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Phase I Archaeological Investigation
Cultural Resources Survey, Hawaii Geothermal Project
Makawao and Hana Districts
South Shore of Maui, Hawaii

by

Conrad Erkelens

INTERNATIONAL ARCHAEOLOGICAL RESEARCH INSTITUTE, INC.
March 1994

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-- Draft Report --

**PHASE I ARCHAEOLOGICAL INVESTIGATION
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MAKAWAO AND HANA DISTRICTS
SOUTH SHORE OF MAUI, HAWAII**

by

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ABSTRACT

This report details the archaeological investigation of a 200 foot wide sample corridor extending approximately 9 miles along the southern portion of Maui within the present districts of Hana and Makawao. A total of 51 archaeological sites encompassing 233 surface features were documented. A GPS receiver was used to accurately and precisely plot locations for each of the documented sites. Analysis of the locational information suggests that archaeological sites are abundant throughout the region and only become scarce where vegetation has been bulldozed for ranching activities. At the sea-land transition points for the underwater transmission cable, both Ahihi Bay and Huakini Bay are subjected to seasonal erosion and redeposition of their boulder shorelines. The corridor at the Ahihi Bay transition point runs through the Moanakala Village Complex which is an archaeological site on the State Register of Historic Places within a State Natural Area Reserve. Numerous other potentially significant archaeological sites lie within the project corridor. It is likely that rerouting of the corridor in an attempt to avoid known sites would result in other undocumented sites located outside the sample corridor being impacted. Given the distribution of archaeological sites, there is no alternative route that can be suggested that is likely to avoid encountering sites.

A total of twelve charcoal samples were obtained for potential taxon identification and radiocarbon analysis. Four of these samples were subsequently submitted for dating and species identification. Bird bone from various locations within a lava tube were collected for identification. Sediment samples for subsequent pollen analysis were obtained from within two lava tubes. With these three sources of information it is hoped that paleoenvironmental data can be recovered that will enable a better understanding of the setting for Hawaiian habitation of the area. A small test unit was excavated at one habitation site. Charcoal, molluscan and fish remains, basalt tools, and other artifacts were recovered. This material, while providing a extremely small sample, will greatly enhance our understanding of the use of the area. *ah*

Recommendations regarding the need for further investigation and the preservation of sites within the project corridor are suggested. All sites within the project corridor must be considered potentially significant at this juncture. Further archaeological investigation consisting of a full inventory survey will be required prior to a final assessment of significance for each site and the development of a mitigation plan for sites likely to be impacted by the Hawaii Geothermal Project.

ACKNOWLEDGMENTS

Many people on Maui helped to make this project both fruitful and enjoyable. Outreach to the community was an important aspect of this work and due to the help of numerous individuals, public awareness of the archaeological work undertaken by International Archaeological Research Institute, Inc. (IARII) was high. Thanks to Theresa Donham, Annie Griffin, Michael Kolb, and Nathan Napoka at the State Historic Preservation Division (SHPD) for providing both background information and the names of contacts on Maui for whom historic preservation is critical.

During the course of the fieldwork a variety of individuals either accompanied the IARII crew during survey or were shown newly discovered sites as an example of the sites that were found to be present within the survey corridor. Kevin Mahealani Kaiaokamalie, Kawaipi'ilani Paikai, and Lisa Hamilton all braved the lantana, *kiawe*, and *kikania* during different portions of the fieldwork to actively experience the rediscovery of the past with the archaeological team. Because of their dedication, weekend site visits were made by Elizabeth Anderson from the Maui County Planning Department, Cultural Resources Commissioner Lori Sablas, and Theresa Donham, the Maui County State Historic Preservation Archaeologist.

Special thanks are due Kevin Mahealani Kaiaokamalie for sharing the knowledge from his grandfather that is now his to pass along, Kawaipi'ilani Paikai for her direct questions, chants, and *aloha*, Moe Molner, Donna Simpson, and the other dedicated individuals of the Kahikinui Ohana for their hospitality and interest in the history and revival of Kahikinui. Thanks also to John T. MacKillop for the use of his guest house and his hospitality.

My deepest gratitude is due Lisa Hamilton of Kipahulu who served as a point of contact for the South Maui community.

Finally, thanks is also due to the marksmanship of the Perreira workers who may have been bad shots and missed but were most probably good shots and aimed to miss.

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INTRODUCTION

This report documents the results of an archaeological cultural resources survey conducted by International Archaeological Research Institute, Inc. (IARII) on the island of Maui in the state of Hawaii. The purpose of the survey is to identify and evaluate the significance of the prehistoric and historic cultural resources that lie within a corridor in south Maui through which the State of Hawaii proposes to place a transmission line to carry electrical power generated on the island of Hawai'i. This transmission line is part of a proposed Hawaii Geothermal Project, which would involve the generation of electrical energy through the development of geothermal resources in the Puna district on Hawai'i Island and the transmission of that power via undersea cables and overhead lines to other islands in the Hawaiian Island chain.

The southernmost island in the Hawaiian chain is the volcanically active Hawai'i Island. The Puna district located at the southeast corner of the island is approximately 354 km (220 miles) southeast from the main population center in Honolulu on O'ahu. Between Hawai'i and O'ahu lie the inhabited islands of Moloka'i, Lana'i, and Maui. The island of Maui is closest to Hawai'i Island, separated from it by a 46 km (29 mile) wide ocean channel. To the northeast of Maui, O'ahu lies beyond the islands of Lana'i and Moloka'i approximately 161 km (100 miles) from central Maui and 274 km (170 miles) from the northeast coast of Hawai'i Island.

A portion of the Hawaii Geothermal Project involves the conveyance of electrical power, generated from geothermal energy on the island of Hawai'i, to the island of O'ahu. Part of this route will include an undersea cable originating on Hawai'i Island and terminating on O'ahu. Enroute the transmission line will make landfall on the southern coast of Maui. From there electrical power will be conveyed via overhead transmission lines crossing the districts of Hana and Makawao over a distance of 27.4 km (17 miles). On the southwest corner of the island, the transmission lines will join another undersea cable leading to O'ahu (Fig. 1).

The Environmental Analysis and Assessment Section of the Energy Division of Oak Ridge National Laboratory (ORNL) is assisting the U.S. Department of Energy (DOE) Office of Conservation and Renewable Energy in identifying and evaluating potential environmental impacts of the proposed Hawaii Geothermal Project. IARII was contracted by Martin Marietta Energy Systems, Inc., which operates Oak Ridge National Laboratory, to provide information concerning the archaeological resources present in both the Puna District and the proposed Maui transmission line corridor.

Energy
Efficiency

This document details the archaeological investigation for the portion of the contract addressing the trans-Maui overhead electrical transmission line corridor and the undersea cable transition points on Maui. This information will be used by ORNL in the preparation of an Environmental Impact Statement (EIS) assessing potential environmental impacts of the Maui portion of the proposed project.

The portion of Maui Island involved in the proposed project is a long and narrow corridor. The eastern end of the 140 ft wide corridor for the electrical transmission line starts at Huakini Bay where the undersea cable leading from Hawai'i Island would contact Maui¹. The transmission line corridor then swings inland across the Pi'ilani Highway (Route 31) running to the west approximately 300 m inland from the coast. The corridor then continues west in a relatively straight line until crossing the highway once again approximately 600 m to the west of Pahala Gulch. From this point the transmission line corridor roughly parallels the highway approximately 100-200 m downslope of the road. At Luala'ilua Hills, the route swings downslope to the 1400 ft elevation contour and then back upslope to join the highway again where it runs 50-100 m downslope of the road for approximately 5.6 km (3.5 miles). The remainder of the transmission line corridor extends as a shallow arc extending from the highway to Ahihi Bay at Kanahena where the proposed line will join an undersea cable leading to O'ahu.

Scope of Work

Prior to the start of fieldwork, a Statement of Work was developed through discussions among ORNL, the State Historic Preservation Division, and IARII detailing the scope of the archaeological investigation. The Statement of Work specifies two stages of research: (1) the preparation of a research design, and (2) a Phase 1 archaeological field verification survey and preparation of a final survey report.

The preparation of the project research design included a background literature review of archaeological and historical documentation relevant to the project area and a preliminary reconnaissance survey of the project area. The research design prepared by IARII incorporates this background information and sets forth in more detail than the Statement of Work the objectives of the field verification survey and the methods that would be used in conducting the survey (Erkelens 1993). This document in turn guided the Phase I cultural resources survey.

To provide ORNL with information concerning historic resources in the project area, the main task of the archaeological investigation would be a pedestrian survey spanning the transmission line corridor. This survey would be conducted by three

¹ Reference 1983 edition USGS Makena, Luailua Hills, and Kaupo quad maps.

Not in file

archaeologists walking line-abreast transects covering the entire span of a 200 ft wide survey corridor. The purpose of this survey was to thoroughly and quickly identify all surface archaeological sites and likely areas of subsurface archaeological deposits within the 140 ft wide transmission line corridor. The additional 60 ft width of the survey corridor was designed to provide a buffer zone along either side of the transmission line corridor. A detailed recording of each identified site location using a Global Positioning System (GPS) receiver would allow for the accurate plotting of all archaeological resources. During the survey a brief description of the site features and condition would be made for the evaluation of their significance and research potential.

The archaeological investigation, as presented in the research design, would also involve additional tasks. The evaluation of the potential for underwater archaeological resources at the Ahihi Bay and the Huakini Bay land-sea transition points for the electrical transmission lines and cable would be undertaken as part of the preliminary planning for archaeological fieldwork. Prior to and during all phases of fieldwork consultation with members of the general public and Native Hawaiians were to be undertaken. This would involve both informal meetings and occasional site visits by interested individuals. Subsequent to the recovery of any archaeological materials and the completion of fieldwork, analysis would be undertaken including artifact description, radiocarbon analysis, wood charcoal identification, faunal analysis, and pollen analysis. Following results of the findings from the survey and analyses, a report would be prepared and submitted detailing the investigation including recommendations concerning the significance of the archaeological resources present within the corridor. This would also include predictions arising from the interpretation of the corridor as a sample of the range of archaeological sites present across the regional landscape. Findings concerning the total number and types of sites likely to be impacted by this project will be critical to planning and public discussion regarding effects of the proposed project.

Factors Affecting Fieldwork

The identification and subsequent contacting of landowners whose property the proposed corridor crossed was undertaken by IARII prior to the start of fieldwork. Permission was obtained for right of entry to unleased State of Hawaii owned lands, lands leased by the state to Diamond B Ranch, and lands owned by Haleakala Ranch; these constituted about 55% of the proposed corridor. Requests for right of entry for the purpose of conducting the archaeological survey were either ignored or firmly denied by landowners or lessees who controlled access rights to the remaining 45% of the proposed corridor. As a result only the first 13.1 km of the transmission line corridor from Huakini Bay to Luala'ilua and 2.1 km of the corridor running inland from Ahihi Bay could be surveyed.

Residents of the area are extremely sensitive concerning land, property rights, and ownership issues. On one occasion while working in an area controlled by the State Department of Hawaiian Home Lands for which permission to enter had been secured, the survey team was shot at by individuals working for the Perreira cattle operation who, "wanted to know what we were doing." Given this general attitude in the community concerning the use of firearms, it was not thought prudent to approach areas for which permission to enter had not been granted.

In July 1993, preliminary reconnaissance of the project corridor from the ground and from a helicopter revealed numerous sites along its length. The vegetation was light and did not obscure site visibility nor make traversing the survey corridor on foot difficult (Photo 1). However, due to a delay in the notice to proceed, the initial period of the verification survey fieldwork took place in December with Hawaii's rainy season already underway. Wet weather conditions resulted in a dramatic increase in the growth of vegetation, analogous to a desert bloom, within the project area (Photo 2). The denser vegetation hampered site visibility to a marked degree and made access to the project corridor difficult. On one occasion, a delay was caused because a section of Pi'ilani Highway was submerged under a rain-swollen stream making it impassable. Due to these factors and the substantial number of sites encountered, the allotted field time did not allow for the in-depth recording of site information or subsurface test excavation during this phase of fieldwork. It was therefore decided that GPS site location data, in-depth feature descriptions, and limited excavation and retrieval of samples would be undertaken during additional fieldwork periods following the holiday season.

The extra time required for the survey was somewhat balanced by the smaller size of the area eventually surveyed. As a result, field time originally slated for survey of the corridor was used to: 1) more fully investigate a number of sites (i.e., Sites 4, 7, 9, 13, 17, and 35); 2) undertake the schematic mapping of the Moanakala Village Complex at Ahihi Bay; 3) collect pollen samples, fossilized bird bone, and charcoal samples; and 4) to conduct test excavation of a habitation deposit at Site 35.

The following report therefore details the archaeological investigation of a 200 ft wide survey corridor extending along 15.2 km of the proposed 27.4 km (17 mile) 140 ft wide transmission line corridor. It should be noted that the research aim of this survey was to provide a representative sample of the number and general condition of sites that exist in the corridor. Because the surveyed area is believed to be representative portion of the archaeological sites found within the entire corridor, this information can be extrapolated to suggest the approximate extent of archaeological sites and previous Hawaiian settlement for the remainder of the transmission line corridor and for alternative routes across South Maui through which the corridor might be routed.

Scheduling

Four phases of fieldwork were eventually undertaken to accomplish the stated goals of the investigation. Preliminary investigation of the project corridor and land-sea transition points was undertaken from July 6, 1993 to July 8, 1993 by David Welch, Ph.D., serving as the Principal Investigator and Conrad Erkelens, M.A., serving as the Field Director. This involved overflight of the entire transmission line corridor by helicopter and brief reconnaissance of portions of the corridor on foot. In total, 6 person days were expended completing this first phase of fieldwork.

The second phase of fieldwork took place from December 1, 1993 to December 10, 1993. During this period Conrad Erkelens was joined by archaeologists Tim Coleman, B.A. and Chris Fadden, B.A., who served as members of an archaeological team conducting the pedestrian survey of the corridor. Brief informal meetings with Native Hawaiians occupying a portion of the project corridor and site visits by members of the interested public were also accomplished. In total, 29 person days were expended completing this second phase of fieldwork.

During the third phase of fieldwork Conrad Erkelens was joined by archaeologists Roger Blankfein, B.A., and Audre Harlow, B.A. This period of fieldwork took place from January 17, 1994 to January 22, 1994 and involved the accurate plotting of the sites locations using a GPS receiver and the further descriptive documentation and mapping of sites and individual archaeological features. Additional informal meetings with Native Hawaiians and site visits by members of the interested public were also conducted during this period. In total 16 person days were expended completing the third phase of fieldwork.

The final phase of fieldwork took place from February 7, 1994 to February 9, 1994. During this phase of fieldwork tasks included the recovery of fossil bird bone from a lava tube, collection of sediment samples for pollen analysis, the recovery of charcoal samples for radiocarbon analysis, and the excavation of a small test unit in a habitation deposit. J. Stephen Athens, Ph.D., assisted Conrad Erkelens and Roger Blankfein in the recovery of these materials. Two informal meetings and one site visit by Native Hawaiians were conducted during this period. In total 8 person days were expended completing this final phase of fieldwork.

An additional visit to three significant sites was undertaken on February 25, 1994 by Conrad Erkelens (IARII), Lillian Trettin from ORNL, Theresa Donham, the State Historic Preservation Division archaeologist for Maui, and Commissioner Lori Sablas from the Maui County Planning Department Cultural Resource Commission.

BACKGROUND

Physical Environment

Maui is an island approximately 188,500 ha (728 square miles) in size. The volcanic mountain Haleakala dominates the island rising 3,055 m (10,023 ft) above sea level. This volcano (still considered active) last erupted in approximately 1790. This *a'a* lava flow covered land at the western end of the project corridor including Ahihi Bay at Kanahena. The remainder of the project corridor lies along the southern flank of Haleakala. The physical environments through which this corridor extends vary greatly within a range that includes a near-shore underwater reef areas, high impact boulder beaches, deep gulches with vertical walls (Photo 3), relatively open grassland, densely vegetated scrub land, subterranean lava tube caves, and large barren areas of razor sharp, unconsolidated *a'a* lava.

The majority of the project area lies in the rain shadow of the Haleakala Crater and is subject to a median annual rainfall of approximately 700-750 mm (Giambelluca *et al.* 1986). Ripperton and Hosaka (1942), recognizing the correlation of elevation, rainfall, and vegetation, characterized the project corridor as a mixed open forest and shrub land. Resnick noting the importance of fog drip precipitation (cf. Juvik and Perreira 1974; Juvik and Ekern 1978) as an important aspect of the water cycle suggested that the forest/agricultural zone probably did not extend below 2000 ft (1977:22). By late 1800s after 50 years of browsing by introduced feral livestock, the forest had retreated to approximately the 4000 ft elevation as depicted on Alexander's map of Kahikinui (1894). This should have had a dramatic impact on the quantity of both surface and subsurface water sources in the project area.

The soils in the eastern two thirds of the project corridor are shallow in depth and have been characterized as a highly erodable silty loam (Foote *et al.* 1986). Because the corridor crosscuts lava flows of various ages, this section of the corridor alternates, crossing over soil classified as "very stony silt loam" (the Puu Pa series), "extremely stony silty clay loam" (the Waiakoa series), and "very stony land" (Foote *et al.* 1986:118,127, 127). The latter of these also constitutes the majority of the western third of the project corridor and may be best characterized as barren *a'a* (Sahara *et al.* 1967). The characteristic slow rates of sedimentation, erosion, and soil formation are important factors in considering the visibility of surface and subsurface archaeological sites in the project corridor. These soil characteristics, along with factors relating to the hydrographic cycle, may be factors relating to the general location of settlement clusters in this region.

Although a few representatives of native vegetation were noted during the survey, the majority of the vegetation in the corridor is comprised of non-native species. Most prevalent are *Lantana*, *Ocimum* sp. (basil), *Leucaena leucocephala* (koa haole), *Solanum sodomium* (kikania), *Erythrina sandwicensis* (wiliwili) and *Dodonaea* sp. ('a'ali'i). Less common are *Prosopis pallida* (kiawe), *Euphorbia* sp. ('akoko), *Opuntia megagantha* (prickly pear cactus), and various grasses. Presently in upslope areas above the elevation where fog-cloud precipitation is active, stands of *Aleurites molluccana* (kikui), *Santalum* sp. (iliahi), *Metrosideros* sp. ('ohia), *Myoporum* sp. (naio), *Acaia* sp. (koa), *Sophora* sp. (mamane) and other representatives of the native forest can be found. Although the range of these species may have once extended into the project corridor, their presence was not observed.

Historical Background

Data from oral sources and traditional or legendary accounts is being documented by the Cultural Action Network Developing Options (CANDO) ethnographic team². Archival research using missionary records and historical documents was undertaken as a collaborative effort with the archaeological investigation. A synopsis of information relevant to the presence of archaeological sites within the project corridor follows.

The project corridor extends through the three traditionally constituted land divisions or districts ('okana) named Honua'ula, Kahikinui, and Kaupo that have been incorporated into the present districts of Hana and Makawao. The project corridor also crosses 15 named smaller subdivisions of the districts called *ahupua'a*. Traditionally, an idealized *ahupua'a* was a land division that extended from areas of offshore resources to the island's central upland mountain range and incorporated all the natural products and materials necessary for Hawaiian existence and settlement of an area (cf., Handy and Handy 1972; Thrum 1925).

Accounts detailing settlement and land use in the areas through which the project corridor extends for the period prior to European contact have not been previously published. Generalized unsupported references are made to a sizable population that once inhabited Kahikinui and Kanaio by present day informants. Missionary records from the 1830s noting the number of literate individuals in school record 408 "readers" in Kaupo, 58 in Kahikinui, and 282 in Honua'ula (Green 1833). Clearly the population figure would be considerably higher than the number of literate people in these areas during the 1830s. The 1832 missionary census listed the population of Honua'ula as 3,340 (Schmitt 1973:18).

