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THE MOST RECENT ERUPTIONS OF HUALALAI VOLCANO, HAWAI'I: AN ANNOTATED BIBLIOGRAPHY

by

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Abstract

The most recent eruptions of Hualalai produced three lava flows and two flow fields from at least six different vents. Because they occurred early in the history of Hawai'i after contact with the western world, scientific descriptions of the events were not made. We have found a few details from a search of available sources including ship logs, missionary diaries, travel diaries, maps, early geologic papers, and Hawaiian legends. Of all the events, it is most certain that the Hu'ehu'e flow field occurred in 1801, but dates for the other eruptions are less certain. Most, if not all, of the descriptions of eruptive behavior may also be for the Hu'ehu'e flow.

Introduction

Hualalai is the westernmost of the three active volcanoes on the Island of Hawai'i. Eruptions have occurred every few hundred years from its summit and rift zones. The most recent eruptions took place at the beginning of the 19th century from multiple vents; of the produced flows, only the Hu'ehu'e and Ka'upulehu flow fields reached the ocean (Macdonald and others, 1983; Moore and Clague, 1991). At that time (slightly more than 20 years after initial contact with the Western world), Hawaiians still lived in villages at the Hualalai shoreline and labored in upslope agricultural areas. Fishponds, a unique Hawaiian inventions for aquaculture, were common along the coastline. The government was a monarchy under the leadership of Kamehameha. Although eruptions, such as these most recent ones from Hualalai, must have severely affected this Hawaiian civilization; however, records of those effects are few.

The relative infrequency of Hualalai eruptions, compared with those of Kilauea and Mauna Loa, does not mean that future Hualalai eruptions are no cause for concern. At present, the second largest town on the island, an international airport, and several major resort complexes are less than 15 km away from these eruptive centers. Hualalai has steeper slopes than the other active Hawaiian volcanoes thereby increasing the hazard. In current lava flow hazard assessments (Heliker, 1990), all of Hualalai is rated as Zone 4, which is the next lowest hazard behind 90% of Kilauea and Mauna Loa. A recent study suggests that the style of Hualalai eruptions may make them more hazardous than typical Kilauea or Mauna Loa eruptions. Guest and others (1995) conclude that the Ka'upulehu flow had "an exceptionally low viscosity on eruption and that the flow of the lava stream was extremely rapid . . . future eruptions of a similar type would pose considerable hazard to life as well as property."

Because of the continued urban development on the slopes of Hualalai, the U.S. Geological Survey's Hawaiian Volcano Observatory saw a need to better define the

dynamics of the last eruptions of Hualalai as a predictor of future eruptive styles of the volcano. This paper represents the first step in this investigation - a bibliographic search for any relevant details about these eruptions from the extensive historical record. We began with Wright and Takahashi (1989) and continued with available manuscripts describing conditions in this area at the beginning of the 19th century. Most sources of information for years before 1820 were ship logs and accounts of personal travel. Contrary to McGetchin and Eichelberger (1975), we found no firsthand or eyewitness accounts of these eruptions. There are a few secondhand accounts from writers who interviewed either John Young or Isaac Davis, two Westerners detained in the Kingdom of Hawai'i in 1791 to become powerful advisors to Kamehameha until their deaths (Day, 1984). American missionaries began arriving in 1819, and a few of them wrote down their experiences and observations of the time. Two U.S. Exploring Expeditions came to Hawai'i in the 1840s bringing geologists to record volcanic details (Wilkes, 1845) and 1880s (Dutton, 1883 and 1884). Early maps were also an important source of information, especially about place names that are no longer in use (Fitzgerald, 1986). Modern geologic study really began in the 1940s with the work of Stearns and Macdonald (1946). Archaeological work done in the 20th century revealed cultural conditions at the time of the eruptions. The Hawaiian point-of-view is represented in the rich body of Hawaiian legend. Because many early sources were hard to find, the relevant texts in all consulted references are quoted in the appendices.

Physical Description of the Lava Flows

Based on this historical research and preliminary fieldwork (e.g., Cashman and others, 1996), the most recent eruptions of Hualalai took place out of vents (Figure 1). The uppermost is a pahoehoe flow that issues out of the preexisting Ka'upulehu Cone and is called the Ka'upulehu Cone Flow. Immediately to the northwest and downrift from Ka'upulehu Cone is the Ka'upulehu Flow Field that consists of pahoehoe and 'a'a flows issuing out of several en-echelon fissures. The bulk of the flows goes north from the vents. At mid-elevations, it turns into 'a'a flows and pahoehoe channels in 'a'a flows. The flows split at the 3,000 foot elevation, come back together again, and split again at the 600 foot elevation. Both branches reach the ocean. The Middle Flow also issues from a preexisting cone and is pahoehoe near the vent. The flow changes to 'a'a within a few kilometers from the vent. We rediscovered the small pahoehoe pad inside the preexisting Kileo Cone described in Emerson (1888). The Ka'upulehu Cone Flow, the Middle Flow, and the Kileo Cone Flow do not reach the ocean. Finally, the lowest in elevation is the Hu'ehu'e Flow Field, which consists of three different lava flows issuing from two different sources. The underlying and, therefore, oldest is a channelized 'a'a flow issuing from a spatter rampart called Puhi-a-Pele. On top of this are two pahoehoe flows;

the underlying pahoehoe was emplaced as uninflated sheets, and the upper pahoehoe is inflated sheet flows and tumuli. The upper pahoehoe issues out of a separate, lava-tube-like opening about 300 m south of Puhi-a-Pele. The source of the lower pahoehoe is unknown.

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Cashman, K.V., Kauahikaua, J., and Clague, D.A., 1996, A longer look at the Ka'upulehu flow field, Hualalai Volcano, Hawaii [abs.]: Eos, v. 77, p. W124.

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Guest, J.E., Spudis, P.D., Greeley, R., Taylor, G.J., and Baloga, S.M., 1995, Emplacement of xenolith nodules in the Kaupulehu lava flow, Hualalai Volcano, Hawaii: Bulletin of Volcanology, v. 57, p. 179-184.

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Wilkes, C., 1845, Narrative of the United States Exploring Expedition during the years 1838, 1839, 1840,1841, 1842, vol. 4: Philadelphia, Pennsylvania, Lee and Blanchard, p. 87-231.

Wright, T.L., and Takahashi, J., 1989, Observations and Interpretation of Hawaiian Volcanism and Seismicity 1779-1955: An annotated bibliography and

subject index: Honolulu, Hawaii, University of Hawaii Press, 270 p.

List of Figures:

Figure 1. Map of Hualalai showing the three lava flows and two lava flow fields that comprise the last eruption of Hualalai. They are named, from west to east, Hu'ehu'e flow field, Kileo cone flow, Middle flow, Ka'upulehu flow field, and Ka'upulehu Cone flow. In addition, place names mentioned in the text are also included.

Figure 2. Undated Kukio-Maniniowali, Awakee, Mahaiula, Kaulana, Awalua-Ohiki, Puukala Gov't Tracts, North Kona map of the Hawaii Territory Survey.

Figure 3. Undated Kailua Section North Kona, Hawaii map of the Hawaii Territory Survey.

Figure 4. Compilation of archaeological work in this area of Hualalai. Shaded regions are the study areas.

Appendix A: ANECDOTES BY YEAR OF OBSERVATION

All references are included here, even if they make no mention of geologic details, in order to clearly indicate which sources were consulted. Spelling errors in original texts are retained in the quoted material. Italicized comments within square brackets are those of the authors of this bibliography.

Beaglehole, J.C., 1779, The Journals of Captain James Cook on His Voyage of Discovery, 1776-1780: New York, New York, Cambridge University Press, 1647 p.

February 6th, 1779 ". . . .the Southernmost extm *[extreme]* is the Westernmost point of Owhyhe, & between the two extreams the Coast bends in, & forms a deep bay.... The s *[south]* part appeard rocky & black, & partakes more of the nature of the land about Karakakooa *[Kealakekua]*." [p.525]

"FEBRy 6th. Sailing round the Lee point of O-wy-hee, much Lava on this part of the Island, The Indians seem to prefer the Lava to any other spot for building their Towns on, as they are thicker on those parts that are covered with it than anywhere else." [p. 1189]

[This earliest known description only notes a broad bay formed between Keahole Point and Kawaihae that has a lot of lava on the coast.]

Dixon, G., 1968, A voyage round the world ...: New York, New York, Da Capo Press, 360 p.

[Although they visited Hawai'i in May, 1786 (p. 50-56), November, 1786 to March, 1787 (p. 87-140), and September, 1787 (p. 248-280, most of their time was spent on O'ahu, Kaua'i, and Ni'ihau. They always landed on Hawai'i first, but there are no descriptions of the geology of Hawai'i Island, perhaps because they stay on the island was so brief.]

Meares, J., 1967, Voyages made in the years 1788 and 1789 from China to the North-west Coast of America to which are prefixed an Introductory narrative of a Voyage performed in 1786, from Bengal, in ship Nootka; Observations on the probable existence of a North West Passage and some account of the trade between the North West Coast of America and China; and the latter country and Great Britain: New York, New York, Da Capo Press, 372 p.

[Nootka lands in Hawai'i in August 1787 and picks up passenger Tianna. Felice

landed at Kawaihae in October, 1788. Iphigenia arrived off Maui in December 1788.]

Colnett, J., 1940, The Journal of Captain James Colnett aboard the Argonaut from April 26, 1789, to Nov. 3, 1791: Toronto, The Champlain Society, Publication no. 26, p. 220.

[While Colnett was sitting at anchor off Kailua on April 16 1791] " Since I was there in the Prince of Wales, two Volcanoes have open'd on the Lee side the Isle, which burn'd night and day with great fury and Tremendous Explosion which they say Captain Cook has caus'd."

[Between the end of their last visit on November 12, 1788 and April 16, 1791, two eruptions were noted by the Hawaiians and Colnett locates the eruptions on the lee (west) side of what we assume to be the Island of Hawai'i, Colnett's location at the time of his writing. The eruptions could be either Hualalai and/or Mauna Loa, or a mislocated reference to the 1790 phreatomagmatic eruption of Kilauea and the similarly timed eruption of Haleakala.]

Ingraham, J., 1791, The log of the Brig Hope: Honolulu, Hawaii, Hawaiian Historical Society Reprints, No. 3.

[Describes two visits in May, 1791 and October, 1791. During the first, he encounters John Young in Ma'alaea harbor and finds that he has been to Kaua'i between his stranding by the Eleanora (more than six months before) and his relocation to Maui.]

Marchand, E., 1801, Voyage round the World, Performed during the Years 1790, 1791, and 1792, v. 2 [trans. from the French of C.P. Fleurieu]: London, T.N. Longman and O. Rees, p. 14-35.

[No observations of geologic interest during their visit in October, 1791.]

Vancouver, G., 1968, Voyage of Discovery to the North Pacific Ocean and Round the World: New York, New York, Da Capo Press, .

[March 1792 visit did not mention anything about eruptions or of geologic interest.]

". . . .some rocks and breakers were seen lying, about half way from the shore, off the west point of the island, and extending two or three miles from thence towards Toeaigh *[Kawaihae]*. To the north of these the bottom is free from rocks. . . ." [v.2,

p. 165].

[This may be a description of the outermost wall of the fishpond Pa'aiea in 1793.]

[On the way northward to Kawaihae in 1794] ". . . .adjacent shores were uninteresting, chiefly composed of volcanic matter, and producing only a few detached groves of cocoa nut trees, with the appearance of little cultivation and very few inhabitants" [v. 3, p. 62].

Menzies, A., 1909, Ascent of Mount Hualalai: Hawaiian Annual for 1910, p. 72-89.

[He proceeded along the coast from Kealakekua to the village of Haunaoora (Ahu'ena?), then uphill to the summit. He visited a deep hole near the summit]

"After kindling a fire and partaking of some refreshment the natives took us to see the crater of a volcano on the north side of the peak, a little below the summit: it formed a rugged hole of 7 or 8 yards in diameter, and of immense depth, so much so, that when a stone was thrown into it its noise was heard in its descent, striking against the sides for some time after, and it did not appear to have been long extinguished as the ashes and cinders round the mouth of it were quite fresh" [p. 82]

[They returned to Kealakekua along a different route, first going southeast from the summit.]

Menzies, A., 1920, Hawaii Nei 128 Years Ago: Honolulu, Hawaii, 199 p.

"The land about this point *[Keahole]*, though low, appeared so barren and rugged with volcanic dregs and fragments of black lava" [p. 99]

Delano, A., 1817, Narrative of Voyages and Travels, in the Northern and Southern Hemispheres: comprising Three Voyages round the World together with a Voyage of Survey and Discovery, in the Pacific Ocean and Oriental Islands: Boston, E.G. House, p. 387-404.

"we arrived on the 10th of December *[1801]* ... The highest land of Owhyhee is three large mountains, which are some of the highest land in the world... One of them is a volcano, which sometimes burns with incredible fury" [p. 387].

[Delano describes the area around Kawaihae] "Part of it has been burned over by volcanoes, in such a manner as to look almost as bad as the Gallipagos Islands" [p.

389].

"we took our departure from the Sandwich Island on the 20th of December, 1801" [p. 404].

[Kamehameha is described as having been in Kawaihae during Delano's visit. It seems incredible that there is no mention of the eruption of Hualalai that must have occurred earlier that year. This reference also includes observations from a stop in 1806.]

Turnbull, John, 1813, Voyage round the World in the years 1800, 1801, 1802, 1803, and 1804: in which the author visited Madeira, the Brazils, Cape of Good Hope, the English Settlements of Botany Bay and Norfolk Island; and the principal Island in the Pacific Ocean with a continuation of their history to the present period: London, A. Maxwell, p. 244.

"On the evening of the 21st of January *[1803]*, we stood along the shore to the eastward, taking the advantage of a land breeze. In this course, we had a very full view of some eruptions from the volcanoes in the centre of the island of Owyhee. Many parts of the surface of this island is covered with lava, calcined stones, black dust, and ashes, emitted by former eruptions."

[Because their next port-of-call was Tahiti to the south and they were leaving from Kealakekua, it is unlikely that they would have sailed to the east of the island on their way out of Hawai'i. Therefore, Turnbull must have been witnessing an eruption from west of the island and south of Kealakekua, probably from Mauna Loa. Alternatively, Turnbull may have been referring to some particularly distinct lava flows that were no longer active.]

Barratt, G., 1987, The Russian Discovery of Hawai'i: Honolulu, Hawaii, Editions Limited, 259 p.

[This source includes maps of the presumed course taken by Lisianskii and shows that his ship approached the Lae'apuki area of Puna from the southeast, sailed around Ka Lae, and anchored at Kealakekua. From there, he sailed to Kaua'i, then away to the north.]

"Ovigi *[Hawai'i]* is the largest of all the Sandwich Islands, stretching 80 miles from north to south and almost as many from east to west. Its shores are precipitous in many places. At other points, however, they slope up gently. Rising little by little toward the interior of the island, the land culminates in mountains: Roa [Loa], Kau

[Kea], and Vororai [Hualalai], the first being 18,000 feet high; such, at least, is the measurement mentioned in Captain Cook's third Voyage. Judging by the lava and other inflammable substances that are everywhere on the shores of Ovigi, the island at one time contained great subterranean fires. Even now, the natives say, there is between the island's eastern cape and Mount Roa [Mauna Loa] an aperture which belches fire, known locally as Taura-Peri [Ka'ula Pele?]. And Young told me that three years previously [1801], Mount Makaura [Makahuna], lying on the west side of the island near Tovai-Gai Bay, threw up sufficient lava to fill in a small bay at its base, destroying a number of settlements. Since then, however, it had quitened down again. Only the aperture remained" [p. 52].
[This is from the first (1812) of two publications of Lisianskii's story. It contains more details than the 1814 publication, including the source of the information about a recent eruption (John Young) and an indication of the damage done. These sources are the most definitive for the date of the Hu'ehu'e flow, in which the Maka'ula ahupua'a lies. Tovai-Gai Bay must be Kawaihae Bay and Taura-Peri must be Ka-lua-o-Pele or Kilauea.]

Lisianskii, I.F., 1968, Voyage round the world in the years 1803,1804,1805, and 1806: New York, New York, Da Capo Press, 388 p. [originally published in 1814]

"Owyhee is the largest of the Sandwich Islands, and is remarkable for containing one of the highest mountains in the world, Mount Roi. Considering the quantity of lava, and other volcanic substances, that are found everywhere in this island, it would seem as if it had formerly been subject to eruptions in more places than one; though there is only one mountain at present, called Tavoorapery, where they occasionally happen. I was told, indeed, that three years ago Mount Macaoora, by a sudden burst, did much mischief, but had since that time been perfectly quiet" [p. 134].
[This entry is from June 1804. Tavoorapery must be Ka-lua-ka-Pele, or Halema'uma'u. Mount Macaoora must refer to the Makaula ahupua'a, which is one of the ahupua'a that the Hu'ehu'e flow went through.]

Campbell, A., 1967, A voyage round the world, from 1806 to 1812; in which Japan, Kamschatka, the Aleutian Island, and the Sandwich islands were visited; including a narrative of the author's shipwreck on the island of Sannack, and his subsequent wreck in the ship's long-boat: with an account of the present state of the Sandwich Islands, and a vocabulary of their language: Honolulu, Hawaii, University of Hawaii Press, 220 p.

[Campbell's ship, the Neva under the command of Captain Hageimeister, reached

Hawai'i from Kodiak on 27 January 1808, and coasted along the "north side of the island." The Neva was the same ship that was commanded by Krusenstern under Lisianski in 1804.]

"Mouna-roa*, one of the mountains in the interior, is a volcano; a few years before this time a violent eruption took place, when it sent forth a stream of lava which ran into the sea. Isaac Davis, with whom I afterwards resided, and who had gone in a canoe to witness it, informed me that where the lava joined the sea, the heat was so intense that he could not approach nearer than fifty yards. We did not see any flame or smoke issuing from the crater" [p. 87].

[They proceeded on to Maui. Campbell, and perhaps Isaac Davis, must be mistaken about Mauna Loa having erupted a lava flow that entered the ocean as there is no evidence or other accounts of such an eruption around 1800. This must be a description of the Hualalai eruption of 1801 because, prior to 1859, the only Mauna Loa flow to have reached the ocean did so at least 150 years before 1800 (F.A. Trusdell, 1995, oral communication).]

Whitman, J.B., 1979, The Hawaiian Journal of John B. Whitman 1813-1815 -- An Account of the Sandwich Islands (Holt, J.D., ed.): Honolulu, Hawaii, Topgallant Publishing Co. Ltd. & Peabody Museum of Salem, Mass., p. 62-64.

"On a clear day the snow may be seen covering vast tracts and reaching several hundred feet down the sides of these mountains, which on the N.W. part a thin blue smoke *[vog?]* may be observed coming from a volcano which is described by the natives as a lake of burning lava *[Kilauea?]*, these mountains extend even to the sea, where they form in some places high and bold promontories nearly perpendicular for several hundred feet. The Island is rife with beautiful scenery, hill and valley, bold rocks, deep ravines, forests of trees of immense growth and high summit lands of luxuriant verdure with but a small proportion of that soil suited to the cultivation of the taro, the Island is at times in some measure dependent on the others for a supply of that necessary article.

