi'iaka vine



Figure 3. Property Photos



3g. A few sandalwood shrubs are present near a drainage at mauka end of Parcel 75 ▲

▼ 3h. View to gulch that borders the survey area to the south



Figure 3. Property Photos



3i. Subtle riparian vegetation of koa haole thickets in intermittent drainage ▲
▼ 3j. Tree tobacco individual



Table 1. List of Plant Species Detected Within Property

Scientific Name	Family	Common Name	Life Form	Status*
<i>Abutilon grandifolium</i>	Malvaceae	Abutilon	Herb	A
<i>Acacia confusa</i>	Fabaceae	Formosa Koa	Tree	A
<i>Acacia farnesiana</i>	Fabaceae	Klu	Shrub	A
<i>Acacia mearnsii</i>	Fabaceae	Black Wattle	Shrub	A
<i>Ageratum conyzoides</i>	Asteraceae	Ageratum	Herb	A
<i>Anagallis arvensis</i>	Primulaceae	Scarlet Pimpernel	Herb	A
<i>Casuarina sp.</i>	Casuarinaceae	Ironwood	Tree	A
<i>Cenchrus ciliaris</i>	Poaceae	Buffel Grass	Grass	A
<i>Cenchrus setaceus</i>	Poaceae	Fountain Grass	Grass	A
<i>Centaurium erythraea</i>	Gentianaceae	Bitter Herb	Herb	A
<i>Chamaecrista nictitans</i>	Fabaceae	Partridge Pea	Herb	A
<i>Chamaesyce hirta</i>	Euphorbiaceae	Garden Spurge	Herb	A
<i>Chamaesyce prostrata</i>	Euphorbiaceae	Prostrate Spurge	Herb	A
<i>Chenopodium murale</i>	Chenopodiaceae	Chenopodium	Herb	A
<i>Chenopodium oahuense</i>	Chenopodiaceae	‘Aweoweo	Shrub	E
<i>Conyza canadensis</i>	Asteraceae	Horseweed	Herb	A
<i>Crotalaria sp.</i>	Fabaceae	Crotalaria	Herb	A
<i>Cucumis dipsaceus</i>	Cucurbitaceae	Teasel Gourd	Vine	A
<i>Desmodium incanum</i>	Fabaceae	Spanish Clover	Herb	A
<i>Dodonaea viscosa</i>	Sapindaceae	‘A‘ali‘i	Shrub	I
<i>Dysphania carinata</i>	Chenopodiaceae	Dysphania	Herb	A
<i>Emilia fosbergii</i>	Asteraceae	Pualele	Herb	A
<i>Eragrostis tenella</i>	Poaceae	Lovegrass	Herb	A
<i>Ficus microcarpa</i>	Moraceae	Chinese Banyan	Tree	A
<i>Furcraea foetida</i>	Asparagaceae	Mauritius Hemp	Shrub	A
<i>Heteropogon contortus</i>	Poaceae	Pili Grass	Herb	I
<i>Indigofera suffruticosa</i>	Fabaceae	Indigofera	Herb	A
<i>Jacquemontia ovalifolia</i>	Convolvulaceae	Pā‘ū-o-Hi‘iaka	Vine	I
<i>Kalanchoe tubiflora</i>	Crassulaceae	Chandelier Plant	Shrub	A
<i>Lantana camara</i>	Verbenaceae	Lantana	Shrub	A
<i>Leucaena leucocephala</i>	Fabaceae	Haole Koa	Shrub	A
<i>Malva parviflora</i>	Malvaceae	Cheeseweed	Herb	A
<i>Megathyrsus maximus</i>	Poaceae	Guinea Grass	Herb	A
<i>Merremia aegyptia</i>	Convolvulaceae	Merremia	Vine	A
<i>Neonotonia wightii</i>	Fabaceae	Glycine	Vine	A
<i>Nerium oleander</i>	Apocynaceae	Oleander	Tree	A
<i>Nicotiana glauca</i>	Solanaceae	Tree Tobacco	Shrub	A
<i>Olea europaea</i>	Oleaceae	Olea	Tree	A
<i>Opuntia ficus-indica</i>	Cactaceae	Panini	Shrub	A
<i>Polygala paniculata</i>	Polygalaceae	Milkwort	Herb	A
<i>Portulaca pilosa</i>	Portulacaceae	Portulaca	Herb	A
<i>Prosopis pallida</i>	Fabaceae	Kiawe	Tree	A
<i>Psidium guajava</i>	Myrtaceae	Common Guava	Tree	A
<i>Ricinus communis</i>	Euphorbiaceae	Castor Bean	Shrub	A
<i>Salsola tragus</i>	Chenopodiaceae	Tumbleweed	Shrub	A

Table 1, continued				
Scientific Name	Family	Common Name	Life Form	Status*
<i>Santalum ellipticum</i>	Santalaceae	Sandalwood	Shrub	E
<i>Schinus terebinthifolius</i>	Anacardiaceae	Christmas Berry	Shrub	A
<i>Senecio madagascariensis</i>	Asteraceae	Senecio	Herb	A
<i>Sida fallax</i>	Malvaceae	'Ilima	Herb	I
<i>Solanum linnaeanum</i>	Solanaceae	Apple Of Sodom	Herb	A
<i>Sonchus oleraceus</i>	Asteraceae	Sow Thistle	Herb	A
<i>Spergula arvensis</i>	Caryophyllaceae	Corn Spurry	Herb	A
<i>Tridax procumbens</i>	Asteraceae	Coat Buttons	Herb	A
<i>Trifolium repens</i>	Fabaceae	White Clover	Herb	A
<i>Verbena litoralis</i>	Verbenaceae	'Owi	Herb	A
<i>Verbesina encelioides</i>	Asteraceae	Golden Crown Beard	Herb	A
<i>Waltheria indica</i>	Sterculiaceae	'Uhaloa	Herb	I
<i>Wikstroemia pulcherrima</i>	Thymelaeaceae	'Akia	Shrub	E
<i>Xanthium strumarium</i>	Asteraceae	Cocklebur	Vine	A

*A = alien, E = endemic, I = indigenous, End = Federal and State listed Endangered Species (none)

Note: Several plants were either sterile or unidentifiable.

Table 2. Bird Species Observed on Property

Scientific name	Common Name	Status
<i>Acridotheres tristis</i>	Common Myna	Alien Resident
<i>Asio flammeus sandwichensis</i>	Short-eared Owl (Pueo)	Endemic Resident
<i>Bubulcus ibis</i>	Cattle Egret	Alien Resident
<i>Cardinalis cardinalis</i>	Northern Cardinal	Alien Resident
<i>Carpodacus mexicanus</i>	House Finch	Alien Resident
<i>Francolinus pondicerianus</i>	Gray Francolin	Alien Resident
<i>Geopelia striata</i>	Zebra Dove	Alien Resident
<i>Lonchura cantans</i>	Warbling Silverbill	Alien Resident
<i>Passer domesticus</i>	House Sparrow	Alien Resident
<i>Pterocles exustus</i>	Chestnut-bellied Sandgrouse	Alien Resident
<i>Serinus mozambicus</i>	Yellow-Fronted Canary	Alien Resident
<i>Sicalis flaveola</i>	Saffron Finch	Alien Resident
<i>Streptopelia chinensis</i>	Spotted Dove	Alien Resident
<i>Zosterops japonicus</i>	Japanese White-eye	Alien Resident

Final Report
Archaeological Survey and Evaluation
Land of Ouli
District of South Kohala
Island of Hawaii, Hawaii

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APPENDIX B

ABSTRACT

The results of a pedestrian survey and evaluation program of a 458-acre parcel within the Land of Ouli, South Kohala, Hawaii Island are presented (TMK 6:2:1-18,74, and 76). The initial field survey was completed between October 28 and November 6, 1990 with subsequent field visits to record and map the sites in more detail. A total of 75 sites are located within the parcel and are considered significant because they meet one or more of the criteria provided in Section 13-146-5 (b) of the Rules Governing Procedures for Historic Preservation. It is recommended that a data recovery program be completed at 7 of the sites recorded. This program should include detailed mapping and subsurface excavation. It is further recommended that 2 of the sites be preserved and protected.

TABLE OF CONTENTS

<u>TITLE</u>	<u>PAGE</u>
ABSTRACT	i
TABLE OF CONTENTS	ii
INTRODUCTION	1
ENVIRONMENTAL SETTING	1
Climate	1
Soils	5
Vegetation	5
BACKGROUND	6
Historic Background	6
Previous Archaeological Studies	8
SETTLEMENT	10
METHODS	14
RESULTS	15
MILITARY PERIOD SITES	19
RANCHING PERIOD SITES	22
HISTORIC PERIOD SITES	22
TRADITIONAL HAWAIIAN SITES	27
DISCUSSION	27
CONCLUSIONS	30
SIGNIFICANCE	30
IMPACTS AND MITIGATION MEASURES	33
REFERENCES CITED	36

LIST OF FIGURES

<u>NUMBER</u>	<u>TITLE</u>	<u>PAGE</u>
1	Project Location Land of Ouli	2
2	Location of Survey Land of Ouli, Hawaii Island	3
3	Ouli 1935 Tax Map	4
4	Archaeological Site Locations, Land of Ouli	16
5	Location of Military Sites	21
6	Location of Ranching Sites	24
7	Location of Historic Sites	26
8	Location of Traditional Hawaiian Sites	29

LIST OF TABLES

<u>NUMBER</u>	<u>TITLE</u>	<u>PAGE</u>
1	Criteria Defining Military Shelters and Features	12
2	Site Types	15
3	Ouli Feature Summary	17-18
4	Military Sites	20
5	Ranching Sites	23
6	Historic Sites	25
7	Traditional Hawaiian Sites	28
8	Management Recommendations	32

LIST OF APPENDICES

<u>LETTER</u>	<u>TITLE</u>	<u>PAGE</u>
A	Site Records	A-1

INTRODUCTION

This report describes and evaluates the results of an intensive archaeological survey completed within the *`ili kupono* of Ouli, South Kohala, Hawaii (TMK 6:2:1-18,74,74) (Figures 1 and 2). The investigations were performed by Ogden Environmental and Energy Services Company (formerly ERCE), Honolulu, Hawaii, for Nansay Hawaii, Inc., Kamuela, Hawaii.

The *`ili kupono* of Ouli is located immediately south of Kawaihae Road (Highway 19) between Kawaihae and Waimea. The study area is bounded on the north by Kawaihae Road and Kawaihae 2 *ahupua`a* and on the south by Keanuiomano and Waikoloa streams and Lalamilo *ahupua`a* (Figure 3). The western, or *makai*, boundary is a historic stone wall. The eastern, or *mauka*, boundary is not as well defined by cultural or natural features. The elevation of the parcel ranges from approximately 1150 ft (350m) along the *makai* boundary to approximately 1570 ft (480m) along the *mauka* boundary.

The scope of the program includes background research to establish the historic land use patterns and to review comparative archaeological literature; an intensive pedestrian field survey to record the cultural resources within the parcel; and an evaluation of the significance of the recorded resources. The specific goals of the program are to locate and identify significant cultural resources and to provide management recommendations to mitigate the impacts to those resources.

ENVIRONMENTAL SETTING

Climate

The Hawaiian archipelago enjoys a bi-seasonal weather pattern with summer between May and October and winter between November and April. Generally, the warmest months are August and September, with average temperatures between 79 and 80 degrees F; the coldest months are February and March, with temperatures between 74 and 76 degrees F (Armstrong 1983:53-58).

Rainfall throughout the state is variable. This variability is related to changes in temperature due to elevation and cloudiness due to the shadowing effect (Giambelluca et al. 1986:1-2). Rainfall generally increases with the Kona storms during the winter months and decreases during the summer months when the northeast tradewinds prevail. Rainfall along the leeward coast near Kawaihae averages less than 250mm annually and rainfall at Kamuela averages approximately 1800mm annually (Armstrong 1983:57). Annual rainfall within the study area is approximately 500mm.

Soils

Two soils series are represented within the study area: the Kawaihae series and the Puu Pa series (Sato et al. 1973:26, 50, map 18). Kawaihae extremely stony very fine sandy loam occurs in the lower, or *makai*, portion of the parcel. The surface layer of the soil is described as "...dark reddish-brown extremely stony very fine sandy loam about 2 inches thick." Underlying the surface layer is "...dark reddish-brown and dusky-red stony silt loam and loam." Finally, pahoe-hoe bedrock occurs at a depth of approximately 33 inches (Sato et al. 1973:26).

The upper, or *mauka*, portion of the parcel consists of Puu Pa extremely stony very fine sandy loam. The surface layer of this soil is described as "...very dark brown extremely stony very fine sandy loam about 6 inches thick." Beneath this layer is "...dark brown and dark yellowish-brown very stony very fine sandy loam about 34 inches thick." Beneath this stratum is fragmental *a`a* lava (Sato et al. 1973:50).

Vegetation

In a study for the Mudlane-Waimea-Kawaihae road corridor, McEldowney (In Clark and Kirch 1983:407-448) describes 8 vegetation zones present in the area and proposes that 12 vegetation zones were present prior to AD 1850. Of interest to the current study is McEldowney's vegetation zone IV. The principal ground cover is fountain grass (*Pennisetum setaceum*), which has replaced most other grasses. *Pili* grass (*Heteropogon contortus*) is also represented, but is more common at lower elevations. *Kiawe* (*Prosopis pallida*) and *koa haole* (*Leucaena leucocephala*) are found primarily along the stream beds and in swales.

BACKGROUND

The following discussion focuses on historical and archaeological research that may provide information concerning land use patterns within study area. The purpose of such research is twofold: it provides advanced information on the types of archaeological resources that may be expected within the study area and it provides a context in which to interpret those resources. The primary sources of information for the present study included the Historic Preservation Division of the Department of Land and Natural Resources, the State Archives, the Bureau of Conveyances, and the Land Survey Division.

Historic Background

Kohala was one of the six original chiefdoms of the Island of Hawaii. When King Kamehameha I unified the island in 1790, the geographic divisions of these chiefdoms were retained as districts of his kingdom. It was not until after the Great Mahele of 1848 that the district boundaries changed significantly; Kohala and Kona were each divided into north and south districts in 1859 and Hilo was divided into north and south districts in 1886.

In 1790 the first American ships, the *Eleanora*, under the command of Captain Metcalf, and the *Fair America*, under the command of Metcalf's son, visited the islands. In retaliation for the humiliating treatment at the hands of the crew of the *Eleanora*, Kameeiamoku captured the *Fair America* and, with the exception of the mate Isaac Davis, killed the entire crew. Davis was captured and eventually became allied with Kamehameha in his conquest of the islands. John Young, of the *Eleanora*, was captured by Kamehameha because it was feared that he knew of the fate of the *Fair America* and her crew, and would warn Captain Metcalf of the *Eleanora*.

Davis and Young joined Kamehameha in his conquest to unite the islands and, upon his success, were given land as a reward. Young was given Ouli as an *`ili kupono* and the *ahupua`a* of Kawaihae 2. Davis was given the less productive lands of Waikoloa (Clark and Kirch 1983; Kelly 1974). The children of John Young and Isaac Davis received considerable land in the Great Mahele of 1848 (Kelly 1974:46; Native Register

Vol. 3:708). Two of Young's sons, Keoni Ana and James Y. Kanehoa, received East Kawaihae and Ouli, respectively. George Davis Hueu, one of Isaac Davis' sons, received Waikoloa.

The Kohala field system is perhaps the most intensively studied agricultural complex in leeward Hawaii Island (Kirch 1985). At one time, the Kohala field system was 3 km wide and 20 km long (Rosendahl 1972). In 1793, while sailing from Hamakua to Kawaihae with Vancouver, Menzies (1920) noted the extent and number of small fields visible from the sea.

Research conducted by Griffin et al. (1971) and Rosendahl (1972) has provided considerable information concerning the Kohala field system, particularly the *ahupua`a* of Lapakahi. The coastal region of Lapakahi was first settled around AD 1300 by people relied heavily on fishing for subsistence. As the population increased the uplands were developed for agriculture, and by about AD 1500 shifting cultivation using slash-and-burn techniques was widespread. By AD 1800 the agricultural system had expanded further and had become permanent (Rosendahl 1972). The principal crop grown was sweet potato (*Ipomoea batatas*).

The Waimea-Lalamilo field system was also an extensive system and was still in use as late as 1935 (Handy and Handy 1972; Barrera and Kelly 1974). In 1793 Menzies (1920) commented on the "plantations" and the fertile soil of the region, and in 1824, Ellis (1827) noted the large villages surrounded by plantations. Ellis estimated the population size as high as 1,200.

The Waimea-Lalamilo field system was composed of four complexes located south and west of the present town of Waimea. In contrast to the Kohala field system, the Waimea-Lalamilo field system was irrigated using *`auwai* to divert water from the streams (Clark 1983a). The principal crops were taro (*Colocasia esculenta*) and bananas (*Musa paradisiaca*), but stone mounds for the cultivation of sweet potatoes (*Ipomoea batatas*) and gourds (*Lagenaria siceraria*) have been found in the area (Clark 1983a; 1983b). This system dates from AD 1200-1300.

Mounds, cairns, and terraces indicating dryland cultivation of sweet potatoes and gourds have been found at the lower elevations between Waimea and Kawaihae (Clark 1983a;

Welch 1983). Radiocarbon dates from sites between Kawaihae and Waimea indicate an occupation and use of the area from AD 1600 to AD 1800.

By AD 1850 the population of the region had grown considerably (Rosendahl 1972; Griffin et al. 1971). By 1900, however, the introduction of cattle had severely damaged the field systems, and cattle ranching and a cash economy had replaced the agricultural system.

Previous Archaeological Studies

The South Kohala District extends along the coast from the of Anaeho`omalo to approximately Kai opae Point, and includes the lower leeward slopes of Mauna Kea, the south Kohala Mountains, and the Waimea area.

A number of archaeological studies have been completed in the district. The Mudlane-Waimea-Kawaihae road corridor (Clark and Kirch 1983) is perhaps one of the more useful studies because it provided a transect across several elevation and vegetation zones from near sea level to 2800 ft. Most sites occur between 40 and 280 ft elevation, with the highest density near gullies and gulches. Density drops off, however, around 160 ft.

Sites found between 40 and 500 ft elevation include historic and possible prehistoric farming complexes, residential sites, and burial sites. Between 500 and 1300 ft elevation major site types include cairns, shelters, stone alignments, and historic military. A single cremation burial, open camps, field shelters, and agricultural features were found between 1300 and 1900 ft elevation. Clark (1986:334) refers to this region as the intermediate zone, rejecting the use of terms like transitional (Ching 1971), unoccupied (Griffin et al. 1971), and barren (Rosendahl 1972, 1973). The area was more of a transitional settlement zone between the coastal and upland settlements. It experienced limited, temporary occupation for specialized resources, agriculture, and later cattle ranching. The inland agricultural complexes are found between 1300 and 2600 ft elevation. Field shelters are found between 1300 and 1900 ft and residential sites are found between 1900 and 2800 ft elevation. Generally, there is a very low site density with no permanent habitation between 500 and 1900 ft. The arid zone between 1900 and 2000 ft is location of the lower component of the Lalamilo agricultural complex.

A total of 179 sites have been recorded in the lands of Kalahuipua`a-Anaeho`omalu, Waikoloa, and Lalamilo (Kirch 1979). Included are 449 features in 21 categories. The sites reflect marine exploitation and it is expected that inland agricultural sites were maintained in a manner similar to that demonstrated by Rosendahl (1972) at Lapakahi.

Jensen (1989) surveyed 130 acres for the Mauna Lani Resort within the lands of Kalahuipua`a and Waikoloa. Eighteen sites with 46 component features were recorded. These include caves, surface habitation features (C-enclosures and linear wall segments), cairns, petroglyphs, abrader basins, a modified bedrock outcrop, a historic fence, and the Kiholo-Puako Trail.

An extensive agricultural complex is known to have existed in the area of Lalamilo and Waimea (Clark 1981). Located in the wet windward valleys were irrigated taro pondfields (lo`i). In contrast, the dry leeward slopes and table lands were not irrigated. The fields were dry (kula) and the major crops included sweet potato, dry taro, and yams. The two systems, wet and dry, can best be characterized as intensive and extensive, respectively.

The North Kohala District includes the windward and leeward slopes of the North Kohala Mountains. Virtually continuous settlement is known to have existed from the hanging Valley of `Awini to the district boundary of Waika (Tomonari-Tuggle 1981; Tuggle and Griffin 1973). Site types in the Lapakahi area include walls and shelters, large enclosures, habitation complexes, water catchment features, rock mounds, wall sections, and trails. Most of the sites are located between sea level and 165 ft elevation and are within 250 to 500 ft from coast. There are no sandy beaches within the ahupua`a of Lapakahi and habitation clusters appear to have been associated with canoe access (Tuggle and Griffin 1973).

An extensive upland agricultural complex existed at elevations between 500 and 2500 ft, and upland habitation extended inland approximately 2 miles to an elevation of 1000 ft. The makai boundary of the upland agricultural zone coincides with the *kiawe* belt, or the transition zone. *Kiawe* was introduced after the turn of the century; the transition zone was previously dominated by *pili* grass and *wiliwili* trees.

SETTLEMENT

An important initial step in the analysis of subsistence-settlement patterns is the development of a site typology. This classification must take into account the relationship between time, space, and function (Flannery 1976:163; Spaulding 1960). Typologies that consider only spatial distribution of sites and the activities performed at the sites suffer because the time element has not been taken into account. Without temporal control, local regional interaction during a specific period, and the study of changes in these interactions cannot be studied.

Several chronological sequences have been posited for the Hawaiian archipelago (see for example Kirch 1985; Cordy 1981; Hommon 1976). Clark (1979; 1986) proposes a sequence consisting of six major phases: three prehistoric and three historic phases. Clark's sequence is used here because it provides a framework based on research closely related to the present project. Briefly, Clark (1986: 143-154) uses artifact typologies and assemblages along with chronometric data to develop his sequence.

Clark's earliest phase is termed the Settlement Phase and dates to between AD 300 and 1200. This phase is further divided into Early and Late. During the Early settlement Phase the islands were colonized by predominantly marine-oriented people who brought with them agricultural products, a simple chiefdom political system, and kin-based system of land tenure (Clark 1986: 146). These early settlers occupied the windward regions first.

While no dates are proposed, the Late Settlement Phase is distinguished archaeologically by a decreased emphasis on marine resources and a concomitant increase in the dependence on agricultural products. By the end of the Settlement Phase, Clark proposes that exploration of the archipelago had been completed and much of the usable area was settled, or at least explored; expansion into the uplands had begun (1986:146).

Clark's Developmental Phase dates from AD 1200 to 1600 and was marked by transition from a simple chiefdom to a more complex socio-political structure (1986:146, 149). While the basic concept of the *ahupua`a* may have come with the colonizers, it was during this period that the *ahupua`a* system became more pronounced. The importance of agriculture continued to increase and population continued to grow.

The Late Prehistoric Phase dates to between AD 1600 and 1778. Socio-political stratification increased as the commoners lost ownership rights to land and the chiefly classes dominated nearly all aspects of daily life. Warfare between chiefs for control of land accelerated, and, once again, population and dependence on agricultural products was increasing.

Clark's historic period is divided into three phases: Early Historic, AD 1778-1819; Transformational, AD 1819-1855; and Late Historic, post-AD 1855. The Early Historic Phase began with the arrival of Captain Cook and ended with the death of Kamehameha the Great (Kamehameha I). During this period, with the help of European/American technology and men like John Young and Issac Davis, Kamehameha was able to conquer and unify the islands. Clark (1986: 152) maintains that, while the impact to the Hawaiian culture was 'profound', there is little difference archaeologically between this phase and the Late Prehistoric Phase. The population began to shift, however, toward areas frequented by the foreign traders.

The Early Historic Phase ended and the Transformational Phase began with the death of Kamehameha the Great and the breaking of *kapu* by Liholiho (Kamehameha II). The cattle industry began in earnest and foreign goods began replacing the traditional material culture. With the breaking of *kapu*, many of the traditional religious practices were abandoned in favor of Christian doctrines.

As Clark notes (1986:153) considerable changes took place during the Late Historic Phase. The Phase was marked by greater foreign influence and the general replacement of the Hawaiian material culture with foreign goods.

The current project is located in the uplands between 1100 and 1700 ft elevation. This is within Clark's Intermediate Zone (1986: 334-356). This zone includes Environmental Zone 2 and much of Environmental Zone 3; it may be characterized by a hot, arid climate with shallow soils. Water is generally available only during rainy periods. According to Clark's chronological sequence, this area would have been explored by the end of the Settlement Phase but was probably not used, or occupied, until the agricultural expansion in the Developmental Phase or the Late Prehistoric Phase.

Ethnohistoric sources indicate that human occupation of this zone was very limited (Clark 1986:335), and the archaeological information supports this thesis. The sites found within this zone typically reflect short-term occupation and are located near areas of soil accumulation suitable for growing. Radiocarbon dates from sites 8827 and 8828 indicate late Prehistoric use of the area. Clark concludes that the zone was marginally used for temporary shelter and limited agriculture during the Late Prehistoric and Early Historic phases.

Clark also noted a number of features, which, after considerable fieldwork, he determined were military, i.e., the result of World War II training. Clark (1986: 196-199) provides several criteria for defining military shelters so that they can be distinguished from Hawaiian single-use or recurrent-use shelters. These criteria should not be taken as all-inclusive; that is, one or more criterion may be absent. These criteria are presented below in Table 1 followed by some suggested additions.

Table 1
CRITERIA DEFINING MILITARY SHELTERS AND FEATURES

Presence of military debris; e.g., cartridge casings, shrapnel, equipment.

Basal rocks of features are not embedded in the soil, but rest on the ground.

Military structures were more commonly placed in swales and other areas where soil was present. In contrast, Hawaiian structures were placed in areas of little or no soil.

The interior of the military structures are often slightly excavated to afford greater protection.

While C-shapes and L-shapes were used, military structures were typically U-shaped with a narrow interior, or oval to rectangular.

Military shelters are generally smaller than Hawaiian shelters, ranging from 1 to 9 sq m.

Hawaiian shelters occur as isolated features or in small groups, generally associated with agricultural features, while military structures usually occur in large numbers.

We propose two additional criteria which may help in determining the origin of a specific structure: differential patination (weathering) and recent fractures. It was noted that many of the structures within the present study area were built with stones exhibiting a weathered surface indicative of considerable exposure to the elements and a ground-stained surface exhibiting little or no weathering. This difference is the result of selecting stones partially imbedded in the soil for construction, thereby exposing the un-weathered surface. A similar phenomenon was also noted at known military shelters within the U. S. Army Pohakuloa Training Area, Hawaii Island.

Recent fractures may also be indicative of historic, e.g., military, construction. As with the differential weathering noted above, the weathered surfaces are distinguishable from the more recent fracture planes or scars by color and surface texture.

Previous archaeological studies have documented a settlement configuration dated to the late prehistoric-early historic period that extended from the coastal zones to the interior valleys. A variety of archaeological sites are associated with this occupational network.

Messers. William Akau and Clayton Bertleman, both lifetime residents of the area, were interviewed by Mr. Harvey Auna on February 23, 1991 to gather additional information concerning the use of the study area. Mr. Akau stated that his uncle, Abraham Akau, supervised the construction of the north-south wall to Waikoloa Village in the late 1800s. The principal use during the historic period was for cattle industry, the entire area between Kamuela and Kawaihae was no doubt used extensively. The study area was also used as a bivouac area by the Marine Corps between 1942 and 1945.

Based primarily on the research conducted for the Mudlane-Waimea-Kawaihae Highway corridor (Clark and Kirch 1983; Clark 1986), but also taking into account research at Lapakahi (Rosendahl 1972; Griffin et al. 1971) and Lalamilo (Kirch 1979), a limited variety of site types are expected to occur within the current study area. Specifically, small temporary shelters and agricultural features. More permanent dwellings and the extensive field systems found at Lapakahi and Lalamilo are not expected. It is also expected that military sites will be present.

METHODS

The initial field survey was completed by a crew of four between October 28 and November 6, 1990. The crew included Bert Rader, Dan Costello, Doug Reveley, and Dr. Fred Reinman. The pedestrian survey consisted of walking a series of north-south transects over the project area with the survey crew spaced approximately 10-15 meters apart. The survey began at the *makai* boundary of the parcel, marking each successive transect with blue surveyors tape.

Sites were recorded on standard ERCE survey forms, which register observations regarding the formal type of site, the features present, site and feature dimensions, surface remains, the topographic setting and prevalent vegetation, and a field assessment of the significance of the site taking into account its integrity, function, chronological period and ethnic origin, and its value for scientific research and interpretation for the public. Sketch maps were made of all but the most simple and repetitive features and color slide photographs were made of most features. Occasionally probing was utilized as a method to assess soil depth. Sites were marked with orange flagging tape and given temporary field numbers, and their locations marked on a parcel survey map with a 1 inch = 200 feet scale. Isolated artifacts were not collected, their location and descriptions were noted and photographs taken.

Subsequent field visits were made in May 1991 and April 1993. Allan Schilz met Mr. Keith Wallis and Richard Stevens to investigate what Messers Wallis and Stevens believed to be Hawaiian trails. These trails were walked and it was determined that they were recent cattle trails and no evidence of Traditional Hawaiian trails were visible.

Messers Wallis and Stevens also noted two features that had not been mapped during the initial survey: a revetment along the old Kawaihae-Waimea Road and a lava tube shelter. These features were visited and recorded on May 22, 1991.

Also, Site 14713 was tested on May 14, 1991 to determine if a burial was present. The feature was disassembled and found not to contain a burial, but to be a historic fence post support.

On April 26 and 27, 1993, Mr. Allan Schilz and Mr. William Fortini performed a field check to collect additional information on the sites recorded. The principal purpose of this field visit was to confirm which sites could be attributed to military and ranching use.

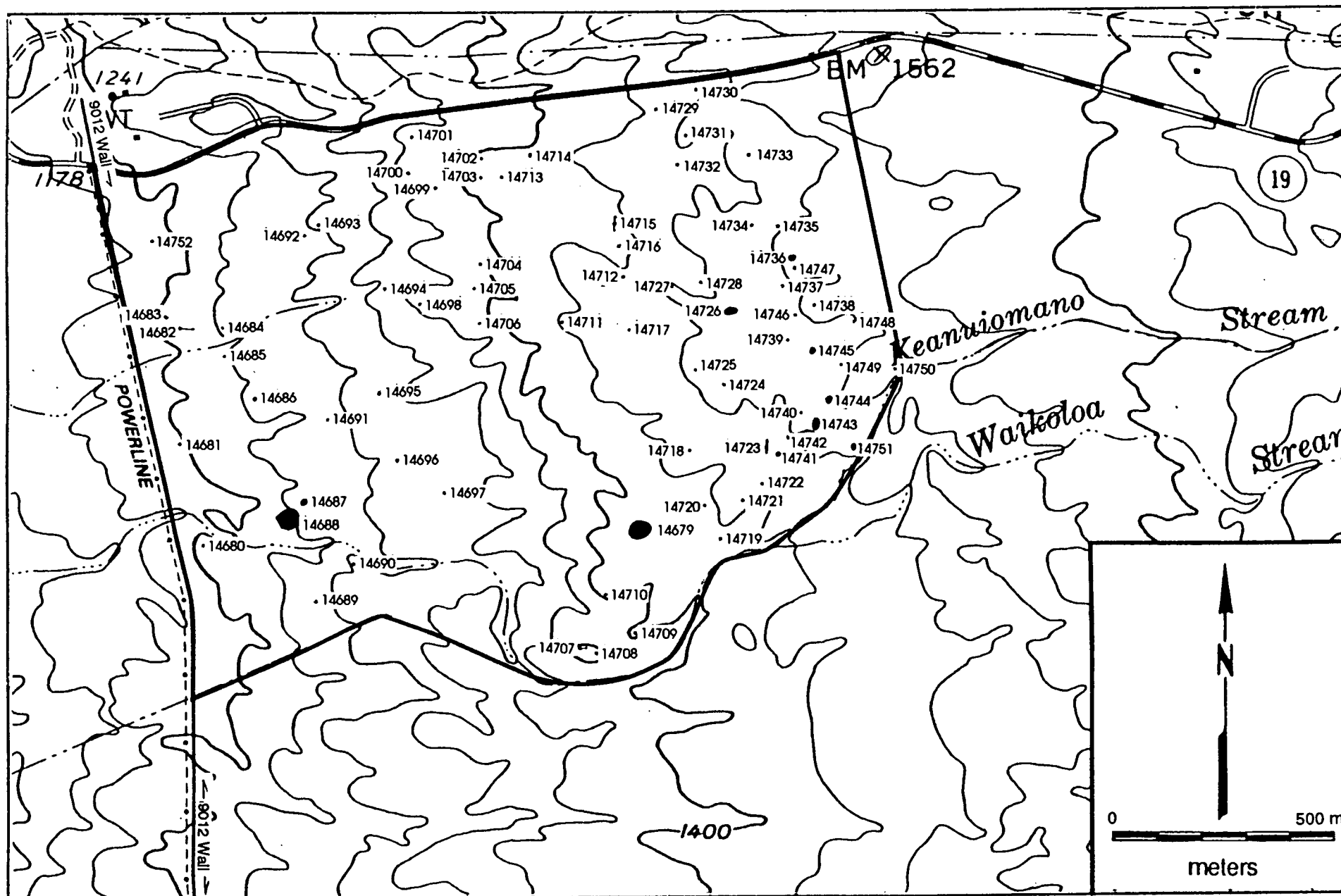
RESULTS

Seventy-five archaeological sites, including two sites previously recorded by Clark (1983:308-313), are located within the project area (Figure 4). Included are 115 component features comprising nine major site types (Tables 2 and 3). The sites are distributed throughout with some apparent clustering along the Keanuimano and Waikoloa streams.

Table 2
Site Types

Site Type	Number of Sites	Percent of Total	Recommended for Preservation
Military	45	60%	no
Ranching	14	19%	1
Historic	9	12%	no
Traditional Hawaiian	7	9%	1

A total of 75 sites were recorded within the project area; despite this relatively large number, many of the sites and features are very similar in form and construction, and represent only a limited range of functions. The sites can be grouped into four cultural periods, with a limited range of functional site types representing each period. The four periods are Military, Ranching, Historic, and Traditional Hawaiian. Military sites are the most common, followed in descending order by the next three categories. Military sites date to the period between 1942 and 1945; Ranching sites date from the 19th century to the start of military use of the area; Historic sites are those from the 19th or 20th centuries that could be either Military or Ranching, but which lack enough evidence to determine their specific function or cultural period but which do contain evidence that they are



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Archaeological Site Locations
Land Of Ouli

FIGURE

4

**Table 3
Ouli Feature Summary**

Quadrangle	SIHP Number	Modified Outcrop	Wall	Alignment	Overhang Shelter	Lava Tube Shelter	C-Shape	Rectangular Enclosure	Circular Enclosure	Irregular Enclosure	Midden	Pavement	Calm	Road	Burial
5	14679										x		2		
5	14680												1		
5	14681						1							1	
5	14682												1		
5	14683												1		
5	14684												1		
5	14685												1		
5	14686												1		
5	14687								1	1	x	x			
5	14688									1					
5	14689						1						1		
5	14690												1		
5	14691												1		
5	14692						1								
5	14693						1								
5	14694												1		
5	14695												1		
5	14696												2		
5	14697			1											
5	14698						1	1							
5	14699												1		
5	14700												2		
5	14701						1								
5	14702								1						
5	14703			1											
5	14704						1								
5	14705						1								
5	14706						1						1		
5	14707													1	
5	14708												1		
5	14709			1											
5	14710												1		
5	14711												1		
5	14712		1				1								
5	14713												1		
5	14714							1							
5	14715												3		
5	14716						1								
5	14717						1								
5	14718	1								1					

Table 3
Ouli Feature Summary (continued)

	SIHP	Modified			Overhang	Lava Tube		Rectangular	Circular	Irregular					
Quadrangle	Number	Outcrop	Wall	Alignment	Shelter	Shelter	C-Shape	Enclosure	Enclosure	Enclosure	Midden	Pavement	Calm	Road	Burial
5	14719							1							
5	14720												1		
5	14721	1							1				1		
5	14722						1								
5	14723			1			1						3		
5	14724			1											
5	14725		1												
5	14726						2						1		
5	14727						1								
5	14728						1						1		
5	14729												1	1	
5	14730												1		
5	14731												1		
5	14732												3		
5	14733													1	
5	14734			1											
5	14735	1													
5	14736						4								
5	14737													1	
5	14738	1					1								
5	14739	2													
5	14740	1													
5	14741				1										
5	14742						1								
5	14743			2			4								
5	14744								1				1		
5	14745												5		
5	14746						1								
5	14747						1							1	
5	14748		2												
5	14749												1		
5	14750				1						x				
5	14751				1						x				
5	14752					1									x
5	9012		1												

post- Contact or non-Traditional types of sites or features. Traditional Hawaiian sites are those that contain artifact or architectural evidence indicating they were used in the pre-Contact period (prior to 1778) or in the early part of the 19th century.

MILITARY PERIOD SITES

Forty-five sites (60% of the total) were interpreted as representing military related activities, primarily fortifications or targets, with some road berms (Table 4). Sites interpreted as fortifications included C-shapes, low walls, and alignments; these sites probably served as bivouac or training areas. The sites were characterized by military debris, poorly constructed features, and the presence of earth-staining on the rocks used as building materials, indicating that such features were relatively recent constructions. Sites interpreted as targets consisted of mounds of broken or shattered rock, often exhibiting bullet marks or spent bullets in the area. Military related sites tended to occur on the tops of ridges and are present throughout the project area, but are more common in the *mauka* portion of the area (Figure 5).

The military sites are indicative of training activities that involved the opportunistic construction of small features, rather than large-scale or pre-planned construction projects. Such small, opportunistic features were probably constructed by individuals or small groups on an as-needed basis, rather than according to any kind of master plan or design. Construction of these features probably impacted evidence of earlier use of the area, as rocks were moved around or constructed into new feature types; this is illustrated by Site 14726, a site containing two C-shapes constructed by the military and a scatter of marine shell midden, suggesting Traditional Hawaiian use of the area.

Military activities undoubtedly had a major impact on the archaeological record and are primarily responsible for the architectural features present within the project area today. Construction by military personnel adversely affected sites from the earlier cultural periods, making it difficult to determine the extent of pre-Military activities in the project area.

Table 4
Military Sites

Quadrangle	SIHP Number	Modified Outcrop	Well	Alignment	C-Shape	Rectangular Enclosure	Circular Enclosure	Irregular Enclosure	Calrn	Road
5	14681				1					1
5	14682								1	
5	14689				1					
5	14692				1					
5	14693				1					
5	14697			1						
5	14698				1	1			1	
5	14699								2	
5	14700									
5	14701				1					
5	14702						1			
5	14703			1						
5	14704				1					
5	14705				1					
5	14706				1				1	
5	14707									1
5	14709			1						
5	14712		1		1					
5	14714					1				
5	14716				1					
5	14717				1					
5	14718	1						1		
5	14719					1				
5	14720								1	
5	14721	1					1		1	
5	14722				1					
5	14723			1	1				3	
5	14724			1						
5	14727				1					
5	14728				1				1	
5	14733									1
5	14734			1						
5	14735	1								
5	14736				4					1
5	14737									
5	14738	1			1					
5	14739	2								
5	14740	1								
5	14742				1					
5	14743			2	4					
5	14744			1			1		1	
5	14745									
5	14746				1					
5	14747				1					1
5	14748		2							

RANCHING PERIOD SITES

Fourteen sites (19% of total) relate to the Ranching period use of the project area (Table 5). The most common type of Ranching sites are small rock mounds used as fence post supports; these occur in straight lines and still often contain milled-lumber posts. Other Ranching sites include an animal enclosure with stacked stone walls and another enclosure that probably functioned as a field house or field shelter.

The ranching sites also occur throughout the project area, but are more common in the *makai* portion (Figure 6). This pattern may be the result of military use of the project area and the impact of military activities on sites, since military sites are more common in the *mauka* portion of the project area and construction of such features may have destroyed previous ranching features.

HISTORIC PERIOD SITES

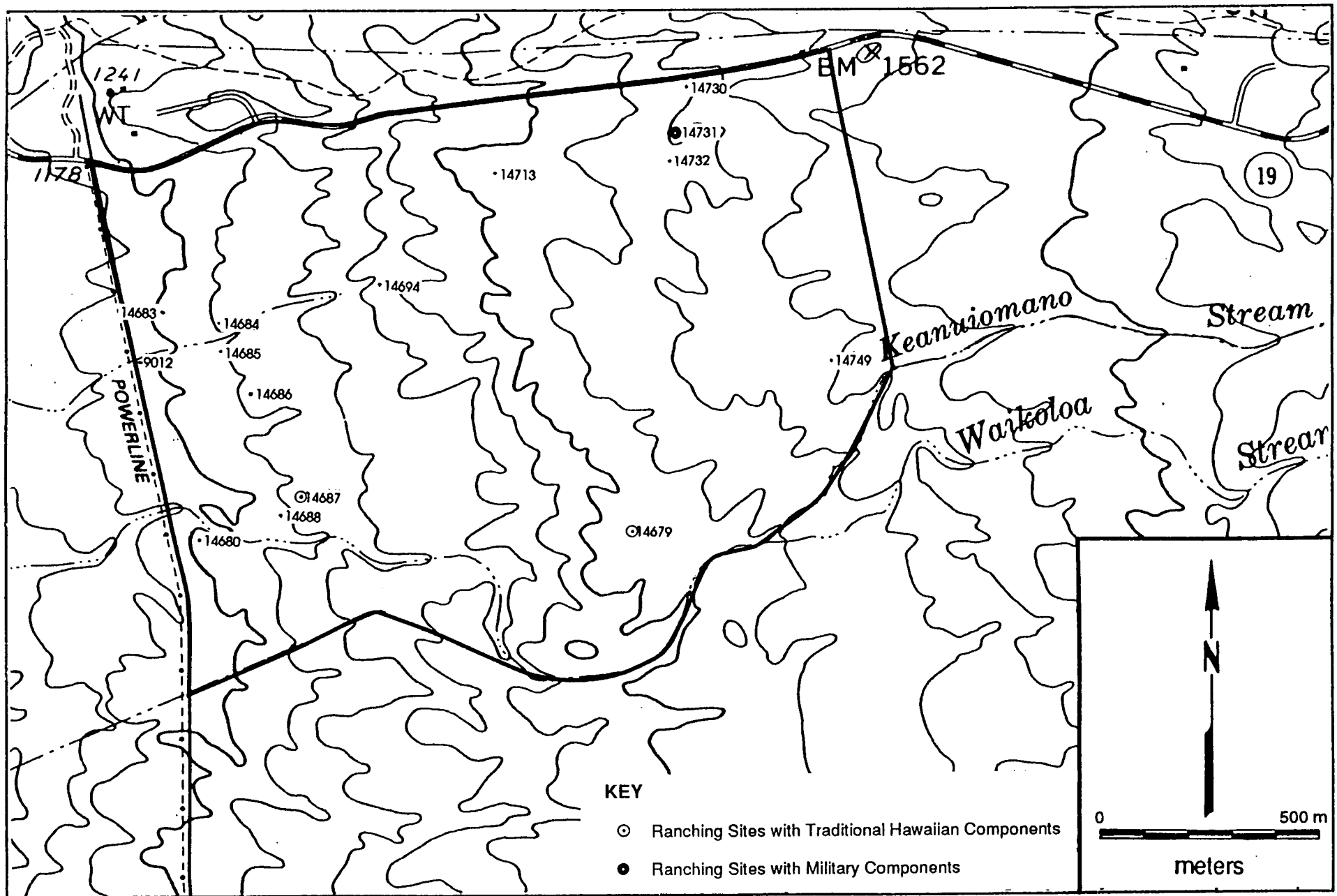
Nine sites (12% of total) were identified as Historic period sites (Table 6). These are sites that relate to post-Contact use of the project area during the 19th and 20th centuries, as determined from architectural elements, but for which no more definite period (e.g., Ranching or Military) could be determined. The Historic sites consist of cairns, with one exception (a road). These cairns are not Traditional Hawaiian features, as evidenced by the style of construction and the presence of rocks with earthen staining on them.

Although a more specific cultural period could not be assigned to the Historic sites, it seems more probable that they are Military period features, perhaps related to military trails or jeep paths that are no longer evident. No military debris were noted around the Historic sites, but little might be expected if they served primarily as road or trail markers. Alternatively, the Historic period sites could have functioned as road or trail markers during the Ranching period. The Historic period sites occur scattered throughout the project area (Figure 7), including in areas containing Military and Ranching sites.

The Historic period sites seem to have served as transportation aids during the 19th or 20th centuries, if the cairns served as markers for transportation routes. Based on the

Table 5
Ranching Sites

Quadrangle	SIHP Number	Wall	Circular Enclosure	Irregular Enclosure	Midden	Pavement	Cairn
5	14679						2
5	14680						1
5	14683						1
5	14684						1
5	14685						1
5	14686						1
5	14687		1	1	X	X	
5	14688			1			
5	14694						1
5	14713						1
5	13730						1
5	14731						1
5	13732						3
5	14749						1
5	9012	1					

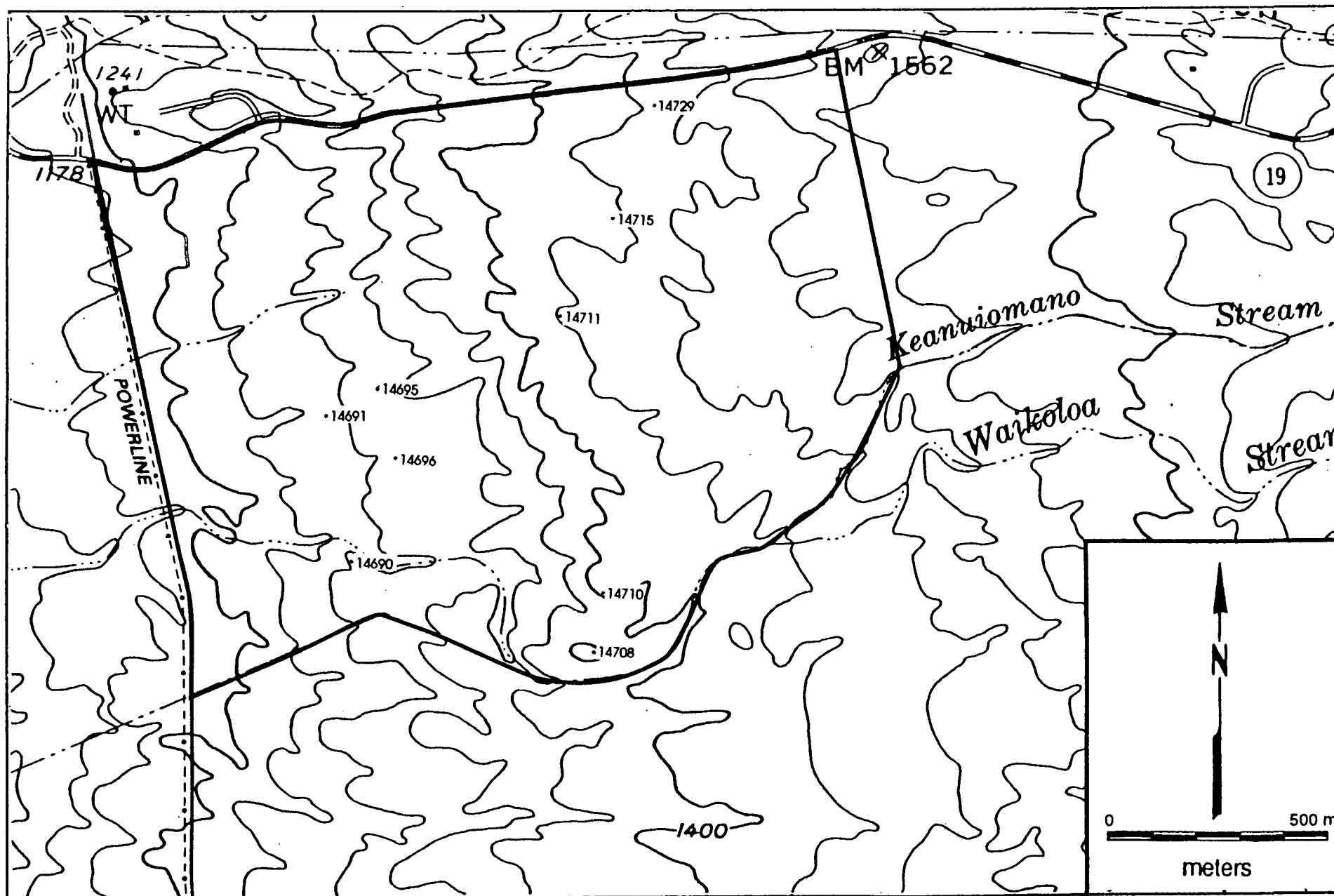


FIGURE

6

Table 6
Historic Sites

Quadrangle	SIHP Number	Cairn	Road
5	14690	1	
5	14691	1	
5	14695	1	
5	14696	2	
5	14708	1	
5	14710	1	
5	14711	1	
5	14715	3	
5	14729	1	1



OGDEN
■ ■ ■ ■ ■

Location of Historic Sites

FIGURE

7

evidence gathered to date, this seems the most likely function for the cairns, since they contained no cached goods, nor appeared to have been used as targets during the Military period.

TRADITIONAL HAWAIIAN SITES

Seven sites (9% of total) relate to Traditional Hawaiian period use of the project area (Table 7). Traditional Hawaiian sites include overhang shelters, a lava tube burial, C-shapes, enclosures, and cairns. The majority of these sites (five of the seven) occur in or near Keanuiomano Stream gulch (Figure 8). Since Keanuiomano Stream provides a fairly dependable water source, it is not surprising that the Traditional Hawaiian sites are located near the stream. The exceptions to this pattern are Site 14752, a lava tube with a burial, and Site 14726, a midden scatter impacted by military activities.

Traditional Hawaiian sites were identified by the presence of midden or artifacts or by certain architectural characteristics, such as wall heights, quality of construction, and the lack of earthen staining on structural rocks. Marine shell midden was present in four of the seven Traditional Hawaiian sites.

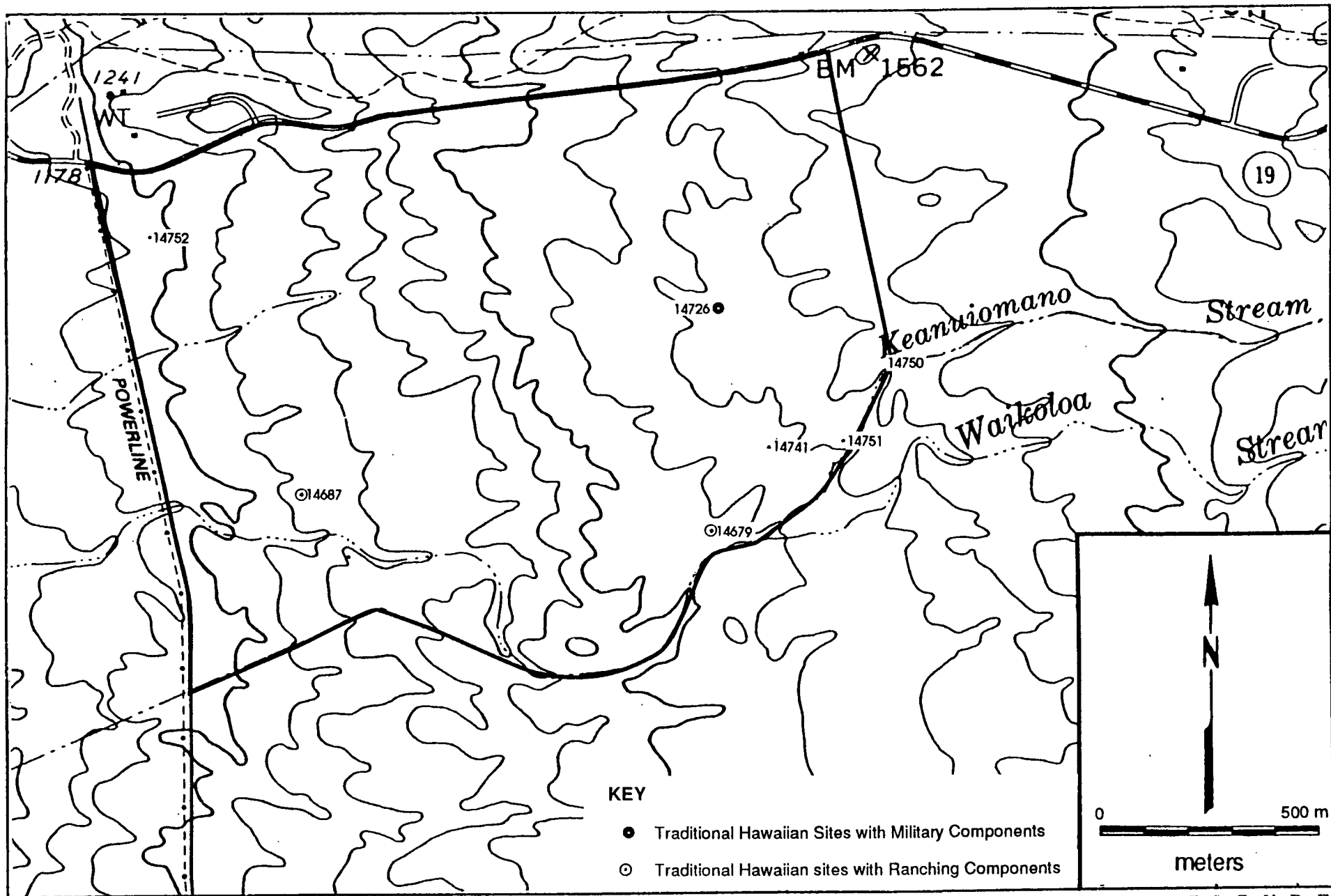
All of the Traditional Hawaiian sites appear to be related to temporary exploitation of the project area during the pre-Contact or early post-Contact period; none of the sites represents permanent occupation. The lands within the project area may have been used for resource exploitation or Keanuiomano Stream may have formed a route leading *mauka* into the interior. If so, the sites identified as Traditional Hawaiian may have served as resting or camping points.

DISCUSSION

Military and ranching activities have greatly impacted the archaeological record within the project area, with military activities probably causing the most serious changes by probably destroying evidence for Traditional Hawaiian use of the area. Use of the area during pre-Contact times may have been primarily for temporary resource exploitation, but the presence of Keanuiomano Stream makes it possible that some more permanent or long-term occupation occurred within the project area; if this is true, however, the subsequent Ranching and Military period use of the area destroyed the evidence. Other

Table 7
Traditional Hawaiian Sites

Quadrangle	SIHP Number	Overhang Shelter	Lava Tube Shelter	C-Shape	Circular Enclosure	Irregular Enclosure	Midden	Pavement	Cairn	Burial
5	14679						X		2	
5	14687				1	1	X	X		
5	14726			2					1	
5	14741	1								
5	14750	1					X			
5	14751	1					X			
5	14752		1							X



FIGURE

8

than the occurrence of the majority of Traditional Hawaiian sites along Keanuimano Stream, no other site patterning was obvious except for a greater concentration of Military sites in the *mauka* portion of the project. In general, though, Military, Ranching, and Historic sites occurred throughout the project area, without any clustering or grouping of site types.

CONCLUSIONS

SIGNIFICANCE

The recognition that historic and prehistoric archaeological sites, i.e., cultural resources, are valuable to society is reflected in the federal and state laws and regulations designed for their protection. Based on existing legislation, cultural resources are those historic and prehistoric sites, artifacts, features, and other humanly produced elements that represent or reflect the heritage of the people within an area of affected environment. Prehistoric resources may vary from isolated rock features to site complexes that may include midden deposits, fish ponds, and any number of related features. Historic resources may vary from an individual structure, or remains of a structure, to a complex of structures encompassing an entire community.

As stated in Chapter 6E, paragraph 2 of the Hawaii Revised Statutes (H.R.S.),

"Historic preservation means the research, protection, restoration, rehabilitation, and interpretation of buildings, structures, objects, districts, areas, and sites, including underwater sites, significant to history, architecture, archaeology, or culture of this State, its communities or the nation."

Paragraph 6E-2 further states that,

"Historic property means any building, structure, object, district, area, or site, including *heiau* and underwater site, that is significant in the history, architecture, archaeology, or culture of this State, its communities, or the nation."

The Historic Preservation Division, Department of Land and Natural Resources has drafted rules and regulations (Title 13, Subtitle 6, Chapters 146-154, draft May 1989) to govern the procedures and standards for historic preservation. Chapter 146, Rules Governing Procedures for Historic Preservation Review, defines the criteria to be used in

evaluating significance. Section 13-146-5 (b) states that, "to be significant, a historic property shall possess integrity of location, design, setting, materials, workmanship, feeling, and association and shall meet one or more of the following criterion:

1. Criterion "a". Be associated with events that have made an important contribution to the broad patterns of our history;
2. Criterion "b". Be associated with the lives of persons important in our past;
3. Criterion "c". Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;
4. Criterion "d". Have yielded, or be likely to yield, information important for research on prehistory or history;
5. Criterion "e". Have an important historical cultural value to an ethnic group of the state.

Seventy-five archaeological sites were located and recorded during the inventory survey of the project parcel. A total of nine sites are considered significant under criterion d of the State of Hawaii Register of Historic Places; criterion d applies to sites that are significant if they have yielded, or likely to yield, information important for research on prehistory or history. Seven of the nine sites are classified as Traditional Hawaiian. Included are 14679, 14687, 14726, 14741, 14750, 14751, and 14752. The other two sites are related to historic ranching (Table 8).

Site 14752 is also considered significant because it meets the requirement of criterion e, it has "...an important historical cultural value to an ethnic group of the state." It is the location of human remains.

Of the remaining 66 sites, 13 relate to the ranching period and one site is attributing to the ranching period but was apparently altered by the military during training exercises in the 1940s and 1950s. Most of these sites are former fence supports. Fifty-two sites are related to military activities conducted in the 1940s and 1950s. The remaining site

Table 8
Mitigation Recommendations

Quadrangle	SIHP Number	Site Function	Cultural Period	Significance Criteria	Data Recovery	Preservation
5	14679	Hab./Fence Support	Trad. Hawaiian/Ranching	d	X	
5	14687	Habitation	Trad. Hawaiian/Ranching	d	X	
5	14688	Corral	Ranching	d	X	
5	14726	Hab./Fortification	Trad. Hawaiian/Military	d	X	
5	14741	Habitation	Trad. Hawaiian	d	X	
5	14750	Habitation	Trad. Hawaiian	d	X	
5	14751	Habitation	Trad. Hawaiian	d	X	
5	14752	Habitation/Burial	Trad. Hawaiian	d,e	X	X
5	9012	Ranching/Boundary	Ranching	d		X

(site 14729) is the former route of the early Kawaihae-Waimea Highway. Sufficient data has been collected for the 66 sites mentioned above and they are deemed no longer significant.

IMPACTS AND MITIGATION MEASURES

Section 13-146-6 (a) (draft May 1989) provides four criteria to be used in assessing impacts to significant historic properties. These are:

1. "No effect". The project will have no effect on significant historic properties.
2. "Beneficial effect". A project will have a beneficial effect on significant historic properties if the project is to protect, exhibit, restore, or otherwise enhance these properties.
3. "Adverse effect". These effects include partial or total destruction, detrimental visual impingement, detrimental spatial impingement, and/or increasing access with chances of resulting damage.
4. "No adverse effect". This category applies only to cases where an historic property, significant solely for its information content, is planned to undergo data recovery to record and/or recover a reasonable and adequate amount of its significant information. Until data recovery is planned, one of the other three effects applies.

In the absence of a program to avoid or mitigate impacts, 75 historic properties (i.e., significant cultural resources) would be adversely effected by the proposed development within the Land of Ouli.

Mitigation of impacts to resources whose significance lies in their potential to yield information (criterion d) can be accomplished through a data recovery program. Of the 75 sites located within the project area, 7 are considered significant solely for their information content. Therefore, a data recovery program is an appropriate mitigation measure. The extent of the data recovery is directly related to the information available. Sixty-six of the sites considered significant for their information.

Site 14679 consists of two cairns and a sparse midden scatter. Data recovery in the form of detailed mapping, photography, and excavation would mitigate any adverse impact future development would have. Once the proper data are collected this site will be considered no longer significant.

Site 14687 consists of two enclosures, a pavement, a midden scatter, and military debris. The site appears to be a pre-Contact habitation site with a historic component. Data recovery in the form of instrument mapping, photography, and excavation would likely mitigate adverse impact of future development. Once the data are collected this site will be considered no longer significant.

Site 14688 consists of a historic enclosure utilized as a corral. Data recovery at this site would include detailed mapping and photography. This would mitigate any adverse impact that future development would have on the site. Once the data are collected for this site it will be considered no longer significant.

Site 14726 consists of a complex comprised of two C-shapes and a cairn. The surface structures may relate to the military exercises conducted in the 1940s and 1950s but there also may be a pre-Contact component based on the presence of marine shell scattered on the surface. Data recovery in the form of instrument mapping, photography, and excavation would mitigate adverse impact that future development may have on the site.

Site 14741 is a small overhang shelter containing marine shell on the surface. Data recovery in the form of instrument mapping, excavation, and photography would mitigate any adverse impact that future development may have on the site. Once data collection is completed the site would be considered no longer significant.

Site 14750 is an overhang shelter containing marine shell and coral on the surface of the overhang. Data recovery in the form of excavation, instrument mapping, and photography would mitigate any adverse impact that future development may have. Once data collection is completed the site would be considered no longer significant.

Site 14751 is an overhang shelter with marine shell, coral, and kukui nut located on the surface. Data recovery in the form of excavation, detailed mapping, and photography will mitigate any adverse impact that future development would have. Once data collection is completed the site would be considered no longer significant.

Site 14752 is a lava tube shelter consisting of two side chambers. The lava tube contains gourd fragments, coconut shell fragments, waterworn pebbles and a cobble, marine shell, and a human long bone. Since only one human bone was observed, it is recommended that limited testing be done. Limited testing is recommended to determine the absence or presence of a human burial. If a burial is discovered all excavation will halt and the proper agencies will be notified. However, if no burial is discovered it is recommended that data recovery in the form of excavation, mapping, and photography. This would mitigate any adverse impact that future development would have. Once completed the site would be considered no longer significant.

Site 9012 is historic wall that was utilized for a property boundary wall that was built in the late 1800s. This site is recommended for preservation.

In summary, it is recommended that no further archaeological work be conducted at 66 sites, a data recovery program be completed at seven sites, and that two sites be preserved.

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APPENDIX
SITE RECORDS

SIHP SITE NUMBER: 05-14679

FORMAL TYPE: Midden, cairns.

FUNCTIONAL TYPE: Habitation/Fence support.

TEMPORAL ORIGIN: Pre-Contact/Post-Contact.

CULTURAL PERIOD: Traditional Hawaiian/Ranching.

DIMENSIONS: 50m x 50m (2500 sq m).

SETTING: Low relatively level ridge overlooking dry drainage to N-N/W. Elevation 1400 ft.

VEGETATION: Grasses (bunch); small unknown bush/shrub. Large agave to N/W ca. 100m.

FEATURES: The site consists of two rock structures located 1m apart. There is a light midden scatter on the surface covering an area of approximately 2500 sq m. Marine shells include *Cypraea*, *terebra*, and unidentified gastropod. There is also a light scatter of metal debris in the area. Included are rusted shrapnel fragments and M-1 carbine bullet casings. An isolated basalt flake tool was found on the surface 100m west of the site.

Feature A is a small rock cairn measuring 1m east-west by .75m NS and .50m high. The cairn was apparently much larger and was disturbed by removing the cobbles and boulders to construct Feature B. The feature was partially disassembled and no evidence of recent breakage or ground stain was seen. The cairn is generally rectangular, but its original size and shape cannot be determined.

Feature B is a larger cairn measuring 2.0m east-west by 1.75m NS and .50m high. The cobbles used to construct Feature B appear to have been taken from Feature A. Feature B was also partially disassembled and no recent breakage or ground stain were evident on the cobbles. This feature was more loosely constructed and a portion of a fence post was found in the feature.

The cobbles in Feature A are partially imbedded in the soil and the cobbles in Feature B are sitting on the surface.

SIHP SITE NUMBER: 05-14680

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Fence support.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Ranching.

DIMENSIONS: 1m x 1m x .70m high.

SETTING: Located on a bluff overlooking Waikoloa River to North. Elevation 1185 ft.

VEGETATION: Grasses, unknown shrub, *koa* (small).

FEATURES: This site is located 50m east (mauka) of site 9012, the large stone wall forming the west (makai) boundary of the project area. The feature is oval shaped and the cobbles exhibit some recent breakage and ground stain. The feature is sitting on the soil surface, none are imbedded in the soil.

SIHP SITE NUMBER: 05-14681

FORMAL TYPE: C-shape.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 3.5m x 2m x .50m high.

SETTING: Located on the west facing slope of a ridge between Waikoloa River (south) and an unnamed drainage (north). Elevation 1195 ft.

VEGETATION: Grasses.

FEATURES: Site 14681 is a single C-shape structure situated on a rock outcrop 50m east (mauka) of site 9012. It measures 3.5m across the wings, 2m deep, and .50m high. It is open to the southwest. Some of the cobbles used to construct the feature display ground stain and recent breakage.

SIHP SITE NUMBER: 05-14682

FORMAL TYPE: Road berm.

FUNCTIONAL TYPE: Road berm.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military

DIMENSIONS: 38m long x 30cm high.

SETTING: Gentle southeast slope. Elevation 1190 ft.

VEGETATION: Grasses.

FEATURES: Site 14682 is a historic road berm. The road is overgrown with low grasses and is partially eroded. The berm is oriented east-west and extends for a distance of 38m.

SIHP SITE NUMBER: 05-14683

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Fence support.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Ranching.

DIMENSIONS: 1.5m x 1.5m x 1.0m high.

SETTING: At end of NE/SW trending ridge, 200m east of Site 9012. Elevation 1200 ft.

VEGETATION: Grasses, *koa haole*, unidentified shrub.

FEATURES: This site consists of a single fence post support mound. It was constructed on top of a natural pahoehoe outcrop. Exposed ground stain and some recent breakage were noted on the cobbles.

SIHP SITE NUMBER: 05-14684

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Fence support.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Ranching.

DIMENSIONS: 1m diameter x 70cm high.

SETTING: On top of a natural outcrop in the center of an intermittent drainage. Elevation 1230 ft.

VEGETATION: Low grass, shrubs.

FEATURES: Site 14684 is a single fence post support situated on a boulder outcrop. it measures 1m in diameter and .70m high. The stones used to construct the feature included some broken water-worn cobbles and some angular cobbles with ground stain.

SIHP SITE NUMBER: 05-14685

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Fence support.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Ranching.

DIMENSIONS: 1m x 1m x 50cm.

SETTING: Located on a boulder outcrop on a low, west-facing ridge. Elevation 1215 ft.

VEGETATION: Lowland shrubs and grasses.

FEATURES: Site 14685 is a single cairn constructed of loosely piled pahoehoe cobbles. Ground stain was noted on the cobbles, but no recent breakage was evident.

SIHP SITE NUMBER: 05-14686

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Fence support.

TEMPORAL ORIGIN: Post-Contact

CULTURAL PERIOD: Ranching.

DIMENSIONS: 1.5m diameter x 40cm high.

SETTING: Located on a southwest facing slope of a ridge between two drainages. Elevation 1220 ft.

VEGETATION: Grasses, low shrubs.

FEATURES: Site 14686 is a circular stone cairn constructed of pahoehoe cobbles. Ground stain was noted on the cobbles.

SIHP SITE NUMBER: 05-14687 (Figure A-1)

FORMAL TYPE: Complex.

FUNCTIONAL TYPE: Habitation.

TEMPORAL ORIGIN: Pre-Contact/Post-Contact.

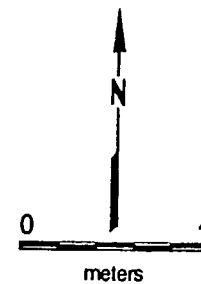
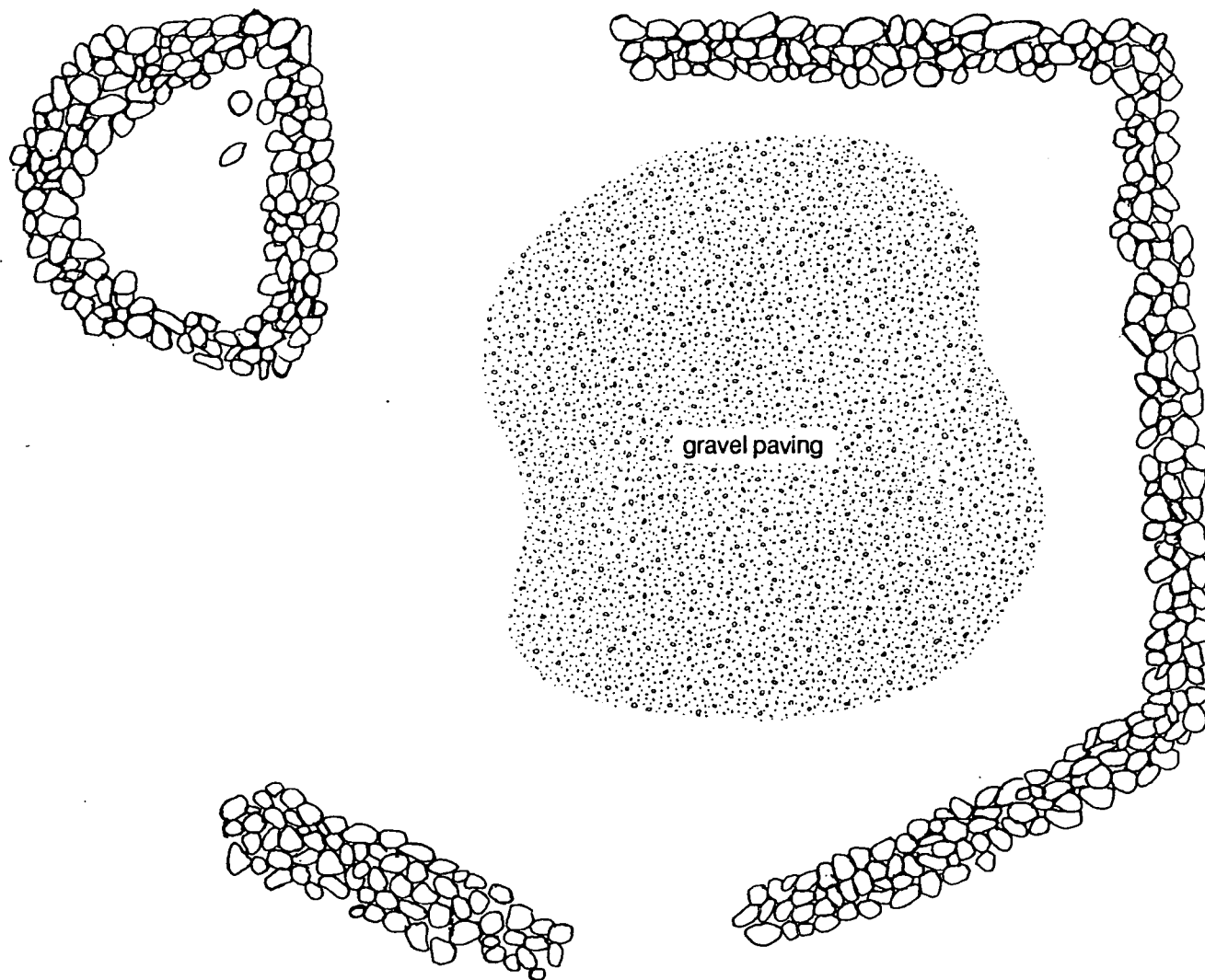
CULTURAL PERIOD: Traditional Hawaiian/Ranching.

DIMENSIONS: 15m x 15m.

SETTING: On east-west trending ridge on north side of Waikoloa Gulch. Elevation 1245 ft.

VEGETATION: Grasses, small shrubs, *koa haole* trees to NW, agave to south.

FEATURES: The site consists of two adjacent walled enclosures. Midden remains (i.e., *Cypraea* shell fragments) and square nails were found within and surrounding the walls. Small paving gravel was found within the walls. Military debris, including shrapnel and mortar fragments, was also found at the site.



Feature A is the remnant of a rectangular structure measuring 12m x 14m. The walls range from .50m to .75m thick and they are 40m to .80m high. The east wall is 8.5m long, the north wall is 6.5m long, and the south wall is in two segments: 4m and 5m long.

Feature B is a rough circular structure west of the north wall. It measures 3.5m east-west by 4m north-south.

SIHP SITE NUMBER: 05-14688 (Figure A-2)

FORMAL TYPE: Enclosure.

FUNCTIONAL TYPE: Corral.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Ranching.

DIMENSIONS: 50m x 50m.

SETTING: Just off ridge line in depression of major east-west drainage. Elevation 1210 ft.

VEGETATION: *Kiawe*, agave, banyan, grasses.

FEATURES: This site is a historic corral constructed using a natural U-shaped cliff opens to the west; a constructed wall extends northwest from the southern edge of the cliff face for 40m. A 20m long wall extends west from the northern portion of the cliff and then heads southwest to meet southern wall.

The walls range in thickness from .70m to 1.0m and range in height from .80m x 1.0m. The wall construction also includes natural boulder outcrops.