² Senior members are Jon Matsuoka, Ph.D., Luciano Minerbi, Ph.D., and Davianna McGregor, Ph.D.

Across the Hawaiian Islands during the mid 1800s migration to the urban centers and repeated epidemics resulted in a continual decline in population in the rural areas. By 1836 the population in Honua'ula had declined to 1,911 (Schmitt 1973:36). Settlement and land use in South Maui would be further impacted by the spread of cattle into region. In 1847, a letter requesting the purchase of a 1,000 acre parcel³ stated, "There are about 6 native families in said tract, who cultivate about 12 acres, and there are some 4 acres cultivated by people who live at the Sea Side" (Torbert 1847). This suggests very low population density by the late 1840s. Although there are general references to other villages along the coast being occupied until the late nineteenth century (Walker 1933:300), there is no detailed information in this regard.

In Hawaiian environments analogous to the project area, it is generally understood that a range of dryland crops, with an emphasis on sweet potato production, was the norm for such locations. Land Commission Awards (LCAs) from the mid-nineteenth century are often used as a source of data concerning potential land use in a given area. Although these data are skewed because of dramatic changes in population, introduced cultigens, the open grazing of livestock, and the production of cash crops, it still occasionally provides a glimpse of the potential traditional Hawaiian land uses for a given location. Although the corridor does not pass through any LCAs, testimony by claimants citing land use for LCAs in the vicinity of the project corridor confirm the reliance on dryland cultigens. However, these mid-nineteenth records are more reflective of the land use for pasturage and the cultivation of cash crops following European contact than necessarily representative of traditional Hawaiian usage of the area.

Settlement information from late nineteenth century maps (Alexander 1894; Baldwin 1884; Kanakanui 1910; Lawrence 1882) show at least two areas, Kanaio Homesteads and Kahikinui, served as the major loci of upland settlement during the nineteenth century. A possible third habitation area, labeled as Mahamenui, was also depicted, but there is as yet no further documentation of this settlement's existence. Presently most of the residents of the region are located at Kanaio in the vicinity of the Honua'ula (Kanaio) Church⁴, which was established in 1825.

The present Kanaio community can be generally divided between two groups (Bordner 1994 pers. comm.). They consist of returning Hawaiians with old ties to the area and the new residents. These Hawaiian residents note strong genealogical ties with South Kohala and a tenure on the land extending back to Kamehameha's conquest of Maui. This would suggest that the "traditional" accounts concerning Maui prehistory

³ The parcel was described as lying between the forest and the old Mauka Road, and between Kaloi and Kauhao.

⁴ Also known as Pi'iloa-Kanaio Church, Makena Church, The First Church of Honua'ula, and in 1944 Keawalai (HEA 1965; Judd 1958).

arising from sources in South Maui may date no farther back in time than Kamehameha's settlement of the region with immigrants from South Kohala early in the nineteenth century.

Since the 1840s, the generalized use of the area has been as ranch land for cattle. At Kahikinui the ranch operated by Manuel Pico in 1874 (doing business as A. Enos and Co.) was known as Kahikinui Ranch. Other cattle, which until recently were still being grazing in the project area, belong to Ulupalakua, Haleakala, and Kaupo Ranches, and the Perreira family. Ranching activities have directly impacted the presence of archaeological sites in the area by the mechanized clearing of vegetation that took place to increase the available pasturage. In addition, the destruction to archaeological sites from trampling and erosion caused by the passage of cattle and goats had major impact on the preservation of sites.

The present Pi'ilani Highway (Route 31) is essentially located along the same route as an earlier upland foot trail. Alexander's map refers to this route as the Hana Road (1894). This trail was connected to the main shoreline trail by a number of smaller inland routes. The large coastal trail was called "Maui Road" or *Ke Alaloe O Maui* until the 1930s and now generally referred to as the "King's Trail" or as the *Alaloe*. Kamakau, writing in the 1860-70s, noted that 15 generations previously, Kiha the *ali'i* son of Pi'ilani (also known as Kihapi'ilani) had constructed paved roads on the islands of Moloka'i and Maui (1992:429). A fanciful pamphlet by Flemming in 1933 detailed the construction of this "paved trail" by Kiha in 1516 (Flemming 1933; Handy and Handy 1972:489). It is impossible to determine the accuracy or validity of Flemming's information and much of the subsequent documentation concerning the building of this trail may be based on Flemming's early work. Flemming provides details of the road's construction stating that the paved curb lined floor of the trail was from four to five feet wide and laid out in a checkerboard pattern using smooth stones (1933:5). It is possible that accounts concerning the construction of this trail's location and construction will be important as a further documentation of the traditional Hawaiian infrastructure.

An often encountered source of historical and legendary information for Maui are the notes and a publication by Inez Ashdown (1971). Ashdown arrived in Hawaii in 1907 when she was 8 years old. In spite of her position as a co-founder of the Maui Historical Society, her information must be regarded critically and somewhat dubious as an accurate source of information concerning the prehistoric period. Similarly questionable are the eclectic published manuscript notes from Elspeth Sterling, often referred to as "Sites of Maui." Sterling tended to use any and all information without regard for a source's authority resulting occasionally in a mixing of quotes from fictional travelogues alongside archaeological data.

Analysis of information from these sources, legendary data, and interview data from informant interviews is being covered more fully by the CANDO ethnographic team and will not be reiterated within the body of this report. However it can be stated

that, review of the historical map data and the historical records, reveals only two known archaeological features or historic resources that are likely to be directly impacted by construction of the transmission line. These are a section of the King's Trail crossed by the east end of the corridor at Nakula and sections of the nineteenth century "Hana Road" bed that the corridor approaches at Mahamenui, Lua-la'ilua, and Auwahi.

Previous Archaeology

Compared to other areas in Hawaii, there has been little archaeological investigation of this sizable portion of the island of Maui. John Stokes traveled through the area in 1916, but he did not record any sites near the project area (Stokes 1916, 1919). In 1929 Winslow Walker recorded 22 sites in the general area of the project corridor. This work was never published, although a rough manuscript, sketch map, and site list were prepared (1929, 1931a, 1931b).

Generally all of Walker's sites were located next to a road or well traveled trail suggesting there was no effort made to survey less accessible areas. Walker did provide a description of the major trails through the area. He recorded that part of the trail from Kaupo to Kipahulu and another section at the west end from Honua'ula to Honokohau and Kahakuloa were attributed to Kihapi'ilani. Walker, noting the trail was paved, stated, "from the way in which the smooth flat beach stones have been laid down side by side, it is evident that the trail was not intended for horse travel since it is exceedingly slippery when wet." (1931a:300). Walker differentiated these trails from the King's Trail running along the coast below the project area, which he calls the "Makai Trail" (1931a:300). A more important observation by Walker was that these older trails differed from those "used by the cowboys" in that they ran in a straight course, unlike the newer trails, from one ridge to the next disregarding the natural contours (1931a:300).

Judging from the rough manuscript, Walker's survey was remarkably eclectic for the time since he tended to record, although superficially, a wide range of sites. This was apparently one of the reasons the work was never published (Emory 1933). The major concern for this time period, which continued to be the focus until the early 1970s, was to discover and refine archaeological typologies for the development of a chronological framework (Graves and Erkelens 1991). Walker was not explicit in how functional determinations for sites were reached although he recorded 140 house sites out of a total of 300 between Manawainui and Lua-la'ilua (1931a:93).

In 1961 Kenneth Emory excavated a cave (Site M3) at the coastal fishing village of Kamoamoa in the *ahupua'a* of Mahamenui (Chapman and Kirch 1979:19). Emory was mainly interested in obtaining a large assemblage of artifacts from stratified contexts for the construction of seriated sequences and relative chronologies (Kirch 1985:16). During this same time period Soehren (1963) conducted a survey of East

Maui sites, which he recorded in an unpublished manuscript. Soehren's survey area did not, however, extend to the drier portion of Maui and the lands in the vicinity of the project corridor.

In 1966, to answer the same questions that had been asked by Emory (Chapman and Kirch 1979:ix), Peter Chapman conducted a settlement pattern survey at Kahikinui in the *ahupua'a* of Kipapa and Nakaohu extending from the coast to approximately 2600 ft in elevation. Chapman found over 600 archaeological features (1967) but never completed or published the analysis of the survey results except for the preparation of a manuscript map prior to his death in 1979. Also in 1966, Chapman supervised excavation at five coastal sites and two lava tube shelters (Sites M7 and M9) near the present corridor as a supplement to the survey work (Chapman and Kirch 1979). However, in spite of the number of sites recorded during Chapman's studies, the representativeness of the work and any resulting settlement pattern analysis is open to question. As Kirch wrote, "in our 1966 work we ignored both certain types of sites (particularly open habitation sites, field shelters, and the like) and analytical procedures (for example, quantitative midden analysis)..." (Chapman and Kirch 1979:ix). It is also clear from the manuscript map that large areas away from trails remained unsurveyed. It is therefore probable that many more sites exist in the area surveyed by Chapman in the *ahupua'a* of Kipapa and Nakaohu.

In 1972 a report titled "Endangered Archaeological Sites within Maui County" was produced by Bishop Museum (Emory and Hommon 1972). One of the sites mentioned in this report was located on the south side of Ahihi Bay at Kanahena, near the western transition point for the transmission line. The site, called Moanakala, is a village complex that was probably connected to the system of trails crossing the *a'a* lava flow within the project corridor. This site and its component features have yet to be fully documented (Connolly 1973a), although a sketch map depicting part of the site was prepared (Emory and Hommon 1972:55).

In the years from 1973 through 1974, the State of Hawaii hired the Bishop Museum to conduct an inventory and evaluation of known sites for possible inclusion in the Hawaii State Register of Historic Places. The scope of work for this project mandated (for budgetary reasons) that only previously recorded sites be investigated during the inventory. In South Maui the work of Connolly (1973a 1973b) and Hommon (1973a, 1973b, 1973c, 1973d, 1973e, 1974) therefore did little more than report on the state of preservation and add slightly to the documentation of sites previously recorded by Walker in 1929 and Chapman in 1966.

Some of these previously recorded sites are lava tube or cave shelters. These geological formations continue to be of particular interest to both archaeologists and paleontologists due to the generally well preserved materials they contain. Puu Naio Cave, State Historic Site 50-50-14-1009 (Hommon 1973d), is close to the project corridor and has been used by previous researchers to investigate questions involving

prehistoric bird extinctions and suggest independent verification for the timing of human settlement in the area. A preliminary study by James *et al.* (1987) tripled the number of known endemic land birds by adding 19 new species to the avifauna record of Maui.

More recently, Michael Kolb (1991) has investigated the relationship between ceremonial architecture and the development of a centralized authority in Hawaiian society. A part of this investigation involved the survey of architectural and design features for 16 known *heiau* in the *ahupua'a* crossed by the project corridor.

Particularly useful comparative information has been provided by Rick Bordner (1994 pers. comm.), who has been investigating for a number of years the distribution of archaeological sites in the *ahupua'a* of Kanaio and Auwahi as part of ongoing dissertation research. The distribution of archaeological site complexes from his manuscript map was added to this project's AutoCAD base map for comparative purposes and to partially document the number of archaeological sites present within the project corridor. However, because survey methods differed in the two studies, the results are not directly comparable. Bordner has noted that in Kanaio and Auwahi the main zones of human habitation and agriculture were located at the coast and between the 1100-2200 ft in elevation. He suggests the apparent lack of sites between the coast and 1100 ft in elevation may be related to the non-availability of water and suitable agricultural soils in the intervening area.

Additional archaeological research is presently being undertaken on lands used by the National Guard in Kanaio; however, the findings from this work are not yet available (Paul Cleghorn 1994 pers. comm.).

Settlement Patterns

Chapman and Kirch suggested a land use pattern of permanent settlement inland, with the majority of sites being agricultural, and the use of temporary shelters along the coast for the gathering of marine resources (1979:36). It is impossible to determine if this conclusion resulted from their archaeological data or from a reliance upon information provided Sam Po, a local informant with detailed knowledge concerning the area around Kanaio. Oddly, this suggested pattern ignored Walker's (1931a:90) documentation of numerous large permanent village complexes at the coast, which remained occupied until the late nineteenth century. Ashdown (1971), who is echoed by Handy and Handy (1972) and present day informants, also describes settlement of South Maui as a seasonal movement of temporary habitation from the coastal fishing resources to the upland farming region. The source of this information describing the prehistoric settlement is certainly questionable and may reflect the nineteenth century habits of the region's remaining inhabitants, who, because of dramatic population collapse and the influx of cattle and European cultigens, found it necessary to move seasonally.

Based upon historic records and present rainfall and vegetation patterns, Resnick suggests any upland seasonal farming probably took place above the 2000 ft elevation in Honua'ula (1977:22). Based upon the admittedly small number of observations made during fieldwork for this project it appeared that in Kahikinui, the fog-cloud line descended no lower than 1400 ft at Nakaohu *ahupua'a* and then swung inland and uphill above the cinder cones at Luaia'ilua. This area is well above the project corridor, which tends to run well downslope of the area presently understood to be the best suited for agricultural production. It was therefore reasonable to assume that most permanent habitation sites would be located in the vicinity of this agriculturally productive area at higher elevation than the project corridor. It could also be assumed that seasonally occupied sites would also tend to be located in the higher elevations where rainfall and soil development appear to have been more conducive to agriculture.

Settlement Chronology

Although the evidence is minimal, there have been attempts to fit a time frame to the initial settlement of Southeast Maui (Chapman and Kirch 1979; Kirch 1985). Based upon three radiocarbon dates collected by Chapman from one inland and two coastal sites, Kirch reported the area, "was first settled after the thirteenth century" (1985:138). This is the oldest possible interpretation of the range of dates falling between AD 1240 and 1950 (Chapman and Kirch 1979:35). Kirch also noted that the proposed settlement scenario of the dry leeward portion of Maui somewhat paralleled the timing and settlement in Kona and Kohala on the island of Hawai'i (1985:138). Although Kolb's (1991) analysis did not specifically address settlement in the project area, his generalized findings supported the earlier hypothesis by Kirch (1985) that expansion into the dry, leeward, marginally productive part of the Maui occurred after AD 1500 or otherwise, "relatively late" (Kolb 1991:259).

Conflicting findings from James *et al.* (1987) suggested more data and further analysis was called for to date the first human occupation of the area. Two charcoal samples and one pooled bone sample from the Polynesian introduced species *Rattus exulans* were submitted as three samples for radiocarbon analysis. The dates were stratigraphically consistent and ranged from 825 ± 115 BP to 390 ± 90 BP. These data suggested an earlier expansion into the marginal environment of South Maui than was previously presented (Kirch 1985:138). Clearly more data is required before a precise and representative analysis of the area's prehistory can be suggested.

Present Research Focus

Although the ends of the proposed route of the transmission line corridor are located at the coast, the majority of the corridor can be characterized as containing a single upland scrub land-open forest environmental zone (Ripperton and Hosaka 1942;

Sahara *et al.* 1967) and rainfall isohyet (Giambelluca *et al.* 1986). However this corridor does crosscut alternating areas of barren rocky terrain and areas of silt loam soil (Foote *et al.* 1972). Hence the survey corridor provided an opportunity to gather evidence of the adaptive strategy and land use for what we perceive is a marginal environment within these differing geologic areas.

Two models describing settlement patterns continue to provide the basis for archaeological investigations of site use and distribution in dry marginal environments of Hawaii. The first model that has been proposed is one of seasonally shifting residences from coastal to inland sites similar to that suggested by Chapman's Kanaio informant, Sam Po. Rosendahl's archaeological investigation (1972) at Lapakahi on Hawai'i Island, an environment similar to the project corridor, suggested that upland agricultural production dependent upon winter rains and reciprocal seasonal fishing, resulted in a cyclical movement of settlement between the coastal and upland regions. If this model is valid for the project corridor, sites should reflect the temporary, seasonal nature of the residence in the inland zone by showing scattered middens, numerous work areas, and multiple episodes of use, rebuilding, or modification. This would also validate the claims of local informants that nineteenth and twentieth century patterns reflected traditional land use practices.

The second model is dependent upon a reciprocal trade between coastal inhabitants and inland inhabitants, who each exchange products and resources not otherwise easily available in the alternative settlement zone. This model is based upon the ethnographic description (Handy and Pukui 1958) of the nineteenth century social system in Ka'u on the island of Hawai'i. While Ka'u is environmentally similar to the project area, the adaptive strategy and social system on Maui may have been dramatically different. The validity of this model can be easily tested by the presence of artifacts associated with fishing (fishhooks, net weights, shell lures, etc.) in the sites of the upper, inland project area and by the presence of habitation sites with evidence of long term use in the form of thick occupation layers, established work areas, or dense midden concentrations.

It is possible that either one or both of these models describes Hawaiian use of the area during some periods in the past. To understand the prehistoric Hawaiian adaptations to the settlement of dry upland environments we only have the analogs from the Ka'u and Kohala areas of the island of Hawai'i. To suggest that we fully understand the Hawaiian adaptation to this area on Maui based upon its potential analogs would only continue the past tendency to generalize, mold data to fit the historic record, and to reify a uniform, invariant "Hawaiian culture" (Graves and Erkelens 1991). These past practices in Hawaiian archaeology not only ignore the variation archaeologists seek for an understanding of differing adaptations, but have occasionally resulted in interpretations by archaeologists in Hawaii that have little basis in the empirical record.

A third possibility is that some intensive settlement occurred in the region between the coastal zone marine resources and the upland agricultural zone. In this manner both zones were accessible due to the centralized location of these mid-elevation habitation areas that were otherwise unsuitable for agricultural production.

The opportunity to gather data from the project corridor is therefore of great significance to the prehistory of South Maui. Information from this investigation will document the variation in adaptive strategies developed by Hawaiians for the exploitation of marginal environments and will hopefully aid in Hawaiians seeking to reestablish settlements in the area.

FIELD METHODS

Preliminary investigation of the project corridor and land-sea transition points was undertaken prior to the start of the field survey. This involved overflight of the entire transmission line corridor by helicopter and brief reconnaissance of portions of the corridor on foot. This reconnaissance served to familiarize the project directors with the overall project corridor and conditions, allowed for the ground checking of AutoCAD generated maps, and presented an opportunity to assess the potential for underwater archaeological remains at the two land sea transition points.

Following the preliminary reconnaissance, a pedestrian survey was undertaken to find and document all archaeological sites in the project corridor. To do so, archaeologists were placed at regular intervals perpendicular to the corridor, separated by 10 m or as few as 5 m as dictated by visibility given the vegetation density. The archaeological team then walked in segments the entire survey corridor while visually inspecting the sample area. Where appropriate, machetes were used for the limited clearing of potential archaeological sites to document the extent and nature of the structures.

During the pedestrian survey, sites were numbered consecutively as encountered on individual transect sweeps; however, adjacent sites were not always identified during the same transect and therefore did not necessarily receive consecutive numbers. For this reason, the discussion of site distribution and individual feature attributes is organized by geographic area, divided into traditional Hawaiian land divisions called *ahupua'a*.

The survey corridor specified by the research design was to be 200 ft wide. In addition to completely surveying the corridor, archaeological features spotted by the survey team lying outside the corridor were also occasionally investigated when in proximity to the corridor or when forming a logical continuation of a site. It must be emphasized that although the survey occasionally documented archaeological sites and features outside the 200 ft corridor, the only area systematically surveyed was that within the corridor. The additional documentation of sites and features outside the corridor was serendipitous.