"At some former period not far from 1790 a terrible eruption of the volcano covered a considerable tract of land with its burning lava destroying everything in its course and reaching the sea formed an Ironbound coast for two or three miles along the shore, where in its strife with an element of a nature to oppose its further peaceful course, it is thrown into wild confusion, and as the waves dash against it and into the cavities driving the air through thousands of holes and crevices of different sizes a wild discord of unearthly sounds, indescribably horrible, the screeching of owls, neighing of steeds, barking and howling of dogs and the roaring of lions all commingled with the wailing of human beings in agonies of torture, are

forced upon the imagination, as if the reality were under his feet.

"Tracing the lava from the shore for six or seven miles up the mountain I observed that it presented some curious features, in a number of places the location of some sturdy tree is indicated by a round hole in the lava, having measured several of them I found the lava to be from three to six feet thick, and in one I found small bits of charcoal. From the appearance of the surface of the lava I think it must have cooled or become somewhat less fluid in its descent of this place, in some places the surface having cooled is cracked by the melted lava which was probably obstructed in its downward progress and has forced a passage through the crust and can be traced for some distance over it, in other places it has oozed through holes made in the crust and formed concentric circles as it spread over the surface of five to ten feet diameter and again we find it forced into undulating waves as the melted mass bore down against that which was cooler. I could compare the surface to nothing that will convey so clear an idea of its appearance as a mass of thick paste in a state of evident ebullition.

"At the time of the eruption the poor natives were struck with consternation and apprehended the destruction of their little world. Thousands of victims are said to have been sacrificed to appease the angry Gods . . . ."

[By the reported dimensions of the flow, 2-3 miles along the coast, at least 6-7 miles long, and 3-6 ft thick as measured in tree molds, he must have been describing the Hu'ehu'e flow. By comparison, the coastal 6-7 miles of the Ka'upulehu flow is entirely 'a'a on its edges and at least 6 feet thick with no known tree molds. The length of the Ka'upulehu flow along the coast is a little over 3 miles in two branches, which cover a total distance of 6-7 miles.]

Choris, L., 1822, Voyage pittoresque autour du monde .. Paris, translator unknown.

[In November 1816] "On its side the Mona-Vororai which faces the sea is entirely covered with lava. When the sun shines in that direction it is almost impossible to look at it as it reflects such a brilliant light. We were told that in 1774 this volcano had an eruption causing large ravages on the isle, even now it often vomits smoke."

[This must be a reference to the Hu'ehu'e flow, which is pahoehoe, and not the Ka'upulehu flow, which is almost entirely 'a'a along its lower half.]

Holman, L.R., 1931, Journal of Lucia Ruggles Holman: Honolulu, Hawaii, Bernice P. Bishop Museum Special Publication 17, 40 p.

"All the fresh water used by the natives is brought from the mountains 5 miles distant from the village. This is all brought on the Kahnahka's (men) shoulders in

calabashes. The natives use fresh water only to drink; they bathe in the sea. And should we be obliged to settle here, we must employ at least 20 men to fetch wood and water - the wood is brought the same distance and in the same manner, over a continued rock of Lava. There is not a spot in the whole village of Kiarooah [Kailua] large enough for a garden, but what is covered with Lava and cinders. What a tremendous scene must here have been exhibited, when this volcano first broke out! It is now, and has been burning for this 40 years. This village is built upon the ruins of a former one which was buried by the volcano" [p. 21].

[The entry is dated Tuesday, April 4, 1820 and seems to have been written while on board the Brig Thaddeus bringing the first U.S. missionaries to Hawai'i. The Brig was at anchor off Kailua (Thurston, 1882, p. 33); Ms. Holman mentions seeing the "Great Temple of the Gods" which must be Ahuena, and going ashore to dine with Liholiho.]

Ellis, W., 1963, Journal of William Ellis -- Narrative of a tour of Hawaii, or Owyhee; with remarks on the history, traditions, manners, customs and language of the inhabitants of the Sandwich Islands: Honolulu, Hawaii, Advertiser Publishing Company, Ltd., p. [originally published in 1827]

"In the afternoon, Messrs. Thurston and Bishop walked out in a N.W. direction, till they reached the point that forms the northern boundary of the bay, on the eastern side of which Kairua is situated. It runs three or four miles into the sea; is composed entirely of lava; and was formed by an eruption from one of the large craters on the top of Mouna Huararai, (Mount Huararai), which about twenty-three years ago, inundated several villages, destroyed a number of plantations and extensive fish-ponds, filled up a deep bay twenty miles in length, and formed the present coast.

"An Englishman, who has resided thirty-eight years in the islands, and who witnessed the above eruption, has frequently told us he was astonished at the irresistible impetuosity of the torrent.

"Stone walls, trees, and houses, all gave way before it; even large masses or rocks of hard ancient lava, when surrounded by the fiery stream, soon split into small fragments, and falling into the burning mass, appeared to melt again, as borne by it down the mountain's side.

"Numerous offerings were presented, and many hogs thrown alive into the stream, to appease the anger of the gods, by whom they supposed it was directed, and to stay its devastating course.

"All seemed unavailing, until one day the king Tamehameha went attended by a large retinue of chiefs and priests, and, as the most valuable offering he could make, cut off part of his own hair, which was always considered sacred, and threw it into the torrent.

"A day or two after, the lava ceased to flow. The gods, it was thought, were satisfied; and the king acquired no small degree of influence over the minds of the people, who, from this circumstance, attributed their escape from threatened destruction, to his supposed interest with the deities of the volcanoes" [p. 30-31].

[The filling of a deep bay 20 miles in length is impossible. The Hu'ehu'e flow is approximately 3 miles wide and the Ka'upulehu flow is a total of about 2 miles wide at the coast. The "Englishman" has always been assumed to be John Young.]

[The party of Thurston, Goodrich, Harwood, and 3 others left Kailua at 8:00 am on 9 July 1823.] "Having traveled about twelve miles in a northerly direction, they arrived at the last house on the western side of the mountain . . . . *[at 3:00 pm]* Leaving the path, the party began to ascend in a S.E. direction, and traveled about six miles, over a rough and difficult road, sometimes across streams of hard lava, full of fissures and chasms, at other times through thick brushwood, or high ferns, so closely interwoven as almost to arrest their progress . . . . *[They spent the night here, continuing the next morning]* The road, lying through thick underwood and fern, was wet and fatiguing for about two miles, when they arrived at an ancient stream of lava, about twenty rods *[20x5.03 m = 100.6 m]* wide, running in a direction nearly west. Ascending the hardened surface of this stream of lava, over deep chasms, or large volcanic stones imbedded in it, for a distance of three or four miles, they reached the top of one of the ridges on the western side of the mountain . . . .

"Between nine and ten in the forenoon they arrived at a large extinguished crater, about a mile in circumference *[about 500 m diameter]*, and apparently 400 feet deep, probably the same that was visited by some of Vancouver's people, in 1792. The sides sloped regularly, and at the bottom was a small mound, with an aperture in its centre. By the side of this large crater, divided from it by a narrow ridge of volcanic rocks, was another, fifty-six feet in circumference *[about 5 m in diameter]*, from which volumes of sulphureous smoke and vapour continually ascended. No bottom could be seen; and on throwing stones into it, they were heard to strike against its sides for eight seconds, but not to reach the bottom *[making it over 300 m deep]*. There were two other apertures near this, nine feet in diameter, and apparently about 200 feet deep.

"As the party walked along the giddy verge of the large crater, they could distinguish the course of two principal streams, that had issued from it in the great eruption, about the year 1800. One had taken a direction nearly north-east *[Ka'upulehu flow?]*; the other had flowed to the north-west *[Hu'ehu'e flow?]*, in broad irresistible torrents, for a distance of twelve or fifteen miles to the sea, where, driving back the waters, it had extended the boundaries of the island. They attempted to descend this crater, but the steepness of its sides prevented their examining it so fully as they desired.

"After spending some time there, they walked along the ridge between three and four miles, and examined sixteen different craters, similar in construction to the first they had met with, though generally of smaller dimensions . . . .

"They continued ascending till three p.m. when, having suffered much from thirst, and finding they should not be able to reach the highest peak before dark, the sky also being overcast, and the rain beginning to fall, they judged it best to return to Kairua, without having reached the summit of Mouna Huararai; particularly as they were somewhat scattered and found difficulty in pursuing the most direct way, on account of the thick fog which surrounded the mountain.

"On their return they found the aid of their pocket compass necessary to enable them to regain the path by which they had ascended in the morning . . . .

"They traveled about three miles further, when, being wet with the fog, and weary with traveling, they erected a hut on the lava, and encamped for the night . . .

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"On the morning of the 11th, the party still felt unwilling to return without reaching the top of the mountain, and hesitated before they began again to descend; but having been a day and two nights without water, and seeing no prospect of procuring any there, they were obliged to direct their steps towards Kairua.

"The walked several miles along the rough stream of lava by which they had ascended, till they arrived at the woody part of the mountain. Two of them, in searching for a more direct road to Kairua, discovered an excellent spring of water . . . . Having filled their canteens, they, with renewed strength and grateful hearts, kept on their way to the town.

"Owing to the roughness of the paths and the circuitous route by which they traveled, they did not arrive at Kairua until after sunset, much fatigued, and almost barefoot, their shoes having been destroyed by the sharp projections in the lava" [p. 37-38].

[The vagueness of this account may be due to the fact that Ellis did not go on this trip. At any rate, it is very likely that the 500-m-diameter crater that they find is Pu'u 'Alala. To my knowledge, it is the lowest-elevation crater that has narrow edges, making any who walk along the crater rim feel "giddy." It is nearly 320 feet deep at its deepest point according to the Kailua 7.5' quadrangle. It has a flat bottom with a small mound at its southeastern edge, which does have a narrow, deep hole in it. Further to the southeast, there are a few small holes which are separated from Pu`u `Alala by "a narrow ridge of volcanic rock." It would be one of these that was fuming. Pu`u `Alala is also the highest place, on a trip to the summit, that one can see the Hu`ehu`e and Ka`upulehu flows well because the terrain flattens out at higher elevations. Pu`u `Alala is also at the top of the dense tree zone, but roughly at the lower edge of the zone of common fog. It is also stated that the 1800 flows issued from this crater. An additional inference that might be made is that, at the time of this trip, the collapses that produced the elongate pit

craters uprift of Pu'u 'Alala had not yet occurred. They make specific note of small, deep holes, but fail to mention any large collapses immediately uphill.]

".... I had left Towaihae on the preceding day at six in the morning, in a canoe kindly furnished by Mr. Young.

"About nine a.m. I stopped at Kaparaoa, a small village on the beach, containing twenty-two houses, ... again embarked on board my canoe, and sailed to Wainanarii, where I landed,, repaired to the house of Waipo, the chief, who, as soon as the object of my visit was known, directed the people to assemble at his house...

"About four in the afternoon I landed at Kihoro, a straggling village, inhabited principally by fishermen...

"This village exhibits another monument of the genius of Tamehameha. A small bay, perhaps half a mile across, runs inland a considerable distance, From one side to the other of this bay, Tamehameha built a strong stone wall, six feet high in some places, and twenty feet wide, by which he had an excellent fish-pond, not less than two miles in circumference.

"There were several arches in the wall, which were guarded by strong stakes driven into the ground so far apart as to admit the water of the sea; yet sufficiently close to prevent the fish from escaping. It was well stocked with fish, and water-fowl were seen swimming on its surface...

"Just before sun-set, I left Kihora. The men paddled the canoe past Laemano, (Shark's point), a point of land formed by the last eruption of the great crater on Mouna-Huararai, which took place twenty years ago.

"Between seven and eight in the evening, we reached Kaupulehu, where the men drew the canoe on the beach, and, as the inhabitants were all buried in sleep, laid down to repose on the sand" [p. 294-296].

[Ellis is mistaken in believing that Lae Mano was formed by the last eruption of Hualalai. It is on a pahoehoe flow between the two branches of the Ka'upulehu flow and is estimated to be 2100 years old (Moore and Clague, 1991).]

Thurston, L.G., 1882, Life and times of Mrs. Lucy G. Thurston, wife of Rev. Asa Thurston, pioneer missionary to the Sandwich Islands, gathered from letters and journals extending over a period of more than fifty years, Selected and arranged by herself: Honolulu, Hawaii, The Friend, 311 p.

"On the mountain Hualalai, just back of Kailua is a large crater. It is now extinct. But our old people tell us of the time in their childhood, when they were aroused from their midnight slumbers, to see red hot balls hurled into the air from out of the crater on this mountain. Torrents of molten lava flowed from crater to coast, extended the shore farther out into the sea and encrusted the surface of the earth,

besides leaving an abundance of large loose scoriae, tossed about in every direction" [p. 82].

[This is in a section of the book is dated as 1825.]

Bishop, D.S., 1829, Journal of Delia Stone ("Mrs. A.") Bishop: Honolulu, Hawai'i, Bishop Museum, unpublished manuscript, p. 20-21.

". . . . We soon had a little breeze which took us in the bay of Kaelehuluhulu which is 15 miles from Kailua. A little cluster of houses situate on the sea beach bounded on the east by Hualalai which contains several ancient craters; half way up the mountain was aheap of lava jutted out to considerable height where the stream of red hot lava burst out of the earth & run down to the sea shore. The lava that was thrown out of the Volcanoes extends some miles around, & we can see where cocoanut trees were burnt out by the roots of it. Mr. Young a foreigner who witnessed the scene 30 years ago says there were large pieces of lava sent up into the air a great many feet, & when they came down rolled into the sea, & heat the water so as to kill the fish near the shore, & the canoes became soft that conveyed the natives to obtain then, so much so that they were afraid to stay any longer. They however brought a large quantity ashore with them. Mr. Y. Says the report of the volcanoes were like the report of 20 armed ships. The inhabitants escaped for their lives, while the little improvements they had made together with their houses were laid in ruins."

[Ka'elehuluhulu is always described as near Mahai'ula Bay. This description of the eruption must then be describing the Hu'ehu'e flow.]

Chevalier, M.E., 1844, Voyage autour du monde ... de la Bonite, Partie Geologie, p. 183-213.

"Le baie *[of Kailua],* telle qu'elle est auhourd'hui, a, dit-on ete formee par une des dernieres eruptions du Mouna Harai, dont une coulee forme une pointe avancee dans la mer.

"Mouna-Hararai, situe a une petite distance de la cote occidentale, a eu sa derniere eruption au commencement de ce siecle; sa hauteur est de 3,374 metres. Plusieurs voyaguers ont tente d'arriver au sommet, mais pas un n'a jusqu'a present reussi. Quelques crateres d'ou s'exhalent des vapeurs acido-sulfureuses sont sur le penchant de Mouna-Hararai, et parmi eux plusieurs semblent eteints depuis longtemps, car ils se sont recouverts de vegetation."

[The voyage was in 1836-1837. It is difficult to tell whether these are observations or references culled from the writings of others. It does report that craters on

Hualalai's slopes are fuming sulfuric acid vapors.]

Ellis, W., 1969, Polynesian Researches: Hawaii: Tokyo, Japan, Charles E. Tuttle Co., 471 pp.

"...This book was published originally in 1842 by Peter Jackson, Late Fisher, Son, & Co., London" [p. xiv]

[This account is substantially the same as the journal (Ellis, 1827). In particular, the parts about Hualalai and its last eruption are identical to Ellis' earlier work.]

Wilkes, C., 1845, Narrative of the United States Exploring Expedition during the years 1838, 1839, 1840,1841, 1842, vol 4: Philadelphia, Pennsylvania, Lee and Blanchard, p. 87-231.

"The town of Kailau is the residence of Kuakini, better known among foreigners by the name of Governor Adams, who is governor of Hawaii.

"This district lies to the north of Kealakeakua, and begins about five miles from Napolo. It is similar to it in character, but the lava is of more recent formation, the eruptions from Hualalai having flowed down and covered nearly the whole northern portion. This eruption happened about thirty years since, in 1809 and 1810" [p. 94-95]

[Wilkes goes on to describe a trip from somewhere on the coast in Kona to Ahu a 'Umi and on towards Mauna Kea, then up the saddle flank of Mauna Loa to Kilauea, then Hilo. J.D. Dana, the expedition geologist, was on a different trip around South Point to Kilauea. The accompanying map of the Island of Hawai'i shows the place name "Ka'elehuluhulu" being approximately in the vicinity of Mahai'ula, although the details of the map are poor. "Pt. Mano" is located where Keahole Point is, and "Wainanali'i" and "Kanihu" (probably Kaniku) are located too far south.]

"At night, on our return, we had a visit from the old guide, Keaweehu, the bird-catcher, who gave us the name of the terminal crater, as Moku-a-weo-weo, and of that south of it as Pohakuohanalei. According to his statement, Moku-a-weo-weo emitted fire not long after Cook's visit, and again five years since, on the north side" [p. 150].

[Hualalai is northwest of the summit of Mauna Loa and these statements could refer to eruptions there.]

Gilman, G., Journal of Gorham Gilman, Nov. 19,1844 - Jan. 30, 1845 (Trip to

Hawaii): Honolulu, Hawaii, unpublished, handwritten manuscript.

". . . . we continued on sometime further ascending until we came to a singular hill near which the volcano when in action some 50 or 60 years ago found vent. It is a long way from the summit of the mountain. several miles and there is quite a tract of cultivated ground higher up - *[the Hu'ehu'e flow]* The stream first oozed up like a rivulet and ran towards the sea for about 1/4 of a mile when it burst up forming a scragy - burnt black looking peak *[Puhi a Pele?]* whence issued a stream of the liquid rock and spread like a river of fire - running towards the sea a mile or so from the fountain it branches off one stream running to the S. and one northerly. It destroyed some villages and a young woman also perished by the all*[?]* proving*[?]* elements. She had fled for safety to a Pandanus tree which but a poor protection and she was soon overwhelmed - The marks of the course are as distinct as if the eruption took place but last year - and is the most awasting example I have seen of the volcano - we here commenced our descent having been a little more than 3 hours in the ascent. We passed through a tract of wooded country but saw nothing to notice. on emerging from the wood saw the village of Kiholo a few miles ahead soon after leaving the woods we came to a dreary tract of "aa" *[the Ka'upulehu flow]* - and had a fine view of the N.W. side of the Mt. it was from this side that the principal [] of the action of the eruption mentioned above took place. it poured forth from the top of the Mt. in a large stream and ran N.W. tly making its way mostly over a tract of country that had suffered before from the volcanic fires. This stream also seperated and formed 2 branches. It rolled on destroying every thing with in its influence villages and hamlets [] towns were overwhelmed in the course of its progress and a number of lives lost. The stream ran into the sea - and some(?) can better be imagined then described of the effect of the contact of two such elements. The fish were killed along the coast and floated dead on the water. as we passed over the streams I was struck with the resemblance to a water course and my guide remarked that it came down like water. it was entirely different from the surrounding tracts of lava. It must have been a grand magnificent sight to see 2 rivers of fire pouring down a course of several miles in length. a mile or two brot us to Kiholo which is called half way to Kawahai *[Kawaihae]* - we had been 6 hours instead of a whole day and I was encouraged to push on in hopes of reaching K. by set of sun. We stopped here to rest and eat. The house where we stopped was one that is used for a church - and was a very neat clean place. I found here that it was no disadvantage to be a f... to H. Ex. the Gov. *[friend to His Excellency the Governor]* - for I had as many coconuts brot me as I wished - free of expense. Upon leaving this village we passed over a long-wide-solid wall of stone built across an arm of the sea that stretched in here by K. *[Kamehameha]* for a fish pond. it is a tremendous walk - *[?]* judge it be *[blank]* yards long - with 2 battlements of 8 feet wide with a passage between them like this *[drawing of battlement]* of 5 feet in width. The people from 3 districts came to the work. If the same spirit was

manifested now in works of improvement that the old K. King manifested - this island as well as the others would bear a different aspect from this we passed over a sandy beach and out a tract of the smooth lava - Just as we left the lava my guide pointed out a tomb of an ancient priest was very highly esteemed - so much so that long after his decease, the chiefs and people came with their sacrifices to offer at his this shrine. The chiefs at his head and the common people at his feet. The tomb is enclosed and an old heiau stands near at hand both in good preservation. Near this is the village of "water for the chiefs." *[Wainanali'i]* a place to which they used to resort to bathe - we passed back of it it had a pleasant appearance amidst the trees. . . ."