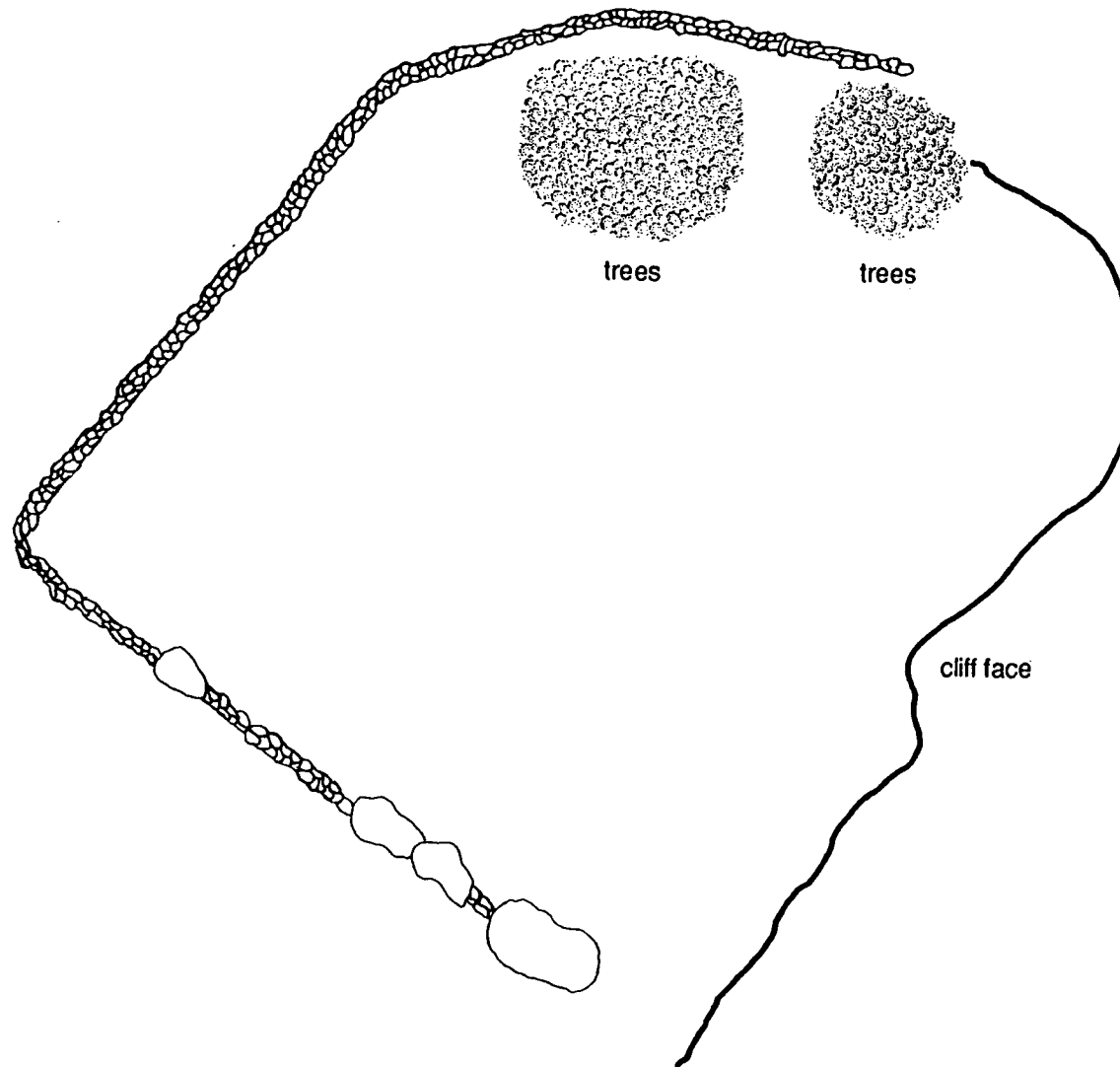
SIHP SITE NUMBER: 05-14689

FORMAL TYPE: Complex.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.



DIMENSIONS: 5m x 50m.

SETTING: Located on a west-facing ridge finger south of Waikoloa River. Elevation 1255 ft.

VEGETATION: Grasses, *koa haole*, small shrubs.

FEATURES: Site 14689 consists of two features: a C-shape and a stone cairn. Rusted can fragments were found scattered in the site area.

Feature A is a circular mound of loosely piled pahoehoe cobbles. The mound is 2m in diameter and .75m high.

Feature B is a C-shape located 50m southwest of Feature A. The C-shape is open to the southwest and measures 2.75m wide, 1.0m deep, and .40m high.

SIHP SITE NUMBER: 05-14690

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Marker.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Historic.

DIMENSIONS: 1.5m x 1m x 60cm.

SETTING: On ridge south of Waikoloa Stream. Elevation 1270 ft.

VEGETATION: Lowland grasses and shrubs, *kiawe* trees between feature and stream.

FEATURES: Site 14690 is a single rock cairn constructed of pahoehoe cobbles stacked 3-high. Ground stain is evident on the cobbles, but no recent breaks are present, and no military debris is located nearby.

SIHP SITE NUMBER: 05-14691

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Marker.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Historic.

DIMENSIONS: .80m x .50m x .70m high.

SETTING: On low ridge above circular depression with six large *koa haole* trees to south. Road cut runs from east-west across north side of depression, 75m south of cairn. Elevation 1250 ft.

VEGETATION: Grasses, small unidentified shrub.

FEATURES: Site 14691 is a rock cairn constructed of pahoehoe cobbles. The long axis of the cairn is oriented east-west. Ground stain is evident on the cobbles, but there are no recent breaks on the cobbles or military hardware in the area.

SIHP SITE NUMBER: 05-14692

FORMAL TYPE: C-shape.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 4m x 3m.

SETTING: Located on a west-facing ridge immediately south of a dry wash. Elevation 1250 ft.

VEGETATION: Grass, *kiawe*.

FEATURES: The site consists of a C-shape constructed of pahoehoe cobbles using a natural boulder outcrop to form part of the shelter. The wall of the C-shape is one to two cobbles wide and is loosely piled. The wall is .40m to 5.0m thick and ranges in height from .50m to 1.0m. It is open to the southwest. Military debris, including M-1 carbine cartridges, was noted on the surface. The C-shape is sitting on the surface of the soil, not imbedded; and ground stain was noted on the cobbles.

SIHP SITE NUMBER: 05-14693 (Figure A-3)

FORMAL TYPE: C-shape.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 1m x 2m.

SETTING: Low east-west trending ridge south of a dry wash. Approximately 20m upslope from Site 14692. Elevation 1255 ft.

VEGETATION: Grasses, dead koa haole.

FEATURES: Site 14693 is a C-shape open to the west. It measures 2.1m across the wings, .80m deep, and .35m high. The wall of the structure is .30m thick. The cobbles used to build the structure exhibit some recent breakage and ground stain. Rusty metal fragments are lightly scattered in the area.

SIHP SITE NUMBER: 05-14694

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Fence support.

TEMPORAL ORIGIN: Post-Contact.

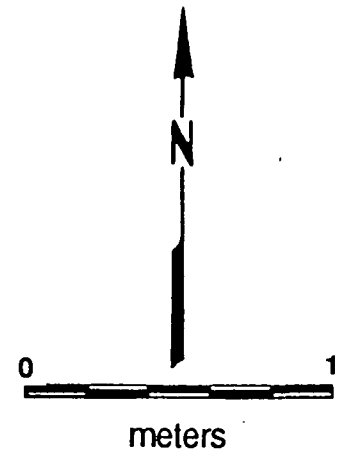
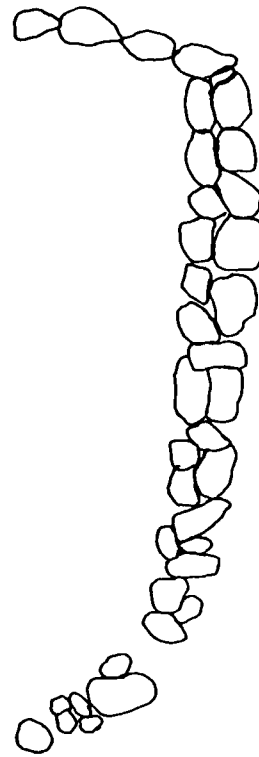
CULTURAL PERIOD: Ranching.

DIMENSIONS: 2.0m x 1-3m.

SETTING: East-west trending ridge between two small drainages north and south. Elevation 1320 ft.

VEGETATION: Grasses, small unidentified shrub.

FEATURES: This site measures 2.0m north-south, 1.3m east-west, and .80 high. It is constructed of numerous small to medium size pahoehoe cobbles, many exhibiting exposed ground stains. Weathered, milled lumber was found within the feature and rusty tin cans were found nearby.



SIHP SITE NUMBER: 05-14695

FORMAL TYPE: Cairn

FUNCTIONAL TYPE: Marker.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Historic.

DIMENSIONS: 1.5m x 1.0m.

SETTING: Ridge top overlooking broad swale to south and west. Elevation 1280 ft.

VEGETATION: Grass.

FEATURES: This site is a rock cairn measuring 1.5m x 1.0m x .5m high. Ground stain is exposed on some of the cobbles, but there is no recent breakage. Also, there is no military debris in the vicinity of the cairn.

SIHP SITE NUMBER: 05-14696

FORMAL TYPE: Cairns.

FUNCTIONAL TYPE: Marker.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Historic.

DIMENSIONS: 2m x 10m.

SETTING: Top of knoll. Elevation 1270 ft.

VEGETATION: Bunch grass.

FEATURES: This site consists of two rock cairns situated 9m from one another. Feature A measures .5m in diameter and .4m high. Ground stain is evident on several boulders.

Feature B is also a cairn. It measures 1.0m north-south by 1.2m east-west. It is .5m high and is made of small to medium cobbles exhibiting some ground stain.

No historic debris, e.g., military hardware or rusted tin cans, were found in the area.

SIHP SITE NUMBER: 05-14697

FORMAL TYPE: Alignment.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 1.0m x 3.5m.

SETTING: Flat in broad swale. Elevation 1280 ft.

VEGETATION: Grasses, sparse *koa haole* nearby.

FEATURES: Site 14697 is an alignment 3.5m long by 1.0m wide and .87m high. It curves slightly with the inside of the curve open to the west. Ground stain and recent breakage are evident on the cobbles.

SIHP SITE NUMBER: 05-14698

FORMAL TYPE: Enclosures.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 5m x 12m

SETTING: On ridge top between up-slope from Site 14694. Elevation 1330 ft.

VEGETATION: Grasses, *koa haole*.

FEATURES: Site 14698 consists of two enclosures located 10m from one another. Feature A is a rectangular enclosure measuring 2.1m north-south by 1.4m east-west. The walls are composed of pahoe-hoe cobbles stacked a maximum of .55m high.

Feature B is a rectangular C-shape structure . It measures 1.7m north-south and 1.2m east-west. It is .3m high and recent breakage and ground stain are evident on some of the cobbles. This feature is open to the west-southwest and is located 10m northwest of Feature A.

SIHP SITE NUMBER: 05-14699

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Target.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL ORIGIN: Military.

DIMENSIONS: 1m x 1.5m.

SETTING: On top of ridge between two small drainages. Elevation 1355 ft.

VEGETATION: Lowland grass and shrubs.

FEATURES: This site is a single rock cairn measuring 1m x 1.5m x .5m high. Recent breakage and ground stain are evident on the cobbles and military debris, e.g., rusted cans and shrapnel, is scattered in the area.

SIHP SITE NUMBER: 05-14700

FORMAL TYPE: Cairns.

FUNCTIONAL TYPE: Targets.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 1m x 3m x 70cm.

SETTING: On top of ridge.

VEGETATION: Lowland grasses and shrubs.

FEATURES: Site 14700 consists of two small cairns made of medium sized cobbles piled three stones high. Both cairns measure approximately 1m x 3m x .7m high. They are situated 10m from one another and the cobbles exhibit recent breakage and ground stain.

SIHP SITE NUMBER: 05-14701

FORMAL TYPE: C-shape.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 3m x 2m.

SETTING: On a west facing slope of a ridge 50m south of Waimea Kawa`ae Highway. Elevation 1365 ft.

VEGETATION: Lowland shrubs and grasses.

FEATURES: This site is a small well constructed C-shape open to the west (down slope). It measures 1.5m across the wings, 2m deep, and .75m high. It is constructed of small to medium sized cobbles. The cobble exhibit recent breakage and exposed ground stain. Broken glass and rusted metal debris are located down slope from the structure.

SIHP SITE NUMBER: 05-14702

FORMAL TYPE: Enclosure.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 3.1m in diameter.

SETTING: On grassy ridge ca. 60m south of the Waimea-Kawaihae Highway.

VEGETATION: Grasses, small *koa haole* shrubs.

FEATURES: Site 14702 is a small circular enclosure constructed of a single line of medium size pahoehoe cobbles. The cobbles were not imbedded in the soil and ground stain was exposed. Metal fragments and an M-1 cartridge were found within the enclosure and an ammunition can lid was found 5m north of the enclosure.

SIHP SITE NUMBER: 05-14703 (Figure A-4)

FORMAL TYPE: Alignment.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 3.2m long x .75m wide.

SETTING: Low ridge, grassy with lava rubble. Elevation 1400 ft.

VEGETATION: Grasses, small unidentified shrubs.

FEATURES: Site 14703 is a rock alignment 3.2m long by .75m wide. It is made of medium size cobbles piled two to three rocks high. Its maximum height is .45m. The alignment is oriented east-west and a small pile of rocks is located near the west end of the alignment. Military debris, e.g., rusted metal and rifle cartridges, are scattered throughout the area.

SIHP SITE NUMBER: 05-14704

FORMAL TYPE: C-shape.

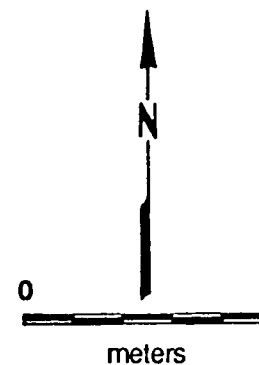
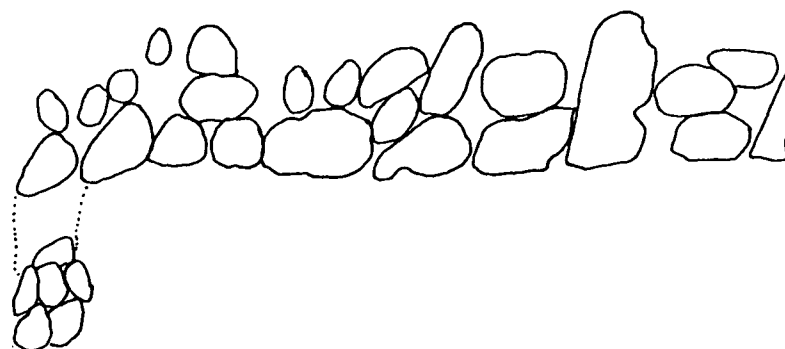
FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 2.5m x 1m.

SETTING: On top of a relatively prominent ridge. Elevation 1375 ft.



VEGETATION: Low grasses and shrubs.

FEATURES: This site is a single C-shape measuring 2.5m across the wings, 1m deep, and .4m high. The opening faces the northwest. It is made of small to medium size cobbles piled three to four high. The wall is .3m thick and the cobbles exhibit exposed ground stain.

SIHP SITE NUMBER: 05-14705

FORMAL TYPE: C-shape.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 2.5m x 1.2m.

SETTING: On northeast facing slope. Elevation 1360 ft.

VEGETATION: Grasses.

FEATURES: This site is a C-shape situated on a relatively steep slope. The opening is facing east, i.e., up slope. The C-shape measures 2.5m across the wings, 1.2m deep, and .30 to .40m high. The wall thickness ranges from .30m to .40m and ground stain is exposed on several of the cobbles.

SIHP SITE NUMBER: 05-14706 (Figure A-5)

FORMAL TYPE: Complex.

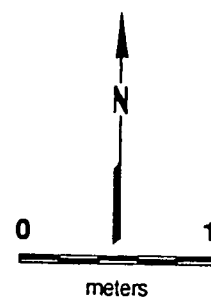
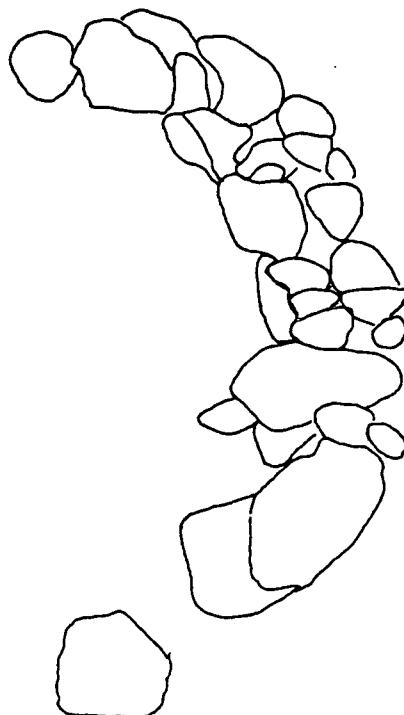
FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 5m x 15m.

SETTING: Situated on the southwest facing slope of a broad ridge. Elevation 1350 ft.



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Plan View Site 5-14706

FIGURE

A-5

VEGETATION: Grass, small unidentified shrubs.

FEATURES: The site consists of two features, a C-shape and a rock cairn. Feature A is a C-shape measuring 3.0m across the wings, 2.1m deep, and .8m high. The feature is open to the west and the southern portion of the feature makes use of a natural outcrop. It is constructed of medium to large cobbles.

Feature B is a small cairn located 10m east of Feature A. It is 1.0m in diameter and .55m high. Ground stain and recent breakage are evident on both features.

SIHP SITE NUMBER: 05-14707

FORMAL TYPE: Road berm.

FUNCTIONAL TYPE: Road berm.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 16m long x .35m wide.

SETTING: West facing slope along a low ridge. Elevation 1355 ft.

VEGETATION: Grasses.

FEATURES: Site 14707 is a single row of medium to large cobbles extending for a distance of 16m. The large cobbles are .35m across. The alignment is oriented east-west and the area appears to have been scraped.

SIHP SITE NUMBER: 05-14708

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Marker.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Historic.

DIMENSIONS: 1.6m x 1.0m.

SETTING: Near south boundary fence and dirt jeep road. Elevation 1350 ft.

VEGETATION: Grasses, *koa haole* shrubs.

FEATURES: This site is a small rock cairn measuring 1.6m north-south by 1.0m east-west. It is .4m high. Ground stain is exposed on the cobbles, but there is no evidence of breakage.

SIHP SITE NUMBER: 05-14709 (Figure A-6)

FORMAL TYPE: Alignment.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 5.5m x 1.3m.

SETTING: In low swale between two ridges and 10m from dirt road and fence line. Elevation 1380 ft.

VEGETATION: Grasses, low unidentified shrubs.

FEATURES: Site 14709 is a linear structure 5.5m long. It is .5m high and ranges in thickness from .7m to 1.3m. The structure is oriented northwest to southeast and some ground stain is exposed on the cobbles.

SIHP SITE NUMBER: 05-14710

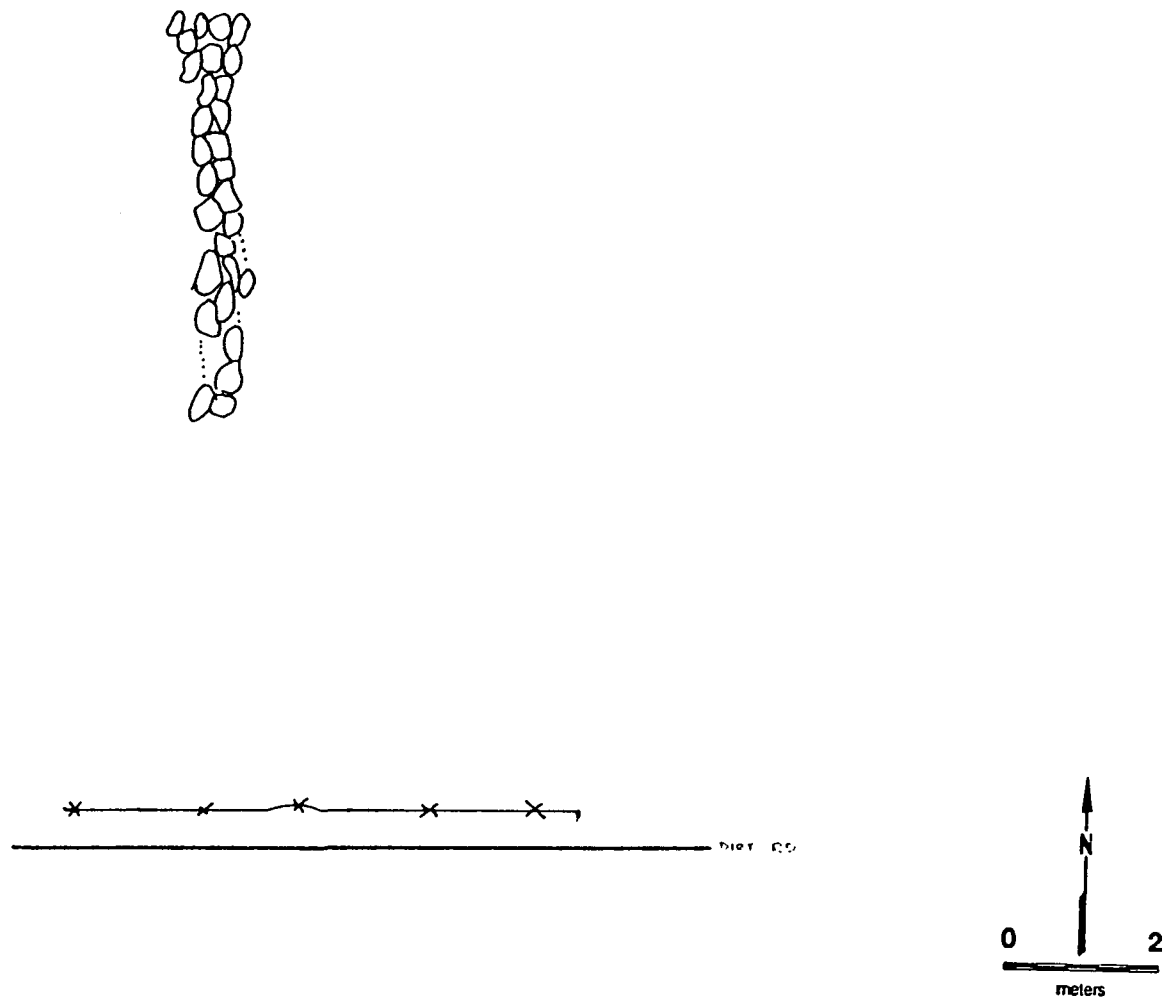
FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Marker.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Historic.

DIMENSIONS: 1.5m x 1.5m.



SETTING: On southwest facing slope of a broad ridge. Elevation 1375 ft.

VEGETATION: Low shrubs and grasses.

FEATURES: Site 14710 is a rock cairn 1.5m in diameter and .55m high. The cairn is constructed of loosely piled medium size pahoe hoe cobbles on a natural boulder outcrop. Ground stain is exposed on the cobbles.

SIHP SITE NUMBER: 05-14711

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Marker.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Historic.

DIMENSIONS: 1m x 1m.

SETTING: On a relatively prominent ridge. Elevation 1415 ft.

VEGETATION: Low grasses and shrubs.

FEATURES: This site is a rock cairn measuring 1m in diameter and .5m high. It is constructed of medium size cobbles that exhibit exposed ground stain. The cobbles forming the base of the cairn are not imbedded in the soil.

SIHP SITE NUMBER: 05-14712

FORMAL TYPE: Complex.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 4m x 2m x 60cm.

SETTING: On a ridge between 2 small dissections.

VEGETATION: Lowland grasses and shrubs.

FEATURES: This site consists of a C-shape structure and a short wall segment. Also located at the site is an aerial photography target. Feature A is a C-shape measuring 4m across the wings and 2m deep. It is .6m high and makes use of a natural boulder outcrop. It is open to the southwest.

Feature B is a short wall segment located 8m east of Feature A. The wall segment is 1.5m long, 6m thick, and .6m high. The cobbles used to construct both of the features exhibit recent breakage and exposed ground stain. Considerable military debris, e.g., rusted metal, was found throughout the area.

The aerial photography target and a recent cobble cairn are situated between the two features. The cairn appears to have been constructed to hold a survey pole.

SIHP SITE NUMBER: 05-14713

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Fence support.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Ranching.

DIMENSIONS: 2.0m x 2.0m.

SETTING: Swale between two east-west trending ridges. Elevation 1390 ft.

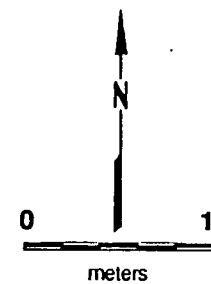
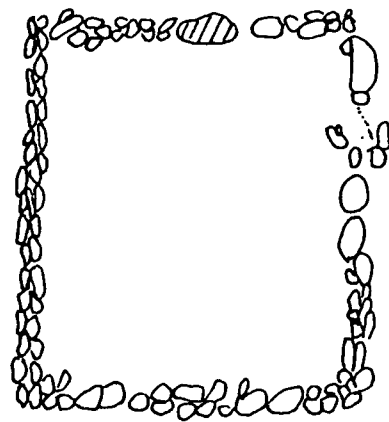
VEGETATION: Grasses, koa haole.

FEATURES: This site consists of a single rock cairn. It is roughly rectangular and measures 2.0m on a side and is .6m high. It was originally believed to be a possible burial cairn. It was subsequently disassembled and found to contain fragments of milled lumber and charred pieces of *kiawe*. The cobbles used to construct the cairn exhibited exposed ground stain.

SIHP SITE NUMBER: 05-14714 (Figure A-7)

FORMAL TYPE: Enclosure.

FUNCTIONAL TYPE: Fortification.



TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 3.0m long x 1.80m wide.

SETTING: Low area of ridge trending east-west. Elevation 1410 ft.

VEGETATION: Grasses, *koa haole*.

FEATURES: Site 14714 is a small rectangular structure measuring 3.0m long and 1.8m wide at the south end and 1.6m wide at the north end. Its long axis is oriented north-south. It is constructed with a single row of cobbles, with one pahoehoe slab placed on edge. The slab stands .39m high.

Ground stain is exposed on the cobbles and there is considerable military debris in the area, including ammunition cans, cartridges, and rusted metal fragments.

SIHP SITE NUMBER: 05-14715

FORMAL TYPE: Cairns.

FUNCTIONAL TYPE: Marker.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Historic.

DIMENSIONS: 2m x 30m.

SETTING: Northwest facing slope between two broad ridges. Elevation 1405 ft.

VEGETATION: Low grasses and shrubs.

FEATURES: This site consists of three cobble cairns located within 10m of one another. They are aligned approximately north-south. All three are approximately 1.5m in diameter and .7m high. Ground stain is exposed on the cobbles but there is no evidence of breakage.

SIHP SITE NUMBER: 05-14716

FORMAL TYPE: C-shape.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 1.5m x 2m.

SETTING: Northwest facing slope between two broad ridges. Elevation 1415 ft.

VEGETATION: Grass, *koa haole*.

FEATURES: This site is a single C-shape open to the southeast. It measures 2.0m across the wings, 1.4m deep, and .7m high. The wall of the structure is .5m thick of loosely piled, medium size cobbles. Ground stain and recent breaks are exposed on the cobbles.

SIHP SITE NUMBER: 05-14717 (Figure A-8)

FORMAL TYPE: C-shape.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

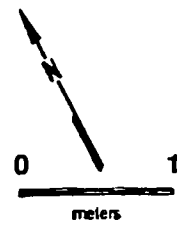
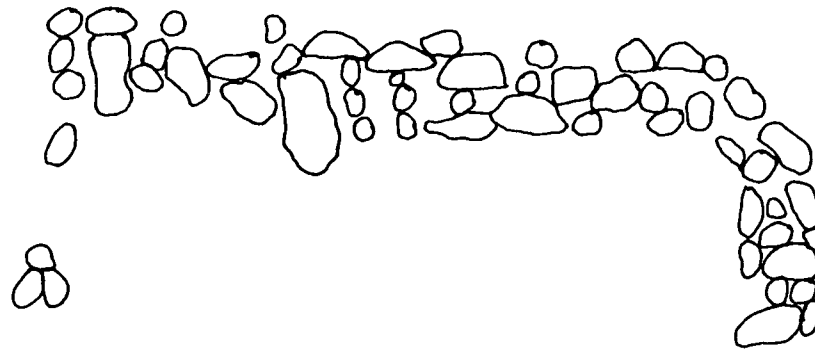
CULTURAL PERIOD: Military.

DIMENSIONS: 5.35m x 2.3m.

SETTING: On east end of low ridge with structure open to west. Area within structure relatively level. Elevation 1445 ft.

VEGETATION: Grasses, unidentified small shrubs.

FEATURES: Site 14717 is a C-shape measuring 5.35m by 2.3m .. It is .5m high and is open to the west. It is rectangular-shaped rather than semi-circular. The cobbles at the base do not extend into the soil and ground stain is exposed on the cobbles.



SIHP SITE NUMBER: 05-14718

FORMAL TYPE: Complex.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 2m x 2m.

SETTING: West end of small ridge. Elevation 1440 ft.

VEGETATION: Grasses.

FEATURES: This site consists of two features: an irregular enclosure and a modified outcrop. Feature A is an enclosure that measures 1.8m north-south by 1.7m east-west. It is open to the west and has a maximum height of 1.5m.

Located at the west end of the southern wall is a natural boulder outcrop (Feature B). This outcrop has been modified by removing fractured pieces to construct the enclosure.

SIHP SITE NUMBER: 05-14719 (Figure A-9)

FORMAL TYPE: Enclosure.

FUNCTIONAL TYPE: Fortification.

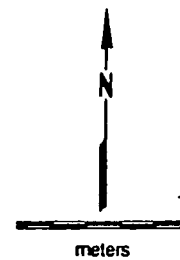
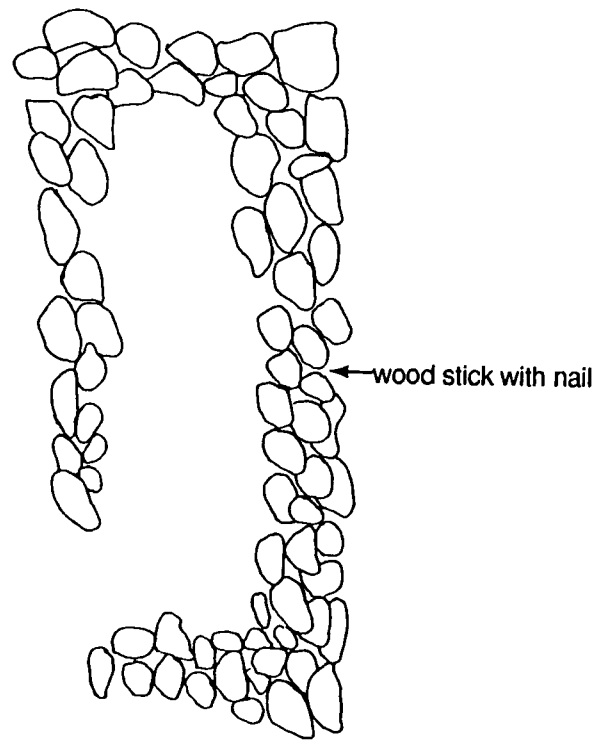
TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 4.7m x 3.1m.

SETTING: On slope of southwest trending ridge. Elevation 1420 ft.

VEGETATION: Low shrubs and grasses.



FEATURES: This site is a rectangular enclosure measuring 4.7m by 3.1m. Its long axis is oriented north-south. It is constructed of small to medium size cobbles and the walls are .45m thick and .6m high. A wooden stick with a nail in it is imbedded in the east wall. There is a small 1m wide opening in the west wall near the corner at the south wall.

SIHP SITE NUMBER: 05-14720

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Target.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 1.70m x 1.30m.

SETTING: On a broad west trending finger of a southwest trending ridge. Elevation 1425 ft.

VEGETATION: Grasses.

FEATURES: Site 14720 is a single rock cairn measuring 1.7m east-west by 1.3m north-south. The down slope side of the cairn measures .9m high and the up slope side measures .3m high. Military hardware, e.g., rusted metal and cans, was noted in the area and the cobbles used to construct the feature exhibit recent breakage and ground stain.

SIHP SITE NUMBER: 05-14721 Figure A-10)

FORMAL TYPE: Complex.

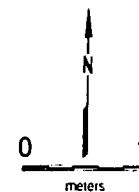
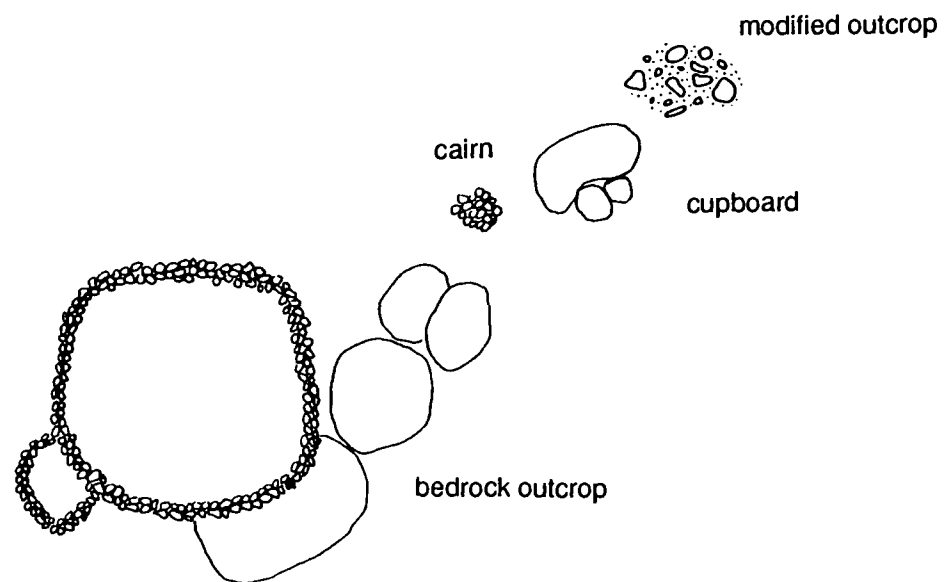
FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 5m x 13m.

SETTING: Knoll top and outcrop 150m North of stream. Elevation 1435 ft.



VEGETATION: Grasses.

FEATURES: This site consists of three features: a modified outcrop, a circular enclosure, and a cairn. The features are aligned northeast to southwest. Feature A is a modified outcrop located at the northeast end of the complex. It is composed of a natural outcrop with cobbles piled against one side and two pahoehoe slabs leaning against the opposite side.

Feature B is a rock cairn composed of small to medium cobbles. It is approximately .5m in diameter and .5m high. Feature B is located 1m southwest of Feature A.

Feature C is a rectangular enclosure with rounded corners. It measures 4.2 m east-west and 3.8m north-south. The walls are .7m high and .5m to .7m thick. It is built adjacent to three outcrop boulders and is 2m southwest of Feature B.

Rusted metal fragments and cans were found near the features and the cobbles used to construct the features displayed recent breaks and ground stain.

SIHP SITE NUMBER: 05-14722

FORMAL TYPE: C-shape.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: Ca. 2m across cusp.

SETTING: Located on southeast facing slope of southwest trending ridge. Elevation 1440 ft.

VEGETATION: Grasses.

FEATURES: Site 14722 is a C-shape measuring 2m across the wings and 1m deep. It is constructed of medium size cobbles stacked one to two high (ca.10-20cm). During a recent field check, two live hand grenades were found near the C-shape.

SIHP SITE NUMBER: 05-14723

FORMAL TYPE: Complex.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 8m x 32m.

SETTING: On slope of low east-west trending ridge. Elevation 1450 ft.

VEGETATION: Grasses, unidentified shrub.

FEATURES: This site consists of a complex of an alignment, a C-shape, and three cairns. Feature A is an alignment measuring 3m long by 1m thick, by .5m high. It is oriented north-south.

Feature B is a C-shape located 7m southwest of Feature A. The C-shape measures 2.2m across the wings, .9m deep, and .5m high.

Feature C is a cairn located 5m northwest of Feature A. It measures approximately 1m in diameter and .5m high.

Feature D is a cairn located 3m east of Feature A. It measures 1.5m by 1m by .5m high.

Feature E is a cairn located 25m northeast of Feature A. It measures 1m by .5m by .5m high.

The cobbles used to construct these features display exposed ground stain and recent breaks. Also, the cobbles forming the bases of the features are not imbedded in the soil. M-1 rifle cartridges and 50 cal. machine gun cartridges are scattered on the surface.

SIHP SITE NUMBER: 05-14724

FORMAL TYPE: Alignment.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 1m x 10m.

SETTING: Located on the south side of a broad, west-trending ridge. Elevation 1475.

VEGETATION: Low grasses and shrubs.

FEATURES: Site 14724 consists of a rock alignment extending in a north-south direction for a distance of 10m. It consists of a single row of boulders and large cobbles (ca. 30-40cm) running perpendicular to the ridge line. Cartridge cases and rusted metal debris were found scattered along the ridge.

SIHP SITE NUMBER: 05-14725

FORMAL TYPE: Wall.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 1.5m long x .50m wide.

SETTING: Located toward the west end of a broad, west-trending ridge. Elevation 1475 ft.

VEGETATION: Grasses.

FEATURES: This site is a single rock wall 1.5m long by .5m wide by .6m high. It was constructed of medium to large cobbles and is oriented approximately north-south (340 degrees). The cobbles exhibit exposed ground stain and some recent breakage.

SIHP SITE NUMBER: 05-14726

FORMAL TYPE: Complex.

FUNCTIONAL TYPE: Habitation/Fortification.

TEMPORAL ORIGIN: Pre-Contact/Post-Contact.

CULTURAL PERIOD: Traditional/Hawaiian/Military.

DIMENSIONS: 15m x 25m.

SETTING: Located along a narrow, west-facing ridge. Elevation 1480 ft.

VEGETATION: Grasses.

FEATURES: This site consists of two C-shapes and a rock cairn. The features are generally aligned on an axis of 240-60 degrees. Feature A is a cairn 1.5m in diameter and .35m high. It is constructed of medium to large cobbles.

Feature B is a C-shape located 10m west of Feature A. It measures 2.7m across the wings, 1.5m deep, and 1.1m high. It is rectangular-shaped and the cobbles were carefully stacked.

Feature C is a second C-shape located 8m west of Feature B. It is also rectangular-shaped and it measures 3.0m across the wings, 1.8m deep and .7m high.

Military debris was found scattered along the ridge. Included were M-1 carbine cartridge clips, mortar covers, and rusted metal fragments. Also found at the site, scattered over an area of 15m x 25m, were *Cypraea*, conus, and unidentified bivalve fragments.

SIHP SITE NUMBER: 05-14727 (Figure A-11)

FORMAL TYPE: C-shape.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

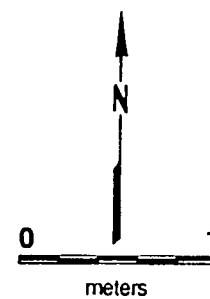
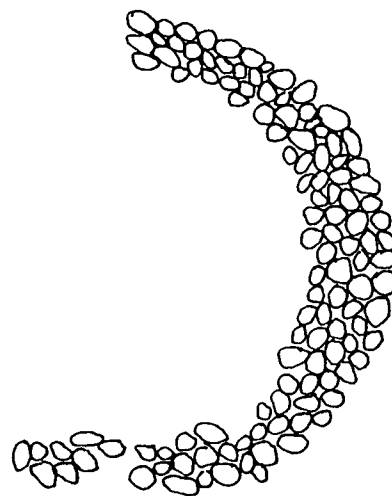
DIMENSIONS: 4.5m x 2.2m.

SETTING: Located on narrow, northwest trending ridge. Elevation 1455 ft.

VEGETATION: Grasses, *koa haole*, *kiawe*.

FEATURES: Site 14727 is a single C-shape structure. It measures 4.5m wide across the wings, 2.2m deep, and .7m high. The wall has a maximum thickness of 1.2m. It is a semi-circular and ground stains and recent breakage are evident on some of the cobbles.

Military debris was found scattered along the ridge. Materials included an ammunition can lid, rusted metal fragments, and several unidentified pieces of equipment.



SIHP SITE NUMBER: 05-14728

FORMAL TYPE: Complex.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 5m x 15m.

SETTING: Located on broad west facing slope between two ridges. Elevation 1455 ft.

VEGETATION: Grasses, a few unidentified shrubs.

FEATURES: Site 14728 consists of two features: a rock cairn and a C-shape. The features are located within 10m of one another. Feature A is a cairn measuring 3m by 2m and .7m high. Its long axis is oriented northwest-southeast.

Feature B is a C-shape located 10m southeast of Feature A. The C-shape measures 2.7m across the wings, 1.5m deep, and .75m high. It is open to the southwest (ca. 230 degrees).

Both features exhibit recent breakage and exposed ground stain. Cartridge shells and rusted metal fragments were found scattered along the slope.

SIHP SITE NUMBER: 05-14729

FORMAL TYPE: Complex.

FUNCTIONAL TYPE: Road/Marker.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Historic.

DIMENSIONS: 1m diameter.

SETTING: Located in low area along northern boundary of the parcel. The old highway enters the parcel at an elevation of 1350 ft and extends inland to an elevation of 1475 ft.

VEGETATION: Grasses, small *koa haole*.

FEATURES: Site 14729 consists of a single rock cairn an remnant of the old Kawaihae-Waimea Highway. The road enters the study parcel at an elevation of 1350 ft and extends approximately 650m east, where it crosses the present highway at an elevation of 1475 ft. The width of the roadway averages 5.5m and it follows the southern, north-facing slope of a ridge system.

Located toward the east (mauka) end of the road extension, at an elevation of 1445 ft. is a rock cairn measuring 1m in diameter and .5m high. This cairn is located immediately north of the roadway near a basalt cobble revetment. The revetment faces north and provides support for the road as it crosses a swale. It measures 12.4m long, and 1.35m high. It is up to six courses high of angular and sub-angular basalt boulders.

SIHP SITE NUMBER: 05-14730

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Fence support.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Ranching.

DIMENSIONS: 1m x 1m.

SETTING: Located near the inland end of the Kawaihae-Waimea Highway. Elevation 1470 ft.

VEGETATION: Grasses.

FEATURES: This site consists of a single cairn measuring 1.2m long, 1m wide, and .35m high. The cairn is constructed of four medium size cobbles and is aligned with sites 14731 and 14732, indicating that it served as a fence post support.

SIHP SITE NUMBER: 05-14731

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Fence support/Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Ranching/Military.

DIMENSIONS: 1.2m x 1m.

SETTING: Located in a narrow saddle of a southwest trending ridge. Elevation 1470 ft.

VEGETATION: Low grasses and shrubs.

FEATURES: Site 14731 is a rock cairn built adjacent to a boulder outcrop. It measures 1.2m by 1m and it is .5m high. Military debris, e.g., hand grenade pins and cartridge cases, were found scattered nearby.

The feature is aligned with sites 14730 and 14732, and the cobbles used to construct the feature exhibit exposed ground stain and recent breakage.

SIHP SITE NUMBER: 05-14732

FORMAL TYPE: Cairns.

FUNCTIONAL TYPE: Fence support.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Ranching.

DIMENSIONS: 2m x 12m.

SETTING: Located at the southern side of a broad ridge. Elevation 1470 ft.

VEGETATION: Low shrubs and grasses.

FEATURES: Site 14732 consists of three cairn aligned with sites 14730 and 14731. These cairns measure approximately 1m in diameter and .4m high. The cairns are situated 6m from one another and the southern most cairn contains a weathered fragment of milled lumber.

SIHP SITE NUMBER: 05-14733

FORMAL TYPE: Road berm.

FUNCTIONAL TYPE: Road berm.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 4.5m long x 1.25m wide.

SETTING: Located on a broad, west-facing slope. Elevation 1480 ft.

VEGETATION: Grasses, *koa haole*.

FEATURES: This site is a linear rock feature 4.5m long by 1.25m wide by .5m high. It follows what appears to be an early scraped roadway leading to the east (mauka) property boundary. The scraped area is eroding and is somewhat overgrown with grasses.

SIHP SITE NUMBER: 05-14734

FORMAL TYPE: Alignment.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 3m x .35m.

SETTING: Located on the west-facing slope of a broad ridge. Elevation 1495 ft.

VEGETATION: Low grasses and shrubs.

FEATURES: Site 14734 is an alignment 3m long by .35m wide and .7m high. It is oriented northwest-southeast and was constructed of medium to large cobbles. Ground stain and recent breakage are exposed on the cobbles.

SIHP SITE NUMBER: 05-14735

FORMAL TYPE: Modified outcrop.

FUNCTIONAL TYPE: Target.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 3m x 2m.

SETTING: Located on a broad, west-facing ridge. Elevation 1505 ft.

VEGETATION: Grasses.

FEATURES: Site 14735 is a modified outcrop. It consists of medium sized cobbles stacked .7m high against a boulder outcrop. Recent breakage is exposed on the cobbles and M-1 carbine cartridges were found scattered around the feature.

SIHP SITE NUMBER: 05-14736

FORMAL TYPE: C-shapes.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 20m x 20m.

SETTING: Located on the south facing slope of a broad, west-trending ridge. Elevation 1505 ft.

VEGETATION: Grass, unknown shrub.

FEATURES: Site 14736 consists of four C-shape structures. Feature A measures 7m across the wings, 3m deep, and .55m high. It is seem-circular and it is open to the west.

Feature B measures 2.5m across the wings, 1.5m deep, and .6m high. Feature B is located 5m east of Feature A and it is open to the southwest.

Feature C is 2m northeast of Feature B. It measures 3m across the wings, 1.5m wide, and 1.3m high. it is open to the southwest.

Feature D is 2m northeast of Feature C. It measures 2.8m across the wings, 2.5m deep, and .55m high. It is open to the southwest.

All of the features are semi-circular in shape and Features B, C, and D are aligned along a northeast-southeast axis. Military debris, including bullets and bullet shell casings were found near Features B and D.

SIHP SITE NUMBER: 05-14737

FORMAL TYPE: Road berm.

FUNCTIONAL TYPE: Road berm.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 3m x .5m.

SETTING: Located in low area between two west-trending ridges. Elevation 1490 ft.

VEGETATION: Grasses.

FEATURES: This site is a small alignment measuring 3m long, .5m wide, and .5m high. It is oriented along a northwest-southeast axis (330-150 degrees) and is located along the edge of a cleared area on a low ridge. The cleared area is overgrown with low grasses and there is considerable rusted metal debris in the area.

SIHP SITE NUMBER: 05-14738

FORMAL TYPE: C-shape.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 3m x 12m.

SETTING: On the west-facing slope of a broad ridge. Elevation 1510 ft.

VEGETATION: Grasses.

FEATURES: This site is a large C-shape structure measuring 5m across the wings, 2m deep, and .66m high. The wall is .3m thick. It is semi-circular and is open to the west. The cobbles that make up the base of the C-shape are imbedded in the soil, but there is no midden present.

A second feature, a modified outcrop, is located 6m west of the C-shape. This consists of two boulders with cobbles stacked on top. Located between the C-shape and the modified outcrop are M-1 carbine cartridges and rusted metal fragments. The cartridges are stamped with "LC42" and "LC43".

SIHP SITE NUMBER: 05-14739

FORMAL TYPE: Modified outcrops.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 2m x 7m.

SETTING: Located in the saddle of a small, west-facing ridge. Elevation 1485 Ft.

VEGETATION: Grasses.

FEATURES: Site 14739 consists of two modified outcrops with a surface scatter of M-1 cartridge casings. The outcrops are located adjacent to one another and each has small cobbles placed on top and between the boulders. The M-1 carbine casings are stamped with "FA37".

SIHP SITE NUMBER: 05-14740

FORMAL TYPE: Modified outcrop.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 4m x 3m.

SETTING: In broad, southwest-facing valley between two ridges. Elevation 1465 ft.

VEGETATION: Low shrubs, grasses, cactus.

FEATURES: This site consists of a boulder outcrop that has been modified by stacking medium sized cobbles against the east side of the boulders. The resulting structure measures 4m long by 3m to 4m across and exhibit exposed ground stain and recent breaks.

SIHP SITE NUMBER: 05-14741 (Figure A-12)

FORMAL TYPE: Overhang shelter.

FUNCTIONAL TYPE: Habitation.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Traditional Hawaiian.

DIMENSIONS: ca. 10m x 10m.

SETTING: Located on narrow, southwest-trending ridge. Elevation 1460 ft.

VEGETATION: Grasses, *koa haole*.

FEATURES: Site 14741 is a small overhang shelter located on a south-facing slope. Pahoehoe cobbles are located in front of the shelter and unidentified shell fragments were noted within the overhang. The overhang measures 3m long and extends into the cliff 1m to 2m.

SIHP SITE NUMBER: 05-14742

FORMAL TYPE: C-shape.

FUNCTIONAL TYPE: Fortification.

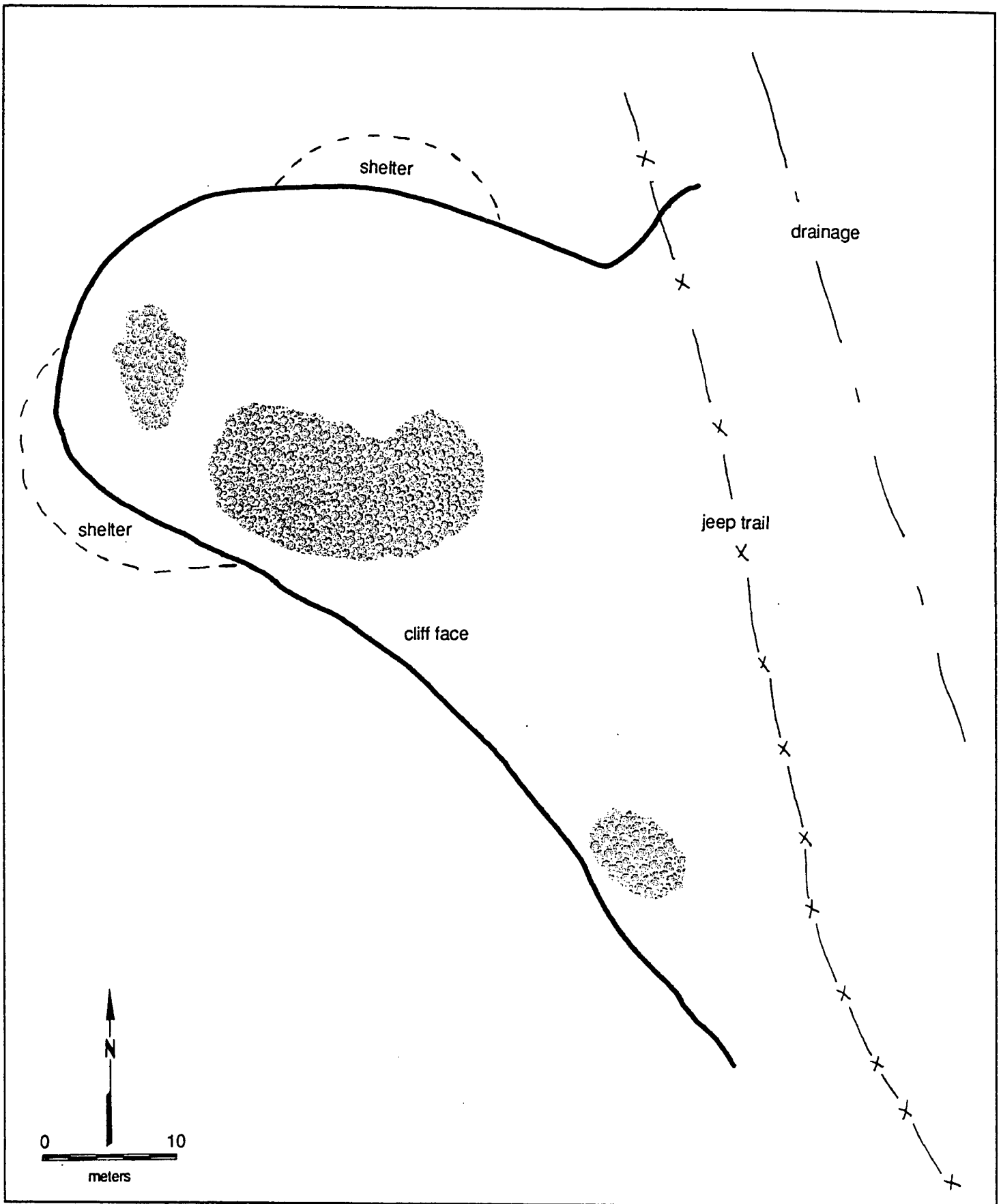
TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 3m long x 2.1m wide x 1m high.

SETTING: On narrow, southwest-trending ridge. Elevation 1465 ft.

VEGETATION: Low shrubs, grass.



FIGURE

OGDEN
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Shelters Site 5-14741

A-12

FEATURES: This site consists of a single C-shaped structure situated on a narrow ridge. It makes use of a natural boulder outcrop and forms a semi-circular structure open to the west. It measures 3m across the wings (including the boulder outcrop), 2.1m deep, and 1m high. Cartridge casings were found on the surface near the structure.

SIHP SITE NUMBER: 05-14743

FORMAL TYPE: Complex.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 15m x 25m.

SETTING: Located along a narrow, southwest trending ridge. Elevation 1470 ft.

VEGETATION: Grasses, *koa haole*, unknown shrubs.

FEATURES: Site 14743 consists of two rock alignments and four C-shape structures. The two alignments are slightly curved with the concave side facing southwest.

Feature A is an alignment measuring 3m long by 1m wide and .55m high. Feature B is located 20m south of Feature A and measures 3.2 long by 1m wide and .5m high.

Features C, D, E, and F are semi-circular C-shaped structures. Feature C measures 2.8m across the wings by 1.6m deep and .6m high. It is located 2m from Feature B at a compass heading of 275 degrees.

Feature D measures 5.5m across the wings by 2.5m deep and 1m high. It is located 6m from Feature B at a compass heading of 320 degrees.

Feature E measures 6m across the wings by 3m deep and 1m high. It is located between Features A and B, approximately 15m from Feature B.

Feature F measures 2.5m across the wings by 1.5m deep and .7m high. It is located 3m from Feature B at a compass heading of 325 degrees.

As with other military features in the area, the cobbles and boulders used in construction display exposed ground stain and recent breaks.

SIHP SITE NUMBER: 05-14744

FORMAL TYPE: Complex.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 15m x 15m.

SETTING: Located on a narrow, southwest-facing finger of a broad ridge. Elevation 1505 ft.

VEGETATION: Low grasses and shrubs.

FEATURES: Sit 14744 consists of two features: a circular structure and a rock cairn. Feature A is an elongated circular structure measuring 5m east-west by 3.5m north-south. It consists of a single row of medium to large cobbles. Rusty metal fragments were found within the feature. What appears to be a small impact crater is located 2m south of the feature.

Feature B is a cairn measuring 1m in diameter by .65m high. It is located 10m northwest of Feature A.

SIHP SITE NUMBER: 05-14745

FORMAL TYPE: Cairns.

FUNCTIONAL TYPE: Targets.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 30m x 30m.

SETTING: Located on a relatively flat ridge, overlooking a dry wash. Elevation 1500 ft.

VEGETATION: Grasses.

FEATURES: Site 14745 consists of five low cairns. Four of the cairns form a quadrangle 25m on a side. The fifth cairn is located 10m northwest of the group. The position of four of the cairns suggests that they may have supported poles of a temporary structure. The cairns range in height from .5m to 1m and are 1m to 1.5m in diameter.

They were constructed of small to medium pahoehoe cobbles and sit on exposed bedrock or soil. Ground stain is exposed on many of the cobbles and recent breakage is evident. Spent bullets, cartridge casings, and rusted metal shrapnel is scattered throughout the area.

SIHP SITE NUMBER: 05-14746

FORMAL TYPE: C-shape.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 2.1m x 1.8m.

SETTING: Located on a broad, southwest-trending slope. Elevation 1500 ft.

VEGETATION: Grasses.

FEATURES: Site 14746 is a single C-shape measuring 2.1m across the wings, 1.8m deep, and .3m high. It is situated across a gully from Site 14745. Rusted metal was found on the surface around the feature and between the feature and the gully.

SIHP SITE NUMBER: 05-14747

FORMAL TYPE: Complex.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 4.0m x 1.9m deep x .50m high.

SETTING: Located on a broad, west-facing ridge. Elevation 1505 ft.

VEGETATION: Grass, unknown shrub.

FEATURES: Site 14747 is a large C-shape structure situated on a broad ridge. The structure measures 4m across the wings by 1.9m deep and .5m high. It is semi-circular in shape and the southern wing appears to have been disturbed, perhaps by a bulldozer. The structure is open to the west and military hardware and rusted cans were found in the vicinity. The cobbles used to construct the feature exhibit recent breaks and exposed ground stain.

SIHP SITE NUMBER: 05-14748

FORMAL TYPE: Walls.

FUNCTIONAL TYPE: Fortification.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Military.

DIMENSIONS: 2m x 20m.

SETTING: Located on the south-facing slope of a broad ridge, overlooking a narrow gully. Elevation 1525 ft.

VEGETATION: Grasses.

FEATURES: This site consists of two walls located 10m from one another. Both walls run parallel to the ridge and adjacent gully. They are constructed by filling the space between natural outcrop boulders with cobbles and small boulders. Each wall is approximately 3m long and 1m high and the cobbles and boulders used in construction exhibit recent breakage and exposed ground stain.

Located east of the walls is a rusted oil drum that was used as a target. It contains numerous bullet holes and was weighed down with small rock debris.

SIHP SITE NUMBER: 05-14749

FORMAL TYPE: Cairn.

FUNCTIONAL TYPE: Fence support.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Ranching.

DIMENSIONS: 1.3m diameter.

SETTING: Located on top of a broad ridge where it splits into two narrow ridges. Elevation 1515 ft.

VEGETATION: Lowland grasses and shrubs.

FEATURES: This site consists of a single rock cairn. The cairn measures 1-3m in diameter by .45m high. It is constructed of medium sized cobbles on exposed bedrock. The cobbles exhibit exposed ground stain.

SIHP SITE NUMBER: 05-14750 (Figure A-13)

FORMAL TYPE: Overhang shelter.

FUNCTIONAL TYPE: Habitation.

TEMPORAL ORIGIN: Pre-Contact.

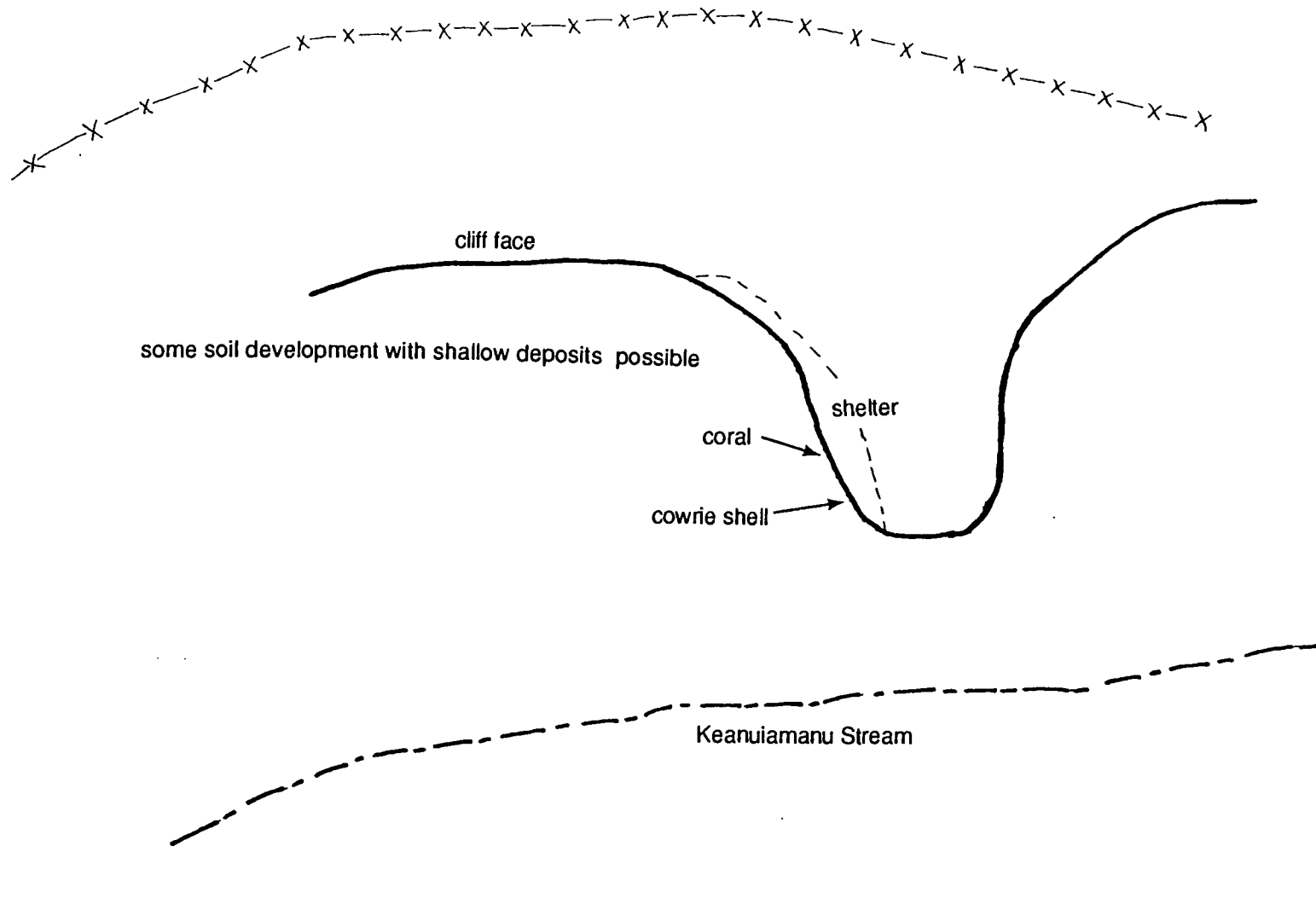
CULTURAL PERIOD: Traditional Hawaiian.

DIMENSIONS: Overhang 6m long, 1.5m deep, relatively flat area in front measures 7m x 7m.

SETTING: North edge of Keanuiomano Stream in broad channel. Elevation 1530 ft.

VEGETATION: Grasses, shrubs (koa haole and unknown).

FEATURES: This site is an overhang shelter located at the edge of the stream bed. The opening faces the stream to the southwest. Cypraea and unidentified bivalves are on the surface within the shelter and on the slope outside of the shelter. The shelter sits approximately 2m above the stream bed and there is an accumulation of soil. Fragments of coral were also found in front of the shelter as well as up stream from the shelter.



SIHP SITE NUMBER: 05-14751 (Figure A-14)

FORMAL TYPE: Overhang shelter.

FUNCTIONAL TYPE: Habitation.

TEMPORAL ORIGIN: Pre-Contact.

CULTURAL PERIOD: Traditional Hawaiian.

DIMENSIONS: 12m x 12m.

SETTING: Drainage edge (south side) of fork leading into Keanuiomanu Stream. Elevation 1475 ft.

VEGETATION: *Koa haole*, grasses.

FEATURES: Site 14751 is an overhang shelter. The shelter measures 12m wide by 1m to 2m deep. It has a maximum height at the drip line of 1.5m. Located in front of the shelter is a flat area measuring 10m east-west by 7m north-south.

The shelter faces northwest and there is some accumulation of soil. Located within the shelter and on the flat area outside of the shelter are fragments of *kukui* shells, *Cypraea*, and coral.

SIHP SITE NUMBER: 05-14752 (Figure A-15)

FORMAL TYPE: Lava tube shelter.

FUNCTIONAL TYPE: Habitation/Burial.

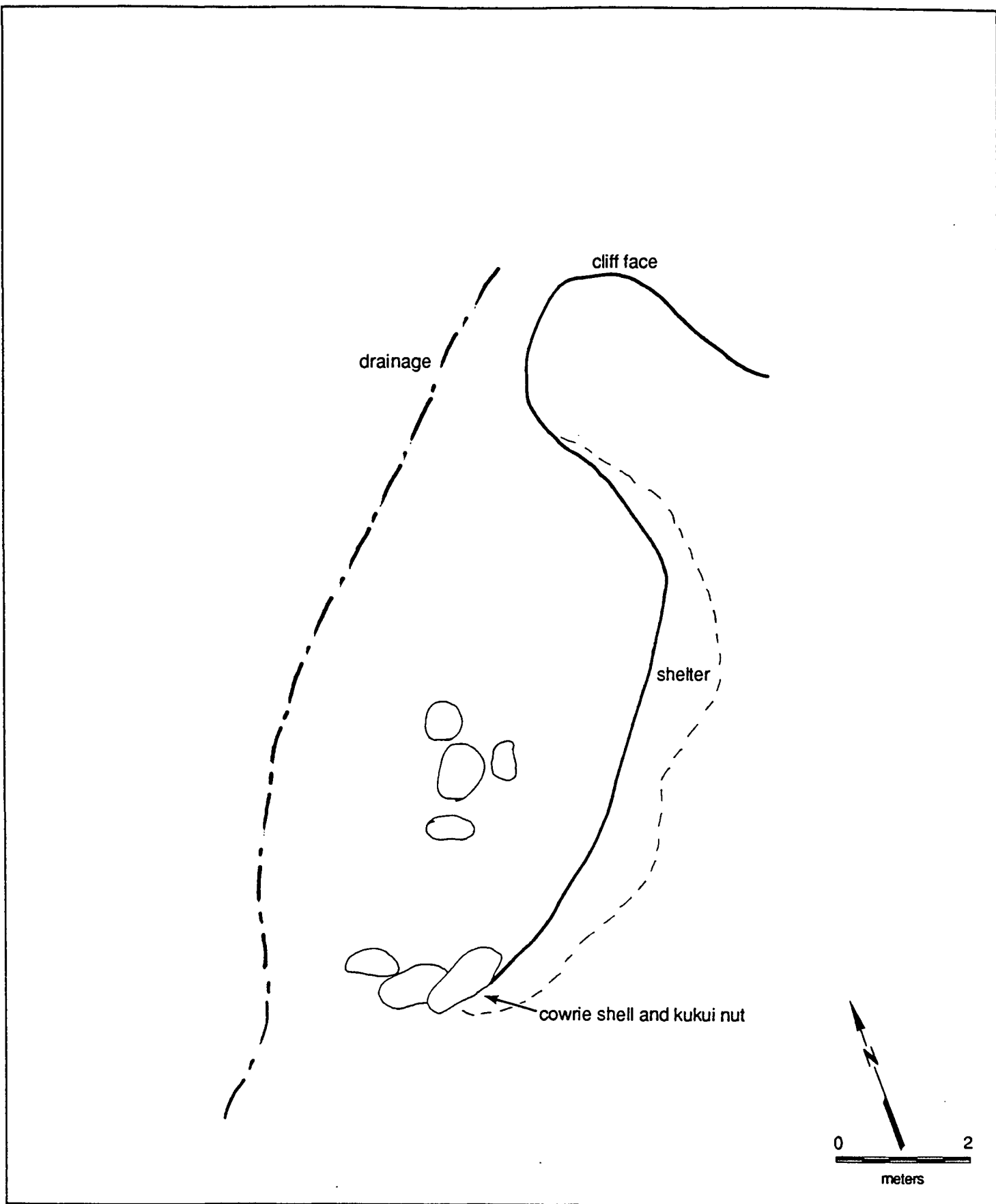
TEMPORAL ORIGIN: Pre-Contact.

CULTURAL PERIOD: Traditional Hawaiian.

DIMENSIONS:

SETTING: A small knoll created by a lava bubble. Elevation 1175 ft.

VEGETATION: Grasses.



FIGURE

OGDEN
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Shelter Site 5-14751

A-14



FEATURES: Site 14752 is a lava tube shelter consisting of two chambers. There is some soil accumulation within the shelter. The soil is very fine, light to medium brown silt. The entrance faces south and measures 1m in diameter and the entire shelter measures 11m east-west and 7m north-south. Except at the edges of the shelter, where the roof meets the floor, the ceiling ranges from .5m to 1.25m high. To the right (mauka) of the entrance is a waterworn cobble, and several angular pahoehoe cobbles, and fragments of gourd, coconut shell, and marine shells. A human long bone fragment (ulna) was found leaning against the east walls.

Located to the left of the entrance is the largest chamber. Within the center of the chamber is scatter of angular pahoehoe cobbles. On the soil surrounding the cobbles are *Cypraea*, *patella* (*opihi*), unidentified marine shell, gourd fragments, and waterworn pebbles.

SIHP SITE NUMBER: 05-9012

FORMAL TYPE: Wall.

FUNCTIONAL TYPE: Ranching/Boundary.

TEMPORAL ORIGIN: Post-Contact.

CULTURAL PERIOD: Ranching.

DIMENSIONS: Average height ca. 1m x 4000m long (continuous).

SETTING: Extends south from highway for a considerable distance. Elevation ranges from 1140 ft to 1190 ft.

VEGETATION: Grasses, *kiawe*, *koa haole*.

FEATURES: This site is a historic wall built in the late 1800s. It forms the west (makai) boundary of the property and runs from Kawaihae-Waimea Highway south for several kilometers. It is finely stacked and faced 2-3 boulders thick and up to 7 courses high. Within the current project it ranges from 1m to 1.5m and averages 1m thick.

CULTURAL IMPACT ASSESSMENT
TMK: (3) 6-2-001:075 PORTION
‘ŌULI AHUPUA‘A
SOUTH KOHALA DISTRICT
ISLAND OF HAWAI‘I

KULAIWI ARCHAEOLOGY, LLC

Archaeological, Cultural, and Historical Resource Management Services

P.O. Box 1213, Captain Cook, HI 96704

Phone: 808-493-8884

CULTURAL IMPACT ASSESSMENT
TMK: (3) 6-2-001:075 PORTION
‘ŌULI AHUPUA‘A
SOUTH KOHALA DISTRICT
ISLAND OF HAWAI‘I

By:

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Prepared for:

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July 2024

KULAIWI ARCHAEOLOGY, LLC

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MANAGEMENT SUMMARY

At the request of Keith Kato, Executive Director of the Hawai'i Island Community Development Corporation, Kulaiwi Archaeology, LLC has completed a Cultural Impact Assessment (CIA) for two areas (Project Lot 1 and Project Lot 2) located in 'Ōuli Ahupua'a, South Kohala District, Island of Hawai'i. The two areas total 13.941-acres and are designated as the Area of Potential Effect (APE) in this report. The APE is situated within the 237.5-acre TMK: (3) 6-2-001:075.

The objective of the CIA is to identify any culturally significant resources or traditional cultural practices that occurred within the project area and its immediate vicinity. The CIA relies upon archival research focused on historical documents, previous archaeology studies, previous CIA reports, and oral interviews. This assessment addresses potential cultural impacts that future development could have on any traditional cultural practices or resources following the framework set forth by the Hawai'i Supreme Court in the case of Ka Pa'akai O Ka 'Aina vs. the Hawai'i State Land Use Commission (LUC).

Contents

MANAGEMENT SUMMARY	ii
INTRODUCTION	1
Scope of Work	1
Project Area Description	1
Methods	6
ARCHAEOLOGICAL AND HISTORICAL BACKGROUND	9
Historical Documentary Research	9
Previous Archaeological Work in Vicinity of the APE	24
ORAL HISTORIES	28
Previous Oral Histories	28
CONCLUSION	40
TRANSLATION OF HAWAIIAN WORDS	41
REFERENCES	43
APPENDIX A – APRIL 2024 KA WAI OLA MAGAZINE NOTICE	48

Figures

Figure 1. Portion of USGS 2017 Kawaihae Quadrangle showing Area of Potential Effect (obtained from usgs.gov)...	2
Figure 2. Tax Map Key (3) 5-2-001 dated July 1935 showing Area of Potential Effect (obtained from hawaiiicounty.gov).....	3
Figure 3. Location of Area of Potential Effect.	4
Figure 4. Proposed development within Area of Potential Effect.	5
Figure 5. January 13, 2024 aerial view of Area of Potential Effect vicinity (obtained from Google Earth).	7
Figure 6. Donn’s 1901 Hawaii Territory Survey Register Map 2060 (obtained from DAGS).....	10
Figure 7. Close-up detail of Donn’s 1901 Hawaii Territory Survey Register Map 2060 (obtained from DAGS).....	11
Figure 8. Loebenstein’s 1893 Map of the Homesteads in Pauahi (Register Map 1682; obtained from DAGS).....	23
Figure 9. Location of Clark and Kirch’s (1983) sites in the Mudlane-Waimea-Kawaihae Road corridor and Area of Potential Effect (modified from Robins et al. (2000:6).	25
Figure 10. Location of Schilz (1994) sites and Area of Potential Effect (modified from Robins et al. (2000:16).	26

INTRODUCTION

At the request of Keith Kato, Executive Director of the Hawai'i Island Community Development Corporation, Kulaiwi Archaeology, LLC has completed a Cultural Impact Assessment (CIA) for two areas (Project Lot 1 and Project Lot 2) located in 'Ōuli Ahupua'a, South Kohala District, Island of Hawai'i (**Figure 1**). The two areas total 13.941-acres and are designated as the Area of Potential Effect (APE) in this report. The APE is situated within the 237.5-acre TMK: (3) 6-2-001:075 (**Figure 2**).

The project proponent plans to construct an affordable housing development within the APE (**Figure 3** and **Figure 4**). Project Lot 1 contains 39 lots and Project Lot 2 contains four. The purpose of the CIA is to identify any traditional cultural resources or practices that may be impacted by this proposed development.

Scope of Work

This CIA is intended to assist in providing information to address the constitutional duty of agencies of the State of Hawai'i to protect the reasonable exercise of customarily and traditionally exercised rights of native Hawaiians, to the extent feasible. To this end, the Hawai'i Supreme Court, in September 2000, pronounced an analytical framework within which State and County agencies may fulfill this constitutional duty. In the case of *Ka Pa'akai O Ka 'Aina vs. Land Use Commission (LUC)*, the court directed the LUC, in consideration of petitions, to make specific findings before reaching a decision on the petition concerning:

- The identity and scope of "valued cultural, historical and natural resources" in the petition area, including the extent to which traditional and customary native Hawaiian rights are exercised in the petition area;
- The extent to which those resources – as well as traditional and customary native Hawaiian rights – will be affected or impaired by the proposed action; and
- The feasible action, if any, to be taken by the LUC to reasonably protect native Hawaiian rights, if they are found to exist.