Subsurface testing was undertaken at one location. Excavation proceeded by arbitrary 10 cm levels within natural strata. All material was screened through nested 1/8 and 1/16 inch screens. Material from each of the two screen fractions was then bagged separately for later sorting and analysis in the laboratory. Upon completion of

the excavation, the base of the unit was marked with flagging tape and the unit was backfilled.

Sediment samples were obtained from two locations within lava tubes. The locations were chosen because of the apparent depth of the alluvial sediment. Using a clean trowel, a 15 cm square hole was dug. After preparation of the sidewalls to minimize contamination between levels, bulk sediment samples were removed from the sidewall beginning from the surface in arbitrary 5 cm levels. This material was then immediately placed into clean plastic bags and sealed.

Fossil bird bone remains were collected from three locations in one lava tube. This material was alluvially deposited and the collection strategy involved locating areas on the surface where these remains were most concentrated (Photo #) After collection of the fossil bone from the surface, the underlying shallow sediment was collected in bulk for the recovery of the smaller bone during sorting in the laboratory.

Navigation and Plotting

Given the narrow width of the survey corridor, accurate navigation in the field during the survey was considered important. Prior to the start of fieldwork infra red aerial photographs of the area surrounding the survey corridor were obtained. The survey corridor was then laid out on the photographs for use in the field. During initial reconnaissance of the project corridor in July 1993, it was determined that positions within the corridor could be determined by comparing vegetation patterns, the locations of individual trees, archaeological features, and prominent landforms with those visible in the photographs.

Waypoints were also determined at intervals along the corridor from which a compass bearing could be followed. The best waypoints proved to be road curves and gulch crossings, given the otherwise relatively featureless terrain. Because of the proximity of the corridor to the Pi'ilani Highway, it was not difficult to measure the distance the corridor was set off the road and then to follow a compass course to the next established waypoint. Ultimately however, it should be noted that the research design (Erkelens 1993) recognized that this survey was constituted to be only a sample of the archaeological sites present along the south coast of Maui. Therefore, although an accurate survey of the transmission line corridor was made, it is irrelevant how precisely the 200 ft wide survey corridor conformed to the projected location of the actual corridor.

During the initial survey of the corridor, archaeological sites and individual features were flagged using surveyors ribbon. At that time preliminary site data such as feature type, condition, size, and general location were recorded. During the second phase of fieldwork a Trimble GPS Pathfinder Basic Plus satellite navigator was used to

document the accurate and precise location of all archaeological sites in the corridor (Table 2).

A global positioning system (GPS) such as the Trimble system uses satellites that are operated by the U.S. Department of Defense (DOD) to compute precise positions using a portable hand held receiver (cf. Leick 1990). However, for security reasons the DOD introduces random errors into the data received from the satellites. To eliminate the inaccuracies introduced by these errors field positions must be "differentially corrected." This requires data from a stationary base receiver and the computer processing of the raw field data to correct for these introduced errors and enable accurate and precise plotting of recorded positions. Base station data was obtained from a receiver operated by the State Historic Preservation Division for the express purpose of providing a differential correction capability for those using GPS in Hawaii.

Site Descriptions

Areas containing archaeological remains are termed sites in this report. Sites may consist of an area containing a concentration of artifacts denoting previous human use of the identified location and/or one or more surface features. A feature is any structure, such as a wall, constructed by humans or a location modified by them, such as a clearing or trail.

Each site identified consists of one or more constructed archaeological features. The boundaries between sites and the assignment of particular features to each site was loosely based upon the physical division of individual site features but is otherwise arbitrary. These site groupings were used as a means to catalog archaeological remains, but do not necessarily group or divide archaeological features into functional units.

Generally all features within close proximity to one another were assigned to the same site number. Distances and directions between features are approximate. Cited bearings between sites and features refer to defined true compass bearings (corrected for 011.5° east declination). For example, 'to the east' refers to a compass bearing of 090° , while 'west northwest' refers to a bearing of 292.5° , and so forth. Generally the distance between sites and metric attributes of individual site features were estimated unless otherwise noted. More precise measuring would have been either too time consuming or inaccurate because of the topography, strong wind, vegetation, and distances that often exceeded 50 m. However, at least one GPS satellite fix was obtained at each site and usually at more than one feature within a site, providing precise and accurate plots for the computation of relative distance and bearings between specific sites and features.

The structural integrity or condition of each site feature is described as either poor, fair, or good. In cases where the majority of the feature's structure has lost integrity and has collapsed, the condition was termed poor. If only a portion of the

feature had collapsed but some of the original structure remained standing, such as a single wall of an enclosure, the condition was termed fair. If the majority of the feature was intact the condition of the feature was termed good.

Descriptions of topography are meant to approximate specific land form types. Gulches are deep (in excess of 100 ft), steep sided stream eroded cuts in the project corridor. Ravines are smaller than gulches and although steep sided, could be traversed without climbing equipment. A gully is a small ravine that is less than 30 m wide.

Because of the distance from the coast of most recorded sites, all shellfish, coral, and water-worn stones should be considered artifactual. This is also true for the Moanakala Village Complex where naturally deposited coral and shellfish remains are easily distinguished from artifactual deposits due to the presence of the *a'a* substrate. Unless otherwise noted in the description of individual features, the presence of surface artifacts or additional feature components such as fire hearths could not be determined. Generally all the archaeological features encountered would require extensive clearing of vegetation and decaying plant matter prior to a thorough definition of all feature components.

In Hawaiian archaeology, topological, descriptive categories have been in general use to differentiate between particular traditionally constructed Hawaiian structures. In the project corridor, all of these types are constructed without the use of mortar from basalt boulders and cobbles. In general Hawaiians seldom shaped the stone used in these constructions, creating a variety of walled or platform-like features. Two common masonry techniques are stacked constructions, involving the fitting of each stone with those adjacent, and core filled constructions, involving the construction of two parallel walls or an encompassing wall in the case of platforms, and the placement of smaller material into the space between the walls with the fill constituting the majority of the volume. These two techniques are neither stylistic nor diachronic indicators of construction and are instead dependent upon the availability of the construction material.

In general, the majority of the remnant structures denoted as archaeological features in this report once served as foundations for a more elaborate wood and thatch structure that has long since decayed. Most of these structures were probably habitation structures or structures related to the occupation of an area such as storage shelters or workshops.

Feature Definitions

Three types of structures were common in the area and all functioned as barriers to the prevailing wind. The most common type of feature encountered were small semi-circular structures called **C-shapes** by Hawaiian archaeologists because the shape

of their semi-circular wall resembles the letter "C". General consensus is that these small structures whose wall blocked the prevailing wind and internal level area served as a temporary shelter or storage area. The engineering of these structures is such that a maximum area is encompassed by a minimum of building material while the wall provides a strong buttressed barrier to the elements.

Also noted with regularity were structures described here as **windward walls**. A sub-category of this structure type was termed **L-shapes** due to their resemblance to the letter "L". Like all windward walls, these features were not isolated sections of longer enclosing walls and were oriented with the long axis to the northeast-southwest. L shapes differ from the straight, single windward walls in that they have a short section at one end extending at a right angle from the is the longer and generally higher wall. Windward walls were generally 50-75 cm in height and ranged in size from 3-12 m in length. It is assumed that all windward walls served as a foundation/barrier for a structure located in the lee of the feature.

Enclosures are generally 4 walled structures that enclose a living area. Prior to European contact it is assumed that these structures served as the floor and boundary for thatched buildings used for habitation, as workshops, or other domestic activities. During the historic period these types of structures may also have served as animal pens.

Platforms are elevated structures artificially raised in height above their surroundings by a build-up of material to create the raised platform. A sub-category of this type of feature is a terrace platform that is distinguished by its location on a slope and having three sides raised above its surroundings with the upslope side approximately level with ground surface.

Boundary walls, like other archaeological features in the project area, were constructed of the natural readily available, unmodified basalt. These walls were vertically sided stacked or core filled linear constructions generally 70-100 cm in height and 80-90 cm in width at the base. Boundary walls often extended for hundred of meters and occasionally were gated or incorporated sections of barbed wire fencing.

It is generally believed that Hawaiians did not construct basalt boundary walls until the introduction of cattle in the early historic period. It is therefore assumed that all boundary walls noted in the project area date to the historic period, circa the 1840s or later.

Bubble shelters are small caves that were modified or used as temporary shelter or work areas. These features were formed when a gas bubble in a lava tube broke through-to-the-surface-and ~~created~~ ^{created} an overhang ceiling of basalt. These structures do not extend underground more than a few meters and were differentiated from lava tubes by this characteristic. When these features are too low or shallow to permit entry, they were

often used as storage areas by Hawaiians and are designated **cupboards** by archaeologists.

Lava tubes are linear, cave-like structures extending underground that once conveyed molten lava. Openings from roof collapse or a surface exposure that formed when the lava was molten provide access into the tubes. These natural shelters were used by Hawaiians for habitation, as a refuge from warfare, and as burial crypts. Lava tubes also trapped various species of birds whose skeletal remains may provide an indication of the paleoenvironment that once surrounded the lava tube.

Mounds are piles of rock having an informal structure but are generally round in shape. Low mounds (less than 50 cm) are generally believed to be either clearing piles resulting from the removal of rock from an area or elevated features that were mulched for the traditional cultivation of vining plants such as sweet potato and gourd. A more formal, straight sided mound would generally be referred to as a cairn, which is most often interpreted to have functioned as a burial marker or location of a family *ahu* (shrine).

Petroglyphs are stylized pictographs that have been afforded little formal study by Hawaiian archaeologists. They are generally found along trails having been carved into the basalt by pecking smooth *pahoe 'hoe* lava.

SURVEY RESULTS

The following descriptions of individual sites are organized by geographic area using the currently known traditional *ahupua'a* names. These geographic areas are described in order from east to west beginning at the cable transition/landing point at Huakini Bay. Table 1 provides a listing of the sites and component features. Precise locational information for individual sites and selected features is provided in Table 2 and depicted in Figure 2.

As previously noted, the ordinal aspect of site numbers is not important and reflects their time of discovery in the field and not necessarily the order of their geographic occurrence in the corridor. These numbers should therefore be thought of as temporary numeric names for the sites, which will eventually be replaced by the assignment of permanent State Site Numbers to be allocated by the SHPD.

Huakini Bay

Following a submittal of IARII's letter report concerning the July 1993 reconnaissance of the project area and describing the high energy beach environment at Huakini, IARII was informed that this location may therefore be unsuitable as a transition point for the undersea cable. During subsequent fieldwork, survey of approximately 4.8 ha (11.8 acres) and a perusal of the shoreline from Huakini Bay to Pahihi Gulch (to the west approximately 800 m), revealed the environment is similar along this portion of shoreline except where the boulder beach is interrupted by sheer vertical sea cliffs (Photo 4). Based upon limited knowledge of the parameters required for an undersea transition point, it would seem that there may not be a suitable location for the transition point in the vicinity of Huakini Bay. Moving the transition point will also necessitate an additional survey of the new location and resultant section of transmission line corridor needed to join with the presently surveyed route.

Surprisingly there were no indications of archaeological sites present on the surface at Huakini Bay or close to the shore. The area is used intensively by campers and fishermen. Recent modifications to the area from their activities is pervasive and fire pits, stacked stone shelters, food remains (bone), and trash were noted over the entire surveyed area. It is doubtful however that these activities would have so completely destroyed all evidence of previous archaeological sites. The geomorphic history of the area may be such that all indications of previous use of the area are only present as subsurface archaeological remains. It is probable that storm waves or tsunami, rather than humans, have had more effect on visibility of the archaeological record in the area.

Nakula

The approximate boundaries for this *ahupua'a* encompass Huakini Bay and extend to Waiopai Gulch (Fig. 3). This area of the corridor is grassland with the occasional presence of lantana, basil, and *kiawe* trees. Experience in similar environments in Hawaii suggested that the vegetation pattern and topography had been altered by mechanized clearing of areas for the creation of better pasturage for cattle. This supposition was later confirmed by the discovery of chain drags at two locations in two similar appearing sections of the corridor. The chain drags were made from lengths of $\frac{3}{4}$ in. steel cable that were attached to a pair of bulldozers. As the bulldozers traveled in parallel across a field the cable strung between them was used to pull down all the larger vegetation to create a grassland. Chain dragging would also eliminate most visible evidence of archaeological surface features. This may partially explain why the majority of archaeological sites in this area were located at the edge of or within small gullies where they would be unaffected by the clearing operations.

Site 36

Site 36 is located above the Highway, to the west of Huakini Bay and contains five features clustered along a small gully. All the surface features at this site are stacked construction and are in poor shape retaining little integrity of their original construction (Fig. 4).

Feature 1, on the east side of the gully, consists of two collapsed L-shaped walls approximately 2 x 1 m and 2 x 2 m in length. Although they are adjacent, they are not terraces on the side of the gully but do form windbreak-foundations. Feature 2, located approximately 4 m to the east of Feature 1, is a 2 m diameter collapsed C-shape. Feature 5 is also a C-shape, similar in size to Feature 2 and is located 14 m south of Feature 1. Across the gully in the shade of a *kiawe* tree 19 m to the southwest, Feature 3 is a 2 x 4 m collapsed L-shape. All these features, the majority of which were constructed in the lee of this small gully, appear to have served as windbreaks for shelters.

The remaining feature at the site, Feature 4 is a low meandering pile of basalt boulders approximately 15 m in length located along the east edge of the gully. This feature may have resulted from mechanical clearing of the pasture area immediately to the west since it lacks evidence of construction technique.

Site 37

This site at the next gully to the west of Site 36 consists of a single stacked boulder wall approximately 5.5 m in length and 60 cm high. This wall is oriented north-south and probably served as a windbreak for a structure located in its lee.

Site 38

This site consists of a 2 m diameter, C-shape in poor condition located approximately 300 m to the east of Pahihi Gulch. The remnant wall of this structure consists of a low pile showing signs of disturbance from cattle such as manure on top of the structure. It is located 15 m to the north of a large prominent 3 m high boulder that is visible from Pi'ilani Highway.

Site 39

This site consists of a large enclosing wall designated Feature 1 and an attached rectangular enclosure designated Feature 2. Feature 1 is approximately 25 m wide and 50 m long with stacked boulder walls 70-110 cm in height and 50-75 cm in thickness. Approximately 8.3 m from the southwest corner there is a opening in the wall that may have served as a gated entrance.

Adjacent to this entrance, Feature 2 is located inside the enclosure at the southwest corner of Feature 1 and therefore has two walls in common with it. The walls of Feature 2 are approximately 70 cm in height and form an enclosure 6 x 7 m in size. In the north wall of Feature 2 is a well preserved doorway. Vegetation within the features consisting of 1-1.5 m high lantana and basil make it impossible to discern additional smaller surface features without the clearing of vegetation.

Site 40

This number was reserved for a site reported by local informants to exist in Pahihi Gulch. This site was said to consist of an unknown number of petroglyphs. Documentation of this site would be important because petroglyphs are unknown from this region of Maui. Unfortunately the precise location of this site was unknown by our informant and it was not located during the investigation of the survey corridor passing through Pahihi Gulch.

Site 41

This site is located to the west of Pahihi Gulch and is visible from the road on the sloping side of the gulch 80 m north of the road. The site consists of three features (Fig. 5). Feature 1 is a 17 x 18 m stepped terrace platform located in the lee of a natural basalt outcrop at the edge of the gulch. The downslope wall of the platform has a facing approximately 1 m in height. In the northwest corner, the surface of the platform is paved with small basalt pebbles. Much of the remainder of the platform surface appears to be disturbed or collapsed. Coral and shellfish remains are scattered near the southern wall of the platform. This area is also the location of many artifactual water-worn cobbles and a few boulders. While some of the water-worn cobbles have the patina and

weathering denoting their long presence at the site, many show signs of having been recently placed there. The placement of water-worn stones or stones wrapped in the leaf of a *ti* plant (*Cordyline terminalis*) are a traditional form of offering (*ho'okupu*) at Hawaiian religious sites.

Feature 2 is located 16 m west of Feature 1 at the base of the slope. Feature 2 is a 2 x 2.5 m U-shaped enclosure with the opening facing the wind and the platform upslope (Feature 1). The walls of the structure have collapsed but judging from their present width (approximately 1 m) they may have stood approximately 1 m high.

Feature 3 is a C-shape shelter located 50 m to the north of Feature 1 against a basalt outcrop. The wall of the feature is approximately 70 cm high and encloses a space approximately 2 m in diameter. Although there are spaces under the outcrop forming cupboard storage locations, there was no evidence of their use as such.

Site 41 should not be confused with Walker's Site 169, which he called, "Heiau at Pahihi" (1931a:239) and also known as Pahihi Heiau (Hommon 1974), given State Site# 50-50-16-160. Walker gives the location as 1/4 mile (400 m) above the trail (now the highway) and Hommon, who revisited the site in 1974, records the location as being 500 m above the road. Besides other inconsistencies suggesting the two identifications are not the same, the most significant is that Site 41 lies only 80 m above the road.

The function of Site 41 is unknown at present. The platform Feature 1 may have served as the foundation for a habitation structure with the other two features serving as a storage (Feature 3) and an activity or workshop area (Feature 2). The elevated location of Feature 1 and placement of water-worn stones are suggestive of a religious site. However, important aspects of the site suggest otherwise. Based upon the placement of known *heiau* and *ko'a* an unimpeded view of either the surrounding territory or the nearshore conditions (respectively) were important (cf. Kirch 1985). In the immediate vicinity there are numerous locations that would have better served as vantage points. Site 41 is in the lee of a vertical ridge-outcrop suggesting a sheltering function for the site.

Because of the adjacent nineteenth and twentieth century road from which Site 41 would have been both visible and accessible, it is unusual that a traditional Hawaiian religious site remained unrecorded by the earlier inventory surveys of Stokes in 1909 and Walker in 1929. This is especially strange since Walker did record Site 169 located 400 m upslope of Site 41. Although both Site 41 and Site 169 are west of Pahihi Gulch, neither the sketch by Walker nor the other descriptive information provided describes this newly documented site. However, the construction and layout of features at Site 41 are similar enough to the features at Site 169, Pahihi Heiau, to suggest the two sites may have had similar functions. While the original function of Feature 1 is unknown at present, it is being treated as if it were a *heiau* or *koa* religious site by some

members of the community, as evidenced by the recent offerings placed on the surface of the site at Feature 1.

Site 42

Site 42 is located on the western edge of the wide gulch to the east of Waiopai Gulch where the Pi'ilani Highway is unpaved. The single feature at this site is a 2 x 2 m L-shape with collapsed walls that are presently only 30 cm in height. Indications are that this wall was stacked and provided a barrier to the wind and a foundation for a small shelter at this location.

Site 43

This site consists of boulders stacked upon a natural basalt outcrop. The resulting pile has a 50 x 75 cm base and is approximately 50 cm high. The presence of a basalt dike stone (anomalous for this provenience) is also an indication of the purposeful construction of the feature. The probable function of this site is as a marker cairn for a nineteenth century land boundary.

Site 44

This site is located approximately 200 m east of the Haleakala Ranch corral's northeast corner. The feature is a stacked enclosure measuring 4 x 5 m. The walls are in very poor condition due to damage from grazing cattle. On the north side of the enclosure there is a low cobble alignment paralleling the wall forming a 2 m wide area.

Site 45

This site is located approximately 350 m east of Waiopai Gulch and is the most western site in the corridor in Nakula. The site consists of two features, both of which served as windbreak walls for adjacent shelters. Feature 1 is an L-shape forming an interior space 2 x 1.5 m behind the 60 cm high stacked wall. Feature 2 is located 25 m to the south and is formed by two joined L-shapes on the lee side of a small depression. The upslope L-shape is 8 x 1 m and the lower is 5 x 2 m. Both have stacked boulder walls approximately 60 cm in height.