Whitney, H., 1859 (10 Mar.), The volcano of Mauna Loa, Hawaii: Pacific Commercial Advertiser, v. 3, Mar. 10, p. 1-2.

"The natives still narrate to travelers the story of the death of a woman and child which occurred in one of the last eruptions on Hualalai. The base of that mountain had been*[?]* as it has now, small fishing villages scattered along its shore. The last eruption began in the night, and the natives were raised from their slumber by the noise of the lava stream flowing down towards their settlement. Nearly all succeeded in escaping. In one hut, however, the husband only was awaked, and went out to learn the source*[?]* of the noise, but from fright ran off leaving his wife and child. The lava approached rapidly, but before the woman was waked by the wild shrieks of the natives, it had encircled the hut and found its way to the sea. Escape was impossible. To attempt to cross the fiery stream was instant death. Nearer and nearer the stream came until it reached the hut, setting it on fire. The frightened woman, with her child in her arms, sought refuge in a pandanus tree - but here safety was only for a moment. The hut was fast crumbling to ashes beneath the fiery destroyer, which was rapidly approaching the roots of the tree. There was now no hope, the lava had reached the tree and burned the roots, and soon the woman and child fell a sacrifice to the insatiate goddess Pele."

de Varigny, C., 1981, Fourteen years in the Sandwich Islands 1855-1868 (translated by Alfons Korn): Honolulu, Hawaii, The University Press of Hawaii, 289 p.

"Since the discovery of the islands by Europeans, eight major eruptions have occurred on Hawaii... Details are lacking concerning the second eruption, which took place in 1801. All that is known about this occurrence is that it occurred on the mountain called Hualalai, 10,000 feet high, situated in the southernmost part of Hawaii and forming, with Mauna Kea and Mauna Loa at much higher elevation, one of the three mountain masses dominating this island. . . ." [p. 210].

Kamakau, S., 1992, Ruling Chiefs of Hawaii (revised edition): Honolulu, Hawaii, The Kamehameha Schools Press, 513 p.

[written for various newspapers in the 1860s]

[During the time of Lono-i-ka-makahiki] ". . . . The spies sent by Kama-lala-walu went to Hawaii and landed at Kawaihae in the evening. . . . When Ka-uhi-o-ka-lani returned his fellow spies and hosts asked, "Where did you go?" "I went visiting from here to the lava bed and the pond that lies along the length of the land." "Kaniku is the lava bed and Kiholo, the pond. Then did you turn back?" "No, I went on to the long stretch of sand, to the small bay with a point on that side and one on this side. There are large inland ponds." "The sandy stretch is 'Ohiki, and the walled-in ponds are Kaloko and Honokohau. Then you came back?" "No, I went on to the large rocky cape below, where there was a small bay with big groves of coconut trees. The land from there on is good, and a small village is located there." "The point that juts out is Hi'iaka-noho-lae and the sandy beach inside of that is Kaiakeakua. Next is Kailua. The coconut groves are Holualoa and Kahalu'u. Then you came back?" "No, I went to the hill below with a bay inside [the hill below which a bay reaches far into the land]. A cliff stands back of the bay, and there is a sharp ridge like the comb of a cock. There is a hole [cave mouth] underneath that leads where the smooth. water-worn stones are. I laid a section of my sugar cane right over the entrance" [of that cave]. The natives replied, "The hill is Pu'uohau; the bay is Ka'awaloa; the hole that leads in is Lepeamoa. Your swiftness is like that of a god. The day has waned into evening, and the baggage on the canoes has not been completely removed by us. This is indeed marvelous" [p. 56].

[This reference only suggests that there were no significant landmarks between Kiholo Bay and the Kaloko-Honokohau area at this time.]

[In 1782] ". . . . Ka-me'e-ia-moku was living at Ka'upulehu, and Kamanawa at Kiholo" [p. 118].

[In 1790 after the Olowalu massacre (Kalolo-pahu), the small sloop The Fair American was sailing along the Kona coast.] ". . . . Ka-me'e-ia-moku ... was living at Ka'upulehu, South Kona, at the time, and seeing a sloop sailing by he and his men immediately determined upon its capture" [p. 147].

"Kamehameha was a chief who did not know the true God in heaven; but when Hawaii was threatened by a lava flow that went down toward Kiholo, Ka'upulehu, and Mahai'ula, and might have filled up the ponds with lava, he was afraid when the prophets and priests said, "The fire can be extinguished easily, and the fishponds of which you are so fond can be saved if you yourself take the sin

offering and offer it with your own hands. The goddess will not heed a prophet, a kahuna, or any other chief but you alone." It happened just as the prophets had predicted, as Ka'ahumanu, Kaheiheimalie, Ululani, and other royal personages were eyewitnesses. From old times it has been an important duty of ruling chiefs to invoke an answer [from the gods]" [p. 140-141].

". . . .They left Kailua and went as far as Luahinewai at Kekaha, where they landed the canoes. Keoua went to bathe . . . ." [p. 156]. *[Keoua continued to Kawaihae, was killed, and sacrificed at Pu'u Kohola so the visit to Luahinewai, which is now within the Ka'upulehu flow, must have occurred in 1791.]*

" Another important event which occurred in the fourth year of Kamehameha's rule was the lava flow which started at Hu'ehu'e in North Kona and flowed to Mahai'ula, Ka'upulehua, and Kiholo. The people believed that this earth-consuming flame came because of Pele's desire of *awa* fish frcm the fish ponds of Kiholo and Ka'upulehu and *aku* fish from Ka'elehuluhulu; or because of her jealousy of Kamehameha's assuming wealth and honor for himself and giving her only those things which were worthless; or because of his refusing her the tabu breadfruit of Kameha'ikana which grew in the uplands of Hu'ehu'e where the flow started. ... Kamehameha was in distress over the destruction of his land and the threatened wiping-out of his fish ponds. None of the kahunas, orators, or diviners were able to check the fire with all their skill. Everything they did was in vain. Kamehameha finally sent for Pele' seer (kaula), named Ka-maka-o-ke-akua, and asked what he must do to appease her anger. "You must offer the proper sacrifices," said the seer. "Take and offer then." replied the chief. "Not so! Troubles and afflictions which befall the nation require that the ruling chief himself offer the propitiatory sacrifice, not a seer or a kahuna." "But I am afraid lest Pele kill me." "You will not be killed," the seer promised. Kamehameha made ready the sacrifice and set sail for Kekaha in Mahai'ula.

". . . . From Keahole Point the lava was to be seen flowing down like a river in a stream of fire extending from the northern edge of Hualalai westward straight toward Ka'elehuluhulu and the sweet-tasting *aku* fish of Hale'ohi'u. There was one stream whose flames shot up the highest and which was the most brilliant in the bubbling mass as it ran from place to place. . . .

"The flow had been destroying houses, toppling over coconut trees, filling fish ponds, and causing devastation everywhere. Upon the arrival of Kamehameha and the seer and their offering of sacrifices and gifts, the flow ceased; the goddess had accepted the offering.

The reasons given for the flow may be summed up as: first, Pele's wanting the *aku* of Hale'ohi'u and the *'ahi* fish of Kiholo; second, her anger at being denied the breadfruit of Kameha'ikana in upper Hu'ehu'e; third, her wrath because Kamehameha was devoting himself to Ka-hiehie-malie and neglecting Ka-'ahu-

manu. It was said that Pele herself was seen in the body of a woman leading a procession composed of a multitude of goddesses in human form dancing the hula and chanting: . . . ." [p. 184-186].

[Kamehameha completed conquest of all but Kaua'i in 1796-1797 so the fourth year of this rule would have been 1800 or 1801. However, Kamehameha consolidated his rule over the island of Hawai'i in 1791 so his fourth year of rule for this island could have been 1795.. The last paragraph describing a lava flow from Keahole Point must refer specifically to the Hu'ehu'e flow.]

Kamakau, S.M., 199?, Ka Po'e Kahiko, The People of Old: Honolulu, Hawaii, Bernice P. Bishop Museum Special Publication 51.

"The fishpond of Kiholo in North Kona, Hawaii, was constantly being threatened by lava flows while Kamehameha was ruler of the kingdom of Hawaii. A flow came down close to the pond of Kiholo; Kamehameha brought a pig and cast it in; the 'fires' stopped. The flow had gone down as far as Ka`upulehu and Mahai`ula and had almost plunged into the sea. Kamehameha's bringing of a pig and offering it made the flow stop. There were eyes in the lava to see Kamehameha, and ears to hear his appeals and his words of prayer, and the great blazing lava flow dies down" [p. 67].

Ii, John Papa, 1959, Fragments of Hawaiian History: Honolulu, Hawaii, Bishop Museum Press, 202 p. *[written in 1860s]*

[The name of the Kiholo-Akahipu'u trail] - ". . . . Immediately back of the wall was the pond of Alanaio, where stood some houses. There, too, was the start of the road that goes to Puu o Kaloa and on as far as Kiholo, where it joins the road from the upland that is called Kealaehu. The upland road runs from South Kona through the middle of the 'ama'uma'u fern belt, and this is thought to have been the road by which Kauhiakama traveled all the way around the island in a few days" [p. 119-120].

[Describes the two main trails crossing the Hu'ehu'e and Ka'upulehu flows from Kailua area.]

"Because of his ability he became a favorite of the king, and it was thus that he received the whole of Puuwaawaa and the fish ponds Paaiea in Makaula and Kaulana in Kekaha" [p. 132].

Dutton, C.E., 1884, The Hawaiian Volcanoes, in U.S. Geological Survey, 4th Annual Report: Washington, D.C., Government Printing Office, p. 75-

219.

". . . . The trail now turns away from the seacoast, and, leading obliquely up the slopes of the mountain, at length enters upon a lava field which is evidently of very recent date. In truth it was erupted in 1805. Though far inferior in magnitude to the historic eruptions of Mauna Loa, it is by no means an inconsiderable one. It broke out at a point upon the northwestern flank of Hualalai at an elevation of nearly 4,000 feet above the sea, and reached the ocean in a stream about a mile and a half in width and about seven miles long *[must be the Ka'upulehu flow, although the length is too short by a factor of 2]*. The lava is extremely ferruginous and contains considerable olivine and no conspicuous feldspar *[he must have noticed dunnite xenoliths]*. ...After a hard day's march, we camp on the western flank of Hualalai, at the height of about 2,300 feet above the sea. A little below us is a curious-looking crater, which erupted in 1811, sending a stream of lava into the ocean *[must be the Hu'ehu'e flow]*. It is hagged-looking cone *[Puhi a Pele]*, having the abnormal and abortive appearance which we have frequently observed around the orifices of eruption on Mauna Loa. Here is the point where the last sign of activity in Hualalai manifested itself. From that day to this Hualalai has remained in perfect repose." [p. 173].

". . . .It appears that these cinder cones were formed by the contact of the lava with water. Their structure and general appearance are quite normal, corresponding in all respects with the cinder cones which are formed over ordinary volcanic vents. Here is an unquestionable instance of the formation of an ordinary volcanic crater by the adventitious contact of liquid lava with water. Nor are these cones by any means exceptional occurrences on this island. At the end of the great flow of 1840 from Kilauea, which strikes the ocean at Nanawale, in Puna, near the eastern angle of the island, three cinder cones were formed in precisely the same manner. Upon the northwestern base of Hualalai the eruption of 1801 produced a similar cinder cone at the water's edge. . . ." [p. 181].

[Dutton described a littoral cone presumably on one of the branches of the Ka'upulehu flow. We have been unable to find such a feature.]

Dutton, C.E., 1883, Recent exploration of the volcanic phenomena of the Hawaiian Islands, American Journal of Science, 3rd series, v. 25, p. 219-226.

". . . . I also visited Hualalai. . . . This volcano it is well known has been active in the early part of the present century. From 1801 to 1811 there were three distinct eruptions, separated by intervals of a very few years, but all of them were small.

One of them, as nearly as can be made out, must have occurred about the year 1801, the second in 1805, and the last in 1810 or 1811."

Emerson, J.S., 1888, Surveyor notebook, Akahipuu District: Honolulu, Hawaii, Hawaii State Archives, p. 33-40.

[The notes consist of vertical and horizontal angles turned from specific points to other specific points. In addition, they contain anecdotes about the area, presumably from local assistants.]

"The flow of 1801 burst out on the makai side of the road just below the two last points sighted on, having come from its source, the crater of Kileo, under ground. The road, which was the "alaloa" of Kamehameha I. was left uninjured and occupies its old position at the present time" [p. 33-34].

"Kaleahi	Kanaina	132	7	30...
	Mag. South	9	58	...
	Akahipuu	74	5	...
	Puhiapele	135	36	...
	Kuili	139	3	...
	Kukui o Kileo flag	315	36	...
	Kileo	302	28	...
	Kileo Hill	275	59	...
	Pt. on fissure of 1801	120	43	...
	" " " " "	118	43	...
	" " " " "	120	54	...
	" " " " "	120	43	...

After the fire had disappeared from the crater of Kileo, it appeared along the above fissure; but no molten material was thrown out until it burst out below the Gov't road" [p. 35-36].

[This describes the Hu'ehu'e flow having begun in Kileo cone followed by its issuance below the road. Puhiapele is specifically excluded as the 1801 vent; the 1801 fissure is farther south, in fact, at the position of the uppermost tube outflow on the pahoehoe Hu'ehu'e flows.]

Westervelt, W.D., 1908, Early historic Hawaiian lava flows: Paradise of the Pacific, v. 21, p. 11-15.

"The story as told by the Hawaiian runs as follows: ' In the very ancient time Mauna Kea threw out vast Pele fires, but long ago these eruptions have been

imprisoned. The earth has covered them in on all sides and the abundant soil, large trees and green things of many kinds are multiplying. But not so Mauna Loa and Hualalai, other mountains of this island Hawaii. Pele fires have burst forth from them even up to recent times. Not many years ago, perhaps fifty [true date 1801], a fire door opened from the interior of Hualalai. The lava burst forth and poured down into the sea on the Kona coast, destroying cocoanut groves and fertile lands and even the villages. This eruption was visited by Kamehameha, who cut off some of his sacred hair and threw it into the lava as an offering to Pele. This was a day or two before the flow stopped."

Brigham, W.T., 1909, The volcanoes of Kilauea and Mauna Loa on the Island of Hawaii: Memoirs of the Bernice Pauahi Bishop Museum, vol. II, No. 4.

[On p. 3, there is a copy of the "Government Survey Map" dated 1909 which shows only the Hu'ehu'e flow as a flow which goes westward and splits into two branches before entering the ocean and is labeled the "1801", and three separate flows issuing from the Ka'upulehu vent area.]

"On Thursday afternoon, July 28, 1864, Mr. Horace Mann and myself, with a native guide left Kaawaloa. Our way led at first through open pastures, then through tracts of tall ferns, and finally we came to the forest, where the soil was black and muddy, and the bushes so close as to almost prevent our passage in some places ... It rained hard so that we were quite wet, and the clouds prevented our seeing much on either side. After some six miles of forest, we came upon a bed of a-a, fresh-looking and rough, and the trees were thinner and smaller. We were now on a dismal plain of pahoehoe and gravely sand, where in the scotch mist we could see but little out of our path. This was the elevated plain between the mountains, and being at least 5000 feet above the sea the atmosphere was cold as well as damp *[this elevated plain is southeast of Hualalai summit]*.

". . . . Twisted lava streams, and masses of scoriae crossed our path and so complicated were they that it was almost impossible to trace their course. About sunset we came to the place our guide had selected for our camp, and we soon had a fire at which we dried ourselves and roasted some sweet potatoes, and as the rain had ceased, slept comfortably under some bushes. Out water came from a curious pool in the last place one would think of looking for water, in the midst of a horribly rough bed of scoriae almost as porous as pumice, and broken into irregular masses of all sizes. The basin holds about twelve gallons of cold, pure water, and has no evident inlet or outlet, yet is never entirely exhausted; we nearly emptied it and the next morning it was full again. It was found accidentally, and three columns of stone are piled up to mark the place, which would be most difficult to find without these signals.

"At half-past five in the morning we started for the summit, toward which a good path led for some distance, and we galloped over the hard gravel beds, dodging in a zigzag course the clumps of bushes in our way. The morning was clear, and the birds, which are scarce near the shore, were abundant, and sang merrily. The path ended after three miles, and we had to slowly pick our way over difficult and even dangerous lava-fields. Our horse occasionally broke through, causing some trepidation to the riders, but no accidents occurred; and after passing nearly round the summit, crossing the flow of 1801, and counting ten flows from the top, and many others almost indistinguishable, we reached the base of the highest plateau at eight o'clock, and left our horses in a little valley where strawberries were abundant, and also American potatoes, planted by some native.

"A climb up a steep slope some three hundred feet high, and we were in the midst of a series of large pit craters extending over the entire summit. these craters were very much alike, from three to five hundred feet deep, and from seven hundred to a thousand feet in diameter. The walls were of solid grey lava capped very seldom by more recent basalt (although fresh looking lava was piled near by), and were nearly perpendicular. Vegetation extended to the bottom, and the beautiful Silver-sword . . . . was growing in the clefts far down the sides. The bottom was usually flat and gravely, but in some cases covered with smooth black lava, and in others rough and broken. Fragments of the walls were often seen at their base, and in one crater they were partly melted in to the fresh lava which covered the bottom, proving that the compact lava of this mountain summit is fusible by the melted black basalt.