Kulaiwi Archaeology LLC was contracted to complete the following specific tasks to satisfy the Ka Pa'akai requirements as stated above:

1. Conduct background review and research of existing ethnographic, historical, anthropological, and sociological documentary literature relating to traditional cultural practices and resources in the project area and its immediate vicinity;
2. Identify and consult with individuals and organizations to identify knowledgeable individuals with expertise concerning the types of cultural resources, practices, and beliefs found in the vicinity of the project area;
3. Prepare and submit a CIA report including: (a) a discussion of all methods and procedures used for data collection; (b) identification of identified cultural resources, practices, and beliefs within the vicinity of project area; (c) an assessment of the potential effects of the proposed project on any identified resources, practices, and beliefs; and (d) recommendations for mitigating any potential adverse effects.

Project Area Description

The APE is comprised of the 13.005-acre Project Lot 1 and the 0.936-acre Project Lot 2, located in 'Ōuli Ahupua'a at elevations ranging from approximately 1,382 to 1,465 feet. The elevations presented in this report are in feet above

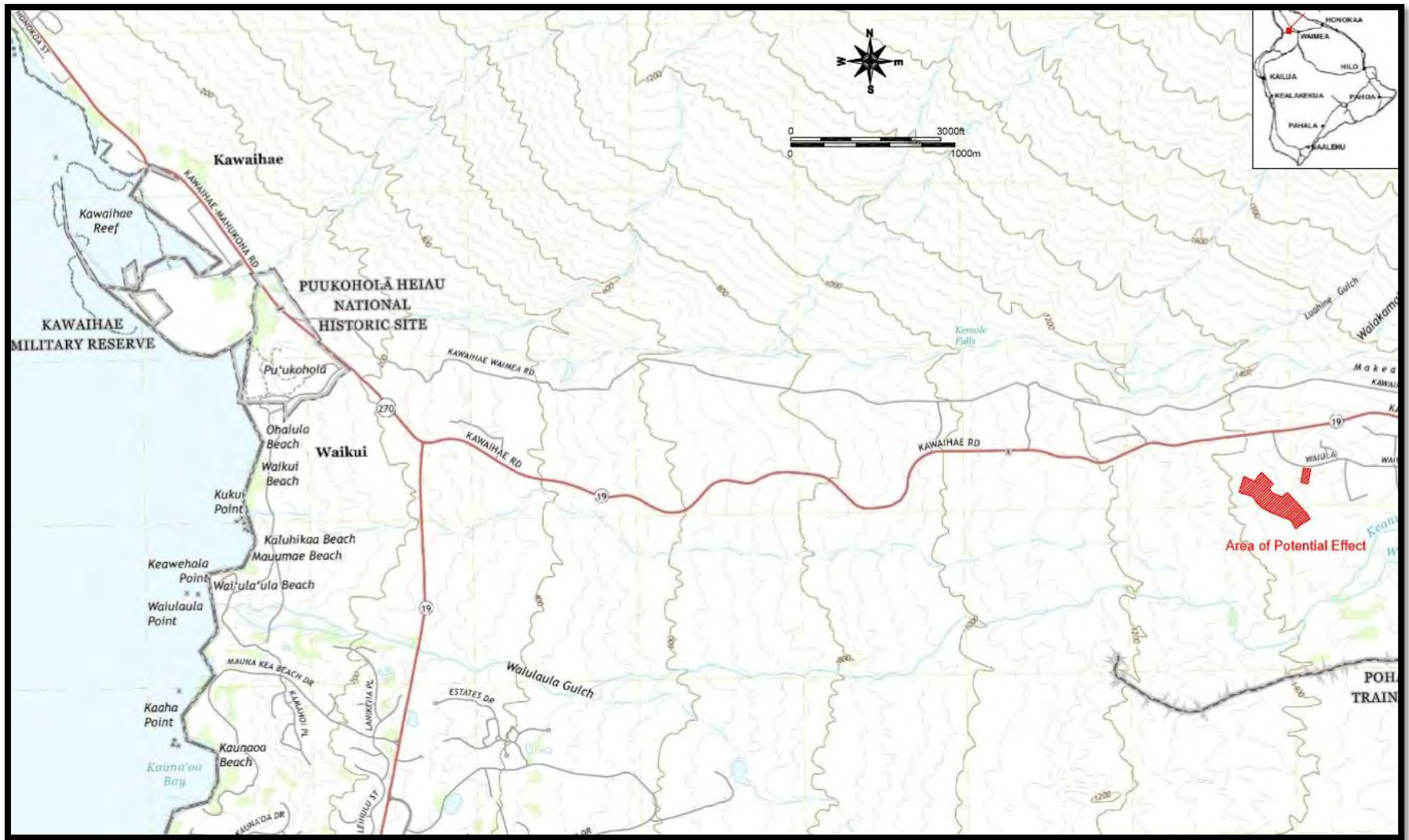


Figure 1. Portion of USGS 2017 Kawaihae Quadrangle showing Area of Potential Effect (obtained from usgs.gov).

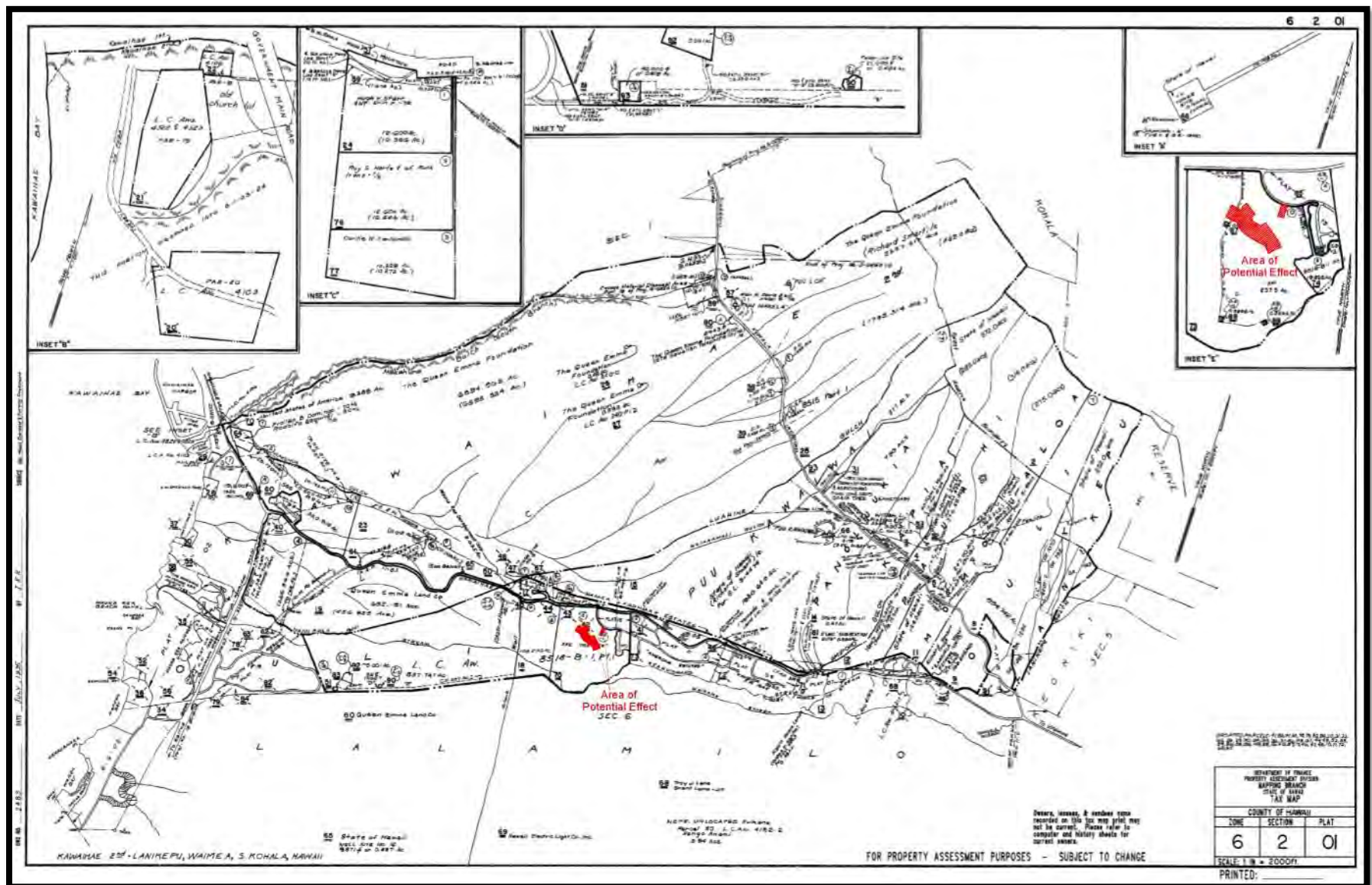


Figure 2. Tax Map Key (3) 5-2-001 dated July 1935 showing Area of Potential Effect (obtained from hawaiicounty.gov).

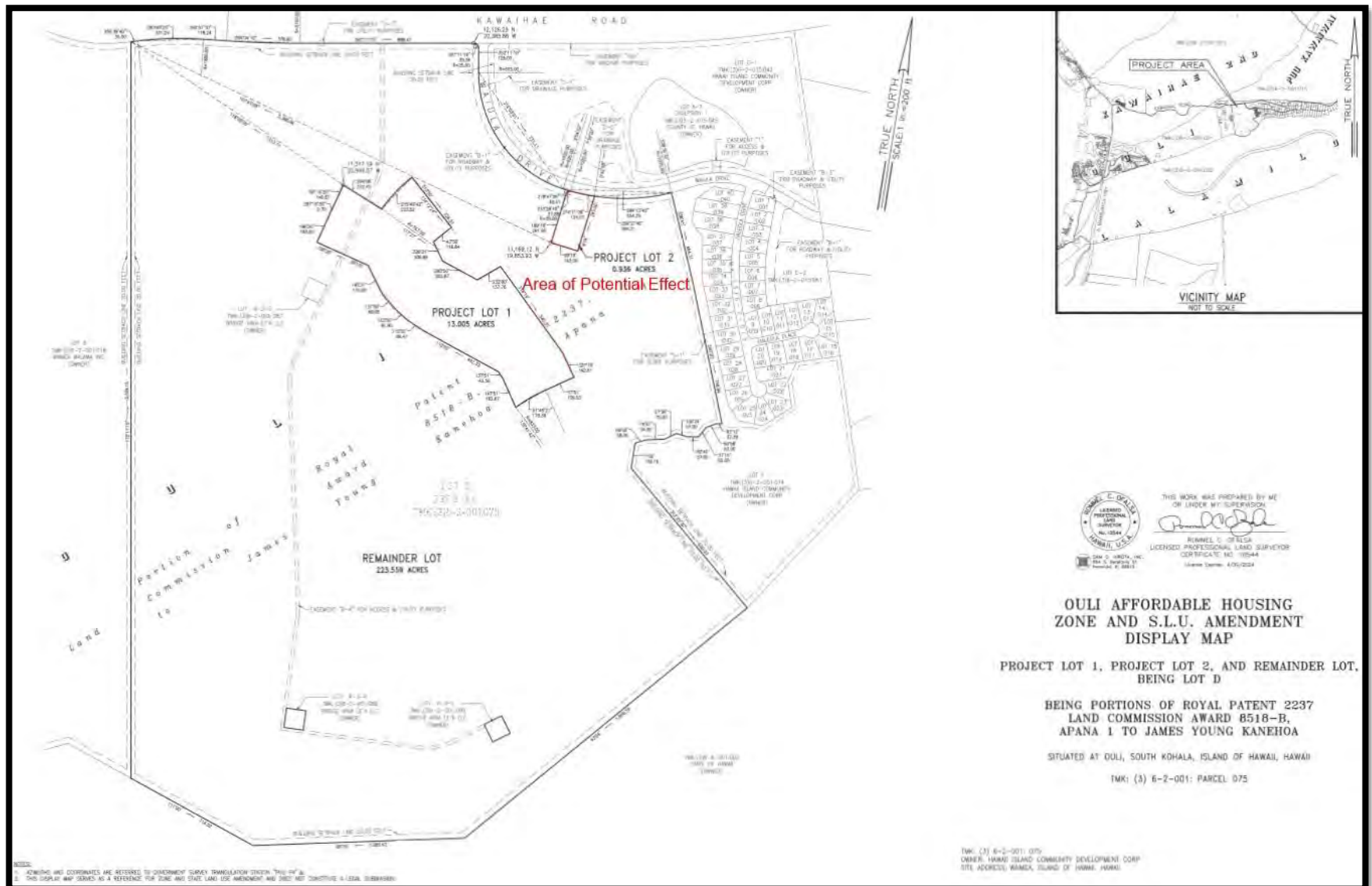


Figure 3. Location of Area of Potential Effect.

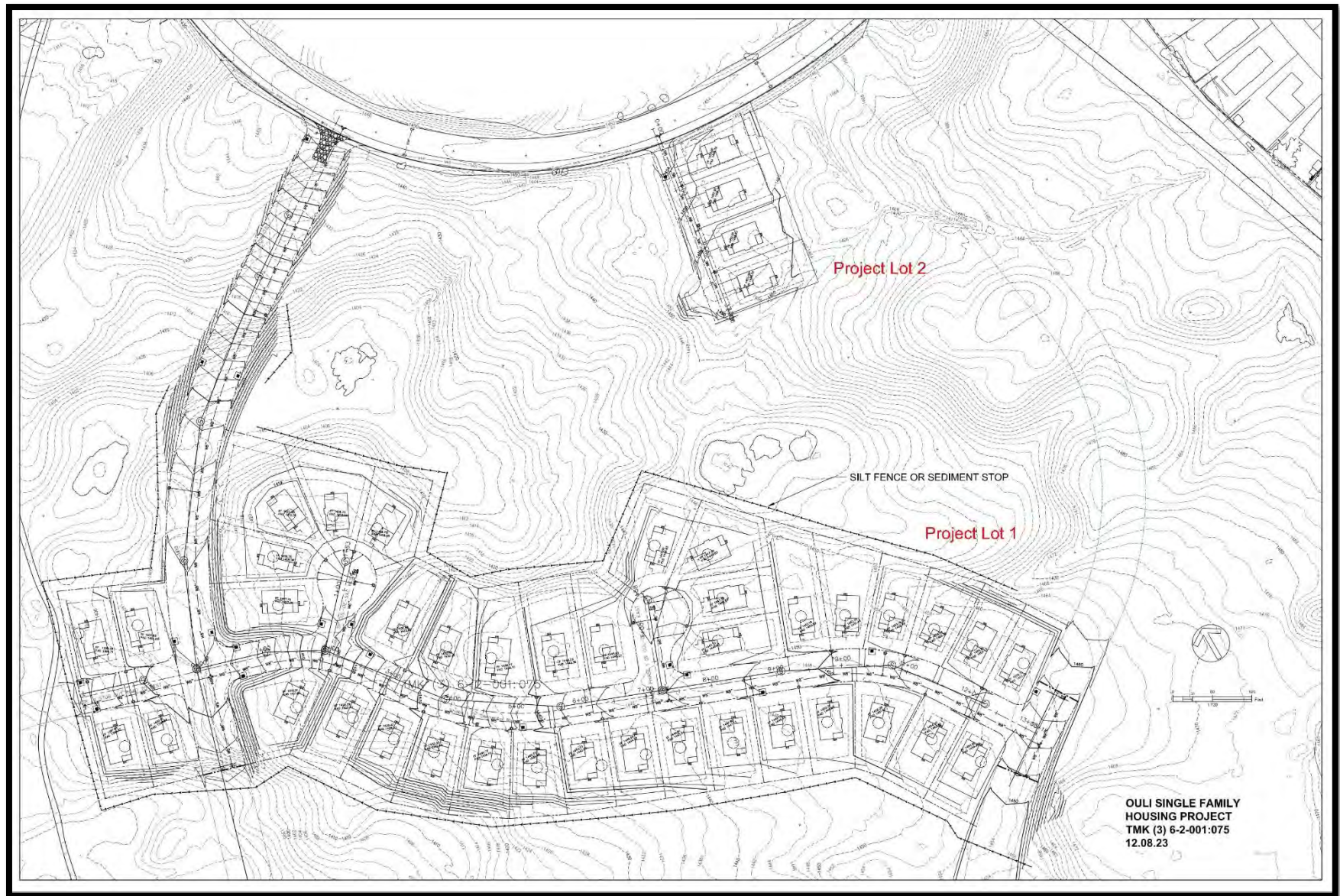


Figure 4. Proposed development within Area of Potential Effect.

mean seal level (AMSL). The Project Lot 1 portion is situated approximately 230 meters south of Kawaihae Road (Highway 19) and 175 meters south-southwest of Waiula Drive. The Project Lot 2 portion is situated adjacent to the south side of Waiula Drive. The parcels are depicted on a January 13, 2024 aerial view of the APE vicinity obtained from Google Earth (**Figure 5**).

The APE is situated in a very arid portion of Hawai'i Island, with the terrain consisting of rolling hills, ridges and drainages that slope to the west with the soil comprised of Kawaihae extremely stony very fine sandy loam (6-12 % slopes) and Puu Pa extremely stony, very fine sandy loam (6-12% slopes; Sato et al. 1973:26, 50 and Map 18). The Kawaihae stony very fine sandy loam represents the Kawaihae series of "excessively drained extremely stony soils formed in volcanic ash (1973:26). This soil type is located on the leeward coastal plains of Mauna Kea and is characterized by thin (2") soils over bedrock. The Puu Pa soil evidences a surface layer of "very dark brown extremely stony very fine sandy loam about 6 inches thick" (Sato et al. 1973:50). Beneath this layer is a "dark brown and dark yellowish-brown very stony very fine sandy loam about 34 inches thick" that overlies fragmental a'ā lava (Sato et al. 1973:50).

The vegetation in the APE is comprised of scattered *kiawe* (*Prosopis pallida*) and low fountain grass (*Pennisetum setaceum*). Waikoloa Stream and Keanuimanu Stream are located to the south of the APE parcels. No water sources are present within the APE. Annual rainfall in the vicinity of the project area ranges from 40 to 105 mm (1.5 to 4.1 inches; Giambelluca et al. 2013). The mean average temperature in this general area is approximately 75 degrees F (usclimatedata.com).

Methods

Archival research was conducted at the Hamilton Library Hawai'i and Pacific Collection at the University of Hawai'i at Manoa, the University of Hawai'i at Hilo Hawaiian Collection, the Land Survey Office and the Archives Division of the Hawai'i Department of Accounting and General Services, the Bishop Museum Archives, the State Historic Preservation Division library in Hilo, the Hawaii Cultural Resource Information System (HICRIS), the Hawai'i State Public Libraries in Honolulu and Hilo, and correspondence with the SHPD librarian.

Attempts were made to contact individuals with knowledge of the 'Ōuli area who could potentially add to the knowledge collected by Maly (2003). Mr. Solomon Kailihiwa, Principal Investigator of Kulaiwi Archaeology, LLC initially contacted Mr. Christian Omerod, Department of Land and Natural Resources – State Historic Preservation Division (SHPD) History and Culture Branch, to determine if there were any descendants from 'Ōuli that should be contacted however, no information was provided.

Mr. Kailihiwa then contacted Roberta Ku'ulei Keakealani (Ku'ulei), a *kupa'aina* (native born with deep roots in an area) of Ka'upūlehu. Maly (2003) features an interview of her grandfather, Robert Keakealani, conducted by his daughter Leina'ala Lightner, the summary of which is featured below. A summary of subsequent correspondence is presented in **Table 1**. Ku'ulei has no specific information concerning the project; however, she did recommend contacting Keoki and Yvonne Carter, longtime residents of 'Ōuli Ahupua'a and knowledgeable about the project area vicinity.

Kulaiwi Archaeologist Nicole Lui and Ku'ulei made repeated attempts to contact the Carters via email. However, to date, they have not responded to any of Ms. Lui's requests.

In addition to emails, and telephone calls, a public notice was placed in the May 2024 edition of the *Ka Wai Ola* Magazine. The notice contained (a) the project name and location information, and (b) the identification of a contact person. A copy of the notice is attached to this plan (**Appendix A**). The notice requested that any person having information concerning cultural resources or traditional cultural practices on or in the vicinity of the project area contact Mr. Solomon Kailihiwa of Kulaiwi Archaeology, LLC. To date, no one has responded to the *Ka Wai Ola* public notice.

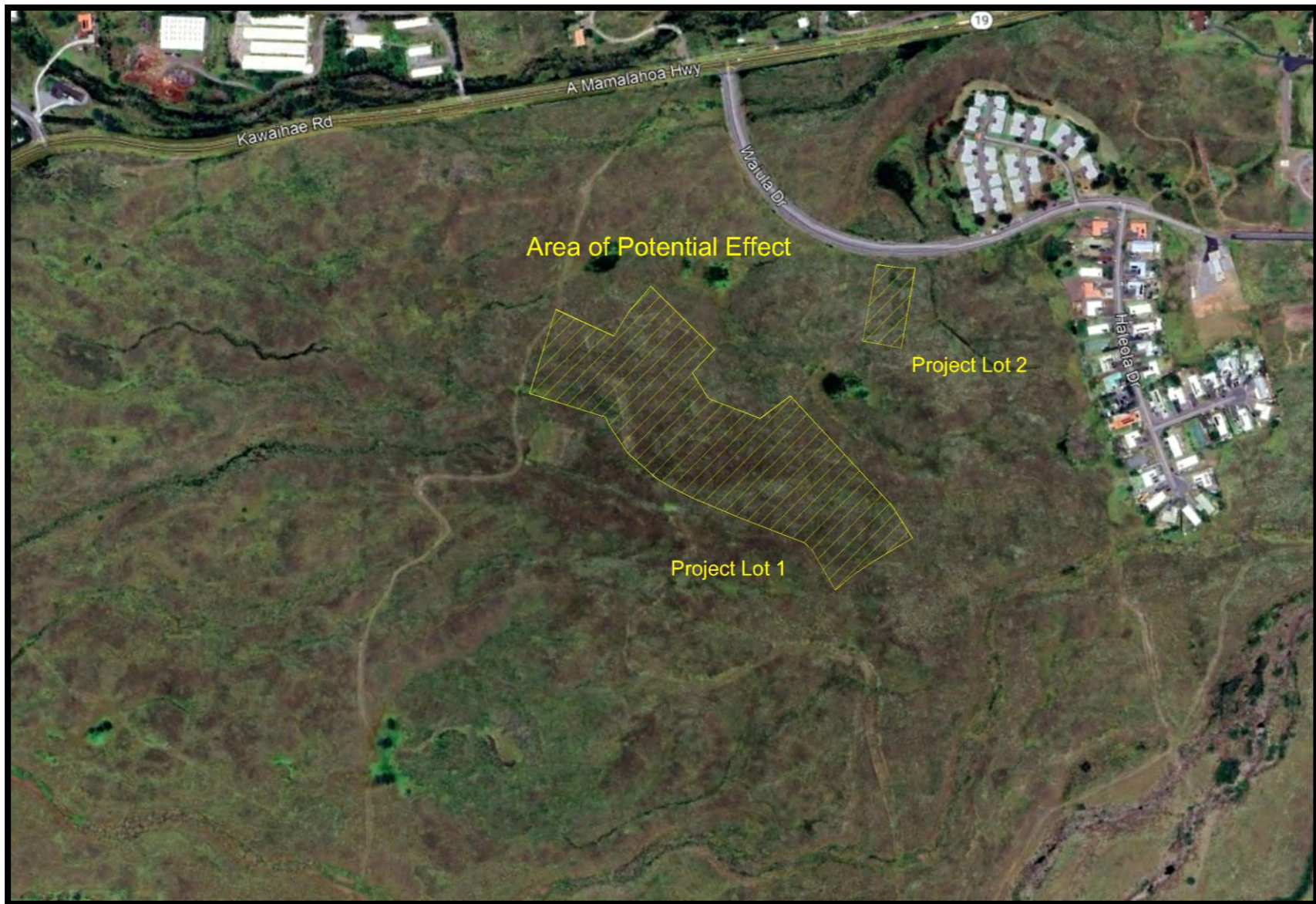


Figure 5. January 13, 2024 aerial view of Area of Potential Effect vicinity (obtained from Google Earth).

Table 1. Summary of correspondence

Kulaiwi Archaeology Staff	Knowledgeable Individual	Date	Communication Type	Communication
Solomon Kailihiwa	Ku'ulei Keakealani	April 16, 2024	Email	Email to Ku'ulei asking for assistance in contacting individuals who were knowledgeable of the project area. Response from Ku'ulei via phone call.
Solomon Kailihiwa	Ku'ulei Keakealani	April 30, 2024	Phone Call	Call from Ku'ulei recommending that Kulaiwi Archaeology contact Keoki and Yvonne Carter.
Solomon Kailihiwa	Ku'ulei Keakealani	May 18, 2024	Email	Follow-up email to Ku'ulei asking for an introduction or contact information for the Carters and attaching maps of the project area.
Nicole Lui	Ku'ulei Keakealani	June 7, 2024	Email	Email to Ku'ulei asking for assistance in contacting the Carters. Response via email.
Nicole Lui	Ku'ulei Keakealani	June 10, 2024	Email	Email from Ku'ulei to Nicole stating that she will reach out to the Carters and ask permission for Kulaiwi to reach out regarding the project.
Nicole Lui	Ku'ulei Keakealani, Keoki & Yvonne Carter	June 12, 2024	Email	Email from Ku'ulei introducing Nicole to Yvonne & Keoki Carter.
Nicole Lui	Ku'ulei Keakealani	June 17, 2024	Email	Email to Ku'ulei touching base to confirm that she may contact the Carters via email.
Nicole Lui	Ku'ulei Keakealani	June 17, 2024	Email	Email from Ku'ulei confirming that the best way to reach out to the Carters is via email where they may exchange additional contact information.
Nicole Lui	Yvonne & Keoki Carter	June 17, 2024	Email	Email to the Carters introducing herself inquiring if the Carters would be willing to participate in this CIA. No response to date
Nicole Lui	Yvonne & Keoki Carter	June 18, 2024	Email	Follow-up email to the Carters. No response to date.
Nicole Lui	Ku'ulei Keakealani	June 19, 2024	In Person	Ku'ulei says she will reach out to the Carters in person to contact Nicole.
Nicole Lui	Yvonne & Keoki Carter	June 21, 2024	Email	Follow-up email to the Carters. No response to date.
Nicole Lui	Yvonne & Keoki Carter	June 26, 2024	Email	Follow-up email to the Carters. No response to date.
Nicole Lui	Hannah Springer	June 28, 2024	Phone Call	Nicole speaks with Hannah Springer regarding the project area. She is not familiar with 'Ōuli and did not know of anyone with whom she should speak.

ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

Historical Documentary Research

The project area is located within the *ahupua'a* of 'Ōuli on the northwestern side of the island of Hawai'i in the South Kohala District. The island of Hawai'i is divided into six traditional districts or *moku-o-loko*, consisting of Kohala, Kona, Hāmākua, Hilo, Puna and Ka'ū. **Figure 6** is the 1901 Hawai'i Territory Survey Register Map 2060 prepared by John M. Donn showing these major traditional divisions, obtained from Archives Division of the Hawai'i Department of Accounting and General Services (DAGS; <http://ags.hawaii.gov/survey/map-search>). The Kohala District, divided into North and South areas, extends from the northern end of the island, south to the western flank Mauna Loa Volcano where it adjoins the districts of Hāmākua and Ka'ū.

The six major Hawai'i Island districts were subdivided into smaller land units called *kalana* or '*okana*' which were further divided into land units designated as *ahupua'a* that were tended by the *maka'āinana* or people of the land (Malo 1951:63-67). The *ahupua'a* are generally linear or wedge shaped parcels of land that originate along the shoreline and extend inland to the mountains, providing the *maka'āinana* access to the wide range of marine and terrestrial resources.

Based on research conducted by Haun et al. (2003), Welch (1989), Barrera (1971), and Barreré (1971, 1983), Waimea was a *kalana* of Kohala that included all of the land south of the Waikoloa Stream. Waimea was composed of eight subdivisions with the majority of the subdistrict being composed of the '*ili* of Waikoloa and Pu'ukapu. The remainder consisted of the '*ili* of Wai'aka, Lālāmilo, 'Anaeho'omalua, Kalāhuipua'a, Puakō, and 'Ōuli. This is confirmed by Maly and Maly (2003:1) who state:

We find that in native accounts, 'Ōuli and other neighboring lands to the south, were not classed as *ahupua'a*, as was the general case in the ancient land system. Instead, 'Ōuli was called an '*ili*, and as such was classed as a parcel of land within, and generally subordinate to the larger division of Waimea. Because 'Ōuli belonged to Waimea, its political affiliation and access to a range of resources and environmental zones were tied to the larger Waimea region, and the native residents of 'Ōuli also had residency and land use privileges in other lands of Waimea.

Native witnesses in early historic testimonies described Waimea as a "*Kalana*" or "*Okana*," a land division which in ancient times was treated as a sub-district, smaller than the *moku o loko*, or one of the six major districts that make up the island of Hawai'i, yet comprised of a number of smaller lands that contributed to its wealth...In the 1840s and 1860s, elder native witnesses described 'Ōuli and the other lands as "*ili*," also observing that the lands fell under the jurisdiction of the chiefs of Waimea. Understanding this difference in the status of the land divisions of the Waimea region helps explain why lands such as 'Anaeho'omalua and Kalāhuipua'a have no upland agricultural resources; and why Waikōloa and all the other lands extending north from it, except for Lālāmilo and 'Ōuli, have no ocean frontage. Interestingly, in this unique system of land management under which Waimea fell, the '*ili* of 'Ōuli had a large range of resources, extending from the ocean fisheries, across the *kula* (plains land), and into the upland forests (Maly and Maly 2003:1-3).

'Ōuli is situated on the leeward slopes of the Kohala mountains, which block the prevailing tradewinds that approach from the northeast. Consequently, the majority of 'Ōuli is dry, and was known traditionally as the '*aina kaha* or "arid shore land" (Maly and Maly 2003:3). The *ahupua'a* of 'Ōuli is a roughly L-shaped section of land that originates along the shoreline between Hapuna Bay and Waiulaula Point. It extends upslope to the east for approximately 2,400 foot elevation, then angles to the north and continues inland to approximately 5,000 feet. **Figure 7** is a closeup detail of the 1901 Hawai'i Territory Survey Register Map 2060 that depicts the extent of 'Ōuli. It is bordered on the north



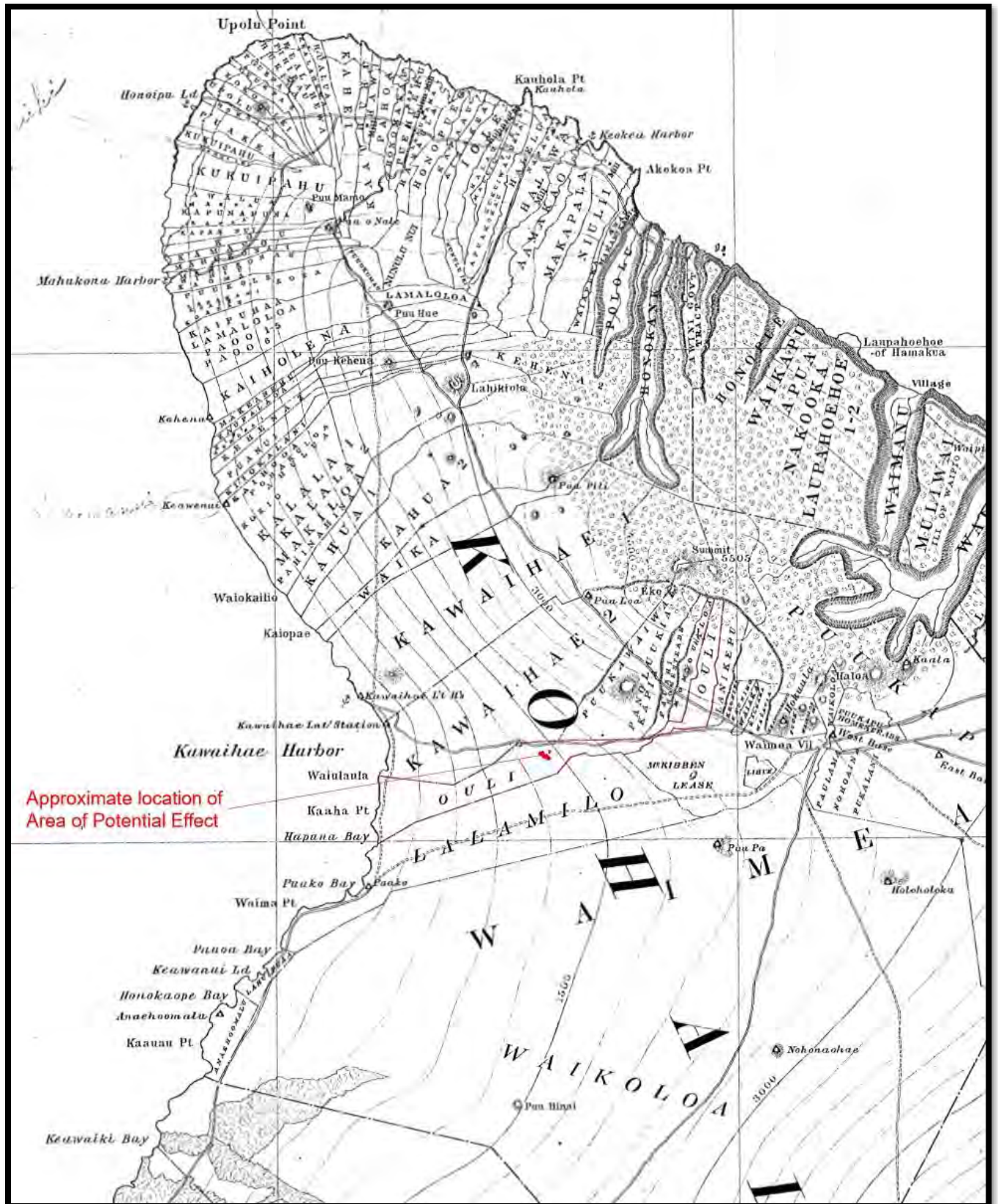


Figure 7. Close-up detail of Donn's 1901 Hawaii Territory Survey Register Map 2060 (obtained from DAGS).

by Kawaihae 2, Pu'ukawaiwa, Kapia, Pauahi, and Momouhaloa, on the south by Lālāmilo, and on the east by Lanikepu.

Kepa Maly translated portions of the fabled exploits of two brothers, commemorated in "The Heart Stirring Story of Ka-Miki", compiled by Hawaiian historians John Wise and J.W.I. Kihe and published in installments in the Hawaiian newspaper, *Ka Hoku o Hawai'i* between 1914 and 1917. The following narrative, cited in Maly and Maly (2003) provides descriptions of where some of the place names in the general vicinity of 'Ōuli area originated:

...Kanakanaka was an expert *lawai'a hī-ahi* (deep sea tuna lure fisherman) and his wife Pili-a-mo'o was a powerful priestess and *ōlohe*. Kanakanaka's sister was the wind goddess Waikōloa. Kanakanaka and Piliamo'o were the parents of Nē'ula (a fishing goddess), and she married Pu'u Hīna'i a chief of the inlands. Nē'ula and Pu'u Hīna'i were the parents of Lālāmilo, and like his grandfather, Lālāmilo was skilled as a *lawai'a* (fisherman). Because of Lālāmilo's fame as an expert *ōlohe* and fisherman, Lālāmilo gained Puakō as his wife, and it was through Puakō that Lālāmilo obtained the supernatural *leho* (cowry shell octopus fishing lure) which came to be called Kalokunu.

The *leho* (octopus fishing lure) was so powerful that if it was only shown to the *he'e* (octopus), they would climb upon the canoe and be caught. Lālāmilo carefully guarded this lure and even slept with it. When Lālāmilo did leave the lure, he stored it in the *hōkeo aho hī-ahi* (tuna lure and *olonā* line storage gourd) of his grandfather Kanakanaka, and this was hidden, tied to the ridge pole of his house.

Lālāmilo's grandmother Piliamo'o, discerned the nature of the lure, and instructed Lālāmilo to kill all people who inquired about the lure, or sought to see it. Because the fame of this lure spread around Hawai'i, and because people were curious about it, many people were killed.

Pili-a-Ka'aiea the chief of Kona greatly loved octopus fishing, and had sent several messengers to inquire of Lālāmilo how he might acquire the lure. All of the messengers were killed by Lālāmilo and Piliamo'o. While at the contest field called Hinakahua in Puapua'a, Ka-Miki agreed to fetch the lure for Pili as one of the conditions he needed to fulfill in order to become the foremost favorite of Pili. Now as these events at the court of Pili were unfolding, Lālāmilo decided to visit his father Pu'u Hīna'i; his sister Pu'u 'Iwa'iwa; and his grand aunt Waikōloa, who was Pu'u 'Iwa'iwa's guardian. To this day, places are named in Kohala for all of these people. (Maly and Maly 2003:6)

'Ōuli lies within an area severely impacted by warring chiefs. During Lono-i-ka-makahiki's (Lono) reign, Kanaloa-kua'ana, his elder brother tried to gain control over the Island of Hawai'i. One of the battles associated with this attempt happened within 'Ōuli. According to Fornander (1996), the invading forces were encamped at:

...the land called Anaehoomalu, near the boundaries of Kohala and Kona. The rebel chiefs were encamped seaward of this along the shore. The next day Lono marched down and met the rebels at the place called Wailea, not far from Wainanalii, where in those days a watercourse appears to have been flowing. Lono won the battle, and the rebel chiefs fled northward with their forces. At Kaunooa [Kauna'oa, 'Ōuli], between Puako and Kawaihae, they made another stand, but were again routed by Lono, and retreated to Nakikiaianihau, where they fell in with reinforcements from Kohala and Hamakua. Two other engagements were fought at Puupa and Puukohola, near the Heiau of that name, in both of which Lono was victorious... (Fornander 1996:120-121)

Historian Samuel Kamakau describes another attempt to overtake the Island of Hawai'i during Lono's reign. Maui *ali'inui* Kama-lala-walu ignored the advice of his counsel and sent his half-brother Ka-uhi-o-ka-lani (both sons of Kiha-

a-Pi'ilani) to spy on Hawai'i island, to see how large the population was. They landed in Kawaihae and the following occurred:

Ka-uhi-o-ka-lani ran about that same evening and returned before the canoes were dismantled and placed in the house. The keepers of the gods at Mailekini were servants of Kama, and so they concealed the canoes of the spies. When Ka-uhi-o-ka-lani returned his fellow spies and hosts asked, "where did you go?" "I went visiting from here to the lava bed and Kiholo, the pond. Then did you turn back?" "No, I went on to the long stretch of sand, to the small bay with a point on that side and one on this side. There are large inland ponds." "The sandy stretch is 'Ohiki, and this walled-in ponds are Kaloko and Honokōhau. Then you came back?" No, I went on..." (Kamakau 1992:56).

The next morning the spies began a circuit of Hawai'i. After they returned to Maui, they reported to Kama-lala-walu the following:

"We went all around Hawaii. There were many houses, but few men. We went to Kohala and found the men only on the shores...." The spies had seen the land of Kohala but had failed to see the people for on all of the fields where sports were held from inner Kohala to outer Kohala, from Kohala of the coastal cliffs to Kohala of the inland, a crowd of people gathered every day from morning to night to play. Kohala was known as a thickly-populated land. The spies thought that if Kohala was conquered, Kona, Ka'u and Puna would be easily taken, and they felt that Hilo and Hamakua would lend no assistance. This was true, for the chiefs of these districts were cousins of the chiefs of Maui (Kamakau 1992:56-57).

While most of the prophets and seers supported Kama-lala-walu's war on his cousins of Hawai'i Island, children of his father's sister Pi'ikea and 'Umi-a-Liloa did not. Some warned that if he did go, he would die and not return to Maui alive. They landed at Kohala and began the destruction of the people of Kohala. Kanaloa-kua'ana, son of Keawe-nui-a'Umi was captured and treated cruelly. "His whole skin was tattooed, his eyelids turned inside out and tattooed." He was renamed Ka-maka-hiwa.

From Kohala, Kama-lala-walu set forth for Kawaihae, and found no one there. The people had gone up to Waimea, for all observed the services at the heiau of Mailekini. Only those of lower Kawaihae and Puako remained. The battlefield was at Waimea. Kama-lala-walu's counselors said, "Waimea is not a battle site for strangers because the plain is long, and there is no water.... It is better to go to Kona..." (Kamakau 1992:58).

Kama-lala-walu did not take heed and listened instead to two old men of Kawaihae who gave him false information and suggested that he cut up his canoes before heading up to Waimea so that Maui warriors would not be tempted to retreat to Maui. Then they headed for the plains of Waimea. When they got there they looked back towards the sea and saw the men of Kona advancing toward them.

The lava bed of Kaniku and all the land up to Hu'ehu'e was covered with men from Kona. Those of Ka'u and Puna were coming down from Mauna Kea, and those of Waimea and Kohala were on the level plain of Waimea. The men covered the whole of the grassy plain of Waimea like locusts (Kamakau 1992:58).

The battle of Pu'u'oa'oaka commenced just outside these plains. The light-weighted lava rocks here contributed to the defeat of the Maui warriors who were used to heavier water-worn rocks. The Maui warriors retreated; some to Kawaihae, others to Kohala. And because of the lack of canoes, very few escaped alive. Ka-uhi-a-Kama, son of Kama-lala-walu who was killed on the plain of Puako, escaped to Kekaha, found a canoe and fled to Maui. He was saved by

Hinau, the foster son of Lono-i-ka-makahiki. Many of the chiefs of Kona were relatives of Ka-uhi-a-Kama through his mother Kapu-kini-akua (Kamakau 1992:59-60).

After the death of Hawai'i Island *ali'inui* Lono-i-ka-makahiki, his children did not succeed him and Hawai'i Island was divided into smaller divisions (Kamakau 1992:61-63). The descendants of Kanaloa-kua'ana (Keawe, Ke'eaumoku, Kalani'opu'u and Keoua) later ruled Kohala, Kona and Ka'u. The descendants of Keawe-nui-a-'Umi ruled Hilo and Hamakua. This was not a peaceful period. The chiefs of Kona and Hilo fought each other for the various resources each area had. These wars lasted for several decades with the Hilo chiefs usually defeating the Kona-Kohala chiefs, especially during the reigns of Kua'ana, Kuahu'ia, Ka-lani-ku-kau-la'ala'a and Moku. Ke-aka-mahana was the ruler of Kona during the wars with Hilo.

The rulers of Kona who succeeded Ke-aka-mahana were her daughter Keakea-lani and her son, Keawe [Ke-awe-i-kekahi-ali'i-o-ka-moku]...Keakea-lani was the ruler of Kona and Kohala. The Mahi clan were the war leaders, that is they were in charge...But the chiefs of Hilo were always victorious over those of Kona...after they won the battle of Hu'ehu'e the secret places and burial caves in Kona were broken open... In the battle of Mahiki, Ka-lani-ku-kau-la'ala'a and Moku were the chief war leaders of Hilo (Kamakau 1992:61-63).

After Moku the Hilo chiefs ceased to reign. Kohala *ali'inui* Keawe's half-sister Ka-lani-kau-lele-ia-iwi was the mother of Alapa'i-nui-a-Ka-uaua, who went to live on Maui with his half-sister, Ke-ku'i-apo-iwa-nui (wife of Ke-kau-like, Maui *ali'inui*) after his father's (Ka-uaua-nui-a-Mahi) death at the hands of the Hilo chiefs in the battle of Mahiki. When Alapa'i heard of Keawe's death and the unrest between the district chiefs, he went back to Hawai'i Island with plans to make war on all the chiefs. He captured the chiefs of Kohala and Kona, and became ruler of those districts. However, when his brother-in-law Ke-kau-like heard about Alapa'i's victory, Ke-kau-like made war on Alapa'i in order to return Kohala and Kona to their chiefs. He wasn't successful, but Ke-kau-like's warriors prevented Alapa'i from conquering the Hilo and Ka'u chiefs (Kamakau 1992:64-65). During these battles a lot of damage was done on the landscape.

The fighting began with Alapa'i at Kona. Both sides threw all their forces into the fight. Ke-kau-like cut down the trees throughout the land of Kona. Obligated to flee by canoe before Alapa'i, he abused the country people of Kekaha. At Kawaihae he cut down all the coconut trees. He slaughtered the country people of Kohala, seized their possessions and returned to Maui (Kamakau 1992:66).

In retribution, Alapa'i decided to carry the battle to Maui. While Alapa'i and his warriors were encamped in Kohala, Kamehameha was born to Ke-ku'i-apo-iwa (II) in Kapakai ('I'i 1983:3), in the *ahupua'a* of Kokoiki, in the *moku* of North Kohala near the Mo'okini *heiau*. Kamakau (1992:67) says it was AD 1736; however, others say it was between 1753 and 1758 with more leaning towards 1753 (Cahill 1999:56-57). He was quickly taken by Kohala chief Nae'ole and hidden in Halawa (Kamakau 1992:67-69), his ancestral homeland. Ke-ku'i-apo-iwa (II) was the daughter of Kekela and Ha'ae. Kamehameha's father was Keoua, younger brother of Ka-lani-'opu'u. Because of her weakened condition, Ke-ku'i-apo-iwa did not accompany the Alapa'i expedition to Maui. The infant Kamehameha was placed in the charge of Nae'ole and his younger sister Ke-ku-nui-a-lei-moku until he was five. He was then returned to Alapa'i who placed the child in the care of his wife, Ke-aka (Kamakau 1992:68-69).

Before Alapa'i reached Maui, a dying Ke-kau-like [Ka-lani-ku'i-hono-i-ka-moku] made his son Kamehamehanui his successor. Ke-kau-like died enroute to Kula (Kamakau 1992:69). When Alapa'i heard of his death, he decided not to make war on his sister's son. While visiting them on Maui Alapa'i heard that the O'ahu chiefs attacked his relatives on Molokai, so he went there to help (Kamakau 1992:70).

Alapa'i was said to have been a good ruler and loved by the common people, but his rule had come about by slaying *ali'inui* Ka-lani-nui-i-a-mamao [father of Kalani'opu'u and Keoua] and his brother Ka-lani-ke'e-au-moku, rightful

ali'inui of Hawai'i island, and taking control. This would be the cause of several battles between Alapa'i and his nephew, Kalani'opu'u (Kamakau 1992:75-78).

In 1754 Alapa'i became ill and moved to Kikiako'i in Kawaihae. As his illness progressed "at Kikiako'i in the *heiau* of Mailekini, Kawaihae, he appointed his son Keawe-'opala to be ruler over the island" (Kamakau 1992:77). However, this was short-lived due in part to shifting allegiances of Keawe-'opala's chiefs (i.e., his relative Ke'eumoku) and *kahuna*, to go with Kalani'opu'u. "A canoe arrived from Kekaha and brought word to Ke'eumoku that Ka-lani-'opu'u was at Kapalilua (in south Kona) and was coming to make war against Keawe-'opala. Ke'eumoku therefore made up his mind to join forces with Ka-lani-'opu'u" (Kamakau 1992:78). It was that same year that Kalani'opu'u, a lover of war, became *ali'inui* of Hawai'i island (Kamakau 1992: 78-79). Kalani'opu'u was the son of Ka-lani-nui-i-a-mamao (ruling chief of Ka'u whom the *Kumulipo* was composed for) however, his biological father was said to be Pele-io-holani, *ali'inui* of Oahu (Kamakau 1992:110). About 1759 Kalani'opu'u conquered East Maui from his wife's brother the Maui king Kamehamehanui (son of Kekaulike) by using Hana's prominent Pu'u Kau'iki as his fortress. He appointed one of his own Hawai'i chiefs, Puna, as governor of Hana and Kipahulu. "Many chiefs from Hawai'i at this time settled on Maui, some of them grandchildren of Keawe" (Kamakau 1992:79-80).

Conflict between Hawai'i chiefs continued. Ke'eumoku, son of Keawe-poe-poe rebelled against Kalani'opu'u and set up a fort at Pololū and Honokane. He was attacked by Kalani'opu'u so he moved to Maui. In 1766 Maui *ali'inui* Kamehameha-nui became ill in Hana and ceded his lands to his younger brother Ka-hekili-nui-'Ahu-manu (Kahekili), a fierce warrior and "manipulator." Following the death of Kamehameha-nui, Ke'eumoku "married" his widow Namahana, a cousin of Ku-nui-akea Kamehameha (Kamehameha I). Their daughter Ka'ahumanu, would later become a favorite wife of Kamehameha I (Kamakau 1992:79-84, 309).

Between 1775 and 1779 fighting continued between Kalani'opu'u and Kahekili. In 1775 Kalani'opu'u and his Hana forces raided and severely destroyed the neighboring Kaupo district, before continuing several more raids on Molokai, Lanai, Kaho'olawe and parts of West Maui. It was at the battle of Kalaeoka'ilio that Kamehameha, nephew and favorite warrior of Kalani'opu'u, was first recognized as a great warrior and given the name of Pai'ea (hard-shelled crab) by the Maui chiefs and warriors (Kamakau 1992:84). Kalani'opu'u returned again to Maui in 1776, but was severely defeated by Kahekili's warriors.

In January 1778 Cook landed in Waimea, Kauai and the culture of old Hawai'i began its spiraling change (Day 1992). Cook left Hawai'i for several months, but returned later in the year. Kalani'opu'u was fighting Kahekili's forces in Wailua, Maui on November 19, 1778 when Cook's ship was sighted on his return trip to the islands. Kalani'opu'u visited Cook on the *Resolution*, while Kahekili visited Clerke on the *Discovery* (Kuykendall and Day 1976:16).

When Cook sailed into Kealahou Bay on January 17, 1779, Kalani'opu'u was still fighting Kahekili on Maui. At this time Kahekili's brother Ka'eo-kulani was ruling chief of Kauai; Ka-hahana was ruling chief of Oahu and Molokai; Kahekili'ahumanu of western Maui, Lanai and Kaho'olawe; and Kalani'opu'u was ruling chief of Hawai'i and Hana (Kamakau, 1992:84-86, 92, 97-98). On January 25th Kalani'opu'u visited Cook again at Kealahou Bay, presenting him with several feather cloaks. In February Cook's plan to kidnap Kalani'opu'u as a hostage was thwarted and Cook was killed following a skirmish over a stolen cutter (Kuykendall and Day 1976:18).

Lieutenant King made the following observation when they entered Kawaihae Bay on February 6, 1779:

Although the northwestern part of the bay which...is called Toe-yah-ya looks green and pleasant, yet as it is neither wooded or hardly any signs of culture, and a few houses. It has certainly some defect, and does not answer the purposes of what the natives cultivate (Beaglehole 1967:525 In Allen 1987:14).

A month later King made the following observations:

Along the NE side of the bay close to which we Sailed [sic], It is very little Cultivated, & we saw but few houses; the Peoples appearance shewd that they were the lowest Class that inhabited them.
(Beaglehole 1967:608)

The off and on warring between the Hawai'i and Maui forces continued, but Kalani'opu'u was aging. Kalanio'opu'u schemed for peace by having his son Kiwala'ō by Kalola, sister of Kahekili, and their twin half-brothers, go to Kahekili, who had the battles cease (Kamakau 1992:88-89; Desha 2000:49-50). Kalanio'opu'u declared his young son Ka-lani-kau-ke-a-ouli Kiwala'ō to be his heir; to his nephew Kamehameha he gave the war god, Ku-ka'ili-moku (Kamakau 1992:107). But even before the death of Kalani'opu'u in 1772, chiefs and *kahuna* were already taking sides between Kiwala'ō and Kamehameha.

Kamehameha and a few other chiefs were concerned about their land claims which Kiwala'ō did not seem to honor, so after usurping Kiwala'ō with a sacrificial ritual, Kamehameha retreated to his district of Kohala. While in Kohala, Kamehameha farmed the land growing taro and sweet potatoes (Handy and Handy 1978:531). After Kalani'opu'u died civil war broke out and the wars between Maui and Hawai'i also continued (Kuykendall and Day 1976:23, 24; Handy and Handy 1978:528).

In 1781, after Kahekili heard about the death of Kalani'opu'u, Kahekili, split his forces and sent them through Maui's south-eastern Kaupo Gap and the north-eastern Ko'olau Gap into Hana. After damming and diverting the supply of spring water to Pu'u Kau'iki, the Hawai'i chiefs were finally defeated, and the Maui *ali'inui* regained control of Hana in 1782 (Kamakau, 1992:84-86; 115-116; Fornander 1900:Vol II 146-7, 150, 216). Following his Hana victory, Kahekili went on to gain control of all the islands except Hawai'i, by trickery and warfare (Kamakau 1992:116, 128-141).

Kiwala'ō [Keōpūolani's father] was killed in 1782 (Cahill 1999:62), but the warring between the forces of Hawai'i Island districts continued. Demographic trends during the early historic period indicate a population reduction in some areas, yet show increases in others, with relatively little change in material culture (Kirch 1985:308, Kent 1983:13). There was a continuum of craft and status material, intensification of agriculture, *ali'i* (chief) controlled aquaculture, upland residential sites, and oral records which were rich in information. The *Kū* cult, along with its *luakini heiau*, and the *kapu* (restriction or regulation) system were at their peak, although western influence was already altering the cultural fabric of the islands.

In 1790, when Captain George Vancouver made his first stop in the Hawaiian Islands he was told that Kalaniopu'u was dead; Hawai'i was ruled by Keoua Kuahu'ula (half-brother of Kiwala'ō), his uncle Keawe-mau-hili, and Keoua's cousin, Kamehameha (Day 1984:77). Vancouver went on to trade with Kalanikūpule in Waikiki. He then found that the ruling chief of Kauai, Ka-umu-ali'i, was a mere child; his father Ka'eo was on Maui with Kahekili. Vancouver also noted a decrease in the population and the number of chiefs since the arrival of Cook (Kamakau 1992: 162-163).

During this same year the *Eleanora*, a fur-trading vessel arrived at Kealakekua Bay, as did the *Fair American*, which accompanied the *Eleanora*. The former ship was commanded by Captain Simon Metcalf, and the latter by his son, Thomas (Kuykendall 1965). The chief Kameeiamoku, who resided at Kaupulehu, had been stuck by the elder while onboard the *Eleanora*. The offended chief vowed revenge on the next foreign ship to visit, which was the *Fair American*. Kameeiamoku and his followers killed the entire crew except Isaac Davis. Kamehameha, who at the time controlled the northwestern half of Hawai'i Island, subsequently took possession of the ship and Davis. During the capture of the *Fair American*, the *Eleanora* was anchored at Kealakekua Bay. The boatswain, John Young, went ashore for a visit and was detained under the order of Kamehameha to ensure the *Eleanora's* crew did not learn of the *Fair American's* fate and seek revenge. The ship subsequently left without Young.

Davis and Young became friends while in the service of Kamehameha. They assisted him in his conquest of Hawai'i and were rewarded with gifts of land. Young received the *ili kupono* of 'Ōuli and Kawaihae 2 Ahupua'a. Davis was

given the ahupua'a of Waikoloa. During the Great Mahele, Young's sons, James Kanehoa and Keoni Ana, were awarded 'Ōuli and East Waikoloa, respectively. One of Davis' sons, George Hueu, was awarded Waikoloa.

In 1793, during a voyage to Hamakua and Kawaihae, Menzies (1920) noted inland fields. These fields have been subsequently documented as the Kohala field system by Griffen et al. (1971) and Rosendahl (1972), and the Waimea-Lālāmilo field system by Handy and Handy (1972), Barrera and Kelley (1974), and Clark and Kirch (1983). Use of the latter field system spans the period between AD 1200-1300 and the 1930s.

Young later served as Governor of Hawai'i Island (1802-1812) and maintained a residence at Kawaihae, located between Makahuna and Makeāhua gulches (Allen 1987:15).

Kame'eiamoku, one of the North Kona chiefs on Hawai'i, however, had previously been insulted by Metcalf and vowed revenge on the next ship that passed his way. By coincidence, it happened to be the Fair American, seeking land near Kawaihae Bay. The opportunity to avenge his insult by foreigners, the defenseless state of the vessel due to its small crew and inexperienced commander, and the value of the muskets and other iron implements on board sealed the vessel's doom. Metcalf and his crew were either killed or drowned. The only survivor was Isaac Davis, who, although wounded, jumped overboard and managed to reach a native canoe, whose occupant clubbed him into submission but for some reason spared his life. The Fair American was hauled ashore and Kamehameha later appropriated it, its guns, ammunition, and other articles of trade, as well as Davis himself (Rhodes 1993: Chapter III).

By 1790 Kamehameha I had gained enough control of the island of Hawai'i that he could leave to join the war parties on Maui. Kamehameha also had at his disposal western weapons, and an armed schooner (n.a. 1967:5). Kamehameha brought a cannon from the *Eleanora* along with the expertise of Isaac Davis and John Young, who were now advisors and *aikane punahele* (favorites) of Kamehameha I (Kamakau 1992:147-148).

Finding their lives secure, and being watched closely and unable to escape, Young and Davis became reconciled to their lot. Their fortunes became quickly and closely linked to those of the king. They would play a significant role in Kamehameha's rise to dominance, and Young, especially, who quickly gained the king's trust and became his principal advisor, would be visited, consulted, or at least mentioned by every visitor to the islands for the next forty years (Rhodes 1993:Chapter III).

"At Kawaihae and Kealahou, Young and Davis built up an army and navy for Kamehameha along European lines, introduced firearms to Hawaiian warfare, and directed their use in Kamehameha's conquest of Maui, Lanai and Molokai" (n.a. 1967:5). His canoe fleet "beached at Hana and extended from Hamoa to Kawaipapa" to battle Kalanikūpule, son of Kahekili (who now ruled Oahu). After several battles along the East Maui coast, Kamehameha's forces reached Wailuku where the "great battle" took place. This would be the beginning of the end of independent ruling chiefs because of the inequity of battle strategy and weaponry (Kamakau 1992:147-148).

Back on Hawai'i Island in 1790, Keoua Kuahu'ula [twin brother of Keoua Pe'e'ale, sons of Kalaniopu'u and Kane-kapolei (Kamakau 1992:120)] ravaged Kamehameha's birthlands of Kohala. At the advice of Ka-pou-kahi, a *kahuna* from Kauai (Kelly 1974:6), Kamehameha personally helped to construct the heiau Pu'u Koholā in the summer of 1791, to assure his victory over his cousin, Keoua Kuahu'ula, who was sacrificed at the *heiau* (Day 1984:77; Kamakau 1992:154-157). John Young reportedly noted that "Kamehameha offered 11 human sacrifices at the dedication of the *heiau*. The principal offering was the body of Keoua Ku-ahu'ula" (Llopis and Sharp 1994:1). Pu'u Koholā Heiau is said to have been a reconstructed older Lono *heiau* from the time of Lonoikamakahiki (c. 1580) and Kama and "consecrated by Lono" (Kelly 1974:6). Kamehameha thought first of re-constructing Mailekini Heiau, which was on

the slope of a hill named Pu'u Kohola, but his chief *kahuna* advised him to build a new one at the top of the hill instead.

"Kamehameha may have rebuilt an abandoned *heiau* there or constructed a new one, but the *heiau* platform he built in 1791 still dominates...Kawaihae" (n.a. 1967:6). "...the common people came in relays from all parts of Kamehameha's dominions to carry stone for the walls and platforms of the *heiau*. The workers are said to have camped by thousands on the neighboring hillsides" (n.a. 1967:7; see also Fornander 1996:328 [2]). "John Young later told Waimea's missionary Lorenzo Lyons that he had seen thirteen humans sacrificed on the altars of Pu'ukoholā during the ceremonies" (n.a. 1967:7).

Tradition holds that the present *heiau* on the "hill of the whale" overlooking Kawaihae Bay is located on the site of an earlier temple structure. Folklore centering around one of King Lonoikamakahiki's battles with his enemies on Hawai'i, at Kawaihae, as recounted by Fornander, mentions Mailekini and Haleokapuni and alludes to Pu'ukohola as a strategic point that the rebels hoped to occupy. There is a brief mention of a temple at Pu'ukohola, but no physical description [233]. Fornander makes two references to human sacrifices on the hill. First, he states that the rebel forces encamped at Haleokapuni, who planned to occupy Pu'ukohola and shower rocks down on the forces of Lono, "would not ascend Pu'ukohola unless a man on the side of Lonoikamakahiki should be slain; then only would Pu'ukohola be scaled for human sacrifices" [234]. He also relates that "This battle of Lonoikamakahiki at Pu'ukohola was named the Kawaluna, because of the night strategy successfully executed by him on that occasion. Kanaloapulehu, having been made prisoner, was killed and laid upon the altar (lele)" [235]. We can only surmise that this means the altar of a temple on top of the hill. After winning his battles, Lono conducted religious services at certain temples in thanks and celebration; one of these observances was held at Pu'ukohola (Greene 1993: Chapter VII).

"At the time of the dedication of Pu'ukoholā Heiau in 1791, the coastal region from Kawaihae to Puakō supported a sizable Hawaiian population" (n.a. 1967:8). [Note: During Fornander's time, someone who carried the stones was still alive and talked to him about it (Kelly 1974:6).]

After the death of his older brother [Kiwala'ō] Keoua lived in Ka'u, successfully fighting off Kamehameha's generals. Following the new strategy, Kamehameha sent Keoua's uncles, Keaweheulu and Kamanawa, to convince Keoua that Kamehameha was offering him a truly respectful peace. Apparently trustful at first, Keoua consented to go with them, but at some point on the trip to Kawaihae he evidently suspected he was being led into a trap. His canoes landed briefly at the sacred place of Luahinewai near Kiholo. There, in the beautiful fresh-water pool, he bathed.... After bathing he cut off the end of his...*'omu'o*, an act which believers in sorcery call 'the death of Uli' and which was a certain sign that he knew he was about to die.... 'The death of Uli' refers to death caused by the vengeance of the sorcerer, since Uli is the goddess worshipped by sorcerers. The part cut off is used for the purpose of sorcery so that those who do a man to death may themselves be discovered and punished.... Just as Keoua was stepping from the canoe onto the beach at Kawaihae, Keeaumoku and the other chiefs of Kamehameha's forces attacked him and the occupants of his canoe (Kamakau 1961:156-157 In Kelly 1974:7).

[Note: At Kawaihae today a different version is told. Keoua is said to have been shot and killed by John Young and Issac Davis who stood a short distance back from the water's edge below Mailekini Heiau. This area now is known as Pelekani, meaning Britain or British, because of Young and Davis' action taken there (Kelly 1974:7).]

In addition to the reconstruction of Pu'ukoholā, Kamehameha also worked to restore other *heiau* in the area. According to Maly and Maly (2003:12), "Kamehameha worked on the *heiau* of the land and ensured the safety of those who traveled the trails of Kohala waho. Among the *heiau* restored, was one dedicated to Uli, a sorcery goddess, for whom the land of 'Ōuli is thought to have been named. While no specific location of the *heiau* is given, the narratives tell that it was in the uplands, and it is possible that it was within the land which bears the name of the goddess".

On his second voyage to Hawai'i in 1793, Vancouver counseled the chiefs to stop making war on each other. He gave Kamehameha some cows and sheep (at Vancouver's advice Kamehameha put a ten-year *kapu* on them). Vancouver went on to visit Kahekili in Lahaina and made the same request; then on to Waikiki to Kalanikūpule.

Young and Davis became an integral part of this early period of modern Hawaiian civilization, and for their efforts Kamehameha rewarded them by making them high chiefs and endowing them with large tracts of land on which they settled and raised families. This property was given particularly for their services in helping conquer the islands of Hawai'i, Maui, Molokai, and O'ahu. [28] The land given to Young included Mailekini and Pu'ukohola *heiau*. Near their homes in Kawaihae, Young and Davis raised fruits and vegetables new to Hawai'i from seeds procured from foreign ships. Their residence in this area made it a required port of call for sea captains who had to obtain Young's blessing before conducting business with the Hawaiian government. In 1793 Vancouver landed the first cattle in Hawai'i at this spot (Rhodes 1993: Chapter III).

In 1810, Issac Davis died and it was left to Young to carry on; he acquired the nickname "Olohana" which was a Hawaiian equivalent to sailor's cry "All hands!" He also adopted Davis' six children, raised them as his own, and held Davis' estate in trust for them (n.a. 1967: 9, 11).

Davis served as governor of O'ahu during the early years of the nineteenth century. In 1810 he negotiated terms of peace for Kamehameha with Ka'umu'ali'i, the king of Kaua'i, bringing that island under Kamehameha's dominion. When Ka'umu'ali'i journeyed to Honolulu on board a foreign vessel to see Kamehameha, some lower chiefs conspired to kill him and proposed to Kamehameha that a sorcerer perform this deed. The king refused and even had the sorcerer slain. The chiefs then hatched a plot to kill Ka'umu'ali'i secretly as he journeyed into the interior. Learning of these plans, Davis warned Ka'umu'ali'i to return on board ship. Shortly thereafter, Davis died by poisoning, possibly in retaliation for this act of loyalty to Ka'umu'ali'i [30] Davis's grave is located at Kawaihae (Rhodes 1993: Chapter III).

After the conquest of O'ahu, Young was designated governor of Hawai'i Island, an office that primarily involved superintending tax gathering for the king. He governed Hawai'i from his home at Kawaihae from 1802 to 1812 while Kamehameha attended to royal business on other islands; Young later became the resident chief of Kohala, with frequent assignments to Honolulu and elsewhere (Rhodes 1993: Chapter III).

Coastal Kawaihae was developing into an important provisioning "port-of-call" by the early 1800s with sweet potatoes, yams and a variety of other crops, which were cultivated in the vicinity, particularly the uplands. By the mid-1800s ranching became a flourishing economic factor in the Kohala and North Kona areas with cattle being shipped out of Kawaihae (Rosendahl 1972:11).

Kawaihae's principal articles of trade in the period were salt and sweet potatoes, timber for ship repairs, high quality tapa...hogs, fowl, taro, sugar cane, breadfruit, melons, coconuts and bananas. Vessels replenished their water stores from either stream or springs. Among his private enterprise, Olohana conducted a thriving canoe-making venture and supervised the land he had received as a

gift from Kamehameha which included the two *ahupua'a* of Ouli and Kawaihae 2nd. Young modified Mailekini *heiau* to serve as a protective fort for Kawaihae. Eyewitness accounts describe the fort as being mounted with twenty-two guns and had the appearance of the broadside of a European warship (n.a. 1967:12).

As business agent for Kamehameha, as well as chief of the area, Young supervised the trade with ships at this port, where local salt and sweet potatoes, timber for ship repairs, hogs, fowl, taro, sugar cane, breadfruit, muskmelons, coconuts, and bananas were traded for nails, iron, and finally, at Young's suggestion, for more sophisticated types of goods. A lucrative sandalwood trade also originated here; with Young supervising from his home the measuring and loading of trees. Young was involved in, or witness to, most of the significant events in the early years of the Hawaiian kingdom (Rhodes 1993: Chapter III).

In 1815 John Palmer Parker, an ex-seaman, made his home at Kawaihae where he began hunting cattle that roamed the slopes of Mauna Kea. By this time the Vancouver's cattle of 1793 had increased to destructive numbers and Parker was hired to thin the wild herds. Since people had not yet developed a taste for beef, Parker salted the meat with Kawaihae salt and tanned the hides to trade with ships that stopped at Kawaihae. He later built pens to confine the cattle and horses (n.a. 1967:14-15).

Kamehameha I died on May 8, 1819 in Kailua-Kona and once again the culture of Hawai'i was to change radically.

On the morning after his father's death, Liholiho left Kailua, which had been defiled by death, for Kawaihae in Kohala, as was the custom. During his absence, as was also the custom, the population committed all kinds of excesses, breaking the kapu with impunity. Although the usual mourning ceremonies on the death of a king took place, no sacrifices occurred to provide the old king with companions in the next world. During this mourning period, the dead chief's bones were secreted in a cave, the traditional action that ritually disassociated the mandate to rule from the dead king so that his heir could re-establish it on his return to the area. After the requisite ten days of seclusion had passed, Liholiho returned to assume power, at which time he was also supposed to re-establish the kapu system, something he did not do. Instead he left again for Kawaihae in the Kohala district, where he took up residence until October, probably hoping to avoid having to make some important decisions concerning land redistribution, requests by the ali'i to share in the sandalwood trade, and whether or not to break the kapu, an action he knew Ka'ahumanu and others favored (Greene 1993: Chapter V).

After Kamehameha's death, a degree of unrest existed among some of the principal chiefs regarding several economic matters, including the king's monopoly of the sandalwood trade. This tension in the political situation disturbed the elderly Young, who entreated de Freycinet to stress to the Hawaiians that peace and unity were essential for the future of the country and could only be attained by continuing loyalty to the Kamehameha dynasty. De Freycinet's draftsman, Jacques Arago, noted that this request of Mr. Young's could only have been dictated by generosity of sentiment; personal interest had no share in it; the poor old man has but a few days to live; extended on a bed of sickness, he perceives the rapid approach of death, and, little regarding his own sufferings, his last prayers are offered up for a country, which the beneficence of Tammeamah makes him grieve to leave a prey to the factions which are about to divide it (Rhodes 1993: Chapter III).

Six months after his death, his son and successor Liholiho, met with *kuhina nui* Ka'ahumanu, and a council of chiefs and chiefesses at Kawaihae. His advisors, which included his father's *kahuna* Hewahewa, convinced the new king Kamehameha II to abolish the *kapu* system. He signified his agreement by sitting down and eating with his mother

Keōpūolani, breaking the *‘ai kapu* (Kuykendall and Day 1976:41; Kamakau 1992:222-228).

Liholiho's cousin Kekuaokalani, caretaker of the war god Ku-Kailimoku, disagreed with the new edict and revolted. By December of 1819 the revolution was quelled. Kamehameha II sent edicts throughout the kingdom renouncing the ancient state religion, ordering the destruction of the *heiau* images and the *heiau* structures to be destroyed or abandoned and left to deteriorate, allowing the personal family religion, the *‘aumakua* worship, to continue (King 1990; Kamakau 1992:222-228).

During this period, the sandalwood trade was wreaking havoc on the commoners who were weakening with the heavy production, exposure, and famine just to fill the coffers of the ali'i who were no longer under any control constraints (Kuykendall and Day 1976:42; Bushnell 1993:212). On a stopover in the Kohala district in the early 1800s Ellis wrote the following:

About eleven at night we reached Towaihae [Kawaihae], where we were kindly received by Mr. Young...Before daylight on the 22nd, we were roused by vast multitudes of people passing through the district from Waimea with sandal-wood, which had been cut in the adjacent mountains for Karaimoku, by the people of Waimea, and which the people of Kohala, as far as the north point, had been ordered to bring down to his storehouse on the beach, for the purpose of its being shipped to Oahu. There were between two and three thousand men, carrying each from one to six pieces of sandalwood, according to their size and weight. It was generally tied on their backs by bands of ti leaves, passed over the shoulders and under the arms, and fastened across their breasts.... (Kuykendall and Day 1976:42, 43, Ellis 1963:397).

The lack of control of the sandalwood trade was to soon create the first Hawaiian national debt as promissory notes and levies were initiated by American traders and enforced by American warships. "In the 1820s, the sandalwood trade was at its peak and every tree found was cut for its value. The forests of Kohala, which reached almost to the Kawaihae shore as late as 1815, contained an abundance of the coveted wood, presumably the dry land species" (n.a. 1967:16).

In 1825, Kuhina-nui Ka'ahumanu [King Kamehameha III was just a child] placed a *kapu* on cutting sandalwood trees. She saw what it was doing to the people; neglecting their crops and fishing and getting into debt (Brennan 1995:48). This was too late for Kawaihae. In 1820 the missionaries on the *Thaddeus* noted the "green slopes of Kohala" on arriving at Kawaihae; by 1832 missionary Lorenzo Lyons remarked that Kawaihae was "about as desolate a place as I have ever seen, nothing but barrenness, with here and there a native hut, " and "scorched, withered and desolate Kawaihae...Between the denuded forest, and the wild cattle ravaging any re-growth, a growing community in Waimea diverted the streams, forever changing the Kohala leeward landscape and climate" (n.a. 1967:18).

Beef became a barter item (Brennan 1995:48); and in 1832, Kamehameha III sent a high chief to California to bring some *vaqueros* back to Hawai'i to help with the training of horse and cattle handling. Although the cattle were being slaughtered by the thousands for their hides and tallow, their numbers were increasing beyond belief. Over 100,000 wild cattle were roaming the mountains of Waimea alone. Many crops were ruined by the hordes of cattle (Brennan 1995:51-54). The solution was for the *vaqueros* or *paniolo* as Hawaiians called them, to first train Hawaiian and *haole* men to be good horsemen or wrangler or cowboy (*paniolo*). This was the beginning of Hawai'i's cattle kingdom (Brennen 1995:70). Paniolo Jack Purdy and John Parker, Kamehameha III's chief cattle killer, partnered to furnish the king with badly needed beef for bartering with foreign ships (Brennan 1995:74).

In the mid-1800s Kawaihae was a popular anchorage for foreign vessels. Hawaiian chiefs were actively involved in foreign trade, and food, sandalwood, firewood, *pulu*, and fresh water were exchanged for imported goods (Kelly 1974:36-77). These items were generally brought from areas outside Kawaihae, but salt was one important trade good produced locally. A well-developed salt

manufacturing system was maintained near the beach and each salt pan was said to be named (Kelly 1974:33-34). Apparently salt was an important traditional exchange item for Kawaihae residents as well, being traded to Kona and other parts of Kohala for food and *tapa* (Barrère 1983:30 In Allen 1987:15).

The Hawaiian culture was well on its way towards Western assimilation as industry in Hawai'i went from the sandalwood trade, to a short-lived whaling industry, to cattle ranching, and the more lucrative sugar industry. Sugar cane was grown on all islands and when Cook arrived, he wrote of seeing sugar cane plantations. The Chinese on Lanai are credited with first producing sugar as early as 1802. However, it was not until 1835 that sugar became established commercially, primarily to replace a waning sandalwood industry (Oliver 1961:263; Kuykendall and Day 1976:92). 1835 was also the year that John Olohana Young died at the age of 93 in Honolulu where he is buried at the Royal Mausoleum (n.a. 1967:19).