Manawainui

The approximate boundaries of this *ahupua'a* extend from Waiopai to Pahala Gulch. An alternative name for this area was Kahaleaimakini (Kevin Mahealani Kaiaokamalie 1994 pers. comm.) As the corridor approaches Manawainui and continues

to the west, elevation changes become more pronounced and the gulches are wider and deeper.

Site 46

This site is located on the west edge of Waiopai Gulch. The natural arch at the coast bears 222° (true north) from Feature 1 at this site. Feature 1 is a 1.5 m diameter C-shape with a stacked wall approximately 70 cm in height. The floor of the shelter contains little sediment at this rocky location.

Approximately 6 m downslope of Feature 1 is a terrace platform extending a total of 6 m and incorporating 2 meters of a natural outcrop into the terrace facing. This structure, designated Feature 2, created a 1 m wide platform that would not have had much useable area so its function remains unknown.

Feature 3 is a 2 m long low terrace whose integrity of construction was so poor as to make its designation as an archaeological feature debatable. However the incorporation of a manuported water-worn cobble into the construction of the terrace leaves no doubt of its purposeful construction. The function of this feature, located 4 m downslope of Feature 1, is unknown. All three features are located at the edge of the gulch in this somewhat inaccessible site. Feature 1 provides an excellent view of the nearshore area and probably provides the best indication for the function of this lookout shelter.

Mahamenui

The approximate boundaries of this *ahupua'a* extend from Pahala to Kamole Gulch (Fig. 6). Compared to the relative scarcity of sites in Manawainui immediately to the east, there is an abundance of sites in Mahamenui. This difference is presently unexplainable since topography and soil characteristics appear to be identical in the two *ahupua'a*. Late nineteenth century maps (Lawrence 1882; Willis 1894) suggest a settlement cluster approximately 1 km uphill from the present highway.

Site 104

This site consists of three features. Feature 1 encloses a 3 x 4 m area with stacked walls 50 cm high that are in good condition. From the southeast corner a low collapsed wall extends 4 m south. From the northwest corner an L-shaped wall extends 2 m west and turns 4 m south. Although the lantana was thick and the grass high at this feature, a water-worn cobble was noted on the surface to the south of the feature. Approximately 10 m to the southeast (120°mag), Feature 2 was a 3 m long 40 cm high

terrace wall. The third feature, located 40 m beyond Feature 2 along the same bearing, was a low, loose clearing pile of basalt boulders and cobbles approximately 15 m square.

Site 103

This site consists of a 4 x 2.5 m terrace in poor condition. A natural outcrop forms the northeast wall of the feature, with the southeast corner and the remainder of the structure forming the terrace. Although the surface of the terrace is dirt, this deposition is less than 10 cm thick and was deposited following abandonment.

Site 102

This site consists of two anomalous mounds approximately 2 x 4 m and 2 x 1 m in area standing 1 m high. Immediately upslope of these mounds are a series of natural loose terraces formed by falling rock. These mounds are probably related to the presence of the adjacent curb-lined section of the late nineteenth century road labeled "Hana Road" by Alexander in 1866 (Wall 1894), which runs past this location and is more readily visible to the east of the site (Photo 5).

Site 101

Feature 1 is a collapsed C-shape that was probably similar in size (2 m diameter) to other C-shape structures encountered in the project corridor given the volume of structural material present. Cattle frequenting the location have caused the apparent damage to the site. Feature 2 is a 3 x 3 x 1.2 m high corner terrace located 15 m to the southeast.

Site 100

This site consists of a single corner terrace feature 3 x 4 x 1 m high. Construction of the feature consisted of boulder stacking of the outer walls with cobble fill of the interior. The feature was in fair condition.

Site 29

This site consists of four features located adjacent to Pi'ilani Highway where the transmission line corridor crosses the road. Feature 1 is located on the east side of the ridge at this location, near the top, and is a poorly constructed 3 m long 60 cm high curved wall approximating a flattened C-shape. Offerings (*ho'okupu*) of food (fruit) had been placed at this feature by unknown persons suggesting some individuals consider the feature to have spiritual significance. Feature 2 is located 115 m to the west and is a section of wall 3 m long and 40 cm high in poor condition. Feature 3 is located 25 m

west of Feature 2 and approximately 12 m downslope of the road. This feature is a 1 m diameter C-shape in fair condition, although its condition was difficult to assess given the heavy growth of lantana obscuring the feature. Feature 4 is located 196 m to the west of Feature 1 and 5 m downslope of the road. This feature is a terrace platform with low walls on the west and north sides. The platform is core filled and approximately 4 x 3 m in area. A red scoriaceous basalt boulder was located on the north wall of the feature. Numerous recently discarded beer bottles and trash were also notably present on and around the feature.

Site 30

There are two features at this site, both of which are structures that serve as windbreaks. Feature 1 is an L-shape 2 x 3 m and 60 cm in height. Feature 2 is located 60 m downslope and is a flattened C-shape with a wall height of 60 cm. The feature is in good condition.

Site 31

This site consists of a single C-shape with a 2 m diameter internal area and an unusually thick (1.5 m) wall approximately 80 cm in height.

Site 32

Site 32 consists of five features. Feature 1 is an enclosure located in a steep sided gully. The walls of the enclosure were approximately 1.5 m in height and enclosed an square area that was 9 m on a side, although some of the walls have partially collapsed. The eastern side of Feature 1 incorporated the vertical face of the gully as the fourth wall of the pen.

Feature 2 is part of a four feature complex centered 70 m west of Feature 1. Feature 2 is a 4 x 6 m enclosure with stacked walls 60 cm in height that are in good condition. Feature 3 is a 11 x 16 m 30 cm high corner terrace that encompasses Feature 4 and Feature 5. Feature 4 is an L-shape 6 x 8 m in length located at the downslope foot of Feature 5. Feature 5 is a 6 x 8 m enclosure in good condition with 60-70 cm high walls. Near the center of the north wall is an opening for a doorway. Placed on this wall were two water-worn cobbles. The larger of these showed evidence of use as a hammerstone.

Site 33

This site is located 100 m upslope of Site 32, Feature 5. The area around this site, which is across the road from a corral, has been impacted by bulldozing. Feature 1

is a 20 m long roughly constructed meandering wall, located 35 m downslope of the road. This wall and the two linear piles immediately downslope that form a rough triangle, incorporate boulders that display scars from the blade of a bulldozer. In the same immediate area, Feature 2 is a 7 m long well constructed stacked wall. Feature 3 is a 7 x 11 m enclosure. Feature 4, located 20 m downslope, is a square enclosure with walls measuring approximately 2 m across. Approximately 20 m to the west is a long (>300 m) north-south stacked wall.

Site 34

This site consisting of four features is easily visible from the highway because of the 1.5 m high encircling wall of Feature 1 that forms a rough parallelogram approximately 60 x 50 m in size. Approximately 10 m downslope from the north wall of Feature 1, along the centerline of the encircling wall, is an L-shaped wall designated Feature 2. The wall is 90 cm in height, 9 x 5 m in length and is in excellent condition. Some of the vegetation was cleared from the feature but no further components of the feature were apparent. Feature 3 is located 40 m to the west of Feature 2, adjacent to the encircling wall. Feature 3 is comprised of two 30 cm high parallel walls, 2 m apart and 3 m in length. Feature 4 is located 10 m outside the enclosing wall of Feature 1, approximately 60 m to the southeast of Feature 2. Feature 4 is a 2 m diameter C-shape with walls in good condition approximately 60 cm in height.

Nakaaha

This *ahupua'a* is the western extent of the open, rolling grassland present in the corridor to the east. In the next *ahupua'a* to the west (Nakaohu), the grassland is replaced by rocky, broken scrub land comprised of *lantana*, *basil*, *kikania*, *haole koa*, and *wiliwili*. No sites were located within the boundaries of this *ahupua'a*. The dilemma of equifinality, whether the absence of sites is due to their not having been present or their destruction during the historic period, makes understanding the archaeological record in this region all the more difficult. The presence of an abandoned chain drag cable discovered at the approximate *ahupua'a* boundary where the vegetation change was noted suggests the possibility of modern site destruction. It is probable that archaeological surface features in this area would have been removed by the mechanized clearing of the area and that vegetation patterns were purposefully altered. However it is not clear to what degree the area was modified. It is possible that Hawaiians preferentially inhabited the rockier areas leaving the more open (presently) grassland areas for dryland agriculture.

Nakaohu

The vegetation patterns and the presence of archaeological sites changes dramatically from Nakaaha to Nakaohu. Vegetation in this section of the corridor consisted of low wind swept lantana, basil, and various grasses. The few *koa haole* trees that were present in this area were located in the protected lee of outcrops or at the base of gullies and ravines.

Archaeological sites in this area appear to be grouped in linear clusters oriented along north-south (uphill downhill) axes and are therefore crosscut by the survey corridor. Although additional features outside the corridor were observed to the north and to the south at many of the sites, they could not be fully investigated given the time constraints. However some locations, such as Site 35, were explored more fully, thereby extending the width of the sampled corridor by more than 5 times the width of the actual corridor.

Site 28

This site consists of a single collapsed 5 x 6 m enclosure in poor condition. Extending from the southeast corner a collapsed wall continued for an additional 9 m to the south. This feature is located approximately 10 m south of a corral. In the northwest corner of the feature barbed wire was noted embedded within the construction.

Site 27

Feature 1 is a 5 m long collapsed wall approximately 20 cm in height. Feature 2 is located 50 m east and is a 4 x 5 m three walled enclosure in poor condition. The walls of the feature have collapsed and there is only a thin cover of sediment covering the rocky substrate.

Site 35

This site consists of three lava tubes, only two of which show signs of modification or usage. This site is in close proximity to the features of Site 26. Additional features to the south of the corridor were noted but not investigated due to time constraints. There is also the distinct possibility that additional lava tube entrances are present downslope to the south along the common ridge with those at Site 35

The upslope ends of the three lava tubes at Site 35 had steep, narrow, rock filled crawl ways that made access from that end difficult or impossible without the removal of some of the rock (Photo 6). These modified ends may have functioned as vents providing for some security and the circulation of air. The upslope opening of Tube 1 was artificially filled with boulders and cobbles. Entry at this end was not attempted.

The downslope entrance, 15 m to the southeast, was also partially filled but upon removal of the boulder and cobble fill, entrance to the tube was possible. There were no signs of previous use of this lava tube except for the constructions at each end.

The upper vent end of Lava Tube 2 shared the same opening with the downslope entrance to Tube 1. The obvious entrance to Tube 2 was located 68 m downslope to the south southeast beyond the survey corridor. This entrance is a large 2 m wide by 1.5 m high opening that is enclosed by a 50 cm high curved wall. Other features are present to the east and west. The height of the tube from the entrance to 5 m within the tube is 1.5 m. Beyond this point the tube is approximately 1 m high, although the width remains constant.

On the rock outcrop immediately outside this wall a basalt awl was noted and collected. Inside the tube, 5 m from the entrance is a 30 cm high terrace. Between this terrace and the entrance the remains of shellfish, basalt flakes, charcoal, and a bird bone awl were noted lying on the surface of the dark silty dirt floor. The bird bone awl was collected. A 50 x 50 cm test unit was excavated along the west wall of the tube, 2.5 m from the entrance. The findings from this excavation will be discussed in a later section of this report.

On the east side of the tube 10 m from the entrance there is a small side terrace where a concentration of charcoal, shellfish, bird bone, and a trigger fish dorsal spine were noted. Charcoal from this concentration was collected for wood identification and radiocarbon analysis. On the east side of the tube located 16 m from the entrance was a concentration of *kukui* nut shell fragments. Besides other uses in cooking, the oily meat of the *kukui* nut was burned by Hawaiians as a source of light. Beyond this point in the tube there were no indications that the remaining 52 m of the Tube 2 were used or occupied in any way.

Lava Tube 3 is located 16.5 m downslope from the entrance to Tube 2. The entrance is a 50 cm diameter opening in an otherwise featureless area. Stepping down into this entrance there is a 1.5 m drop to the floor of the tube. The vaulted roof of the tube to the north is 2.2 m high and extends 7 m until an abrupt end. The floor is a collection of large boulders from roof fall and waterborne sediment and there is no sign of usage of this section of the tube.

Immediately below the entrance to the tube is a narrow opening to the remainder of the tube leading down and to the south. The cobble and boulder slope of this opening is similar to the upper ends of Tube 1 and Tube 2 immediately upslope. The narrow opening extends for 9 m at a 53° drop to the level floor of the tube, which is located approximately 7.5 m below the ground. The vaulted roof in this section of the tube is 2-2.5 m in height affording ample headroom. The tube continues downslope for approximately 45 m where the roof height decreases and the tube is blocked by large boulders that appear natural in their placement.

At the foot of the slope a water-worn cobble hammerstone was noted. Other than this artifact, there were no other indications of previous usage of this section of Lava Tube 3. At 26 m from the entrance sediment samples were obtained for pollen analysis. Sediments in this section of the tube appeared to have been transported by water and were approximately 10-15 cm in depth.

Site 26

Feature 1 is an L-shaped wall 3 x 1.5 m in length and 60 cm in height. Red cinder gravel provides a flat paved area in the lee of the feature's sheltering wall. Within 15 m of the road, Feature 2 is located 35 m to the northeast of Feature 1 and is a C-shape approximately 2 m in diameter. Feature 3 is a 2 m square enclosure. Adjacent to the north and northeast corners are two 75 cm high mounds of stacked basalt boulders. Feature 4, approximately 67 m to the east southeast of Feature 2, is composed of two 1.5 x 3 m L-shaped walls.

Site 25

Located 100 m west of Site 26, the single feature at this site is a long 50 cm high stacked wall on the side of a 30° slope that runs along a north-south ridge. The upslope section of the wall is 7 m long, breaks for 15 m, and then meanders for another 30 m. This wall incorporates natural rock outcrops along its length, and while the west face is 50-70 cm high, the eastern face is often at ground level because of the adjacent topography.

Site 24

Feature 1 is a 7 x 4 m by 60 cm high, collapsed enclosure. There is a pecked *papamu* board on the southeast corner of the 1 m wide wall. Feature 2 is upslope 100 m north and 40 m east of Feature 1. Feature 2 is a 9 x 4 m by 60 cm high enclosure in fair condition, adjacent to a long north-south boundary wall. Feature 3 located 15 m to the west is an enclosure with three walls measuring 7 x 4 m by 60 cm height.

In a shallow wash to the east of the structural features are a series of natural appearing single rock terraces that may have been used for agricultural purposes. The overgrowth of vegetation made a more precise determination of the nature of this area impossible.

Site 23

There are five features at this site. Feature 1 is a three-walled enclosure measuring 4 m square and having a stacked windward wall 110 cm in height. Feature 2

is located downslope 67 m south and 41 m east. This feature is a 9 x 26 m enclosure with walls 110 cm high. Feature 3 is 71 m upslope of Feature 2 and 30 m east of Feature 1. The feature is a 3 x 4 m three-walled enclosure with the core filled windward wall 100 cm in height. Feature 4 is a three-walled enclosure identical to Feature 1 in size. Feature 5 is a 7 m long 70 cm high wall running perpendicular to the prevailing wind.

Site 22

There are four features at this site. Feature 1 is located to the east of a low ridge, 30 m downslope of a single large *wiliwili* tree. Feature 1 is a 5 m square enclosure with stacked walls 40 cm in height. Feature 2 is located to the west on the lee side of the ridge. The structure is a 1.4 m diameter C-shape with a maximum wall height of 70 cm. Approximately 80 m to the north northeast of Feature 1, Feature 3 is a 2 m diameter, 50 cm high C-shape. Feature 4 is 20 m to the west and is a 3 m long 40 cm high wall.

Site 21

This site consists of five features within the corridor with additional features located to the north and south of the corridor as a continuation of the site. Although other linear clusters of sites that cross-cut the corridor were investigated during the survey (e.g. Site 4, Site 17), the full extent of this site was not explored.

Feature 1 is a large enclosure in poor condition. The core filled walls measure 10 x 13 m. Feature 2 is a 3 m square enclosure with walls 50 cm in height. This feature is built in the lee of a small gully out of the wind. Feature 3 is an L-shape 2 x 3 m. A cowry (*Cypraea* sp.) shell was noted on the surface adjacent to this feature. Feature 4 is located beyond a stand of *wiliwili*, 88 m on a bearing of 281° from Feature 1. Feature 4 is a 10 m long by 1.5 m wide stacked windward wall that provided a barrier to the prevailing wind. Feature 5, located 40 m to the southeast of Feature 4, is a 2 m diameter C-shape.

Site 20

This site is located downslope to the east southeast of the St. Inez Church site. Like Site 21, this site has multiple features within the corridor and additional features located to the north and south of the corridor in a continuation of the site that was not investigated during this survey.

Feature 1 is a 4 m long 75 cm high stacked windward wall built upon a basalt outcrop. Feature 2 is a terrace platform located 20 m to the east. This platform is approximately 10 m square and has a 50 cm high L-shape wall along the east and north sides. The downslope face of the platform is approximately 1 m high. On top of the

platform. a small raised area (1 x 4 m) was present in the northeast corner and along the north inner wall. A 1 m diameter half circle alignment of cobbles was also noted on the platform at the inside end of the east wall. The southwest corner of the platform has collapsed but retains enough integrity that a constructed step could be noted at this corner.

Feature 3 is second terrace platform and measures 7 x 11 m with a 1 m high windward wall. The downslope west and south faces of the platform are 1.3 m in height. Feature 4 is located 12 m to the southeast of Feature 3 (bearing 120° at 73 m from Feature 1) and is a 5 x 9 m L-shape. Coral, 'ili'ili, water-worn basalt pebbles, a flaked tool, and shellfish remains including *Cypraea* sp., *Cellana* sp., and *Drupa* sp. were present on the surface. Located 10 m west of the large Feature 2 platform, Feature 5 is a 2 x 3 m terrace platform approximately 50 cm high. with an adjacent 3 m long 50 cm high windward wall.

Kipapa

Vegetation in this area is a mixture of *koa haole* with an understory of lantana, basil, and *kikania*. Occasionally a small stand of *wiliwili*, lone 'ohia shrub, or 'a'ali'i bush were noted because of their rarity. Site and feature density was high in this and adjacent *ahupua'a* to the west (Fig. 7). Goats were more prevalent in this area based on the extensive animal trails, number of skeletal remains, and droppings observed during the survey.

Site 19

This site is the first to the west of the St. Inez Church. Feature 1 is in the same approximate position as a feature designated #601 by Peter Chapman (1967). Chapman labeled this feature a raised platform, which is equivalent to those features described as terrace platforms in this report. This feature, measuring 3 x 12 m, is in poor condition with the eroding facing approximately 40 cm in height. Feature 2 at this site was the eastern part of the long wall enclosing approximately 7.5 ha (18.5 acre). This wall follows the natural terrain running downslope near the road for approximately 300 m, turning perpendicular to the slope for 200 m, and then meandering upslope to complete the roughly rectangular area. Within this enclosed area are Sites 17, 18 and 19. Although portions of this stacked wall have collapsed, it was 60-80 cm high when in good repair.

Site 18

The single feature at this site is a 4 x 12 m L-shape wall approximately 50 cm in height. Chapman called this feature (#581) a wall (1967).

Site 17

This site is a cluster of 17 features in proximity to one another, which span 200 m of the survey corridor. Feature 1 was a 5 m diameter circle in poor condition outside the western edge of the long 30 cm wide wall designated Site 19. Feature 2. Chapman described Feature 1 as a pen (#624) (1967).

Located approximately 9 m to the southeast, Feature 2 is a 10 x 12 m enclosure with stacked and core filled walls 100 cm in height. Feature 3 is a 8 m square terrace platform in poor condition to the southwest of Feature 1. The northeast corner of the feature was paved with pebbles of *a'a* basalt. Chapman called this feature a limited clearing. A remnant section of wall may extend upslope for 10 m but destruction from cattle and goats make it impossible to determine its extent without in depth study. Feature 4 is a 6 x 7 m enclosure under a stand of *wiliwili*. The walls of this enclosure are core filled and are 140 cm in height.