"No sign of steam or sulphurous fumes were visible, but on the edge of one of the deepest craters, on the wall which separated it from another less than two hundred feet distant, was a mound of scoriae some fifty feet high, composed of drops and slightly agglutinated fragments of all sizes and colors, black, blue, orange, red, golden, apparently ejected in a viscid state, and in the centre of this blow-hole about twenty-five feet in diameter, and as nearly as we could judge by throwing stones, eighteen hundred feet deep to a ledge, to one side of which we could see a deeper, rather smaller hole. I was obliged to lie flat on the edge to examine it, the scoriae were so loose, and the whole cone jarred as we climbed over it. . . . . A similar blow-hole was described by Ellis lower down the mountain. . . . . In the afternoon we camped about a mile from our last night's resting place, between two cones. . . . . As the sun rose, the lava-flow of 1859 was visible through its whole length from near the summit of Mauna Loa to the sea near Kawaihae, shining like a river of silver, owing to its glossy black surface. All the plain between the mountains, which covers many square miles, is intersected by lava-flows from all three mountains, and is wholly rocky and uneven, with caves and beds of a-a. ..A road was attempted by Government some years ago under the direction of Dr. Judd, from Kailua on the western coast of Hawaii to Hilo, but only fifteen miles of this road . . . . were built. Caves are the only sources of water here,

the surface being too porous to retain pools or streams; but in the caves the water from the frequent rains drips from the roof and is collected in calabashes" [p. 9-13].

[This trip to the summit of Hualalai includes a portion over what Brigham identifies as the 1801 flow; however, their route as described is on the other side of Hualalai from any of the most recent flows. The party starts at Ka'awaloa and camps the first night near a water source at about the 5000 ft elevation, which might be Waikulukulu on the USGS Hualalai quadrangle. Their journey to the summit on the next day then apparently starts from a point 6.5 miles southeast of the summit, goes to the northwest for about three miles before the trail disappears, then continues "nearly round the summit" before arriving at the base of the summit plateau about 2.5 hours later. Brigham must have been mistaken about the 1801 flow.]

"The only recorded eruption from this mountain took place in 1801 . . . . The account of Ellis, taken from the lips of an Englishman and of natives is as follows:

> Stone walls, trees, and houses all gave way before it, even large masses of rocks of hard ancient lava, when surrounded by the fiery stream, soon split into small fragments, and, falling into the burning mass, appeared to melt again, as borne by it down the mountain's side. Offerings were presented, and many hogs thrown alive into the stream to appease the anger of the gods, by whom they supposed it was directed, and to stay its devastating course. All seemed unavailing, until one day the king Kamehameha, went attended by a large retinue of chiefs and priests, and, as the most valuable offering he could make, cut off part of his own hair, which was always considered sacred, and threw it into the torrent, A day or two after, the lava ceased to flow. The gods, it was thought, were satisfied.

To this eruption is referred the sad story, often told to travelers by the natives, of the death of a mother and her infant. At the beginning of the century the base of Hualalai had many fisherman's hamlets along its shore. At night, while all were sleeping, the eruption began. The stream of lava came thundering down upon the people on the shore, and while nearly all succeeded in escaping, in one hut only the husband was awakened, and in his terror he fled leaving his wife and child. Before she was aroused by the shrieks of her friends, the lava had encircled the hut and escape was no longer possible. The lava set fire to the house, and the woman sprang into a pandanus tree near by, but her refuge was of short avail, and the lava-stream, which was flowing into the sea, consumed, as it passed, the two human sacrifices to Pele.

"The remarkable rapidity with which this stream descended indicates great fluidity. It appears to have flowed fifteen miles in two or three hours, much of the way through forests. Its source was a little below the summit, and it issued in two

stream, one to the northwest and the other to the northeast. Twenty-three years after this Ellis found a warm spring at Kailua where Glauber's salts were formed by the action of sulphurous vapors on sea water, and warm springs were also found at Kawaihae at tide level. These are now cooled and there are no signs of volcanic activity anywhere on the mountain. This latest effort of Hualalai, besides destroying several small villages, and filling up fish ponds, ended by changing the coast line for twenty miles from a bay to a headland several miles beyond the old coast. The streams which in former ages flowed at intervals down its sides do not appear to be of so great volume as those from Mauna Loa, and this may be owing to the great number of vents. Their physical structure, however, is identical with that of those from the other mountains" [p. 14].

[Brigham infers rapid flow then goes on to quote Ellis (1927). We believe that this has been the source of a misunderstanding that there exist "eyewitness" accounts for rapid flow. Reading Ellis carefully shows no such description so it must be Brigham's inference incorrectly attributed to Ellis.]

Hitchcock, C. H., 1911, Hawaii and its volcanoes: Honolulu, Hawaii, The Hawaiian Gazette Co., Ltd., 314 p.

"The last known eruption started from the altitude of 1,800 feet and flowed to the sea in 1801, spreading out very much laterally.

"The distance between the extreme points on the shore exceeds the length of the flow. Three other very distinct earlier but prehistoric flows are delineated on the north side of Hualalai, starting from points 3,700 to 6,000 feet above the sea level. The 1801 flow was visited by Kamehameha I, who cut off a lock of his hair and threw it into the stream, with the result that the lava ceased to discharge further" [p. 159].

[1800 ft is closest to the elevation of top of the Hu'ehu'e pahoehoe flow. The middle flow is at an elevation more like 4000-4200 ft, and Ka'upulehu Crater is at an elevation of 6,000 ft. The statement that the distance between extreme points on the shore exceeds the flow length is confusing. It is not true of the Hu'ehu'e flow, but is true of the combined Hu'ehu'e and Ka'upulehu flows, the latter of which did not start at the 1800 ft elevation.]

Bryan, W.A., 1915, Natural History of Hawaii: Honolulu, Hawaii, Hawaiian Gazette Company (Ltd.), p. 152-153.

"The last eruption of Hualalai is placed at about 1801. It occurred from an opening on the sea or western side of the mountain. From there the lava descended to the sea in a wedge-shaped stream. The flow was a very liquid one and is said to

have traveled a distance of fifteen miles in two or three hours. This flow is believed to have marked the extinction of the volcanic fires beneath the mountain.

"An early missionary, The Rev. William Ellis, gathered an account of the eruption from eye witnesses, who were living in 1823, about twenty years after the flow. . . ."

[The author goes on to repeat Bingham's assertions and Ellis' account. The author is describing the Hu'ehu'e flow being wedge-shaped, but it is the Ka'upulehu flow that is 15 miles long.]

Powers, S., 1920, Notes on Hawaiian petrology: American Journal of Science, 4th Series, v. 50, p. 256-280.

"Hualalai was last in activity with a lava flow in 1801, the flow being observed by one of the earlier mariners, but smoke issues from the mountain as late as 1823 and possibly as late as 1840-41. Instead of a single flow in 1801, as has been previously supposed, two main streams of lava poured from the mountain and several ash cones were formed. An ascent of the mountain in 1915 from McGuire's ranch, together with a review of the Hawaiian traditions concerning the activity at the time, has shown that the eruption took place along one or more radial fissure-lines extending from near the summit of the mountain in a northwest direction toward the sea near Makalawena. The greatest, and probably the first 1801 outbreak, occurred near the summit of the mountain at Kaupulehu, and from it lava streamed to the sea near Kiholo, 11 miles distant, destroying the Paiea fishpond and the Hawaiian villages at the shore *[Ka'upulehu flow]*. Farther down the mountain three small flows, each a hundred yards in length, are seen emanating from the same line of weakness at elevations of 2,400 to 4,000 feet *[Middle flow?]*; and 110 feet below the Kona-Kohala highway the Huehue flow broke out of a little cavern in the older pahoehoe at an elevation of 2,200 feet, flowed over a stone wall and poured down the slope of the mountain. The flow was apparently fed from a number of openings now concealed by the lava, as in the center of the flow, far below the road, there is a blackened cone *[Puhia Pele]*. The flow entered the sea between Keahole Point and Makalawena. While the Huehue flow and the smaller flows above are pahoehoe, the larger flow *[Ka'upulehu flow]* on the north is aa."

[Other than the fact that Powers is probably mistaken about the Ka'upulehu flow destroying the Pa'aiea fishpond, this is the first accurate description of these flows.]

Appendix B: Maps

Fitzgerald, G. L., 1986, The Early Mapping of Hawai'i: Honolulu, Hawaii,

Editions Limited, 160 p.

[This is an excellent history of the mapping of Hawai'i and includes reproductions of all available early maps, therefore these maps will not be included here. Comments will refer to figure numbers.

1779: Complete map of Hawai'i Island showing a prominent, peninsular western point, which is probably Keahole Point. The only geographic locations named on this island are Kawaihae and Kealakekua Bays, Mauna Loa, Mauna Kea, and the six districts (Kohala, Kona, Ka'u, Puna, Hilo, and Hamakua) (p. 17).
1794: Complete map of Hawai'i Island again showing a prominent, peninsular western point, which is probably Keahole Point. Only the districts, Mauna Loa, Mauna Kea, and Hualalai are identified (p. 41).
1825,1827: Complete map of Hawai'i Island showing many more place names, but no prominent, peninsular western point. Place names of interest to this paper are (from north to south along the coast) Kihoro, Laemano, Kaupulehu, Kuhiko, Kaulano, and Kalaoa (p. 86-87).
1838: Complete map of Hawai'i Island, with a coastline very similar to the 1825-1827 map. Place names of interest to this paper are (from north to south) Kiholo, Laemano, Kaupulehu, Kaelehuluhulu, Kaloko, and Honokohauiki (p. 110-111).
1839: Complete map of Hawai'i Island showing the location of Kaelehuluhulu only (p. 114).
1841: Complete map of Hawai'i Island showing prominent, peninsular western point labeled "Pt. Mano" and appearing to use much of Vancouver's 1794 map outline. Kaelehuluhulu is located quite a bit further north (p. 141).
1843: Complete map of Hawai'i Island similar to 1825 map showing five lava flows issuing from Hualalai. Place names of interest to this paper are (from north to south) Kihoro, Laemano or Shark's Point, Kaelehuluhulu, Kaupulehu, Kuhiko, Kaloko, Kaulano, Kalaoa, and Kealakehe. Note the inverted order for Kaupulehu and Kaelehuluhulu as compared to the 1838 map (p. 145).]

Ching, F.K.W., 1971, The archaeology of South Kohala and North Kona from the ahupua'a of Lalamilo to the ahupua'a of Hanamana -- Surface survey Kailua-Kawaihae road corridor: Hawaii State Archaeological Journal 71-1, 260 p.

"Fig. 30. PORTION OF MAP OF THE HAWAIIAN ISLANDS COMPILED BY JOHN ARROWSMITH, BASED ON VANCOUVER;S SURVEY. The dotted lines and crossed lines indicate periodic or constant breakers observed. This map was first published in London in 1843 [Cartwright, 1925; Healy, 1959] A copy of the map is in the Hawaii State Archives" [p. 96].

[The figure shows "Mowna Huarari Volcano last eruption 1785" with four, elongate stippled patterns, which may represent lava flows, spreading in westerly directions from the mountain. Keahole Point seems to be labelled "Kaulano Pt.", Lae Mano is labelled "Lava or Laimano Pt.", and Ka'upulehu village is labelled "Kaupuleho".]

Emerson, J.S. n.d., Kukio-Maniniowali, Awakee, Mahaiula, Kaulana, Awalua-Ohiki, Puukala, Gov't Tracts, North Kona, 1 in. = 2000 ft. scale map of the Hawaii Territory Survey.

[Map (Figure 2) portrays Hu'ehu'e flow as "Flow of 1801" originating at Kileo Crater which is sublabeled "Source of 1801 Flow" and extending across the government road to a point above Puhiopele. This reflects Emerson's notes of April 1888 and this map is assumed to be based on his surveying, even though he is not credited explicitly.]

Emerson, J.S., n.d., Kailua Section, North Kona, Hawaii, 1 in. = 2000 ft. scale map of the Hawaii Territory Survey, Survey and Map by J.S. Emerson.

[Map (Figure 3) portrays "Flow of 1801" consisting of a first flow of smooth pahoehoe and a second flow of very rough pahoehoe of 1801. The only vent shown for these flows is Puhiapele. The Ka'upulehu flow is underestimated in width, is not dated, and is suggested to come from two sources in the approximate vicinity of the true vents and flowing around Puu Alala. The easternmost vent is directly north of a benchmark called "Kaupololiu 6143.2", which is probably the same as the Kaupulehu Crater benchmark (6141) on the current USGS Kailua quadrangle. This location matches the uppermost fissure of the Ka'upulehu flow. The main vent is suggested to be south of Hinakapoula. Two other features are shown in the vicinity of the "Kaupololiu" benchmark - an apparent pit crater and a "Steam crack active Aug. '82", which plot in nonsensical positions on current maps. If we assume that the pit crater shown on this map is the same as the one NNE of the Kaupulehu Crater BM on the Kailua Quad, then the steam crack would be located on the Ka'upulehu flow's easternmost fissure. Names are given for Kaiwi o Pele (mauka and makai), Puu Alala cones (unnamed on the Kailua quadrangle), and a second Waha Pele upslope from Pu'u 'Alala but on the northeast rift zone.]

Appendix C: LEGENDS:

Maguire, E.D., 1966, Kona Legends: Hilo, Hawaii, Petroglyph Press, p. 4-10.

[The following two stories are quoted directly out of this reference. The quote marks are left out here because of the confusion with the abundant quotes already in the stories]

THE FISHPOND OF PAAIEA

This was a very large fish-pond extending from Kaelehuluhulu, adjoining the little fishing hamlet of Mahaiula, and as far as Wawaloli on the boundary of Ooma. This point was not far from Ka-Lae-O-Keahole, (Fisherman's Point) which is the extreme Western point, or cape on the Island of Hawaii, and on which there is a lighthouse.

To mariners of the days of sailing crafts, this point was a test of skillful navigation; the wind and tide and current, all combining to thwart the mariner's effort to round the cape, and make the entrance into Kailua Bay.

This Fish-Pond of Paaiea was three miles long, and a mile and a half wide. The fishermen going to Kailua and further South, often took a short cut by taking their canoes into the pond and going across, thus saving time and the hard labor of paddling against the Eka [A strong sea breeze from the South] and also against the strong current from Keahole.

This fish-pond belonged to a certain Chief, and it was well guarded.

No one was allowed to take or eat a fish without the Chief's permissions, and from him to the Konohiki (Overseer).

There were houses for the guards and the Overseer of the fish-pond.

This Konohiki or Overseers name was Kepaalani, and under him were the stewards and other servants of the Chief.

One day an old woman appeared at the large canoe shed of Kepaalani.

The canoes had come in with a large catch of fish, Aku, and the fishermen were cleaning and salting them, and preparing them for drying.

This was the season for Aku, along the Kona coast, and the canoes were filled with fish.

When the people saw this strange woman decorated with a wreath of Kookoolau, they greeted her "Aloha!" and she returned their greeting, "Aloha!"

A man by the name of Kapulau said to her: "Malahini?"

She replied "I am a Kamaaina, not exactly a total stranger, but I do not often come down here to the seashore.

"Living in the restful uplands, and hearing that there was plenty of fish down at the beach, I hastened down to see if the fishermen would give me a bit of palu."

Kapulau answered: "There is plenty of fish and plenty of palu, but we have not the right to give the fish or palu; the Konohiki is the one who has that right. He is sitting over there, and you go and ask him."

The old woman went away, and to the great astonishment of every one, they saw a great crowd of people following her.

When she appeared before Kepaalani, he asked: "A stranger? From where?"

She replied: "From the tangled wilds of the uplands. Hearing of the great quantity of fish down here at the beach I came to get a few."

"No fish," replied the stern Overseer.

"The fish is given to the men of the Chief, I am only a guardian."

"Well! if there is no fish, give me a bit of palu."

"There is no palu; all given to the men of the Chief."

"Then give me a few opae from the pond of the Chief."

"No! You cannot have fish, palu, shrimps or anything. It all belongs to the Chief, and only the Chief can give them to you.

"Well! That is all. I now return to the uplands without even a grain of salt." The old woman stood up and turned around to go.

When she had gone quite a distance, another great crowd was seen walking around the edge of the pond.

When she came to Kapulau's house, she was urged to remain and have something to eat. She consented and sat down. When she had finished her meal, Kapulau gave her a fish.

The old woman stood up, and before starting to go, she gave these instructions to her host:

"Tonight, you and your wife put up a lepa back of your house, and here on your fence; for it is said, there will be a night of great doings, and tonight may be the night, and you will have your unuunu ready against any evil befalling you."

She turned around and started to go up, but mysteriously disappeared.

Not a sign of anyone to be seen by the people who were watching for her appearance on the plains above.

That night, the people living at the beach, saw a fire on the Mountain of Hualalai, and as they saw it coming down its slopes, they realized that the old woman whose request for fish, palu and shrimps had been refused, could have been no other than the Goddess Pele.

The lava came and destroyed the great fish-pond of Paaiea, dried its water and filled and covered it with black rocks.

That is the way the Goddess Pele avenged herself on those who did not acknowledge her as Supreme, and refused to grant her slightest wish.

THE TWO GIRLS ROASTING BREAD-FRUIT

The legend of The Fish Pond of Paaiea, in the preceding chapter, tells how an old woman appeared before the fishermen asking for fish, and was told that they would give her nothing, and how, when she left them to go to her home in the mountains, she mysteriously disappeared.

This same old woman soon afterwards appears at a village called Manuahi

which was on the Western slope of Hualalai, and where these two girls who figure in this story, lived.

When this remarkable old woman arrived at the village, it was quite deserted and only two girls were there and they were roasting bread-fruit.

The name of one of these girls was Pahinahina and the name of the other was Kolomu'o.

As soon as the old woman saw then she inquired: "For whom are you roasting your bread-fruit?"

The girl named Kolomu'o answered: "I am roasting my bread-fruit for La'i."

"Who is La'i?"

"That is my God."

"Yes? Has La'i power?"

"Yes, that is the God of my parents."

Then the old woman turned and asked Pahinahina, the other girl, "and for whom, pray, are you roasting your bread-fruit?"

"For Pele," she said.

"Well, if that is so, it is our bread-fruit, and it is cooked."

"I do not think it can be cooked, it has only just been turned over."

"Yes, it is cooked, it is smoking."

When they tasted it, sure enough, it was cooked and they ate all of it.

Then the old woman asked her: "Where is your house?"

"Above there, near that hill."

"And where is the house of this other girl?"

"We all live in one house with our parents, she at one end of the house with her parents."

"Where are your parents?"

"Gone to clear land around to plant for the Chief."

"When your parents come home, you tell them to put up a lepa (sign) on the end of your part of the house."

When her parents came home, Pahinahina told them the instructions this old woman had given her, and they followed it out.

Mysterious instructions of that nature were always followed out, as people of those days believed that only supernatural beings or Gods gave instructions in that manner.

That night, after this old woman's visit to the Fish-Pond of Paaiea, and her interview with the two girls roasting bread-fruit, she appeared as none other than Pele, the Goddess of the Volcano, who lived at Kilauea.

She evidently was in the habit of traveling about and taking up her abode wherever she fancied, and in 1801 she came over to Hualalai Mountain and started her devilish work.

The people, that night, saw a fire on Hualalai, at a place called Ka-Waha-O-Pele, (The Mouth of Pele) and thought it was the fire of the bird catchers of the Ua'u.