In the 1840s, political acts of the Hawaiian Kingdom government would change the land tenure system in Hawai'i. All lands were segregated into one of three categories: "Crown Lands" owned by the occupant of the throne, "Government Lands" controlled by the state, and "*Konohiki* Lands" controlled by the chiefs; and "were all subject to the rights of native tenants" (Chinen 1958:29, Beamer 2014:143). In 1846, King Kamehameha III appointed a Board of Commissioners commonly known as the Land Commissioners, to "confirm or reject all claims to land arising previously to the 10th day of December, AD 1845." Notices were frequently posted in *The Polynesian* (Moffat and Kirkpatrick 1995); however, the legislature did not acknowledge this act until June 7, 1848 (Chinen 1958:16; Moffat and Kirkpatrick 1995:48-49) and the act is known today as *The Great Māhele*. In 1850, the Kingdom government passed laws allowing foreigners to purchase fee simple lands (Speakman 2001:91). The Kuleana Act of 1850 allowed for fee simple land ownership by commoners.

During the *Māhele*, the entirety of 'Ōuli was awarded to John Young (Olohana) and James Young Kānehōa, son of Namokuelua, a Hawaiian chiefess connected to the Kamehameha line, as Land Commission Award (LCA) 8518:B-1. According to Boundary Commission testimony, 'Ōuli comprised 3,632-acres and extended from the coast to approximately 5,000 feet elevation.

Five additional claims for *kuleana* in 'Ōuli were claimed (LCA 3833 to Helu, 3903 to Naoho, 4143 to Kamhakaaua, 4152 to Kaohimaunu, and 4199 to Kaikai); however two only were subsequently awarded (LCAs 3903 and 4199). According to Maly and Maly (2003:25), "Apparently, no native tenants claimed house lots or residency rights on the near-shore lands of 'Ōuli during the *Māhele*. All of the native tenant claimants did describe residency and agricultural uses in the mauka (upland) section of 'Ōuli, and some also identified land use practices in neighboring land divisions or *ili* which were a part of the *kalana* of Waimea".

The location of LCA 4199 is depicted on the 1893 Map of the Homesteads in Pauahi (Register Map 1682) also obtained from DAGS is presented in **Figure 8**. According to testimony, Kaikai's property encompassed 2.65-acres and contained two houses and an enclosure measuring fifty fathoms on the north, east and south, and forty fathoms on the west. The location of LCA 3903 could not be determined; however, according to testimony, Naoho's property was comprised of a house lot and an enclosure, measuring 50 fathoms long by 50 fathoms wide and encompassed an area of 8.4-acres.

Later historic use of the lower portion of 'Ōuli was apparently restricted to ranching. The area was part of Parker Ranch until its sale for resort development in the early 1970s. 'Ōuli lies within the former Waikoloa Maneuver Area, an area of 91,000 acres acquired by the U.S. Navy in December 1943 through a license agreement with Richard Smart of Parker Ranch. The training area extends from the ocean to the Pohakuloa Training Area, and from the Waimea-Kawaihae Road to south of the Waikoloa Road. The area was used for military exercises including the use of live ammunition and other explosives. The land was sold to the Parker Ranch in September 1946.

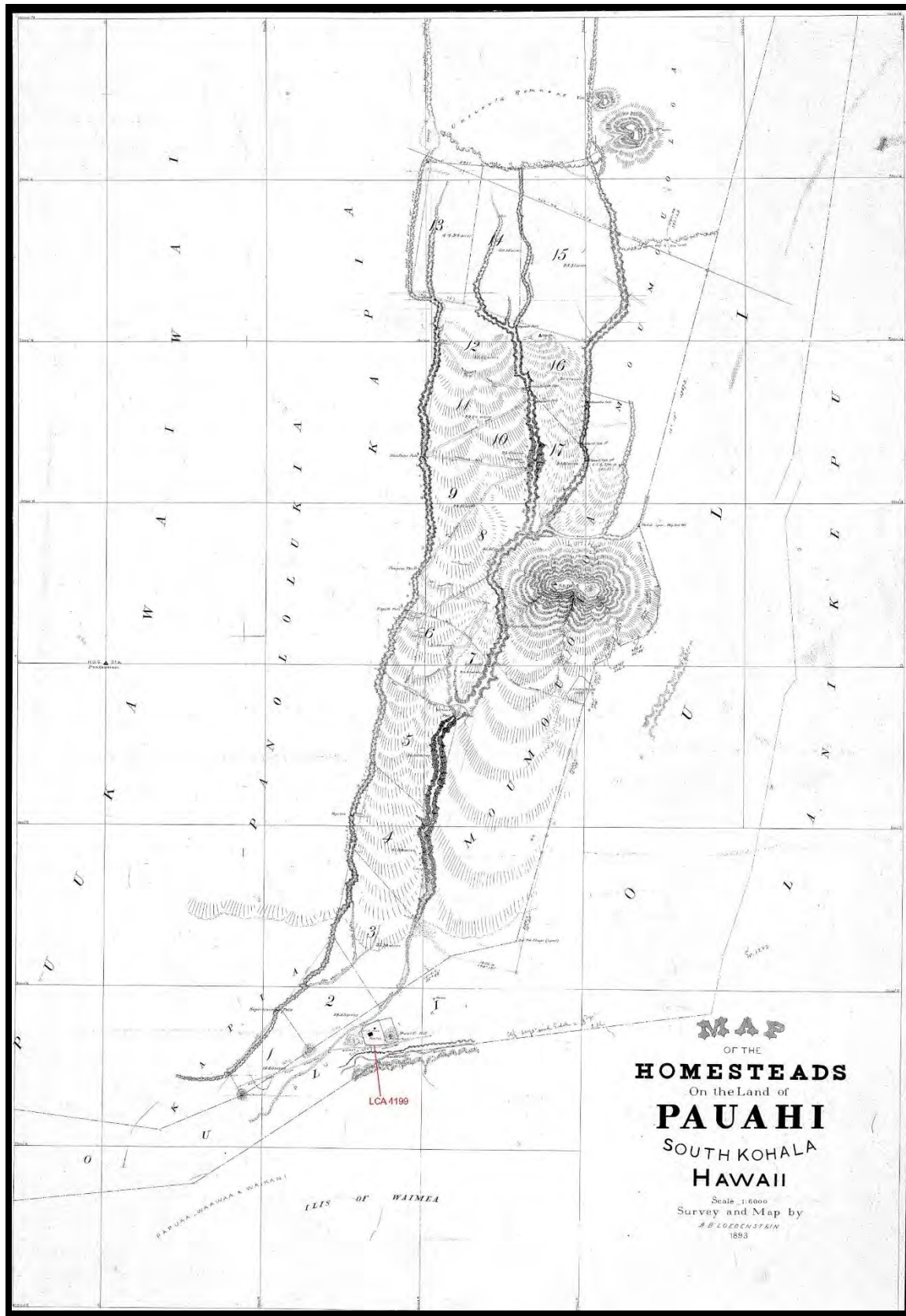


Figure 8. Loebenstein's 1893 Map of the Homesteads in Pauhi (Register Map 1682; obtained from DAGS).

Previous Archaeological Work in Vicinity of the APE

Several archaeological studies have been conducted in Ōuli Ahupuaʻa that are located within or adjacent to the current APE. These consist of work conducted by the Bishop Museum, Department of Anthropology (Clark and Kirch 1983) and Ogden Environmental and Energy Services Company (Schilz 1994, Anderson 1999, Anderson and Elbé 2000, and Robins, Elbé and Anderson 2000).

In 1983, Clark and Kirch (1983) presented the results of an archaeological investigation of the Mudlane-Waimea-Kawaihae Road, a curvilinear corridor that extended across multiple environmental and elevation zones, from the shoreline inland to approximately 2,800 feet elevation. A total of 190 sites with 449 features were documented during the study. Of these, three sites are situated in the general vicinity of the current APE (**Figure 9**). The site numbers discussed in the following section are preceded by 50-10-05-¹

As stated, three sites were recorded outside of the Mudlane-Waimea-Kawaihae Road corridor in close proximity to the current APE. These consist of Site 8827, a C-shaped enclosure with 32 associated stone agricultural mounds, Site 8828, a complex comprised of five stone mounds, two terraces and a C-shape, and Site 9012, a linear, north-south oriented stone wall. As indicated in **Figure 9**, none of the Clark and Kirch (1983) sites are situated within with the current APE; however, Site 8827 is located just west of Project Lot 1.

In 1990, Schilz (1994) undertook an archaeological inventory survey of TMK: (3) 6-2-001:018, 074 and 075. A total of 75 sites with 115 features were documented during the project (**Figure 10**). As indicated in this figure, only two sites are present within the current APE, consisting of Sites 14712 and 14727 located in Project Lot 1. No sites are present within Project Lot 2.

The majority of the sites were determined to be associated with military training activities in the area (45 sites or 60%). These consist of targets and temporary fortifications, primarily low walls, C-shapes, roads, cairns and alignments and include Sites 14681, 14682, 14689, 14692, 14693, 14697-14707, 14709, 14712, 14714, 14716-14724, 14727, 14728, 14733-14740, and 14742-14748. As stated, military sites 14712 and 14727 are located within the Project Lot 1 portion of the APE.

The remaining 30 sites consist of 14 associated with ranching activities (19%), nine assigned an historic function (12%) and seven interpreted as pre-contact sites (9%). The 14 ranch related sites are comprised of cairns, enclosures, a pavement, midden and a wall, and include Sites 14679, 14680, 14683-14688, 14694, 14713, 14730-14732 and 14749. As depicted in **Figure 10**, no ranching sites are situated within the current APE.

The nine historic sites identified by Schilz (1994) are comprised of Sites 14690, 14691, 14695, 14696, 14708, 14710, 14711, 14715 and 14729. The majority of the features at the historic sites are comprised of cairns, although one historic road was noted at Site 14729. As indicted in **Figure 10**, no historic sites are situated within the current APE.

The seven pre-contact sites are comprised of Sites 14679, 14687, 14726, 14741, and 14750-14752. These sites include overhang shelters (Sites 14741, 14750, and 14751), a complex of two C-shapes (Site 14726), a complex comprised of two enclosures (Site 14687), a cluster of two cairns and a midden deposit (Site 14679), and a burial lava tube (Site 14752). As indicted in **Figure 10**, no pre-contact sites are situated within the current APE.

Nine of the sites identified by Schilz (1994:32) were assessed as significant under Criterion “d” for their information content. These consist of the seven pre-contact sites (Sites 14679, 14687, 14726, 14741, and 14750-14752), the Site 14688 historic ranch enclosure, and the Site 9012 wall previously noted by Clark and Kirch (1983). The Site 14752

¹ Site listed on the State Inventory of Historic Places (SIHP). Site number is 4 or 5 digit sequential number by island 50 = State of Hawaiʻi, 10= Island of Hawaiʻi, 05= Kawaihae quadrangle

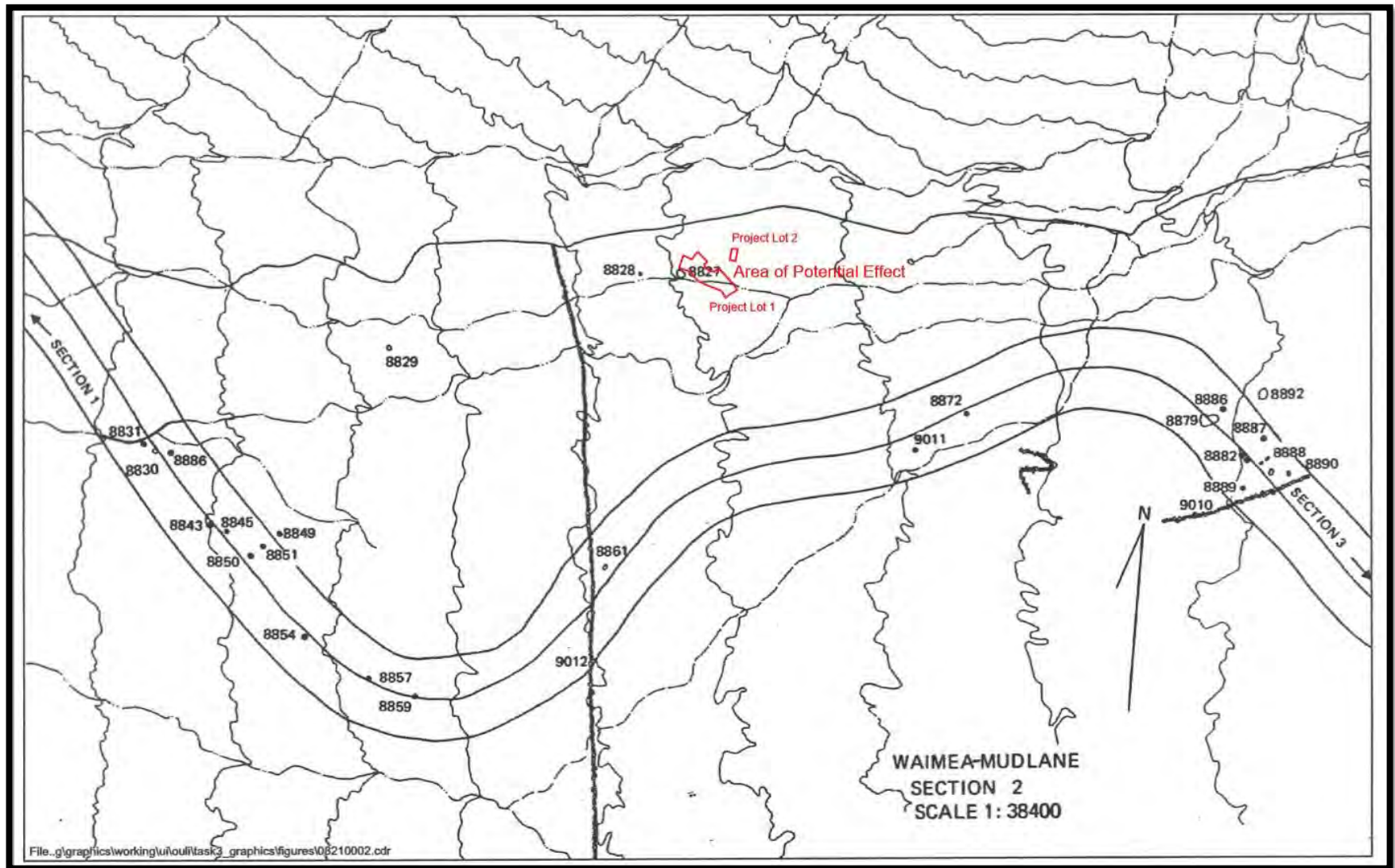


Figure 9. Location of Clark and Kirch's (1983) sites in the Mudlane-Waimea-Kawaihae Road corridor and Area of Potential Effect (modified from Robins et al. (2000:6).

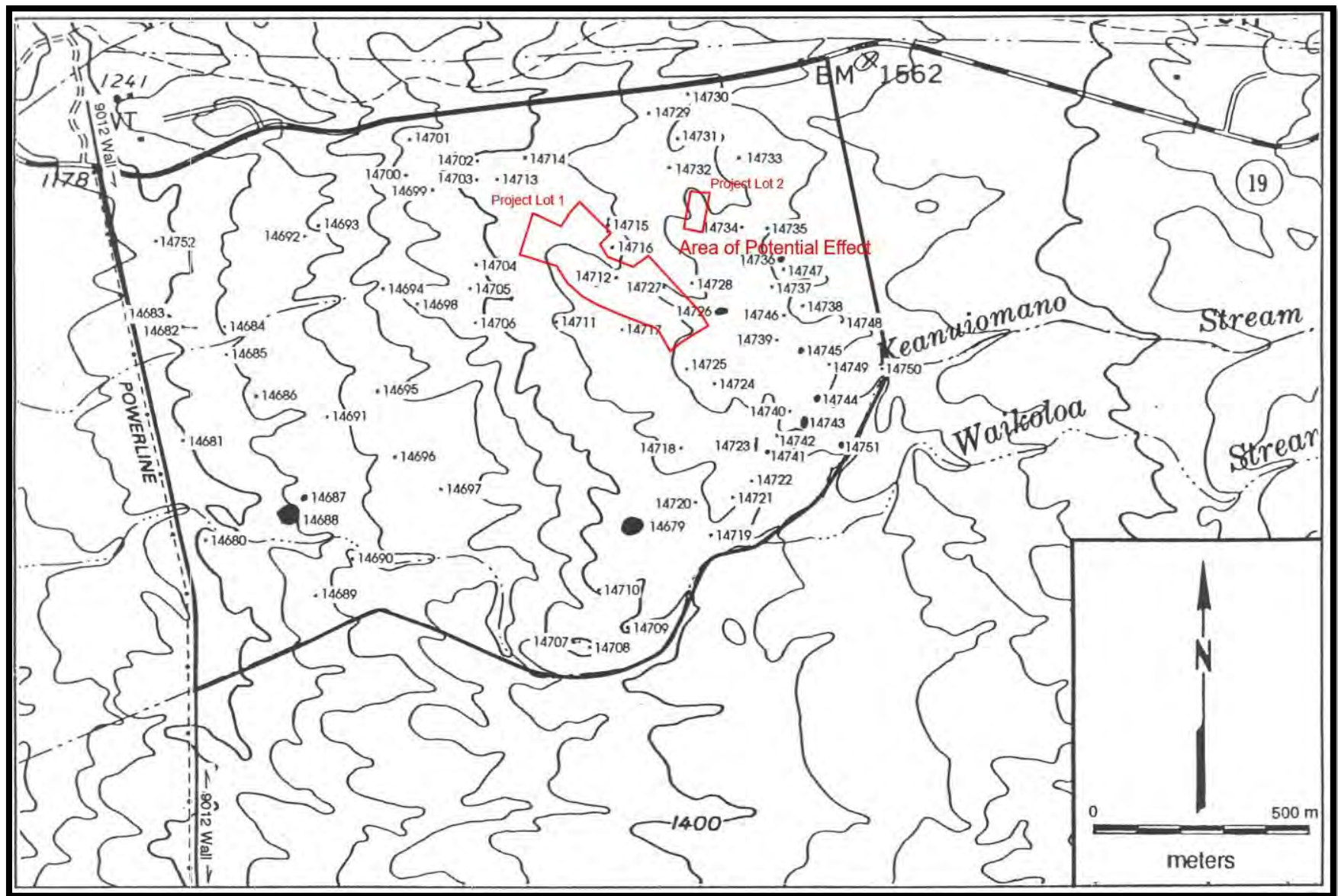


Figure 10. Location of Schilz (1994) sites and Area of Potential Effect (modified from Robins et al. (2000:16).

burial lava tube was additionally assessed as significant under Criterion “e” for its cultural value to the Hawaiian people. No significance assessment was proffered for the remaining sites.

Data recovery was recommended for seven of the sites consisting of Sites 14679, 14687, 14688, 14726, 14741, 14750, and 14751 by Schilt (1994:32). The Site 14752 burial lava tube was recommended for a combination of preservation and data recovery, and preservation was recommended for the Site 9012 wall. The remaining sites were recommended for no further work, including Sites 14712 and 14727 within the current APE.

An Archaeological Site Preservation Plan was subsequently prepared by Anderson and Elbé (2000) for the Site 9012 wall, the Site 14688 historic ranch enclosure, and the Site 14752 burial lava tube. As indicated in **Figure 10**, none of these preservation sites are present in the current APE.

Data recovery was also subsequently conducted by Robins, Elbé and Anderson (2000), guided by an Archaeological Data Recovery Plan prepared by Anderson (1999). The project consisted of excavation and detailed recording at seven sites (Sites 14687, 14719, 14726, 14743, 14744, 14750 and 14751) and detailed recording at Sites 14688 and 14741. During the detailed recording at Site 14688, additional features consisting of petroglyphs and rock shelters were identified.

A total of 27 excavation units were undertaken at the seven sites, resulting in the excavation of 17.75 square meters. The excavations yielded 311.4 grams of invertebrate remains (Robins et al. 2000:115-116), 18.0 grams of vertebrates (2000:117) including fish, bird, pig, mouse and unidentified mammal bones, 294.3 grams of floral remains (2000:120) consisting of seed pods, gourd fragments, *kukui* nutshell, and tree fern caudex, 47 indigenous artifacts (2000:122-123) comprised of volcanic glass and basalt debitage, coral files, coral and basalt abraders, ground stones, and modified bones, and 177 historic artifacts (2000:126) consisting of glass fragments, metal nails, metal buttons, Kaolin pipe stems, and slate and metal fragments.

A total of nine samples of charred material from Sites 14687, 14726, 14750 and 14751 were submitted for radiometric age determination by Robins et al. (2000:128). The earliest date was obtained from Site 14750 with a calibrated age range of AD 1015 to 1280. This is followed by a date of AD 1175 to 1305 from Site 14751. The remaining dates span from the mid-1400s to beyond 1950. As indicted in the preceding maps and discussion, none of the dated sites are present in the current APE.

Based on the results of the data recovery work, Sites 14687, 14719, 14726, 14743, 14741, 14744, 14750 and 14751 are considered no longer significant and require no further work (Robins et al. 2000:138). Robins et al. (*ibid.*) re-assessed Site 14688 as significant under Criterion “c” as an excellent site type examples, and under Criterion “e” for its cultural value to the Hawaiian people. The preservation of this site is already detailed in the Anderson and Elbé (2000) preservation plan.

ORAL HISTORIES

Previous Oral Histories

The following oral history interviews were conducted by Kepa Maly of Kumu Pono Associates between 1980 and 1999 (from Maly and Maly 2003:53-67). The participants are from families who are kama'āina to the lands of the Kawaihae-Kapalaoa region and include Robert Keakealani Sr., Leina'ala Keakealani, William Ah You Akau, Annie Kahikilani Akau, Florence "Coco" La'ikealohaokamāmalu Vredenburg-Hind, Elizabeth "Tita" Kauikeōlani Ruddlespielman, and JK Spielman.

Recorded at Kapalaoa, 1980. Robert Keākealani Sr. (1914-1991), with Leina'ala Keākealani— speaks of catching and drying 'ōpelu to take to market at Kawaihae; describes travel from Kapalaoa to Kawaihae via the old Alaloa-Ala nui Aupuni in the 1920s. There were no houses between Puakō and Kawaihae at the time, the first house in Kawaihae, along the shore, being Jack Paulo's home, near Waiku'i Bay:

RK: Yeah. Us, we make...some we *kāpī* [salt], *pau*, put in the tub. Early in the morning, four-'o-clock, ala [get up]. Sometimes, three-'o-clock, wake up, *kaha* [cut open] the 'ōpelu, *kaka* [rinse] everything. *Kaula'i* [sun dry them], some stay *kaka*, some stay *kaula'i*. By the time everything *pau*, go home, *inu kope*. *Pau*, jump on the canoe again, go, go and bum-by, I come home with that one, *tita* Nancy them stay hold that 'ōpelu, put inside the bucket. That one went first, then the other one, the next morning, *kaula'i* that one. When *malo'o* [dry], put all in the bag, sew 'um up, *pau*, put 'um on top the mule, go Kawaihae [ca. 1925]. Leave home here, sometimes five-'o-clock, six-'o-clock, go by where Maunalani is now, past 70 [mile marker], past Kalāhuipua'a, Paniau. All that place by Jack Paulo's, by the house there. Pass over there, no more those houses before. Only the old man Jack Paulo's house and the old man from down Ke'ei. Oliva, the old man Oliva [La'au]. That's only the people that was over there. Then Ichiro Goto. We go, go, go, past white sand, Waimā, Hāpuna, all that place, and go down. Kawaihae, no more that gas tank, *mamua* [before]. No more those tanks, only the... Doi Store no had. No more that store. Only down, by the shipping pen, where you folks *holo* [go].

LK: Yeah. What kind store?

RK: Well, one old store. Kimo, the name of that store. And the old post office was over there, where they go get their mail eh. And the shipping pen was right over there. Parker Ranch cowboys came over there, and us, we go from Puakō. Shipping.

LK: What about the 'ōpelu?

RK: We take over here on the mule. Take to Kimo [store at Kawaihae].

LK: To sell?

RK: Him, he buy. We sell our 'ōpelu, then we buy rice, flour, salt, coffee.

LK: All you folks go on the pack mule?

RK: Sometimes, uncle Kiona tell only about two, three boys go. The rest got to go make 'ōpelu [chuckles]. Every time, me and uncle George, and uncle Kamu.

LK: Ohh, that's his favorite, uncle George?

RK: Three guys go. We go, they wild...[inaudible] Us we go Kawaihae *holoholo* eh.

LK: [chuckling] Play.

RK: Oh yeah, we go Kawaihae, we eat ice cream [laughing]... We go Kawaihae, we eat and uncle, he suck 'um up eh. *Pau*, we come home. We leave Kawaihae, I think about 2-'o'clock, come home. We reach home here about 6:30 p.m. When come home, the animal like come home eh.

LK: Yeah, *ho'i* [returning]...

Recorded July 6th and April 10th 1999. William Ah You Akau (1927), and sister, Annie Kahikilani Akau (1937), with Kepa Maly — Speaking of various locations and place names recalled, along the Kawaihae-'Ōuli shore. Describes travel along the coastal trail; care for native Hawaiian sites and resources; and changes brought about by World War II:

KM: 'Ae. Could we mark a couple of place names along here, just so that I can make sure to know? This is again Register Map 2786; Waiku'i so you have 'Ōhai'ula is here, Mau'umae, Wai'ula'ula, now you know the one thing that's interesting though, is that on the side where the stream comes down there's, if you look today and you're on this side of the stream across has a house yeah? There's a house that was built right on the side overlooking right where Wai'ula'ula comes down, is that right?

WA: Yes

KM: On this [the north] side of the gulch, there's what looks like a small platform a stone platform overlooking the ocean. Do you remember any *heiau* or *ko'a* or anything along here that were ever pointed out to you?

WA: No, no, not around there. But people used to go. Before there was nothing there but people used to camp there.

KM: Make small camp areas, fishermen like that?

WA: Yes, to fish. I know some of those people, but they're already gone.

KM: All gone?

WA: Yes, so they used to fish in that area, where Mrs. Roth's home is.

KM: Roth, yeah?

WA: Yes, good fishing. So they usually do that. I guess they build a little camp.

KM: Yes... [earlier you mentioned Onehonu] Where would you put Onehonu, again if we look at this map? [pointing out locations] Here's Hāpuna, Mau'umae. This is the trig station for Wai'ula'ula but this is the stream.

WA: Onehonu supposed to be in here someplace [pointing to location on map].

KM: Okay, so you think in here [marking location on map]?

WA: Yes.

KM: Now see there's a little cove in here too. Onehonu, and you said this was the birthing of ...the kind where they lay eggs, you think?

WA: Yes, turtles.

KM: The *honu* come to lay eggs, yeah?

WA: Maybe on this side, I think, yeah.

KM: Okay, yeah...Kauna'oa is here.

WA: [looking at map] Eh, this map is different, Hāpuna Bay is over here, I think this maybe is... Oh, Puakō is over here.

KM: Here's 'Ōhai Point, Puakō Bay, here's a little cove here.

WA: Puakō, Hāpuna...

KM: Actually this should be Kauna'oa, yeah, here is that right?

WA: Right here, Wai'ula'ula, this map is...?

KM: Maybe this map is...

WA: Kauna'oa has a big bay you know?

KM: Yes.

WA: Well anyway, put Kauna'oa right around here.

KM: Okay. Because from Wai'ula'ula Stream, the next big bay over is Kauna'oa?

WA: Oh this is some kind of point.

KM: That's a point only. These are boundaries.

WA: Oh, okay, okay.

KM: This is the gulch where the stream comes down.

WA: Oh this is Wai'ula'ula. So it has to be around here, Onehonu.

KM: Oh, okay. So past [south of] Wai'ula'ula?

WA: Yes, yes. [looking at the map] Mau'umae, okay.

KM: So then this would become?

WA: Kauna'oa.

KM: Kauna'oa. And that's an old name?

WA: That's the name of the place that I remember.

KM: What about Mauna Kea?

WA: Mauna Kea, there's no such thing as Mauna Kea down here.

KM: Like Kānekanaka, Kanakanaka?

WA: Kanakanaka.

KM: And Piliamo'o, did you hear the name Piliamo'o?

WA: No. All this place get names before.

KM: This is Kanakanaka on this side?

WA: Kanakanaka, [looking at map] 'Ōhai Point, this is Puakō...

KM: Here's Waimā, down here.

WA: There's a lot of more names inside here.

KM: Yes, I think I have, there maybe, there's another old map that has some of those names on it... [Discussing trips made to Kauna'oa and further south to Puakō and beyond, along the Ala nui Aupuni-Alaloa prior to 1941]:

KM: ...So you were walking this trail through, up to World War II time, or even after?

WA: Before that.

KM: Before, because after World War II...?

WA: Because when we were young we were going to school. Every so often we used to go as a group, walk and go on picnics and swimming. We used to go down when everything was just you know... [pauses]

KM: Where would you go swim, and go for picnic?

WA: Down at Kauna'oa, or go down to Waile'a.

KM: So, from your school here?

WA: Yes.

KM: At Kawaihae School?

WA: Yes, Kawaihae School. Hattie Saffrey, she was a Saffrey. She used to take care of the aunty and the grandma, they used to stay *makai* here. So we used to go to school here, we were young then. Then, we used to hike down, walk the trail, you know how the same way that we go. It was clean, that trail was clean, you know.

KM: Had all the kiawe, like that when you were young?

WA: No. You see, because someone always maintained the trail. So you go from Pelekāne from over here you start walking because guys from Puakō coming back and forth, eh?

KM: Yes, yes.

WA: You see.

KM: Even Kapalaoa people would come down like that?

WA: Yes. But most times they come on a canoe or...later eh, only thing that they used the trail was when the ocean was rough. That's when they used the trail, that's a long hike for them especially from Kapalaoa. But other than that, when normal time, they get canoes and they used to come up... [Notes that while he walked the trails, that he and his family did not speak of old Hawaiian sites in the area. Suggests that old Hawaiian places be "left alone."]:

KM: But in general by your time, do you remember having any old house sites or *heiau*, or *ko'a* pointed out to you?

WA: On the trail?

KM: Yes, along the trail here, this *ala hele*?

WA: [thinking] Let me see.

KM: Because you know like when you get up to this side here, this area what I understand where Kauna'oa Bay ends somewhere in here, they call this Piliamo'o.

WA: Piliamo'o?

KM: It's from an old name and then Kanakanaka is over at this side, here. And there are series of old house sites; in fact that's where they are developing what they call Mauna Kea Bluffs, they are trying to make that new subdivision. Have you seen that?

WA: No.

KM: It's a new subdivision over on the side. Mauna Kea Hotel is over here, and they've made Mauna Kea Bluffs.

WA: Yes, I think they did do some work in here.

KM: Yes, Rosendahl and Hammatt.

WA: Yes, but what they found, I really don't know.

KM: Oh, so you folks mainly would walk the trail and you folks didn't bother things, yeah, along the side then? If it had an old wall or something, you just left it?

WA: We just...the old people tell you that you leave things alone, because they're not bothering you.

KM: So that's the...today the bottom line would be leave it alone then?

WA: Yes.

KM: You use the trail, walk, enjoy but don't *hana 'ino* [desecrate] the old things.

WA: I mean, what are you going to do that for, turn one rock, what for, you see it doesn't make sense? If it belongs there, let it stay there... [Describes events along the Kawaihae-Puakō section of the trail during World War II, and changes in travel from foot traffic to army vehicles]:

WA: ...During the war, had all the big kind of guns along side the shoreline.

KM: So there were gun embankments and outposts all along here?

WA: Yes.

KM: Were you folks under *kapu*, couldn't walk along the ocean or could you not go fish, throw net?

WA: No, no they put us with the home guard. We were responsible for the guns. Certain families were assigned to gun posts along the coast.

KM: So you folks were actually posted out there, you were manning the guns?

WA: Right.

KM: Oh, home guard.

WA: Not staying there twenty-four hours a day. It's there, but when they need the men to work on it we would go out.

LA: They knew exactly which gun nest they were supposed to go to. There's one gun nest, behind here, it's still out there.

KM: Mauka here still yet, of your home here?

WA: Yes, that was the Marine engineer's gun post.

KM: Did they bulldoze any roadways along here or something during that time?

WA: The Puakō Road that they started with the old trail, you know. They started bulldozing making a road, that's how the Puakō road got started.

LA: Those gun nests are still intact, had one here, up the *heiau* had one...

WA: Mine was at Kauna'oa [pointing to the southern point marking Kauna'oa Bay].

KM: Kauna'oa. Is the gun embankment still there?

WA: The wall is.

KM: The wall, so the embankment, the wall is still there.

WA: Yes. There's lots of places like that you see all these high walls and you see the remains.

KM: That's what I was wondering about some of these areas here.

WA: Yes, so my place was Kauna'oa, right on this point [the southern promontory of the bay, Kauna'oa Pt.]

KM: So on this point here? [marking map]

WA: Yes. KM: Okay.

WA: And the next one is supposed to be on this point [pointing to location].

KM: So that's Kanakanaka side, north of Waile'a.

WA: Yes, this was Jack Paulos' gun before.

KM: Jack Paulo? [marking map]

WA: Yes.

KM: [pointing to map] So this is you, William Akau. You, and you said someone else was with you?

WA: Yes, Eddie Lā'au. Okay and right above Mau'umae, at Waiku'i on the point over here has one [pointing to location on map].

KM: Okay, at Waiku'i.

WA: Yes, Waiku'i okay on the point over there.

KM: Hmm. There are some walled enclosure's behind the shore here, on the mauka side of the trail, was the gun there?

WA: No, the gun was right on the shoreline.

KM: Okay.

WA: *Makai* side of the trail.

KM: Okay, who's gun was that?

WA: This one was, my dad.

KM: Oh, so this is William Akau Sr. [marking map]

WA: Yes...

LA: Where's Joseph Hu'i's one?

WA: Joe Hu'i? [thinking] ...Supposed to be five you know, we get four over there now. Joe Hu'i's gun, I think it was over here, near Onehonu [pointing to location], where Mauna Kea Hotel is now.

KM: Hmm. How did they make these gun embankments here? Did they drive it in, did you haul it in or horse?

WA: No, the engineer's did that, they made the roads and they set it up, they came.

KM: Did they barb wire any of this coast line?

LA: Yes, the whole coast line.

WA: They did.

KM: So were you folks allowed to go out to fish during that time or were you?

WA: It was restricted. Sometime afterwards, then they opened it up.

KM: After the attack on Pearl Harbor within a short time, everything blocked down yeah?

WA: There was nothing, no access... [Discusses land of 'Ōuli in relationship to other lands of South Kohala, and importance of sharing information with people who travel the land, so that they can understand some of the history of the area]:

WA: [the signs are up along the highway] ...But, what's the sign, it says "Shore Access" eh. So you get the sign, but where is the shore? But if we take that sign and we say "This is it right here, going in that direction," you see, so at least you put the information. When the people walk, "oh this is the shoreline trail."

KM: Yes, where the trail is?

WA: Right.

KM: So then it's important to interpret, you know to tell some of the story. How the trail may have been used, what land you're in, the customs of the people when you can, and if there are stories, that way it preserves something.

WA: Like for instance, everybody goes to Hāpuna, if you kept the trail from Hāpuna to Waile'a, okay at the beginning you put the sign over there. This point goes south, so you get to Waile'a Bay, so you mark it. So they say, "Oh, it goes to Waile'a. So Waile'a is the next bay, and this is the trail that takes you there." And maybe you say it takes you, if you walk a certain pace, it takes you maybe fifteen, twenty minutes.

KM: So they know what they're going to be doing?

WA: Yes. So, they get an idea and that becomes a very interesting part, because you can tell them well, you walk in the evening when it's nice and cool, but when it's from 10 o'clock up to 3 o'clock, it's too hot. Things like that, so people can appreciate that.

KM: That's right, and if you share some of the history a little bit, like what Waile'a means, or Hāpuna?

WA: That's right.

KM: Some of the traditions, the stories.

WA: So you are kind of giving them a history, a background.

KM: Yes, that way they will take care.

WA: Yes. So each point, maybe point down an interesting point oh Keawewai, Keawewai is makai of Hāpuna, what Keawewai is all about. So you know?

KM: Is there a Keawewai at Hāpuna?

WA: Yes. Hāpuna, makai side. Yes, Keawewai.

KM: Oh, you know speaking of that, is at Hāpuna there's an interesting alignment of stone in the water, in the ocean, is that right? You know like there's the black alignment of stones?

WA: In the center of the beach?

KM: Yes.

WA: Okay, that's the boundary line of the land. Let's see now, there's a mark on it, the division is Parker Ranch.

KM: Oh, yes.

WA: One is 'Ōuli, 'Ōuli runs from there to Wai'ula'ula, I think. 'Ōuli has a narrow strip line runs all the way mauka.

KM: 'Ae.

WA: That portion is sold, I think. So I don't know if Parker Ranch still owns it.

KM: So that stone in the ocean is...?

WA: Is the dividing line. [Uncle's discussion of the stone (named Kaihumoku) and boundaries of 'Ōuli match those recorded by the Boundary Commission in the 1870s.]

KM: The dividing line. You know it's so interesting to see, I just knew that it has to be symbolic of something, because you look at the alignment of that natural stone in the water there almost like pūhi [an eel] or something, you know.

WA: [chuckles] You try look on it...if it's covered up, but if you look mauka there's supposed to be the mark, chiseled in the rock, you know.

KM: Oh, so that's the boundary between 'Ōuli and Lālāmilo.

WA: Lālāmilo.

KM: Is Lālāmilo, the old name or was it Puakō and Lālāmilo was within do you remember hearing about that?

WA: I think Lālāmilo is that ahupua'a. You have five ahupua'a in South Kohala. You get...well this is one Kawaihae, then Queen Emma has one Kawaihae, then you get 'Ōuli, you get Lālāmilo, and you get Waikōloa.

KM: 'Ae.

WA: So five.

KM: So Kawaihae 1, Kawaihae 2 which is Queen Emma's land, then 'Ōuli, Lālāmilo and Waikōloa?

WA: Yes. So that's it.

KM: So that's what makes up South Kohala?

WA: That's right...

Recorded September 30, 1998. Florence "Coco" La'ikealohaokamāmalu Vredenburg-Hind (1923-2002) with Kepa Maly — Describes travel along the old trail to Kauna'oa in the 1930s:

KM: Okay. Did you spend any time at all at Puakō?

CH: No, because by that time when I came along we were in Waimea.

KM: Sure.

CH: And that was when the Doi's were in that area and I remember they raised watermelons and stuff down there. It was perfect, hot and perfect for... And there was no road of course, we had to hike, you went by trail to...

KM: So you did take this trail sometimes from Kawaihae [pointing to the coastal trail on Reg. Map 2786]?

CH: Oh, yes, we used to hike from...well this was when we'd go down and camp at Kawaihae, we'd hike over to Kauna'oa, where the Mauna Kea [Hotel] is now.

KM: Kauna'oa.

CH: Yes, Kauna'oa Beach.

KM: I think what we're looking at right now is a portion of Register Map 2786. CH: [looking at map] Let's see, where is it...yes.

KM: And so it shows Kawaihae Village... [discuss various activities at Kawaihae]

KM: ...So you folks did go along this old trail though?

CH: We used to camp at Kawaihae during the summers. Sometimes my mother would take us and a bunch of ladies with their kids. We'd all camp, in fact Billy Paris' wife, Bertha Hermann, she and her sisters and her mother, the Arioli's and Queenie and her kids, and... I'm trying to think, who else was down there, anyway all these ladies. And we would camp down there, and the father's would all come down for the weekend. And then we'd hike over.

KM: Where did you folks camp in relationship to the heiau?

CH: Oh you know where Spencer Park is?

KM: Yes.

CH: We camped right there.

KM: Oh, so you camped right in there.

CH: And old Lā'au, old man Lā'au was the park keeper at the time, he and his wife, such a handsome old Hawaiian couple. When I look back now, nice looking Hawaiian man and his wife was so nice. And they had good looking kids. In fact Lucy Lā'au married a Grace boy from Kona.

KM: Oh.

CH: And I used to see her when I grew up in Kona. Yeah, we'd camp at Spencer Beach and then one day we'd hike...you know we're always doing something, keeping busy.

KM: Yes.

CH: So we hiked to Kauna'oa Beach.

KM: Yes, that's roughly this area, here on the map.

CH: We'd stop and we'd swim all the way, we'd get hot and have to swim and then keep on going. There was another beach somewhere along here, I'm trying to think where was it, was where Hartwell Carter later built a house. There was a Watson's Beach where we would stop and swim, the swimming was good there.

KM: Okay.

CH: We'd cool off and keep on going to... We didn't go to Hāpuna, we went to Kauna'oa, once we got there, there was no point in going Hāpuna.

KM: That's right, because the beach was so beautiful at Kauna'oa.

CH: Yeah, we didn't have to go any further.

KM: Yeah. You know out of curiosity when you were down walking along this trail, and of course, I know you guys were young and so you know things were different, did anyone ever, do you remember ever hearing any stories even like about the heiau or about?

CH: Just that one heiau was in the water, I know that. One heiau was below, there were three, I think. There was the top one and another one, and then one was in the water.

KM: Yes, Haleokapuni.

CH: And I remember they used to tell us, "Don't swim there, don't go swimming there because there's shark's...that's where the..." I don't know where the shark slept or not, but vaguely in my mind, I know we kids were always told, unless they were just trying to scare us.

KM: No.

CH: "Don't go swimming in there, you mustn't disturb it, that's where all the sharks come in and sleep" or whatever [chuckles] so, they don't sleep, or they just gather and then rest so, it was where the heiau was...

Recorded March 26, 1999. Elizabeth "Tita" Kauikeōlani Ruddle-Spielman (1924) and son, JK Spielman, with Kepa Maly — Describes travel between Paniau and Kawaihae, following World War II:

KM: ...So, in your time really there may have been just localized use of the trails?

TR-S: Uh-hmm. K

M: There wasn't a great deal of traffic it seems, by the 1930s and 1940s like that?

TR-S: No.

KM: And by the time the war, just shortly after the war broke out they had opened up the road so your heavy four drive wheel vehicles like you were showing me the big military trucks?

TR-S: Uh-hmm.

KM: And then your papa brought some after the war?

TR-S: We had three of them which we used. The command car, big weapons carrier, and a jeep.

KM: How long was the drive out here?

TR-S: It was long. It was very, very rough. You had to go by Kauna'oa Beach Hotel, and where the river comes to the ocean.

KM: Oh, at Wai'ula'ula, where the river comes down?

TR-S: Right. There were times when we couldn't cross.

KM: Is that right?

TR-S: The road went right through that river.

KM: Yes, yes. In fact you can still see it, you know.

TR-S: It was high. I know my brother, Billy and I were at Paniau and I had some visitors coming up from Honolulu. So we were going to pick them up. Happy Cockett flew them into Waimea. We got there and there was no way we were going to cross that stream. I said, "We've got to get up there Billy because they'll be waiting." And he said you know what we'll go up through the pastures. I said, "What about that stone wall that goes all the way across?"

KM: Yes, yes.

TR-S: He said, "There is a gate." He said, "I'm not quite sure where it is but we'll find it." We went, we just hit it absolutely straight, right straight the gate.

KM: So you were able to find, there were little like...?

TR-S: No, there was no road, we made our own.

KM: You made your own. Wow.

TR-S: We made our own road and got up by the airport and picked them up. And they said, "Where have you been?"

KM: That's amazing.

TR-S: We said, "You don't want to know" [chuckles]. And then we had to come back the same way. [Describes travel from Kawaihae to Paniau]:

KM: ...Even from Kawaihae, I would imagine almost two hours or something?

TR-S: Yeah. And we had to go...the road didn't go all in the back. We went through Kauna'oa Beach we had to go on the beach there was no road and got stuck a couple of times. It went on Kauna'oa.

KM: Here's Kauna'oa [pointing at the map] in fact you can see it right back of the beach there.

TR-S: Right. Well you had to go through the beach, go right on the beach.

JK: And then come back up.

TR-S: And Hāpuna was the same way.

KM: Yes, yes right on the sand?

TR-S: Right on the sand. So you wanted to go when it was nice and damp.

KM: And you were able to get a vehicle up the side of...? Like on the other side of Hāpuna it goes up?

JK: It's all *pali*.

KM: *Pali*.

TR-S: We had to go up and then over. But it was a long, long trip. But once we got here of course, it was well worth all the dust.

JK: I was just going to mention, you were talking about the trails and asking about people using it. In my humble opinion I would assume that being in an area like this where it was so dry, hot and desolate that not many people would have used the trail in later years as opposed to earlier years out of necessity when they had to use it. Because once there were roads and so forth and alternatives to fishing and so forth. This was a rugged coastline, you did have the brackish ponds to cool off and a lot of fish and so forth but it was so hot and not very many trees. I think that it was probably a trail that wasn't used as much, what they're calling the Ala Kahakai.

KM: Yes. That's what they're calling it today, Ala Kahakai today. You're right, and it's very interesting, this section here...the older name is Alaloe.

JK: So does Alaloe turn in to the same trail as the Māmalahoe?

KM: 'Ae. That's what's interesting.

JK: There are the two? There's the beach...

KM: Yes, you have this one here [pointing to section on Reg. Map 824].

TR-S: Uh-hmm.

KM: This is the Alaloe, Alanui Aupuni became the Government Road. They were working on this Government Road in the 1860's already...This was established in the 16th century during the battles between Lono-i-ka-makahiki, here, and Kamalāhāhale of Maui. This is a very old alignment.

JK: Right.

KM: And then, just like you said, the smaller trails along the shore here for the local fisherman. Uncle Robert Keākealani does talk about traveling by trail but you see what they did is, they went and see this trail, comes up to here [pointing to site on Reg. Map 1278]?

TR-S: Yes.

JK: Uh-hmm.

KM: They would cut from Kapalāhāhā go all the way to Kawaihāhā.

TR-S: Uh-hmm.

KM: But they would come mauka, along this section of the trail here connect with...

TR-S: This one [pointing to the Government Road]

KM: Yes, the Alaloe and then go across.

TR-S: Uh-hmm... (Maly and Maly 2003:53-67)

CONCLUSION

The objective of this assessment is to identify any culturally significant resources or traditional cultural practices that will be affected as a result of the proposed undertaking. Direct effects within the study area and indirect effects within the vicinity of the proposed undertaking were considered. The study relied upon archival research that focused on historical documents, previous archaeological studies, and previous oral history interviews of former residents of the area (Maly and Maly 2003). These interviews documented Hawaiian cultural practices in the second half of the 20th Century that were generally seasonal and shore-based, predominantly concerned with obtaining marine resources. Some of the residents interviewed lived in the uplands and walked the trails to the shore, which was in part why the trails were considered so significant and why each family participated in their upkeep. Nearly all of the Hawaiians interviewed by Maly (Maly and Maly 2003) spoke of the bountiful marine resources that were the focus of traditional subsistence activity along the coast.

Historic documentary research identified many traditional or legendary references to 'Ōuli and the surrounding vicinity. This area, known traditionally as the *'āina kaha* or "arid shore land" was also within the area that was severely impacted by warring chiefs of Hawai'i and Maui. Though no direct remnants of the sandalwood trade having occurred within the project area have been identified, it is likely that this activity took place within the general vicinity.

The historic use of the 'Ōuli was likely restricted to ranching associated with the massive Parker Ranch. The APE is also located within the former 91,000-acre Waikoloa Maneuver Area and was apparently used for World War II era military exercises including the use of live ammunition and other explosives.

The archaeological work conducted by Schilz (1994) identified only two sites within the boundaries of the APE (see **Figure 10**). Sites 14712 and 14727 are both associated with World War II era military training activities. Seven pre-contact sites were documented in the general area, consisting of overhang shelters (Sites 14741, 14750, and 14751), a complex of two C-shapes (Site 14726), a complex comprised of two enclosures (Site 14687), a cluster of two cairns and a midden deposit (Site 14679), and a burial lava tube (Site 14752). However, none of these sites are located within the APE.

Direct effects to significant cultural resources within the proposed APE have been mitigated through the documentation by Schilz (1994). No known cultural resources, such as culturally significant sites, flora or fauna, or cultural practices or places will be directly affected as a result of the proposed project. No evidence of customary native Hawaiian rights being conducted in the APE has been identified. Traditional cultural practices and properties may have been present in 'Ōuli Ahupua'a; however, the proposed development within the APE should not interfere or have a negative impact on them.

TRANSLATION OF HAWAIIAN WORDS¹

a'ā – jagged lava

ahupua'a – traditional Hawaiian land unit usually extending from the uplands to the sea

'aikapu – to eat according to the restrictions of the kapu

'aumakua – family or personal gods

'ainakaha – arid shore land

aikane punahele – favorite

ali'i – chief, chiefess, officer, ruler, monarch

ali'inui – supreme ruler; king

hana 'ino – desecrate

heiau – place of worship, shrine

he'e – octopus

ho'i – returning

hōkeo aho hī-'ahi – tuna lure and *olonā* line storage gourd

holo – go

honu – turtle

'ili – land section, next in importance to *ahupua'a* and usually a subdivision of an *ahupua'a*

ili kupono – a nearly independent *'ili* land division within an *ahupua'a*

inu kope – to drink coffee

kaha – to cut open

kaka – to rinse

kahuna – priest, sorcerer, magician

kalana – division of land smaller than a *moku*

kāpī – salt

kapu – restriction

kaula'i – to sun dry

ko'a – shrine, often consisting of circular piles of coral or stone

konohiki – headman of an *ahupua'a* land division under the chief

Kū – one of the four major gods brought from Kahiki

kuleana – small piece of property, as within an *ahupua'a*

lawai'a – fisherman

lawai'a hī-'ahi – deep sea tuna lure fisherman

leho – cowry (*Cypraea* sp.) shell octopus lure

Lono – one of the four major gods brought from Kahiki

luakini – temple, church; large heiau

māhele – land division of 1848

makahiki – ancient festival beginning about the middle of October and lasting about four months, with sports and religious festivities and taboo on war

makai – seaward

makaʻāinana – commoner, populace, people in general

maloʻo – to dry

mamua – before

mauka – inland

moku – district, island, islet, section

moku-o-loko – traditional land district

ʻopelu – mackerel scad (*Decapterus pinnulatus*)

pahoehoe – Smooth, unbroken type of lava, contrasting with *aʻā* lava

pali – cliff, precipice, steep hill or slope

paniolo – cowboy

pau – finished, ended

pūhi – eel

ʻokana – District or subdistrict, usually comprising several ahupuaʻa

ti – plant. Kī

¹ - from wehewehe.org

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APPENDIX A – APRIL 2024 KA WAI OLA MAGAZINE NOTICE



Ka Wai Ola
E S F R THE LAHUI ka

Apelila (April) 2024 | Vol. 41, No. 04

Hawai'i Prepares to Host the Festival of Pacific Arts & Culture

OHA Announces \$1.5 Million Sponsorship on Behalf of the Lāhui

PAGES 14-15

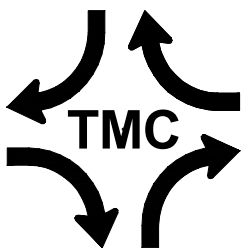
'ŌULI AHUPUA'A

Kulaiwi Archaeology, LLC is conducting a cultural impact assessment (CIA) for TMK: (3) 6-2-001:074 and 075, located in 'Ōuli Ahupua'a, South Kohala District on the Island of Hawai'i. The landowner currently proposes to develop affordable housing within a 15-acre portion of the parcels. All persons having information on traditional cultural practices and places located within 'Ōuli Ahupua'a and the vicinity of the project parcel are hereby requested to contact Solomon Kailihiwa, skailihiwa@kulaiwiarchaeology.com, (808)493-8884, within thirty (30) days of this notice.

Voyaging canoes and other wa'a from morning Waka Ceremony at the 11th Festival of Pacific Arts & Culture in 2012 in Honiara, Solomon Islands

TRAFFIC IMPACT ANALYSIS REPORT
FOR THE PROPOSED
OULI SINGLE FAMILY HOUSING
SOUTH KOHALA, HAWAIʻI ISLAND
TAX MAP KEY: (3) 6-2-001: 075

PREPARED FOR
HAWAIʻI ISLAND COMMUNITY DEVELOPMENT CORPORATION
JANUARY 18, 2024

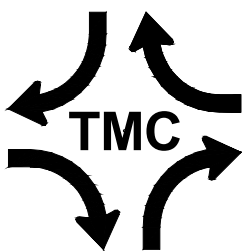
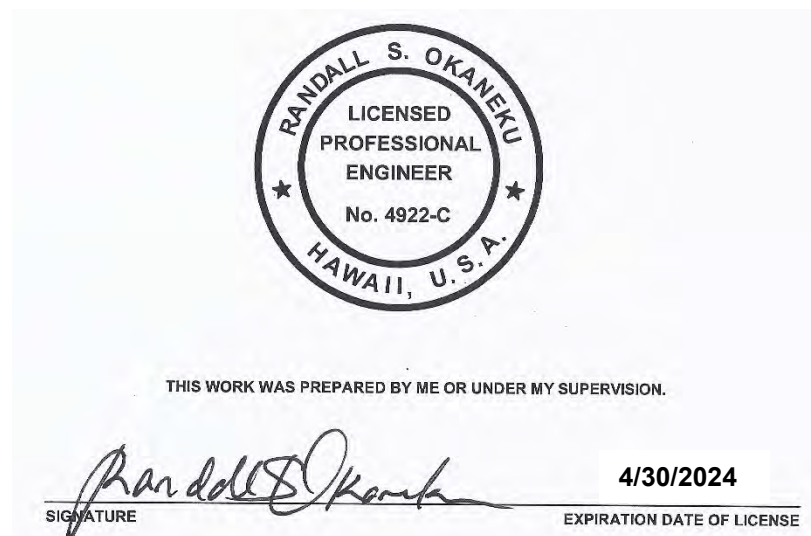


PREPARED BY
THE TRAFFIC MANAGEMENT CONSULTANT

APPENDIX D

TRAFFIC IMPACT ANALYSIS REPORT
FOR THE PROPOSED
OULI SINGLE FAMILY HOUSING
SOUTH KOHALA, HAWAII ISLAND
TAX MAP KEY: (3) 6-2-001: 075

PREPARED FOR
HAWAII ISLAND COMMUNITY DEVELOPMENT CORPORATION
JANUARY 18, 2024



PREPARED BY
THE TRAFFIC MANAGEMENT CONSULTANT
RANDALL S. OKANEKU, P.E., PRINCIPAL * 1188 BISHOP STREET, SUITE 1907 * HONOLULU, HI 96813

Table of Contents

	<u>Page</u>
I. Introduction.....	1
A. Project Description.....	1
B. Purpose and Scope of the Study.....	1
C. Methodologies.....	4
1. Capacity Analysis	4
2. Trip Generation.....	5
II. Existing Conditions.....	5
A. Roadways.....	5
B. Existing Peak Hour Traffic Volumes.....	6
1. Field Investigation and Data Collection	6
2. Existing AM Peak Hour Traffic Analysis.....	6
3. Existing PM Peak Hour Traffic Analysis	6
III. Future Traffic Conditions	8
A. Background Growth in Traffic.....	8
B. Year 2028 Peak Hour Traffic Without Project	8
IV. Traffic Impact Analysis	8
A. Trip Generation Characteristics	8
B. Year 2028 Peak Hour Traffic With Project	10
1. Site Traffic Assignment	10
2. Year 2028 Peak Hour Traffic Analysis With Project	10

Table of Contents (Cont'd.)

	<u>Page</u>
V. Long-Range Traffic Analysis	10
A. Future Growth in Traffic.....	10
B. Year 2033 Peak Hour Traffic Without Project	10
C. Year 2033 Peak Hour Traffic With Project	10
D. Year 2043 Peak Hour Traffic Without Project	15
E. Year 2043 Peak Hour Traffic With Project	15
VI. Conclusions.....	15

List of Figures

	<u>Page</u>
Figure 1. Location Map.....	2
Figure 2. Site Plan.....	3
Figure 3. Existing Peak Hour Traffic.....	7
Figure 4. Year 2028 Peak Hour Volumes Without Project	9
Figure 5. Peak Hour Site Traffic Assignment.....	11
Figure 6. Year 2028 Peak Hour Traffic With Project.....	12
Figure 7. Year 2033 Peak Hour Volumes Without Project	13
Figure 8. Year 2033 Peak Hour Volumes With Project.....	14
Figure 9. Year 2043 Peak Hour Traffic Without Project.....	16
Figure 10. Year 2043 Peak Hour Traffic With Project.....	17

TRAFFIC IMPACT ANALYSIS REPORT
FOR THE PROPOSED
OULI SINGLE FAMILY HOUSING
SOUTH KOHALA, HAWAI`I ISLAND
TAX MAP KEY: (3) 6-2-001: 075

I. Introduction

A. Project Description

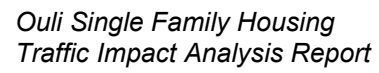
Ouli Single Family Housing is a planned residential development in South Kohala, Hawai`i Island. Hawai`i Island Community Development Corporation will be seeking a Change of Zone from the County of Hawai`i for the project site. The property is identified as Tax Map Key: (3) 6-2-001: 075. The 237.5-acre project site is located on the south side of Kawaihae Road between Waiula Drive and Waiemi Place. Ouli Single Family Housing would be developed on a 15-acre portion of the property. Figure 1 depicts the project location map.

Ouli Single Family Housing will consist of a total of 43 affordable single family dwelling units. Access will be provided on Waiula Drive for 39 lots. Four (4) lots will access Waiula Drive at a separate intersection, which will be located further east of the larger subdivision. Twenty (20) dwelling units are expected to be completed by the Year 2025. The remaining 23 dwelling units are expected to be fully built out and occupied by the Year 2026. The proposed Ouli Single Family Housing site plan is depicted in Figure 2.

B. Purpose and Scope of the Study

The purpose of this study is to analyze the traffic impacts resulting from the development of the proposed Ouli Single Family Housing project. This Traffic Impact Analysis Report (TIAR) is prepared in accordance with the Hawai`i County Code Chapter 25, Section 25-2-46 "Concurrency Requirements". The scope of the TIAR for the proposed project includes the following:

1. Description of the Ouli Single Family Housing development.
2. Evaluation of existing roadway and traffic conditions.
3. Analysis of the future 5-year, 10-year, and 20-year traffic conditions without the proposed project.
4. Development of the trip generation characteristics of the proposed project.

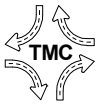


This aerial map from Google Earth shows the project location on Kawaihae Road. The road runs horizontally across the middle of the image. A yellow dot marks the 'Project Location' on the south side of Kawaihae Road, just west of its intersection with Waiula Dr. To the left of the project location, Kawaihae Road passes Waremi Pl. To the right, it passes Ahekeke St and continues past Waiula Dr. The surrounding landscape is a mix of brown, cleared land and green, vegetated areas. A scale bar in the bottom right corner indicates 2000 feet, and a north arrow points towards the top right.

2



Figure 2. Site Plan



5. Assignment of the site-generated trips onto the roadway network.
6. Identification and analysis of the traffic impacts resulting from the development of the proposed project within the 5-year, 10-year, and 20-year time frames of this TIAR.
7. Recommendation of roadway improvements, as necessary, which would mitigate the traffic impacts identified in this study.

C. Methodologies

1. Capacity Analysis

The highway capacity analysis, performed in this study, is based upon procedures presented in the Highway Capacity Manual, 6th Edition (HCM), published by the Transportation Research Board. HCM defines the Level of Service (LOS) as “a quantitative stratification of a performance measure or measures representing quality of service” of a roadway facility. HCM defines the six (6) Levels of Service from the traveler’s perspective, ranging from the best LOS “A” to the worst LOS “F”. LOS translates the complex mathematical results of the highway capacity analysis into an A through F grading system for the purpose of simplifying the roadway performance for decision-makers.

LOS’s “A”, “B”, and “C” are generally considered to be satisfactory Levels of Service. The Hawai’i County Code “Concurrency Requirements” defines LOS “D” as the minimum acceptable Level of Service. LOS’s “E” and “F” are considered to be worse than acceptable Levels of Service. The LOS of an intersection facility is primarily based upon the average vehicle delay (d) in seconds per vehicle (sec/veh). The delays at unsignalized intersections, which include stop-controlled intersections and roundabouts, are generally shorter than signalized intersections, due to the drivers’ expectation and acceptance of longer delays at higher-volume signalized intersections.

Synchro is a traffic analysis software that was developed by Trafficware. Synchro is an intersection analysis program that is based upon the HCM 6th Edition methodology. Synchro is used to calculate the Levels of Service for the study intersection. Worksheets for the capacity analysis, performed throughout this report, are compiled in the Appendices. Table 1 summarizes the HCM LOS criteria.

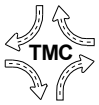


Table 1. Intersection Level of Service Criteria (HCM)		
LOS	Unsignalized Control	Description
A	$d \leq 10$	Control delay is minimal.
B	$10 < d \leq 15$	Control delay is not significant.
C	$15 < d \leq 25$	Stable operation. Queuing begins to occur.
D	$25 < d \leq 35$	Less stable condition. Increase in delays, decrease in travel speeds.
E	$35 < d \leq 50$	Unstable operation, significant delays.
F	$d > 50$	High delays, extensive queuing.

2. Trip Generation

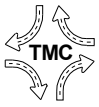
The trip generation methodology is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in the Trip Generation Manual, 11th Edition. The ITE trip generation methodology is cited in the Hawai'i County Code "Concurrency Requirements" for use in traffic impact analysis studies. The ITE trip rates were developed by correlating the total vehicle trip generation data with various land use activities/characteristics, such as the vehicle trips per hour (vph) per dwelling unit (DU).

II. Existing Conditions

A. Roadways

Kawaihae Road (Route 19) is a State of Hawai'i arterial highway between Waimea and Kawaihae Harbor. Kawaihae Road is a two-way, two-lane highway, in the vicinity of the project site. The posted speed limit on Kawaihae Road is 45 miles per hour (mph).

Waiula Drive is a two-way, two-lane local road, which provides access to a residential neighborhood. The west leg of Waiula Drive is stop-controlled at its Tee-intersection with Kawaihae Road. The west leg of Waiula Drive terminates about 0.4 mile east of Kawaihae Road. The posted speed limit on Waiula Drive is 25 mph.



B. Existing Peak Hour Traffic Volumes

1. Field Investigation and Data Collection

Turning movement traffic count surveys were conducted on September 12-13, 2023 during the peak periods of traffic at the intersection of Kawaihae Road and Waiula Drive. The traffic count surveys included vehicle-type classification, bicycles, and pedestrians.

2. Existing AM Peak Hour Traffic Analysis

The existing AM peak hour of traffic in the study area occurred from 7:00 AM to 8:00 AM. Kawaihae Road carried over 600 vehicles per hour (vph), total for both directions, during the existing AM peak hour of traffic. The existing AM peak direction of traffic on Kawaihae Road was in the westbound direction with a 70-30 split. Waiula Drive carried about 40 vph, total for both directions. No pedestrians crossed the intersection of Kawaihae Road and Waiula Drive, while two (2) bicycles entered the study intersection, during the existing AM peak hour of traffic.

Waiula Drive operated at LOS “B”, during the existing AM peak hour of traffic. The left-turn movement from westbound Kawaihae Road into Waiula Drive operated at LOS “A”.

3. Existing PM Peak Hour Traffic Analysis

The existing PM peak hour of traffic in the study area occurred from 4:00 PM to 5:00 PM. During the existing PM peak hour of traffic, Kawaihae Road carried about 700 vph, total for both directions. The existing PM peak direction of traffic on Kawaihae Road was in the eastbound direction with a 66-34 split. Waiula Drive carried about 50 vph, total for both directions. No pedestrians crossed the intersection of Kawaihae Road and Waiula Drive, and zero (0) bicycles entered the intersection of Kawaihae Road and Waiula Drive, during the existing PM peak hour of traffic.

During the existing PM peak hour of traffic, Waiula Drive continued to operate at LOS “B” at Kawaihae Road. The left-turn movement from westbound Kawaihae Road into Waiula Drive operated at LOS “A”. The existing AM and PM peak hour traffic data are depicted in Figure 3.

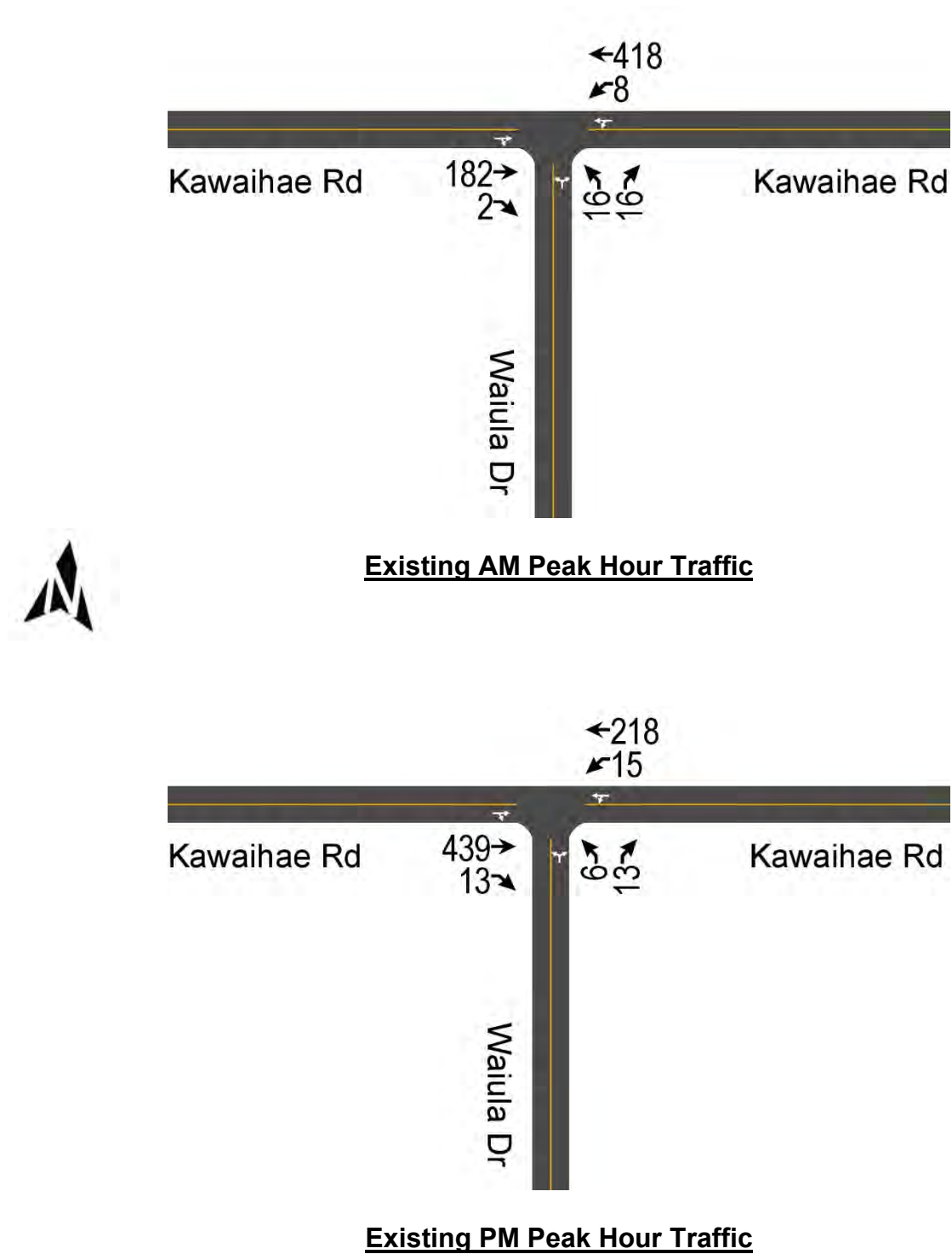
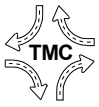
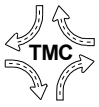


Figure 3. Existing Peak Hour Traffic



III. Future Traffic Conditions

A. Background Growth in Traffic

The Transportation Plan for the District of Hawai'i (TPDH) was prepared for the State of Hawai'i Department of Transportation (DOT), in cooperation with the County of Hawai'i Department of Public Works and Planning Department. The TPDH developed long-range travel forecasts for Hawai'i Island based upon future socio-economic conditions.

The TPDH projected an annual growth rate of about 2.0 percent in vehicle trips in South Kohala. For the purpose of this traffic impact analysis, an annual average growth factor of 2.0 percent was uniformly applied to the existing (Year 2023) peak hour traffic to estimate the Year 2028 peak hour traffic demands without the proposed project.

B. Year 2028 Peak Hour Traffic Without Project

During the Year 2028 AM and PM peak hours of traffic without the proposed project, the intersection of Kawaihae Road and Waiula Drive is expected to operate at the same Levels of Service as during the existing AM and PM peak hours of traffic. The Year 2028 peak hour traffic volumes without the proposed project are depicted in Figure 4.

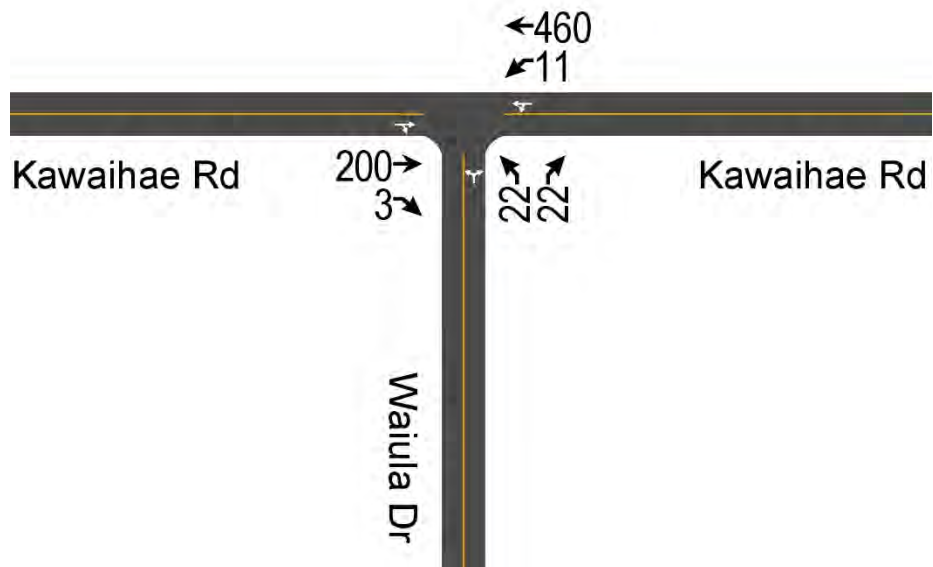
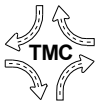
IV. Traffic Impact Analysis

A. Trip Generation Characteristics

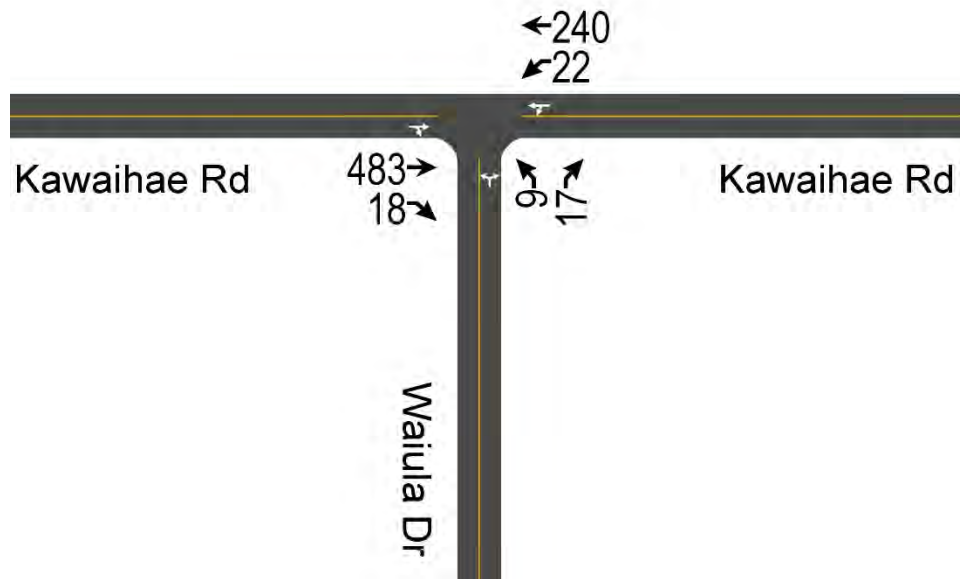
The trip generation characteristics for Ouli Single Family Housing were based upon the ITE trip generation methodology for single family detached housing. The ITE trip generation rates were used to derive the vehicle trips per hour (vph) per dwelling unit (DU), during the weekday AM and PM peak hours of adjacent street traffic.

The proposed project is expected to generate totals of 35 vph and 45 vph, during the AM and PM peak hours of traffic, respectively. The trip generation characteristics in vehicle trips per hour for the proposed project is summarized in Table 2.

Table 2. Trip Generation Characteristics							
Land Use (ITE Code)	DU	AM Peak Hour (vph)			PM Peak Hour (vph)		
		Enter	Exit	Total	Enter	Exit	Total
Single Family Housing (223)	43	9	26	35	28	17	45

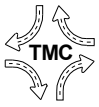


Year 2028 AM Peak Hour Traffic Without Project



Year 2028 PM Peak Hour Traffic Without Project

Figure 4. Year 2028 Peak Hour Volumes Without Project



B. Year 2028 Peak Hour Traffic With Project

1. Site Traffic Assignment

The peak hour site-generated traffic assignments, depicted in Figure 5, were based upon the existing traffic circulation patterns.

2. Year 2028 Peak Hour Traffic Analysis With Project

Waiula Drive is expected to continue to operate at LOS “B” at Kawaihae Road, during the Year 2028 AM and PM peak hours of traffic with the proposed project. The left-turn movement on westbound Kawaihae Road into Waiula Drive is expected to continue to operate at LOS “A”. Figure 6 depicts the Year 2028 AM and PM peak hour traffic with the proposed project.