Feature 5 is a 2 m diameter C-shape in good condition. Feature 6 is a 4 x 10 m terrace platform on the east side of a small gully. The downslope facing of the terrace is approximately 100 cm in height. Feature 6b is a short 1.5 m long, 50 cm high terrace located 2 m downslope of Feature 6. Feature 6c is a low platform-paving measuring 2.5 x 12 m along the spine of the ridge to the east of Feature 6.

Feature 7 is a 3.2 x 4 m low platform approximately 10-15 cm in height formed by two separate construction episodes. This feature may mark a grave site. Located 10 m east of Feature 7, Feature 8 is a 1.5 x 2.4 m low mound. A sherd from a ceramic vessel was noted on the surface at this feature. Two boulders mark the seaward end of the platform and may be headstones.

Feature 9 is a 4 x 5 m enclosure located 30 m east of Feature 8. Approximately 10 m further to the east, Feature 10 is a terrace platform measuring 2 x 4 m. This feature is collapsed and in poor condition. Feature 11 is a 4 x 6 m L-shape in poor condition. There is an accumulation of sediment and cobbles in the lee of the feature. Downslope and to the west the additional surface features include an eroding platform terrace and an 8 m long windward wall.

Feature 12 is a rounded rectangular enclosure whose walls define an area measuring approximately 6 x 7 m. Feature 13 is a 8 m square enclosure. Feature 14 is a series of wall segments that are not apparently contiguous; however dense vegetation makes an accurate determination difficult. Feature 15 is a 3 x 6 m enclosure. Feature 16 is a 6 x 10 m high walled enclosure. The walls of the feature were core filled. Feature 17 is an L-shape whose walls are each 3 m in length and approximately 70 cm high. 0

Site 16

Located approximately 100 m downslope of the road, Feature 1 is a bubble shelter with a low, collapsed rock wall partially enclosing the entrance. The shelter measures 2.2 m wide, 2.6 m deep, and at the opening is slightly over 100 cm in height. A piece of coral was visible on the surface although the interior surface had mostly been disturbed by a pig that was flushed from this shelter. A marine shell (*Conus* sp.) was noted on the surface 12 m to the east of this feature.

Feature 2 is a 7 x 8 m enclosure with 60 cm high by 70 cm wide piled cobble and boulder walls. Inside the enclosure at the southeast corner is a low collapsed 1 m diameter mound. Feature 3 is a 6 x 10 m L-shape with walls 80 cm in height located 12 m southeast of Feature 2.

Feature 4 is located upslope of Feature 1 and approximately 25 m downslope from the road. Feature 4 is a 9.5 m square platform terrace with walls measuring 70 cm high. A low 1 x 1.4 m mound is located near the southeast corner of the terrace.

Approximately 54 m upslope to the northwest from Feature 1, Feature 5 is a platform corner terrace measuring 3 x 4 m with a corner facing 150 cm high. Feature 6 is formed by two step platform corner terraces in poor condition. The upper step is 4 x 5 m and 30 cm high and the lower is 3 x 6 m and approximately 60 cm high. The shell from a *Cypraea* (sp.) was noted on the surface at the corner of the terrace.

Approximately 50 m south of the corridor, beyond a prominent stand of *wiliwili*, the survey team noted four enclosures that were easily visible within the *lantana*, *koa haole*, *ilima*, and basil scrub vegetation. The shell from a *Cypraea* (sp.) that had been modified for use as a *he'e* (octopus) fishing lure was noted on the surface during this brief reconnaissance outside the corridor. Given the vegetation, many additional features probably exist in this immediate area that remain unrecorded.

Site 15

Site 15 is the continuation of a long *kuleana* boundary wall (shown on the USGS map) that crosses the road and runs downslope to the coast. Immediately upslope of the road crossing, this wall joins another long wall that encloses part of Alena above the road. The wall designated Site 15 may define the approximate boundary between Alena and Kipapa.

Alena

As the corridor extends to the west into Alena, the topography changes with ridges of bare *a'a* that are the result of recent lava flows. These areas are devoid of soil and remain largely unvegetated while in the ravines and gullies to either side, older more developed sediment and weathered basalt is present. The *ahupua'a* boundary separating Alena and Kipapa (to the east) seems to reflect this transition in the terrain and vegetation patterns.

Site 14

Feature 1 is a notched enclosure located 12 m from the edge of the road (Fig. 8). This enclosure was built as if a corner had been removed from the quadrangular structure creating a "notch" in the northeast corner. Archaeological features with this attribute were first described by Walker (1931). The enclosure measures 7 x 8 m. Inside the enclosure along the north wall a 1.2 m wide 30 cm high platform spans the interior.

Site 13

This site consists of five features located along the spine of a ridge. The area is very rocky with scattered small pockets of humus accumulation but no soil deposits capable of supporting substantial vegetation. Feature 1 is a walled terrace platform. An L-shaped 15 x 15 m long windward wall extends along the east and north side of the feature and is approximately 50-90 cm in height (Fig. 9). Within the walls the uphill portion of the area appears to be an unmodified surface. The downslope portion of the constructed terrace (4 m) is paved with *a'a* gravel. The height of the downslope facing varies between 70-120 cm in height. In the approximate center of the facing at ground level, the remains of a small mammal⁵ burial can be seen within the facing stones. Coral, basalt flakes, a basalt awl, a water-worn boulder, burnt bone, and concentrations of shellfish were noted on and around the platform. An unidentified iron object and an iron hay pike were also noted on the surface.

A local informant working with the CANDO ethnographic team indicated this position on a map as the location of *Puohoka Moa Heiau*. Manuscript notes from Inez Ashdown describe this *heiau* as being located to the west of Santa Inez Shrine which is also consistent with the location of Site 13.

Feature 2 is an L-shape located 64 m downslope to the south. The feature measures 3.3 x 5.5 m with the stacked wall approximately 70 cm high. The feature is in fair condition. Approximately 57 m downslope to the southeast from Feature 2, Feature 3 is an oval enclosure measuring 7.3 x 9.3 m across. Only one portion of the

⁵ Possibly dog or pig. It was not collected for analysis.

wall remains standing and measures 100 cm in height. Construction of the wall is both stacked and core filled using the basalt *a'a* cobbles and boulders that occur at that location. Downslope to the east southeast 32 m, Feature 4 is a "D" shaped enclosure measuring 5.8 m along the straight side and 6.2 m across. The walls of this feature are approximately 80 cm in height and like Feature 3 are both core filled and stacked.

Feature 5 is located 1.5 m to the east of Feature 1. It is a 3 m diameter walled circular pit. These walls are stacked to a height of 70 cm although they may have partially collapsed. A shell from a *Cypraea* (sp.) and a fragment of yellow ware ceramic were noted on the surface at this feature.

Site 12

The single feature at this site is an amorphous 3 m long pile of rock that is 30 cm high and 50 cm wide. It is located in a ravine under a single *wiliwili* to the west of Site 13 and may be a planting mound in poor condition.

Site 11

Feature 1 is a square enclosure measuring 6 m on a side. The upslope core filled wall measures 100-130 cm in height although the others have collapsed. Sediment accumulation on the floor of the enclosure is in excess of 10 cm deep. Feature 2 is a small square C-shape measuring 4 m across with a wall height of 60 cm. This feature has an unusual orientation in that the open side faces the prevailing wind (129° true). The interior of the feature is paved with small boulders and cobbles.

Site 1

The features at this site are located in the protection of a gully adjacent to the jeep trail leading from Pi'ilani Highway to the coast between the *ahupua'a* of Alena and Lua-la'ilua. This jeep trail was formerly the route for a foot trail as depicted on nineteenth century maps (Alexander 1894; Lawrence 1882). Nothing remains of the original trail in the corridor due to the damage from vehicular traffic and cattle.

Feature 1 is an L-shaped walled platform terrace in poor condition measuring 3 x 5 m. The stacked walls of the feature are 50 cm in height. Located 10 m downslope, Feature 2 is a 3.5 x 4 m platform raised 20-50 cm above the ground. The feature is constructed from cobbles and is in good condition.

Feature 3 is a small cupboard formed by a natural outcrop at the edge of the gully, 4 m south of Feature 1. A 50 cm high stack of small boulders has been placed above the opening to this cupboard.

Located approximately 40 m south of Feature 1, Feature 4 is a set of two constructions adjacent to one another. The first is a cairn in good condition measuring 1.3 x 4 m and is 40 cm in height. The second is a 1 x 3 m linear pile of rock measuring approximately 40 cm in height. Each is oriented along the same east-west axis. The Feature 4 mounds may mark the locations of burials.

Approximately 50 m to the west of Feature 1, Feature 5 is a three-walled enclosure in poor condition measuring 4 m square. The stacked basalt walls have collapsed but one remnant section measured approximately 80 cm in height.

Luala'ilua

The change in the vegetation and topography between Lua-la'ilua and Alena is again reflected in the approximate *ahupua'a* boundary. Lua-la'ilua has a more rolling topography than does Alena with its steep gullies and ravines. There is a change in the vegetation moving west into Lua-la'ilua with few open areas and a generalized pattern of lantana, basil, *kikania*, 'a'ali'i, and various grasses as ground cover with an occasional *wiliwili* stand in some locations.

Because the corridor alignment appeared to be drawn through a house to the west of Lua-la'ilua Hills, the survey corridor was angled south to center upon the route of the nineteenth century road bed visible from the present highway because of differential vegetation growth. Permission to survey into the area encompassed by this landholding was not granted and posted signs reading "No Trespassing - have gun will shoot" were taken seriously.

Site 5

Paralleling the highway a stacked wall topped with barbed wire runs from Alena to Lua-la'ilua and is a historical cattle fence. Feature 1 is a partially collapsed core filled wall running perpendicular to this fence for 15 m and ending in a 6.3 x 10 m enclosure. The core filled wall is mostly collapsed but an intact section measures 1 m wide and 85 cm high. The core filled and stacked walls of the enclosure measure 160 cm in height. Although the two eastern corners of the feature have partially collapsed, the remainder of the feature is in good condition including the intact doorway on the northwest side.

Feature 2 is an enclosure in poor condition located 28 m to the south. This feature measures 9.5 x 12 m with walls 70 cm in height. A fragment of shell from a *Chronia tritonis* was found outside the southern wall. A long east-west wall extends from the northeast and southwest corners of the feature.

Feature 3 is a 4 m diameter circular enclosure with stacked and core filled walls approximately 80 cm in height. Feature 4 is located 75 m south of Feature 1 and is a three walled platform terrace measuring 9 x 10.6 m. Like Site 11 Feature 2, the unprotected open side faces the prevailing wind. The core filled walls are mostly collapsed, although some interior facing remains to a height of 80 cm.

Site 6

Feature 1 is a terrace platform in good condition. This feature measures 7 x 10 m with a downhill stacked facing 100-150 cm in height. Although the surface of the platform is not level, it does appear to have intact areas of water-worn 'ili'ili paving. The shell from a *Cypraea* (sp.) was found on the surface 25 m to the south of Feature 1. Feature 2 is located 30 m east of Feature 1 and is a windward wall in good condition. This feature is 2.5 m in length, approximately 100 cm wide and 75 cm in height. Feature 3 is located 28.6 m south southeast from Feature 2 and is an enclosure in poor condition. The stacked walls of this feature measure 7.3 x 12.3 m and the few intact sections are 60 cm in height. A water-worn cobble was found on top of the north wall.

Site 2

Feature 1 is a meandering 15 m long core filled wall under a stand of *wiliwili* at the bottom of a ravine. The wall is in poor condition and measures approximately 40 cm in height. Feature 2 is located 30 m to the northeast on the side of the slope and is a small collapsed terrace platform.

Site 3

The features of this site are located along a low ridge. Feature 1 is a C-shape in good condition located within a dense growth of 'a'ali'i on an a'a flow. The feature measures 3 x 5 m with the stacked and core filled wall 100 cm in height. On the surface 10 m north of the feature, a basalt core (from which flakes had been removed) and a *Cypraea* (sp.) shell fragment were found.

Feature 2 is a modified bubble shelter 50 m north and upslope of Feature 1. A stacked wall 30-60 cm thick surrounds the cavity that measures 100-150 cm deep from the top of the wall. Outside the feature 2 m to the south a fragment of coral was noted on the surface. Approximately 15 m to the east, Feature 3 is a 10 x 13 m enclosure with a smaller 4 m square enclosure attached on the southeast corner. The stacked and core filled walls stand approximately 100 cm in height and are 100-150 cm thick. This feature is in good condition.

Uphill from Feature 2 approximately 5 m to the northwest, Feature 4 located under a *wiliwili* is a curved corner platform terrace measuring 7 m along the face. The

stacked facing is in good condition with a height of the 70 cm. On the north side of the platform terrace, a 1 x 7 m long stacked wall 70 cm high is in poor condition. Beginning approximately 2 m to the north, Feature 5 is an indistinct 8 m long collapsed wall now measuring 50 cm in height. This wall runs between Feature 4 and Feature 6.

Feature 6 is located 83 m north of Feature 1 and approximately 14 m north:west of Feature 4. Feature 6 is an enclosure measuring 6 x 10 m with core filled walls 60-110 cm in height. An adze preform was noted on the surface 3 m to the northwest of the feature. A horseshoe was found 3 m to the south.

Site 4

This site consists of 14 features oriented along a north-south axis (Fig. 10). Feature 1 is a windward wall measuring 9 m in length and 40-60 cm in height. The stacked windward facing is sloped while the leeward facing is vertical. A piece of coral was noted on the wall.

Feature 2 is a long, meandering boundary wall beginning 20 m to the southwest of Feature 1. Arcing from the southeast to the northwest for approximately 40 m and then turning to the south, it extends an additional 28 m where it blends into a natural outcrop. This wall averages 1 m in width and ranges from 30-80 cm in height. Several tabular upright boulders were incorporated into the construction of this core filled and stacked wall.

Feature 3 is a 4 x 7 m enclosure in good condition. The core filled and stacked walls are 60-150 cm in height although the south and west walls have partially fallen. The southern extent of Feature 2, curving downhill from the west northwest, is located 12 m to the northwest. Feature 4 is located 7 m to the west and is a circular enclosure approximately 5 m in diameter. The surrounding stacked wall is 70 cm in height although it has partially collapsed. Tabular upright boulders were used to face part of the interior wall. Downslope approximately 10 m, Feature 5 is an enclosure in fair condition. The stacked and core filled walls measuring 4 x 7 m and 60-100 cm in height have mostly collapsed but retain some of the interior facing.

Feature 6 is located approximately 10 m downslope of Feature 5. This feature is an enclosure with an adjacent platform abutting the north wall and a larger square enclosure attached to the southern corners. The central enclosure is 7 x 10 m with walls measuring 150 cm in height. The paved platform measures 5 x 10 m and on the east end is elevated 50 cm above the ground. The enclosure to the south begins as an added continuation of the eastern wall. The walls of this 15 m square enclosure are 80 cm in height and relatively roughly constructed. At the southeast corner of the central enclosure a dense grained basalt core measuring 35 cm in length was found on the surface.

Site 4, Feature 7 is a 5 m diameter enclosure in fair condition with stacked walls 55 cm in height. Several upright boulders were incorporated into the construction of this feature. Feature 8 is 5 m from Feature 7 and is an enclosure, wall, and adjacent platform in good condition. The enclosure measures 5 x 9 m with stacked walls 140 cm in height. The platform on the north side measures 3 x 7 m. Pieces of coral were noted on this platform and south wall of the main enclosure. Beginning 1.5 m from the northeast corner of the main enclosure at a basalt outcrop, a wall extends 5 m to the northwest and ends 2 m from the northeast corner of Feature 7. This wall is 90 cm wide and 40 cm high.

Feature 9 is 9.4 m to the southwest from Feature 8 and is a 6 x 7 m enclosure. The stacked walls are 150 cm wide and 120 cm in height. Feature 10 is located in a depression behind a basalt outcrop approximately 10 m from Feature 9. Feature 10 is a 6 x 10 m enclosure in poor condition. The east and west walls incorporate the outcrop into portions of their length. The resultant interior height of the walls is 100 cm and the top of the wall is level with the exterior ground surface. The interior surface of the enclosure is not level and appears unmodified.

Feature 11 is located 35 m to the southwest of Feature 3. This feature is a core filled wall 100 cm in height similar to Feature 1. It did not appear that this feature was a remnant continuation of Feature 2, which ended approximately 15 m to the north against a basalt outcrop.

Feature 12 is a large enclosure measuring 7 m east to west and 66 m north to south. The enclosing wall is approximately 50-110 cm in height as measured from the inside of the enclosure but incorporates basalt outcrops at various locations along its length so the outer wall height is often at ground level. The southern wall of the feature extends to the east beyond the enclosure and into the gully that parallels the linear cluster of features at Site 4. At the southwest corner of the enclosure the wall extends to the south and downhill away from the corridor.

Feature 13 is an enclosure in the 'a'ali'i approximately 30 m west of Feature 1. This small enclosure in poor condition measures 1.5 x 2.2 m and has stacked walls approximately 50 cm high. Feature 14 is approximately 15 m upslope and is a 6 x 8 m terrace that appears to have been cleared of larger stones leaving a level area composed of pebbles and cobbles.

Site 7

This site is a lava tube with an vertical entrance measuring 3 m long and 80 cm wide⁶. A loose pile of boulders provides a ramp down to the floor of the tube, which has a ceiling height of 2.2 m in the center and is 2.5 m wide. Other than the informal entrance ramp, this area of the tube has no sign of previous usage. The lava tube extends from the entrance both uphill to the northwest and downhill. From the entrance, 12.5 m uphill there is a junction where a lower tube extends back down and under the entrance tube for 30 m before ending abruptly. Approximately 12.8 m from the entrance to the lower tube a complete skeleton from a bird was found, collected, and tentatively identified as a barn owl (*Tyto alba*). Near the end of the tube there were at least three commingled burials partially visible in the waterborne sediment at this location. A pile of carbonized grass-like material was present on the surface of the sediment, which may have fallen from an illuminating torch (Photo 7). This material was collected for identification and radiocarbon analysis. Approximately 1 m from the end of this lower tube, sediment samples were taken for subsequent pollen analysis.

At the junction, 3.5 m above the floor was a 75 cm entrance to an upper chamber approximately 3 m in diameter and 100 cm in height. A single burial on a wooden slab was present in a niche in the northwest corner of the chamber. Metatarsals from this individual were found at the entrance to the chamber having been displaced by water transport. Two fire brands were found within the entrance of this chamber. It is difficult to enter the chamber opening due to the sharp basalt and narrow entrance. These fire brands may have been dropped or forgotten in the passage from this chamber by those interrering the burial. Below the entrance to the upper chamber a third fire brand was found on a small shelf. All three of these fire brands were collected for wood identification and radiocarbon analysis.

At the junction the tube continues uphill to the northwest for an additional 15 m to a roof fall blockage. With some additional work removing loose boulders this blockage could be traversed. The floor of the tube between the roof fall and the junction displayed evidence of episodic erosion and deposition from water flowing through this portion of the tube. Below the entrance to the upper chamber a human vertebrae and patella were found commingled with the waterborne gravel. On the left side of the tube floor, 6 m from the junction, a small human ulna was found. This area of the tube floor was also covered with the fragmentary skeletal remains from numerous birds mixed in with the gravel and sand alluvial deposit. Two areas of concentrated remains at 5 m and 9 m from the junction were surface collected for subsequent identification of the bird bone.