Then the fire disappeared, and again lower down, burst forth where the scrub lehua and ferns grew, a place called Ka-Iwi-O-Pele, (The back-bone of Pele) and it was thought to be a camp fire of the canoe builders.

There the fire flared brightly, then it dwindled down and went out. Soon after, it appeared below Kileo, one of the many spurs of Hualalai, and about a quarter of a mile to the right Akahipuu, coming out of a little opening and flowing in a thin stream of lava, spreading and growing larger until it covered the South end of the girls' house.

Pele continued her course to the sea and finished her work of destruction.

The cinder hill of Puhi-A-Pele, (Pele's Bon-Fire) which looms like a huge castle of ebony, showing in strong relief against the silvery kukui grove above it, represents the home of one of the two girls roasting breadfruit which Pele destroyed.

It is, at present, a striking landmark plainly visible, about a mile below the road, as one crosses the ridge of the Kona Mountain.

Westervelt, W.D., 1963, Hawaiian Legends of Volcanoes: Tokyo, Japan, Charles E. Tuttle Company, 210 p.

[DESTRUCTION OF KAMEHAMEHA'S FISH-PONDS is principally a story comprised of quotes from Ellis and from Kamakau's articles in the Kuokoa newspaper of 1867 (p. 146-151)].

Kelly, M., 1971, Kekaha: 'Aina Malo'o. Historical survey and background of Kaloko and Kuki'o Ahapua'a, North Kona, Hawaii: Honolulu, Bernice P. Bishop Museum, Department of Anthropology, Rept. 71-2. Dept. of Anthropology, p. 39-40.

"A modern day informant gave his version of the story as follows:

When the volcano flowed at Kiholo, that's where my grandmother was married to my grandfather at Makalawena. The Kohala people had come to see the lava flow and stayed six months. There is where they met.

Pa'aiea was the name of the big fishpond of Kamehameha. People from Makalawena could get into a canoe and come all the way to Keahole paddling in the fishpond. After that, they put their canoes back into the ocean and went to the bay at Kailua.

My grandmother lived up at Kuki'o, beyond Mahaiula. My grandmother had a couple of acres of cotton fields. When she had to mend the olden-day quilts, she went to pick cotton. One day when she was there a lady appeared before her. My grandmother said to her, "Aloha ano 'aia, ua pa'ina 'ai 'oe? (Greetings, shall we eat together?) This is the aloha of the olden days. She said, "I have poi and salt, but no

fish." "I will get us some fish," the lady said. But when the lady went to the pond and asked Kamehameha's fishermen for fish, one of the men said, "No, everything is for King Kamehameha." She asked for scales, but the answer was, "No." She asked for the inner parts (na'au, pihapiha), but she got nothing. She went back. When she reached Mahaiula, the konohiki said, "We are in trouble."

When she reached the black hill, two girls were roasting breadfruit. Of the first girl she asked, "For whom are you roasting your breadfruit?" "For La'i," the girl replied. "Is La'i a strong god?" "Yes," the girl answered.

The second girl said she was roasting her breadfruit for Pele. The woman said, "Let's sit down and eat it now." She asked the girl where her parents were. "They went to Hualalai to cut ohi'a trees." "When your parents come back," the woman said, "tell your father to put a white flag--not a red flag--to mark the boundaries of your house."

When the parents of the girl returned, the father knew someone had been to the house. He asked his daughter who had been there, and she told him the story. That evening Kamehameha's workmen saw a red glow on Hualalai, They said, "We are in trouble."

The flow came from the hill where the girls had roasted breadfruit for La'i. From there it destroyed the fishpond of Kamehameha. When the lava came, it almost covered the fishpond. The konohiki and Kamehameha brought a small pig. They let the pig run and the fire pi'o (went out, the lava ceased to flow).

The old fishpond at Keahole Pa'aiea. It covered the distance from Keahole to Ka'elehuluhulu near Mahaiula, nearly 5 miles. That was the place of the pond called Pa'aiea."

Desha, S. L., 1992 translation by, A Tale of Kekuhaupio, the famous warrior of the era of Kamehameha the Great (Frances N. Frazier, trans.): Ka Hoku o Hawaii, unpubished manuscript, p. 31-35.

"170. PELE ASKS FOR FISH AT PAAIEA August 14, 1924

. . . .

During the period in which Kamehameha ruled, perhaps it was the year 1801, Kamehameha appointed Kepaalani as Konohiki to catch fish at Haleohiu at Kekaha, North Kona, Hawaii, while Kamehameha was staying at North Kohala, fishing for flying-fish.

Kepaalani's status at Kekaha was as a konohiki palau hulu, in other words, on the days of fishing to gather all the various kinds of fish caught for the alii. The most famous fish, perhaps of Kekaha were the opelu and the aku.

On the evening of a certain of these days when all the fish were reserved for the alii, some canoes landed which were full of aku. Because of the great numbers of the aku fishing fleet, the black sands of Haleohiu were covered over with the fishing canoes.

It is said that inland from that black sand, from that place called Hoona, to Mahaiula, there was a large fishpond named Paaiea. There was a famous saying about this fishpond:

'The stars of the heaven are above, and Paaiea is below.' The reason for this saying was because of its really large size. Within the wide waters of this pond were numerous little islets which were compared to the stars in the heavens.

On the evening of that day on which the people were gathering the alii's catch from those numerous canoes, a weak, bent old woman appeared. She was in such a weak condition as to be pitied. She came before the konohiki Kepaalani who was charged with gathering fish for the Alii Aimoku Kamehameha.

When the old woman came before Kepaalani, she uttered the words customary at such a time: "E Kalani e, a little fish for me. I ask for forty thousand (kini), four thousand (mano), for me." Kepaalani answered rather rudely: "You shall not have the fish of the alii, you haughty woman who comes here to ask for the alii's fish."

"And if I lack for the forty thousand and the four thousand, then how about four hundred (lau) for me?" Kepaalani replied "You shall not have a lau of the alii's fish."

"And if I do not get four hundred, then forty (kaau)."

"You shall not have any fish at all, old woman who is eyeing the fish of the alii, it is all for the Alii Kamehameha."

"And if not forty, then give me four (kauna), and the rest shall be for the alii."

"You shall not have the alii's fish, you shall not have the large part, nor a kauna", was Kepaalani's rude reply.

"Auhea mai oe, e Kalani, if I shall lack for a kauna of fish, then just give me one, and I shall return inland with one fish.

"Hear me, old woman who thinks to ask for fish, you shall have none of the alii's fish. Let your ear hear this refusal."

Then that old woman went and leaped on the bow of a canoe and saw it was full of silvery aku, and turning back, asked for the last time:

"E Kalani e, perhaps I shall lack for the flesh of the aku, so then my final request to you is for the base of the fish-gills, and let the Alii Kamehameha have the flesh of the fish."

171. PELE SENDS HER FIRE TO PAAIEA August 21, 1924

Then Kepaalani replied in a harsh, unyielding voice: "Have you no hearing in your ear? You shall not have fish, nor even the base of its gills. I am irritated at your numerous requests for the Alii's fish."

At that moment that old woman turned and glided upland, ascending the pili grass kula of Puukoaae, and then down below Puio. She went to a place close to Huehue, in South Kohala.

When she arrived at a place close to a certain cave, she saw some young women

broiling breadfruit. The breadfruit was cooked and they were spearing it, when the old woman said to them: "Only one, and there is life. The breadfruit is cooked." One of the young women replied rather rudely:

"My breadfruit is kapu, it is not to be eaten by any other person."

The supernatural old woman asked the girl: "And if your breadfruit is kapu, to whom is it freed (noa), girl?"

"My breadfruit is kapu and it is freed to Laanui."

Then the old woman asked again: "And if it is freed to Laanui, who is Laanui?"

"A strong god is Laanui, one of power, he is the god of my parents," replied the girl with a truthful voice.

"Ah, Laanui is truly a god, your breadfruit is truly consecrated and freed to your god. And what of your breadfruit, you girl over there, to whom is your breadfruit freed?"

"My breadfruit is also kapu, and it is freed to my god, who is Pele."

When that remarkable old woman who had arrived at the evening of life (Luahine... hiki ahiahi) heard this, she said to her: "If, indeed, your breadfruit is freed to Pele, your is the one to be eaten."

When that girl heard these words by the old woman, she did not retort saucily, but she prepared the breadfruit well, and then divided it and gave a portion to the old woman.

Then the old woman said: "I shall not eat your breadfruit, since your good-heartedness has satisfied me--you eat your breadfruit, And where are your parents?"

"They have gone up to do farming and will soon return since it is evening," replied that good-hearted girl.

"When your parents return, then you must say that an old woman had arrived here at our place, and commanded you with these words: While wee are sleeping the next night or so, we must all lie together on one side of the house, and that girl and her parents must lie on the other side. Also, you must set up flags around your house."

After the old woman finished speaking, she immediately disappeared. The girls left the place where they had broiled the breadfruit and returned to their house. When they got there, the parents of the good-hearted girl arrived, and she told them all the old woman had directed them to do.

When the parents heard their daughter, they wailed loudly and said to her: "You really escaped death from our god, since it could have been none other than Pele, the god in whom we believe. What a pity for your companion, she will die because she was stingy towards Pele with her breadfruit."

Without delay, after the parents spoke they set up numerous flags around their house, and carried out the command to lie all on one side of the house, which was the side towards Kohala. That night a fire was seen burning above on Hualalai, and the fishermen at sea thought that it was a fire made by the "fishers" (lawaia) of shearwater birds in the upland. On the next night the lava emerged at a place very

close to where the Government road is at this time, a little to the North of Huehue, which was also close to the house of those girls.

When the fire arrived at that place, the house where those people slept was partially consumed, The end of the house where the family of the good-hearted girl slept was spared, and the side where the stingy girl lay was consumed by the fire, and the girl and her whole family died because she had been stingy with her breadfruit, saying that only her god Laanui was free to eat it.

Then the lava began to flow very fast, and perhaps half a mile seaward of the place where the good-hearted girl's family had escaped, it heaped up in a large cone. When the volcanic cone became quite high, the lava ran down three miles toward the sea. That cone lies there until this day, and is called "Puhi a Pele" by the kamaaina of Kekaha.

When the lava flowed seaward it came very close to that great fishpond of Paaiea, and began to fill up the deep places where so many fish had swum. The lava continuously consumed the Alii Kamehameha's great fishpond with its immeasurable flow.

172. KAMEHAMEHA MAKES OFFERING TO PELE August 28, 1924

When the alii who had been stingy with fish for the old woman saw that the Alii Kamehameha's fishpond was being filled up with pahoehoe, he hastened to Kamehameha at Kohala, to come and see the rage of Pele who was continuing to consume the good things of the great fishpond of Paaiea. When Kepaalani arrived at Kohala, he found Kamehameha farming in the upland of Halawa.

Kepaalani told of the damage to the alii's fishpond by the lava flow, and that they had come for Kamehameha to go and extinguish that earth-consuming fire. When Kamehameha heard his Konohiki, he bowed his head, and then sighed, turned and said to him:

"Ea, e Kapaalani e, perhaps you were stingy with fish to one who asked of you?"

"Yes, I withheld the fish. A certain weak old woman came and asked persistently for fish and I did not give her any since I thought the fish was kapu for you, O Alii."

"And did she not ask you to give her the base of the gills of the aku?"

"She did so ask, but I did not give it to her," replied Kepaalani.

"Yes," replied Kamehameha to Kepaalani: "You were very wrong in withholding fish from that old woman. The proper action for you to have taken was when she asked for fish you should have given it all to her. You did not act with aloha towards that request of the old woman. Did you not, perhaps, think when that weak person who asked you for fish, which you hard-heartedly withheld -- did you not think that it would only be a matter of getting more fish? But now, the fishpond of the Alii has been entirely ruined and will never come again.

"Auhea mai oe e Kepaalani, that old woman was none other than Pele, the

aliiwahine of the famous pit of Halemaumau. We are seeing the fishpond being consumed by lava. Well, what of this -- we must just go and attempt to appease the fury of that rock-eating woman of Kilauea. If she listens, then in the future the fishponds of the Alii will escape. And, indeed, if the right time [for appeasement] has passed, then the Alii will be deprived of that famous fishpond of Kekaha."

With these words, Kamehameha abruptly ordered his strong paddlers to take him and Kepaalani to the Paaiea fishpond which was continuing to be consumed by the goddess Pele. They sailed on Kamehameha's swift canoe to Kekaha to a place near the fishpond.

When they arrived there, he witnessed with his own eyes the spread of the pahoehoe lava over about nine miles of that great fishpond. The only part that remained was next to Hoona, and that remainder was being voraciously consumed by Pele.

It is said that when Kamehameha saw the ruination of his famous fishpond, his tears fell because of his genuine regret at this loss. The lamentations of the makaainana were heard, but it was useless, since the Woman of Kilauea was munching up the wealth of that fishpond.

Kamehameha went close to where the lava was munching and he sacrificed (uhau) a solid-black pig. The people saw the lava flow immediately diminish and become extinguished. Some old people who lived beyond that time were eye-witnesses to Kamehameha's action which truly stopped the lava. It became a legend told by some people of this race, about how the rage of the woman of the famous pit of Halemaumau was appeased. There remained only that very small portion of the fishpond, close to Hoona, and it was a place beloved by the alii who came afterwards. Kauikeaouli [Kamehameha III] stayed there once when he had sailed to Kona for a rest. He stayed for some days at Hoona and bathed in the water which remained of that famous fishpond which his father had so greatly regretted to lose.

Perhaps we might not believe in the extinguishing of the lava flow by Kamehameha's sacrifice of the pig, nevertheless, Kamehameha did come to that place, and he truly did sacrifice that solid-black pig, and the fire of Pele was truly extinguished. Some old people who had seen those actions by Kamehameha at that fishpond of Paaiea, lived until the time when Christianity arrived in Hawaii. One of them was the great-grandfather of John H. Wise.

S. Kalilikane's great-grandfather, who was the father of Kaelemakule, who lived to be a hundred years old. was another person who had gone to work on the walls (kuapa) of that famous fishpond of Paaiea. While Kaelemakule's father was working on the fishpond, Kaelemakule was born. "

Pukui, M.K., and Green, L.C.S., 1995, Folktales Of Hawai'i: Honolulu, Bernice P. Bishop Museum Press, p. 23.

" The Breadfruit Offering

Two girls who were roasting breadfruit in the upland boasted of their gods. "Laka is my god, a beneficent god!" said one.

"Kapo is my god, an amiable god!" said her companion.

While they were thus praising their gods, an old woman appeared. She said to the first girl, "Give me some of your breadfruit."

"No," answered the girl, "my breadfruit belongs to Laka."

"Is Laka a powerful god?"

"Yes, a powerful god indeed!"

"Give me some water from your gourd."

"No, indeed! This water belongs to Laka."

The old woman turned to the second girl and asked her for breadfruit. Knowing that she had not bowed the breadfruit to her favorite god, she gave it gladly. When the old woman had eaten, she asked for water from her gourd and received it. When she rose to go, before leaving she said to the girl who had treated her kindly, "Go home and tell your parents to store food in their house and to hang up flags for ten days at the corners of the house."

When the girl told her family what the old woman had said, they knew that it was no old woman, but Pele herself. They were glad that the girl had been kind to her. They obeyed all her commands, and when ten days had passed, fire from the volcano appeared above Moku'aweoweo. The lava flowed over Ka'u district and destroyed many homes but spared the house and family of the kind-hearted girl. Parents and grandparents teach their offspring not to be stingy, not to answer strangers rudely, that they might not offend Pele someday and have evil befall them.

[Mrs. Lifte of Kahalu'u, North Kona, Hawai'i, told the same story of two girls at Pu'uhu'ehu'e.]

Maly, Kepa, 1996, Appendix C: Historical Documentary Research, in Head, J., Rosendahl, P.H., and Walker, A.T., Archaeological Inventory Survey Ka'upulehu Makai - Lot 4, V. 2, 39 p.

"Ka-loko-o-Pa`aiea' (The fish pond of Pa`aiea) was written in Hawaiian by J.W.H.I. Kihe who was also a primary informant for E. Maguire's "Kona Legends (1929). . . . These narratives were printed in Ka Hoku o Hawai`i in 1914 and 1924" [p. C-6].

"Pa'aiea or Ka-loko-o-Pa'aiea (The fish pond of Pa'aiea)

"The great fish pond of Pa`aiea extended from Ka`elehuluhulu near Mahai`ula to Wawaloli [at Puhili Point, a site on the border of `O`oma-Kohanaiki], and the pond was more than three miles long and half a mile wide (2/5/1914).

"The guardian's compounds were situated at Ka`elehuluhulu and Ho`ona [at

Kalaoa], it was at these places that the pond guardians and Konohiki (Overseer) dwelt. At these sites were also the supply houses of the chief in which all of his wealth was kept. Kepa'alani was the headman, and below him were the chief's retainers and servants.

"While traveling in the form of an old woman, Pele visited the Kekaha region of Kona, bedecked in garlands of the Ko`oko`olau (Bidens spp.). Upon reaching Pa`aiea, Pele inquired if she might have a few small fish to take home with her. Kepa`alani, refused Pele`s request, so she departed and traveled to the uplands.

"After departing from Pa`aiea, Pele went to the uplands of Manuahi where there was a village (kulanakauhale) of many people. At this quiet village, Pele saw two girls, who were e pulehu `ulu ana (broiling breadfruit); these girls were Pahinahina and Kolomu`o. All the other people of the village were away performing agricultural service for their chief.

"Pele approached the two girls and inquired about their tasks. When she asked who would receive the first offerings of this `ulu, Kolomu`o said her goddess La`i would receive the offering for she was a powerful deity. Kolomu`o did not acknowledge Pele, and Pahinahina replied that her goddess Pele-Honuamea would receive the first offering. Not knowing that the old woman was Pele, the girls responded to Pele's comments about the power of their goddesses.

"When their conversation was completed, Pele told Pahinahina, our `ulu is cooked; let us eat. Pele then instructed Pahinahina to mark the boundary between her and her family's dwellings and the dwelling of Kolomu`o with lepa (white kapa flags). She also told Pahinahina not to fear the events that would occur that night.

"During the night, a white flash was seen to travel from Mauna Loa to Hualalai and in a short time a red glow was seen at Ka-iwi-o-Pele. The people along the coast thought that it was the fire of the bird catchers at Hono-(manu)-`ua`u. The light dimmed and then appeared at (pu`u Kileo where the shiny hills of black pahoehoe may be seen. Pele then went underground and appeared at Keone`eli where she caused deep fissures to open, and the kahe-a-wai (fire rivers) to flow.

"Kolomu`o ma were consumed by the lava, and the lava flats below Kepuhiapele and a shoreward `opelu fishermen's ko`a (shrine) bear the name of Kolomuo. The area where Pahinahina and her family lived was left untouched, and this open space bears the name of Pahinahina to this day. The area at which the girl's dwelled is near Ke-one`eli (The dug sand, or cinders) by the site now called Kepuhiapele (a`a hills approximately 200 feet high, below the old Maguire house at Hu`ehu`e). It is because of this event that the lands of Manuahi came to be called Ka-`ulu-pulehu (The Broiled Breadfruit), and this has been shortened to Ka`upulehu.