V. Long-Range Traffic Analysis

A. Future Growth in Traffic

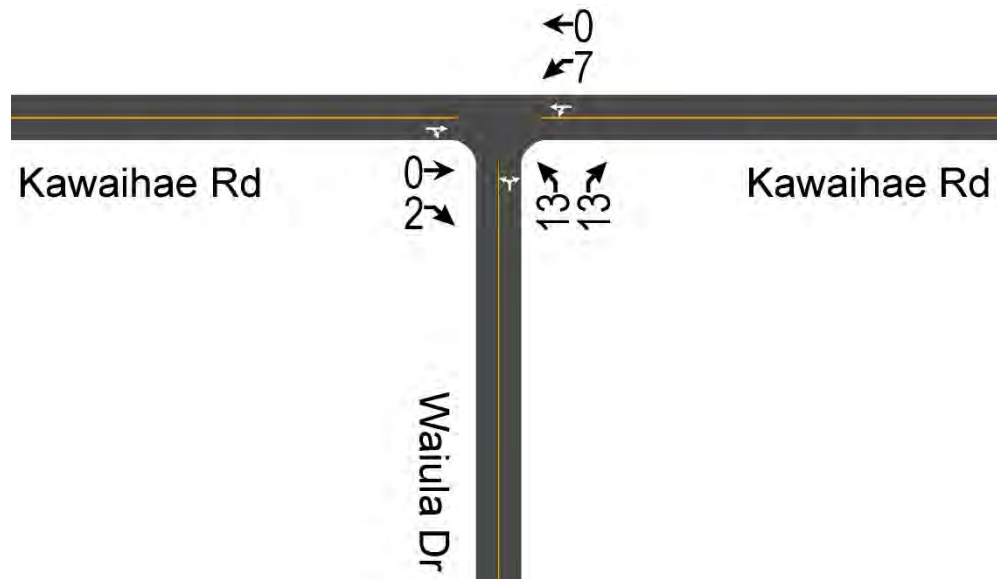
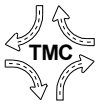
The proposed project is expected to be fully built out and occupied by the Year 2028. The trip generation is assumed to remain constant beyond the Year 2028. However, the Hawai'i County “Concurrency Requirements” requires the analysis of the ten-year (2033) and twenty-year (2044) traffic projections for future growth of traffic in the project area, which are beyond the development time frame of the proposed project. The TPDH average annual growth rate of 2.0 percent vehicle trips generated in the South Kohala region was extrapolated to estimate the Years 2033 and 2043 AM and PM peak hour traffic without the proposed project. The peak hour site traffic assignments were added to the traffic forecasts for the Years 2033 and 2043 peak hour traffic with the proposed project.

B. Year 2033 Peak Hour Traffic Without Project

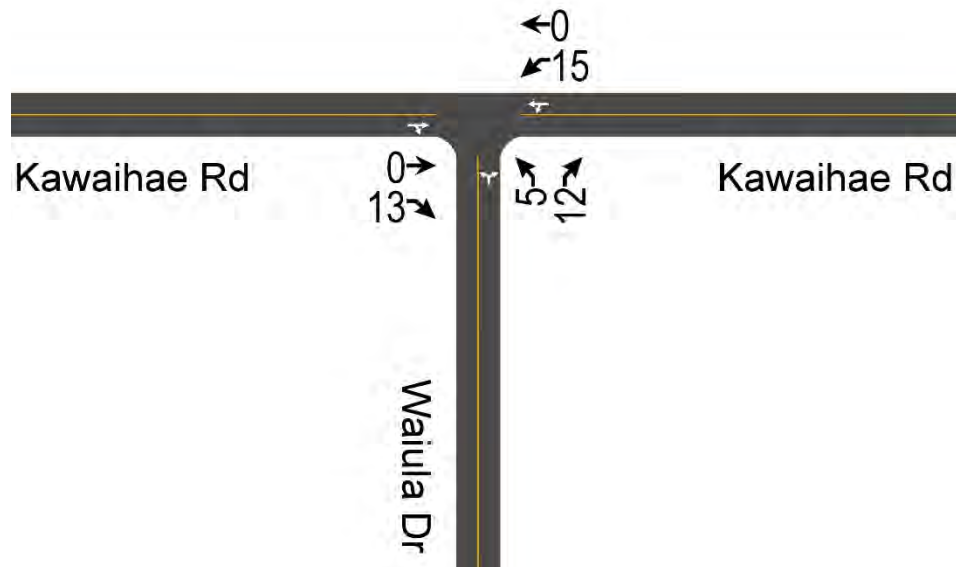
By the Year 2033, the intersection of Kawaihae Road and Waiula Drive is expected to continue to operate at the same Levels of Service as during the existing AM and PM peak hours of traffic. Figure 7 depicts the Year 2033 peak hour traffic volumes without the proposed project.

C. Year 2033 Peak Hour Traffic With Project

Waiula Drive is expected to continue to operate at LOS “B”, during the Year 2033 AM and PM peak hours of traffic with the proposed project. The left-turn movement from westbound Kawaihae Road is expected to continue to operate at LOS “A”. The Year 2033 AM and PM peak hour traffic volumes with the proposed project are depicted in Figure 8.

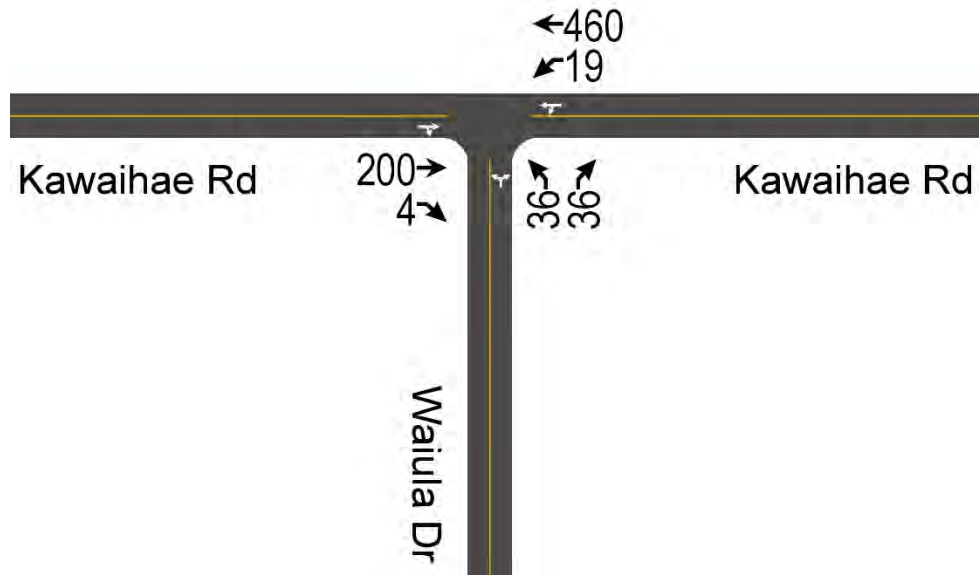
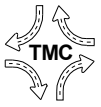


AM Peak Hour Site Traffic Assignment

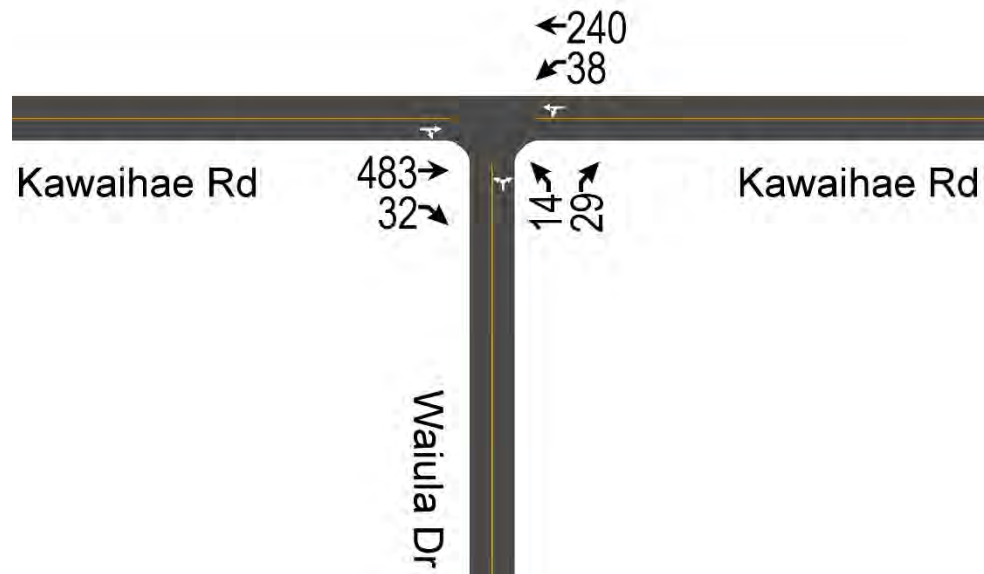


PM Peak Hour Site Traffic Assignment

Figure 5. Peak Hour Site Traffic Assignment

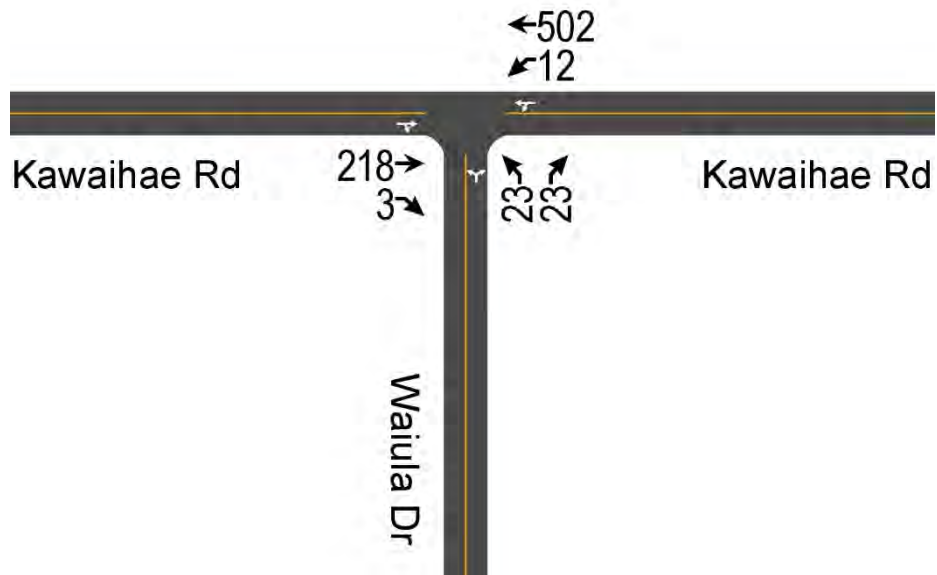
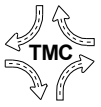


Year 2028 AM Peak Hour Traffic With Project

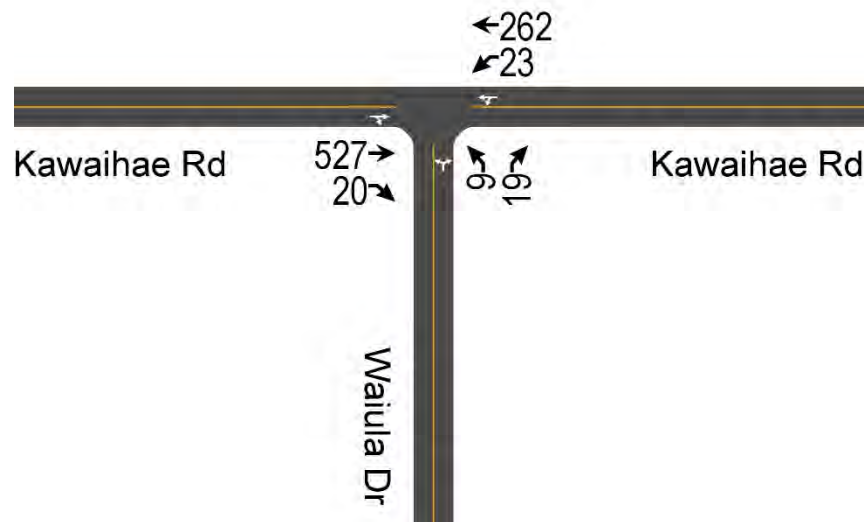


Year 2028 PM Peak Hour Traffic With Project

Figure 6. Year 2028 Peak Hour Traffic With Project

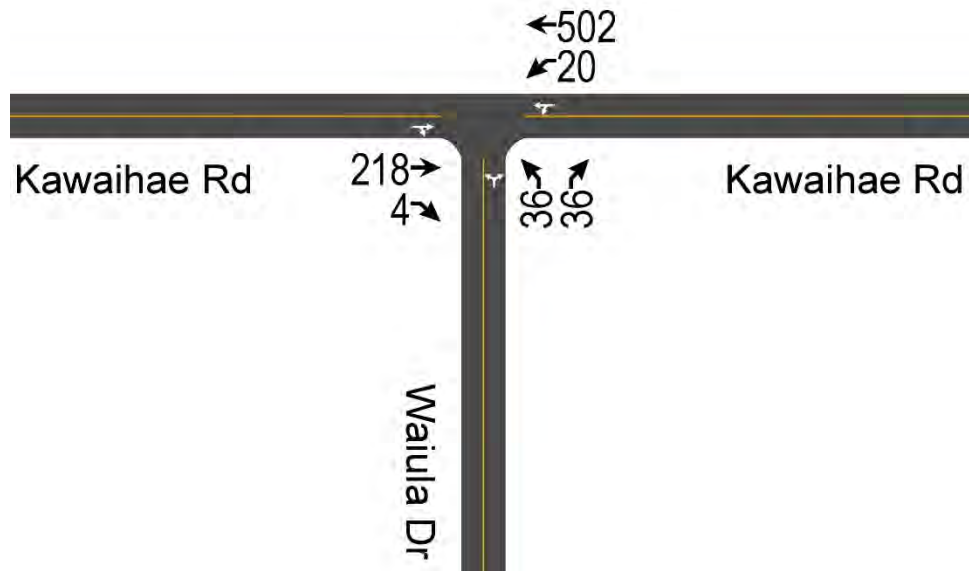
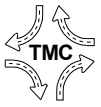


Year 2033 AM Peak Hour Traffic Without Project

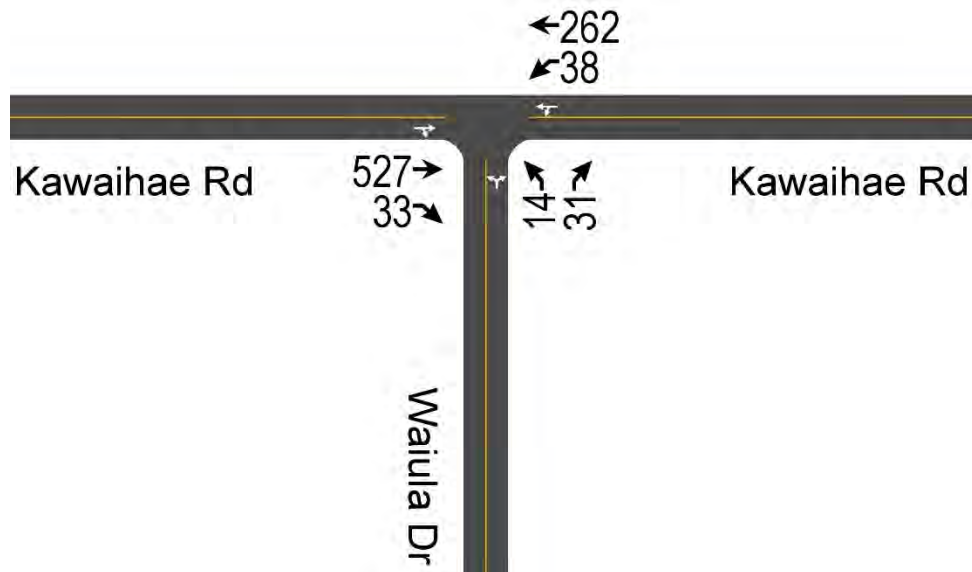


Year 2033 PM Peak Hour Traffic Without Project

Figure 7. Year 2033 Peak Hour Volumes Without Project

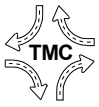


Year 2033 AM Peak Hour Traffic With Project



Year 2033 PM Peak Hour Traffic With Project

Figure 8. Year 2033 Peak Hour Volumes With Project



D. Year 2043 Peak Hour Traffic Without Project

Waiula Drive is expected to operate at LOS “C”, during the Year 2043 AM and PM peak hours of traffic without the proposed project. The left-turn movement from westbound Kawaihae Road into Waiula Drive is expected to continue to operate at LOS “A”. The Year 2043 AM and PM peak hour traffic volumes without the proposed project are depicted in Figure 9.

E. Year 2043 Peak Hour Traffic With Project

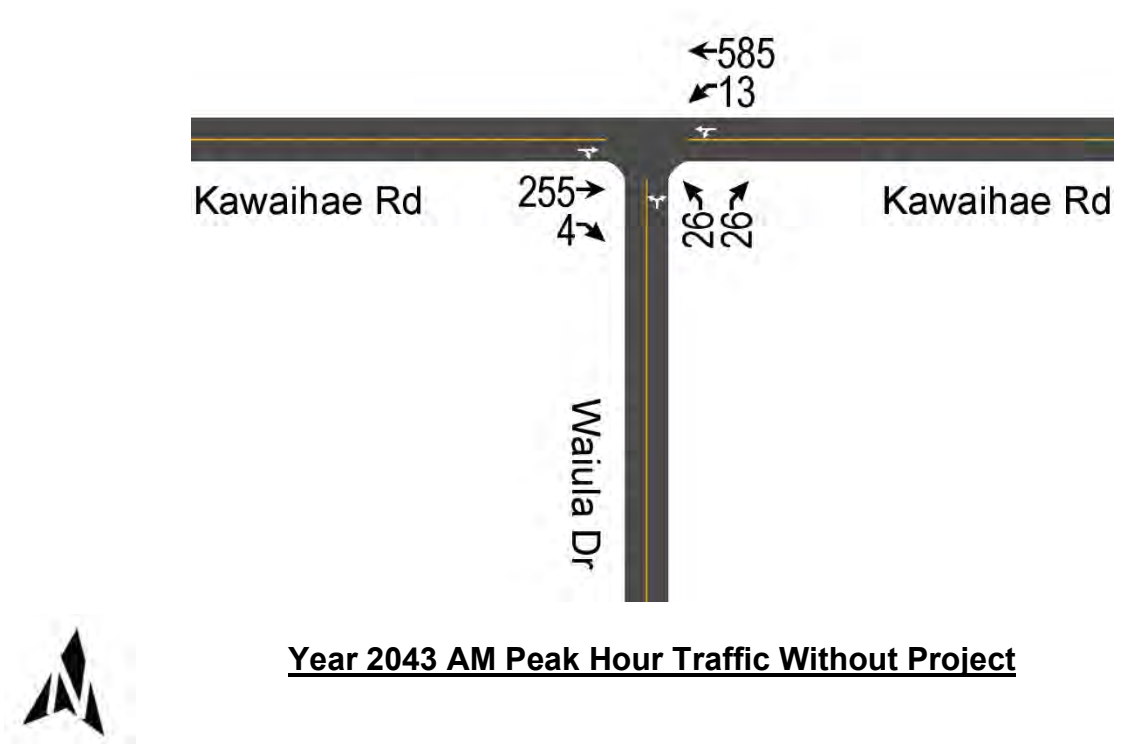
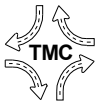
During the Year 2043 AM and PM peak hours of traffic with the proposed project, the intersection of Waiula Drive and Kawaihae Road is expected to operate at the same Levels of Service as during the Year 2043 AM and PM peak hours of traffic without the proposed project. The Year 2043 AM and PM peak hour traffic volumes with the proposed project are depicted in Figure 10.

VI. Conclusions

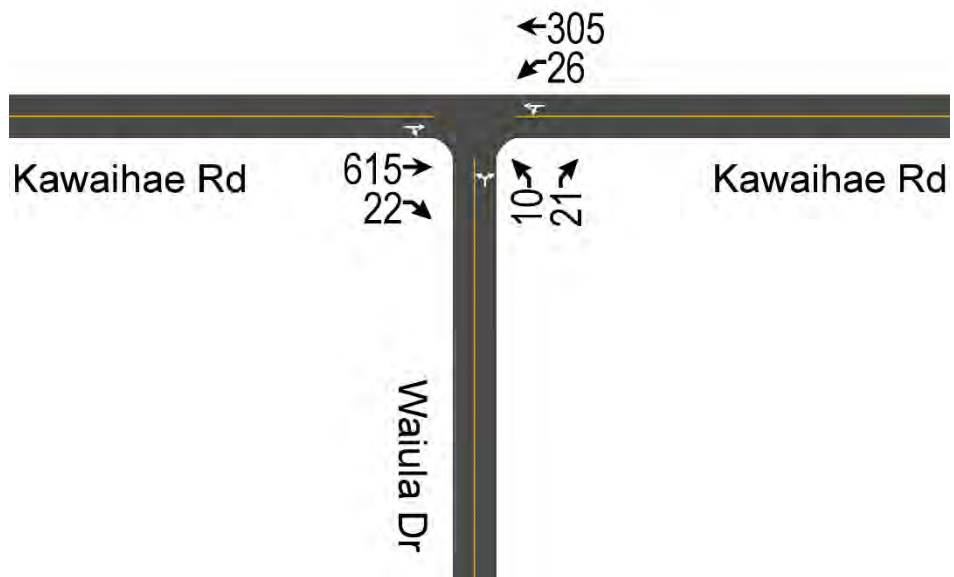
The proposed Ouli Single Family Housing is expected to meet the affordable housing credits, as defined in Hawai‘i County Code Chapter 11 Section 11-4.b.2. As such, area traffic mitigation is not required in accordance with the Hawai‘i County Code Chapter 25, Section 25-2-46 “Concurrency Requirements”.

Waiula Drive operated at LOS “B” at Kawaihae Road, during the existing AM and PM peak hours of traffic. Waiula Drive is expected to continue to operate at LOS “B”, during the AM and PM peak hours of traffic through the Year 2033 without and with the proposed project. By the Year 2043, Waiula Drive is expected to operate at LOS “C”, during the AM and PM peak hours of traffic without and with the proposed project.

The proposed project is expected to increase traffic demands at the Kawaihae Road intersection at Waiula Drive by about 5 percent and 6 percent, during the AM and PM peak hours of traffic, respectively. The proposed project is not expected to significantly impact traffic operations at the intersection of Waiula Drive and Kawaihae Road, during the peak hours of traffic. Traffic mitigation measures are not recommended at this time.

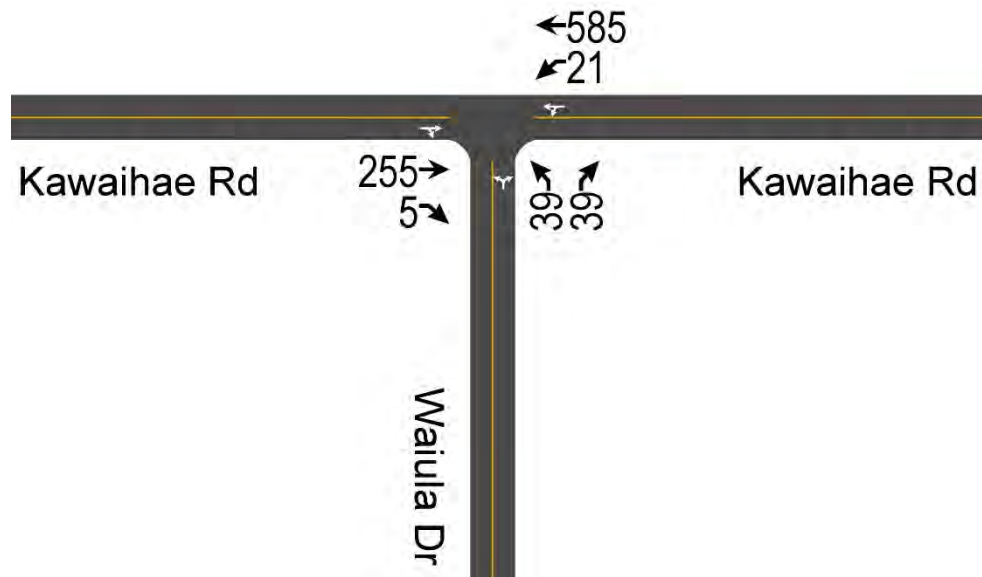
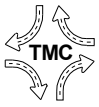


Year 2043 AM Peak Hour Traffic Without Project

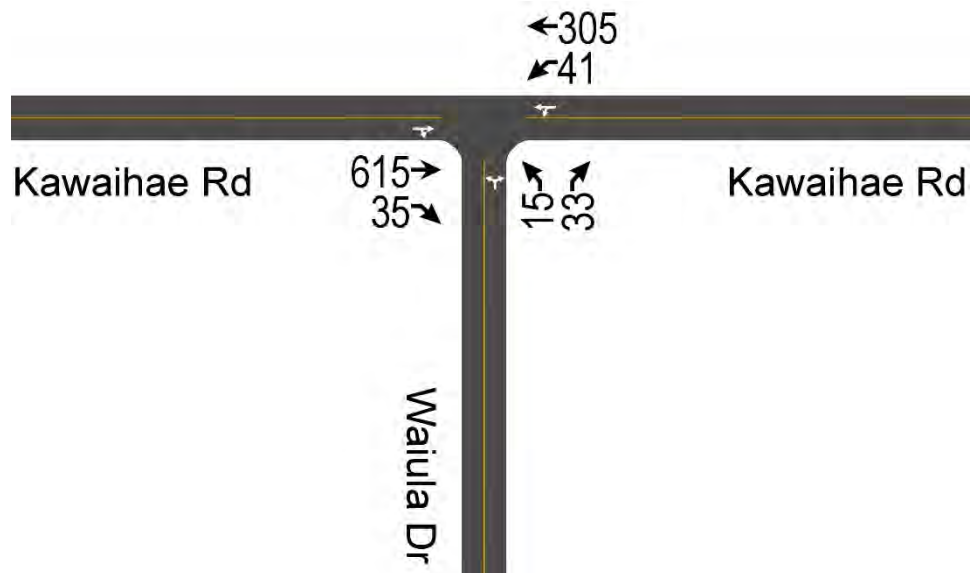


Year 2043 PM Peak Hour Traffic Without Project

Figure 9. Year 2043 Peak Hour Traffic Without Project



Year 2043 AM Peak Hour Traffic With Project



Year 2043 PM Peak Hour Traffic With Project

Figure 10. Year 2043 Peak Hour Traffic With Project

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TAX MAP KEY: (3) 6-2-001: 075

APPENDIX A
EXISTING TRAFFIC COUNT DATA

Waiula Dr Kawaihae Rd - TMC

Tue Sep 12, 2023

Full Length (6:30 AM-9 AM, 3 PM-5:30 PM)

All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 1106245, Location: 20.023358, -155.763442, Site Code: Ouli Subdivision



Provided by: The Traffic Management Consultant
1188 Bishop Street, Suite 1907,
Honolulu, HI, 96813, US

Leg Direction	Kawaihae Rd Eastbound					Kawaihae Rd Westbound					Waiula Dr Northbound					
Time	R	T	U	App	Ped*	T	L	U	App	Ped*	R	L	U	App	Ped*	Int
2023-09-12 6:30AM	1	15	0	16	0	109	1	0	110	0	2	2	0	4	0	130
6:45AM	2	17	0	19	0	89	2	0	91	0	5	4	0	9	0	119
Hourly Total	3	32	0	35	0	198	3	0	201	0	7	6	0	13	0	249
7:00AM	0	28	0	28	0	114	2	0	116	0	2	6	0	8	0	152
7:15AM	0	46	0	46	0	122	0	0	122	0	8	1	0	9	0	177
7:30AM	1	45	0	46	0	106	0	0	106	0	2	2	0	4	0	156
7:45AM	0	39	0	39	0	94	1	0	95	0	2	1	0	3	0	137
Hourly Total	1	158	0	159	0	436	3	0	439	0	14	10	0	24	0	622
8:00AM	2	56	0	58	0	79	1	0	80	0	3	0	0	3	0	141
8:15AM	2	43	0	45	0	95	3	0	98	0	7	3	0	10	0	153
8:30AM	1	39	0	40	0	104	3	0	107	0	4	2	0	6	0	153
8:45AM	0	51	0	51	0	65	2	0	67	0	2	2	0	4	0	122
Hourly Total	5	189	0	194	0	343	9	0	352	0	16	7	0	23	0	569
3:00PM	5	93	0	98	0	59	1	0	60	0	4	0	0	4	0	162
3:15PM	7	114	0	121	0	64	5	0	69	0	1	3	0	4	0	194
3:30PM	2	110	0	112	0	62	5	0	67	0	2	0	0	2	0	181
3:45PM	4	98	0	102	0	58	3	0	61	0	1	0	0	1	0	164
Hourly Total	18	415	0	433	0	243	14	0	257	0	8	3	0	11	0	701
4:00PM	4	90	0	94	0	50	2	0	52	0	7	2	0	9	0	155
4:15PM	6	132	0	138	0	53	1	0	54	0	2	1	0	3	0	195
4:30PM	2	115	0	117	0	57	3	0	60	0	2	3	0	5	0	182
4:45PM	1	102	0	103	0	58	9	0	67	0	2	0	0	2	0	172
Hourly Total	13	439	0	452	0	218	15	0	233	0	13	6	0	19	0	704
5:00PM	1	82	0	83	0	51	1	0	52	0	4	0	0	4	0	139
5:15PM	0	92	0	92	0	41	2	0	43	0	0	2	0	2	0	137
Hourly Total	1	174	0	175	0	92	3	0	95	0	4	2	0	6	0	276
2023-09-13 6:30AM	2	8	0	10	0	113	2	0	115	0	3	5	0	8	0	133
6:45AM	3	19	0	22	0	97	1	0	98	0	6	4	0	10	0	130
Hourly Total	5	27	0	32	0	210	3	0	213	0	9	9	0	18	0	263
7:00AM	0	31	0	31	0	94	1	0	95	0	3	6	0	9	0	135
7:15AM	0	45	0	45	0	117	2	0	119	0	8	2	0	10	1	174
7:30AM	1	55	0	56	0	106	3	0	109	0	2	5	0	7	0	172
7:45AM	1	51	0	52	0	101	2	0	103	0	3	3	0	6	0	161
Hourly Total	2	182	0	184	0	418	8	0	426	0	16	16	0	32	1	642
8:00AM	2	43	0	45	0	71	1	0	72	0	3	1	0	4	0	121
8:15AM	0	38	0	38	0	94	2	0	96	0	3	1	0	4	0	138
8:30AM	3	54	0	57	0	103	3	0	106	0	1	4	0	5	0	168

Leg Direction	Kawaihae Rd Eastbound					Kawaihae Rd Westbound					Waiula Dr Northbound					
Time	R	T	U	App	Ped*	T	L	U	App	Ped*	R	L	U	App	Ped*	Int
8:45AM	0	34	0	34	0	75	0	0	75	0	3	0	0	3	0	112
Hourly Total	5	169	0	174	0	343	6	0	349	0	10	6	0	16	0	539
3:00PM	4	74	0	78	0	52	3	0	55	0	4	3	0	7	0	140
3:15PM	1	125	0	126	0	64	5	0	69	0	1	2	0	3	0	198
3:30PM	6	105	0	111	0	59	4	0	63	0	2	0	0	2	0	176
3:45PM	2	121	0	123	0	44	2	0	46	0	4	0	0	4	0	173
Hourly Total	13	425	0	438	0	219	14	0	233	0	11	5	0	16	0	687
4:00PM	2	102	0	104	0	43	2	0	45	0	2	3	0	5	0	154
4:15PM	2	105	0	107	0	56	3	0	59	0	1	1	0	2	0	168
4:30PM	7	101	0	108	0	59	1	0	60	0	1	0	0	1	0	169
4:45PM	4	91	0	95	0	55	2	0	57	0	2	2	0	4	0	156
Hourly Total	15	399	0	414	0	213	8	0	221	0	6	6	0	12	0	647
5:00PM	1	97	0	98	0	41	5	0	46	0	5	1	0	6	0	150
5:15PM	2	96	0	98	0	60	4	0	64	0	2	2	0	4	0	166
Hourly Total	3	193	0	196	0	101	9	0	110	0	7	3	0	10	0	316
2023-09-14 6:30AM	2	14	0	16	0	99	2	0	101	0	1	1	0	2	0	119
6:45AM	1	20	0	21	0	108	2	0	110	0	4	5	0	9	0	140
Hourly Total	3	34	0	37	0	207	4	0	211	0	5	6	0	11	0	259
7:00AM	0	28	0	28	0	93	1	0	94	0	8	6	0	14	0	136
7:15AM	0	55	0	55	0	111	1	0	112	0	4	0	0	4	0	171
7:30AM	0	54	0	54	0	94	0	0	94	0	2	3	0	5	0	153
7:45AM	0	43	0	43	0	78	2	0	80	0	2	2	0	4	0	127
Hourly Total	0	180	0	180	0	376	4	0	380	0	16	11	0	27	0	587
8:00AM	3	56	0	59	0	71	0	0	71	0	3	1	0	4	0	134
8:15AM	2	48	0	50	0	95	0	0	95	0	3	2	0	5	0	150
8:30AM	0	34	0	34	0	105	0	0	105	0	2	2	0	4	0	143
8:45AM	2	41	0	43	0	75	1	0	76	0	1	2	0	3	0	122
Hourly Total	7	179	0	186	0	346	1	0	347	0	9	7	0	16	0	549
Total	94	3195	0	3289	0	3963	104	0	4067	0	151	103	0	254	1	7610
% Approach	2.9%	97.1%	0%	-	-	97.4%	2.6%	0%	-	-	59.4%	40.6%	0%	-	-	-
% Total	1.2%	42.0%	0%	43.2%	-	52.1%	1.4%	0%	53.4%	-	2.0%	1.4%	0%	3.3%	-	-
Motorcycles	0	12	0	12	-	3	0	0	3	-	0	0	0	0	-	15
% Motorcycles	0%	0.4%	0%	0.4%	-	0.1%	0%	0%	0.1%	-	0%	0%	0%	0%	-	0.2%
Lights	88	3018	0	3106	-	3746	90	0	3836	-	131	101	0	232	-	7174
% Lights	93.6%	94.5%	0%	94.4%	-	94.5%	86.5%	0%	94.3%	-	86.8%	98.1%	0%	91.3%	-	94.3%
Single-Unit Trucks	0	60	0	60	-	78	1	0	79	-	0	2	0	2	-	141
% Single-Unit Trucks	0%	1.9%	0%	1.8%	-	2.0%	1.0%	0%	1.9%	-	0%	1.9%	0%	0.8%	-	1.9%
Articulated Trucks	0	82	0	82	-	115	0	0	115	-	0	0	0	0	-	197
% Articulated Trucks	0%	2.6%	0%	2.5%	-	2.9%	0%	0%	2.8%	-	0%	0%	0%	0%	-	2.6%
Buses	6	21	0	27	-	21	13	0	34	-	20	0	0	20	-	81
% Buses	6.4%	0.7%	0%	0.8%	-	0.5%	12.5%	0%	0.8%	-	13.2%	0%	0%	7.9%	-	1.1%
Bicycles on Road	0	2	0	2	-	0	0	0	0	-	0	0	0	0	-	2
% Bicycles on Road	0%	0.1%	0%	0.1%	-	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%	-

Leg Direction	Kawaihae Rd Eastbound					Kawaihae Rd Westbound					Waiula Dr Northbound					
Time	R	T	U	App	Ped*	T	L	U	App	Ped*	R	L	U	App	Ped*	Int
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-

*Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Waiula Dr Kawaihae Rd - TMC

Tue Sep 12, 2023

Full Length (6:30 AM-9 AM, 3 PM-5:30 PM)

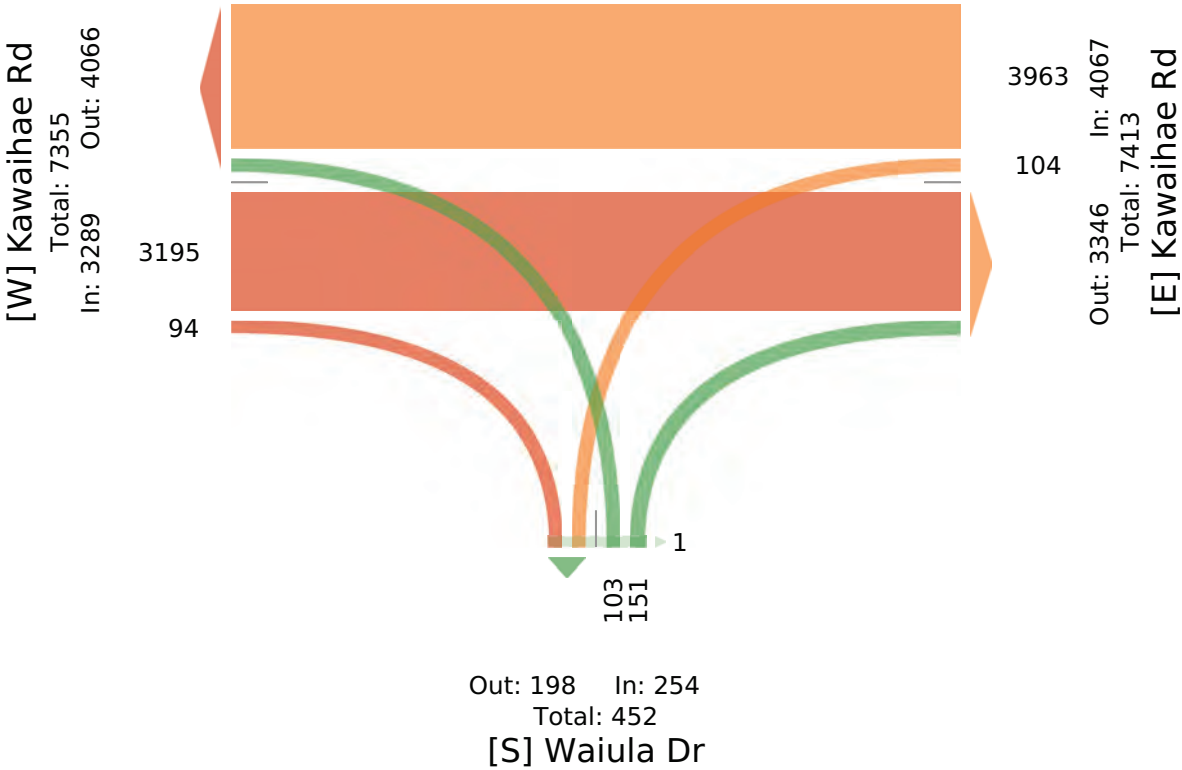
All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 1106245, Location: 20.023358, -155.763442, Site Code: Ouli Subdivision



Provided by: The Traffic Management Consultant
1188 Bishop Street, Suite 1907,
Honolulu, HI, 96813, US



Waiula Dr Kawaihae Rd - TMC

Tue Sep 12, 2023

PM Peak (Sep 12 2023 4PM - 5 PM) - Overall Peak Hour

All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 1106245, Location: 20.023358, -155.763442, Site Code: Ouli Subdivision



Provided by: The Traffic Management Consultant
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Honolulu, HI, 96813, US

Leg Direction	Kawaihae Rd Eastbound					Kawaihae Rd Westbound					Waiula Dr Northbound					
Time	R	T	U	App	Ped*	T	L	U	App	Ped*	R	L	U	App	Ped*	Int
2023-09-12 4:00PM	4	90	0	94	0	50	2	0	52	0	7	2	0	9	0	155
4:15PM	6	132	0	138	0	53	1	0	54	0	2	1	0	3	0	195
4:30PM	2	115	0	117	0	57	3	0	60	0	2	3	0	5	0	182
4:45PM	1	102	0	103	0	58	9	0	67	0	2	0	0	2	0	172
Total	13	439	0	452	0	218	15	0	233	0	13	6	0	19	0	704
% Approach	2.9%	97.1%	0%	-	-	93.6%	6.4%	0%	-	-	68.4%	31.6%	0%	-	-	-
% Total	1.8%	62.4%	0%	64.2%	-	31.0%	2.1%	0%	33.1%	-	1.8%	0.9%	0%	2.7%	-	-
PHF	0.542	0.831	-	0.819	-	0.940	0.417	-	0.869	-	0.464	0.500	-	0.528	-	0.903
Motorcycles	0	1	0	1	-	0	0	0	0	-	0	0	0	0	-	1
% Motorcycles	0%	0.2%	0%	0.2%	-	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0.1%
Lights	13	428	0	441	-	214	12	0	226	-	11	6	0	17	-	684
% Lights	100%	97.5%	0%	97.6%	-	98.2%	80.0%	0%	97.0%	-	84.6%	100%	0%	89.5%	-	97.2%
Single-Unit Trucks	0	1	0	1	-	3	0	0	3	-	0	0	0	0	-	4
% Single-Unit Trucks	0%	0.2%	0%	0.2%	-	1.4%	0%	0%	1.3%	-	0%	0%	0%	0%	-	0.6%
Articulated Trucks	0	5	0	5	-	0	0	0	0	-	0	0	0	0	-	5
% Articulated Trucks	0%	1.1%	0%	1.1%	-	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0.7%
Buses	0	4	0	4	-	1	3	0	4	-	2	0	0	2	-	10
% Buses	0%	0.9%	0%	0.9%	-	0.5%	20.0%	0%	1.7%	-	15.4%	0%	0%	10.5%	-	1.4%
Bicycles on Road	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0
% Bicycles on Road	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Waiula Dr Kawaihae Rd - TMC

Tue Sep 12, 2023

PM Peak (Sep 12 2023 4PM - 5 PM) - Overall Peak Hour

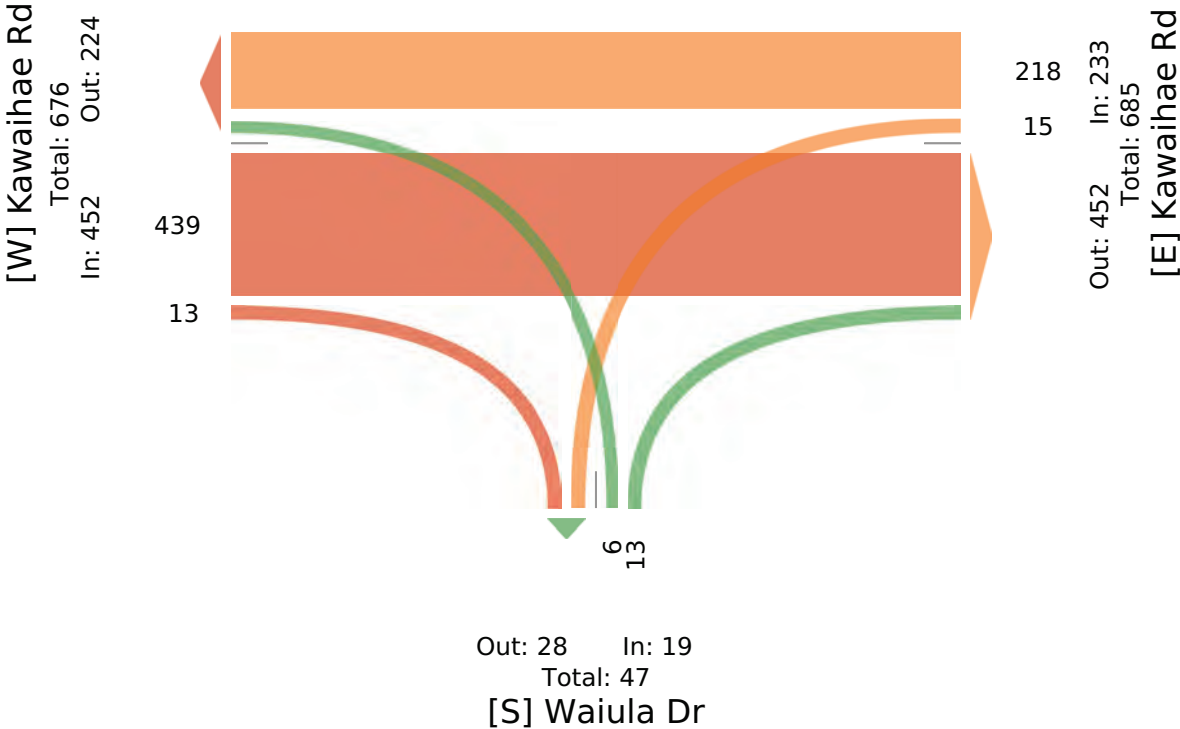
All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 1106245, Location: 20.023358, -155.763442, Site Code: Ouli Subdivision



Provided by: The Traffic Management Consultant
1188 Bishop Street, Suite 1907,
Honolulu, HI, 96813, US



Waiula Dr Kawaihae Rd - TMC

Wed Sep 13, 2023

AM Peak (Sep 13 2023 7AM - 8 AM)

All Classes (Motorcycles, Lights, Single-Unit Trucks, Articulated Trucks, Buses, Pedestrians, Bicycles on Road, Bicycles on Crosswalk)

All Movements

ID: 1106245, Location: 20.023358, -155.763442, Site Code: Ouli Subdivision



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Leg Direction	Kawaihae Rd Eastbound					Kawaihae Rd Westbound					Waiula Dr Northbound					
Time	R	T	U	App	Ped*	T	L	U	App	Ped*	R	L	U	App	Ped*	Int
2023-09-13 7:00AM	0	31	0	31	0	94	1	0	95	0	3	6	0	9	0	135
7:15AM	0	45	0	45	0	117	2	0	119	0	8	2	0	10	1	174
7:30AM	1	55	0	56	0	106	3	0	109	0	2	5	0	7	0	172
7:45AM	1	51	0	52	0	101	2	0	103	0	3	3	0	6	0	161
Total	2	182	0	184	0	418	8	0	426	0	16	16	0	32	1	642
% Approach	1.1%	98.9%	0%	-	-	98.1%	1.9%	0%	-	-	50.0%	50.0%	0%	-	-	-
% Total	0.3%	28.3%	0%	28.7%	-	65.1%	1.2%	0%	66.4%	-	2.5%	2.5%	0%	5.0%	-	-
PHF	0.500	0.823	-	0.817	-	0.893	0.667	-	0.895	-	0.500	0.667	-	0.800	-	0.926
Motorcycles	0	0	0	0	-	1	0	0	1	-	0	0	0	0	-	1
% Motorcycles	0%	0%	0%	0%	-	0.2%	0%	0%	0.2%	-	0%	0%	0%	0%	-	0.2%
Lights	2	158	0	160	-	384	7	0	391	-	14	16	0	30	-	581
% Lights	100%	86.8%	0%	87.0%	-	91.9%	87.5%	0%	91.8%	-	87.5%	100%	0%	93.8%	-	90.5%
Single-Unit Trucks	0	8	0	8	-	12	0	0	12	-	0	0	0	0	-	20
% Single-Unit Trucks	0%	4.4%	0%	4.3%	-	2.9%	0%	0%	2.8%	-	0%	0%	0%	0%	-	3.1%
Articulated Trucks	0	14	0	14	-	18	0	0	18	-	0	0	0	0	-	32
% Articulated Trucks	0%	7.7%	0%	7.6%	-	4.3%	0%	0%	4.2%	-	0%	0%	0%	0%	-	5.0%
Buses	0	1	0	1	-	3	1	0	4	-	2	0	0	2	-	7
% Buses	0%	0.5%	0%	0.5%	-	0.7%	12.5%	0%	0.9%	-	12.5%	0%	0%	6.3%	-	1.1%
Bicycles on Road	0	1	0	1	-	0	0	0	0	-	0	0	0	0	-	1
% Bicycles on Road	0%	0.5%	0%	0.5%	-	0%	0%	0%	0%	-	0%	0%	0%	0%	-	0.2%
Pedestrians	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%	-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100%	-

* Pedestrians and Bicycles on Crosswalk. L: Left, R: Right, T: Thru, U: U-Turn

Waiula Dr Kawaihae Rd - TMC

Wed Sep 13, 2023

AM Peak (Sep 13 2023 7AM - 8 AM)

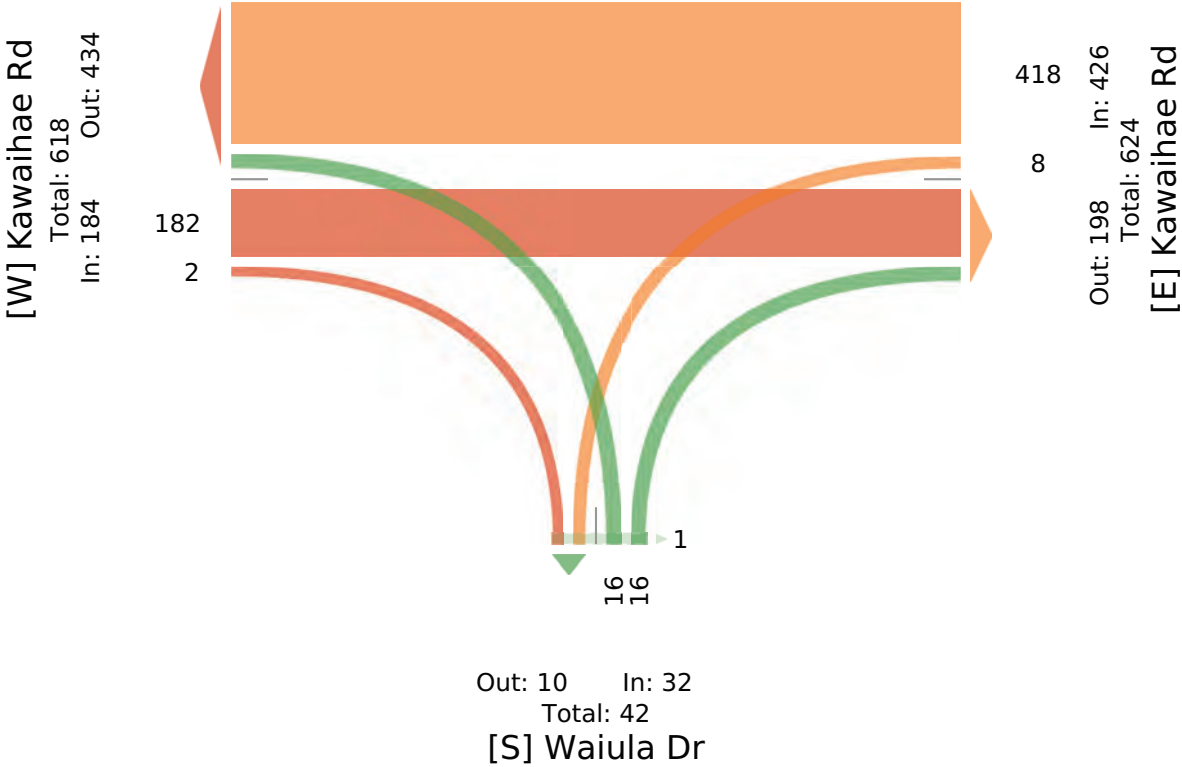
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All Movements

ID: 1106245, Location: 20.023358, -155.763442, Site Code: Ouli Subdivision



Provided by: The Traffic Management Consultant
1188 Bishop Street, Suite 1907,
Honolulu, HI, 96813, US



TRAFFIC IMPACT ANALYSIS REPORT
FOR THE PROPOSED
OULI SINGLE FAMILY HOUSING
SOUTH KOHALA, HAWAI'I ISLAND
TAX MAP KEY: (3) 6-2-001: 075

APPENDIX B
CAPACITY ANALYSIS WORKSHEETS
EXISTING TRAFFIC CONDITIONS

Intersection						
Int Delay, s/veh	0.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	182	2	8	418	16	16
Future Vol, veh/h	182	2	8	418	16	16
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	50	25	7	0	19
Mvmt Flow	198	2	9	454	17	17
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	201	0	672	200
Stage 1	-	-	-	-	200	-
Stage 2	-	-	-	-	472	-
Critical Hdwy	-	-	4.35	-	6.4	6.39
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.425	-	3.5	3.471
Pot Cap-1 Maneuver	-	-	1245	-	424	800
Stage 1	-	-	-	-	838	-
Stage 2	-	-	-	-	632	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1244	-	419	799
Mov Cap-2 Maneuver	-	-	-	-	419	-
Stage 1	-	-	-	-	837	-
Stage 2	-	-	-	-	626	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.1		12	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	550	-	-	1244	-	
HCM Lane V/C Ratio	0.063	-	-	0.007	-	
HCM Control Delay (s)	12	-	-	7.9	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.2	-	-	0	-	

Intersection						
Int Delay, s/veh	0.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰↱	
Traffic Vol, veh/h	439	13	15	218	6	13
Future Vol, veh/h	439	13	15	218	6	13
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	20	2	0	15
Mvmt Flow	477	14	16	237	7	14
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	492	0	754	485
Stage 1	-	-	-	-	485	-
Stage 2	-	-	-	-	269	-
Critical Hdwy	-	-	4.3	-	6.4	6.35
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.38	-	3.5	3.435
Pot Cap-1 Maneuver	-	-	985	-	380	556
Stage 1	-	-	-	-	623	-
Stage 2	-	-	-	-	781	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	984	-	372	555
Mov Cap-2 Maneuver	-	-	-	-	372	-
Stage 1	-	-	-	-	622	-
Stage 2	-	-	-	-	766	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0.6		12.8		
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	480	-	-	984	-	
HCM Lane V/C Ratio	0.043	-	-	0.017	-	
HCM Control Delay (s)	12.8	-	-	8.7	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-	

TRAFFIC IMPACT ANALYSIS REPORT
FOR THE PROPOSED
OULI SINGLE FAMILY HOUSING
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TAX MAP KEY: (3) 6-2-001: 075

APPENDIX C
CAPACITY ANALYSIS WORKSHEETS
PEAK HOUR TRAFFIC WITHOUT PROJECT

Intersection

Int Delay, s/veh 0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	200	3	11	460	22	22
Future Vol, veh/h	200	3	11	460	22	22
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	50	25	7	0	19
Mvmt Flow	217	3	12	500	24	24

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	221
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.35
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.425
Pot Cap-1 Maneuver	-	-	1223
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1222
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	12.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	510	-	-	1222	-
HCM Lane V/C Ratio	0.094	-	-	0.01	-
HCM Control Delay (s)	12.8	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0	-

Intersection						
Int Delay, s/veh	0.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	483	18	22	240	9	17
Future Vol, veh/h	483	18	22	240	9	17
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	20	2	0	15
Mvmt Flow	525	20	24	261	10	18
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	546	0	845	536
Stage 1	-	-	-	-	536	-
Stage 2	-	-	-	-	309	-
Critical Hdwy	-	-	4.3	-	6.4	6.35
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.38	-	3.5	3.435
Pot Cap-1 Maneuver	-	-	939	-	336	520
Stage 1	-	-	-	-	591	-
Stage 2	-	-	-	-	749	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	938	-	326	520
Mov Cap-2 Maneuver	-	-	-	-	326	-
Stage 1	-	-	-	-	590	-
Stage 2	-	-	-	-	727	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0.8		13.9		
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	431	-	-	938	-	
HCM Lane V/C Ratio	0.066	-	-	0.025	-	
HCM Control Delay (s)	13.9	-	-	8.9	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-	

Intersection						
Int Delay, s/veh	0.9					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	218	3	12	502	23	23
Future Vol, veh/h	218	3	12	502	23	23
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	50	25	7	0	19
Mvmt Flow	237	3	13	546	25	25
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	241	0	812	240
Stage 1	-	-	-	-	240	-
Stage 2	-	-	-	-	572	-
Critical Hdwy	-	-	4.35	-	6.4	6.39
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.425	-	3.5	3.471
Pot Cap-1 Maneuver	-	-	1202	-	351	759
Stage 1	-	-	-	-	805	-
Stage 2	-	-	-	-	569	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1201	-	345	758
Mov Cap-2 Maneuver	-	-	-	-	345	-
Stage 1	-	-	-	-	804	-
Stage 2	-	-	-	-	560	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0.2		13.5		
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	474	-	-	1201	-	
HCM Lane V/C Ratio	0.105	-	-	0.011	-	
HCM Control Delay (s)	13.5	-	-	8	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.4	-	-	0	-	

Intersection						
Int Delay, s/veh	0.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰↱	
Traffic Vol, veh/h	527	20	23	262	9	19
Future Vol, veh/h	527	20	23	262	9	19
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None		-	None	
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	20	2	0	15
Mvmt Flow	573	22	25	285	10	21
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	596	0	920	585
Stage 1	-	-	-	-	585	-
Stage 2	-	-	-	-	335	-
Critical Hdwy	-	-	4.3	-	6.4	6.35
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.38	-	3.5	3.435
Pot Cap-1 Maneuver	-	-	898	-	303	487
Stage 1	-	-	-	-	561	-
Stage 2	-	-	-	-	729	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	897	-	293	487
Mov Cap-2 Maneuver	-	-	-	-	293	-
Stage 1	-	-	-	-	560	-
Stage 2	-	-	-	-	705	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0.7		14.7		
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	402	-	-	897	-	
HCM Lane V/C Ratio	0.076	-	-	0.028	-	
HCM Control Delay (s)	14.7	-	-	9.1	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-	

Intersection						
Int Delay, s/veh	1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↶			↷	↶↷	
Traffic Vol, veh/h	255	4	13	585	26	26
Future Vol, veh/h	255	4	13	585	26	26
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	50	25	7	0	19
Mvmt Flow	277	4	14	636	28	28
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	282	0	944	280
Stage 1	-	-	-	-	280	-
Stage 2	-	-	-	-	664	-
Critical Hdwy	-	-	4.35	-	6.4	6.39
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.425	-	3.5	3.471
Pot Cap-1 Maneuver	-	-	1159	-	293	720
Stage 1	-	-	-	-	772	-
Stage 2	-	-	-	-	516	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1158	-	287	719
Mov Cap-2 Maneuver	-	-	-	-	287	-
Stage 1	-	-	-	-	771	-
Stage 2	-	-	-	-	506	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0.2		15.2		
HCM LOS					C	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	410	-	-	1158	-	
HCM Lane V/C Ratio	0.138	-	-	0.012	-	
HCM Control Delay (s)	15.2	-	-	8.1	0	
HCM Lane LOS	C	-	-	A	A	
HCM 95th %tile Q(veh)	0.5	-	-	0	-	

Intersection						
Int Delay, s/veh	0.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	615	22	26	305	10	21
Future Vol, veh/h	615	22	26	305	10	21
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	20	2	0	15
Mvmt Flow	668	24	28	332	11	23
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	693	0	1069	681
Stage 1	-	-	-	-	681	-
Stage 2	-	-	-	-	388	-
Critical Hdwy	-	-	4.3	-	6.4	6.35
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.38	-	3.5	3.435
Pot Cap-1 Maneuver	-	-	824	-	247	429
Stage 1	-	-	-	-	506	-
Stage 2	-	-	-	-	690	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	823	-	236	429
Mov Cap-2 Maneuver	-	-	-	-	236	-
Stage 1	-	-	-	-	505	-
Stage 2	-	-	-	-	661	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0.7		16.8		
HCM LOS	C					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	339	-	-	823	-	
HCM Lane V/C Ratio	0.099	-	-	0.034	-	
HCM Control Delay (s)	16.8	-	-	9.5	0	
HCM Lane LOS	C	-	-	A	A	
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-	

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APPENDIX D
CAPACITY ANALYSIS WORKSHEETS
PEAK HOUR TRAFFIC WITH PROJECT

Intersection						
Int Delay, s/veh	1.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↶			↷	↶↷	
Traffic Vol, veh/h	200	4	19	460	35	35
Future Vol, veh/h	200	4	19	460	35	35
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	25	15	7	0	11
Mvmt Flow	217	4	21	500	38	38
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	222	0	762	220
Stage 1	-	-	-	-	220	-
Stage 2	-	-	-	-	542	-
Critical Hdwy	-	-	4.25	-	6.4	6.31
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.335	-	3.5	3.399
Pot Cap-1 Maneuver	-	-	1274	-	376	798
Stage 1	-	-	-	-	821	-
Stage 2	-	-	-	-	587	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1273	-	367	797
Mov Cap-2 Maneuver	-	-	-	-	367	-
Stage 1	-	-	-	-	820	-
Stage 2	-	-	-	-	573	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0.3		13.4		
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	503	-	-	1273	-	
HCM Lane V/C Ratio	0.151	-	-	0.016	-	
HCM Control Delay (s)	13.4	-	-	7.9	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.5	-	-	0	-	

Intersection						
Int Delay, s/veh	1.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰↱	
Traffic Vol, veh/h	483	31	37	240	14	29
Future Vol, veh/h	483	31	37	240	14	29
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None		-	None	
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	12	2	0	9
Mvmt Flow	525	34	40	261	15	32
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	560	0	884	543
Stage 1	-	-	-	-	543	-
Stage 2	-	-	-	-	341	-
Critical Hdwy	-	-	4.22	-	6.4	6.29
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.308	-	3.5	3.381
Pot Cap-1 Maneuver	-	-	963	-	318	526
Stage 1	-	-	-	-	586	-
Stage 2	-	-	-	-	725	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	962	-	302	525
Mov Cap-2 Maneuver	-	-	-	-	302	-
Stage 1	-	-	-	-	585	-
Stage 2	-	-	-	-	689	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	1.2		14.6		
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	423	-	-	962	-	
HCM Lane V/C Ratio	0.11	-	-	0.042	-	
HCM Control Delay (s)	14.6	-	-	8.9	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-	

Intersection						
Int Delay, s/veh	1.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	218	4	20	502	36	36
Future Vol, veh/h	218	4	20	502	36	36
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	25	15	7	0	11
Mvmt Flow	237	4	22	546	39	39
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	242	0	830	240
Stage 1	-	-	-	-	240	-
Stage 2	-	-	-	-	590	-
Critical Hdwy	-	-	4.25	-	6.4	6.31
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.335	-	3.5	3.399
Pot Cap-1 Maneuver	-	-	1252	-	343	777
Stage 1	-	-	-	-	805	-
Stage 2	-	-	-	-	558	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1251	-	334	776
Mov Cap-2 Maneuver	-	-	-	-	334	-
Stage 1	-	-	-	-	804	-
Stage 2	-	-	-	-	544	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0.3		14.3		
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	467	-	-	1251	-	
HCM Lane V/C Ratio	0.168	-	-	0.017	-	
HCM Control Delay (s)	14.3	-	-	7.9	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.6	-	-	0.1	-	

Intersection						
Int Delay, s/veh	1.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	527	33	38	262	14	31
Future Vol, veh/h	527	33	38	262	14	31
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	12	2	0	9
Mvmt Flow	573	36	41	285	15	34
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	610	0	959	592
Stage 1	-	-	-	-	592	-
Stage 2	-	-	-	-	367	-
Critical Hdwy	-	-	4.22	-	6.4	6.29
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.308	-	3.5	3.381
Pot Cap-1 Maneuver	-	-	922	-	288	493
Stage 1	-	-	-	-	557	-
Stage 2	-	-	-	-	705	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	921	-	272	493
Mov Cap-2 Maneuver	-	-	-	-	272	-
Stage 1	-	-	-	-	556	-
Stage 2	-	-	-	-	668	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	1.2		15.4		
HCM LOS	C					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	394	-	-	921	-	
HCM Lane V/C Ratio	0.124	-	-	0.045	-	
HCM Control Delay (s)	15.4	-	-	9.1	0	
HCM Lane LOS	C	-	-	A	A	
HCM 95th %tile Q(veh)	0.4	-	-	0.1	-	

Intersection						
Int Delay, s/veh	1.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰↱	
Traffic Vol, veh/h	255	5	21	585	39	39
Future Vol, veh/h	255	5	21	585	39	39
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None		-	None	
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	5	25	15	7	0	11
Mvmt Flow	277	5	23	636	42	42
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	283	0	963	281
Stage 1	-	-	-	-	281	-
Stage 2	-	-	-	-	682	-
Critical Hdwy	-	-	4.25	-	6.4	6.31
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.335	-	3.5	3.399
Pot Cap-1 Maneuver	-	-	1208	-	286	737
Stage 1	-	-	-	-	771	-
Stage 2	-	-	-	-	506	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1207	-	277	736
Mov Cap-2 Maneuver	-	-	-	-	277	-
Stage 1	-	-	-	-	770	-
Stage 2	-	-	-	-	491	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.3		16.3	
HCM LOS					C	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	403	-	-	1207	-	
HCM Lane V/C Ratio	0.21	-	-	0.019	-	
HCM Control Delay (s)	16.3	-	-	8	0	
HCM Lane LOS	C	-	-	A	A	
HCM 95th %tile Q(veh)	0.8	-	-	0.1	-	

Intersection						
Int Delay, s/veh	1.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	615	35	41	305	15	33
Future Vol, veh/h	615	35	41	305	15	33
Conflicting Peds, #/hr	0	1	1	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	0	12	2	0	9
Mvmt Flow	668	38	45	332	16	36
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	707	0	1110	688
Stage 1	-	-	-	-	688	-
Stage 2	-	-	-	-	422	-
Critical Hdwy	-	-	4.22	-	6.4	6.29
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.308	-	3.5	3.381
Pot Cap-1 Maneuver	-	-	847	-	234	434
Stage 1	-	-	-	-	503	-
Stage 2	-	-	-	-	666	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	846	-	219	434
Mov Cap-2 Maneuver	-	-	-	-	219	-
Stage 1	-	-	-	-	502	-
Stage 2	-	-	-	-	623	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	1.1		17.9		
HCM LOS	C					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	332	-	-	846	-	
HCM Lane V/C Ratio	0.157	-	-	0.053	-	
HCM Control Delay (s)	17.9	-	-	9.5	0	
HCM Lane LOS	C	-	-	A	A	
HCM 95th %tile Q(veh)	0.6	-	-	0.2	-	

GEOTECHNICAL ENGINEERING EXPLORATION

OULI AFFORDABLE HOUSING DEVELOPMENT, PHASE 1

TMK: (3) 6-2-001: 075

WAIMEA, ISLAND OF HAWAII

JUNE 19, 2024

Prepared for:

HAWAII ISLAND COMMUNITY DEVELOPMENT CORPORATION

PROJECT NO. 012323-00



Kokua Geotech LLC

Soil and Foundation Engineering

June 19, 2024
Project No. 012323-00

Hawaii Island Community Development Corporation
100 Pauahi Street, Suite 201
Hilo, HI 96720

Attention: Mr. Keith Kato

Subject: **Geotechnical Engineering Exploration**
Ouli Affordable Housing Development, Phase 1
TMK: (3) 6-2-001: 075
Waimea, Island of Hawaii

Dear **Mr. Kato**:

We are pleased to submit this report entitled "Geotechnical Engineering Exploration, Ouli Affordable Housing Development, Phase 1, TMK: (3) 6-2-001: 075, Waimea, Island of Hawaii" prepared for the design of the project.

The purpose of our field exploration and this report was to generally evaluate the subsurface conditions underlying the project site and provide geotechnical recommendations to assist in the design of the project. Our work was performed in general accordance with the scope of services outlined in our revised fee proposal dated November 20, 2023.

Our findings and recommendations are summarized as follows:

1. Our field exploration generally encountered volcanic ash soils overlying basalt lava flows consisting of weathered clinker materials and basalt rock formation extending down to the maximum depth explored of about 17 feet below the existing ground surface. The volcanic ash soils were encountered to depths ranging from about 1 to 6.5 feet below the existing ground surface and generally consisted of stiff to very stiff sandy silt with some gravel and cobbles and medium dense to very dense silty sand and gravel with some cobbles and boulders.

Weathered clinker materials generally consisting of medium dense to very dense silty sand and gravel with some cobbles and boulders were encountered underlying the volcanic ash soils to depths ranging from about 3 to 10.5 feet below the existing ground surface. Medium hard to hard basalt rock formation was encountered underlying the volcanic ash soils and weathered clinker materials and extended down to the maximum depth explored of about 17 feet below the existing ground surface.

2. We did not encounter groundwater in the borings/test pits at the time of our field exploration. However, it should be noted that groundwater levels are subject to change due to rainfall, time of year, seasonal precipitation, surface water runoff, and other factors. In addition, subterranean seepage may be encountered during construction due to high rainfall in the area, sloping terrain and relict structure in the clinker materials and basalt rock formation encountered.
3. In general, the on-site soils may be re-used as a source of general fill material, provided they are free of vegetation, deleterious materials, and rock fragments greater than 6 inches in maximum dimension. In addition, we believe fill materials with rock fragments up to 12 inches in maximum dimension may be used below a depth of 4 feet below finished grades provided the grading contractor has sufficient heavy equipment to effectively compact the fill materials.
4. It should be noted that the excavated rock materials will likely need to be processed and crushed to reduce the materials to a relatively well-graded granular material with maximum rock fragment sizes of 6 and 12 inches. In addition, the volcanic ash soils encountered in the borings and test pits were observed to be in a dry, billowy condition at the time of our field exploration. Therefore, these materials may require moisture conditioning to improve their workability when used as general fill material.
5. Based on the subsurface conditions encountered at the project site, we believe the planned building structures may be supported on a shallow foundation system consisting of spread and/or continuous footings or concrete slabs-on-grade with thickened edge footings. To provide a firm and unyielding bearing layer, we recommend placing a minimum 12-inch thick layer of non-expansive structural fill material below the foundations and slabs-on-grade. The structural fill should be compacted to a minimum of 90 percent relative compaction.
6. Structural fill should be imported, non-expansive granular material, such as crushed coral or basalt. The structural fill should be well-graded from coarse to fine with particles no larger than 3 inches in largest dimension. The material should have a CBR value of 20 or higher and a swell potential of 1 percent or less when tested in accordance with ASTM D1883. The material should also contain between 10 and 30 percent particles passing the No. 200 sieve.
7. Based on our experience in the area, cavities and/or voids are commonly encountered in the pahoehoe basalt lava flows that characterize the project site. To reduce the potential for loss of foundation support resulting from collapse of cavities below the shallow foundations of the building structures, we recommend implementing a program of cavity probing and grouting during construction below the structure foundations that are constructed directly on the basalt rock formation.

However, due to relatively light loads anticipated and potential budget constraints, a proof-rolling program described in the “Site Grading” section presented herein may be considered instead of the probing and grouting program if some risk is acceptable to the owner. If a higher level of assurance is desired to reduce the risk of settlement due to collapse of cavities, then a probing and grouting program should be implemented.

8. The construction plans and specifications for the project should be forwarded to us for review to determine whether the recommendations contained in this report are adequately reflected in those documents. If this review is not made, Kokua Geotech LLC cannot assume responsibility for misinterpretation of our recommendations.
9. Kokua Geotech LLC should also be retained to monitor the site and subgrade preparation, proof-rolling of pavement subgrade, aggregate base course placement, and other aspects of earthwork construction to determine whether the recommendations of this report are followed. The recommendations presented herein are contingent upon such observations.

If the actual exposed subsurface soil conditions encountered during construction differ from those assumed or considered in this report, Kokua Geotech LLC should be contacted to review and/or revise the geotechnical recommendations presented herein.

Detailed discussion of our findings and geotechnical engineering recommendations are contained in the body of this report. We appreciate the opportunity to be of service for this project. Should you have any questions concerning this report, please contact our office.

Very truly yours,

Kokua Geotech LLC



Xiaobin (Tim) Lin, P.E.
President

TABLE OF CONTENTS

	PAGE
SECTION 1.0 INTRODUCTION	1
1.1 PROJECT CONSIDERATIONS	1
1.2 PURPOSE AND SCOPE OF WORK.....	2
SECTION 2.0 SITE CHARACTERIZATION AND FINDINGS	4
2.1 GENERAL SITE GEOLOGY	4
2.2 SITE DESCRIPTION	5
2.3 FIELD EXPLORATION.....	5
2.4 SUBSURFACE CONDITIONS	7
2.5 LABORATORY TESTING.....	8
2.6 SEISMIC DESIGN CONSIDERATIONS	9
SECTION 3.0 DISCUSSION AND RECOMMENDATIONS.....	11
3.1 SITE GRADING	13
3.1.1 SITE AND SUBGRADE PREPARATION.....	14
3.1.2 EXCAVATIONS.....	15
3.1.3 FILL/BACKFILL MATERIALS.....	15
3.1.4 FILL/BACKFILL COMPACTION REQUIREMENTS	16
3.1.5 CUT AND FILL SLOPES.....	17
3.2 BUILDING FOUNDATIONS	18
3.3 FOUNDATION PROBING	20
3.4 SLABS-ON-GRADE.....	21
3.5 RETAINING STRUCTURES	22
3.5.1 RETAINING STRUCTURE FOUNDATIONS	23
3.5.2 STATIC LATERAL EARTH PRESSURES.....	23
3.5.3 DYNAMIC LATERAL EARTH PRESSURES	24
3.5.4 RETAINING STRUCTURE DRAINAGE	25
3.6 PAVEMENT DESIGN.....	25
3.7 UTILITY TRENCHES	28
3.8 FIELD INFILTRATION TESTING	29
3.9 WASTEWATER DISPOSAL SYSTEMS.....	30
3.10 SITE DRAINAGE CONSIDERATIONS.....	31
3.11 DESIGN REVIEW AND CONSTRUCTION OBSERVATION SERVICES.....	31

TABLE OF CONTENTS

SECTION 4.0 LIMITATIONS	32
CLOSURE	34
 PLATES	
PROJECT LOCATION MAP	PLATE 1
SITE PLAN	PLATE 2
 APPENDIX A	
LOGS OF BORINGS & TEST PITS.....	PLATES A-1 THRU A-15
 APPENDIX B	
LABORATORY TEST RESULTS	PLATES B-1 THRU B-6
 APPENDIX C	
PHOTOGRAPHS OF ROCK CORE SAMPLES	PLATES C-1 THRU C-5
 APPENDIX D	
FIELD INFILTRATION TEST RESULTS	PLATES D-1 & D-2
 APPENDIX E	
FIELD PERCOLATION TEST RESULTS	PLATES E-1 & E-2

**GEOTECHNICAL ENGINEERING EXPLORATION
OULI AFFORDABLE HOUSING DEVELOPMENT, PHASE 1
TMK: (3) 6-2-001: 075
WAIMEA, ISLAND OF HAWAII**

SECTION 1.0 INTRODUCTION

We have performed a geotechnical engineering exploration for the *Ouli Affordable Housing Development, Phase 1* project in Waimea on the Island of Hawaii. The location and general vicinity of the project site is shown on the Project Location Map, Plate 1.