⁶ Because Site 7 contains human burials, the location of this site has not been provided in the body of this report or depicted in the accompanying figures. This information is however, on file with the SHPD and is available following evaluation of such requests.

From the entrance the tube forks downslope to the east and west. The west fork extends 15.6 m downhill to a roof fall. This blockage has partially covered the skeletal remains of a human burial and it was not possible to explore farther without disturbing or damaging the burial. The entrance to the east fork has a 40 cm high ceiling for the first 3 m along its length. The tube then becomes slightly larger and extends for another 5 m ending in a wall or roof collapse. A single human burial was found on the east side of the tube 4 m from the entrance to this fork.

A second tube from the same flow event was found 40 m upslope bearing 288° mag from the main entrance and approximately 5 m uphill from the old road. This vertical entrance is a 50 x 100 cm opening with a loose pile of boulders providing access to the floor of the tube. This pile of boulders blocks any downslope entry to the tube. Upslope the tube closes off abruptly approximately 4 m from the entrance. There was no evidence this tube had ever been used previously.

Site 8

The features of this site are located within a dense stand of 'a'ali'i. Feature 1 is a curved enclosing wall measuring 4 x 12 m. This wall is stacked 60 cm high around the entrance to a modified bubble shelter and adjacent cupboard. On the surface outside the entrances shellfish midden, coral, basalt flakes from tool production, and a basalt burin were noted. Within the overhang of the shelter a water-worn boulder grinding stone, shellfish remains, a bird bone, coral, and a button were visible on the surface of the dirt floor. In the cupboard a wooden pencil was found deep within the overhang. Feature 2 is a 4.5 x 7 m C-shape located 20 m north of Feature 1. The walls of this feature stand 50 cm in height and are in good condition.

Site 9

The features of this site are located along a ridge crest of an *a'a* lava flow. Feature 1 is a 6 m square enclosure with stacked walls 80 cm in height. A large single *wiliwili* tree marks the location. Feature 2 located 35 m to the south southwest is a cairn measuring 1.8 x 1.9 m and standing 90 cm in height. Feature 3 located 27 m to the south southwest from Feature 2 is also a cairn measuring 1.3 x 1.4 m and standing 90 cm in height. Both cairns are in fair condition and were constructed from stacked *a'a* boulders.

Feature 4 is a walled terrace platform in fair condition located 50 m south of Feature 3. The Platform measures 7.7 x 10.4 m with the core filled windward wall standing 110 cm in height. The stacked facing of the terrace is 40 cm in height. Coral was noted on the surface of the platform.

Feature 5 is located 29 m south of Feature 4 and is an enclosure in good condition. This feature measures 7.3 x 9 m and has core filled walls. Apparently a cut

and fill approach to the construction of the enclosure floor resulted in the north, uphill wall of the enclosure having an internal height of 1.3 m with the top of the wall at ground level. The remaining core filled walls range from 50-160 cm in height above the ground. A flaked blade of volcanic glass, a bird bone, and the shellfish remains of *Drupa* (sp), *Nerita* (sp), and *Cypraea* (sp) were noted in the vicinity of the enclosure.

Feature 6 is located 10 m northeast of Feature 3 as a low cairn in good condition. This stacked square feature measures 1 m across and is approximately 30 cm in height.

Feature 7 is located 14 m to the north of Feature 6 and is a C-shape in poor condition. This feature measures 3 m in diameter and has a wall approximately 50 cm in height. The floor within the feature appears to have been cleared of larger rock. A small cupboard was present within the internal wall of the feature.

Site 10

Located approximately 75 m above the old nineteenth century "Hana Road" on a 10° slope the single feature at this site is an enclosure in good condition. The enclosure measures 3.8 x 4.4 m with walls 50 cm in height. Although the north wall has collapsed a doorway exists on the west side.

To the west of Feature 10 the topography and land forms change abruptly with steep ridges of relatively young *a'a* flows and less vegetation being present. No additional archaeological sites were located between Site 10 and the remainder of the survey corridor at Lua-la'ilua.

Auwahi, Kanaio, Kaloi, Kaunauhane, Kalihi, and Kulapa

The remaining portion of the corridor from Lua-la'ilua to within 2 km of Ahihi Bay is leased from the State of Hawaii by Ulupalakua Ranch. Permission to enter this area was denied and arrest was threatened by the landowner if we inadvertently trespassed upon these landholdings in the *ahupua'a* of Auwahi, Kanaio, Kaloi, Kaunauhane, Kalihi, and Kulapa. As a result the survey of this large portion of the corridor from Lua-la'ilua to Ahihi Bay was not possible. As previously described, resources were therefore expended on a more thorough coverage of the section of the transmission line corridor for which access had been granted.

Ahihi-Kinau and Ahihi Bay at Kanahena

Onshore the archaeological features within the corridor at Ahihi Bay are all within the *ahupua'a* of Kanahena. Because of the proximity of each feature to a number

of other features and the interconnecting system of trails the entire nearshore area should be considered as part of single site forming the Moanakala Village Complex. As previously noted, this site is on the Hawaii State Register of Historic Places (#50-50-14-1018) within the Ahihi-Kinau Natural Area Reserve. A schematic map of archaeological features in the area to the north northwest of the previously documented portion of the site was prepared (Fig. 11). Features in this area include historic artifact scatters, a possible *heiau*, habitation enclosures, trails, C-shapes, mounds, cairns, bubble shelters and cupboard storage areas (Photos 11 and 12). Survey of this nearshore area at Ahihi Bay encompassed approximately 1.33 ha (3.2 acre) from the shoreline to the road.

Extending approximately 1.6 km inland from the Moanakala site, a network of trails was visible leading from the site and crossing the barren *a'a* flow at intervals within the corridor connecting adjacent *kipuka*⁷ (Photos 13 and 14). Three of these trails had tabular blocks of *pahoe'hoe* laid as stepping stones along the cleared trail (Photo 15). The *kipuka* encountered by the corridor were surveyed but the density of the ground cover and the uneven broken ground made site recognition in these areas impossible without the clearing of vegetation. Since these locations are within a State Natural Area Reserve, no clearing was attempted. The survey of the Ahihi-Kinau area extended approximately 2 km inland (Fig. 12), ending at the border with Ulupalakua Ranch land as indicated by the gated *kuleana* boundary wall (Photo 16).

The nearshore underwater area at Ahihi Bay in Kanahena was previously believed to have potential for significant historic resources accessible to underwater archaeological survey techniques. However, in the period between the July reconnaissance and the December survey, the previous steep *a'a* cobble and boulder beach was eroded by storm waves exposing the basalt and coral bedrock and moving the shoreline inland by as much as 10-15 meters in some areas (Photo 17). The transformed shoreline became a scalloped, uneven and the sloping beach-splash zone composed of storm deposited coral and large basalt boulders. This degree of high energy erosion suggests there is little probability that historic resources are present in the nearshore underwater areas of the bay and that the previously proposed underwater archaeological survey was therefore unwarranted. The erosional and depositional activity occurring along this shoreline would also suggest that this area may be unsuitable for the location of an undersea cable transition point.

⁷ *Kipuka* is a Hawaiian word referring to an island of vegetation and fertile soil isolated by a surrounding and generally barren lava flow.

RESULTS

Summary of Survey Results

Fifty-one archaeological sites comprised of 233 features were identified during the field survey. The majority of sites, based on the types of features present, appear to be native Hawaiian sites dating to the prehistoric or early post-contact periods. A small number of sites are clearly historic, post-dating the introduction of ranching in the 1840s. A few sites contain both indigenous Hawaiian and historic features and the age of several sites cannot be determined at this point.

As a result of this survey, a number of generalizations regarding the occurrence of archaeological sites in the proposed corridor can now be made. First, the results of this survey coupled with those of previous surveys and historic documents indicate that there are no areas in this region of southern Maui that are devoid of archaeological sites except where bulldozing of vegetation has occurred. Realignment of the corridor in any particular direction would likely only result in a different set of sites being potentially impacted by the construction of the transmission line. The remoteness of this area from the major population centers and areas of recent development has protected sites to some extent, so that integrity tends to be higher than in most areas in Hawaii. While sites are not evenly distributed along the corridor, on average 3 to 4 archaeological sites, consisting of anywhere from 1 to 14 features, are encountered in a 1 km stretch of the corridor.

Second, the western section of the corridor, approximating the traditional Kahikinui district, has a greater density of sites and site features than does the eastern section; the Kaupo District. Did Hawaiians choose to preferentially inhabit the rockier areas of Kahikinui leaving the more open (presently) grassland of Kaupo for low intensity agriculture? Alternatively, prior to clearing of pastures for cattle ranching, were archaeological sites distributed relatively evenly across both of these traditional districts? It seems implausible that Hawaiians would have left the less foreboding *ahupua'a* to the east of Nakaohu largely uninhabited, while selecting the rocky and broken region to the west as the preferred location for settlement. As previously noted, the vegetation patterns and the presence of archaeological sites changed dramatically from Nakaaha to Nakaohu. The dilemma of equifinality concerning the archaeological record in the eastern-grassland section of the corridor is present because of documented evidence of mechanized clearing within this area. It is probable that archaeological surface features would have been removed by the mechanized clearing of the area and

that vegetation patterns were purposefully altered however, it is not clear to what degree the area was modified.

The third generalization which can be made is that sites are not clustered adjacent to any presently identifiable resources, such as areas with soil characteristics suggesting better agricultural potential or obvious water sources. Many sites in the western portion of the survey corridor (i.e. Sites 4, 9, 13, 16) were clustered along barren ridges of relatively young *pahoe 'hoe* or unconsolidated *a'a*. Although soil depth was minimal adjacent to these site clusters, it may be that some limited agriculture was taking place. Thus habitation complexes were located on the barren outcrops where cultivation could not take place.

Lava tubes in the project corridor were interesting because only three of the six investigated had evidence of usage by Hawaiians. It is unusual that only one of the tubes had been inhabited and only one contained burials. In comparison to lava tube usage on Hawai'i Island, it is also unusual that none of the lava tubes had any evidence of fortification for use as refuge places in times of warfare. This suggests that the population of this region either fled when conflict erupted or that the refuge places were not constructed because war was not common in south Maui.

In spite of the apparent lack of use, the presence of lava tubes may have been an important factor in placement of habitation sites. During a heavy rain on February 9, 1994, water was noted percolating through the roof of Site 35, Tube 3 and collecting in puddles in numerous locations. In other locales, there is documentation of Hawaiians using gourds to collect rainfall from seeps such as this for auxiliary sources of water in dry areas (Emory 1969). There was, however, no evidence that any of the lava tubes in the project corridor had been put to such use. A wider search of the area around previously identified site clusters would be of interest to check for the presence of lava tubes in their vicinity.

With the exception of the Ahihi-Kinau area, the survey corridor had a notable absence of Hawaiian trails. Because of the damage from 4 wheel drive vehicles, cattle, goats, and deer, there are no intact foot trails remaining in the survey area. Most of the present jeep and animal trails follow the same routes as those used by Hawaiians for traversing the southern coast or for their journeys from the uplands to the sea. Unfortunately all visible evidence of this important part of the settlement infrastructure has been erased from the archaeological record within most of the survey corridor. However, trails in the Ahihi-Kinau portion of corridor and at the Moanakala Complex are in an excellent state of preservation.

Excavation Results

One excavation unit at Site 35, Tube 2 was undertaken. Three stratigraphic layers were encountered in this 50 x 50 cm test unit that extended to 60 cm bs (below the surface). The unit was located along the western wall of the lava tube approximately 2.5 m from the entrance. This location was chosen because of the available light and the presence of shellfish midden remains and basalt artifacts on the surface.

Layer I extended to 40 cm bs and consisted of a dark brown (5YR 3/3) silty matrix containing very angular pebble and cobble sized basalt from roof fall. Scattered small pieces of charcoal and midden consisting of shellfish remains were present throughout this level. At 20 cm bs a lenticular charcoal concentration (15 cm in diameter) in the eastern sidewall was bisected by the unit. This charcoal was collected as a separate bulk sample for potential radiocarbon analysis. A total of 22.4 liters of material were contained within this level, which ended at 19-22 cm bs.

Layer II was distinguished by the absence of gravel sized rock within the matrix. Larger boulder and cobble sized rocks were present with voids in between containing little or no sediment. Shell and charcoal continued to be present throughout this layer; however, it may have filtered down between the voids from the layer above. This thin layer extended from approximately 20-46 cm bs. A total of 19.1 liters of material were excavated from this level.

Layer III was a strikingly white colored sediment resulting from the deposition of leached precipitates dripping from the ceiling of the tube. The deposition of an identical looking precipitate partially covered the dirt floor of the Site 7 lava tube at Luaia'ilua. This angular gravel, cobble, and boulder filled layer extended from approximately 46 cm bs to the base of excavation at 63 cm bs. Similar to Layers II and III, the matrix of this layer was loose and there were voids between the larger angular rocks within the unit. The charcoal and shellfish at this level may be material that fell between the larger rocks filtering down to the depth of Layer III. A total of 9 liters of material were excavated from this layer with the majority being rock.

Charcoal Analysis

All charcoal samples were collected from within the lava tubes crossed by the project corridor. Charcoal from four separate locations within the tubes are believed to be the remains from fire brands or torches used by Hawaiians for illumination. These samples were sectioned to permit simultaneous radiocarbon analysis and wood identification. Three of these samples were single sticks of wood that proved to be very hard suggesting a tentative identification of one of the following species: *Dodonaea* ('a'ali'i), *Metrosideros* ('ohia), *Myoporum* (naio), *Acaia* (koa), *Sophora* (mamane).

The other surface sample was a burned grass-like material found in a clump in the lower tube at Site 7 adjacent to a commingled number of human skeletal remains (Photo 7). This grass-like material has yet to be identified and will probably require phytolith analysis for an accurate assessment. The majority of this material (5.5 g) has been submitted for radiocarbon analysis.

Seven additional charcoal samples were obtained from the excavation within Lava Tube 2. These samples were collected from screened bulk sediments excavated by arbitrary 10 cm levels within three stratigraphic layers. The deposition of this charcoal probably resulted from the dispersal of numerous small cooking or heating fires within the entrance to the tube.

Processing of the charcoal samples submitted for radiocarbon dating have not yet been completed by the consulting laboratory. The charcoal samples submitted for species identification have not yet been processed by the consulting specialist (Table 4).

Pollen Analysis

Three sediment samples were obtained from various depths of an alluvial deposit in the lower tube at Site 7. This deposit was located 42 m from the entrance to the surface at Site 7. These samples were then submitted for pollen analysis to gather data relating to the paleoenvironmental conditions in the region. Processing of these samples has not yet been completed by the consulting specialist.

Faunal Analysis

Fossil bird bone was collected from the surface at three proveniences within the lava tubes at Site 7. Midden remains containing shell, fish bone, and bird bone were collected from the excavation unit at Tube 2, Site 35. Analysis of the fossil bird bone will provide data relating to both avifauna extinctions and the paleoenvironmental conditions in the region. Analysis of the midden at the habitation deposit will provide data concerning subsistence practices of the people living at that site. Processing of the fossilized bird bone and midden remains from the excavated habitation deposit has not yet been completed by the consulting specialist.

CONCLUSIONS

The specific and basic questions concerning the settlement patterns and the general prehistory of South Maui may be partly answered by the analysis of data from this investigation. Primary among these concerns the initial settlement of the area. Although prior investigations in the vicinity of the project corridor have returned radiocarbon dates that can be interpreted as ranging from approximately 1300 years before present to essentially modern, the samples are problematic, and there are only six samples presently analyzed. The suggestion that the area was generally settled approximately 500-600 years ago (Chapman and Kirch 1979:36; Kolb 1991) should be considered a tentative finding.

Twelve charcoal samples were recovered during the course of this investigation. Four of these samples were submitted for radiocarbon analysis and wood identification. Results from those analytical procedures have not yet been made available. Interpretation of the results from the forthcoming radiocarbon analysis will document the approximate time period for use of the individual sites from which the samples were obtained and provide a better understanding for dating the regional use of the Kahikinui district.

Two possible models concerning prehistoric settlement have been suggested based upon comparative work from two dryland regions of Hawai'i Island. Their applicability to the region of Maui surveyed during this project remains open to question. In other rural areas of the Hawaiian Islands following European contact, introduced disease, opportunities for wage labor in the urban centers, the introduction of European cash crops, and the mid-1800s the spread of feral livestock completely altered the previous settlement and land use patterns. It is apparent that the same set of circumstances applied to the entire region of South Maui although the history of this change in this region is poorly documented. In addition, the remainder of the nineteenth century saw the introduction of new plants for supplemental cattle forage and the continuing retreat of the native forests from the lower elevations (Resnick 1977). The perception of the area as an uninhabited, marginally productive dryland is probably an inaccurate characterization for the prehistoric period.

It is probable that the retreat of the native forest dramatically affected the availability of water in the project area, resulting in what we now perceive to be an area of low rainfall. Documenting the environmental constraints or opportunities facing Hawaiians who inhabited this region of Maui is necessary before settlement patterns can be understood. If permanent springs, streams, or intermittent water sources once existed in the vicinity of the project corridor, and have now dried-up due to the retreat of the

forest, it would alter the present perception of the area as having marginally productive agriculture. Identification of the wood taxa represented by the charcoal samples will aid in the reconstruction of the paleoenvironmental setting under which Hawaiian settlement took place. Similarly, both the sediment samples submitted for pollen analysis and the identification of the fossilized bird bone will provide additional indicators of the environmental constraints that faced the inhabitants of the area. Results from the analyses of these samples are not yet available.

At this juncture, settlement and land use in the region of South Maui remains an enigma, although some generalized findings can be presented. Indications from Chapman and Kirch (1979) are that the area of intensive settlement ended at approximately 2600 ft. This is immediately below the area where the agricultural potential and water availability appear to have been most favorable. Similar findings are suggested by the ongoing investigation by Bordner (1994 pers. comm.). In addition to this upland area, there are approximately 300 sites located along the coast that were noted by Walker during his reconnaissance (1931a:93). These two areas, the coast and the uplands, are locales for which the factors dictating the placement of settlement are understood. Settlement of these two areas is predicted by both models proposed earlier; 1) migratory, seasonal settlement of the coast and uplands (the Lapakahi Model), and 2) permanent occupation of both areas with the reciprocal exchange of upland produce for marine resources (the Ka'u Model). It is important to note that neither model need be exclusive of the other.

In contrast to the settlement patterns predicted by these models, results from this investigation documented numerous sites located within barren *a'a* lava fields at elevations below 1400 ft in areas that appear to be unsuitable for agriculture. It was unexpected that these apparently least favorable areas at mid-elevation would have been the locations for large settlement clusters. Walker, who had noted some of these sites, made the statement (insupportable) that they were located on the barren *a'a*, "to save all the good land for cultivation" (1931a:92). Another rational for the location of settlement clusters in this region may relate to the cold morning temperature. Prior to the sun heating the ground, the south side of Haleakala is subjected to chilling breezes as cold air descends from the 10,000 ft summit. Habitation sites in elevations lower than 790 m (2,600 ft), such as those in the project corridor, would generally be below the damp fog drip precipitation (cf., Juvik and Perriera 1973; Juvik and Ekern 1978) that would add considerably to the chilling temperatures.

It is also possible that in addition to migratory seasonal settlement of the coast and uplands by some, and reciprocal exchange of goods by others, people also inhabited this region in the mid-elevations so they could use both areas continually. These sites would still be within a half-day's walking distance to both the agriculturally productive upper elevations and the subsistence resources at the coast. Fishing gear was recovered from all the inland sites investigated by Chapman (Chapman and Kirch 1979:24). The

current investigation documented the presence of an octopus lure at Site 16 and a fishhook, sea urchin tests, shell, and fish bone from the excavation at Site 35. This lends more evidence to the suggestion that some people were living at mid-elevation sites while gathering marine resource subsistence from the coast. Additionally these mid-elevation sites may have served as exchange centers and rest stops for those in transit between the coastal and upland areas. An expansion of the scope of the investigation to identify trails associated with these site clusters would therefore be productive.