"Now because Kepa`alani was stingy with the fishes of the pond Pa`aiea, and refused to give any fish to Pele, Pa`aiea was also destroyed by the lava flow. The lava crossed the land from Ka`elehuluhulu to Wawaloli, covering the entire fishpond which had been richly filled with `anae, awa and ahole fish. Because this

pond was so vast, it is said that while traveling to Kailua or perhaps on to Napo'opo'o, etc., that previously the canoe fleets of Kekaha would enter from the Awalua side, and upon reaching the other side, they would carry their canoes over the rocks [at Wawaloli] and continue their journey to Kona. Those who traveled in this manner would sail gently across the pond pushed forward by the 'Eka wind, and thus avoid the strong currents which pushed out from the point of Keahole (J.W.H.I. Kihe 2/5-19,1914 and 5/1-15, 1924)" [p. C-10].

Appendix D: MODERN GEOLOGIC REFERENCES

Stearns, H.T., and Macdonald, G.A., 1946, Geology and Ground-Water Resources of the Island of Hawaii: Division of Hydrography Bulletin 9, p. 146-148.

"Hualalai was last active in 1800-1801, when voluminous lava flows were poured from several stretches of a long crack on the northwestern flank.[45] The main vent of the flows lies between 5,500 and 6,000 feet above sea level. It is an old fissure vent thinly veneered with 1801 lava. Several lava rivers flowed seaward from this vent to form the Kaupulehu flow. This flow contains many thousands of angular and subangular xenoliths of dunite and gabbro mostly under a foot in diameter. Some of the xenoliths formed spheroidal masses which lie loose on the top of the clinkery surface of the flow. Their angularity has been smoothed by a coating of 1801 lava. Feldspar crystals reaching three-quarters of an inch across, some of gem quality, are found in the Kaupulehu flow also. Around one of its source vents, xenoliths, a fraction of an inch to several inches across with a coating of black 1801 lava, are piled up like cobbles. The dunite xenoliths look like green candies dipped in chocolate. Apparently the magma stoped away a large precooled mass of dunite and gabbro before eruption.

"The flow is notable also for its numerous accretionary lava balls, its aa channels in places 30 feet deep, the remarkable lava stalactites, and the brown, red, and black spatter bordering the channels (pl. 45B). In places the levees of the channels touched at the top, forming natural bridges. In other places the levees slumped while the lava was flowing between them, probably because of a drop in the level of the lava river. The gaping slump cracks subsequently were bridged by spatter from the splashing torrent of molten lava.

"Just above the main vent of the Kaupulehu flow is a pit crater 150 feet deep and 20 feet across with dribbles of 1801 lava on its western wall.

"Powers *[above]* states that the flow overwhelmed Paiea fishpond and Hawaiian villages at the shore. One can see today partly buried native house foundations covered with sea sand and shells along the margin of the flow near the beach. Sea sand is buried by the flow for a quarter of a mile from shore. Scattered over the pahoehoe at the beach are clots of lava indicating an occasional mild explosion. Such clots have not been reported in Hawaii before and probably resulted from steam explosions due to the lava burying saturated sand and the ancient fishpond. A few of the bombs dropped by the Army on the 1935 lava flow of Mauna Loa threw out similar clots when they exploded after breaking through the pahoehoe crust.

"Three small pahoehoe flows, each about 100 yards long, issued from vents between altitudes of 2,400 and 4,000 feet [*middle flow*]. At an altitude of 6,050 feet, and separated from the main vent of the Kaupulehu flow, are three short flows

and a lava lake congealed in a prehistoric crater [*Ka'upulehu Cone flow*]. The fresh black color makes it certain that the flows and the lake were formed in 1801. After a short existence the lake level fell about 6 feet, the lava being partially drained out at a lower elevation, and a pronounced rampart similar to the rim of the former lava lake of Halemaumau was left (pl. 45 C). A description which fits this crater is given by Jaggar who points out that such lakes and ramparts are rarely preserved, as collapse concurrent with draining usually destroys them.

"During the mapping, a hitherto unrecorded branch of the Kaupulehu flow was found on the western slope, its lower end extending into the forest. It offers a striking example of the effect of rainfall on the growth of vegetation. The branch on the dry slope is plainly traceable after 140 years, but the one on the wet slope half a mile away is hidden by vegetation.

"A line of 14 spatter cones ranging in height from 5 to 70 feet lies below the main highway (pl. 43B). The cones were the source of a flow, pahoehoe near the cones and aa below, which was erupted shortly after the Kaupulehu flow. It is called the Huehue flow. It is an olivine basalt and contains pieces of partly charred wood in its tree molds, as does the Kaupulehu flow. Some of the charcoal contains lava glass in the checks.

[45]In a personal communication dated January 14, 1938, Dr. T.A. Jaggar states that 'Miss Paris says natives told her father the Kaupulehu flow was the first (1800) and higher, and the Huehue flow was the second (1801) and lower flow.' Miss Ella Paris lives in Kona. Mrs. John Maguire, 80-year-old owner of the Maguire Ranch in Kona, when interviewed in 1931, said that, so far as she knew, the Kaupulehu flow was poured out in 1801 and that Mr. Young visited it and told Reverend William Ellis about it in 1823. The eruption may have been like some on Mauna Loa that break out late in the year and continue several months into the next year. Persons remember the date as either of the two years. It is shown as 1800-1801 on plate 1."

Stearns, H.T., 1966, Geology of the State of Hawaii: Palo Alto, Pacific Books, CA, 266 p.

"Hualalai was last active in 1800-1801 when voluminous lava flows poured from a long crack on the northwest flank. Known as the Kaupulehu flow, it is remarkable for its cognate inclusions. The Lava contains thousands of tons of angular and subangular dunite and gabbro xenoliths mostly less than a foot in diameter. Feldspar crystals, some of gem quality, reaching three-quarters of an inch long also occur. Near the source vent small xenoliths coated with lava of 1801 are piled up like cobbles. These dunite xenoliths look like green candies dipped in chocolate. Before eruption, apparently, the magma stoped away a large precooled mass of dunite and gabbro. The xenoliths have been the subject of intensive study as they shed light on the character of rocks at depth. Also remarkable are the lava

stalactites on the sides of the channels in the flow.

"A line of spatter cones below the main belt road in the same area marks the source of a black flow known as the Huehue flow, which, according to the Hawaiians, also erupted in 1801. The olivine basalt contains pieces of partly charred wood in its tree molds as does the Kaupulehu flow. '

Richter, D.H., and Murata, K.J., 1961, Xenolithic Nodules in the 1800-1801 Kaupulehu flow of Hualalai Volcano, U.S. Geological Survey Professional Paper 424-b, p. B215-B217.

". . . Briefly reconstructing the history of the flow, it appears that the rapidly flowing, extremely fluid lava heavily charged with nodules - lost velocity and carrying capacity on reaching the area of reduced gradient. Here the early flows spread out in relatively thin sheets both on the level area and on the slopes below depositing the nodules in well-defined layers. As lava continued to flow into the level area a pond of considerable depth soon formed first by surface overflow and later by lava running under the surface and floating the crust. Eventually, as the lithostatic head increased the impounded fluid lava broke through the downslope wall of the pond and cut a deep channel through the nodule-bearing flows which had spread out earlier over the surface below the pond. As material drained out of the pond the still fluid lava in many of the nodule zones also drained away leaving discrete nodule beds without appreciable matrix lava. Toward the end of eruptive activity lava domes on the surface of the pond and portions of tubes within the pond collapsed, and it is in these collapse features together with the main lava channel below the pond that the spectacular nodule beds are now exposed."

McGetchin, T.R., and Eichelberger, J., 1975, Emplacement of the 1801 Hualalai lava flow, Hawaii, in Solid Earth Geosciences Research Activities at Los Alamos Scientific Laboratories (LASL): LASL Rept. LA-5956-PR, p. 77-82.

"Witnesses to the eruption included two victims; survivors described an unusually high velocity advance which reached the sea in the order of an hour, some 16 km from the source vents."

Schwartz, D.A., and Fornari, D.J., 1982, Submersible investigations of the northwest rift zone of Hualalai Volcano, Hawaii [abs.], Eos, v. 63, p. 1138.

". . . .Tongues of blocky lava from the 1800-1801 Huehue flow of Hualalai have flowed at least 8 km from the shoreline and drape the slope at the shallow end of the rift zone down to depths as great as 1000 m. Volcanic rock samples taken in situ

from these blocky lava tongues are chemical equivalents of shoreline Huehue lavas."

Macdonald, G.A., Abbott, A.T., and Peterson, F., 1983, Volcanoes in the Sea: Honolulu, Hawaii, University of Hawaii Press, 517 p.

[Same information as in Stearns and Macdonald (1946).]

Moore, R.B., Clague, D.A., Rubin, M., and Bohrson, W.A., 1987, Hualalai Volcano: A Preliminary summary of geologic, petrologic, and geophysical data, *in* Decker, Wright, and Stauffer (eds.), Volcanism in Hawaii: U.S. Geological Survey Professional Paper 1350, p. 571-585.

"Lava flows pose by far the greater danger. Hualalai's summit is only 15 km from Kailua; the average topographic gradient across the distance is 168 m/km, corresponding to a 9.5° slope. A flow as voluminous as that of 1800 could cover that distance in a few hours" [p. 584].

Moore, R.B., and Clague, D.A., 1991, Geology of Hualalai Volcano, Hawaii: USGS Miscellaneous Investigations Series Map I-2213, scale 1:50,000.

"Vent deposits . . . . and lava flows . . . . of historic A.D. 1800-01 eruption - On northwestern flank of volcano. Five principal vents occur discontinuously along 9-km-long segment of northwest rift zone. At highest (southeasternmost) vent, Kaupulehu Crater, little pyroclastic material is present; lava welled up inside preexisting cone and spilled down its flanks. Next vents to northwest produced most cinders and most voluminous flow. Lowest (northwesternmost) vents, including Puhia Pele, erupted extensive pahoehoe flows in A.D. 1801. Volume is estimated at $300\text{-}400\times10^6$ m^3. Basalt contains 1-3 percent olivine, 0-1 percent plagioclase, and 0-1 percent pyroxene phenocrysts. Xenoliths of mafic and ultramafic plutonic rocks are abundant. Radiocarbon ages of <200 years B.P. for flows from upper and middle vents confirm their temporal association with more extensive flows. However, paleomagnetic secular-variation studies suggest that distal end of flow from middle vent (3-4 km east of Keahole Airport) is older flow exposed by bulldozing."

Guest, J.E., Spudis, P.D., Greeley, R., Taylor, G.J., and Baloga, S.M., 1995, Emplacement of xenolith nodules in the Kaupulehu lava flow, Hualalai Volcano, Hawaii: Bulletin of Volcanology, v. 57, p. 179-184.

Baloga, S., Spudis, P.D., and Guest, J.E., 1995, The dynamics of rapidly emplaced terrestrial lava flows and implications for planetary

volcanism: Journal of Geophysical Research, v. 100, p. 24,509-24,519.

"The [Ka`upulehu] flow traversed the 15 km from the vent to the sea extremely rapidly... This inference is also supported by the documented time of approximately 1 hour quoted by Ellis [1842]" [p. 24,510].

[We believe that this is an incorrect citation because we cannot find such a statement in Ellis (1842).]

Appendix E: ARCHAEOLOGY

[Results of these studies are summarized in Figure 4.]

Reinecke, J.E., 1930, Survey of Hawaiian sites from Kailua, Kona to Kalahuipuaa, Kohala: mimeograph copy available in University of Hawaii at Hilo Library.

"The coast surveyed falls into four sections: . . . . the cursorily survey coast past the [Keahole] Light consisting of alternate hamlets on sandy beaches and waste stretches of lava flow and beach (usually coral). The pahoehoe about Lae Mano is of special interest.

"The coast formerly was the seat of a large population. Only a few years ago Keawaiki, now the permanent residence of one couple, was inhabited by about thirty-five Hawaiians. Kawaihae and Puako were the seat of several thousands, and the smaller places numbered their inhabitants by the hundreds. . . . when the economy of Hawaii was based on fishing and hoeculture this was a fairly desirable coast; the fishing is good; there is a fairly abundant water supply of brackish water some of it nearly fresh and very pleasant to the taste; and while there was no opportunity for agriculture on the beach the more energetic Hawaiians could do some cultivation at a considerable distance mauka.

"The remains on this strip of coast have some special characteristics differentiating them from the rest in Kona. . . . Third especially about Lae Mano and to some extent beyond are old salt pans of native construction, which are not found elsewhere in North Kona. Perhaps the large number of cupboard-like recesses in the dwellings at Lae Mano and elsewhere should be noted as a fourth characteristic."

". . . .Site 86. This series continues past the lighthouse almost to the dwelling by the 1801 Flow. . . ."

". . . . Site 90. North edge of Kaulana, at the edge of the flow and where the coral

beach encroaches upon it: Concrete salt pans; six house platforms; stagnant pool. A section of beach with walled pools and a few kiawe trees, is cut off by a wall. Adjoining it mauka are a house platform and pen. Within the wall are various patches of wall and one dwelling site. Back of the north end of the wall are six or seven traces of enclosures or sites of some sort, all very small....

"Site 94. House site in line with the three present houses. Pools and wells by clump of cocopalms. Past the clump is apparently a house site."

"There is some kiawe at Mahaiula, probably covering some sites. Owing to my hurried tour of the coast here, I did not see the heiau which Mr. J. Kaelemakule, a kamaaina of the place, says is located at the spot Kaelehuluhulu, on the beach. It is a fishing heiau, called HALE O HIU. He says that there are petroglyphs on the pahoehoe about 1 1/2 miles from Mahaiula; I did not find them either. . . ."

"Site 121. Remains at Kaupulehu hamlet: . . . ."

"Site 122. After crossing the abominable Kaupulehu Flow, west branch, one reaches a pahoehoe flat about 1 1/2 x 1/2 miles in extent. I have divided it, for purposes of description, into seven areas, but it should be understood that the ruins are practically continuous, if sometimes buried under the sand.

"The whole area is the most interesting on this coast, for several reasons:

1. The great number and continuity of the remains.
2. The apparent considerable age of many of the ruins.
3. The apparent lack of a water supply even barely adequate.
4. The large number of a localized form of storage cupboard, a well-built box-like form at the back of walled sites, due not doubt to the very hard, solid pahoehoe offering no handy little caves.
5. The large number of native salt pans. These were sometimes built directly on the pahoehoe as a floor; sometimes the base was built of carefully arranged flat rocks. As the sun's rays had to strike the pan directly, the walls were usually about 8-12" high, built of carefully selected stones. Sometimes the pan was rectangular, but oftener rounded or circular, about 8 or 10 feet across. The floor and the base of the wall were cemented with a hard native cement of good quality, which still clings to scattered stones and to patches of pahoehoe floor where there are now no walls. Salt is still gathered here, but from natural pockets. . . ."

"Site 129. Luahinewai is a pond behind a black sand beach; no ruins. Waiaelepi is a shallow pond of practically fresh water. "

Walker, A.T., and Rosendahl, P.H., 1988, Archaeological survey and test excavations Kaupulehu Makai Resort Project Area .- Lands of Kaupulehu and Kukio 1st North Kona, lsland of Hawaii: Rosendahl Associates Report 213-032686, 220 p.

Ching, F.K.W., 1971, The archaeology of South Kohala and North Kona from the ahupua'a of Lalamilo to the ahupua'a of Hanamana -- Surface survey Kailua-Kawaihae road corridor: Hawaii State Archaeological Journal 71-1, 260 p.

"Habitation Structures - walled shelters - C-shape Site 1174: Built of stacked pahoehoe on old pahoehoe. Partially covered by the 1801 lava flow.

"Foot Trails Site 1214: this trail is worn on ropy pahoehoe surface. It branches into two trails, one ending at point 1010C and the other heading toward a petroglyph field. The northern end of the trail is covered by a dark a'a flow possibly the 1801 flow.

"Most of the petroglyphs [in Area Theta] appear to be pre-contact. The pahoehoe on which they are located is overrun by the 1800 a'a flow. A footworn trail, makai of the petroglyphs, is also overrun by this same flow. There are no obvious historic petroglyphs (guns, ships, English letters, etc.) such as those found at Honokohau. Human figures with linear bodies greatly outnumber those with triangular bodies. The triangular body is believed to be a later development. . . ." [p. 231].

"The Fishpond of Paaiea in North Kona was reported to be the largest pond on the Island of Hawaii (three miles long by a mile and a half wide) until it was destroyed by an eruption from the western rift zone of Mt. Hualalai. This flow, which took place around the year 1801, lasted several months. It is said to have destroyed several villages, a number of plantations and a large bay (Ellis:1917:47). Ellis' informant was the haole ali'i John Young. When this flow finally stopped it covered four miles of coastline. Nine ahupua'a are located within the flow area at the coast. The tight spacing of most of these ahupua'a is an argument for the size of the Fishpond, as those land units bordering the pond would directly benefit. This also indicates the importance of the Fishpond as a major resource support.

"Numerous archaeological features were discovered in close proximity to this flow. These cover the land from the coast to about two miles inland. All lie on either old pahoehoe or a'a lava. Several of these, mainly C-shape, were found partially overrun by the flow of 1801. These features were noted at several locations, some over a mile apart. The flow thus provides a terminal date for these sites and strongly

suggests that these and other features here are prehistoric (Cluff:1969)

"Two discoveries of particular interest were found in this area, a Cave of Refuge (Feature 262) and a palaoa. Both of these finds are indications of the presence of chiefs in the area and speak of the importance of the region. Similar discoveries were made above the Fishpond of Wainana'lii fifteen miles to the north.

"The Fishpond of Kaulana, like Paaiea, was also destroyed by the Hualalai flow of 1801. The makai portion of Kaulana ahupua'a, in which this Fishpond was located, has been almost completely covered by the lava. A few sites are noted for this area [p. 245]."

Rosendahl, P.H., 1973, Archaeological salvage of the Keahole to Anaehoomalu section of the Kailua-Kawaihae road (Queen Kaahumanu Highway) Island of Hawaii: Bernice P. Bishop Museum Department of Anthropology Report 73-3,121 p.

"Complexes B and C are located about 45,000 ft (13,725 meters) from the Keahole end of the alignment (see Fig. 2), and might best be regarded as components of an even larger cluster of almost 200 features situated on an older, smooth-pahoehoe bed between two fingers of the historic 1800-1801 Kaupulehu flow from Mt. Hualalai. This large cluster, designated as Area Theta in the survey-project report [Ching, 1971: 49, Map 5], is composed principally of low-walled shelter structures scattered over an area approximately 2000 ft (610 meters) (mauka-makai) by 600 to 800 ft (183 to 244 meters) and ranging from 165 to 305 ft (50 to 93 meters) above sea level. The center of this large cluster is approximately 8750 ft (2668 meters) inland from the coast."

Total number of 162 features in complexes B and C. Area Theta includes a petroglyph field" [p. 22].