The purpose of our exploration was to observe and evaluate the general subsurface conditions at accessible locations at the project site to formulate geotechnical recommendations to assist in the design of the project. This report summarizes the findings and presents our geotechnical recommendations resulting from our site reconnaissance, field exploration, infiltration/percolation testing, laboratory testing, and engineering analyses for the project. The findings and recommendations presented herein are subject to the limitations noted at the end of this report.

1.1 PROJECT CONSIDERATIONS

The Ouli Affordable Housing development project is generally located on roughly 415 acres of mostly vacant land to the south of the intersection of Kawaihae Road and Waiula Drive in Waimea on the Island of Hawaii. Based on the information provided, we understand Phase 1 of the project is generally located on the eastern portion of the development, with 39 individual house lots planned and roughly 2,900 linear feet of roadway connecting the parcel to existing Waiula Drive. A layout of the project site is shown on the Site Plan, Plate 2.

We understand the current development plan calls for grading and foundation construction for the house lots, roadways, and related infrastructure such as drainage, sewer, water, and other utilities. Based on the preliminary grading plan provided, we anticipate cuts and fills on the order of about 12 feet deep/thick may be required to achieve the design finished grades at the project site.

In general, we understand drywells are being considered for the on-site management of storm water runoff at the project site. In addition, we understand individual wastewater systems (IWS) consisting of underground septic tanks and leach fields are planned at the project site for wastewater disposal due to the lack of a sewer connection in the area.

1.2 PURPOSE AND SCOPE OF WORK

The purpose of our services was to generally explore and evaluate the subsurface soil conditions at accessible locations at the project site to provide geotechnical recommendations to assist in the design of the project. The work was performed in general accordance with our fee revised fee proposal dated November 20, 2023. The scope of work for this exploration included the following items:

1. Coordination of boring and test pit stake-out and utility clearances by our engineer.
2. Mobilization and demobilization of an excavator and operator for mechanized trail clearing to the proposed boring locations and test pit excavations.
3. Mobilization and demobilization of a truck-mounted drill rig and two operators from the Island of Oahu to the project site and back.
4. Drilling and sampling of seven boreholes extending to depths ranging from about 10 to 17 feet below the existing ground surface. In addition, excavating and sampling of eight test pits extending to depths ranging from about 5.5 to 9 feet below the existing ground surface.
5. Performance of two field infiltration tests at selected locations to evaluate the infiltration characteristics of the subsurface materials to assist in the design of the drainage systems at the project site.
6. Performance of two field percolation tests at selected locations to evaluate the permeability of the subsurface materials for wastewater disposal.
7. Coordination of the field exploration and logging of the borings, test pits, and field infiltration/percolation testing by our field engineer.
8. Laboratory testing of selected soil samples obtained during the field exploration as an aid in classifying the materials and evaluating their engineering properties.

SECTION 1.0 INTRODUCTION

9. Analyses of the field and laboratory data to formulate geotechnical recommendations to assist in the design of the project.
10. Preparation of this report summarizing our work on the project and presenting our findings and recommendations.
11. Coordination of our overall work on the project by our project engineer.
12. Quality assurance and client/design team consultation by our principal engineer.
13. Miscellaneous work efforts such as drafting, word processing, and clerical support.

Detailed descriptions of our field exploration methodology are presented in the following section and the Logs of Borings and Test Pits are presented in Appendix A. Results of the laboratory tests performed are presented in Appendix B. Photographs of the rock core samples recovered from our borings are presented in Appendix C. Results of the field infiltration tests performed are presented in Appendix D. Results of the field percolation tests performed are presented in Appendix E.

END OF INTRODUCTION

SECTION 2.0 SITE CHARACTERIZATION AND FINDINGS

2.1 GENERAL SITE GEOLOGY

The Island of Hawaii was formed by the eruptive activity of five major shield volcanoes: Kohala, Mauna Kea, Hualalai, Mauna Loa, and Kilauea. Kohala has been long extinct while Mauna Kea has had some activity during recent geologic time. Hualalai last erupted in Year 1801 and Mauna Loa and Kilauea are both considered to be active. The project site is on the western flank of the Mauna Kea Volcano, which had been built up by the successive accumulation of basaltic lava flows and pyroclastic materials.

Based on the geologic maps of the Island of Hawaii (Sherrod and others, 2007), the general area of the project site is underlain by Lava Flows of the Hamakua Volcanics Series (Qhm) from the Mauna Kea Volcano. In general, the lava formation encountered at the site appears to consist of both a`a and pahoehoe type flows, which spread and ponded as they approached the ocean. A`a lava is typically characterized by a porous, rough, and irregular flow surface resembling a jagged accumulation of rock fragments including cobbles and boulders. Pahoehoe is characterized by a smooth, rope-like or billowy surface and an internal structure of vesicular (porous) rock.

Cavities and/or voids are commonly encountered in basaltic lavas, especially pahoehoe type lava. Cavities and/or voids form when the lava is still in a molten state, and they represent both lava tubes (intra-flow cavities) and blisters and pockets (inter-flow cavities). Lava tubes form when molten lava drains from the cooling flow, leaving a hollow tube-like structure, which may extend for a large longitudinal distance along the flow. Blisters and pockets are generally smaller in horizontal extent.

Following the cessation of volcanic activity in Kohala and Mauna Kea, activity from the other shields resulted in widespread aerial fall of ash over much of the island. This ash has weathered rapidly into a fine silty soil, which is typified by low in-situ densities and high field moisture contents. In some locales, when the field moisture content is sufficiently high, the ash

SECTION 2.0 SITE CHARACTERIZATION AND FINDINGS

soil exhibits thixotropic properties (i.e., the soil temporarily loses strength when remolded and regains its strength after internal pore pressures dissipate). In more arid areas, the ash soil exists in a dry friable state even though field moisture contents can approach 100 percent of the dry unit weight.

The surface soils underlying the project site are classified as Puu Pa (PVD) by the U.S. Soil Conservation Service in their publication “Soil Survey of Island of Hawaii, State of Hawaii” (1973). The Puu Pa (PVD) soil type is described as very dark brown extremely stony sandy loam that developed in volcanic ash. Puu Pa (PVD) is also described as being essentially non-sticky and non-plastic and having moderate erosion characteristics.

2.2 SITE DESCRIPTION

The project site is generally located on roughly 415 acres of mostly vacant land to the south of the intersection of Kawaihae Road and Waiula Drive in Waimea on the Island of Hawaii. In general, the project site is bordered by vacant land and Waiula Drive to the north, and vacant land to the south, east, and west.

Based on our field observations, the topography of the project site appears to generally slope down from the northeast to the southwest with numerous hilly areas of varying heights and slope inclinations. Based on a topographic survey plan provided, we anticipate existing ground surface elevations at the project site to range from about +1,460 to +1,380 feet Mean Sea Level (MSL) at the northeastern and southwestern portions of the project site, respectively.

At the time of our field exploration, the project site was generally covered by weed grass, small trees, and bushes. Exposed surface soils at the project site generally consisted of brown silty sand and sandy silt with varying amounts of gravel and cobbles.

2.3 FIELD EXPLORATION

We explored the subsurface conditions at the project site by drilling and sampling seven borings, designated as Boring Nos. 1 through 7, extending to depths ranging from about 10 to 17 feet below the existing ground surface and excavating and sampling eight test pits,

SECTION 2.0 SITE CHARACTERIZATION AND FINDINGS

designated as Test Pit Nos. 1 through 8, extending to depths ranging from about 5.5 to 9 feet below the existing ground surface.

The borings were drilled utilizing a truck-mounted drill rig equipped with continuous flight augers and coring tools, while the test pits were excavated using a Komatsu PC220 excavator equipped with a 24-inch wide digging bucket. In addition, bulk samples of the near-surface soils were obtained to evaluate the pavement support characteristics of the near-surface soils.

Two field infiltration tests, designated as Infiltration Test Nos. I-1 and I-2, were performed at selected locations at the project site to obtain subsurface infiltration information in support of the planning of the site drainage systems. In addition, two field percolation tests, designated as Percolation Test Nos. P-1 and P-2, were performed at selected locations to evaluate the permeability of the subsurface materials for wastewater disposal. The approximate boring, test pit, field infiltration, and field percolation locations and are shown on the Site Plan, Plate 2.

Our engineer classified the materials encountered in the borings by visual and textural examination in the field in general accordance with ASTM D2488, Standard Practice for Description and Identification of Soils, and monitored the drilling operations on a near continuous (full-time) basis. These classifications were further reviewed visually and by testing in the laboratory. Soils were classified in general accordance with ASTM D2487, Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

Soil samples were obtained in general accordance with ASTM D1586 by driving a 2-inch OD standard penetration sampler with a 140-pound hammer falling 30 inches. In addition, relatively “undisturbed” soil samples were obtained in general accordance with ASTM D3550 Ring-Lined Barrel Sampling of Soils, by driving a 3-inch OD Modified California sampler using the same hammer and drop. The blow counts needed to drive the sampler the second and third 6 inches of an 18-inch drive are shown as the “Sampling Resistance” on the Logs of Borings at the appropriate sample depths. The blow counts may need to be factored to obtain the Standard Penetration Test (SPT) blow counts.

SECTION 2.0 SITE CHARACTERIZATION AND FINDINGS

Core samples of the rock materials encountered in the borings were obtained by using diamond core drilling techniques in general accordance with ASTM D2113. Core drilling is a rotary drilling method that uses a hollow bit to cut into the rock formation. The rock material left in the hollow core of the bit is mechanically recovered for examination and description. Rock cores were described in general accordance with the Rock Description System in the publication “Suggested Methods for the Quantitative Description of Discontinuities in Rock Masses” by the International Society for Rock Mechanics (March 1977).

Core recovery is defined as the ratio of the cumulative length of the core fragments recovered versus the total length of the core run, expressed as a percentage. Rock Quality Designation (RQD) is defined as the percentage of the core run in rock that is sound material in excess of 4 inches in length without discontinuities, discounting drilling induced fractures or breaks. Generally, the following is used to describe the relative quality of the rock, based on the “Practical Handbook of Physical Properties of Rocks and Minerals (1988).” Photographs of the core samples recovered from the borehole is presented in Appendix C.

SUMMARY OF RELATIVE QUALITY OF ROCK	
<u>Rock Quality</u>	<u>RQD</u> (%)
Very Poor	0 – 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 – 100

2.4 SUBSURFACE CONDITIONS

Our borings and test pits generally encountered volcanic ash soils overlying basalt lava flows consisting of weathered clinker materials and basalt rock formation extending down to the maximum depth explored of about 17 feet below the existing ground surface. The volcanic ash soils were encountered to depths ranging from about 1 to 6.5 feet below the existing ground

surface and generally consisted of stiff to very stiff sandy silt with some gravel and cobbles and medium dense to very dense silty sand and gravel with some cobbles and boulders.

Weathered clinker materials generally consisting of medium dense to very dense silty sand and gravel with some cobbles and boulders were encountered underlying the volcanic ash soils to depths ranging from about 3 to 10.5 feet below the existing ground surface. Medium hard to hard basalt rock formation was encountered underlying the volcanic ash soils and weathered clinker materials and extended down to the maximum depth explored of about 17 feet below the existing ground surface.

We did not encounter groundwater in the borings and test pits at the time of our field exploration. However, it should be noted that groundwater levels are subject to change due to rainfall, time of year, seasonal precipitation, surface water runoff, and other factors. Graphic representations of the materials encountered are presented on the Logs of Borings and Test Pits, Appendix A.

2.5 LABORATORY TESTING

Moisture Content (ASTM D2216) and Unit Weight (ASTM D2937) determinations were performed on selected samples as an aid in the classification and evaluation of soil properties. The test results are presented on the Logs of Borings and Test Pits at the appropriate sample depths.

Three Atterberg Limits tests (ASTM D4318) were performed on selected soil samples to evaluate the liquid and plastic limits. The samples tested generally had low to moderately high Plasticity Indexes (PIs) ranging from 9 to 14 and plotted as low plasticity silt (ML) and high plasticity silt (MH) on a Standard Plasticity Chart. The test results are summarized on the Logs of Borings and Test Pits at the appropriate sample depths. Graphic presentations of the Atterberg Limits test results are provided on Plate B-1.

Five Sieve Analysis tests (ASTM C117 and C136) were performed on selected soil samples to evaluate the gradation characteristics of the soil and to aid in soil classification. Graphic presentations of the grain size distributions are provided on Plate B-2.

Three one-inch Ring Swell tests were performed on remolded samples to evaluate the swelling potential of the on-site soils. Swell test results ranging from about 0.1 to 2.0 percent were observed under a surcharge pressure of 60 pounds per square foot (psf). These test results indicate the on-site soils have a low expansion potential when subjected to moisture fluctuations. The Ring Swell test results are summarized on Plate B-3.

Five Uniaxial Compressive Strength tests (ASTM D7012) were performed on selected rock cores to evaluate the unconfined compressive strengths of the rock materials encountered. Uniaxial compressive strength test results ranged from about 4,910 to 9,834 pounds per square inch (psi) for the core samples tested. Uniaxial compressive strength test results are summarized on Plate B-4.

Two laboratory California Bearing Ratio (CBR) tests (ASTM D1883) were performed on bulk samples of the near-surface soils to evaluate the pavement support characteristics of the on-site soils. Results of our laboratory CBR tests indicate the samples of on-site soils tested had CBR values of about 42.4 and 66.0. The CBR test results are presented on Plates B-5 and B-6.

2.6 SEISMIC DESIGN CONSIDERATIONS

Based on the International Building Code, 2018 Edition (IBC 2018) and American Society of Civil Engineers Standard ASCE/SEI 7-16 (ASCE 7-16), the project site may be subjected to seismic activity, and seismic design considerations will need to be addressed. Based on the subsurface materials encountered at the project site and the geologic setting of the area, we anticipate the project site may be classified from a seismic analysis standpoint as being a “Very Dense Soil and Soft Rock” site corresponding to a Site Class C soil profile type based on Chapter 20 of ASCE 7-16.

SECTION 2.0 SITE CHARACTERIZATION AND FINDINGS

Based on Site Class C, the following seismic design parameters were estimated and may be used for seismic analysis of the project.

SUMMARY OF SEISMIC DESIGN PARAMETERS	
Mapped MCE Spectral Response Acceleration, S_s	1.494g
Mapped MCE Spectral Response Acceleration, S_1	0.547g
Site Class	C
Site Coefficient, F_a	1.200
Site Coefficient, F_v	1.453
Design Spectral Response Acceleration, S_{DS}	1.195g
Design Spectral Response Acceleration, S_{D1}	0.530g
Peak Ground Acceleration, PGA	0.500g
Site Modified Peak Ground Acceleration, PGA_M	0.600g

Based on the subsurface conditions encountered, the phenomenon of soil liquefaction is not a design consideration for this project site.

END OF SITE CHARACTERIZATION AND FINDINGS

SECTION 3.0 DISCUSSION AND RECOMMENDATIONS

Based on the results from our field exploration, the project site is generally underlain by volcanic ash soils overlying basalt lava flows consisting of weathered clinker materials and basalt rock formation extending down to the maximum depth explored of about 17 feet below the existing ground surface. The volcanic ash soils were encountered to depths ranging from about 1 to 6.5 feet below the existing ground surface and generally consisted of stiff to very stiff sandy silt with some gravel and cobbles and medium dense to very dense silty sand and gravel with some cobbles and boulders.

Weathered clinker materials generally consisting of medium dense to very dense silty sand and gravel with some cobbles and boulders were encountered underlying the volcanic ash soils to depths ranging from about 3 to 10.5 feet below the existing ground surface. Medium hard to hard basalt rock formation was encountered underlying the volcanic ash soils and weathered clinker materials and extended down to the maximum depth explored of about 17 feet below the existing ground surface.

We did not encounter groundwater in the borings and test pits at the time of our field exploration. However, it should be noted that groundwater levels are subject to change due to rainfall, time of year, seasonal precipitation, surface water runoff, and other factors. In addition, subterranean seepage may be encountered during construction due to high rainfall in the area, sloping terrain and relict structure in the clinker materials and basalt rock formation encountered.

In general, the on-site soils and excavated basalt rock materials may be re-used as a source of general fill material, provided they are free of vegetation, deleterious materials, and rock fragments greater than 6 inches in maximum dimension. In addition, we believe fill materials with rock fragments up to 12 inches in maximum dimension may be used below a depth of 4 feet below finished grades provided the grading contractor has sufficient heavy equipment to effectively compact the fill materials.

It should be noted that the volcanic ash soils encountered in the borings and test pits were observed to be in a dry, billowy condition at the time of our field exploration. Therefore, these materials may require moisture conditioning to improve their workability when used as general fill material.

In general, excavated basalt rock materials less than 12 inches in maximum dimension may be used as a source of fill. However, we believe the excavated rock materials will likely need to be processed and crushed to reduce the materials to a relatively well-graded granular material with an average rock fragment size of about 6 inches and a maximum rock fragment size of 12 inches.

Based on the subsurface conditions encountered at the project site, we believe the planned building structures may be supported on a shallow foundation system consisting of spread and/or continuous footings or concrete slabs-on-grade with thickened edge footings. To provide a firm and unyielding bearing layer, we recommend placing a minimum 12-inch thick layer of non-expansive structural fill material below the foundations and slabs-on-grade. The structural fill should be compacted to a minimum of 90 percent relative compaction.

Structural fill should be imported, non-expansive granular material, such as crushed coral or basalt. The structural fill should be well-graded from coarse to fine with particles no larger than 3 inches in largest dimension. The material should have a CBR value of 20 or higher and a swell potential of 1 percent or less when tested in accordance with ASTM D1883. The material should also contain between 10 and 30 percent particles passing the No. 200 sieve.

In general, the bottom of the spread and/or continuous footings should be embedded a minimum of 18 inches below the lowest adjacent finished grade. Footings constructed near tops of slopes or on sloping ground should be embedded deep enough to provide a minimum horizontal set-back distance of 6 feet measured from the outside edge of the footings to the slope face. Loose fill material or topsoil on the slope face should not be included when determining the extent of lateral cover.

Based on our experience in the area, cavities and/or voids are commonly encountered in the pahoehoe basalt lava flows that characterize the project site. To reduce the potential for loss of foundation support resulting from collapse of cavities below the shallow foundations of the building structures, we recommend implementing a program of cavity probing and grouting during construction below the structure foundations that are constructed directly on the basalt rock formation.

However, due to relatively light loads anticipated and potential budget constraints, a proof-rolling program described in the “Site Grading” section presented herein may be considered instead of the probing and grouting program if some risk is acceptable to the owner. If a higher level of assurance is desired to reduce the risk of settlement due to collapse of cavities, then a probing and grouting program should be implemented.

Detailed discussion of these items and our geotechnical recommendations for design of site grading, building foundations, foundation probing, slabs-on-grade, new pavements, utility trenches, and other geotechnical aspects of the project are further discussed in the following sections.

3.1 SITE GRADING

Based on the preliminary grading plan provided, we anticipate cuts and fills on the order of about 12 feet deep/thick may be required to achieve the design finished grades at the project site. Site grading items that are addressed in the subsequent subsections include the following:

1. Site and Subgrade Preparation
2. Excavations
3. Fill/Backfill Materials
4. Fill/Backfill Compaction Requirements
5. Cut and Fill Slopes

A Kokua Geotech LLC representative should monitor site grading operations to observe whether undesirable materials are encountered during the excavation and subgrade preparation

process, and to confirm whether the exposed soil conditions are similar to those assumed in this report.

3.1.1 SITE AND SUBGRADE PREPARATION

As mentioned above, the project site is generally underlain by volcanic ash soils overlying basalt lava flows consisting of weathered clinker materials and hard basalt rock formation. Based on our experience in the area, lava tubes and cavities are commonly encountered in basalt formations. Lava tubes and cavities may vary significantly in size from small blisters to large lava tubes of 20 feet in diameter or more.

In general, the majority of small cavities are limited in lateral extent. However, it should be noted that there is a potential for the occurrence of long lava tubes, which may traverse the project site. The general orientation of the long lava tubes would be in a mauka-makai direction. Since lava tubes and cavities may be present in the volcanic rock formation underlying the site, we believe that special attention should be given to the site preparation aspects of the proposed construction.

At the on-set of earthwork, areas within the contract grading limits should be cleared thoroughly. Surface vegetation, debris, deleterious materials, and other unsuitable materials should be removed and disposed of properly off-site.

After clearing and grubbing, we recommend proof-rolling the cut and/or fill subgrades with a minimum 20-ton (static weight) vibratory drum roller for a minimum of eight passes to help detect and collapse near-surface cavities and/or voids. The proof-rolling operations should be performed in the presence of a Kokua Geotech LLC representative.

Yielding areas, loose areas, or cavities disclosed during clearing and proof-rolling operations should be over-excavated and backfilled with compacted fill materials. Contract documents should include additive and deductive unit prices for over-excavation of the collapsed lava tube features (and other features) and backfilling with compacted structural fill to account for variations in the over-excavation and backfill quantities.

Saturation and subsequent yielding of the exposed subgrade due to inclement weather and poor drainage may require over-excavating the soft areas and replacing these areas with well-compacted general fill. A Kokua Geotech LLC field representative should evaluate the need for over-excavation due to soft subgrade soil conditions.

3.1.2 EXCAVATIONS

All excavations should be made in accordance with applicable Occupational Safety and Health Administration (OSHA) and state regulations. The contractor should determine the method and equipment to be used for the excavations, subject to practical limits and safety considerations. In addition, the excavations should comply with the applicable federal, state, and local safety requirements. The contractor should be responsible for trench shoring design and installation.

Based on the information provided, we envision excavations for the project will generally consist of excavations for building pad/roadway construction and infrastructure installation. Based on our borings, test pits, and field observations, these excavations will likely encounter volcanic ash soils generally consisting of medium dense to very dense silty sand and gravel and medium stiff to very stiff sandy silt with some gravel and cobbles. In addition, boulders and/or basalt rock formation may be encountered in the planned excavations.

It is anticipated that most of the material may be excavated with normal heavy excavation equipment. However, excavations encountering large boulders and hard basalt rock formation may require the use of hoerams. Contractors should be encouraged to examine the site conditions and the subsurface data to make their own reasonable and prudent interpretation.

3.1.3 FILL/BACKFILL MATERIALS

In general, the on-site soils and excavated basalt rock materials may be re-used as a source of general fill material, provided they are free of vegetation, deleterious materials,

and rock fragments greater than 6 inches in maximum dimension. In addition, we believe fill materials with rock fragments up to 12 inches in maximum dimension may be used below a depth of 4 feet below finished grades provided the grading contractor has sufficient heavy equipment to effectively compact the fill materials.

It should be noted that the excavated rock materials will likely need to be processed and crushed to reduce the materials to a relatively well-graded granular material with maximum rock fragment sizes of 6 and 12 inches.

Imported materials to be used as structural fill, if required, should be non-expansive granular material, such as crushed coral or basalt. The structural fill should be well-graded from coarse to fine with particles no larger than 3 inches in largest dimension. The material should have a CBR value of 20 or higher and a swell potential of 1 percent or less when tested in accordance with ASTM D1883. The material should also contain between 10 and 30 percent particles passing the No. 200 sieve.

Aggregate base and subbase course materials should conform to the requirements contained in Hawaii Standard Specifications for Roads, Bridges, and Public Works Construction (2005).

3.1.4 FILL/BACKFILL COMPACTION REQUIREMENTS

General fill materials should be moisture-conditioned to above the optimum moisture content, placed in level lifts not exceeding 8 inches in loose thickness, and compacted to a minimum of 90 percent relative compaction. It should be noted that the volcanic ash soils encountered in the borings and test pits were observed to be in a dry, billowy condition at the time of our field exploration. Therefore, these materials may require moisture conditioning to improve their workability when used as general fill material.

In general, excavated basalt rock fill materials should be moisture-conditioned to above the optimum moisture content, placed in level lifts not exceeding 12 inches in loose thickness, and compacted to a minimum of 90 percent relative compaction. It should be

noted that conventional compaction testing may not be practicable in fills composed of excavated basalt rock materials. Instead, a testing program to determine the number of passes of a compactor needed to achieve the desired level of compaction should be conducted at the start of the grading phase of the project. The number of passes determined from this testing program may then be used as the field criterion to achieve adequate compaction.

The non expansive structural fill materials should be placed in level lifts of about 8 inches in loose thickness, moisture-conditioned to above the optimum moisture, and compacted to at least 90 percent relative compaction. Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same soil established in accordance with ASTM D1557 test procedures. Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

Site grading operations should be observed by a representative from Kokua Geotech LLC. It is important that a representative from our office observe the site grading operations to evaluate whether undesirable materials are encountered during the scarification process and whether the exposed soil conditions are similar to those encountered in our field exploration.

3.1.5 CUT AND FILL SLOPES

Based on the results of our field exploration, we recommend cut and fill slopes be designed with a slope inclination of two horizontal to one vertical (2H:1V) or flatter. We envision the cut slopes at the project site generally will expose the volcanic ash soils, clinker materials, and basalt rock formation encountered in the borings and test pits.

Fills placed on slopes steeper than 5H:1V should be keyed and benched into the existing slope to provide stability of the new fill against sliding. The filling operations should start at the lowest point and continue up in level horizontal compacted layers in accordance with the above fill placement recommendations.

Fill slopes should be constructed by overfilling and cutting back to the design slope ratio to obtain a well-compacted slope face. Track-rolling of slopes should not be permitted. If over-cutting of a slope occurs, keying and benching requirements should be implemented instead of backfilling the slope to the design grade with sliver fills. Water should be diverted away from the tops of slopes and slope planting should be provided as soon as possible to reduce the potential for erosion of the finished slopes.

3.2 BUILDING FOUNDATIONS

Based on the subsurface conditions anticipated at the project site, we believe shallow spread and/or continuous strip footings may be used to support the building structures planned at the project site. To provide a firm and unyielding bearing layer, we recommend placing a minimum 12-inch thick layer of non-expansive structural fill material below the foundations and slabs-on-grade. The structural fill should be compacted to a minimum of 90 percent relative compaction.

An allowable bearing pressure of up to 2,500 pounds per square foot (psf) may be utilized for the design of shallow foundations bearing on the minimum 12-inch thick layer of structural fill materials. This bearing value is for supporting dead-plus-live loads and may be increased by one-third ($\frac{1}{3}$) for transient loads, such as those caused by wind or seismic forces. It should be noted that this layer of structural fill materials may be omitted beneath foundations that are constructed directly on the basalt rock formation.

The over-excavated footing subgrades (beneath the minimum 12-inch thick layer of structural fill material) should be recompacted to a firm surface prior to the placement of the structural fill material. Soft and/or loose materials encountered at the bottom of footing excavations should be over-excavated to expose the underlying firm materials. The over-excavation should be backfilled with structural fill material compacted to a minimum of 90 percent relative compaction.

In general, the bottom of footings should be embedded a minimum of 18 inches below the lowest adjacent finished grades. Footings constructed near tops of slopes or on sloping ground should be embedded deep enough to provide a minimum horizontal set-back distance of 6 feet measured from the outside edge of the footings to the slope face. Loose fill material or topsoil on the slope face should not be included when determining the extent of lateral cover.

Footings located adjacent to planned (or existing) retaining walls should be embedded deep enough to avoid surcharging the retaining wall foundations. Foundations next to utility trenches should be embedded below a one horizontal to one vertical (1H:1V) imaginary plane extending upward from the bottom edge of the utility trench, or the foundation should be extended to a depth as deep as the inverts of the utility lines. This requirement is necessary to avoid surcharging adjacent below-grade structures with additional structural loads and to reduce the potential for appreciable foundation settlement.

If foundations are designed and constructed in strict accordance with the recommendations presented herein, we estimate total settlements of the foundations to be less than 1 inch. Differential settlements between adjacent footings supported on similar materials may be on the order of about 0.5 inch or less.

Lateral loads acting on the structures may be resisted by friction between the base of the foundation and the bearing materials and by passive earth pressure developed against the near-vertical faces of the embedded portion of foundations. A coefficient of friction of 0.4 may be used for footings bearing directly on the 12-inch thick layer of structural fill material. Resistance due to passive earth pressure may be estimated using an equivalent fluid pressure of 300 pounds per square foot per foot of depth (pcf). This assumes that the backfill around the footings are well-compacted. Unless covered by pavements or slabs, the passive resistance in the upper 12 inches of soil should be neglected.

A Kokua Geotech LLC representative should observe footing excavations prior to placement of the structural fill materials, reinforcing steel, and concrete to confirm the foundation bearing conditions and the required embedment depths.

3.3 FOUNDATION PROBING

Based on our experience in the area, cavities and/or voids are commonly encountered in the pahoe-hoe basalt lava flows that characterize the project site. To reduce the potential for loss of foundation support resulting from collapse of cavities below the shallow foundations of the building structures, we recommend implementing a program of cavity probing and grouting below the structure foundations during construction.

However, due to relatively light loads anticipated and potential budget constraints, a proof-rolling program described in the “Site Grading” section presented herein may be considered instead of the probing and grouting program if some risk is acceptable to the owner. If a higher level of assurance is desired to reduce the risk of settlement due to collapse of cavities, then a probing and grouting program should be implemented.

For estimating purposes, we recommend drilling probe holes at each isolated spread footing location (one probe per 50 square feet) and at 10-foot on centers for the continuous strip footings. The probe holes should be at least 3 inches in diameter and should extend to a depth of at least 10 feet below the planned bottom of foundation.

If cavities and/or voids are encountered or suspected during the probing operation, additional probe holes should be drilled at closer spacing to help delineate the vertical and lateral extent of the cavity and/or void. An example of subsequent probing would generally include drilling four additional probe holes around the probe hole where the suspected cavity and/or void was encountered. In general, the four additional probe holes should be drilled about 5 feet away from the probe hole and about 90 degrees apart.

The probe holes and discovered cavities should be backfilled with Controlled Low Strength Material (CLSM) with a slump of about 6 to 9 inches. The CLSM should be injected at

low to moderate pressures (about 20 psi) and the CLSM shall be capable of being pumped through a tremie pipe. As an alternate to CLSM, sand-cement grout with a slump of about 6 to 9 inches also may be used for the grouting operations.

Because of the potential for encountering cavities and/or voids at the site, the probe drill should be available on site until the probing and grouting operations are completed. The contractor also should be made aware that a longer lag time between probing/grouting operations and foundation construction might be required in the construction schedule.

3.4 SLABS-ON-GRADE

We anticipate concrete slabs-on-grade will be utilized for portions of the building structures and walkways planned at the project site. To provide a firm and unyielding bearing layer, we recommend placing a minimum 12-inch thick layer of non-expansive structural fill material below the concrete slabs-on-grade. The structural fill should be compacted to a minimum of 90 percent relative compaction.

The structural fill should consist of imported non-expansive granular material such as crushed coral or basalt. In addition, the structural fill material should be well-graded from coarse to fine with particles no larger than 3 inches in largest dimension. The material should have a CBR value of 20 or higher and a swell potential of 1 percent or less when tested in accordance with ASTM D1883. The material should also contain between 10 and 30 percent particles passing the No. 200 sieve.

Prior to placing the non-expansive structural fill material, we recommend scarifying the subgrade soils to a depth of about 8 inches, moisture-conditioning the soils to above the optimum moisture content, and compacting to a minimum of 90 percent relative compaction. The underlying subgrade soils and structural fill should be wetted and kept moist until the final placement of slab concrete. Saturation and subsequent yielding of the exposed subgrade due to inclement weather and poor drainage may require over-excavation of the soft areas and replacement with well-compacted structural fill material.

For interior building slabs (not subjected to vehicular traffic or machinery vibration), we recommend placing a minimum 4-inch thick layer of cushion fill consisting of open-graded gravel (ASTM C33, No. 67 gradation) below the slabs and above the non-expansive structural fill layer. The open-graded gravel cushion fill would provide uniform support of the slabs and would serve as a capillary moisture break. To reduce the potential for future moisture infiltration through the slab and subsequent damage to floor coverings, an impervious moisture barrier is recommended on top of the gravel cushion fill layer.

Where the slabs will be subjected to equipment vibration and/or vehicular traffic, such as the garage and driveway slabs, we recommend placing the floor slab over 6 inches of aggregate subbase material in lieu of the minimum 4-inch thick layer of open-graded gravel cushion fill. The aggregate subbase should be compacted to a minimum of 95 percent relative compaction and meet the material requirements as specified in the Hawaii Standard Specifications for Roads, Bridges, and Public Works Construction (2005).

Control joints should be provided along planned walkways at intervals equal to the width of the walkway with expansion joints at right-angle intersections. The bottom of thickened edges of slabs adjacent to unpaved areas should be embedded at least 12 inches below the lowest adjacent grade. It should be emphasized that the areas adjacent to the slab edges should be backfilled tightly against the edges of the slabs with relatively impervious soils. These areas should also be graded to divert water away from the slabs and to reduce the potential for water ponding around the slabs.

3.5 RETAINING STRUCTURES

We anticipate retaining walls up to about 6 feet high may be utilized for grade separation at the project site. Therefore, we are providing the following guidelines for the design of retaining structures for the project.

3.5.1 RETAINING STRUCTURE FOUNDATIONS

In general, we believe retaining wall foundations may be designed in accordance with the recommendations and parameters presented in the “Building Foundations” section herein. In addition, retaining wall foundations should be at least 18 inches wide and should be embedded a minimum of 24 inches below the lowest adjacent finished grades.

3.5.2 STATIC LATERAL EARTH PRESSURES

Retaining structures should be designed to resist lateral earth pressures due to the adjacent soils and surcharge effects caused by loads adjacent to the walls. The recommended lateral earth pressures for the design of the retaining structures, expressed in equivalent fluid pressures of pounds per square foot per foot of depth (pcf), are presented in the following table.

STATIC LATERAL EARTH PRESSURES FOR DESIGN OF RETAINING STRUCTURES		
<u>Backfill Condition</u>	<u>Active</u> (pcf)	<u>At-Rest</u> (pcf)
Level Backfill	40	60

The values provided above assume that on-site granular soils (general fill materials) will be used to backfill behind the retaining structures. It is assumed that the backfill behind the retaining structures will be compacted to between 90 and 95 percent relative compaction per ASTM D1557. Over-compaction of the retaining structure backfill should be avoided.

In general, an active condition may be used only for gravity walls or walls that are free to deflect by as much as 0.5 percent of the structure height. If the tops of structures are not free to deflect beyond this degree, the structures should be designed for the at-rest condition. These lateral earth pressures do not include hydrostatic pressures that might be caused by groundwater trapped behind the structures.

Surcharge stresses due to areal surcharges, line loads, and point loads within a horizontal distance equal to the depth of the structure should be considered in the design. For uniform surcharge stresses imposed on the loaded side of the structure, a rectangular distribution with a uniform pressure equal to 35 percent of the vertical surcharge pressure acting over the entire height of the wall, which is free to deflect (cantilever), may be used in the design. For walls that are restrained, a rectangular distribution equal to 52 percent of the vertical surcharge pressure acting over the entire height of the structure may be used for design. Additional analyses during design may be needed to evaluate the surcharge effects of point loads and line loads.

3.5.3 DYNAMIC LATERAL EARTH PRESSURES

Dynamic lateral earth forces due to seismic loading will need to be considered in the design of the retaining structures. An appropriately reduced load factor may be used when dynamic lateral earth forces are accounted for in the design of retaining structures. Seismic loading is used to estimate the dynamic lateral earth pressure based on a peak ground acceleration (PGA or a_{max}) of 0.50g. The table below summarizes the dynamic lateral earth forces acting on the retaining structures in the event of an earthquake versus the estimated wall displacements.

Please note that the values provided in the table only apply to level backfill conditions, where H is the height of the wall in feet. The resultant force should be assumed to act through the mid-height of the wall. The dynamic lateral earth forces are in addition to the static lateral earth pressures provided previously.

DYNAMIC LATERAL EARTH FORCES FOR RETAINING STRUCTURES	
<u>Lateral Movement</u> (inches)	<u>Dynamic Lateral Earth Forces</u> (H ² pounds per linear foot)
1.0	50.7
1.5	39.3
2.0	32.1

DYNAMIC LATERAL EARTH FORCES FOR RETAINING STRUCTURES	
<u>Lateral Movement</u> (inches)	<u>Dynamic Lateral Earth Forces</u> (H ² pounds per linear foot)
2.5	26.6
Note: H is the height of the retaining structure in feet.	

3.5.4 RETAINING STRUCTURE DRAINAGE

The retaining structures should be well-drained to reduce the potential for build-up of hydrostatic pressures. A typical drainage system would consist of a 12-inch wide zone of permeable material, such as No. 3 Fine gravel (ASTM C33, No. 67 gradation), placed directly around a perforated pipe (perforations facing down) at the base of the wall discharging to an appropriate outlet or weep holes. As an alternative, a prefabricated drainage product, such as MiraDrain, may be used instead of the drainage material. The prefabricated drainage product also should be hydraulically connected to a perforated pipe at the base of the wall.

The backfill from the bottom of the wall to the bottom of the perforated pipe or weep hole should consist of relatively impervious materials to reduce the potential for significant water infiltration into the subsurface. In addition, the upper 12 inches of the retaining structure backfill should consist of relatively impervious materials to reduce the potential for significant water infiltration behind the retaining structure unless covered by concrete slabs at the surface.

3.6 PAVEMENT DESIGN

We anticipate that both asphaltic concrete (flexible) and Portland cement concrete (rigid) pavements will be considered for the project. In general, we anticipate vehicle loading for the new pavements will consist primarily of passenger vehicles, light pick-up trucks, and occasional heavy vehicular traffic, such as delivery and garbage collection trucks. In addition, we understand the lots at the subdivision are planned to be developed, but the duration of the subdivision construction is unknown and could last several years. Therefore, we anticipate the new

pavements will also be subjected to some heavy vehicular traffic related to construction of the house lots at the project site.

Based on our experience with similar subdivision projects, we believe the asphaltic concrete layer of the pavement structure will likely experience significant wear from the anticipated heavy vehicular traffic related to construction of the individual house lots. Therefore, we recommend consideration be given to not placing the asphaltic concrete layer along the roadways until the heavy vehicular traffic related to construction of the house lots is no longer anticipated.

We have made our preliminary pavement design assuming the pavement subgrade soils will consist of the volcanic ash soils encountered during our field exploration. In addition, we understand a maximum 2-inch thick layer of asphaltic concrete is desired for the roadways due to project budget constraints. Based on the above assumptions, we recommend using the following pavement design sections for preliminary design purposes:

Flexible Pavements for Roadways

2.0-Inch Asphaltic Concrete

6.0-Inch Aggregate Base Course (95 Percent Relative Compaction)

8.0-Inch Total Pavement Thickness on Moist Compacted Subgrade

Rigid Pavements for Roadways

6.0-Inch Portland Cement Concrete

6.0-Inch Aggregate Subbase Course (95 Percent Relative Compaction)

12.0-Inch Total Pavement Thickness on Moist Compacted Subgrade

The pavement subgrade soils should be scarified to a minimum depth of about 8 inches, moisture-conditioned to above the optimum moisture content, and compacted to at least 95 percent relative compaction. The subgrade soils should be thoroughly moistened and kept moist until covered by the pavement structural section.

Aggregate base and subbase course materials should be compacted to at least 95 percent relative compaction and meet the material requirements as specified in the Hawaii Standard Specifications for Roads, Bridges, and Public Works Construction (2005). CBR and field density

tests should be performed on the actual materials used during construction to confirm the adequacy of the above section. The recommended section also assumes that adequate drainage will be provided for the paved areas.

As an additional check for stability and uniform compaction, we recommend proof-rolling the subgrade soils prior to placing the aggregate base/subbase materials using a pneumatic-tired vehicle with a gross vehicle weight of at least 30,000 pounds, such as a fully-loaded water truck. The equipment used for proof-rolling should be operated at a speed of about 300 feet per minute and make at least two passes over each area designated for proof-rolling. Proof-rolling should also be performed on successive lifts of aggregate base course materials. Areas with excessive rutting and/or pumping should be over-excavated to expose firm material, and the resulting excavation should be backfilled with either well-compacted fill or aggregate base/subbase course material.

Paved areas should be sloped, and drainage gradients should be maintained to carry the surface water off the site. Surface water ponding should not be allowed on the site during or after construction. Where concrete curbs are used to isolate landscaping in or adjacent to the pavement areas, we recommend that the curbs be extended a minimum of 2 inches into the soils below the subgrade to reduce the potential for appreciable landscape water migration into the pavement section.

Considering the climate of the area and the results of our field exploration, seepage conditions may be present at localized areas at the site. Therefore, we recommend that provisions be incorporated into the construction documents to provide for subdrains in areas of the site where seepage is observed during and after grading or as recommended by the Engineer during construction.

In general, subdrains should consist of 4-inch diameter perforated pipes (perforations facing down) that are hydraulically connected to the roadway's drainage structures. Subdrains should be surrounded and underlain by at least 6 inches of drainage material, such as No. 3B Fine

gravel (ASTM C33, No. 67 gradation) or equivalent. A non-woven filter fabric, such as Mirafi 180N or equivalent, should wrap around the drainage material.

3.7 UTILITY TRENCHES

We anticipate that underground utilities such as sewer, drain, water, and electrical lines may be required for the project. As discussed above, all excavations should be made in accordance with applicable Occupational Safety and Health Administration (OSHA) and state regulations. The contractor should determine the method and equipment to be used for utility trench excavation, subject to practical limits and safety considerations. In addition, the trench excavations should comply with the applicable federal, state, and local safety requirements. The contractor should be responsible for trench shoring design and installation.

In general, we recommend providing granular bedding consisting of 6 inches of open-graded gravel, such as No. 3 Fine gravel (ASTM C33, No. 67 gradation), under the pipes for uniform support. In addition, open-graded gravel (ASTM C33, No. 67 gradation) should also be used for the initial trench backfill up to about 12 inches above the pipes to provide adequate support around the pipes.

It is critical to use a free-draining material, such as open-graded gravel, to reduce the potential for formation of voids below the haunches of pipes and to provide adequate support for the sides of the pipes. Improper trench backfill could result in backfill settlement and pipe damage.

Trench backfill material above the open-graded gravel may consist of general fill materials (on-site soils) or structural fill material. The backfill should be placed in maximum 8-inch level loose lifts and mechanically compacted to no less than 90 percent relative compaction to reduce the potential for appreciable future ground subsidence. The upper 2 feet below the finished grade in areas subjected to vehicular traffic should be compacted to a minimum of 95 percent relative compaction.

3.8 FIELD INFILTRATION TESTING

We understand drywells are being considered for the on-site management of storm water runoff at the project site. In order to obtain subsurface infiltration information in support of the planning of these drywell systems, we conducted two falling head infiltration tests, designated as Infiltration Test Nos. I-1 and I-2, at selected locations at the project site. The approximate field infiltration test locations are shown on the Site Plan, Plate 2.

The field infiltration tests were performed using the cased borehole method in general accordance with the City and County of Honolulu's accepted infiltration test methods. These procedures are consistent with other state's procedures and may generally be considered an industry standard.

The field infiltration tests were performed by augering boreholes to the selected testing depths ranging from about 8 to 10 feet below the existing ground surface. Upon reaching the testing depth, 4-inch diameter PVC solid casings were set to the bottom of the drilled holes to allow infiltration only through the soil exposed at the bottom of the boreholes. Falling head field infiltration tests were performed to determine the average infiltration rates of the underlying subsurface materials. Each test consisted of four trials of filling the casing with 24 inches of water and taking periodic readings over a 1-hour trial period. The infiltration rates are then calculated based on the results of the fourth and last trial for each test location.

The calculated infiltration rate at each of the test locations is summarized in the following table and in Appendix D.

FIELD INFILTRATION TEST RESULTS		
<u>Test Location</u>	<u>Test Depth</u> (feet)	<u>Average Measured Infiltration Rate</u> (inches/hour)
I-1	10.0	>24
I-2	8.0	>24

SECTION 3.0 DISCUSSION AND RECOMMENDATIONS

It should be noted that the infiltration tests were conducted through 4.5-inch diameter boreholes, which may not represent the actual percolation conditions within the entire infiltration system footprints. Therefore, it may be necessary to require the contractor to verify the actual infiltration rate during construction.

3.9 **WASTEWATER DISPOSAL SYSTEMS**

We understand individual wastewater systems (IWS) consisting of underground septic tanks and leach fields are planned at the project site for wastewater disposal due to the lack of a sewer connection in the area. To evaluate the permeability of the subsurface materials for wastewater disposal, two field percolation tests, designated as Percolation Test Nos. P-1 and P-2, was performed at the site of the proposed leach fields in general accordance with the State of Hawaii, Department of Health's Administrative Rules, Chapter 11-62-31.2, "Wastewater Systems" and Chapter 10 of the Ten States Standards.

The field percolation tests were performed at depths of about 5 feet below the existing ground surface. The approximate field percolation test locations are shown on the Site Plan, Plate 2. The results of the field percolation tests are presented in Appendix E and the calculated percolation rates are summarized in the following table.

FIELD PERCOLATION TEST RESULTS		
<u>Test Location</u>	<u>Test Depth</u> (feet)	<u>Percolation Rate</u> (minutes/inch)
P-1	5.0	0.53
P-2	5.0	0.68

It should be noted that the field percolation tests were conducted through 4.5-inch diameter boreholes, which may not represent the actual percolation condition within the entire leach field footprint. Therefore, it may be necessary to require the contractor to verify the actual percolation rate during construction.

3.10 SITE DRAINAGE CONSIDERATIONS

The drainage condition around the building structures is critical to maintaining proper foundation performance because ponded water could cause subsurface soil saturation and subsequent heaving or loss of strength. Finished grades outside the new structures should be sloped to shed water away from the slab and foundations and to reduce the potential for ponding around the structures. In addition, it is advised to install roof gutter systems around the buildings and to divert the discharge away from the slab and foundation areas.

Drainage systems and finished grades for the project site should be designed by a Licensed Civil Engineer so that surface runoff is directed away from the building and other related structures. Drainage swales should be provided as soon as possible and should be maintained to drain surface water runoff away from the slab and foundations. The foundation excavations should be properly backfilled against the walls or slab edges immediately after setting of the concrete to reduce the potential for excessive water infiltration into the subsurface.

3.11 DESIGN REVIEW AND CONSTRUCTION OBSERVATION SERVICES

The construction plans and specifications for the project should be forwarded to us for review to determine whether the recommendations contained in this report are adequately reflected in those documents. If this review is not made, Kokua Geotech LLC cannot assume responsibility for misinterpretation of our recommendations.

Kokua Geotech LLC should also be retained to monitor the site and subgrade preparation, proof-rolling of pavement subgrade, aggregate base/subbase course placement, and other aspects of earthwork construction to determine whether the recommendations of this report are followed. The recommendations presented herein are contingent upon such observations. If the actual exposed subsurface soil conditions encountered during construction differ from those assumed or considered in this report, Kokua Geotech LLC should be contacted to review and/or revise the geotechnical recommendations presented herein.

END OF DISCUSSION AND RECOMMENDATIONS

SECTION 4.0 LIMITATIONS

This report has been prepared for the exclusive use of Hawaii Island Community Development Corporation and their project consultants for specific application to the design of the *Ouli Affordable Housing Development, Phase 1* project in accordance with generally accepted geotechnical engineering principles and practices. No warranty is expressed or implied. If any part of the project concept is altered or if subsurface conditions differ from those described in this report, then the information presented herein shall be considered invalid, unless the changes are reviewed, and any supplemental or revised recommendations issued in writing by Kokua Geotech LLC.

The analyses and report recommendations are based in part upon information obtained from the field borings/test pits and the assumption that subsurface conditions do not vary significantly from those observed in the borings/test pits. Variations of the subsurface conditions between and beyond the field borings/test pits may occur, and the nature and extent of these variations may not become evident until construction is underway. If variations then appear evident, Kokua Geotech LLC should be notified so that we can re-evaluate the recommendations presented herein.

The owner/client should be aware that unanticipated soil conditions are commonly encountered. Unforeseen subsurface conditions, such as perched groundwater, soft deposits, hard layers or cavities, may occur in localized areas and may require additional probing or corrections in the field (which may result in construction delays) to attain a properly constructed project. Therefore, a sufficient contingency fund is recommended to accommodate these possible extra costs.

The field boring/test pit locations indicated herein are approximate, having been estimated by taping from visible features shown on the Site Plan transmitted by Ms. Nancy E. Burns on March 7, 2024. Elevations of the borings and test pits were estimated from contours

SECTION 4.0 LIMITATIONS

and spot elevations shown on the same plan. The field boring and test pit locations and elevations should be considered accurate only to the degree implied by the methods used.

The stratification breaks shown on the graphic representations of the borings/test pits depict the approximate boundaries between soil types and, as such, may denote a gradual transition. We did not encounter groundwater in the borings/test pits at the time of our field exploration. However, it should be noted that groundwater levels are subject to change due to rainfall, time of year, seasonal precipitation, surface water runoff, and other factors. These data have been reviewed and interpretations made in the formulation of this report.

This report has been prepared solely for the purpose of assisting the design engineers in the design of the project. Therefore, this report may not contain sufficient data, or the proper information, to serve as a basis for detailed construction cost estimates.

This geotechnical engineering exploration conducted at the project site was not intended to investigate the potential presence of hazardous materials existing at the project site. It should be noted that the equipment, techniques, and personnel used to conduct a geo-environmental exploration differ substantially from those applied in geotechnical engineering.

END OF LIMITATIONS

CLOSURE

The following plates and appendices are attached and complete this report:

Project Location Map.....	Plate 1
Site Plan.....	Plate 2
Logs of Borings and Test Pits	Appendix A
Laboratory Test Results	Appendix B
Photographs of Rock Core Samples	Appendix C
Field Infiltration Test Results	Appendix D
Field Percolation Test Results	Appendix E

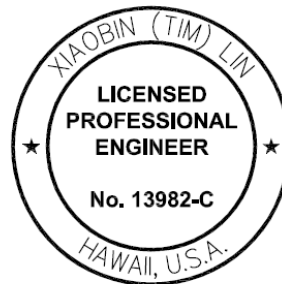
This report concludes our scope of work outlined in our revised fee proposal dated November 20, 2023. If you have any questions regarding this report or if any part of the report is not clear, please contact our office.

Respectfully submitted,

Kokua Geotech LLC



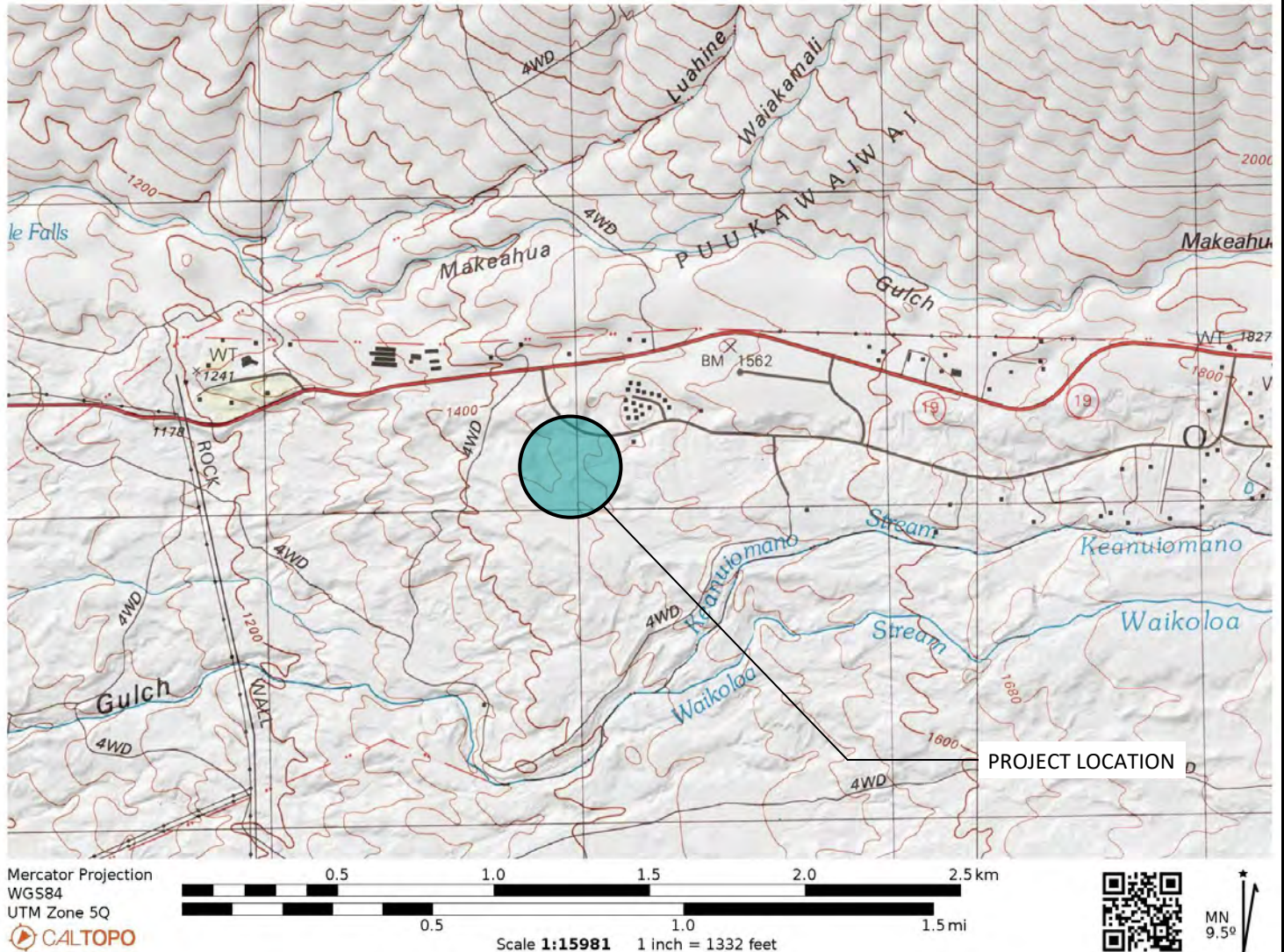
Xiaobin (Tim) Lin, P.E.
President



THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION.
(MY LICENSE EXPIRES 4/30/2026)

PLATES

GENERAL PROJECT LOCATION



PROJECT LOCATION MAP

OULI AFFORDABLE HOUSING DEVELOPMENT, PHASE 1
TMK: (3) 6-2-001: 075
WAIMEA, ISLAND OF HAWAII

PROJECT NO.: 012323-00

DATE: JUNE 2024

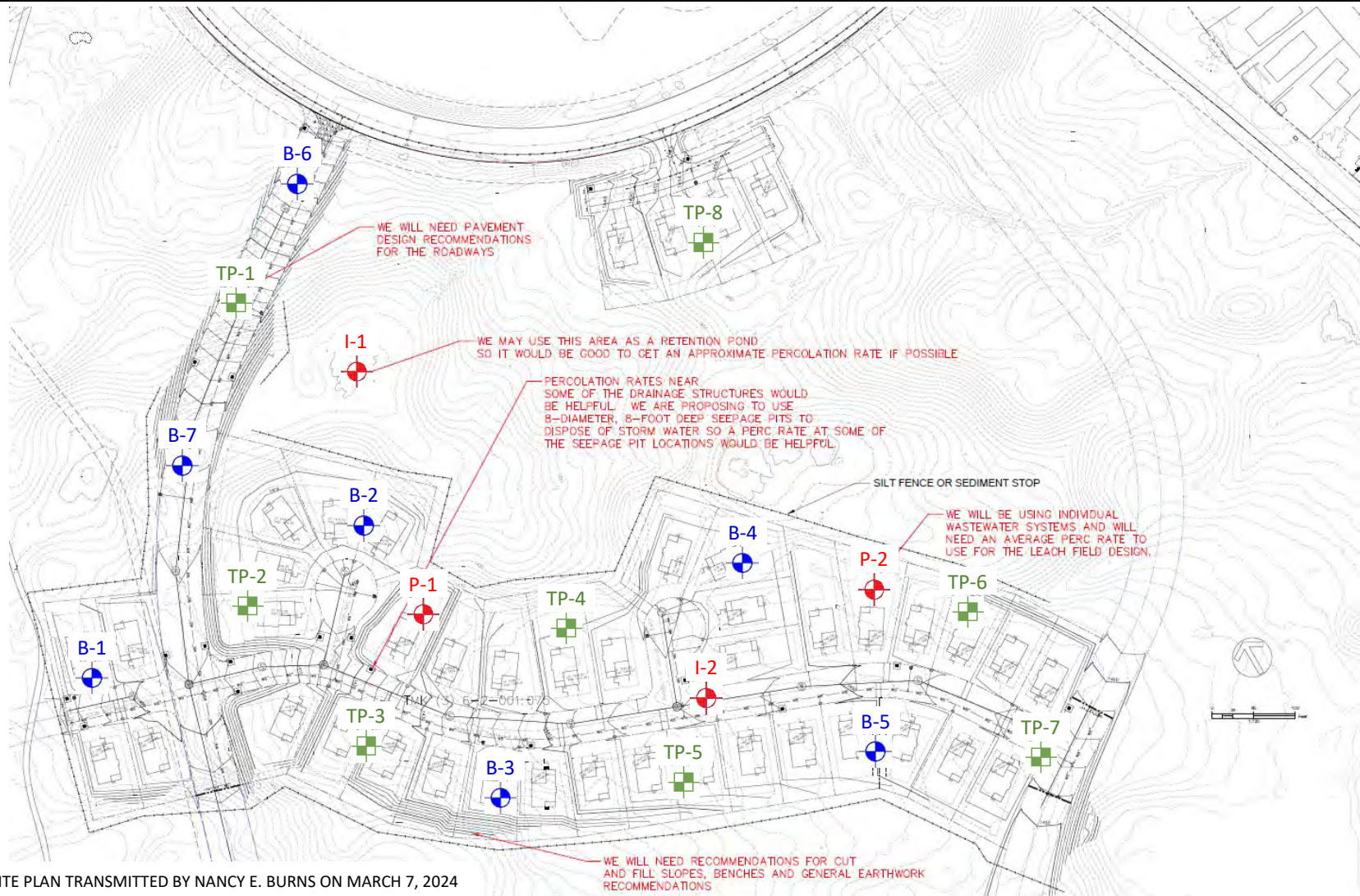
PLATE

1



Kokua Geotech LLC

Soil and Foundation Engineering



REFERENCE: SITE PLAN TRANSMITTED BY NANCY E. BURNS ON MARCH 7, 2024

-  APPROXIMATE BORING LOCATION
-  APPROXIMATE TEST PIT LOCATION
-  APPROXIMATE FIELD INFILTRATION/PERCOLATION TEST LOCATION

SITE PLAN

OULI AFFORDABLE HOUSING DEVELOPMENT, PHASE 1
TMK: (3) 6-2-001: 075
WAIMEA, ISLAND OF HAWAII

PROJECT NO.: 012323-00

DATE: JUNE 2024

PLATE

2

APPENDIX A

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Key to Logs of Borings Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1	2	3	4	5	6	7	8	9	10	11	12	13	14

COLUMN DESCRIPTIONS

- | | |
|--|--|
| <p>1 Elevation (feet): Elevation (MSL, feet).</p> <p>2 Depth (feet): Depth in feet below the ground surface.</p> <p>3 Sample Type: Type of soil sample collected at the depth interval shown.</p> <p>4 Sample Number: Sample identification number.</p> <p>5 Sampling Resistance, blows/ft: Number of blows to advance driven sampler one foot (or distance shown) beyond seating interval using the hammer identified on the boring log.</p> <p>6 Core Recovery, %: , expressed as the amount of recovered material divided by the total length of the core run (presented as a percentage).</p> <p>7 RQD, %: , expressed as a modified core recovery in which the lengths of all sound rock core piece over 4 inches in length are summed and divided by the length of the core run.</p> <p>8 U.S.C.S: Type of material encountered.</p> | <p>9 Graphic Log: Graphic depiction of the subsurface material encountered.</p> <p>10 MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.</p> <p>11 Pocket Pen./Torvane, tsf: the reading from Poecket Penetrometer or Torvane.</p> <p>12 Water Content, %: Water content of the soil sample, expressed as percentage of dry weight of sample.</p> <p>13 Dry Unit Weight, pcf: Dry weight per unit volume of soil sample measured in laboratory, in pounds per cubic foot.</p> <p>14 Remarks and Other Tests: Other Tests</p> |
|--|--|

FIELD AND LABORATORY TEST ABBREVIATIONS

CORR: Corrosivity tests to assess soil corrosivity
 WOR: Weight of Rods
 WOH: Weight of Hammer
 CONS: One-dimensional consolidation test

LL: Liquid Limit, percent
 PI: Plasticity Index, percent
 SPT: Standard Penetration Test
 UC: Unconfined Compression
 MCS: Modified California Sampler

MATERIAL GRAPHIC SYMBOLS

	Basalt Rock Formation		SILT, SILT w/SAND, SANDY SILT (ML)
	Silty GRAVEL (GM)		Silty SAND (SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

	Auger sampler		Grab Sample
	Bulk Sample		HQ Coring
	3-inch-OD California w/ brass rings		3-inch OD Modified California w/ brass liners
	CME Sampler		Pitcher Sample

	PQ Coring
	Probing w/Pointed Tip
	2-inch-OD unlined split spoon (SPT)
	Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

	Water level (at time of drilling, ATD)
	Water level (after waiting)
	Minor change in material properties within a stratum
	Inferred/gradational contact between strata
	Queried contact between strata

GENERAL NOTES

- Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
- Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 1 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 5/23/24	Logged By JL	Checked By AJF
Drilling Method CF Auger and Coring	Drill Bit Size/Type 4-inch SS Auger & HQ-Size Coring	Total Depth of Borehole 16.0 feet
Drill Rig Type Mobil B-59	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,400 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) MCS, SPT & HQ-Core	Hammer Data 140 lbs. with 30-inch drop
Borehole Backfill Soil Cuttings & Gravel	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1400	0						ML		Brown SANDY SILT with some gravel, very stiff, moist (volcanic ash soil)				
			1	42							19	69	
			2	36			GM		Gray with yellow mottling SILTY GRAVEL with some sand, dense, moist (weathered clinker)		12		Sieve #200= 23.0%
1395	5		3	27					grades to medium dense		13		
1390	10		4	30/3" REF.					Gray BASALT, slightly to moderately fractured, slightly weathered, hard (basalt rock formation)		8		
					90	30							UC= 5,552psi
1385	15												
									Boring terminated at approximately 16.0 feet below existing ground surface				
									*Elevations of borings and test pits estimated from Site Plan Transmitted by Nancy E. Burns on March 7, 2024				
1380	20												

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 2 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 5/16/24	Logged By BK	Checked By AJF
Drilling Method CF Auger and Coring	Drill Bit Size/Type 4-inch SS Auger & HQ-Size Coring	Total Depth of Borehole 15.0 feet
Drill Rig Type Mobil B-59	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,418 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) MCS, SPT & HQ-Core	Hammer Data 140 lbs. with 30-inch drop
Borehole Backfill Soil Cuttings & Gravel	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1418	0						SM		Brown with orange mottling SILTY SAND with some gravel, medium dense, dry (volcanic ash soil)				
			1	31							18	75	Sw. = 0.1%
			2	29			SM		Light brown and gray SILTY SAND with some gravel, medium dense, dry (volcanic ash soil)		17		Sieve -#200 = 18.7%
1413	5		3	22/6" +30/2" REF.					grades to very dense		14		
							SM		Gray SILTY SAND with some gravel, very dense, moist (weathered clinker)				
1408	10				100	93			Gray BASALT, slightly to closely fractured, slightly to moderately weathered, hard (basalt rock formation)				UC = 9,834psi
1403	15								Boring terminated at approximately 15.0 feet below existing ground surface				
1398	20												

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 3 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 5/16/24	Logged By JL	Checked By AJF
Drilling Method CF Auger	Drill Bit Size/Type 4-inch SS Auger	Total Depth of Borehole 10.8 feet
Drill Rig Type Mobil B-59	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,430 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) MCS & SPT	Hammer Data 140 lbs. with 30-inch drop
Borehole Backfill Soil Cuttings & Gravel	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1430	0						SM		Brown with orange and gray mottling SILTY SAND with some gravel and cobbles, medium dense, moist (volcanic ash soil)		35	69	LL=59, PI=14
			1	23									
			2	27							18		Sw.= 2.0%
1425	5		3	28			SM		Grayish brown SILTY SAND with some gravel, medium dense, moist (weathered clinker)		13		
									Gray BASALT, medium hard to hard (basalt rock formation)				
1420	10		4	16/6" +30/3" REF.							9		
									Boring terminated at approximately 10.8 feet below existing ground surface				
1415	15												
1410	20												

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 4 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 5/22/24	Logged By JL	Checked By AJF
Drilling Method CF Auger and Coring	Drill Bit Size/Type 4-inch SS Auger & HQ-Size Coring	Total Depth of Borehole 17.0 feet
Drill Rig Type Mobil B-59	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,448 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) MCS, SPT & HQ-Core	Hammer Data 140 lbs. with 30-inch drop
Borehole Backfill Soil Cuttings & Gravel	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1448	0						ML		Brown SANDY SILT with some gravel, very stiff, moist (volcanic ash soil)				
			1	50/4"			SM		Light brown and gray SILTY SAND with some gravel, very dense, moist (weathered clinker)		14	--	Sieve #200= 19.4%
			2	30/3" +10/0" REF.							16		
1443	5				57	0			Gray with red mottling BASALT, severely fractured, moderately weathered, hard (basalt rock formation)				
									grades to severely to closely fractured				
1438	10				73	32			Gray BASALT, massive to slightly fractured, slightly weathered, hard (basalt rock formation)				UC= 9,041psi
1433	15				98	63							UC= 7,701psi
1428	20								Boring terminated at approximately 17.0 feet below existing ground surface				

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 5 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 5/22/24	Logged By JL	Checked By AJF
Drilling Method CF Auger and Coring	Drill Bit Size/Type 4-inch SS Auger & HQ-Size Coring	Total Depth of Borehole 10.0 feet
Drill Rig Type Mobil B-59	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,448 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) MCS, SPT & HQ-Core	Hammer Data 140 lbs. with 30-inch drop
Borehole Backfill Soil Cuttings & Gravel	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1448	0						ML		Brown SANDY SILT with some gravel, stiff, moist (volcanic ash soil)				
			1	32							31	65	Sw. = 0.3%
			2	13/6" +30/3" REF.			SM		Dark gray with yellow mottling SILTY SAND with some gravel, very dense, moist (weathered clinker)		19		
1443	5		3	10/0" REF.					Gray with light tan mottling BASALT, slightly to moderately fractured, slightly weathered, hard (basalt rock formation)				UC= 4,910psi
			4		100	65							
1438	10								Boring terminated at approximately 10.0 feet below existing ground surface				
1433	15												
1428	20												

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 6 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 5/14/24	Logged By JL	Checked By AJF
Drilling Method CF Auger	Drill Bit Size/Type 4-inch SS Auger	Total Depth of Borehole 10.3 feet
Drill Rig Type Mobil B-59	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,436 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) MCS & SPT	Hammer Data 140 lbs. with 30-inch drop
Borehole Backfill Soil Cuttings & Gravel	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1436	0						ML		Brown SANDY SILT with some gravel, stiff, moist (volcanic ash soil)				
			1	23							26	67	
			2	9			ML		Brown and gray SANDY SILT with some gravel and cobbles, stiff, moist (volcanic ash soil)		24		LL=49, PI=9
1431	5		3	25					grades to very stiff		19		
									Gray BASALT, medium hard to hard (basalt rock formation)				
1426	10		4	35/4" REF.					Boring terminated at approximately 10.3 feet below existing ground surface		--		
1421	15												
1416	20												

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of Boring No. 7 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 5/14/24	Logged By JL	Checked By AJF
Drilling Method CF Auger and Coring	Drill Bit Size/Type 4-inch SS Auger & HQ-Size Coring	Total Depth of Borehole 10.0 feet
Drill Rig Type Mobil B-59	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,414 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) MCS, SPT & HQ-Core	Hammer Data 140 lbs. with 30-inch drop
Borehole Backfill Soil Cuttings & Gravel	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1414	0						SM		Brown and gray SILTY SAND with some gravel, dense, moist (volcanic ash soil)		53	69	LL=67, PI=13
			1	60									
			2	46/6" +50/4" REF.			GM		Brown SILTY GRAVEL with some sand, very dense, moist (weathered clinker)		19		
1409	5		3	20/0" REF.					Gray BASALT, moderately weathered, hard (basalt rock formation)				
					33	7							
1404	10								Boring terminated at approximately 10.0 feet below existing ground surface				
1399	15												
1394	20												

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of TP-1 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 4/16/24	Logged By BK	Checked By AJF
Drilling Method Test Pit Excavations	Drill Bit Size/Type Komatsu PC220 Excavator	Total Depth of Borehole 6.0 feet
Drill Rig Type N/A	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,420 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) GS	Hammer Data N/A
Borehole Backfill Soil Cuttings	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1420	0						GM		Light brown SILTY GRAVEL with some sand and cobbles, medium dense, dry (volcanic ash soil)				
			1								13		
			2								11		
			3						grades to light brown		12		Sieve -#200= 19.9%
			4								7		
1415	5								Gray BASALT, hard (basalt rock formation)				
									Test pit terminated at approximately 6.0 feet below existing ground surface on hard basalt rock formation				
1410	10												
1405	15												
1400	20												

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of TP-2 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 4/16/24	Logged By BK	Checked By AJF
Drilling Method Test Pit Excavations	Drill Bit Size/Type Komatsu PC220 Excavator	Total Depth of Borehole 5.5 feet
Drill Rig Type N/A	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,418 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) GS	Hammer Data N/A
Borehole Backfill Soil Cuttings	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1418	0						ML		Brown SANDY SILT with some gravel and cobbles, stiff, dry (volcanic ash soil)				
			1								10		
			2				SM		Light brown SILTY SAND with some gravel and cobbles, medium dense, dry (volcanic ash soil)		7		
			3								6		
			4								4		
1413	5								Gray BASALT, hard (basalt rock formation)				
									Test pit terminated at approximately 5.5 feet below existing ground surface on hard basalt rock formation				
1408	10												
1403	15												
1398	20												

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of TP-3 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 4/16/24	Logged By BK	Checked By AJF
Drilling Method Test Pit Excavations	Drill Bit Size/Type Komatsu PC220 Excavator	Total Depth of Borehole 6.0 feet
Drill Rig Type N/A	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,430 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) GS	Hammer Data N/A
Borehole Backfill Soil Cuttings	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1430	0						ML		Brown SANDY SILT with some gravel and cobbles, stiff to very stiff, dry (volcanic ash soil)				
			1								18		
			2								17		
			3								10		
1425	5		4						Gray BASALT, medium hard to hard (basalt rock formation)		8		
									Test pit terminated at approximately 6.0 feet below existing ground surface on hard basalt rock formation				
1420	10												
1415	15												
1410	20												

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of TP-4 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 4/16/24	Logged By BK	Checked By AJF
Drilling Method Test Pit Excavations	Drill Bit Size/Type Komatsu PC220 Excavator	Total Depth of Borehole 7.0 feet
Drill Rig Type N/A	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,438 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) GS	Hammer Data N/A
Borehole Backfill Soil Cuttings	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1438	0						GM		Light brown and gray SILTY GRAVEL with some sand and cobbles, medium dense to dense, dry (volcanic ash soil)		15		Sieve -#200= 15.9%
		X	1										
		X	2								12		
		X	3								6		
1433	5												
		X	4						Gray BASALT, hard (basalt rock formation)		4		
									Test pit terminated at approximately 7.0 feet below existing ground surface on hard basalt rock formation				
1428	10												
1423	15												
1418	20												

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of TP-5 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 4/16/24	Logged By BK	Checked By AJF
Drilling Method Test Pit Excavations	Drill Bit Size/Type Komatsu PC220 Excavator	Total Depth of Borehole 8.0 feet
Drill Rig Type N/A	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,439 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) GS	Hammer Data N/A
Borehole Backfill Soil Cuttings	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1439	0						SM		Brown SILTY SAND with some gravel, cobbles and boulders, medium dense, dry (volcanic ash soil)				
			1								13		
			2								14		
			3								10		
1434	5												
			4						Gray BASALT, medium hard to hard (basalt rock formation)		4		
									Test pit terminated at approximately 8.0 feet below existing ground surface on hard basalt rock formation				
1429	10												
1424	15												
1419	20												

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of TP-6 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 4/16/24	Logged By BK	Checked By AJF
Drilling Method Test Pit Excavations	Drill Bit Size/Type Komatsu PC220 Excavator	Total Depth of Borehole 9.0 feet
Drill Rig Type N/A	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,460 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) GS	Hammer Data N/A
Borehole Backfill Soil Cuttings	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1460	0						ML		Brown SANDY SILT with some gravel and cobbles, stiff, dry (volcanic ash soil)				
			1								17		
			2				GM		Light brown SILTY GRAVEL with some sand and cobbles, medium dense, dry (volcanic ash soil)		18		
			3								14		
1455	5												
			4				GM		Gray and brown SILTY GRAVEL with some sand, medium dense to dense, moist (weathered clinker)		6		
			5						grades with purple and light tan weathered cobbles and boulders		5		
1450	10								Test pit terminated at approximately 9.0 feet below existing ground surface on hard basalt rock formation				
1445	15												
1440	20												

Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of TP-7 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 4/16/24	Logged By BK	Checked By AJF
Drilling Method Test Pit Excavations	Drill Bit Size/Type Komatsu PC220 Excavator	Total Depth of Borehole 5.5 feet
Drill Rig Type N/A	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,456 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) GS	Hammer Data N/A
Borehole Backfill Soil Cuttings	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1456	0						ML		Brown SANDY SILT with some gravel and cobbles, stiff to very stiff, dry (volcanic ash soil)				
		X	1								17		
		X	2								12		
1451	5								Gray with light tan BASALT, hard (basalt rock formation)				
									Test pit terminated at approximately 5.5 feet below existing ground surface on hard basalt rock formation				
1446	10												
1441	15												
1436	20												