It is proposed that the Mid-Elevation Model, which is inclusive of the other models, is both explanatory and predictive of settlement patterns in the region. It suggests people inhabited this region; 1) to reside in a central location with access to both coastal and upland resources, 2) to provide rest stop and brokerage services to those involved in trade between the upland and coastal regions (the Ka'u Model), and 3) to escape the damp and cold of the upper elevations. In summary, while there do not appear to be any areas that can be considered devoid of sites, settlement in South Maui was apparently clustered in three regions; the uplands, the mid-elevations, and the coast. The occurrence of mid-elevation habitation site clusters is probably related to the availability of water, a centralized location between large coastal and inland settlements, and a viable route connecting the coast with the uplands. Further research with a wider scope of investigation is required to further test the parameters of this model.

EVALUATION AND RECOMMENDATIONS

Assessment of Site Significance

An assessment of the significance of an archaeological site is based upon the criteria of eligibility for nomination to the National Register of Historic Places (36 CFR Part 60 of the National Historic Preservation Act). These require that a site possess integrity and meet one of four criteria of historic value (a, b, c, and d; see Table 4). In addition sites in Hawaii are evaluated for eligibility for nomination to the State Register of Historic Places, currently on the basis of criteria established by the SHPD in their draft rules and regulations. These reflect the national criteria, but also establish a criterion (e) based on the historical cultural value of a site to a particular ethnic group. This standard is particularly concerned with protecting indigenous Hawaiian sacred sites and burial sites.

Fifty-one sites were recorded in the 15 km long surveyed section of the corridor. One of these, the Moanakala Complex, Site 50-50-14-1018, has already been judged eligible and placed on the State Register of Historic Places. This site, the remains of an early historic and almost certainly also late prehistoric Hawaiian village, is composed of a complex of intact features, including a possible *heiau*, habitation structures, and storage features. The site clearly possesses integrity and is important because of the information it may yield concerning Hawaiian prehistory and history (criterion d) and because of its cultural importance (criterion e).

The remaining 50 sites identified during the course of the present survey must all be considered as potentially significant pending further investigation. For most sites further clearing and recording is necessary to determine the degree of integrity of each site, its potential research value in terms of the information it may yield, and the functional and structural information that will allow a determination of significance under criteria c and e. However all sites in the project corridor qualify as potentially significant sites under criterion "d", because they may yield information important in understanding Hawaiian prehistory and history. Information they may contribute includes data concerning settlement patterns in this region of Maui, subsistence practices, the time of initial settlement of the area, native Hawaiian adaptations to this leeward environment, and changes in these adaptations over time. Other sites may qualify under other criteria, although further research is needed before such a determination can be made in most cases. However, at present it is clear that Sites 7, 13, 41, as well as 50-50-14-1018, and perhaps Sites 1, 14, 17, and 29 all additionally qualify under criterion "e" due to the important historical and cultural value these locations

posses. These sites contain known burials or *heiau* or features that may be burials or sacred structures.

Potential Project Impacts to Cultural Impacts

In regard to the planning of the Maui portion of the Hawaii Geothermal Project the following general assessments of potential project impacts can be made. The planned land sea transition at Huakini Bay would appear to present no danger of adverse impacts to historic resources, given the absence of evidence of archaeological sites along Huakini Bay. However above Huakini Bay in the *ahupua'a* of Nakula and the eastern edge of Manawainui there are nine archaeological sites along the corridor that might potentially be impacted by the project. Westward for 3 km through Manawainui ranching activities appear to have destroyed all archaeological sites and no adverse impacts would be anticipated. However from Mahamenui west through Lua-la'ilua there is an average density of 4 to 5 sites each kilometer, all of which could potentially be impacted by the proposed project.

IARII was unable to survey the 12 km of the corridor west from Lua-la'ilua, but other evidence suggests that the density of significant sites in this section of the corridor will be similar to that in the surveyed portions of the corridor. The environmental parameters are similar and information from other sources also suggests a high density of sites. A few sites are visible on the aerial photographs, enclosures and lava tube openings were visible during the preliminary helicopter survey, lava tubes within or in the near vicinity of the corridor have been previously reported, and as yet unpublished archaeological research by others (e.g. Bordner 1994 pers. comm.) has identified the presence of archaeological sites. All these sources of information demonstrate the presence of potentially significant cultural resources in the unsurveyed section of the corridor and the high potential of adverse impacts from the construction of the transmission line through this portion of the corridor.

In the western 2 km surveyed section of the corridor above Ahihi Bay, the only evidence of past human activity were the foot trails crossing the area. The likelihood of adverse impacts in this area is slight. However at Ahihi Bay where the land sea transition is planned, the Moanakala Complex constitutes a large and significant site that could suffer major adverse impacts as a result of the proposed project.

More precise assessment of the potential impact of the proposed project is impossible at this point because of two factors related to the current early planning stage of this project. First, the planned landfall and egress for the undersea cables may be relocated. In addition, the actual planned transmission line corridor has yet to be laid out by surveyors and thereby firmly established on the ground. Second, the physical impacts of the transmission line construction have not yet been established. The possible need for access roads, turn-arounds for construction equipment, grubbing and filling at tower

locations, construction excavation for power line tower footings, construction storage yards, and other possible infrastructure for construction also may affect historic resources in the areas outside the surveyed corridor. The result is that the full extent of archaeological resources that may be adversely affected by this project remains unknown.

Recommendations

Prior to a detailed discussion of preservation measures and mitigation strategies for sites in the project corridor, it is recommended that additional archaeological investigations be conducted. These investigations should consist of a full identification and evaluation survey of cultural resources in the project corridor. This survey should meet all the requirements of the SHPD for an inventory level survey. Such a survey would first involve an identification of cultural resources in those sections of the corridor in which survey was impossible during the present project. Second, it should involve detailed recording and mapping of all cultural resources in the corridor, including both sites already identified and those identified in the remaining sections of the corridor. Third, subsurface testing of some sites with analysis of the excavated materials should be included as part of the inventory survey to assist in determining site significance.

In particular, expansion of the investigations in the vicinity of Sites 4, 9, 13, and 16 is necessary and may provide the information to understand better the parameters involved in the location of Hawaiian settlement in the region. In the same regard, only four of the possible twelve charcoal samples have been submitted for radiocarbon analysis and wood identification. Funding for the processing of additional samples recovered from the recent fieldwork should be sought.

For those sites already identified, the inventory survey should include detailed recording (description, scale mapping, and photography of all sites). For approximately 13 sites, particularly historic boundary walls and a few other small sites lacking associated cultural deposits, such recording will be all the work needed during the inventory survey and may well constitute adequate mitigation for these sites. For 12 of the sites, primarily those with indigenous Hawaiian habitation features at which evidence of artifacts or midden has been observed or at which sediments or soils are present, subsurface testing is recommended as part of the inventory survey. For the remaining 26 sites, it is recommended that subsurface testing be conducted at a sample of the different feature types present in the survey corridor.

Following the inventory field survey, a final assessment of significance for each site can be made. The inventory survey report would contain specific recommendations concerning the need for preservation as is and the avoidance of adverse impacts to certain sites and for mitigation measures for those sites requiring data recovery prior to any adverse impacts from implementation of the project. Once the type of adverse

impacts likely to affect the sites are more precisely defined, then preservation and mitigation plans for significant sites can be prepared taking these impacts into consideration. The preparation of such mitigation and preservation plans should follow the inventory survey and precede any data recovery mitigation of sites in the project area.

While avoidance and preservation as is is the preferred preservation alternative for significant sites, for most sites in the corridor, those which are assessed preliminarily as being significant only for their research value (criterion d), it is likely that mitigation through data recovery excavation will be an adequate mitigation measure. For perhaps one quarter of the sites, detailed recording alone may constitute adequate mitigation and no further investigations be necessary. However for those eight sites (Sites 1, 7, 13, 14, 17, 29, 41, and 50-50-14-1018) evaluated as potentially significant for their cultural value under State of Hawaii criterion e and perhaps for others following the inventory survey, avoidance and preservation as is may be the recommended preservation alternative. It should be noted that the avoidance of adverse impacts to Site 1018 would probably require a change in the placement of the land sea transition station at this end of the transmission line.

In summary, the Maui corridor of the Hawaii Geothermal Project as currently planned contains a relatively high density of potentially significant archaeological sites in the surveyed sections. Site preservation in certain sections of the corridor is excellent compared to most areas in Hawaii and overall site integrity is high. It is expected that the remaining unsurveyed portions of the corridor contain a similar density of sites and that throughout the south Maui region from Huakini Bay to Ahihi Bay archaeological sites will be common. The project is thus likely to adversely impact some archaeological sites regardless of the routing through south Maui. Planning for the project will require measures to avoid sites for which preservation as is is recommended and mitigation measures to preserve the information from sites that will be adversely impacted.

GLOSSARY

- a'a* - A type of basaltic lava, which because of the nature of the flow, is deposited as very sharp and angular, gravel to boulder sized unconsolidated vesicular chinker type rock.
- ahupua'a* - Traditionally, an idealized *ahupua'a* was a land division that extended from areas of offshore resources to the island's central upland mountain range and incorporated all the natural products and materials necessary for Hawaiian existence and settlement of an area (cf. Handy and Handy 1972; Thrum 1925).
- ala* - The generalized name for a footpath, trail, or road.
- ali'i* - Most often translated as "chief", this was the general rank given to any of the rulers or titled persons in Hawaiian society.
- heiau* - Most often translated as "temple", a *heiau* served as a place of worship, schooling, government function, and housing for *ali'i* on their sojourns through their realm. The location of *heiau* was also said to be of particular spiritual significance to Hawaiians.
- ho'okupu* - A traditional Hawaiian offering found at sites of spiritual significance.
- 'ili'ili* - A pebble or a small stone; to collect or glean. The paving created by the selective collection and spreading of pebbles or water-worn coral rubble for a floor.
- kikania* - A thorny bush (*Solanum sodomium*) with green or yellowish fruit resembling a tomato.
- kipuka* - An island of vegetation remaining after a lava flow, as is suggested with the reference to the Hawaiian word for hole (*puka*) implying a gap in the flow.
- koa* - Most often translated as "fishing shrine." While the placement of offerings at these sites denotes their obvious spiritual functioning, the location of these structures and ethnographic accounts also suggest they functioned as locations from which to observe empirical phenomena or

to determine how and when to fish. The placement of water-worn rocks and coral, occasionally fishing gear, and the remains of fish or shellfish as offerings are common indicators of these sites.

koa haole - An introduced tree, *Leucaena leucocephala*.

kuaiwi - Meaning literally "spine," the word was also used to denote the long mounds or low stone walls marking field boundaries in areas of dryland cultivation such as the Lapakahi area in Kohala on Hawai'i Island (cf. Rosendahl 1972).

kuleana - Refers to a right and in relationship to land, a title or granted deed to a property.

lantana - An thorny ornamental bush (*Lantana* sp.) introduced into Hawai'i in the mid 1800s.

pahoe 'hoe - A term referring to a lava, which because of its high temperature, flowed in a very liquid state resulting in a surface characterized by its hard, and smooth or ropy texture.

papamu - A game board constructed by pecking a rectangular grid of dots into a flat stone used in the playing of a Hawaiian game similar to Chinese checkers called *konane*.

wiliwili - A native tree, (*Erythrina sandwicensis*).

REFERENCES

- Alexander, W.
1894 Kaupo, Kahikinui, Honuaula, and Hana, Maui. Reg. Map #1782. On file at the State Survey Office, Honolulu.
- Ashdown, I.
1971 *Ke Alaloe O Maui*. Kama'aina Historians, Wailuku, Hawaii. Available at Hamilton Library, University of Hawaii, Honolulu.
- Baldwin, A.
1884 Honuaula, Maui. Reg. Map #1186. On file at the State Survey Office, Honolulu.
- Butzer, K.
1982 *Archaeology as Human Ecology*. Cambridge University Press, New York.
- Bordner, R.
1994 *The Cultural Landscapes of the Past in Kanaio-Auwahi*. Manuscript, on file with author, Honolulu.
- Chapman, P.
1967 Field sketches and maps of an archaeological survey of Kipapa and Nakaohu, Hana District, Maui. Available at Department of Anthropology, Bishop Museum, Honolulu.
- Chapman, P., and P. Kirch
1979 *Archaeological Excavations at Seven Sites Southeast Maui, Hawaiian Islands*. Department of Anthropology, Report 79-1, Bishop Museum Press, Honolulu.
- Connolly, R.
1973a Manuscript, Moanakala Village Complex. Site description for the State Historic Sites Review Board, on file at the State Historic Preservation Division, Honolulu.
- 1973b Manuscript, Kahikinui Archaeological District. Site description for the State Historic Sites Review Board, on file at the State Historic Preservation Division, Honolulu.

- Cordy, R.
1989 *Research Design for Archaeological Survey Methods: Archaeological Plan for Geothermal Exploration Activities.* Manuscript on file at the State Historic Preservation Division, Honolulu.
- Davis, B.
1992 Human Settlement in Pristine Insular Environments: A Hawaiian Case from Barber's Point, Southwestern O'ahu. Unpublished Ph.D. dissertation, Department of Anthropology, University of Hawaii, Honolulu.
- Emory, K.
1933 Letter to Dr. Gregory dated May 13, 1933. Enclosed in manuscript "Archaeology of Maui" by Walker, Box 1-1, on file at Bishop Museum Archives, Honolulu.
- 1969 *The Island of Lanai.* Bishop Museum Press, Honolulu.
- Emory, K. and R. Hommon
1972 *Endangered Archaeological Sites Within Maui County.* Department of Anthropology, Report 72-2, Bishop Museum Press, Honolulu.
- Fitzpatrick, G.
1986 *Early Mapping of Hawaii.* Editions Limited, Honolulu.
- Flemming, M.
1933 *Old Trails of Maui.* Privately Printed, copy on file at Hamilton Library Hawaiian Collection, University of Hawaii, Honolulu.
- Foote, D., E. Hill, S. Nakamura, and F. Stephens
1972 Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii. United States Department of Agriculture, Soil Conservation Service, U. S. Government Printing Office, Washington, D.C.
- Giambelluca, T., M. Nullet, and T. Schroeder
1986 *Rainfall Atlas of Hawaii.* Report R76, Department of Land and Natural Resources State of Hawaii, Honolulu.
- Gladfelter, B.
1981 Developments and Directions in Geoarchaeology. In *Advances in Archaeological Method and Theory*, Vol. 4, edited by M. Schiffer, pp. 343-363. Academic Press, New York.
- Gordon, C. and J. Buikstra
1981 Soil pH, Bone Preservation, and Sampling Bias at Mortuary Sites. *American Antiquity* 46(3):566-571.

- Graves, M. and C. Erkelens
1991 "Method and Theory in Hawaiian Archaeology." *Asian Perspectives*
30 (1):1-17.
- Grayson, D.
1984 *Quantitative Zooarchaeology*. Academic Press, New York.
- Green, J.
1833 Letter to Rev. R. Anderson, dates December 6, 1833. Missionary Letters,
vol. 6, pp. 1722-1723, on file in the Mission Children's Society Collection,
Mission Houses Library, Honolulu.
- Handy, E. S. and E. G. Handy
1972 *Native Planters in Old Hawaii*. Bishop Museum Bulletin 233, Bishop
Museum Press, Honolulu.
- Handy, E. S. and M. Pukui
1958 *The Polynesian Family System In Ka'u, Hawaii*. The Polynesian Society,
Wellington, New Zealand.
- HEA
1963 Catalogue of Properties by Island. File 120, Hawaii Evangelical Association
of Congregational Churches, Honolulu.
- Hommon, R.
1973a Manuscript, Cave of the Seven Coffins. Site description for the State
Historic Sites Review Board, on file at the State Historic Preservation
Division, Honolulu.
- 1973b Manuscript, Kanaio Mauka Complex. Site description for the State Historic
Sites Review Board, on file at the State Historic Preservation Division,
Honolulu.
- 1973c Manuscript, Lualailua Cave. Site description for the State Historic Sites
Review Board, on file at the State Historic Preservation Division, Honolulu.
- 1973d Manuscript, Kaipolohua Cave. Site description for the State Historic Sites
Review Board, on file at the State Historic Preservation Division, Honolulu.
- 1973e Manuscript, Puu Naio Cave. Site description for the State Historic Sites
Review Board, on file at the State Historic Preservation Division, Honolulu.
- 1974 Manuscript, Pahihi Heiau. Site description for the State Historic Sites
Review Board, on file at the State Historic Preservation Division, Honolulu.
- James, H., T. Stafford, D. Steadman, S. Olson, P. Martin, A. Jull, and P. McCoy
1987 Radiocarbon Dates on Bones of Extinct Birds from Hawaii. *Proceedings of
the National Academy of Science* 84:2350-2354.

- Judd, B.
1958 Report by Bernice Judd as librarian for the Hawaii Mission Children's Society, dated December, 1958. On file at the Mission Children's Society Collection, Mission Houses Library, Honolulu.
- Juvik, J. and D. Perreira
1973 *The Interception of Fog and Cloud Water on Windward Mauna Loa, Hawaii.* Prepared for Island Ecosystems IRP, U.S. International Program. Available at Hamilton Library, University of Hawaii, Honolulu.
- Juvik, J. and P. Ekern
1978 A Climatology of Mountain Fog on Mauna Loa, Hawaii Island. Water Resources Research Center, University of Hawaii. Available at Hamilton Library, University of Hawaii, Honolulu.
- Kamakau, S.
1992 *Ruling Chiefs.* Kamehameha Schools Press, Honolulu.
- 1964 *Ka Po'e Kahiko: The People of Old.* Bishop Museum Special Publication 51, Bishop Museum Press, Honolulu.
- Kame'eleihiwa, L.
1992 *Native Lands and Foreign Desires.* Bishop Museum Press, Honolulu.
- Kanakanui, S.
1910 "Kanaio Homesteads, Honuaula, Maui." Reg. Map #2500, available at the State Survey Office, Honolulu.
- Kolb, M.
1989 Manuscript, "Adze from Site 50-15-1170". Memorandum to Agnes Griffin concerning a recovered artifact, on file at the State Historic Preservation Division, Honolulu.
- 1990 *Preliminary Report on Excavations at Loaloa Heiau, Manawainui, Kaupo District, Maui, Hawaii.* Manuscript on file at IARII, Honolulu.
- 1991 *Social Power, Chiefly Authority, and Ceremonial Architecture, in an Island Polity, Maui, Hawaii.* Unpublished Ph.D. dissertation, University of California, Los Angeles.
- Kuykendall, R.
1965 *The Hawaiian Kingdom, Vol. I.* University of Hawaii Press, Honolulu.
- Lawrence, W.
1882 "Kahikinui District, Maui." Reg. Map #955, available at the State Survey Office, Honolulu.