"A similar sequence of occupation, abandonment, and subsequent reoccupation is suggested by the age estimates available for Feature 701, also a dwelling cave site. Initial occupation might be placed at A.D. 1500 or earlier, and reoccupation at c. A.D. 1650" [p. 59].

"Complex D is located near similar foot trails. Except for the one dwelling cave (701), little can be said of the 62 features in the two clusters of Complex D. Virtually no midden remains or portable artifacts were recovered from these features, either from the surface or from the various excavated and dismantled structures. Whatever the specific nature of occupation associated with these simple features, it was probably temporary in duration.

"In contrast, occupation at the dwelling cave (Feature 701), located in the mauka cluster, can be interpreted as more extended in nature. Several interior structural features were noted, and a wide range of midden remains was recovered. As well, a wide variety of portable artifacts, totaling over 230 items, was found...

"Considered together, the structural and portable remains from Feature 701 all suggest occupation that was extended in nature and involved a range of general living activities. While impossible to argue conclusively on the basis of the stratigraphic or artifactual evidence, the possibility of a sequence of at least one abandonment and reoccupation, posed on the basis of the dating analyses, has been suggested already (see p. 55). It might be speculated that the cave, and perhaps the other features of Complex D, were occupied by people whose activities were related in some way to the nearby great fishpond named Pa'aiea (see Appendix A of this report). If Pa'aiea fishpond, destroyed by the extensive Huehue lava flow of 1801 from Mount Hualalai, were as large as reputed (c. 3 miles long by 1.5 miles wide), then Complex D would have been located quite close by" [p. 62].

"Complexes B and C should be considered as components of a larger cluster of approximately 200 features, including a small petroglyph field. Most features present are small, crude, low. stone-walled shelter structures from which midden remains and portable artifacts were almost totally absent. The surface area of the petroglyph field yielded scattered shell midden, numerous waterworn basalt pebbles, and many low-quality volcanic-glass flakes.

"The only readily apparent relationship between the petroglyph field and the shelter features is a spatial one. The position of the shelter structures between fingers of the historic 1800-1801 Kaupulehu lava flow from Mount Hualalai suggests the possibility of post-1801 occupation. The hydration dates from petroglyph-field glass samples indicate a probable prehistoric age.

"The nature of the archaeological remains from Complexes B and C make it difficult to propose a positive interpretation. Perhaps these crude shelter features represent the temporary encampment of a single good-sized group passing through the area -- for example, a group of warriors. Or perhaps the shelters represent short-term visits to the area for activities of social or religious significance" [p. 63].

Soehren, L.J., 1963, Archaeology and history in Kaupulehu and Makalawena Kona, Hawaii: Bernice P. Bishop Museum Rept., 43 p.

". . . .The Ka'upulehu flow broke out nearer the summit of the mountain, at Hina-kapo-'ula, and ran north toward Kiholo. About half way down the slope most of the

flow crossed over into the neighboring land of Pu'u Wa'awa'a, but then divided about three miles from the sea and sent a western branch back to Ka'upulehu, leaving an older pahoehoe flow between the two streams of a'a.

"Almost a mile and a half of the older shoreline was isolated between the two branches. Near the middle of this shore is Pohaku-o-ka-hae, a prominent finger of pahoehoe projecting into the sea, which marks the eastern boundary of the land of Ka'upulehu. It is in this kipuka that the greatest concentration of sites was found.

"The western branch of the flow extends to the pond at Kahuwai Bay and undoubtedly reduced the ponds to its present size. Near the mauka end of the pond sand has been found under the edge of the lava, indicating the presence of a beach prior to the flow (Stearns and Macdonald, 1946, p. 147). An examination of vertical aerial photographs of the area suggests that at about this point, roughly 500 yards inland, the stream of molten lava had reached deep water. Shallow surface water or concentrated ground water seems to have been reached some distance inland from the old beach, perhaps another half mile. Sites 18 to 23 were thus much nearer the shore at the time of their occupation than they are at present."

"The pond itself, whose name remains unknown, is largely filled with rushes... Two well built stone walls were found beneath the waters at the makai end of the pond, undoubtedly erected to hold fish. Their submersion may be partly accounted for by local subsidence of the shore in connection with the 1801 lava flow a few yards away, and the action of the same tsunami which have destroyed so many other sites" [p. 25, site 14].

"About a half mile inland from Ka'upulehu pond and immediately adjacent to the 1801 lava flow is an interesting complex of features including petroglyphs, papamu, ruined structures and a cave.... Of most interest is the cave, formed by the drainage of lava from under the hardened pahoehoe of the surface. One branch of the cave runs makai parallel to the 1801 lava flow and contains three burials.... A second branch of the cave extends almost under the 1801 flow, and contains about a dozen burials . . . ." [p. 30, site 22].

Clark, S.D., 1984, An archaeological reconnaissance of Natural Energy Laboratory Hawaii (NELH) Property Keahole Point, North Kona, Hawai'i: Bernice P. Bishop Museum, Department of Anthropology Manuscript 110784, 37 p.

[A few sites are noted off the Huehue flow and are dated between 1700 and 1800 A.D. No mention is made of any relation between sites and the flow.]

Barrera W. Jr., 1985, Keahole Point, Hawaii: Archaeological reconnaissance (revised version): report prepared by CHINIAGO, Inc., 1040B Smith

St., Honolulu, Hawaii 96817, 49 p.

"The sites located during this reconnaissance indicate a light probably temporary, utilization of the inland area and a primary concentration of settlement at the coast. Such inland features as were found [with the notable exception of Site 10154] are small scattered mounds and crude shelters with little or no midden deposits. The coastal sites on the whole can be characterized as large well-built structures of a more permanent nature, as evidenced by the presence of considerably greater amounts of midden materials and artifacts."

[Site 10154 is] ". . . . a habitation structure measuring approximately 13 m in length and 3 meters in width, and standing to a height of about 1 meter."

Appendix F: BOUNDARY DESCRIPTIONS

[Boundary descriptions are difficult to obtain and all that were available to us are included here, transcribed by us from longhand versions in the Hawaii State Archives. They are transcribed here as faithfully as possible, including spelling and punctuation errors. Numerous references to something like "CX" is short-hand for "cross-examined". We hope that in describing boundaries that now are located on and over the lava flows of the most recent series of eruptions of Hualalai, the describers might mention details of the relocation of the boundaries by the eruption. Unfortunately, this was not the case and there is only one mention of the Ka`upulehu flow as " the lava flow of 1801"]

203.
The Ahupuaa of Puawaa District N Kona
Island of Hawaii

On this the 13th day of August AD 1873 the Commissioner of Boundaries for the 3d J.C. met at Kiholo N Kona for the purpose of hearing the application of J.O. Dominis for the Commissioners of Crown Lands, for the settlement of the boundaries of Puawaa situated in North Kona Hawaii. Notice of hearing personally served on J.G. Hoapili Agent for Government Lands, Est. of Kamehameha V + c
Present G. Kaukuna for applicant

Aoa K. Sworn
I was born at Puawaa North Kona Hawaii at the time of Keona 1st lived there till a few months ago when I moved to the adjoining lane Puanahulu. I am a kamaaina and know the boundaries Lono, an older cousin of mine, now dead, pointed out the boundaries to me; as the different lands had different Konohiki and different Koele +c. The land of Puawaa is bounded on the Southside by Kaupulehu and mauka by the same. On the North by the land of Puanahulu, and makai by the sea. The ancient fishing rights of the land extend out to sea.

The boundary at sea shore between Puawaa and Kaupulehu is at Pohakuokahai, a rocky point in the aa, on the lava flow of 1801, from Hualalai to sea. I think it is the third point from Kiholo, in the flow as you go towards Kona; thence the boundary between these lands runs mauka on aa to Keahupuaa, a pile of stones, a short distance makai of the Government road, on a spot of old lava in the new flow thence mauka to Oweowe, a hill covered with trees said hill being surrounded by the flow. The kipuka pili to the South is on Kaupulehu thence mauka to Mawae on a narrow strip of aa, in the middle of the flow with wider branches of the flow on each side of this strip thence mauka to where the aa turns towards Kona, as you go up Hualalai. Then the boundary follows up the East side of the flow to Puuako, a waterhole in the Pukeawe trees, on the old trail from Kainaliu to Puanahulu, above the woods. There the boundary of these lands turns towards Kohala, along the old trail to Waikulukulu, a cave with water dripping from the sides, a little above the woods. thence along the trail to Puunahaha, a hill with cracks running along the top, this is above the large hill at the base of Hualalai mauka of here. It can be seen from here when the mountain is clear. This hill is the corner of Puawaa where Kaupulehu and Puanahulu unite and cut it off.X From this boundary or point - the boundary between Puawaa and Puanahulu runs makai to Iana o Maui, a large cave in the Pahoehoe, thence makai along the edge of the aa. (the pahoehoe being on Puanahulu, to Kapohakahiuli, a large cave with water in it; Thence makai and running edge of aa, on south side of Haahua, a pali, with old cultivating ground at the foot, thence to Kaluakauwila, a pali running towards the sea and along the norther edge of the aa near the foot of the pali; thence the boundary runs to

Kukuihakao, a place where people used to live, along the edge of aa. Thence to Kalanikamoa and along an old iwi ana through this place; Thence the boundary runs to Ahuakamalii, a pile of stones, built in olden times on soil. Thence along old trail to Ahinahina running through the middle of the old cultivating ground. Thence makai along the road to Uliulihiaka, a Kahawai now covered by lava flow of 1859, thence makai on the flow of 1859 to Kuanahu, an anua in lava, thence makai to Punaha on old pahoehoe; thence makai to Mimiokanahi, an ahua covered by flow of 1859; thence makai between PunoaLonoakai on Puawaa, and Punoa Kaualu on Puanahulu, now covered with lava, except small portions of the one on this land. Thence to Kalaeiokekae a point - on old lava, on the edge of the flow of 1859 near Keawaiki. I used to go on the mountain after sandalwood, and know these boundaries.
Cx[d]
A hill called Mailihakei is the corner of Keauhou and Kaupulehu. I do not know the boundaries of Keauhou beyond this point. Keauhou does not reach Puawaa.

Nahinalii [K.] Sworn (Witness on Puawaa
I was born here, at the time of the building of Kiholo. I lived here till 1865 when I moved to Kawaihae. Keopu, an old kamaaina (now dead) told me some of the boundaries, and afterwards I went and saw them. Pohakukahai, is the boundary at shore, between this land and Kaupulehu, from this pint the boundaries between these two lands, run mauka to Keahukaupuaa. Paniau is the name of the name place where the Ahu stands, thence mauka to Oweowe, which is as far as I know the boundaries on that side.

The kamaaina of this land told me that the boundary, at the shore between Puawaa and Puanahulu, is between Lonokai, on Puawaa and Puuokanalii on Puanahulu, they are very close to the shore.

The kamaaina of Puanahulu told me that the boundary is at Laeokaaukai, on the Kona side of the houses at Kaawaiki.
I do not know the boundaries mauka of this point until you come to Ahua okamalii, an ahua on the Kona side of the pali some distance from the base; from thence the boundary runs mauka to Puuloa, a pali in the woods which runs mauka toward Hualalai; thence the boundary runs mauka to Kaluaokauila, a long iwi aina, through a cultivation ground.

This is a far as I know the boundaries and have not heard what the other boundaries are,
Have heard that Kaupulehu cuts Puawaa off above the woods and joins Puanahulu.
Cxd

Note
Mr Kaukuna states that he is unable to procure any more kamaaina here. but that there is a man named Keawekolana, a kamaaina, of Puanahulu living in Honolulu.

October 2, 1996

Case Continued until further notice

RALyman
Commissioner of Boundaries 3rd J.C.

See Folio 428. Book B

The Ahupuaa of Kaupulehu District of North Kona, Island of Hawaii 3 J.C.

On this the 8th day of June AD. 1874 the Commission of Boundaries for the Island of Hawaii 3 J.C. met at the store of Henry Cooper. Kailua North Kona, on the application of L.H. Harris Attorney at Law for the J.O. Dominis Administration of the Estate of Kamehameha V. for the settlement of the boundaries of Kaupulehu situated in the District of North Kona Island of Hawaii Notice of hearing served by publication in the Hawaiian Gazette of May 20th 1874 and due notice personally served on all owners or agents of adjoining lands as far as known. Present J.G. Hoapili, and the lessees of Kaupulehu and Keauhou.

For Petitions Folio 240 and 241 Book A.
Testimony

Keliihanapule K. Sworn (rather a young man)
I was born at Kiholo do not know when. I now live at Kohanaiki and know the land of Kaupulehu and its makai boundaries. My Kupuna told them to me. Bounded on the North side by Puawaa Kalaemano is the boundary at seashore between these two lands, a place where they make salt. Thence passing through the middle of Kalaemano to a mawae called Paaniau at the Government road. there is a pile of stones just mauka of the alanui. thence to a kihapai called Hikuhia thence to Puuki, a hill where Kaupulehu joins Puanahulu. Thence along the land of Puanahulu to Puualala. Puawaa bounds it to Puuakowai, thence along Puanahulu to Ahuakamalii, a spot on the lava flow of 1859. This is as far as I know on that side. Bounded on the South side by Kukia owned by Pupule, the boundary at shore is in the middle of a place called Keawaiki. The land had ancient fishing rights extending out to sea. From Keawaiki to Papaomino, a pile of stones at the corner of Pupule's land, thence along said land to Keonehehee a kihapai thence to Puuokai the mauka corner of Pupule's land. Thence along the Government portion ofKukia turning towards Kona and running makai side of Puhiapele, a large ahu aa, makai of this hill the boundary turns and runs mauka over this hill, thence to Maunakilowaa a resting place where you look towards Kona and Kohala, thence mauka to Kauakahiapaoa, this is the mauka corner of Kukia; and there is a large hole there, thence along the land of Mahaiula to Pahulu, mauka corner of Mahaiula. one half of this place belongs to Kaupulehu. Thence along the land of Kaulana to a kihapai called Kauaiki. This is an old kihapai belonging to Kaupulehu. thence along Kaulana to Moonuiahea, a hill where they used to worship where the land called Kau joins Kaupulehu Thence along Kau to Kaimuki, a place where they used to catch uwau, below the Koa woods. Thence along the land of Kaloko to Puualala a punawai. this is as far mauka as I have been told the boundary of Kaupulehu. I do not know where Kaupulehu joins Keauhou

CXd
I do not know a place called Pohakuokahai. the place where they make salt at the sea shore, is on the Puna side of the lava flow, the place I call mawae is at the Government road. the place called Puuoweoweo is on Kaupulehu, and not on the boundary at the point where the aa turns toward Kona, as you go up the mountain. The boundary runs straight up. I do not know a place along there called Waikulukulu or Puuohaha - Puuohaha is an ahua aa, in the middle of Kaupulehu I know a place called Kanoa in the middle of Kaupulehu. I do not know where Puulehu is.

Kahueai Sworn.
I was born here at Kailua at the time of building the heiau. am a kamaaina of Kona and now live at Puawaa. Know the land of Kaupulehu, my kupuna (now dead) told me the boundaries, he was an old bird catcher. The boundary of Kohala side at shore is a spot of sand called Kalomo on the South side of Kalaemano, thence to Keanaowaea at the Government road, way towards the aa, thence to Hikuhia, crossing the aa, thence to Oweowe a cave thence to Pualola a koa grove thence to Pualalaiki, a second Koa grove, there the boundary turning towards Kona runs to a crater called Pohokinikini thence to Kalulu, a cave, thence to Puuakowai, a water hole, there the boundary turns towards Mauna kea, and runs to kolekole thence to Puuiki, thence to a strip of aa opposite a hill called Mailehahei where Keauhou cuts Kaupulehu off, the sand on the mauka side of the aa is Keauhou. Thence to Ihuanu, a place on Keauhou the boundary is below here running along the foot of the pali, thence to Hapuumahoe, the boundary running between these two hills thence to Kipahee a crater and water hole, thence to a hill called Hualalai, on the mountain. The boundary passing on the Kau side of this hill. Thence to Kaluamakani. I do not know whether Keauhou joins Kaupulehu here or not. but this is the boundary of Kaupulehu There are two craters at Kaluamakani belonging to Kaupulehu. Thence along Lanihau to Kumumamani a cave on the mauka corner of Kaloko a little towards the woods thence to the top of Hina-a-kapoula a hill with a crater on top. Kaloko is on the side of this hill, thence along to aa where the boundary leaves Kaloko, thence along the heads of the Kalava's to Kaiwiopele thence to Moonuiahea, a hill, thence to Makaleia an anawai. (Pahulu is in the middle of Kaupulehu.) Thence to the further slope of Akahi hill; where the boundary turns toward Kohala. Thence makai Along Kukia to Maunakilawa, at the Government road. thence to Puhiapele, thence to some hills makai, I do not know the names thence along Pupule's land to shore. Bounded makai by the sea. Ancient fishing rights extending out to sea.
Cxd
The mountain used to be called Hainoa but is now called Hualalai. the top is called Kalalakaukolu. I can go mauka and point out all these boundaries.

Note
J.G. Hoapili states that he has no more witnesses, but he hears there is a kamaaina in Honolulu. He asks to have the testimony of Puawaa taken August 13th, 1873 and of Kauhou taken August 4th & 11. 1873. adjoining Kaupulehu introduced as evidence in this case. Granted.

RALyman
Commissioner of Boundaries 3 J. C.

Copy

Aoa K. Sworn. (Witness on Puawaa)
The boundary at sea shore between Puawaa and Kaupulehu is at Pohakuokahai a rocky point in the aa, on the lava flow of 1801, from Hualalai to sea. I think it is the third point from Kiholo in the flow as you go towards Kona thence the boundary between these lands runs mauka on aa to Keahupuaa, a pile of stones, a short distance makai of the Government road, on a spot of old lava in the new flow thence mauka to Oweowe, a hill covered with trees and surrounded by the flow. The kipuka pili to the South is on Kaupulehu thence mauka to Mawae on a narrow strip of aa, in the middle of the flow with wider branches of the flow on each side of this strip thence mauka to where the aa turns towards Kona, as you go up Hualalai. Then the boundary follows up the East side of the flow to Puuako, a waterhole in the Pukeeawee trees, on the old trail from Kaiholiu to Puanahulu above the woods. There the boundary of these lands turns towards Kohala along the old trail to Waikulukulu, a cave with water dripping from the sides, a little above the woods thence along the trail to Puunahaha a hill with cracks running along the top, this is above the large hill at the base of Hualalai mauka of here. It can be seen from here when the mountain is clear. this hill is the corner of Puawaa where Kaupulehu and Puanahulu unite and cut it off.
Cxd
A hill called Mailihakei is the corner of Keauhou and Kaupulehu. I do not know the boundaries of Keauhou beyond this point. Keauhou does not reach Puawaa.