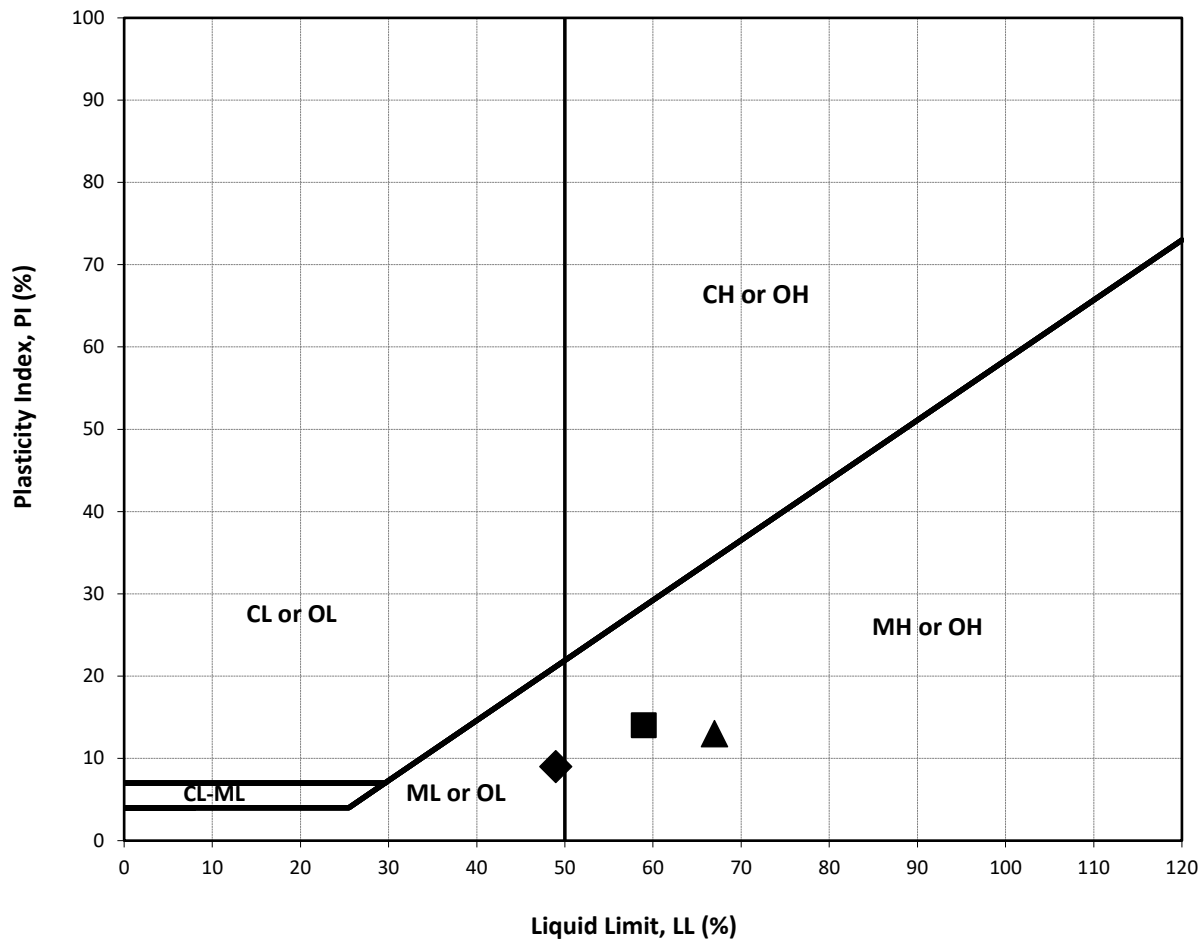
Project: Ouli Affordable Housing, Phase 1	Kokua Geotech LLC 94-974 Pakela St., Suite 109 Waipahu, HI 96797 (808) 397-6974	Log of TP-8 Sheet 1 of 1
Project Location: Waimea, Island of Hawaii		
Project Number: 012323-00		

Date(s) Drilled 4/16/24	Logged By BK	Checked By AJF
Drilling Method Test Pit Excavations	Drill Bit Size/Type Komatsu PC220 Excavator	Total Depth of Borehole 5.5 feet
Drill Rig Type N/A	Drilling Contractor Kokua Geotech LLC	Approximate Surface Elevation +1,456 feet MSL*
Groundwater Level and Date Measured Not Encountered	Sampling Method(s) GS	Hammer Data N/A
Borehole Backfill Soil Cuttings	Location See Site Plan (Plate 2)	

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resistance, blows/ft	Core Recovery, %	RQD, %	U.S.C.S	Graphic Log	MATERIAL DESCRIPTION	Pocket Pen./Torvane, tsf	Water Content, %	Dry Unit Weight, pcf	Remarks and Other Tests
1456	0						GM		Brown SILTY GRAVEL with some sand and cobbles, medium dense to dense, dry (volcanic ash soil)		15		
		X	1										
		X	2								12		
1451	5								Gray BASALT, hard (basalt rock formation)				
									Test pit terminated at approximately 5.5 feet below existing ground surface on hard basalt rock formation				
1446	10												
1441	15												
1436	20												

APPENDIX B

PLASTICITY CHART

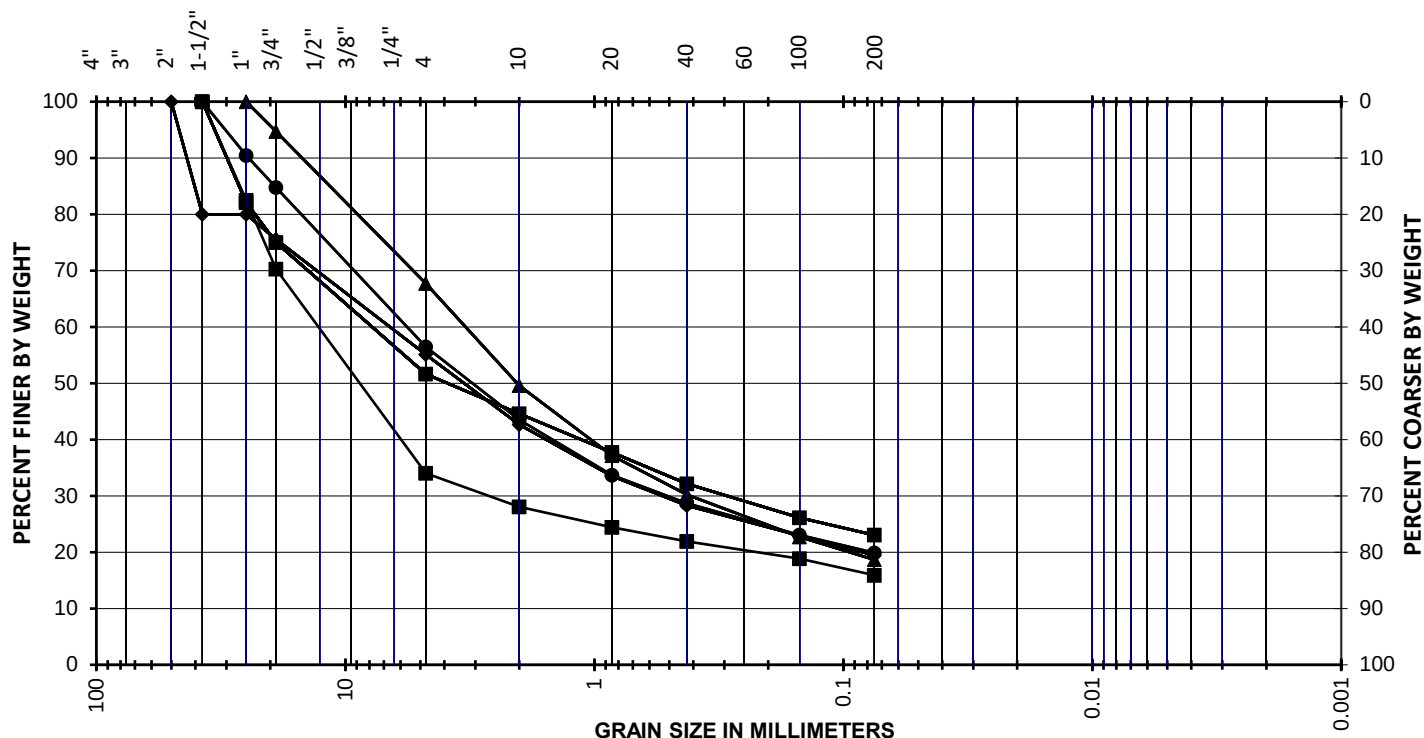


Symbol	Sample	Depth (feet)	Material Description	USCS	LL	PL	PI
■	B-3	1.0 to 2.5	Brown with orange mott. SILTY SAND with some gravel	SM	59	45	14
◆	B-6	2.5 to 4.0	Brown and gray SANDY SILT with some gravel	ML	49	40	9
▲	B-7	1.0 to 2.5	Brown and gray SILTY SAND with some gravel	SM	67	54	13

SUMMARY OF ATTERBERG LIMITS (ASTM D4318) TEST RESULTS

OULI AFFORDABLE HOUSING DEVELOPMENT, PHASE 1
 TMK: (3) 6-2-001: 075
 WAIMEA, ISLAND OF HAWAII

SIEVE ANALYSIS		HYDROMETER ANALYSIS
SIZE OF OPENING IN INCHES	NUMBER OF MESH PER INCH, U.S.	GRAIN SIZE IN MM



COARSE	FINE	COARSE	MEDIUM	FINE	FINES
GRAVEL		SAND			

Symbol	Sample	Depth (feet)	USCS	Description
■	B-1	2.5 to 4.0	GM	Gray with yellow mott. SILTY GRAVEL with some sand
▲	B-2	2.5 to 4.0	SM	Gray w/m.c. mott. SILTY SAND with some gravel
◆	B-4	1.0 to 2.5	GM	Light brown and gray SILTY GRAVEL with some sand
●	TP-1	3.0 to 4.0	GM	Light brown and gray SILTY GRAVEL with some sand
✕	TP-4	2.0 to 3.0	GM	Light brown and gray SILTY GRAVEL with some sand

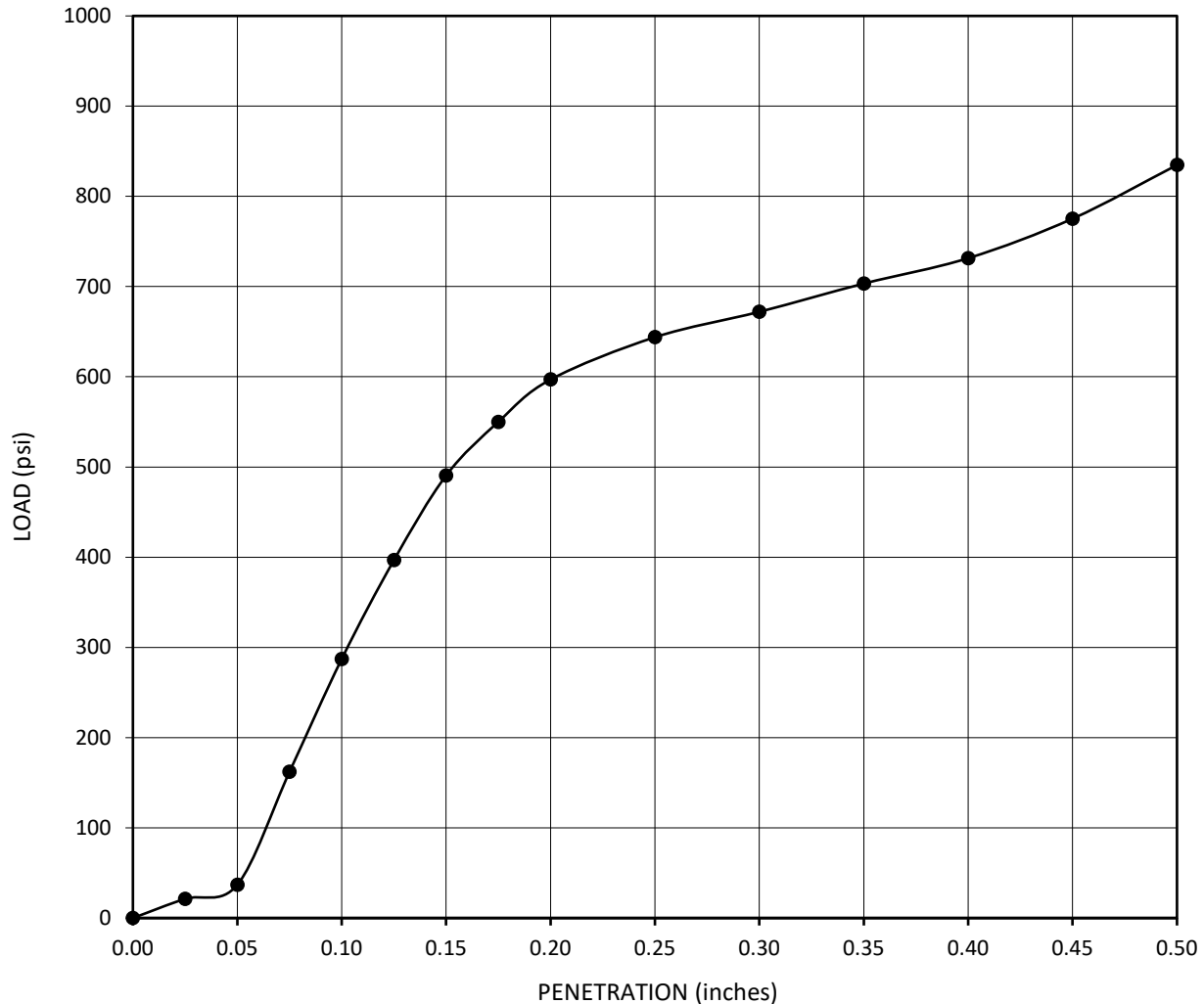
SUMMARY OF GRAIN SIZE DISTRIBUTION (ASTM C117 & C136) TEST RESULTS

OULI AFFORDABLE HOUSING DEVELOPMENT, PHASE 1
 TMK: (3) 6-2-001: 075
 WAIMEA, ISLAND OF HAWAII

<u>Location</u>	<u>Depth</u> (feet)	<u>Length</u> (inches)	<u>Diameter</u> (inches)	<u>Length/ Diameter Ratio</u>	<u>Density</u> (pcf)	<u>Load</u> (lbs)	<u>Compressive Strength</u> (psi)
B-1	13.0 to 14.0	5.94	2.38	2.50	169.1	24,699	5,552
B-2	12.0 to 13.0	5.00	2.38	2.10	181.3	43,750	9,834
B-4	11.0 to 12.0	6.00	2.38	2.52	176.6	40,221	9,041
B-4	14.0 to 15.0	5.75	2.38	2.42	176.6	34,259	7,701
B-5	5.5 to 6.5	5.44	2.38	2.29	169.3	21,844	4,910

SUMMARY OF UNIAXIAL COMPRESSIVE STRENGTH (ASTM D7012) TEST RESULTS

 Kokua Geotech LLC Soil and Foundation Engineering	OULI AFFORDABLE HOUSING DEVELOPMENT, PHASE 1 TMK: (3) 6-2-001: 075 WAIMEA, ISLAND OF HAWAII	
	PROJECT NO.: 012323-00	PLATE B-4
	DATE: JUNE 2024	



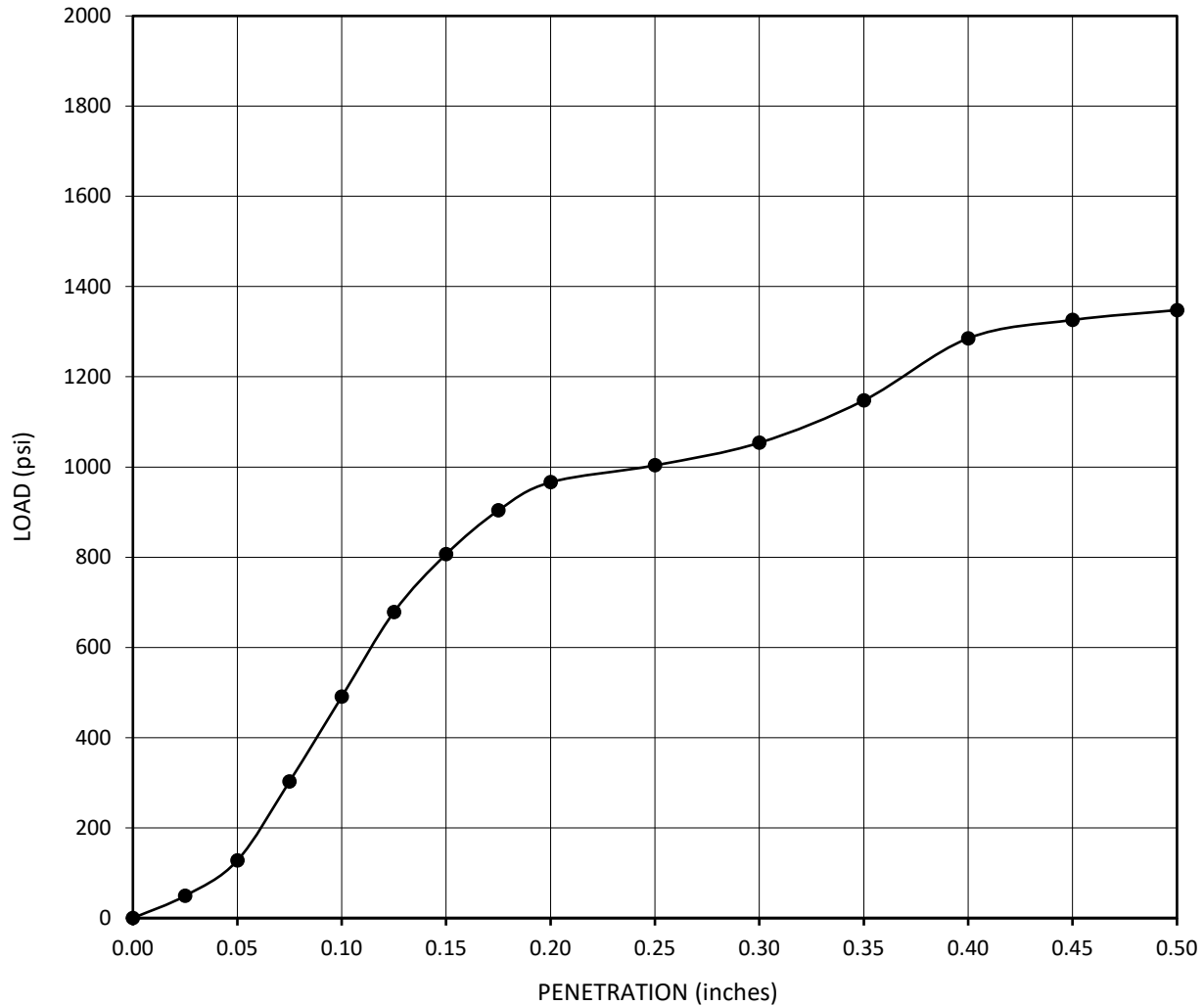
Location: BULK-1 (Cuttings from TP-1)
 Depth: 0.0 to 3.0 feet
 Description: Brown SILTY SAND with some gravel and cobbles

Molding Dry Density: 101.5 pcf
 Molding Moisture: 22.4 %
 Days Soaked: 4
 Aggregate: ¾-inch minus

Corrected CBR @ 0.1": 47.1
 Corrected CBR @ 0.2": 42.4
 Swell (%): 0.1

SUMMARY OF CALIFORNIA BEARING RATIO (ASTM D1883) TEST RESULTS

OULI AFFORDABLE HOUSING DEVELOPMENT, PHASE 1
 TMK: (3) 6-2-001: 075
 WAIMEA, ISLAND OF HAWAII



Location: BULK-2 (Cuttings from TP-7)
 Depth: 0.0 to 3.0 feet
 Description: Brown SILTY SAND with some gravel and cobbles

Molding Dry Density: 100.4 pcf
 Molding Moisture: 17.7 %
 Days Soaked: 4
 Aggregate: ¾-inch minus

Corrected CBR @ 0.1": 72.5
 Corrected CBR @ 0.2": 66.0
 Swell (%): 0.1

SUMMARY OF CALIFORNIA BEARING RATIO (ASTM D1883) TEST RESULTS

OULI AFFORDABLE HOUSING DEVELOPMENT, PHASE 1
 TMK: (3) 6-2-001: 075
 WAIMEA, ISLAND OF HAWAII

APPENDIX C

OULI AFFORDABLE HOUSING DEVELOPMENT, PHASE 1
TMK: (3) 6-2-001: 075
WAIMEA, ISLAND OF HAWAII

BORING NO. 1 – 11 TO 16 FEET



OULI AFFORDABLE HOUSING DEVELOPMENT, PHASE 1
TMK: (3) 6-2-001: 075
WAIMEA, ISLAND OF HAWAII

BORING NO. 2 – 10 TO 15 FEET



OULI AFFORDABLE HOUSING DEVELOPMENT, PHASE 1
TMK: (3) 6-2-001: 075
WAIMEA, ISLAND OF HAWAII

BORING NO. 4 – 3 TO 17 FEET



OULI AFFORDABLE HOUSING DEVELOPMENT, PHASE 1
TMK: (3) 6-2-001: 075
WAIMEA, ISLAND OF HAWAII

BORING NO. 5 – 5 TO 10 FEET



OULI AFFORDABLE HOUSING DEVELOPMENT, PHASE 1
TMK: (3) 6-2-001: 075
WAIMEA, ISLAND OF HAWAII

BORING NO. 7 – 5 TO 10 FEET



APPENDIX D

FIELD INFILTRATION TEST RECORD

Project Name:	Ouli Aff. Housing, Ph. 1		Date of Testing:	5/15/2024	
Project No.:	012323-00		Infiltration Test No.:	I-1	
Method of Testing:	LID Falling Head				
Diameter of Borehole:	4.5	inches	Depth of Borehole:	10.0	feet
Diameter of Casing (ID):	4.0	inches	Length of Casing:	10.0	feet
Datum (above ground):	0.0	feet	Depth of Casing:	10.0	feet
GW level (from ground):	Not Encountered		feet		
<u>Depth (from ground, feet)</u> <u>Anticipated Subsurface Soil Profile</u> 0.0 to 4.0 Brown SILTY SAND with some gravel 6.0 to 10.0 Brown and gray SILTY GRAVEL with some sand and cobbles					

Testing Trial	Elapsed Time (minutes)	Time (hh:mm)	Depth to Water Level (measured from datum) (inches)	Infiltration Rate (inches per hour)
Trial 1	0	13:08	96.0	
	2	13:10	104.0	
	5	13:13	120.0	>24.0
Trial 2	0	13:15	96.0	
	2	13:17	103.0	
	5	13:20	113.0	
	8	13:23	120.0	>24.0
Trial 3	0	13:28	97.0	
	2	13:30	102.5	
	5	13:33	115.0	
	7	13:35	120.0	>24.0
Trial 4	0	13:37	96.0	
	2	13:39	102.0	
	5	13:42	113.0	
	8	13:45	120.0	>24.0

FIELD INFILTRATION TEST RECORD

Project Name:	Ouli Aff. Housing, Ph. 1		Date of Testing:	5/17/2024	
Project No.:	012323-00		Infiltration Test No.:	I-2	
Method of Testing:	LID Falling Head				
Diameter of Borehole:	4.5	inches	Depth of Borehole:	8.0	feet
Diameter of Casing (ID):	4.0	inches	Length of Casing:	10.0	feet
Datum (above ground):	2.0	feet	Depth of Casing:	8.0	feet
GW level (from ground):	Not Encountered		feet		
<u>Depth (from ground, feet)</u> <u>Anticipated Subsurface Soil Profile</u>					
0.0 to 5.0		Brown SILTY SAND with some gravel and cobbles			
5.0 to 8.0		Gray BASALT			

Testing Trial	Elapsed Time (minutes)	Time (hh:mm)	Depth to Water Level (measured from datum) (inches)	Infiltration Rate (inches per hour)
Trial 1	0	8:59	120.0	
	2	9:01	128.0	
	5	9:04	138.0	
	10	9:09	142.0	
	12	9:11	144.0	>24.0
Trial 2	0	9:15	120.0	
	2	9:17	127.0	
	5	9:20	139.0	
	10	9:25	143.0	
	15	9:30	144.0	>24.0
Trial 3	0	9:34	120.0	
	2	9:36	129.0	
	5	9:39	137.0	
	10	9:44	140.5	
	20	9:54	144.0	>24.0
Trial 4	0	10:01	120.0	
	2	10:03	126.5	
	5	10:06	135.0	
	10	10:11	139.0	
	31	10:32	144.0	>24.0

APPENDIX E

DEPARTMENT OF HEALTH – WASTEWATER BRANCH
INDIVIDUAL WASTEWATER SYSTEM (IWS) – SITE EVALUATION / PERCOLATION TEST

Project: Ouli Affordable Housing, Ph. 1 Project No.: 012323-00 Location: P-1
Date/Time: 5/16/2024 11:18 AM Test performed by: Ben Kenna / Tim Lin
Owner: County of Hawaii Tax Map Key: (3) 6-2-001: 075
Elevation: +1,428 feet MSL (Approx.) feet MSL
Depth to Groundwater Table: Unknown feet below grade
Depth to Bedrock (if observed): Unknown feet below grade
Diameter of Hole: 4.0 inches
Depth to Hole Bottom: 5.0 feet below grade

<u>Depth, inches below grade</u>	<u>Soil Profile (color, texture, other)</u>
<u>0 to 12 inches</u>	<u>Brown SILTY SAND with some gravel</u>
<u>12 to 60 inches</u>	<u>Light brown SILTY SAND with some gravel and cobbles</u>

PERCOLATION READINGS

Time 12 inches of water to seep away: 3.1 minutes (first trial reading)
Time 12 inches of water to seep away: 3.5 minutes (second trial reading)

Check one:

☒ For percolation tests in sandy soils, record time intervals and water drops at least every 10 min. for at least 1 hour.

☐ For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals/water drops at least every 10 min. for 1 hour for the first 6 inches to seep away, or if greater than 30 min. record time intervals and water drops at least every 30 min. for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

<u>Time Interval (min)</u>	<u>Drop in Inches</u>	<u>Time Interval (min)</u>	<u>Drop in Inches</u>
<u>2.5</u>	<u>6.0</u>	<u>3.3</u>	<u>6.0</u>
<u>Refilled with 6in. water</u>	<u>--</u>	<u>Refilled with 6in. water</u>	<u>--</u>
<u>3.1</u>	<u>6.0</u>	<u>3.2</u>	<u>6.0</u>
<u>Refilled with 6in. water</u>	<u>--</u>	<u>Refilled with 6in. water</u>	<u>--</u>
<u>3.3</u>	<u>6.0</u>	<u>3.2</u>	<u>6.0</u>
<u>Refilled with 6in. water</u>	<u>--</u>		

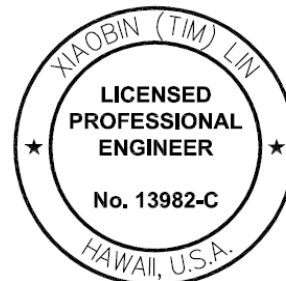
Percolation Rate (time/final water level drop): 0.53 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable.

Kokua Geotech LLC



Xiaobin (Tim) Lin, P.E.
President



THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION.
(MY LICENSE EXPIRES 4/30/2026)

DEPARTMENT OF HEALTH – WASTEWATER BRANCH
INDIVIDUAL WASTEWATER SYSTEM (IWS) – SITE EVALUATION / PERCOLATION TEST

Project: Ouli Affordable Housing, Ph. 1 Project No.: 012323-00 Location: P-2
Date/Time: 5/22/2024 11:18 AM Test performed by: Jeric Licup / Tim Lin
Owner: County of Hawaii Tax Map Key: (3) 6-2-001: 075
Elevation: +1,452 feet MSL (Approx.) feet MSL
Depth to Groundwater Table: Unknown feet below grade
Depth to Bedrock (if observed): Unknown feet below grade
Diameter of Hole: 4.0 inches
Depth to Hole Bottom: 5.0 feet below grade

<u>Depth, inches below grade</u>	<u>Soil Profile (color, texture, other)</u>
<u>0 to 42 inches</u>	<u>Brown SANDY SILT with some gravel</u>
<u>42 to 60 inches</u>	<u>Light brown SILTY SAND with some gravel and cobbles</u>

PERCOLATION READINGS

Time 12 inches of water to seep away: 4.0 minutes (first trial reading)
Time 12 inches of water to seep away: 4.2 minutes (second trial reading)

Check one:

☒ For percolation tests in sandy soils, record time intervals and water drops at least every 10 min. for at least 1 hour.

☐ For percolation tests in non-sandy soils, presoak the test hole for at least 4 hours. Record time intervals/water drops at least every 10 min. for 1 hour for the first 6 inches to seep away, or if greater than 30 min. record time intervals and water drops at least every 30 min. for 4 hours or until 2 successive drops do not vary by more than 1/16 inch.

<u>Time Interval (min)</u>	<u>Drop in Inches</u>	<u>Time Interval (min)</u>	<u>Drop in Inches</u>
<u>3.0</u>	<u>6.0</u>	<u>3.5</u>	<u>6.0</u>
<u>Refilled with 6in. water</u>	<u>--</u>	<u>Refilled with 6in. water</u>	<u>--</u>
<u>3.1</u>	<u>6.0</u>	<u>4.0</u>	<u>6.0</u>
<u>Refilled with 6in. water</u>	<u>--</u>	<u>Refilled with 6in. water</u>	<u>--</u>
<u>3.2</u>	<u>6.0</u>	<u>4.1</u>	<u>6.0</u>
<u>Refilled with 6in. water</u>	<u>--</u>		

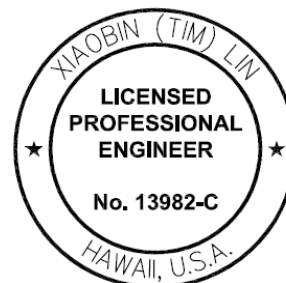
Percolation Rate (time/final water level drop): 0.68 min/in

As the engineer responsible for gathering and providing site information and percolation test results, I attest to the fact that above site information is accurate and that the site evaluation was conducted in accordance with the provisions of Chapter 11-62, "Wastewater Systems" and the results were acceptable.

Kokua Geotech LLC



Xiaobin (Tim) Lin, P.E.
President



THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION.
(MY LICENSE EXPIRES 4/30/2026)

Path: O:\Hawaii\Ouli HICDC Master Plan\GIS\Projects\Ouli Affordable Site Plan\Ouli Affordable Site Plan.aprx



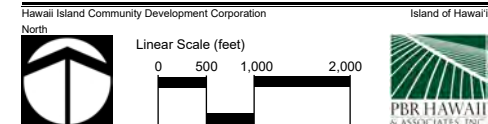
LEGEND

-  Project Area
-  Project TMK (6-2-001:075)
-  County TMK

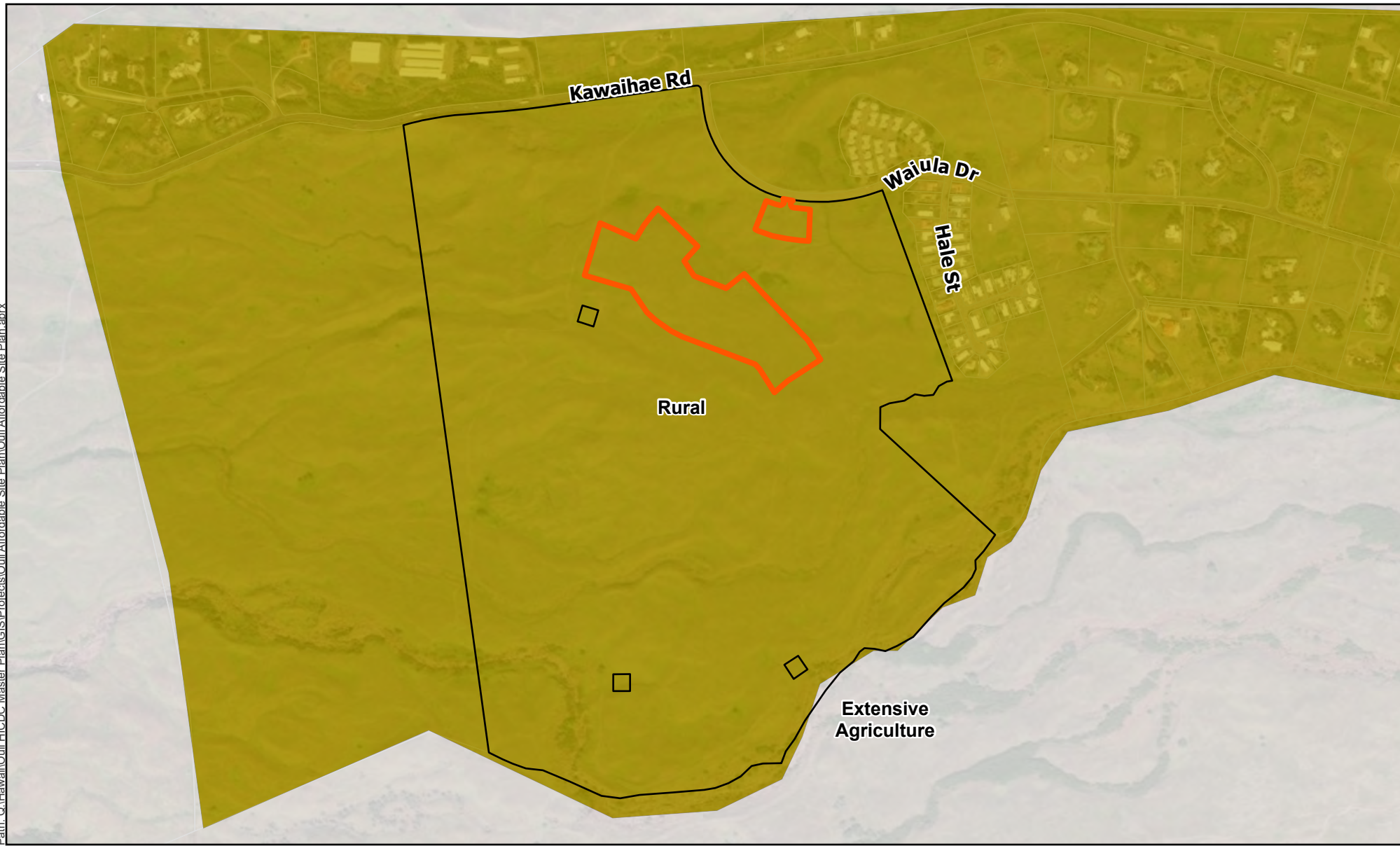
Sources: County of Hawaii, 2023.
Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, Resource Mapping Hawaii, Maxar, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA, USFWS
Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.



FIGURE 1:
Regional Location
'ŌULI AFFORDABLE
SITE PLAN



DATE: 4/3/2024



DATE: 4/3/2024

LEGEND

 Project Area

 Project TMK (6-2-001:075)

 County TMK

General Plan LUPAG (2022)

 Extensive Agriculture

 Rural

FIGURE 2:
Hawai'i General Plan Land
Use Pattern Allocation Guide
‘ŌULI AFFORDABLE
SITE PLAN

Hawaii Island Community Development Corporation

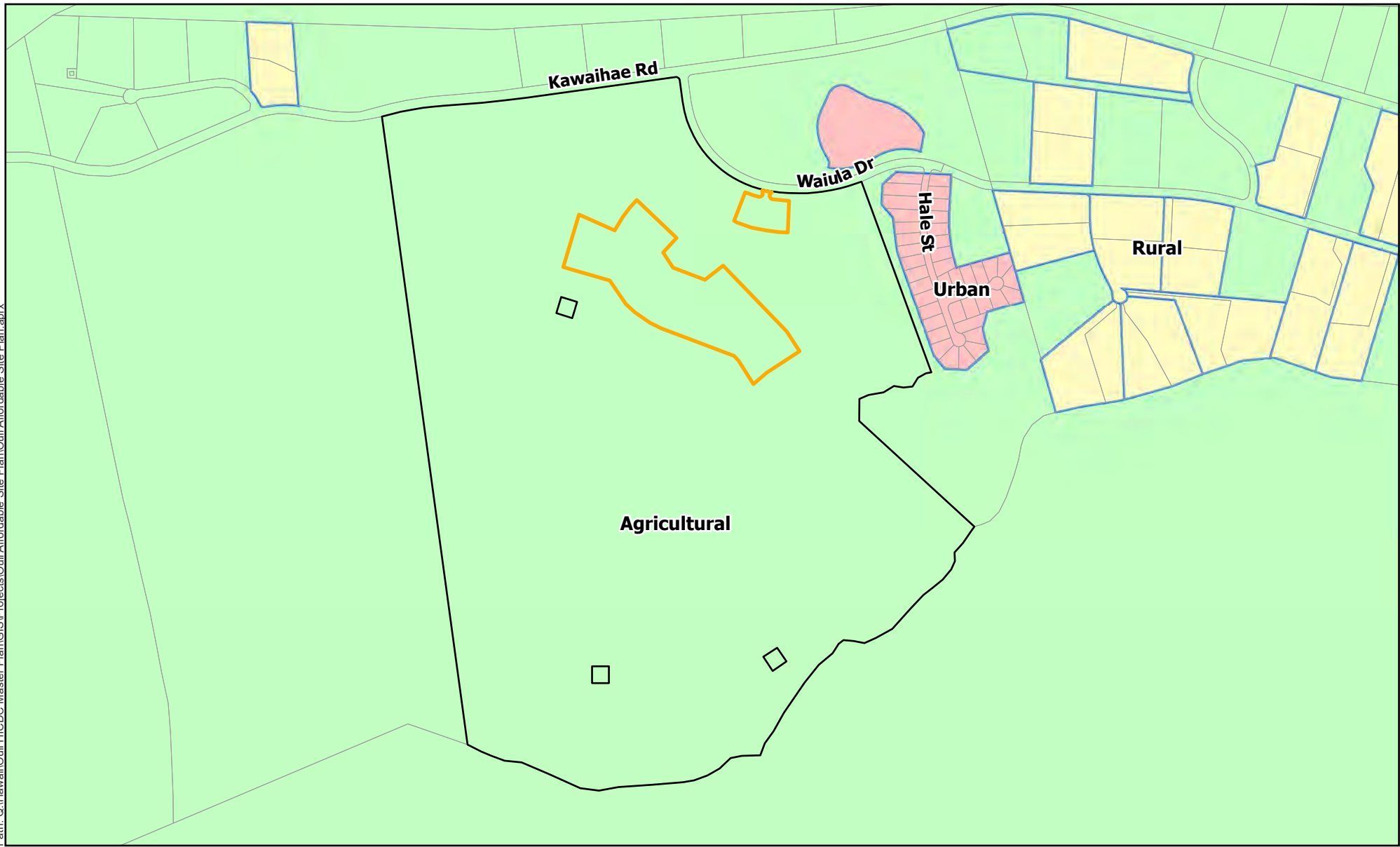
Island of Hawai'i



Sources: County of Hawaii, 2022; 2023.

Resource Mapping Hawaii, Maxar

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



DATE: 4/3/2024

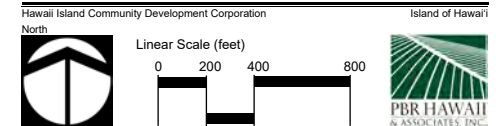
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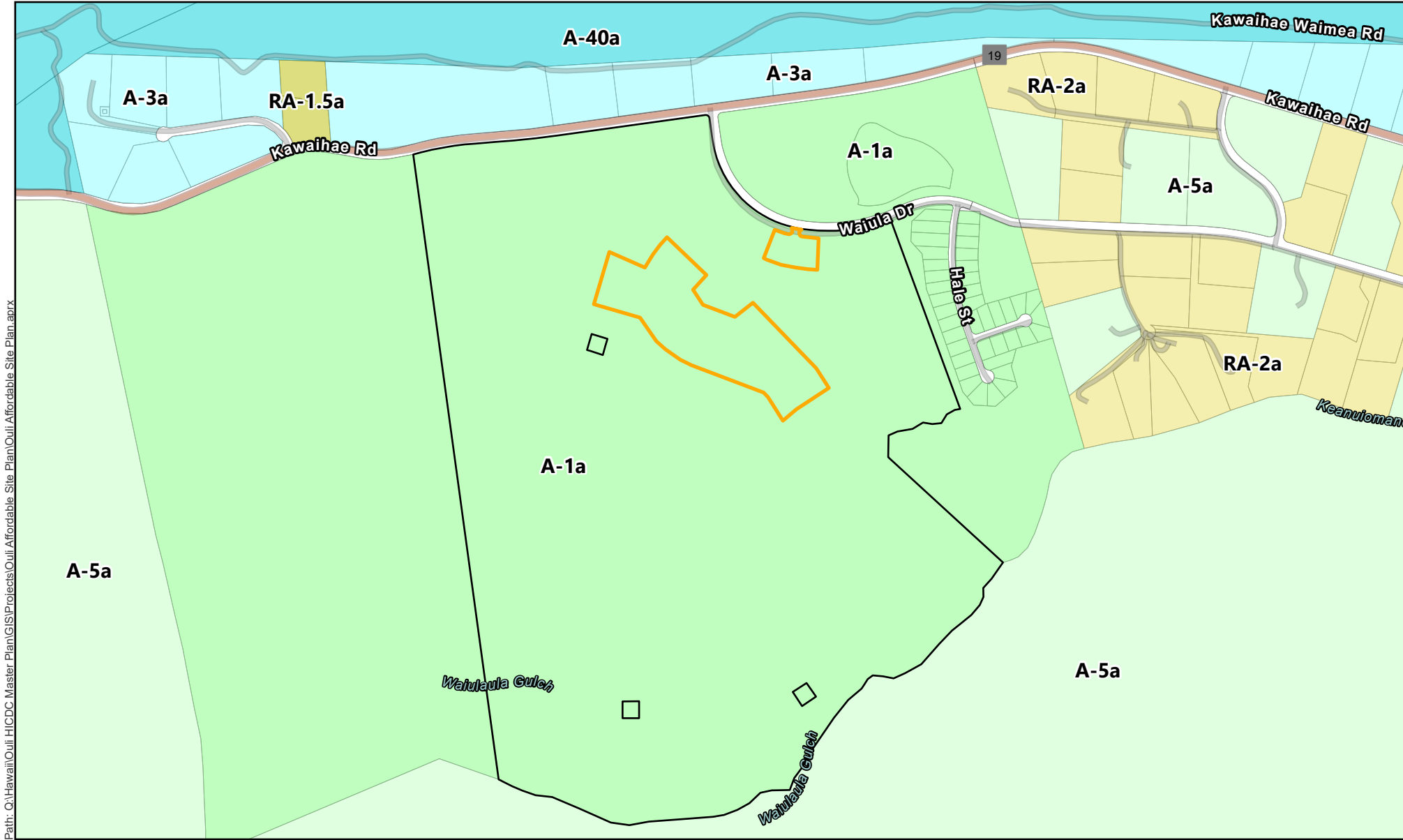
-  Project Area
-  Project TMK (6-2-001:075)
-  County TMK

State Land Use Classifications (SLU)

-  Agricultural
-  Rural
-  Urban

FIGURE 3:
State Land Use Districts Map
‘ŌULI AFFORDABLE
SITE PLAN





Path: Q:\Hawaii\Ouli HICDC Master Plan\GIS\Projects\Ouli Affordable Site Plan\Ouli Affordable Site Plan.aprx

DATE: 4/3/2024

LEGEND

Project Area
 Project TMK (6-2-001:075)
 County TMK

County Zoning

A-1a
 RA-1.5a

A-3a
 RA-2a

A-40a
 A-5a

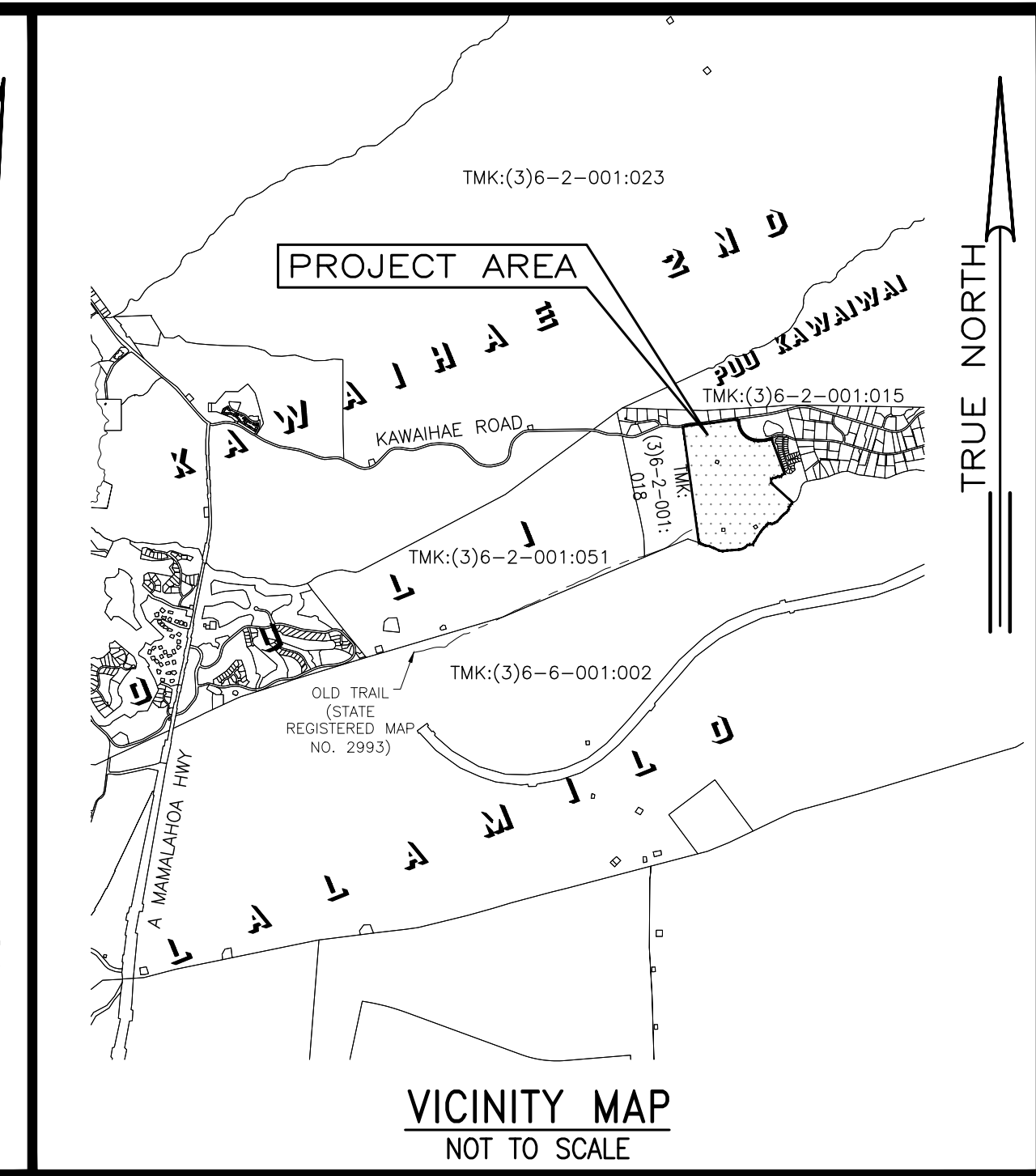
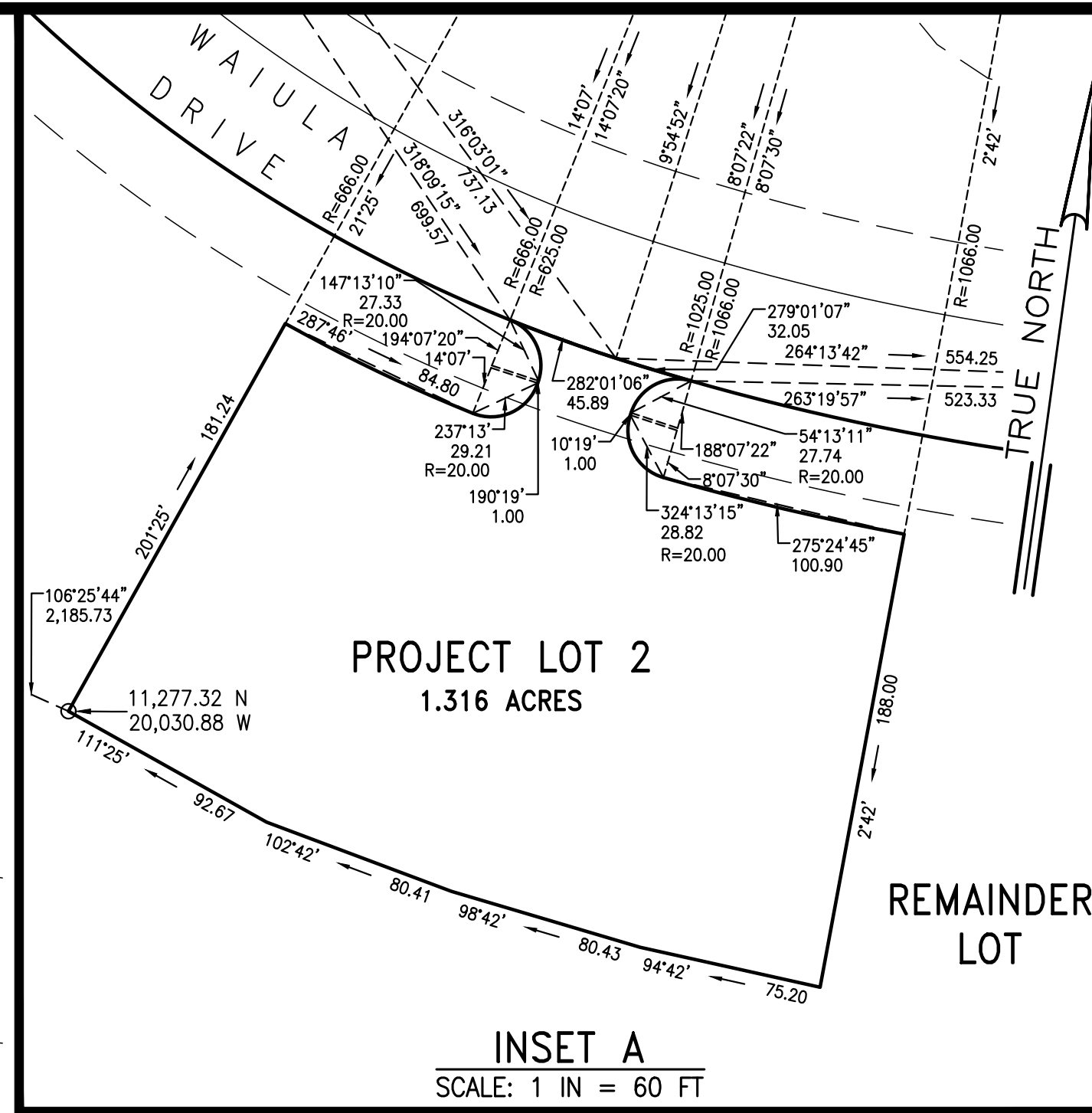
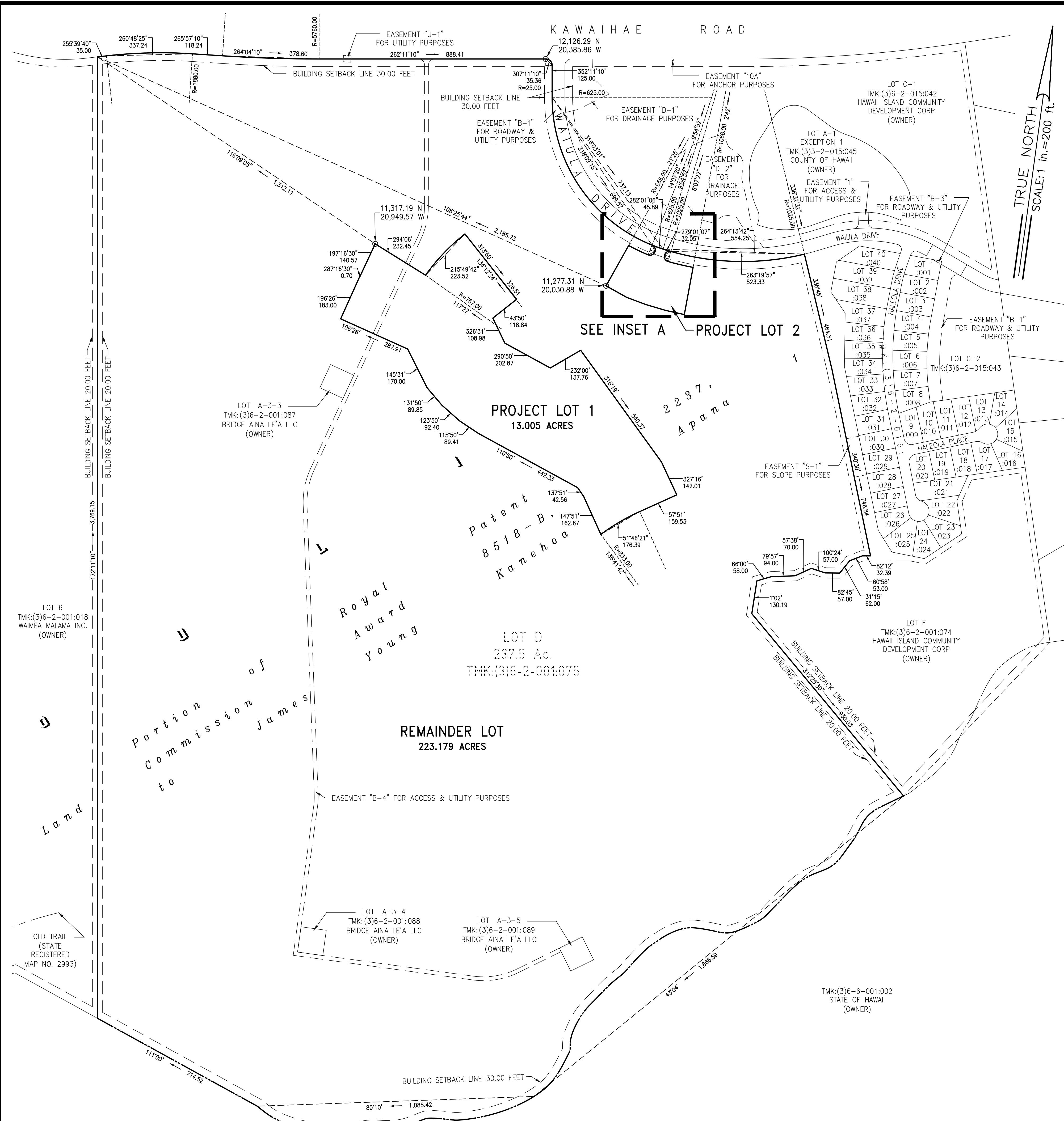
FIGURE 4: County Zoning 'ŌULI AFFORDABLE SITE PLAN

Hawaii Island Community Development Corporation

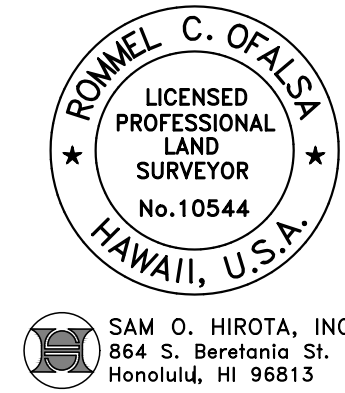
Island of Hawaii

PBR HAWAII & ASSOCIATES, INC.

Source: County of Hawaii, 2023.
 Esri Community Maps Contributors, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA, USFWS
 Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.



- NOTES:
1. AZIMUTHS AND COORDINATES ARE REFERRED TO GOVERNMENT SURVEY TRIANGULATION STATION "PUU PA" Δ.
 2. THIS DISPLAY MAP SERVES AS A REFERENCE FOR ZONE AND STATE LAND USE AMENDMENT AND DOES NOT CONSTITUTE A LEGAL SUBDIVISION.
 3. SOUTHERN BOUNDARY OF TMK(3) 6-2-001: PARCELS 074 AND 075 FOLLOW THE CENTER LINE OF WAIUALA AND KEANUIOMANO STREAMS AS INTERPRETED FROM AERIAL LIDAR/PHOTOGRAMMETRIC SURVEY DONE BY SAM O. HIROTA, INC. ON MARCH 5 THOUGH 7, 2023.



THIS WORK WAS PREPARED BY ME
OR UNDER MY SUPERVISION.

Rommel C. Ofalsa

ROMMEL C. OFALSA
LICENSED PROFESSIONAL LAND SURVEYOR
CERTIFICATE NO. 10544
License Expires: 4/30/2026

OULI AFFORDABLE HOUSING ZONE AND S.L.U. AMENDMENT DISPLAY MAP

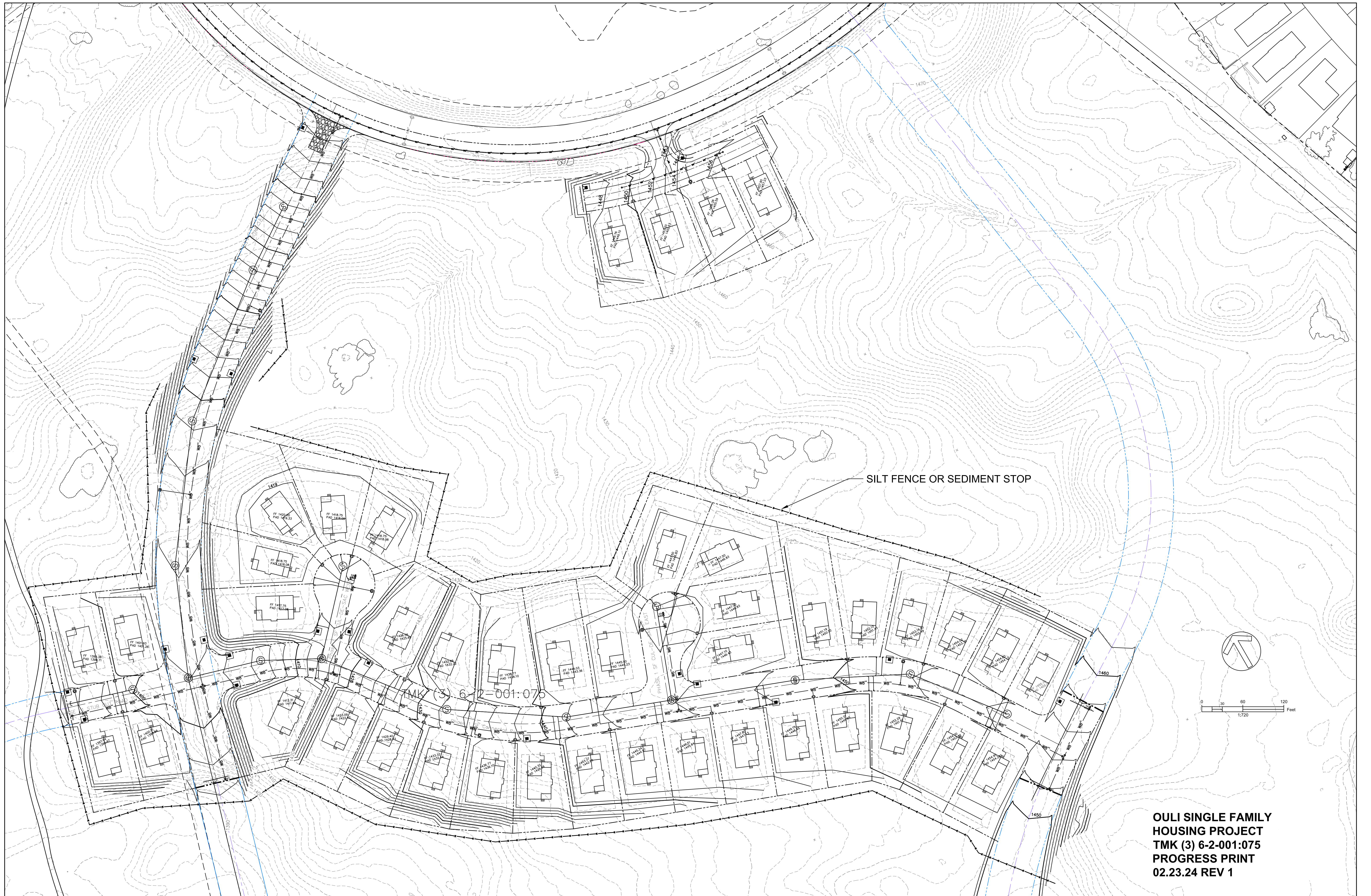
PROJECT LOT 1, PROJECT LOT 2, AND REMAINDER LOT,
BEING LOT D

BEING PORTIONS OF ROYAL PATENT 2237
LAND COMMISSION AWARD 8518-B,
APANA 1 TO JAMES YOUNG KANEHŌA

SITUATED AT OULI, SOUTH KOHALA, ISLAND OF HAWAII, HAWAII

TMK: (3) 6-2-001: PARCEL 075

TMK: (3) 6-2-001: 075
OWNER: HAWAII ISLAND COMMUNITY DEVELOPMENT CORP
SITE ADDRESS: WAIMEA, ISLAND OF HAWAII, HAWAII



OULI SINGLE FAMILY
HOUSING PROJECT
TMK (3) 6-2-001:075
PROGRESS PRINT
02.23.24 REV 1

SUPPORTING INFORMATION
PLANNED UNIT DEVELOPMENT (PUD) PERMIT APPLICATION FOR
Hawaii Island Community Development Corporation
Tax Map Key: (3) 6-2-01: 75 (portion)

A. INTRODUCTION OF APPLICANT AND NATURE OF REQUEST

1. Applicant and Landowner

The Applicant and landowner is Hawaii Island Community Development Corporation.

2. Applicant's Request

Hawaii Island Community Development Corporation (HICDC) is requesting a Planned Unit Development (PUD) Permit to allow for certain exceptions to the Subdivision Code in order to develop an affordable 43-lot single family residential subdivision for low and moderate income households.

As provided by Section 25-6-5 of the Zoning Code regarding Procedure for processing of a PUD, a State Land Use District Boundary Amendment to Urban, and change of zone accompanies this PUD application that will rezone the Project Site from Agricultural-1 acre (A-1a) to Single-Family Residential-10,000 square feet (RS-10).

As further stipulated by Section 25-6-10, (c) of the Zoning Code regarding criteria for granting of a PUD Permit, then basic intent of this PUD application is to develop the proposed 43-lot single family residential subdivision in a manner that *"shall constitute an environment of sustained desirability and stability for the district that is in harmony with the character of the surrounding area, that results in an intensity of land use no higher than otherwise specified for the district, and that maintains the standards of open space at least as high as that otherwise specified for the district in which the development occurs."* The Applicant is requesting these variances to improve the that would not otherwise be possible with the current standards and requirements specified by the Hawai'i County Subdivision Code and Department of Public Works standard details for construction.

3. Location of Subject Site

The subject site consists of two separate areas within TMK: 6-2-01: 75, a 1.316 acre lot and a 13.005 acre lot. These lots are located south of the Waimea-Kawaihae Road approximately 3.3 miles mauka (east) of the Queen Kaahumanu Highway. The planned subdivision would be accessed off of Waiula Drive and is situated makai (west) of the Ouli Self Help Housing Subdivision. -

Statement of Objectives and Reasons for the request

The purpose for the requested PUD Permit is to allow the development of an affordable single-family residential subdivision on a sloping undulating site while seeking to preserving the basic land forms, moderate grading, and minimizing certain development costs where possible. The planned development sites residential uses on gently sloping portions of the larger site and leaving undeveloped the steeper slopes that intervene. A result of this approach is the need for longer and more costly access roads which traverse the steeper portions of the site. These site factors and the desire to fit into the landscape work toward increasing costs. In order to achieve the desired affordability other design approaches are proposed to reduce costs that do not affect the functionality of the project. These are the circumstances and objectives under which this PUD application is proposed.

4. Proposed Project Details

The project is proposed to have paved shoulders, swales, and driving lanes equal to the width of the right of way. No curbs, gutters and sidewalks will be provided. For the four lot cluster access would be provided by a 40-foot wide right of way with each leg being no longer than 150 feet. This would be sufficient for a fire truck to reverse and exist the site if they are called on in the event of a fire.

Drainage would be handled by swales that feed into seepage pits through the project. It should be noted that standard drywells would not be permitted by Department of Health UIC requirements should the planned water wells be developed. Should drywells be initially installed then followed by the development of the water wells the drywells would have to be modified and additional seepage pits installed. Given that it would be prudent to plan for the impact of the well development now by handling the required drainage through the use of seepage pits.

It is also proposed that with the approval of the PUD that all of these roads and the drainage system be dedicated to the County of Hawaii.

5. List of Requested Deviations from the Subdivision Codes

In order to accomplish these stated objectives, the Applicant is requesting, through this PUD Permit application, the following code exceptions as detailed below:

Subdivision Code Sections	Requested Exceptions
Section 23-41. Minimum right-of-way and pavement widths. (a) Unless otherwise indicated on the County general plan, the width of a street in feet shall not be less than the minimums shown in the following table: • Cul-de-sac and dead-end streets: 50 feet minimum right-of-way with 20 foot wide pavement.	The Petitioner request that the requirements be waived to allow a four lot subdivision to be served with by two dead end streets with 40 foot wide right-of-way and a length not to exceed 150 feet with no cul-de-sac or hammerhead turnaround. This exception would allow a smaller and more appropriate access for the limited number of lots served. It would also allow adequate access for fire protection should it be needed. Allowing this and accepting dedication would reduce costs and provide for assured maintenance of the access ways.
Section 23-50. Grades and curves. (a) Vertical and horizontal curves shall be so designed as to give non passing distance visibility in conformance with the following minimum requirements: Minor street horizontal curve- 300 feet	Allow a 200-foot horizontal curve radius as shown on the attached plan for the minor street. This conforms to guidelines provided in AASHTO's A Policy on Geometric Design of Highways and Streets, 7th Edition, 2018 which provide for 200 foot horizontal curves at 25 MPH. Section 23-50(b) states that the Planning Director and the Director of Public Works can allow variations from the required grades and curves. The 200 foot horizontal curve allows the reverse curve road alignment to fit within the site constraints and to create the best lot configuration. Utilizing a 300 foot horizontal curve would reduce the useable depth of the lots between the two cul-de-sacs due to the steep slopes in the rear portion of these lots. The 200-foot horizontal curve is just before a stop sign so cars will either be slowing to a stop or traffic turning into the street will be slowly accelerating after turning into the street. Providing a smaller radius curve will discourage speeding and function as a traffic calming measure. This is important in a neighborhood where children will be present.
Section 23-86. Requirements for dedicable streets. (c) A street shall have sufficient thickness of pavement, and compacted base course and sub-base material to support axle and wheel loads permitted under section 291-35, Hawaii Revised Statutes. In no case shall the streets be less substantial than the following minimum dedicable standards of the County: (1) A street serving areas zoned for lots seventy-five hundred square feet to and including one acre, shall have a six-inch minimum select borrow sub-base course, a base course of four inches of compacted crusher run base with filler, and a pavement of two inches of asphalt concrete or two and one-half inches of asphaltic macadam, applied in three separate applications. Pavement width shall conform to the urban standard as set forth under section 23-41.	The Petitioner requests that the requirements of Section 23-86 be waived to allow for: • Six-inch base course of four inches of compacted crusher run base with filler and two inches of asphalt concrete. • Pavement width, including swales and shoulders equal to the right of way width. Improvements as depicted in the attached road sections. The proposed road section with 2-inches of asphalt, which was the county standard until recently, will substantially reduce costs as compared with 3-inches of asphalt. Eliminating the crushed rock sub-base should also reduce costs while allowing the road section to perform satisfactorily according to the soil report.
Section 23-89. Requirements for sidewalks. For the safety of pedestrians and of children at play, sidewalks on both sides of the street may be required. The director shall have the authority to recommend and the council may, when in its judgment a necessity exists for such improvements, require the construction of sidewalks which shall be constructed in accordance with specifications of the County department of public works.	The Petitioner requests that the requirements of Section 23-89 be waived to allow for: • Paved swales and shoulders equal to the right of way width to provide pedestrian access. • Improvements as depicted in the attached road sections. Utilizing the 10 foot wide swales plus the 5 foot wide shoulders as pedestrian paths will reduce costs as compared to a curb, gutter and sidewalk section. Also, if a curb, gutter and sidewalk section is used seepage pits would not be possible given the county standard detail for intake structures above the drywells where curbs and gutters are present. This would necessitate use of deep drywells which would be in conflict with the DOH prohibition of injection wells within one-quarter mile of a water well.

Subdivision Code Sections	Requested Exceptions
Section 23-91. Curbs and Gutters The director shall have the authority to recommend and the council may, when in its judgment a necessity exists for such improvements, require the construction of curbs and gutters which shall be constructed in accordance with specifications of the Department of Public Works.	The Petitioner requests that the requirements of Section 23-86 be waived to allow for: • Paved swales and shoulders in lieu of curbs and gutters • Improvements as depicted in the attached road sections. Paved swales and shoulders would result in substantially less cost for the eventual buyer of the lots as compared to curbs, gutters and sidewalks and would provide the same level of drainage capacity.
Section 23-92. Drainage, flood and erosion mitigation measures. (b) Storm water shall be disposed into drywells, infiltration basis, or other infiltration methods. The subdivision shall not alter the general drainage pattern above or below the subdivision.	The Petitioner request the requirements of Section 23- 92 be waived: To allow the use of seepage pits in lieu of drywells due to their proximity to planned water well sites in compliance with Department of Health requirements and to assist in lower the cost of affordable housing. DOH Admin Rule 11-23-09(a) states, in part: “Any new injection well, other than subclass D injection wells, shall be sited beyond an area which extends at least one-quarter mile from any part of a drinking water source.” The 43 lot subdivision is adjacent to a designated water well site under the control of the third party. Should that well be developed as a drinking water source any injection well in the subdivision would not be in conformance with the DOH Rule. At that point any retrofit drainage plan to comply with the DOH Rule would be very costly to the homeowners.

6. Anticipated Timeframe for Development

Should the PUD Permit and accompanying change of zone requests be approved in 2024, the Applicant will promptly file the subdivision application with the Planning Department. Anticipated completion of the subdivision expected within 5 years from the date of approval of the PUD Permit and accompanying change of zone, or by the end of 2029.

B. LAND USE AND OTHER REGULATORY CONSIDERATIONS

7. General Plan Land Use Pattern Allocation Guide (LUPAG) Map: Rural

The County of Hawai‘i General Plan is the policy document for the long-range comprehensive development of the island of Hawai‘i. The General Plan Land Use Pattern Allocation Guide (LUPAG) map classifies the Project Site and immediately surrounding area for Rural uses. The existing RS-10 zoning in the surrounding area and the proposed RS-10 designation of the Project Site are both consistent with the Rural designation.

8. State Land Use Designation: Agricultural

The State Land Use district is currently Agricultural. It is being proposed to be re-designated as Urban in an accompanying application.

9. Current County Zoning: Agricultural 1-acre (A-1a)

The current zoning is Agricultural 1-acre (A-1a). This designation is proposed to be changed to RS-10 in an accompanying application.

10. DESCRIPTION OF PROPERTY AND SURROUNDING AREA

11. Project Site Description: The 14.321-acre Project Site consists of two irregular-shaped lots. The site is currently vacant of any structures and is being used for grazing purposes. The sites are moderately sloping areas surrounded by steeper slopes.

12. Description of Surrounding Area: Much of the land in the immediate vicinity is similarly vacant of structures with the exception of the Ouli Self Help subdivision which consists of 40 – 10,000 SF lots on which self help homes were constructed. Also in the vicinity is a Ouli cottages project which is a 33 unit single family rental project for low income households.

13. Flood Insurance Rate Map (FIRM): The US Corps of Engineers' Flood Insurance Rate Map (FIRM) designates most of the subject site to be in Zone X (areas outside of 500-year flood).

14. Flora/Fauna Resources: The Biological Survey Report of the project site by Geometrician Associates, LLC did not identify any rare, threatened or endangered species on the site.

15. Archaeological Resources: The Final Report Archeological Survey and Evaluation Land of Ouli by Allan J. Schilz, M.A. identified military and ranching features with the 14.366 acre area, however, no sites warranting preservation were located in the Project Site. SHPD has concurred with these findings.

16. Cultural or Native Gathering Rights: According Cultural Impact Assessment prepared by Kulaiwi Archeology, LLC there are no known cultural resources or customary Native Hawaiian cultural rights that will be affected as a result of the proposed project.

17. Public Access: There is no record of a designated public access to the shoreline or mountain areas that traverses the two Project Sites.

STATEMENT IN SUPPORT OF A PLANNED UNIT DEVELOPMENT PERMIT

- A. **The construction of the project can begin and be completed within a reasonable period of time from the date of approval.**

Following the PUD Permit and accompanying State Land Use District Boundary Amendment and change of zone requests the Applicant will promptly file a subdivision application with the Planning Department. Anticipated completion of the subdivision is expected within 5 years from the date of approval of the PUD Permit and accompanying change of zone, or by the end of 2029 at the latest.

- B. **The proposed development substantially conforms to the General Plan, any adopted community development plan or adopted master plan and, if applicable, any adopted design guidelines and/or standards affecting the project area.**

HAWAI'I COUNTY GENERAL PLAN

The Project Site is designated for Rural uses by the General Plan which would allow for small single- family residential clusters. The requested PUD Permit and accompanying RS-10 zoning request would be consistent with this General Plan designation.

The requested PUD Permit seeks certain exceptions from the Subdivision Code to facilitate the appropriate design of the proposed 43-lot subdivision while maintaining and enhancing its overall design to conform with the character of existing residential subdivisions in the immediate vicinity while also providing affordability for low and moderate income households.