- Leick, A.
1990 *GPS Satellite Surveying*. Wiley and Sons, New York.
- Macdonald, G. and A. Abbott
1979 *Volcanoes in the Sea*. University of Hawaii Press, Honolulu.
- McEldowney, H. and F. Stone
1991 *Survey of Lava Tubes in the Former Puna Forest Reserve and on Adjacent State of Hawaii Lands*. Manuscript on file at the State Historic Preservation Division, Honolulu.
- Parker, P. and T. King
n.d. *Guidelines for Evaluating and Documenting Traditional Cultural Properties*. National Register Bulletin #38, National Park Service, Interagency Resources Division, Washington, D.C.
- Resnick, J.
1977 *A History of Vegetation Change: Man and Vegetation in Honua'ula, Maui, 1786 to Present*. Unpublished Master's thesis, Department of Geography, University of Hawaii, Honolulu.
- Ripperton, J. and E. Hosaka
1942 *Vegetative Zones of Hawaii*. *Agricultural Experiment Station Bulletin 89*. University of Hawaii Press, Honolulu.
- Rosendahl, P.
1972 *Aboriginal Agriculture and Residence Patterns in Upland Lapakahi, Island of Hawaii*. Unpublished Ph.D. dissertation, University of Hawaii, Honolulu.
- Sahara, T. E. Murabayashi, A. Ching, I. Kuwahara, F. Fujimura, E. Awai, and H. Baker
1967 *Detailed Land Classification - Island of Maui*. Land Study Bureau, University of Hawaii, Honolulu.
- Schmitt, R.
1973 *The Missionary Census of Hawaii*. Pacific Anthropological Records, No. 20, Bishop Museum Press, Honolulu.
- Soehren, L.
1963 "An Archaeological Survey of Portions of East Maui, Hawaii." Manuscript on file, Bishop Museum Archives, Honolulu.
- Stein, J.
1984 • Organic Matter and Carbonates in Archaeological Sites. *Journal of Field Archaeology* 11:239-246.
- 1987 Deposits for Archaeologists. In *Advances in Archaeological Method and Theory*, edited by M. Schiffer, Vol. 11, pp. 337-395. Academic Press, New York.

- Sterling, E.
n.d. Manuscript. On file, Department of Anthropology, Bishop Museum, Honolulu.
- Stokes, J.
1916 "Maui." Manuscript notes Nov-Dec. On file, Bishop Museum Archives, Honolulu.
- 1918 "Report on the *Heiau* of Maui." Manuscript on file, Bishop Museum Archives, Honolulu.
- Thrum, T.
1925 "Hawaiian Land Terms." In, *The Hawaiian Annual for 1925*, pp. 65-71. Printed privately, Honolulu. Available at Hamilton Library, University of Hawaii, Honolulu.
- Torbert, L.
1847 Letter to the Minister of the Interior, dated September 20, 1847. Interior Department Land File, Hawaii State Archives, Honolulu.
- Walker, S.
1929 "East Maui - Keoneoio, Makawao, Keanae, Hana." Notes from Fieldbook, East Maui, on file at Bishop Museum Archives, Honolulu.
- 1931a "Archaeology of Maui", manuscript Box 1-1, on file at Bishop Museum Archives, Honolulu.
- 1931b "Fig. 1", Untitled manuscript map of Maui sites, Box 1-2, on file at Bishop Museum Archives, Honolulu.
- Wall, W.
1894 "Map of Honuaula, Maui, surveyed by W. D. Alexander in 1866-1879." Reg. Map 1763, available at the State Survey Office, Honolulu.
- Willis, E.
1894 "Kipahulu and Kaupo, Maui." Reg. Map 1782, available at the State Survey Office, Honolulu.

FIGURES

Figure 1. Map of Hawaii Geothermal Project Maui Transmission Line Corridor.

Figure 3. Map of the eastern end of the survey corridor depicting site locations.

Figure 4. Sketch map of Site 36, Nakula, Maui.

Key

- ▲ Water-rounded basalt
- ▽ Moderate slope
- Height in cm
- Shell

0 2 4 6 meters

Figure 5. Sketch map of Site 41, Kula, Maui.

Figure 6. Map of the middle section of the survey corridor depicting site locations.

Figure 7. Map of the western section of the survey corridor depicting site locations.

Figure 8. Schematic map of Site 14, Alena, Maui.

Figure 9. Schematic map of Site 13, Alena, Maui.

Figure 10. Schematic map of Site 4. Luaia'ilua, Maui.

Figure 11. Schematic map of additions to the Moanakala Complex.

Figure 12. Map of the Ahihi-Kinau section of the survey corridor.

PHOTOGRAPHS

Photo 1. Low vegetation at Nakula in July 1993. View to the east with Huakini Bay in the foreground and Nuu Bay in the upper left.

Photo 2. Waist high vegetation at Site 36 in Nakula, December 1993.

Photo 3. Pahihī Gulch, July 1993. View to the north.

Photo 4. Boulder beach at Huakini Bay in July 1993. View to the west.

Photo 5. The nineteenth century "Hana Road" cut visible to the right and above the present Pi'ilani Highway, route 31.

Photo 6. Rock filled entrance to Lava Tubes 1 and 2 at Site 35, Nakaha.

Photo 7. Carbonized grass assumed to be the remnants of a torch found 30 m within the lower tube at Site 7.

Photo 8. A bubble shelter at the Moanakala Complex, Ahihi Bay, Maui. View to the northeast.

Photo 9. Small enclosure at the Moanakala Complex, Ahihi Bay, Maui. View to the northeast.

Photo 10. Enhanced infra-red photograph showing the trail network across the *u'a* at Ahihi-Kinai. The Moanakala Complex and Ahihi Bay are in the bottom left. The survey corridor extended from this area to just beyond the upper right hand corner of the photo.

Photo 11. Photo from helicopter showing close-up of trails depicted in upper right of Photo 10.

Photo 12. Stepping stone trail at the Moanakala Complex, Ahiki Bay, Maui. View to the east.

Photo 13. Ranch wall at border of Ahihi-Kinau with Ulupalakua Ranch. View to the northwest.

Photo 14. December 1993 photo of the survey team standing on the remnant of the *a'a* shoreline that was present in July 1993 at Ahihi Bay, Maui. The remainder of the shoreline was eroded and the boulders and coral in the foreground were deposited in the interim. View to the north.

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TABLES

Table 1. Sites in the survey corridor

SITE	FEA	TYPE	SITE	FEA	TYPE
1	1	platform terrace	16	1	bubble shelter
	2	platform		2	enclosure
	3	cairn		3	L-shape
	4	walled cupboard		4	terrace platform
	5	enclosure		5	terrace platform
2	1	terrace (collapsed)		6	terrace platform
	2	wall	17	1	small circle
3	1	C-shape		2	enclosure
	2	bubble shelter		3	enclosure, paved
	3	enclosure		4	enclosure
	4	platform terrace, wall		5	C-shape
	5	wall		6	terrace platform
	6	enclosure		7	platform
4	1	wall		8	mound - burial
	2	boundary wall		9	enclosure
	3	enclosure		10	terrace
	4	small round enclosure		11	wall
	5	enclosure		12	enclosure, rounded
	6	enclosure		13	enclosure
	7	enclosure		14	walls
	8	enclosure		15	enclosure
	9	enclosure		16	enclosure
	10	enclosure		17	L-shape
	11	windward wall	18	1	L-shape
	12	enclosure	19	1	terrace platform
	13	enclosure		2	boundary wall
	14	terrace	20	1	wall
5	1	boundary wall		2	terrace platform
	2	enclosure		3	terrace platform
	3	small enclosure		4	L-shape
6	1	terrace platform		5	platform terrace
	2	windward wall	21	1	enclosure
	3	enclosure		2	enclosure
7	1	lava tube - burials		3	L-shape
8	1	bubble shelter		4	windward wall
	2	C-shape		5	C-shape
9	1	enclosure	22	1	enclosure
	2	cairn		2	C-shape
	3	cairn		3	C-shape
	4	terrace platform		4	windward wall
	5	enclosure	23	1	enclosure
	6	cairn		2	enclosure
	7	C-shape		3	enclosure
10	1	enclosure		4	enclosure
11	1	enclosure		5	windward wall
	2	C-shape	24	1	enclosure
12	1	wall		2	enclosure
13	1	terrace platform		3	enclosure
	2	L-shape		4	ag. terraces
	3	enclosure	25	1	boundary wall
	4	enclosure	26	1	L-shape
	5	circular walled pit		2	C-shape
14	1	terrace platform		3	enclosure
15		boundary wall		4	L-shape

Table 1 (cont.)

SITE	FEA	TYPE	SITE	FEA	TYPE
27	1	wall	37		wall
	2	enclosure	38		C-shape
28	1	enclosure	39	1	enclosing wall
29	1	wall		2	enclosure
	2	wall	40		
	3	C shape	41	1	terrace platform
	4	terrace platform		2	enclosure
30	1	L-shape		3	C-shape
	2	C-shape	42		L-shape
31		C-shape	43		wall
32	1	enclosure	44		enclosure
	2	enclosure	45	1	L-shape
	3	terrace wall		2	L-shape
	4	L shape	46	1	C-shape
	5	enclosure		2	terrace platform
33	1	wall		3	terrace
	2	wall segments	100		terrace platform
	3	enclosure	101		C-shape
	4	enclosure			terrace platform
34	1	kuleana wall	102		mounds
	2	L-shape	103		terrace
	3	parallel walls	104	1	enclosure
	4	C-shape		2	terrace platform
35		3 lava tubes		3	clearing pile
36	1	enclosure			
	2	C-shape			
	3	L-shape			
	4	wall			

Moanakala Village Complex Site# 50-50-14-1018. nine features recorded previously to the southeast of corridor (Connolly 1973), 65 new features documented in Figure 11.

Table 2. UTM coordinates of Site/Feature, (Old Hawaiian Datum, International Spheroid).

Site / Feature	GPS File Name	# of Fixes	Northing	sd	Easting	sd	Elev AMSL	sd
1/2	011822E	54	2281871.18	1.78	781377.37	1.59	412.40	3.68
2/2	011821A	247	2281675.28	2.29	781076.11	1.69	381.11	3.18
3/1	011820D	241	2281632.00	1.62	780944.39	1.99	380.42	4.12
3/2	011820C	255	2281682.53	1.67	780945.20	1.80	387.63	3.33
3/6	011820B	218	2281715.45	1.69	780916.95	1.29	398.14	3.44
4/1	011819F	178	2281517.62	1.60	780832.40	2.34	378.86	8.88
4/5	011819E	169	2281447.73	1.31	780866.94	3.28	367.59	5.54
4/8	011819A	217	2281429.18	2.66	780879.72	5.68	358.27	7.85
4/10	011819D	196	2281398.74	2.28	780870.48	4.54	357.72	5.12
4/12a	011819C	227	2281358.56	1.68	780844.71	3.37	355.55	8.18
4/12b	011819B	226	2281385.21	1.18	780905.70	2.56	347.36	5.22
4/13	011820A	201	2281532.53	2.02	780803.04	2.62	378.12	8.49
5/1	011918B	255	2281787.16	2.63	781057.47	2.61	404.16	3.85
5/3	011918A	159	2281823.07	2.73	781060.46	3.13	410.18	6.10
5/4	011918C	204	2281861.13	3.05	781072.82	3.18	419.41	8.57
6/1	011817A	132	2281611.85	1.84	780812.59	2.21	386.40	7.31
7/1	011818A	206						
8/1	011818C	224	2281442.00	1.96	780796.43	2.78	369.84	5.89
9/1	011821B	203	2281710.57	2.22	781242.43	2.23	404.31	3.28
9/2	011822A	154	2281674.73	2.29	781234.41	2.49	399.06	3.14
9/3	011822B	139	2281647.60	1.84	781226.60	1.58	392.32	1.90

Table 2 (cont.).

Site / Feature	GPS File Name	# of Fixes	Northing	sd	Easting	sd	Elev AMSL	sd
9/4	011822C	185	2281597.95	1.45	781208.28	1.40	383.77	2.62
9/5	011822D	249	2281570.72	3.21	781200.49	2.35	382.52	6.25
10/1	011818B	230	2281487.43	2.00	780689.06	2.19	399.36	2.99
11/1	011917A	285	2282012.67	1.91	781692.49	2.14	408.91	8.38
11/2	011917B	60	2281970.89	1.40	781663.23	2.35	403.76	6.62
12/1	011919B	172	2282068.63	2.01	782130.29	2.18	407.78	11.08
13/1	011919A	399	2282079.70	2.54	782298.95	4.32	411.24	5.19
13/2	011920A	133	2282015.63	1.84	782281.93	2.14	403.79	12.24
13/3	011920B	204	2281970.68	2.30	782316.35	2.23	387.52	4.77
13/4	011920C	201	2281952.25	2.10	782343.35	2.11	387.09	6.51
14/1	011921A	208	2282175.38	1.70	782296.54	1.82	422.84	2.45
15, Hwy	011922A	304	2282238.58	3.04	782651.46	1.85	415.98	3.38
16/1	011922C	187	2282153.09	1.17	782769.02	1.69	389.10	4.18
16/2	011923A	196	2282121.68	1.67	782806.24	1.35	381.95	2.11
16/20	011922B	228	2282215.17	1.44	782727.03	1.23	403.02	2.83
17/2	011923B	261	2282130.73	2.89	783029.21	2.89	361.23	3.38
17/3	012000A	214	2282116.02	1.26	782996.40	2.37	356.48	3.77
17/4	012000B	201	2282040.25	1.65	782996.05	2.51	352.93	3.23
17/5	012000C	204	2282187.15	1.02	783046.91	1.70	365.33	2.47
17/6	012001A	222	2282194.92	1.46	783104.20	2.38	369.32	2.40
17/6c	012001B	203	2282135.74	2.69	783150.51	2.80	361.08	3.56

Table 2 (cont.).

Site / Feature	GPS File Name	# of Fixes	Northing	sd	Easting	sd	Elev AMSL	sd
17/9	012001D	212	2282133.49	2.14	783200.51	3.37	357.84	6.39
17/11	012001C	238	2282103.34	1.47	783210.75	1.39	353.04	4.26
17/13	012001E	204	2282185.22	1.28	783179.48	1.97	365.88	5.34
17/16	012002A	207	2282228.22	1.40	783209.02	1.83	368.28	5.18
19/1	012002B	236	2282217.32	2.13	783274.77	2.72	365.07	5.06
St. Inez Church entrance	012002c	248	2282305.07	1.75	783647.69	1.91	373.36	6.40
20/1	012017A	222	2282269.69	1.57	783868.50	2.72	341.39	7.25
20/4	012017B	224	2282231.41	1.37	783931.32	3.12	320.25	6.47
21/1	012017E	243	2282280.76	1.24	784074.02	1.23	321.36	2.14
21/4	012017C	156	2282263.81	1.63	783987.57	2.00	318.47	4.40
21/5	012017D	166	2282232.43	1.69	784015.21	1.41	313.32	2.27
22/1	012018B	207	2282248.78	1.35	784124.61	2.19	307.64	2.85
22/3	012018A	216	2282324.60	1.63	784153.59	1.72	317.37	2.99
23/1	012018C	265	2282326.86	3.33	784494.02	2.57	299.24	4.38
23/2	012018E	213	2282259.86	1.98	784536.67	1.65	283.77	4.94
23/3	012018D	208	2282330.94	2.81	784531.14	4.20	298.17	4.42
24/1	012018F	234	2282291.45	1.25	784652.47	1.42	293.03	3.09
24/2	012019A	227	2282390.47	1.24	784695.12	3.64	299.53	3.45
24, ag	012019B	207	2282349.33	0.65	784715.63	1.15	289.85	4.54
25/1	012019C	194	2282375.57	2.05	784820.40	3.57	292.12	7.63

Table 2 (cont.).

Site / Feature	GPS File Name	# of Fixes	Northing	sd	Easting	sd	Elev AMSL	sd
26/1	012019E	100	2282380.61	1.36	784925.10	1.41	278.12	4.46
26/3	012020A	256	2282351.35	1.73	784992.10	2.09	272.04	4.64
27/1	012020C	220	2282419.15	1.95	785506.31	3.02	225.41	3.85
27/2	012020D	132	2282419.03	1.62	785557.87	2.87	214.68	3.53
28/1	012021A	202	2282567.62	2.50	785954.63	1.56	208.63	5.00
29/1	012023C	206	2282683.59	1.15	787690.54	1.35	134.24	2.58
29/4	012023B	219	2282695.04	1.80	787494.93	1.55	137.17	2.24
30/2	012023A	175	2282630.56	1.89	787392.65	1.70	128.14	2.41
31/1	012022D	152	2282602.71	1.23	787151.83	2.14	137.24	3.63
32/1	012102A	183	2282513.09	2.03	786839.68	1.66	150.02	4.94
32/5	012022B	113	2282507.74	2.27	786767.28	2.63	159.89	3.31
33/3	012022C	119	2282614.66	4.36	786687.07	2.61	174.18	4.45
34/2	012021B	202	2282483.92	2.54	786477.37	2.97	157.70	4.29
34/4	012022A	105	2282429.63	2.24	786545.21	1.33	147.16	1.87
35, Tube 1	012019D	148	2282367.57	1.82	784863.79	2.35	287.85	5.43
35A	012020B	68	2282302.24	1.21	785149.34	2.63	250.63	2.99
36/1	011723A	244	2284147.88	1.39	792459.52	1.45	18.68	2.40
36/3	011723B	161	2284135.48	1.27	792444.50	1.43	26.01	2.65
37/1	011800A	154	2284184.54	1.60	792367.11	2.57	28.53	2.55
38/1	011801A	229	2284175.90	1.66	792171.60	2.51	32.25	2.28
39/1	011801B	254	2284178.16	1.82	792064.39	2.87	31.32	3.21

Table 2 (cont.).

Site / Feature	GPS File Name	# of Fixes	Northing	sd	Easting	sd	Elev AMSL	sd
41/1	011802A	302	2284005.00	3.07	791676.34	4.56	28.57	8.70
41/2	011802C	321	2284006.71	1.56	791643.68	1.83	18.53	3.14
42/1	012117B	242	2284066.18	1.34	791714.54	1.68	27.65	5.79
43/1	012117A	263	2284048.72	1.46	791584.96	1.79	26.62	6.63
44/1	012117D	249	2284072.17	2.02	791237.68	2.48	46.88	2.48
45/1	012117E	174	2283779.26	1.30	790824.05	1.77	37.03	1.83
46/3	012116A	301	2283610.93	1.88	790456.33	3.53	35.41	5.92
100/1	012023D	156	2282806.91	1.47	787710.90	1.26	147.11	3.26
101/1	012100A	139	2282854.46	1.32	787888.78	1.07	139.83	2.68
102/1	012100B	92	2282857.42	1.85	787984.11	2.23	125.50	2.16
103/1	012100C	122	2282917.84	2.25	788109.70	1.39	130.35	2.48
104/1	012117C	301	2284160.39	1.19	791399.21	1.57	43.01	2.12
MK/C	012120A	300	2282000.33	3.04	766883.10	3.15	-0.46	11.63
MK/24	012122A	363	2282047.23	2.06	766815.71	1.70	-6.15	4.28
MK/32	012120B	306	2282047.23	2.04	766854.77	2.39	-6.69	5.33
MK/59	012123B	406	2282100.66	1.55	766836.52	2.06	-3.81	3.26
MK/63	012123A	352	2282096.98	1.34	766766.88	1.57	-5.17	3.96
USGS Datum. Puu Maneoneo	012220B	289	2283761.29	1.82	794795.40	3.48	93.56	2.81

Table 3. Samples submitted for radiocarbon analysis.

Provenience	Sample #	Weight (g)
Site 7, lower tube, 29.5 m from entrance	MRC 1	8.83
Site 7, upper chamber entrance	MRC 2	5.50
Site 35, Tube 2, TP-1, Layer I/1	MRC 3	11.7
Site 35, Tube 2, TP-1, Layer III/1	MRC 4	4.0

* * * * *

Table 4. Significance Criteria:

Criterion "a"	associated with events making an important contribution to the broad patterns of Hawaii's history.
Criterion "b"	associated with the lives of persons important in Hawaii's past.
Criterion "c"	embody the distinctive characteristics of a type, period, or method of construction.
Criterion "d"	have yielded or be likely to yield information important for research on prehistory or history.
Criterion "e"	have an important historical cultural value to an ethnic group within Hawaii.

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