Any residential or agricultural development shall constitute an environment of sustained desirability and stability for the district that is in harmony with the character of the surrounding area, that results in an intensity of land use no higher than that otherwise specified for the district, and that maintains the standards of open space at least as high as that otherwise specified for the district in which the development occurs.

The Project Site, comprising a total of 14.321-acres with a proposed zoning of RS-10, would allow for a maximum single-family residential unit density of 62 lots. As this PUD application the density proposed is 43 lots. The planned lots larger than the minimum 10,000 square feet would take into account the varying terrain found on the site.

- C. **The development of a harmonious, integrated whole justifies exceptions, if required, to the normal requirements of Chapter 23 and Chapter 25, Hawai'i County Code, as amended, and the contemplated arrangements or use make it desirable to apply**

regulations and requirements differing from those ordinarily applicable under the district regulations.

The purpose for the requested PUD Permit is to allow the development of an affordable single-family residential subdivision on a sloping undulating site while seeking to preserving the basic land forms, moderate grading, and minimizing certain development costs where possible. The planned development sites residential uses on gently sloping portions of the larger site and leaving undeveloped the steeper slopes that intervene. One result of this approach is the need for longer and more costly access roads which traverse the steeper portions of the site. Another site factor is the high winds that regularly occur in the region so the utilities will be placed underground for safety and continuity of service. These site factors and the desire to fit into the landscape both work toward increasing costs. In order to achieve the desired affordability other design approaches are proposed to reduce costs that do not affect the functionality of the project. These are the circumstances and objectives under which this PUD application is planned to achieve.

D. Assessment of archaeological, historic and valued cultural resources.

In view of the Hawai'i State Supreme Court's "PASH" and "Ka Pa'akai O Ka'Aina" decisions, the issue relative to native Hawaiian gathering and fishing rights must be addressed in terms of the cultural, historical, and natural resources and the associated traditional and customary practices of the site. As noted in the Biological Survey Report, Archeological Survey and Evaluation, and Cultural Impact Assessment cited above there should be no significant impact to the resources or Native Hawaiian cultural practices by the development of this project.

CONCLUSION

The approval of this PUD request and the accompanying State Land Use District Boundary Amendment and Change of Zone applications will allow the development of an affordable homeownership opportunity for low and moderate income residents of the Big Island while being consistent with the intent of the PUD provisions of the County Code.

Path: O:\Hawaii\Ouli_HICDC Master Plan\GIS\Projects\Ouli Affordable Site Plan\Ouli Affordable Site Plan.aprx



LEGEND

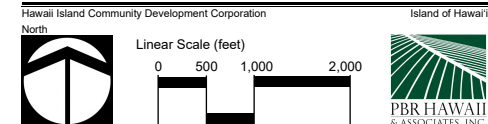
-  Project Area
-  Project TMK (6-2-001:075)
-  County TMK

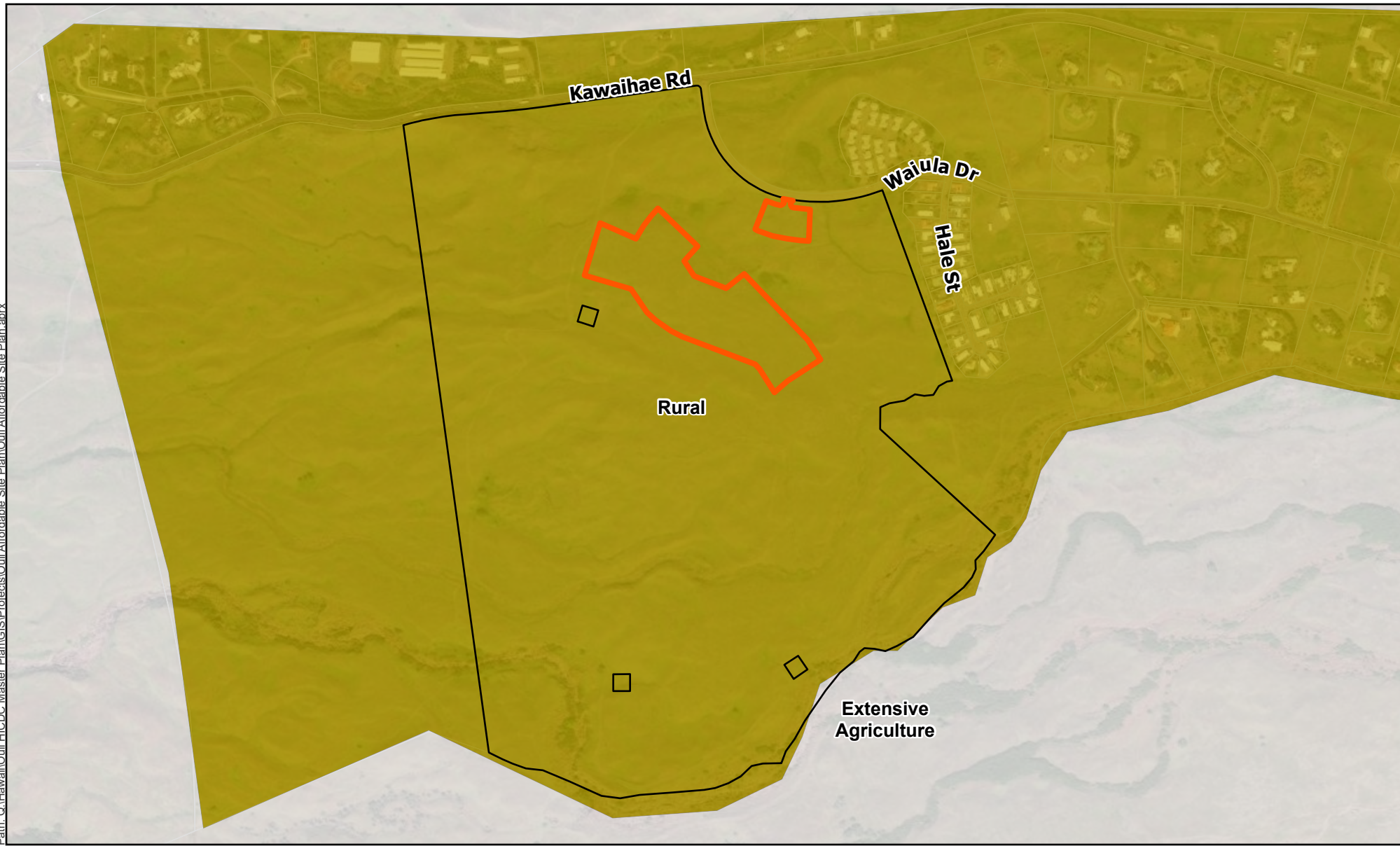
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Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, Resource Mapping Hawaii, Maxar, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA, USFWS
Disclaimer: This Graphic has been prepared for general planning purposes only and should not be used for boundary Interpretations or other spatial analysis.



DATE: 4/3/2024

FIGURE 1:
Regional Location
‘ŌULI AFFORDABLE
SITE PLAN





DATE: 4/3/2024

LEGEND

 Project Area

 Project TMK (6-2-001:075)

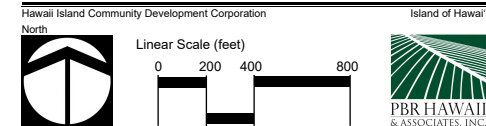
 County TMK

General Plan LUPAG (2022)

 Extensive Agriculture

 Rural

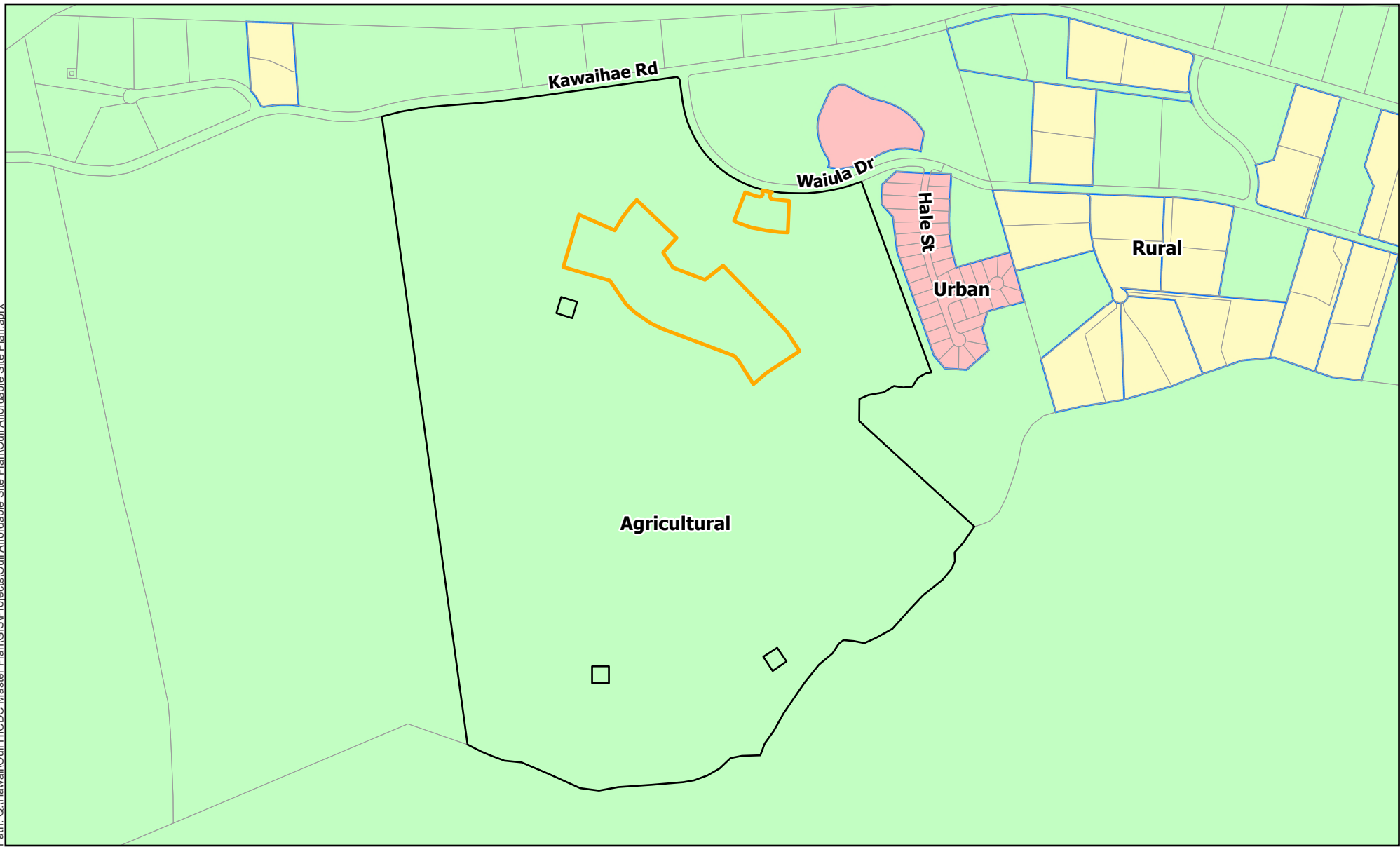
FIGURE 2:
Hawai'i General Plan Land
Use Pattern Allocation Guide
‘ŌULI AFFORDABLE
SITE PLAN



Sources: County of Hawaii, 2022; 2023.

Resource Mapping Hawaii, Maxar

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



DATE: 4/3/2024

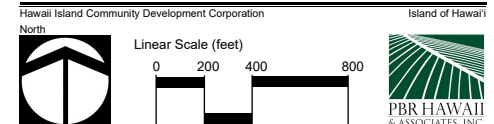
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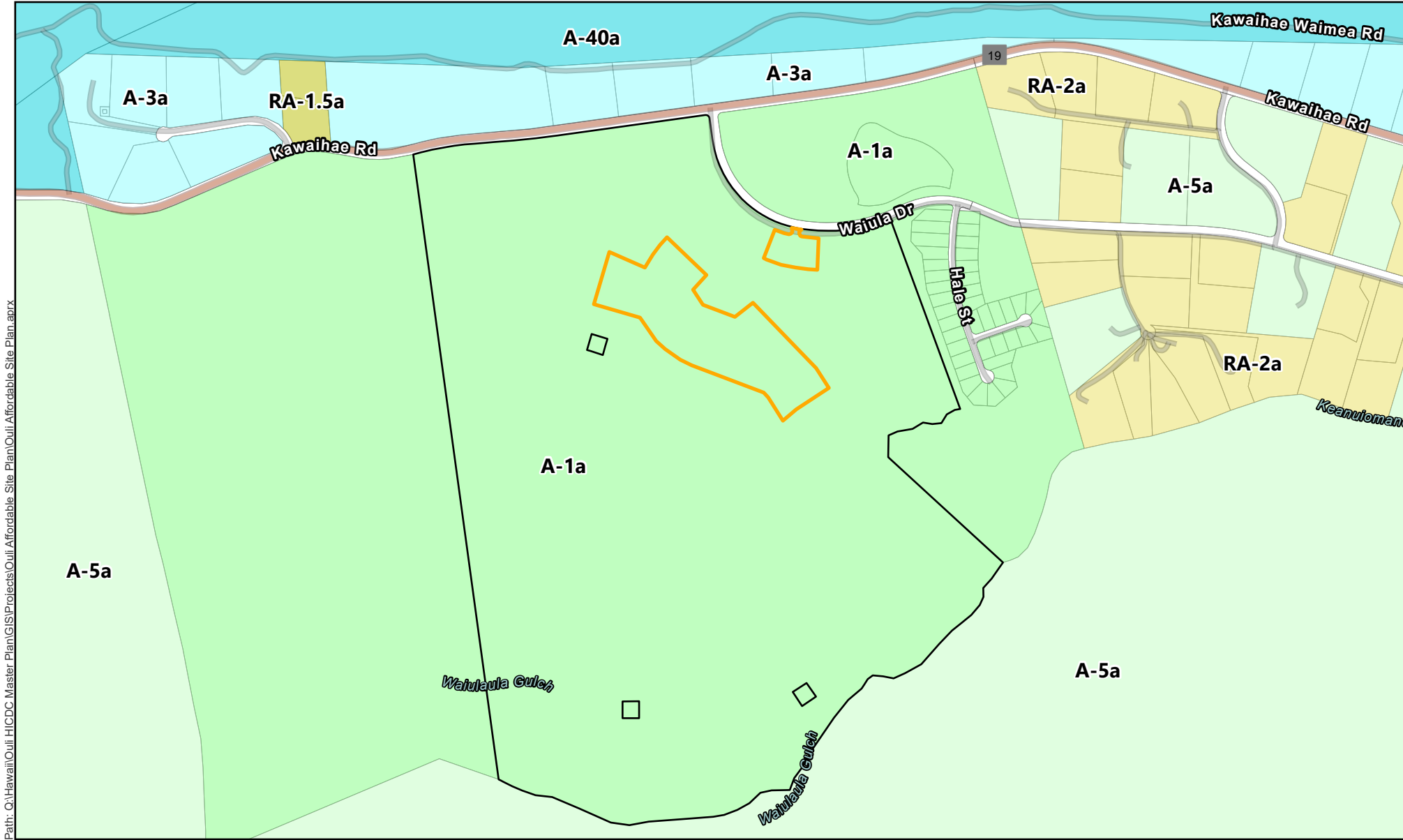
-  Project Area
-  Project TMK (6-2-001:075)
-  County TMK

State Land Use Classifications (SLU)

-  Agricultural
-  Rural
-  Urban

FIGURE 3:
State Land Use Districts Map
‘ŌULI AFFORDABLE
SITE PLAN





DATE: 4/3/2024

LEGEND

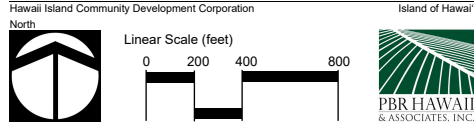
- Project Area
- Project TMK (6-2-001:075)
- County TMK

County Zoning

- A-1a
- A-3a
- A-40a
- A-5a

- RA-1.5a
- RA-2a

**FIGURE 4:
County Zoning
'ŌULI AFFORDABLE
SITE PLAN**



Source: County of Hawaii, 2023.
 Esri Community Maps Contributors, Esri, TomTom, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA, USFWS
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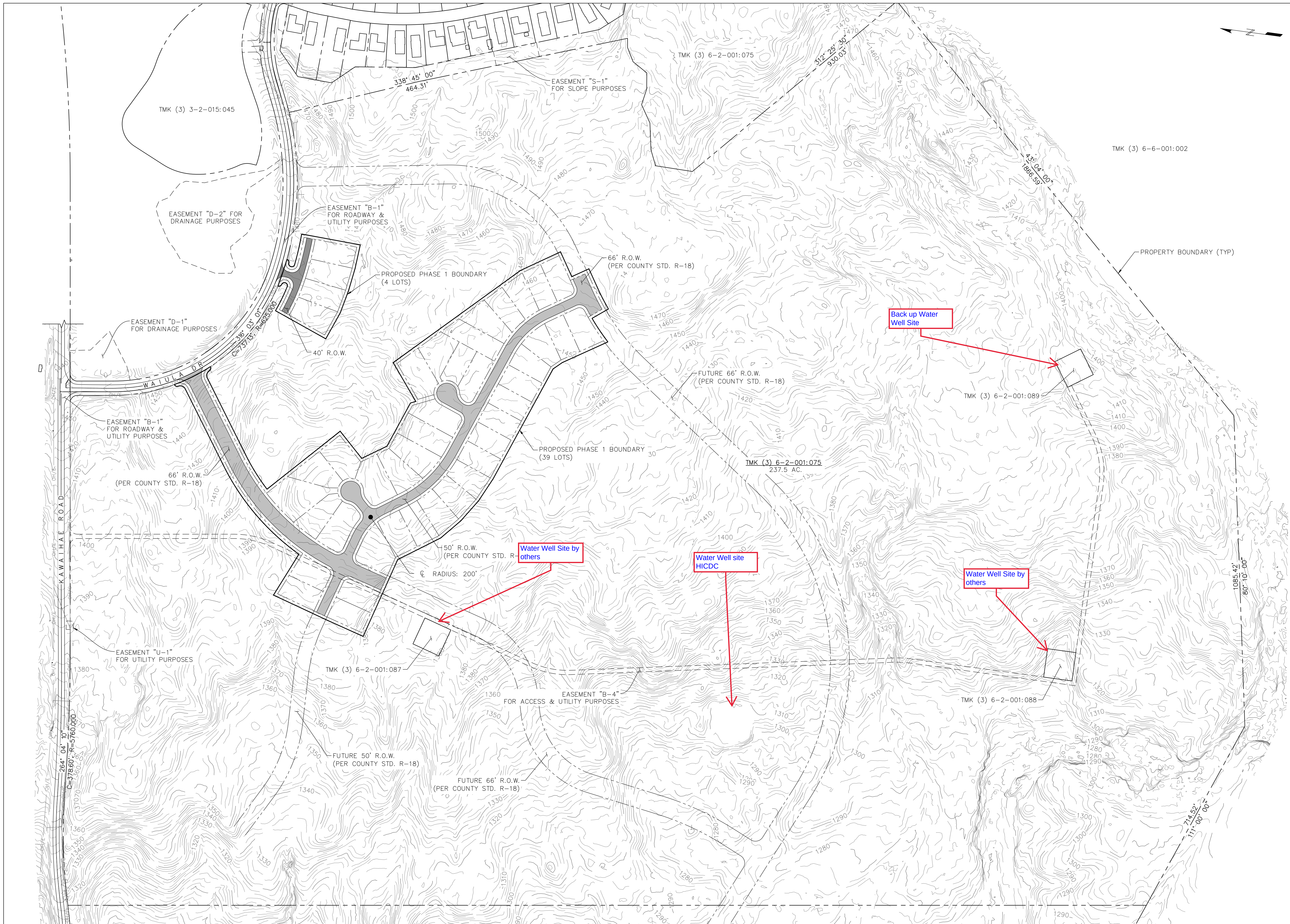


Figure 5. Schematic Site Plan

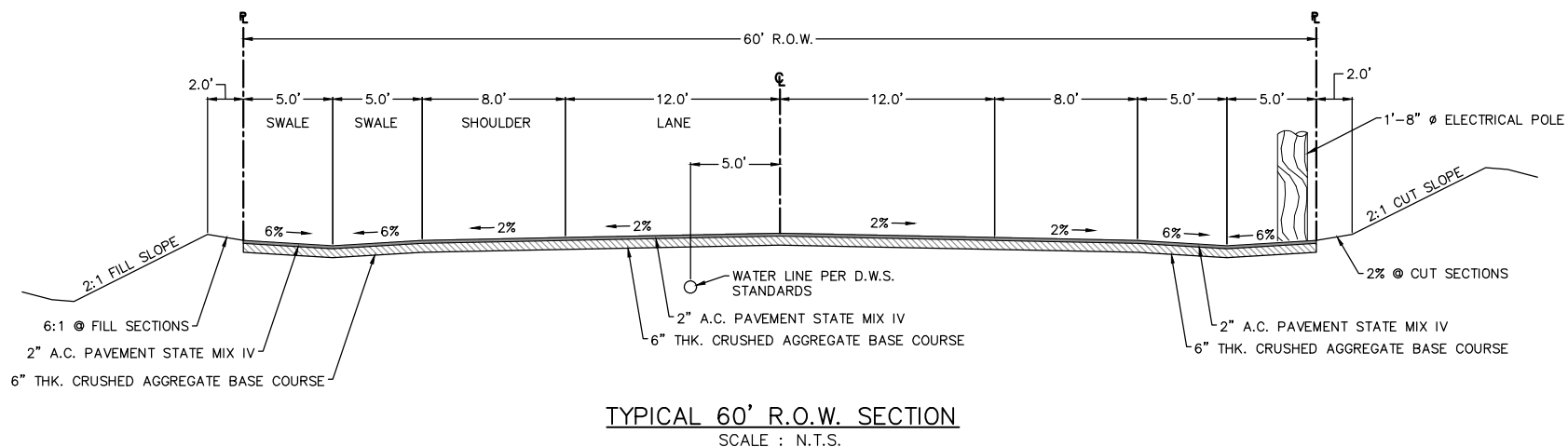
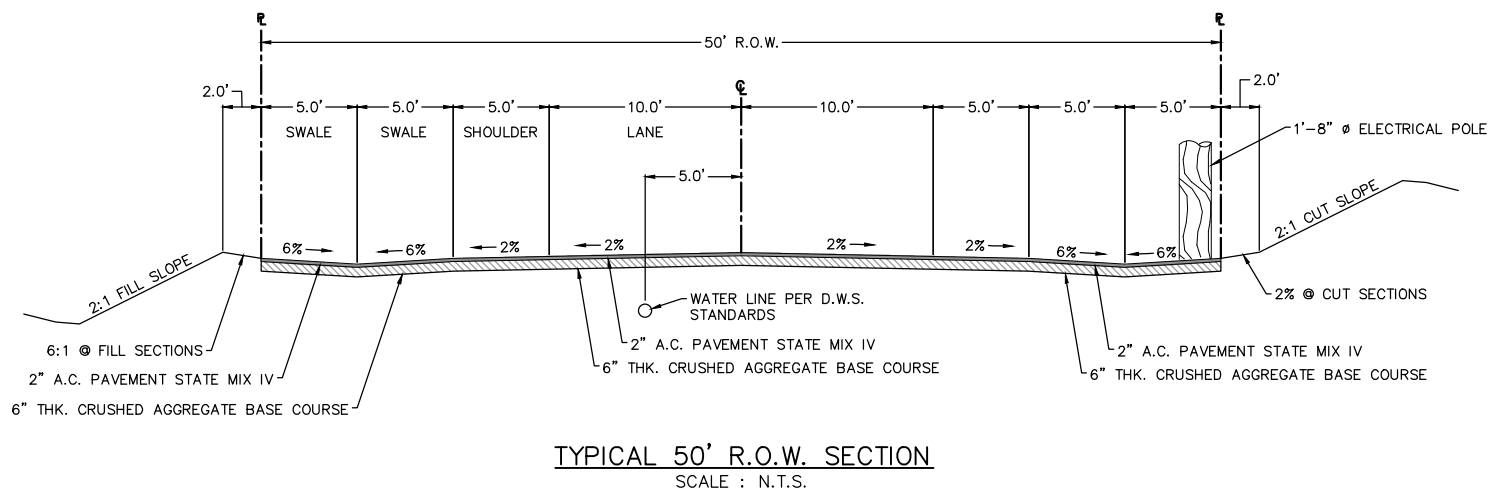
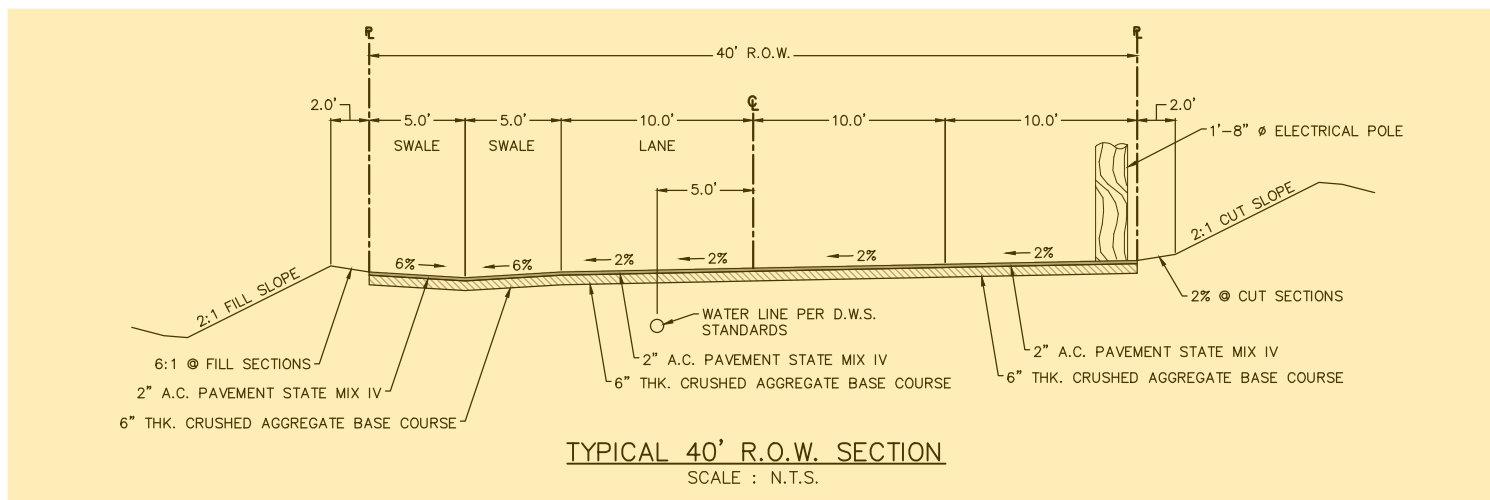
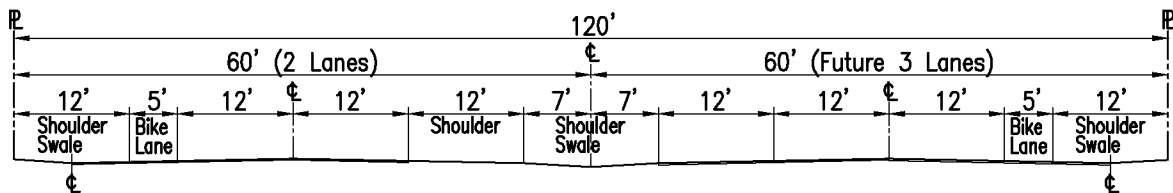
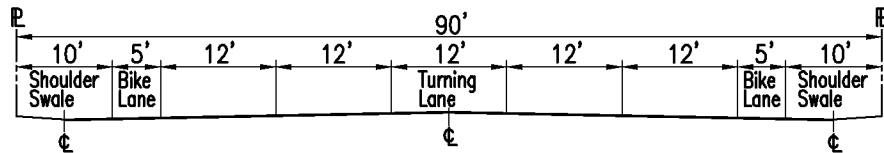


Figure 6. Roadway Sections

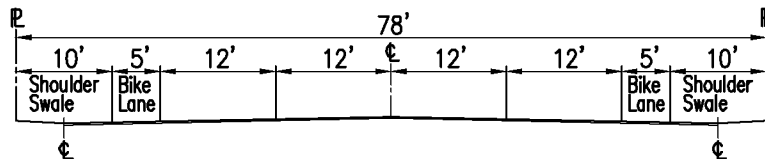
Figure 6a. R-18 Standard Details



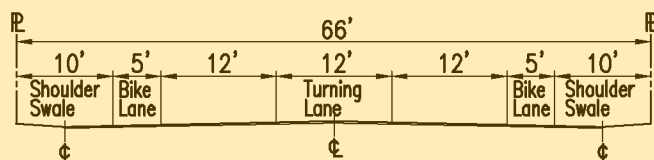
PRIMARY ARTERIAL STREETS



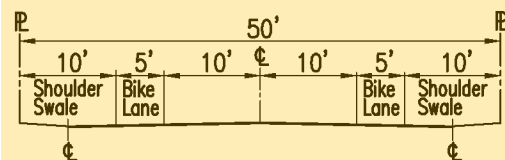
SECONDARY ARTERIAL STREETS



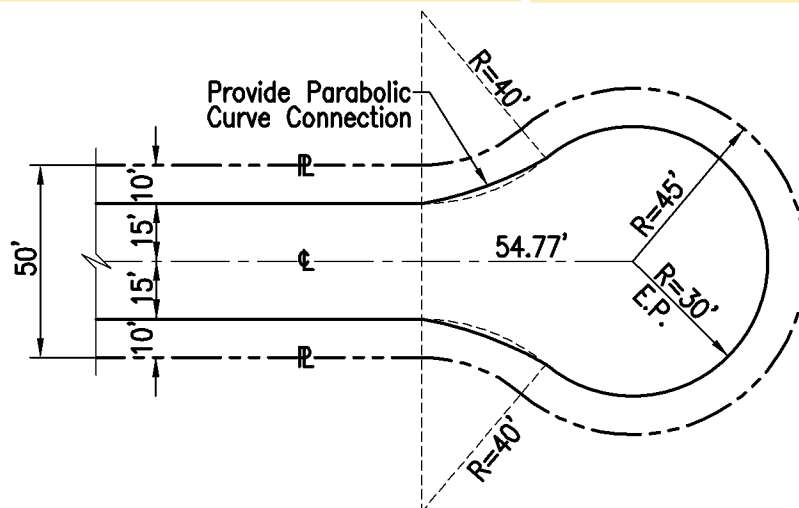
PRIMARY COLLECTOR STREETS



BUSINESS, INDUSTRIAL
COLLECTOR STREETS



MINOR & CUL-DE-SAC
STREETS

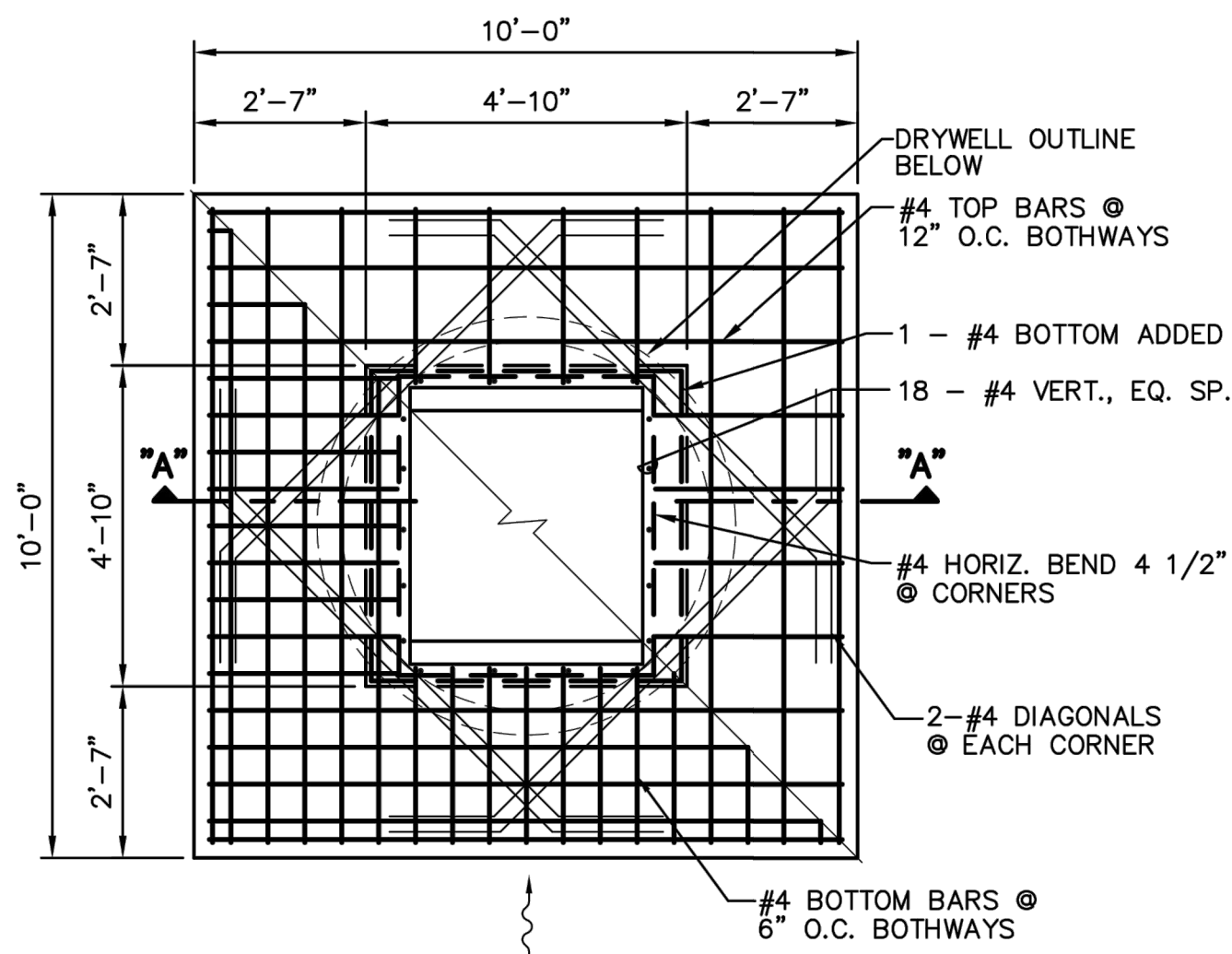


CUL-DE-SAC

NOTE:

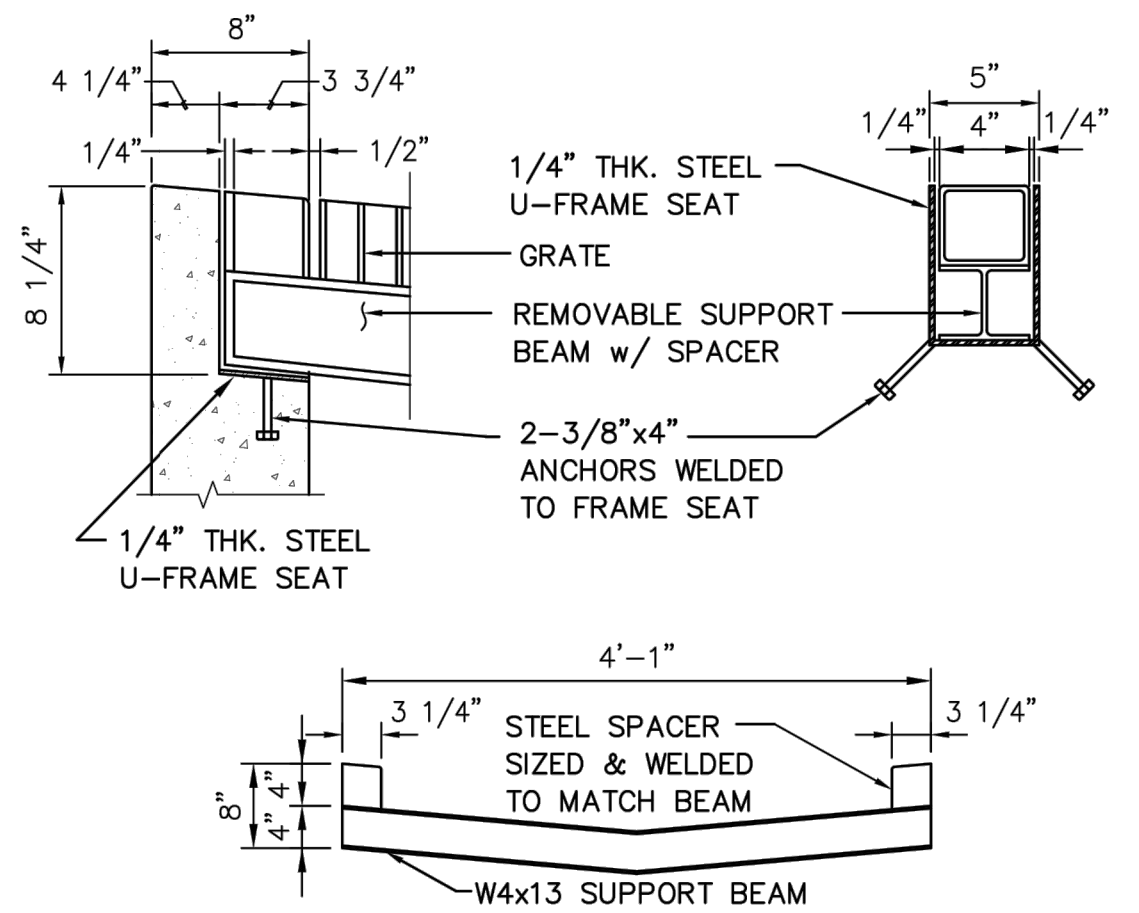
All R/W widths shown are minimum. See Std. Detail
R-20 for Road Pavement and Shoulder Details.

**STREET CROSS SECTIONS
WITHOUT SIDEWALK**



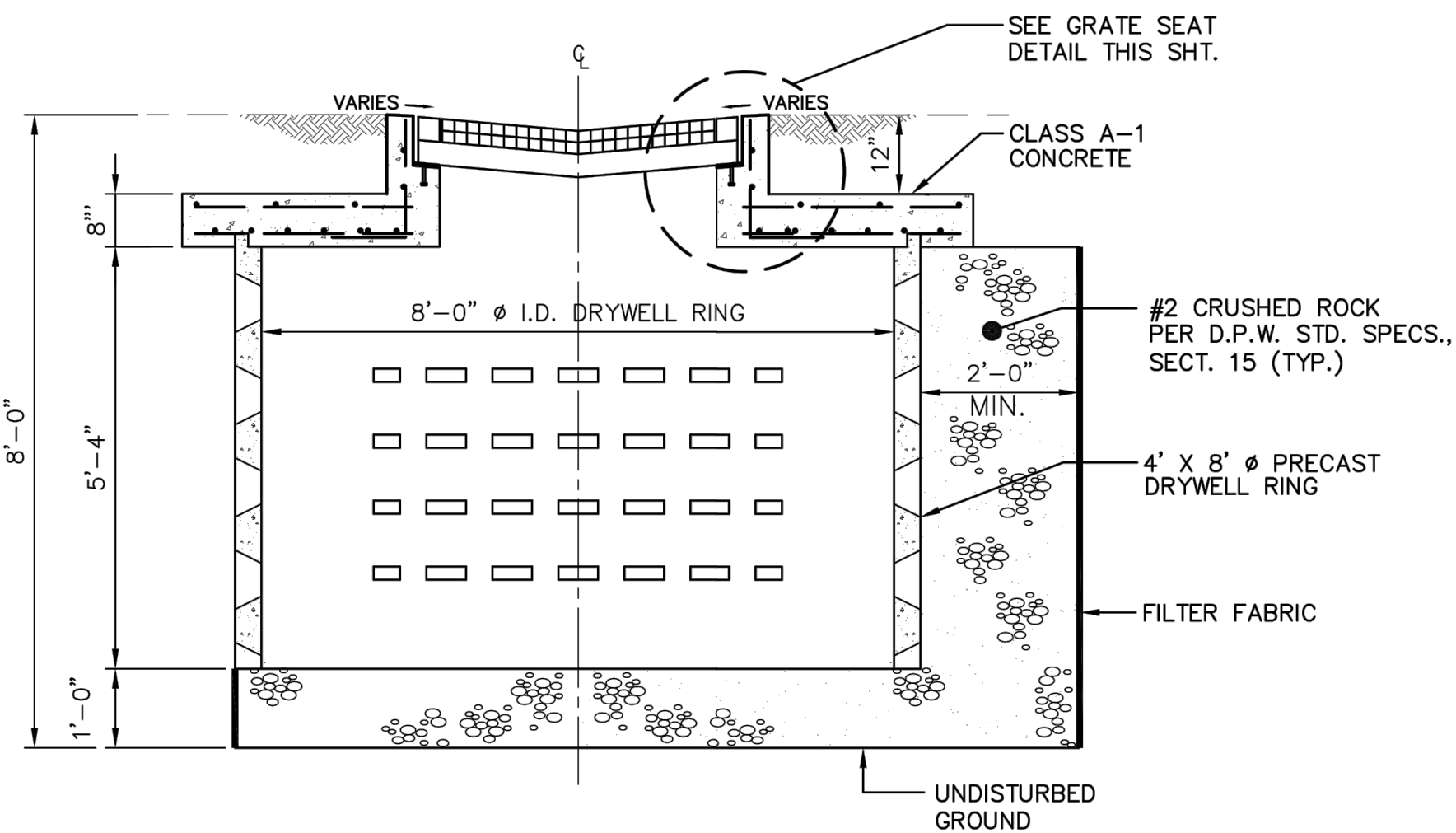
SEEPAGE PIT COVER PLAN

SCALE: $\frac{3}{8}$ "=1'-0"



REMOVABLE SUPPORT BEAM DETAIL

SCALE: N.T.S.



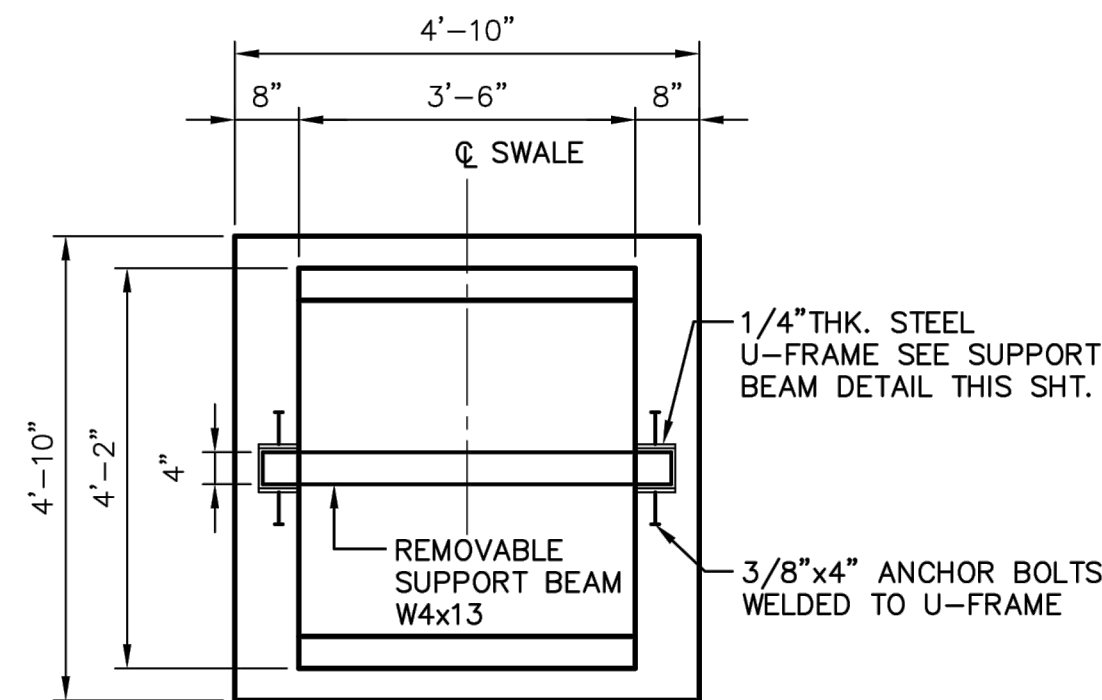
NOTES:

1. ALL WELD 5/16".
2. ALL STEEL SHALL BE STRUCTURAL GRADE.
3. GRATES AND FRAME L'S SHALL BE HOT DIP GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH SECTION 44.3 (H) OF THE STANDARD SPECS.

SECTION "A" - "A"

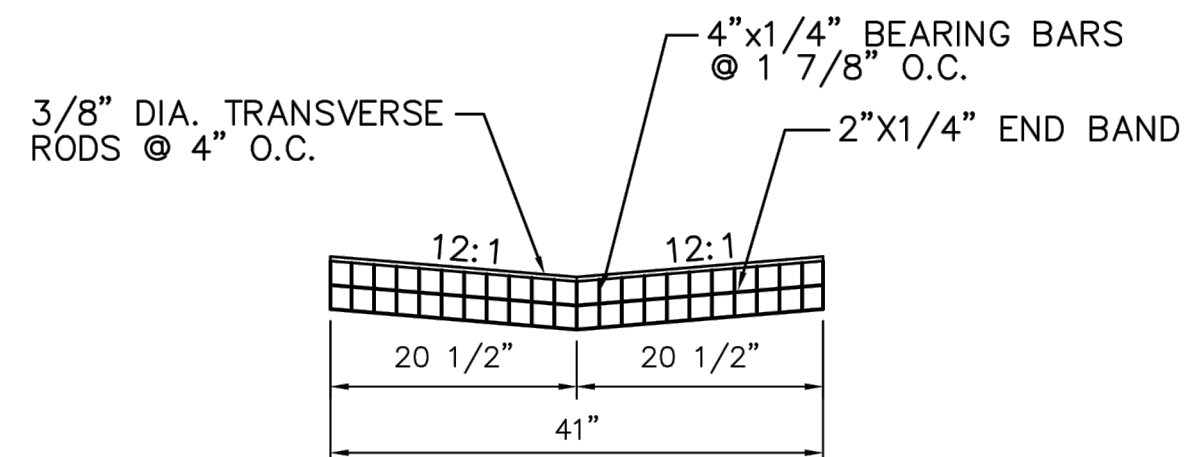
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MOD-A.DWG



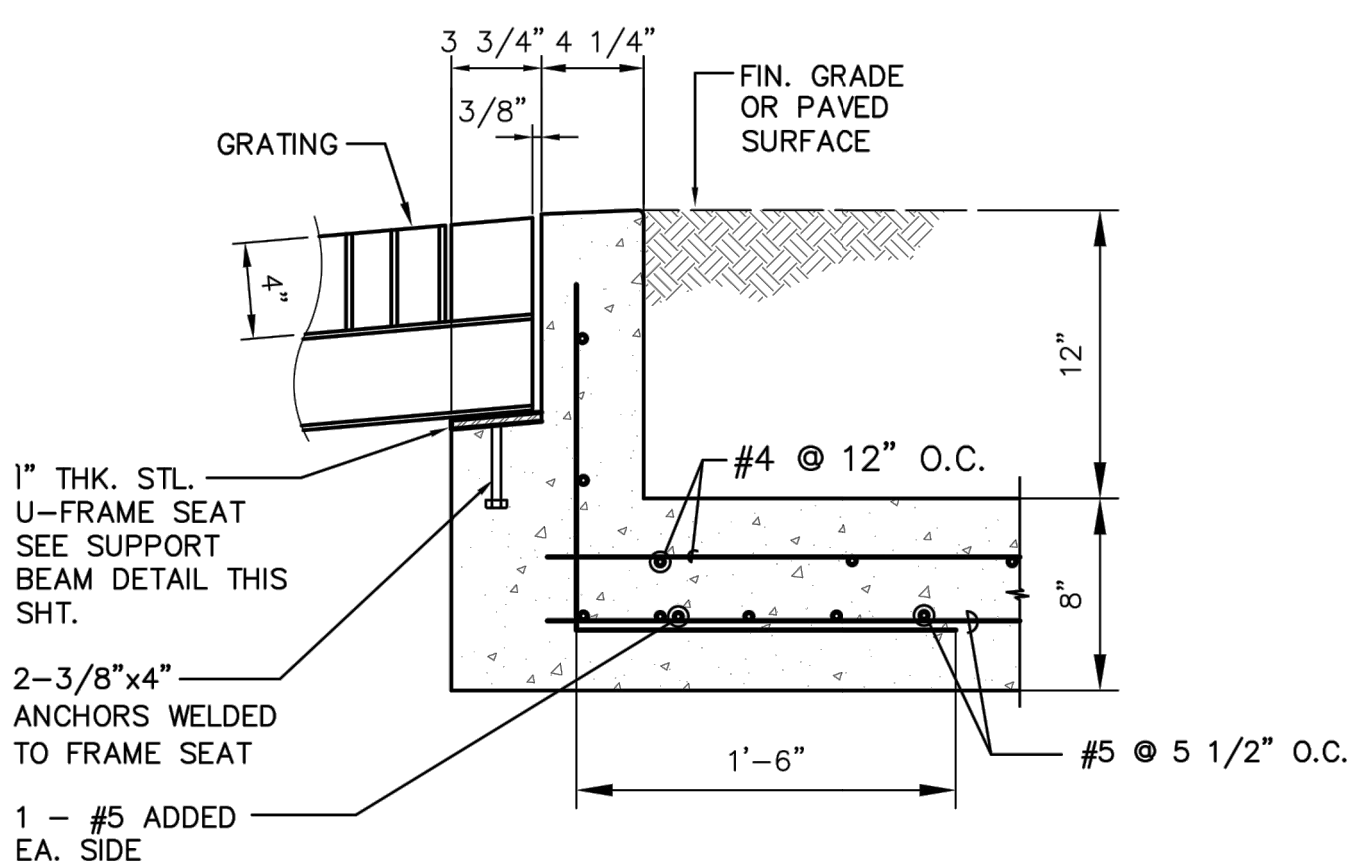
GRATE SEAT PLAN

SCALE: $\frac{1}{2}$ "=1'-0"



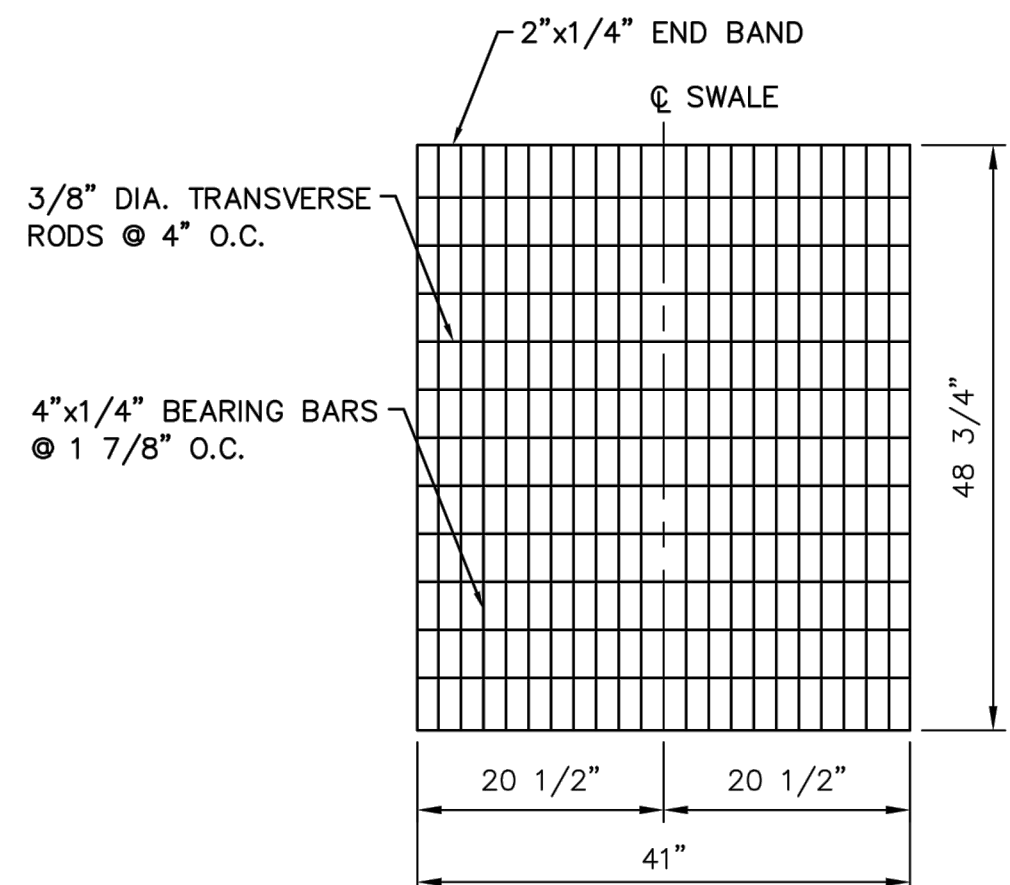
GRATE SECTION

SCALE: $\frac{3}{4}$ "=1'-0"



GRATE SEAT DETAIL

SCALE: $1\frac{1}{2}$ "=1'-0"



GRATE PLAN

SCALE: $\frac{3}{4}$ "=1'-0"

Figure 7. Seepage Pit Details

From: [Keith Kato](#)
To: [Kay, Christian](#)
Cc: [Jackson, Maija](#); [Kurt Inaba](#)
Subject: Re: Ouli REZ Water Availability
Date: Tuesday, October 22, 2024 2:49:08 PM
Attachments: [image001.png](#)
[231227 COH Water Supply TMK 6 2 001 75.pdf](#)

Christian

See attached letter from DWS. The combined properties TMK: 6-2-01: 74, 75 and 18 originally had 50 water commitments. When parcels 74 and 75 were conveyed to HICDC 35 water units came with it. We asked DWS for an additional 8 water units to service the 43 lot subdivision for which we are now requesting REZ/SLU. The DWS letter provides 8 additional units for the 43 lot development with the understanding that 100% of the units would be affordable.

Let me know if you need anything further.

Keith

On Mon, Oct 21, 2024 at 12:14 PM Kay, Christian <Christian.Kay@hawaiicounty.gov> wrote:

Aloha Keith,

I am in the process of drafting the SLU/REZ/PUD reports and I wanted to see if you have any written documentation from DWS to support the statement in your application that, *“Water will be available for this 43 lot subdivision from the Department of Water Supply’s transmission system coming down the Waimea-Kawaihae Road and connecting to Waiula Drive. The 8-inch line within the Waiula Drive right of way is looped with the DWS system in the Anekona Subdivision.”*

We have yet to hear back from DWS and as to ensure compliance with the Concurrency section of the Zoning Code, we need to confirm the water availability mentioned above. Please advise.

Please let me know if you have any questions.

Mahalo,

Christian

Christian Kay, Planner

County of Hawai'i Planning Department
Aupuni Center, 101 Pauahi Street, Suite No. 3
Hilo, Hawaii 96720
Phone: (808) 961-8136
Fax: (808) 961-8742

Email: christian.kay@hawaiicounty.gov

Website: <https://www.planning.hawaiicounty.gov/>



County of Hawai'i

Zoning & Subdivision Code Update
Project Website: COHcodeupdate.com

--

Keith H Kato
Executive Director
Hawaii Island Community Development Corporation
100 Pauahi Street #201, Hilo, Hawaii 96720

Email: keith.hicdc@gmail.com
Direct Line: 808-319-2422

****OFFICE CLOSURE NOTICE DUE TO COVID-19 PANDEMIC**
****Voice messages will be retrieved remotely or via email**

As the safety of our HICDC team members, customers and suppliers are our top priority, our physical office location ([100 Pauahi Street, Suite 201, Hilo](#)) will be closed, effective March 20, 2020, until further notice. Our operations will continue, with HICDC team members operating remotely.



DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII

345 KEKŪANAŌ'A STREET, SUITE 20 • HILO, HAWAII 96720

TELEPHONE (808) 961-8050 • FAX (808) 961-8657

HAWAII ISLAND COMMUNITY
DEVELOPMENT CORPORATION

23 DEC 27 AM 8:56

December 22, 2023

TO: Ms. Susan K. Kunz, Housing Administrator
Office of Housing and Community Development

FROM: Keith K. Okamoto, Manager-Chief Engineer

SUBJECT: **Water Commitment Request for 'Ōuli Affordable Housing
Tax Map Key (3) 6-2-001:075**

This is in response to your memorandum dated December 18, 2023.

The Department understands that the subject project is a 100% affordable housing development.

Therefore, the Department will make eight (8) additional units of water available for the 43-lot development with the understanding that this determination is for a 100% affordable housing project with the support of the County of Hawai'i Administration.

Should there be any questions, please contact Mr. Ryan Quitoriano of our Water Resources and Planning Branch at (808) 961-8070, extension 256.

Sincerely yours,

Keith K. Okamoto, P.E.
Manager-Chief Engineer

RQ:dfg

copy – County of Hawai'i, Office of the Mayor
Hawai'i Island Community Development Corporation

Planning Dept.
Exhibit 6

... Water, Our Most Precious Resource ... Ka Wai A Kāne ...

The Department of Water Supply is an Equal Opportunity provider and employer.

**DEPARTMENT OF PUBLIC WORKS
COUNTY OF HAWAII
HILO, HAWAII**

DATE: September 12, 2024

Memorandum

TO: Zendo Kern, Planning Director

FROM: Department of Public Works, Engineering Division



SUBJECT: State Land Use Boundary Amendment Application (PL-SLU-2024-000011)

Request: Agricultural to Urban for 14.321 Acres of Land

Change of Zone Application (PL-REZ-2024-000066)

Request: Agricultural-1 acre (A-1a) to Single-Family Residential - 10,000
Square Feet (RS-10) for 14.321 Acres of Land

Applicant: Hawai'i Island Community Development Corporation

TMK: 6-2-001:075 (por.)

We have reviewed the subject application dated August 12, 2024 and offer the following comment:

1. We have no objection to amend the State Land Use District from Agriculture to Urban.
2. All activities shall comply with the requirements of Hawaii County Code (HCC), Chapter 10, Erosion and Sedimentary Control.
3. All development-generated runoff shall be disposed of on site and not directed toward any adjacent properties. A drainage study shall be prepared and the recommended drainage system shall be constructed meeting the approval of the Department of Public Works, Engineering Division.
4. The subject parcel is in an area designated as Zone X on the Flood Insurance Rate Map (FIRM) by the Federal Emergency Management Agency (FEMA). Zone X is an area determined to be outside the 500-year floodplain.
5. All connections and construction within Walua Drive shall conform to Chapter 22, County Streets, of the Hawaii County Code and include the provision of adequate sight distances that shall meet with the approval of the Department of Public Works, Engineering Division.

Memo to Planning Department
Page 2
September 12, 2024

6. Based upon the proposed zoning, we recommend that the applicant provide improvements to the subject's street frontage consisting of, but not limited to, concrete sidewalks, drainage improvements, and any required utility relocation, meeting the requirements of the Americans with Disabilities Act.

Should there be any questions concerning this matter, please contact Robyn Matsumoto in our Engineering Division at Ext. 8327.

RM

**DEPARTMENT OF PUBLIC WORKS
COUNTY OF HAWAII
HILO, HAWAII**

DATE: September 12, 2024

Memorandum

TO: Zendo Kern, Planning Director

FROM: Department of Public Works, Engineering Division



SUBJECT: Planned Unit Development Permit Application (PL-PUD-2024-000004)
Request: To Develop a 43-Lot Single-Family Residential Subdivision on
14.321 Acres
Applicant: Hawai'i Island Community Development Corporation
TMK: 6-2-001:075 (por.)

We have reviewed the subject application dated August 12, 2024 and offer the following comment:

Section 23-41. Minimum right-of-way and pavement widths.

We believe the minimum road improvement requirements codified within Chapter 23 of the Hawaii County Code provide public welfare and safety and are a recommendation made by the Department of Public Works on all similar types of subdivision applications. However, should the Planning Director determine that Section 23-15 is applicable, we defer to the director's authority.

Section 23-50. Grades and curves.

We have no objection as it complies with AASHTO.

Section 23-86. Requirements for dedicable streets.

We have no objection as this was determined by a pavement design prepared by a licensed soil engineer.

Section 23-89. Requirements for sidewalks.

We believe the minimum road improvement requirements codified within Chapter 23 of the Hawaii County Code provide public welfare and safety and are a recommendation made by the Department of Public Works on all similar types of subdivision applications. However, should the Planning Director determine that Section 23-15 is applicable, we defer to the director's authority.

Section 23-91. Curbs and Gutters

We believe the minimum road improvement requirements codified within Chapter 23 of the Hawaii County Code provide public welfare and safety and are a recommendation made by the Department of Public Works on all similar types of subdivision applications. However, should the Planning Director determine that Section 23-15 is applicable, we defer to the director's authority.

Section 23-92. Drainage, flood and erosion mitigation measures.

We have no objection since the development is within the Department of Health's one-quarter mile criteria for injections wells.

Should there be any questions concerning this matter, please contact Robyn Matsumoto in our Engineering Division at Ext. 8327.

RM

DEPARTMENT OF PUBLIC WORKS
COUNTY OF HAWAII
HILO, HAWAII

DATE: November 1, 2024

Memorandum

TO: Zendo Kern, Planning Director

FROM: Department of Public Works, Engineering Division



SUBJECT: **Planned Unit Development Permit Application (PL-PUD-2024-000004)**

Request: To Develop a 43-Lot Single-Family Residential Subdivision on
14.321 Acres

Applicant: Hawai'i Island Community Development Corporation
TMK: 6-2-001:075 (por.)

We have the following additional comments which are italicized below for clarification to our memo dated 9/12/24. Please allow this memo to supersede our memo dated 9/12/24.

Section 23-41. Minimum right-of-way and pavement widths.

We believe the minimum road improvement requirements codified within Chapter 23 of the Hawaii County Code provide public welfare and safety and are a recommendation made by the Department of Public Works on all similar types of subdivision applications. However, should the Planning Director determine that Section 23-15 is applicable, we defer to the director's authority. *Since this would not meet DPW's minimum standard or meet any special safety circumstances, DPW would not be able to support dedication of the improvements within the right-of-way.*

Section 23-50. Grades and curves.

We have no objection as it complies with AASHTO. *DPW would still recommend dedication of the right-of-way to the Council if this request was allowed.*

Section 23-86. Requirements for dedicable streets.

We have no objection as this was determined by a pavement design prepared by a licensed soil engineer. *DPW would still recommend dedication of the right-of-way to the Council if this request was allowed.*

Planning Dept.
Exhibit 9

Section 23-89. Requirements for sidewalks.

We believe the minimum road improvement requirements codified within Chapter 23 of the Hawaii County Code provide public welfare and safety and are a recommendation made by the Department of Public Works on all similar types of subdivision applications. *Proposals to the design of the intake box would be evaluated or the seepage pits can be located adjacent to the right-of-way.* However, should the Planning Director determine that Section 23-15 is applicable, we defer to the director's authority. *Since this does not meet DPW's minimum standard or meet any special safety circumstances, DPW would not be able to support dedication of the improvements within the right-of-way.*

Section 23-91. Curbs and Gutters

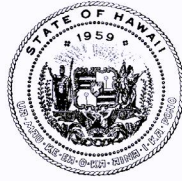
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Section 23-92. Drainage, flood and erosion mitigation measures.

We have no objection since the development is within the Department of Health's one-quarter mile criteria for injections wells. *DPW would still recommend dedication to the Council if this request was allowed.*

Should there be any questions concerning this matter, please contact Robyn Matsumoto in our Engineering Division at Ext. 8327.

RM



STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 916
HILO, HAWAII 96721-0916

MEMORANDUM

DATE: August 26, 2024

TO: Mr. Zendo Kern
Planning Director, County of Hawaii

FROM: Eric Honda
District Environmental Health Program Chief

SUBJECT: State Land Use Boundary Amendment Application (PL-SLU-2024-000011)
Request: Agricultural to Urban for 14.321 Acres of Land
Change of Zone Application (PL-REZ-2024-000066)
Request: Agricultural-1 acre (A-1a) to Single-Family Residential- 10,000
Square Feet (RS-10) for 14.321 Acres of Land
Applicant: Hawai'i Island Community Development Corporation
Tax Map Key: (3) 6-2-001:075 (por.); South Kohala, Hawai'i

In most cases, the District Health Office will no longer provide individual comments to agencies or project owners to expedite the land use review and process.

Agencies, project owners, and their agents should apply Department of Health "Standard Comments" regarding land use to their standard project comments in their submittal. Standard comments can be found on the Land Use Planning Review section of the Department of Health website: <https://health.hawaii.gov/epo/landuse/>. Contact information for each Branch/Office is available on that website.

Note: Agencies and project owners are responsible for adhering to all applicable standard comments and obtaining proper and necessary permits before the commencement of any work.

General summary comments have been included for your convenience. However, these comments are not all-inclusive and do not substitute for review of and compliance with all applicable standard comments for the various DOH individual programs.

Clean Air Branch

Planning Dept.
Exhibit 10

1. All project activities shall comply with the Hawaii Administrative Rules (HAR), Chapters 11-59 and 11-60.1.
2. Control of Fugitive Dust: You must reasonably control the generation of all airborne, visible fugitive dust and comply with the fugitive dust provisions of HAR §11-60.1-33. Note that activities that occur near existing residences, businesses, public areas, and major thoroughfares exacerbate potential dust concerns. It is recommended that a dust control management plan be developed which identifies and mitigates all activities that may generate airborne and visible fugitive dust and that buffer zones be established wherever possible.
3. Standard comments for the Clean Air Branch are at: <https://health.hawaii.gov/epo/landuse/>

Clean Water Branch

1. All project activities shall comply with the HAR, Chapters 11-53, 11-54, and 11-55.
 1. The following Clean Water Branch website contains information for agencies and/or project owners who are seeking comments regarding environmental compliance for their projects with HAR, Chapters 11-53, 11-54, and 11-55: <https://health.hawaii.gov/cwb/clean-water-branch-home-page/cwb-standard-comments/>.

Hazard Evaluation & Emergency Response Office

1. A Phase I Environmental Site Assessment (ESA) and Phase II Site Investigation should be conducted for projects wherever current or former activities on site may have resulted in releases of hazardous substances, including oil or chemicals. Areas of concern include current and former industrial areas, harbors, airports, and formerly and currently zoned agricultural lands used for growing sugar, pineapple or other agricultural products.
2. Standard comments for the Hazard Evaluation & Emergency Response Office are at: <https://health.hawaii.gov/epo/landuse/>.

Indoor and Radiological Health Branch

1. Project activities shall comply with HAR Chapters 11-39, 11-45, 11-46, 11-501, 11-502, 11-503, and 11-504.
2. Noise may be generated during demolition and/or construction. The applicable maximum permissible sound levels, as stated in Title 11, HAR, Chapter 11-46, "Community Noise Control," shall not be exceeded unless a noise permit is obtained from the Department of Health.
3. Construction/Demolition Involving Asbestos: If the proposed project includes renovation/demolition activities that may involve asbestos, the applicant should contact the Asbestos and Lead Section of the Branch at <https://health.hawaii.gov/irhb/asbestos/>.

Safe Drinking Water Branch

1. Agencies and/or project owners are responsible for ensuring environmental compliance for their projects in the areas of 1) Public Water Systems; 2) Underground Injection Control; and 3) Groundwater and Source Water Protection in accordance with HAR Chapters 11-19, 11-20, 11-21, 11-23, 11-23A, and 11-25. They may be responsible for fulfilling additional requirements related to the Safe Drinking Water program: <https://health.hawaii.gov/sdwb/>.
2. Standard comments for the Safe Drinking Water Branch can be found at: <https://health.hawaii.gov/epo/landuse/>.

Solid & Hazardous Waste Branch

1. Hazardous Waste Program - The state regulations for hazardous waste and used oil are in HAR Chapters 11-260.1 to 11-279.1. These rules apply to the identification, handling, transportation, storage, and disposal of regulated hazardous waste and used oil.
2. Solid Waste Programs - The laws and regulations are contained in HRS Chapters 339D, 342G, 342H, and 342I, and HAR Chapters 11-58.1 and 11-282. Generators and handlers of solid waste shall ensure proper recycling or disposal at DOH-permitted solid waste management facilities. If possible, waste prevention, reuse, and recycling are preferred options over disposal. The Office of Solid Waste Management also oversees the electronic device recycling and recovery law, the glass advanced disposal fee program, and the deposit beverage container program.
3. Underground Storage Tank Program – The state regulations for underground storage tanks are in HAR Chapter 11-280.1. These rules apply to the design, operation, closure, and release response requirements for underground storage tank systems, including unknown underground tanks identified during construction.
4. Standard comments for the Solid & Hazardous Waste Branch can be found at: <https://health.hawaii.gov/epo/landuse/>.

Wastewater Branch

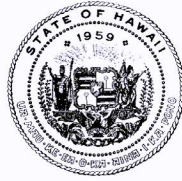
For comments, please email the Wastewater Branch at doh.wwb@doh.hawaii.gov.

Sanitation / Local DOH Comments:

1. According to HAR §11-26-35, No person, firm, or corporation shall demolish or clear any structure without first ascertaining the presence or absence of rodents that may endanger public health by dispersal from such premises. Should any such inspection reveal the presence of rodents, the rodents shall be eradicated before demolishing or clearing the structure. A demolition permit is required prior to demolition.

Other

1. [CDC - Healthy Places - Healthy Community Design Checklist Toolkit](#) recommends that state and county planning departments, developers, planners, engineers, and other interested parties apply these principles when planning or reviewing new developments or redevelopment projects.
2. If new information is found or changes are made to your submittal, DOH reserves the right to implement appropriate environmental health restrictions as required. Should there be any questions on this matter, please contact the Department of Health, Hawaii District Health Office, at (808) 933-0917.



STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 916
HILO, HAWAII 96721-0916

MEMORANDUM

DATE: August 26, 2024

TO: Mr. Zendo Kern
Planning Director, County of Hawaii

FROM: Eric Honda
District Environmental Health Program Chief

SUBJECT: Planned Unit Development Permit Application (PL-PUD-2024-000004)
Request: To Develop a 43-Lot Single-Family Residential Subdivision on
14.321 Acres
Applicant: Hawai'i Island Community Development Corporation
Tax Map Key: (3) 6-2-001:075 (por.); South Kohala, Hawai'i

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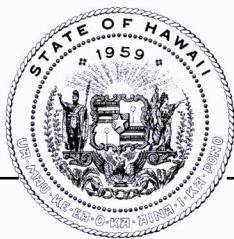
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**STATE OF HAWAII
OFFICE OF PLANNING
& SUSTAINABLE DEVELOPMENT**

JOSH GREEN, M.D.
GOVERNOR

SYLVIA LUKE
LT. GOVERNOR

MARY ALICE EVANS
DIRECTOR

235 South Beretania Street, 6th Floor, Honolulu, Hawai'i 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawai'i 96804

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

Coastal Zone
Management
Program

DTS 202408130820NA
PL-SLU-2024-000011
PL-REZ-2024-000066

Environmental Review
Program

September 12, 2024

Land Use Commission

Mr. Zendo Kern, Planning Director
County of Hawai'i Planning Department
West Hawai'i Office
74-5044 Ane Keohokālole Hwy
Kailua-Kona, Hawai'i 96740
Att: Christian Kay

Land Use Division

Special Plans Branch

State Transit-Oriented
Development

Statewide Geographic
Information System

Dear Mr. Kern:

Statewide
Sustainability Branch

Subject: State Land Use Boundary Amendment Application
Agricultural to Urban for 14.321 Acres of Land
Project File Number PL-SLU-2024-000011
Change of Zone Application
Agricultural-1 acre (A-1a) to Single-Family Residential – 10,000
Square Feet (RS-10) for 14.321 Acres of Land
Project File Number PL-REZ-2024-000066
Applicant: Hawai'i Island Community Development Corporation
TMK: (3) 6-2-001:075 (por.); South Kohala, Hawai'i

The Office of Planning and Sustainable Development ("OPSD") received your memorandum, dated August 12, 2024, requesting comments on the consolidated State Land Use District Boundary Amendment and Zone Change applications ("Application"). The Hawai'i Island Community Development Corporation ("Applicant"), a non-profit, is requesting the redesignation of 14.366-acres to create forty-three (43), ten thousand square foot (10,000 sq ft) self-help and turnkey housing building sites for low to moderate income households ("Project"). The self-help lots would serve households that qualify as 80% of the area median income ("AMI"), while the turnkey lots would be sold at prices affordable to households at 140% AMI. A State Land Use District Boundary Amendment is requested that converts State Agricultural District to State Urban District land. Additionally, the Application involves a change of zoning from Agricultural-1 acre (A-1a) to Single-Family Residential – 10,000 Square Feet (RS-10).

OPSD supports the development of affordable housing across the State of Hawai'i. The Hawai'i Housing Finance and Development Corporation

Mr. Zendo Kern
September 12, 2024
Page 2

estimates the State needs an additional 50,156 units to accommodate population change, to house homeless individuals, and to reduce pent-up demand. Hawai'i County represents about 27% of the total need for additional units across the State. The Project would be implemented under the Applicant's self-help housing program, which would improve affordability by significantly reducing labor and construction costs. The Project would provide affordable and workforce housing serving Waimea Town and hospitality job centers along the Kohala Coast.

However, the proposed Project is located several miles away from essential services and destinations. The developing community currently lacks gathering places and other amenities within walking distance. OPSD suggests that the Applicant or County consider utilizing the 3.13-acre volunteer fire station lot to introduce amenities such as a playground, basketball/pickleball court, park space, or community garden. These additions could foster community engagement and enhance the quality of life for both existing and future residents. Section 205-4.5(a)(6) of the Hawai'i Revised Statutes permits public and private open area types of recreational uses in the State Agricultural District.

Thank you for the opportunity to comment on the Project. If you have any questions, please contact Brandon Soo at brandon.a.soo@hawaii.gov or (808) 587-2888. If you wish to respond to this comment letter, please include DTS 202408130820NA in the subject line.

Mahalo,

A handwritten signature in black ink that reads "Mary Alice Evans". The signature is written in a cursive, slightly slanted style.

Mary Alice Evans
Director