Nahinalii K. Sworn (Witness on Puawaa
I was born here, at the time of the building of Kiholo. I lived here till 1865 when I moved to Kawaihae. Keopu, an old kamaaina (now dead) told me some of the boundaries, and afterwards I went and saw them. Pohakukahai, is the boundary at shore between Puawaa and Kaupulehu, from this pint the boundaries between these two lands run mauka to Keahukaupuaa. Paniau is the name of the place where the Ahu stands. thence mauka to Oweowe, which is as far as I know the boundaries on that side. Have heard that Kaupulehu cuts Puawaa off above the woods

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Keakaikawai K. (Witness on Keauhou 2d)
The boundary of Keauhou runs up the mountain to a cave on the side of the

mountain above the woods called Waikulukulu thence to Puuakawai an old water hole no filled up by cattle tramping around it. This place is the junction of the land of Kaupulehu with Keauhou, thence the boundary runs to the mauka side of a hill called Haalulu in a hollow between the hill and an ahua thence along Kaluanakani a large hole or crater there Kaupulehu ends, and Honuaula joind Keauhou
Cxd
I have never heard that Kaupulehu reaches to the top of Hualalai. My father pointed out these boundaries to me.

Keliikanakaole [K.] (Witness on Keauhou[2])
The boundary of Keauhou[2d] runs along Honuaula to Hualalai a hill on the north side with a deep crater in it. Said hill is the junction of Kaupulehu with Keauhou and the mauka corner of Honuaula. the brow of the precipice is Honuaula and the land back is Keauhou. Kaupulehu comes to the pahoehoe at the base of Hualalai hill thence along the head of Kaupulehu to the hills called Napuumahoe, on the makai side the aa being on Kaupulehu and the pukeawe on Keauhou. Thence to makai side of a hill mauka of lae koa, where my Makuakane lived. Kaupulehu ends at the koa grove.
CX
Waikulukulu is a cave at the base of Hualalai hill

Case Continued till further notice to all interested parties

RALyman
Commissioner of Boundaries 3[d]J.C.

428.
Puawaa N. Kona Hawaii

Hilo June 14-1876..

Case Continued from Aug. 13th, 1873.
See Folios 253.254. n 255. Book A..
D.H. Hitchcock filed map + notes of survey.
D.H.Hitchcock K. sworn says.

I surveyed Puawaa taking Aoa for my kamaaina. I found no dispute as to boundary between Puawaa, and Puanahulu. On the boundary between Kaupulehu and Puawaa there is a dispute. The witness Kahueai of Kaupulehu I found was dead. Commencing on the beach at place called Laemano, old salt works, I took it at an old wall with sand each side, and old salt work on the South side, and salt works some distance off on the north side. Thence we surveyed to Ahu at Mawae a short distance below road, as Aoa pointed out to me. The other kamaaina pointed out the boundary towards Kona taking old cultivating ground Oweowe, that Aoa said always belonged to Kaupulehu. The Ahua Aoa pointed out is near cave. Thence I ran mauka to a point of Aa running down into a kipuka, thence I ran a straight line to Puuakowai. I found that the witness of Puawaa + Kaupulehu all meet at Punakowai, but Keliihanpule's evidencecroped the land of Puawaa to Puuiki and then back to Punakowai. From Punakowai I ran a straight line to Pohakunahaha. It is a prominent mark on side of mountain, an old crater with three divisions in it, middle division belongs to this land, One of the other divisions belongs to Kaupulehu, and another to Puanahulu. Punihaole was with me when I surveyed Puawaa, on the Puuanahulu side, and said he was satisfied with the survey. He is the lepee of Puawaa. Cxd Cooper claims to Puuiki for Kaupulehu. I surveyed as pointed out by Aoa, and my judgement on examining evidence.
Case Continued until further notice to interested parties.
RALyman
Com. of Land Boundaries 3d J.C..

October 2, 1996

In RE Boundaries of Kaupulehu
District of North Kona - Island of Hawaii.

The Boundary Commission met at the house of J.G. Hoapili, Keauhou; North Kona, on the 15th of June, 1886, in accordance with Notice in the Hawaiian Gazette and Kuokoa of May 1886. - there being present, J.M. Alexander, S.W. Mahelona, D. Makainai, D. Alawa, and many others.
J.M. Alexander and S.W. Mahelona, for Petition.

Tracing of Map, and Notes of survey presented by J.M. Alexander, the Surveyor.

Evidence

J.M. Alexander - Sworn - During the year 1885, I surveyed the land of Kaupulehu - mauka it joins Puwaawaa. The kamaainas, Luahine and others, shewed me the boundaries. Ikaaka of Kaupulehu kai was the guide. makai. - Mr. Hitchcock had surveyed this land formerly, but never made a Map - on our surveying tour, we often came to piles of stones which the guides said were put-up by Mr. Hitchcock; one celebrated place, "Keahukaupuaa", below the Government Road, was a pile of stones, and Hitchcock's flag pole. above that toOeowe, Ikaaka and Luahine were the guides, and to Puluohia; they told me the boundaries went on to "Puakowai" water hole. - Punihaole and Keanini sent Keanini a guide who went with Hitchcock, to point out the places, Puakowai, Puupohaku, +c.
we found the water hole as was said. Keanini, Kalamakini, and some other old men at Kaupulehu kai, described the mauka boundary to me, and sent Halona to show me the boundary at "Mailehahee".
where we found the pile and mark that Aaiona said Hitchcock put up when surveying. Kalamakini told me the boundary from Mailehahee to East of Hualalai, and we went there, to the Government Trig. Station - and at Puunahaha Keahous 2^{d} joins Kaupulehu and they run along together to the top of Honuaula, the West Trig. Station, where is an Iron pin, in the ground, and marks on rocks;- then on to a koa grove, and on in woods, adjoining sundry lands. WE marked all the corners of this land with large piles of stones and marked rocks. Kalamakini also went on, adjoining Kaloko, to place near Palahalaha - then to Kawaiokalaepuni, and to Pulehu. Hopulaau and son showed the rest of the boundary on to Moanuiahea, and on to "Puhiapele", and on to head of Kukui 1st survey by J. Fuller, Grant 2121 to Kukulu. - I took the boundaries as per. said Grant, from there to the sea. This is the Map and notes of survey I made. I surveyed along the sea shore, but do not give the bearings, as the sea is the boundary. - some of the witnesses are too far off, or too feeble to come here today - the land is much of its lava.
I have compared my survey with the surveys of the adjoining lands, where there are any, at the Government Survey Office, and this is the correct survey of this land.
I have brought Aaiona and Kalamakini as witnesses.

#

Kalamakini - S. - I know live at Kahaluu - have lived formerly at Kaupulehu, and know that land well at Puuwaawaa. - At Puakowai I began to shew the boundary to Alexander, and on to Pohakuloa, and Mailehahee, and Pukaiki, between Honuaula and Kaupulehu, and on to "Hinakapoula", adjoining Kaloko. then to Palahalaha, along Kaloko, then to "Waiakalaepuni", and on to Pulehu, where the Government lands end; then on to "Moanuiahea", adjoining "Punikala." That was all I know - others shewed the rest.

#

Aalona - S. - I live at Kailua - I shewed the surveyor Alexander, the place "Mailehahee", a hill between Kaupulehu and Keauhou 2^{d} on the East of Kaupulehu and North of Keauhou - then to Puumanu - then to Lalakaukolo on the summit of Hualalai, then I returned home

#

Alexander - recalled - Puuwaawaa has not been surveyed. Kukio 1st is the only land adjoining Kaupulehu that had been surveyed - J. Fuller surveyed it.

Testimony Closed.

It is decided that the Boundaries are to be as given in the Notes of survey.

F.L. Lyman
Commissioner of Boundaries

No 160

Certificate of Boundaries of the Land of Kaupulehu. District of North Kona, Island of Hawaii -

L.C. Award, No.

Commission of Boundaries

Third Judicial Circuit, F.L. Lyman Esq. Commissioner.

In the matter of the Boundaries
of the land of Kaupulehu
District of North Kona
Island of Hawaii

Judgement

An application to decide and certify the Boundaries of the Land of Kaupulehu, District of North Kona, Island of Hawaii having been filed with me on the 13th day of May, A.D. 1886, by J.M. Alexander, for and in behalf of Mrs. Bernice Pauahi Bishop's Estate, in accordance with the provisions of an Act to facilitate the settlement of Boundaries +c., approved on the 22d day of June, A.D. 1868; now therefore, having duly received and heard all the testimony offered in reference to the said boundaries, and having endeavored otherwise to obtain all information possible to enable me to arrive at a just decision, which will more fully appear by reference to the records of this matter by me kept in Book No. 5, page 30, and it appearing to my satisfaction that the true, lawful and equitable boundaries, are as follows, viz.

Beginning at the S.W. corner of Puu Waawaa at the seaward extremity of the ledge called Pohakuokahae, whence the Gov't. trig. station on Akahipuu is S. 2°31'43"W (True) 36137 feet; thence the boundaries run by the true meridian to corners marked by ahus over rectangles cut in rock with crosses cut on surrounding rocks as follows.

S25°47'47"E 13713 feet along Puuwaawaa toKeahukaupuaa on the West side of an "aa" flow, and 440 feet below the Kiholo road, whence Akahipuu is S17°39'4"W 24938 feet; thence

S37°9'3"E 16752 feet along Puuwaawaa to a "lae aa"
on the West side of a lava flow in Oweowe, whence Kuili is
N77°11'11"W 32178 feet; thence

S19°29'13"E 7423 feet along Puuwaawaa to an "aa" flow inPuluohia; thence

S20°47'33"E 16726 feet along Puuwaawaa to the waterholePuakowai thence

S82°21'17"E 8530 feet; along Puuwaawaa to the knollPohakuloa; thence

S71°27'54"E 10481 feet along Puuwaawaa to the knollMawai, thence

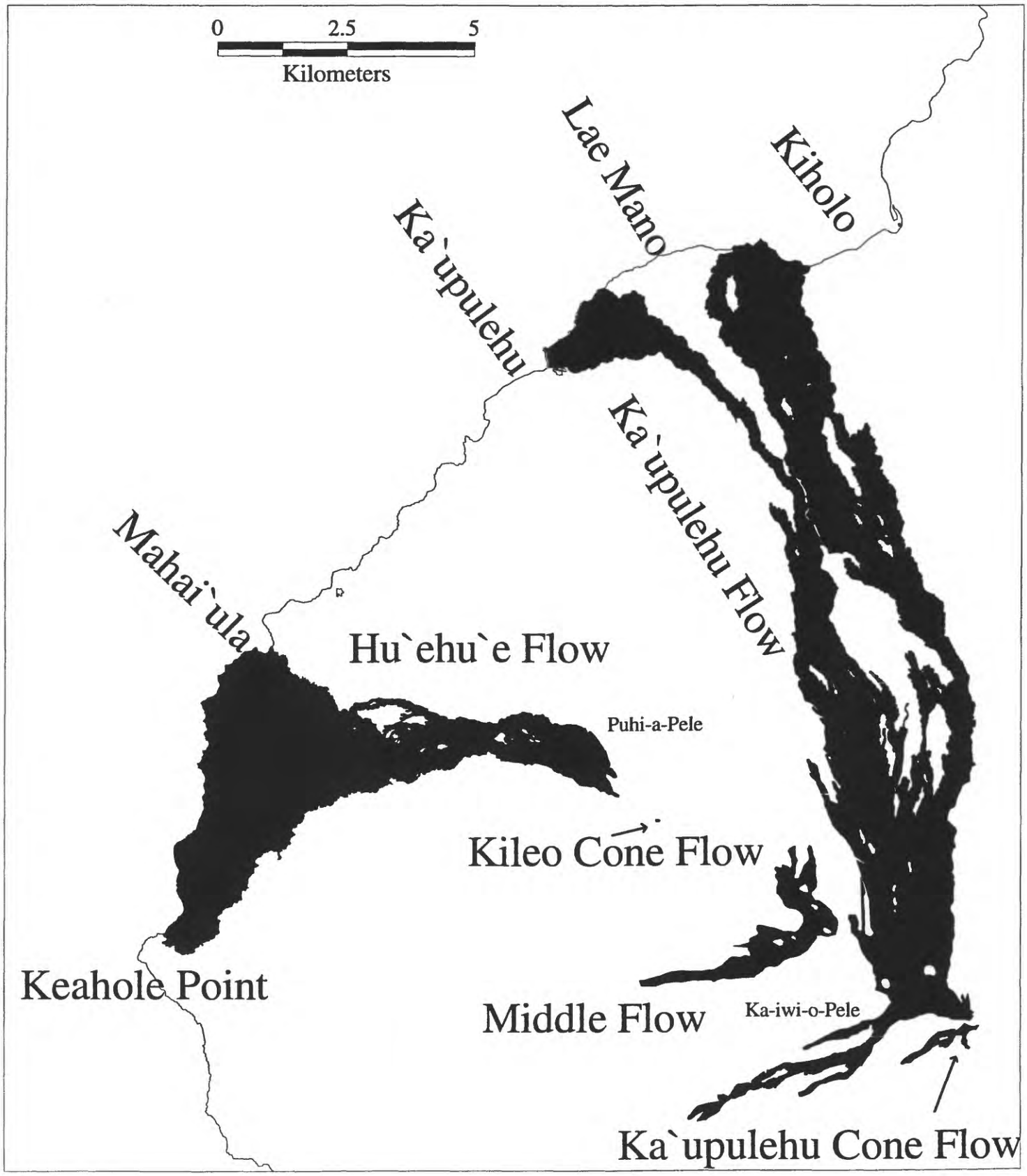
S78°9'17"E 9290 feet along Puuwaawaa to theS.W. peak of the rent crater hill, Puu

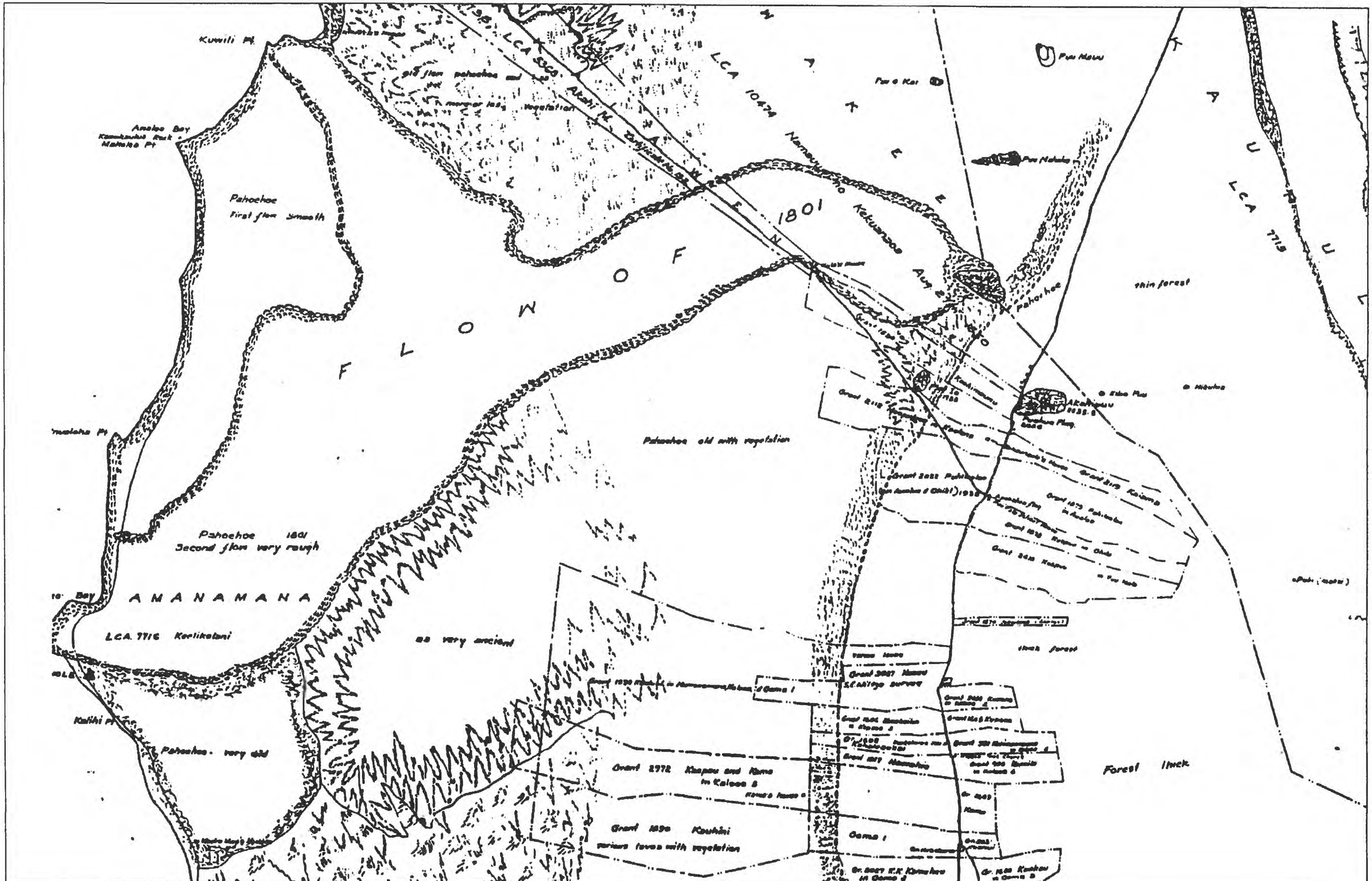
Nahaha, at the upper edge of the forest and at the South corner of Puuwaawaa thence
S37°22'42"E 11383 feet along Keauhou 2nd to the E rim of Mailehahee the hill furtherest down the E. slope of Hualalai thence
N78°53'37" W 24683 feet along Keauhou to the Gov't. Trig. Station E Hualalai; thence
S88°32'33"W/ 2096.9 feet along Keauhou 2nd to the Gov't. Trig. Station, W. Hualalai, thence
S80°30'17"W 6499 feet along Honuaula to a knoll above - a "Lae Koa" thence
N39°47'53"W 15509 feet along Honakahou and Kaloko to the E edge of the woods, whence Hinakapaula is
S62°29'28" E 1550 feet Kaloko to a little N E of the waterhole, Palahalaha whence Hinakapoula is
N88°27'23" E 7058 feet; thence
N80°22'52" W 1366 feet along Kaloko to the S W side of the Kalaoa road at Kawaiokalaipuna thence
N66°15'34"W 2875 feet to the N side of the Kalana road at Pulehu thence
N16°53'28"W 7021 feet along Kalana and other lands to the mauka side of Puu Moanuiahea thence
N35°45'48"W 4108 feet to the east side of a cavern thence
N63°48'4"W 1343 feet to the mauka end of Kukio 1st thence
N44°24'2"W 6177 feet to the South peak of Puhiapele; thence
N12°6'39"W 12192 feet to the East corner of Grant 2121, to Pupuli, thence
N10°35'30"W 3168 feet along Kukio to the West side of Puu Poopoomino, thence
N29°55'13"W 5280 feet along Kukio; thence
N33°21'36"W 1491 feet along Kukio 1st, thence
N43°11'40"W 1158 feet along Kukio 1st to the shore, thence
N53°32'54"W 142 feet to the ocean, thence along the ocean to the point of beginning.
8 folio descrip. Area 23545 Acres.
(as surveyed by J.M. Alexander, A.D. 1885)

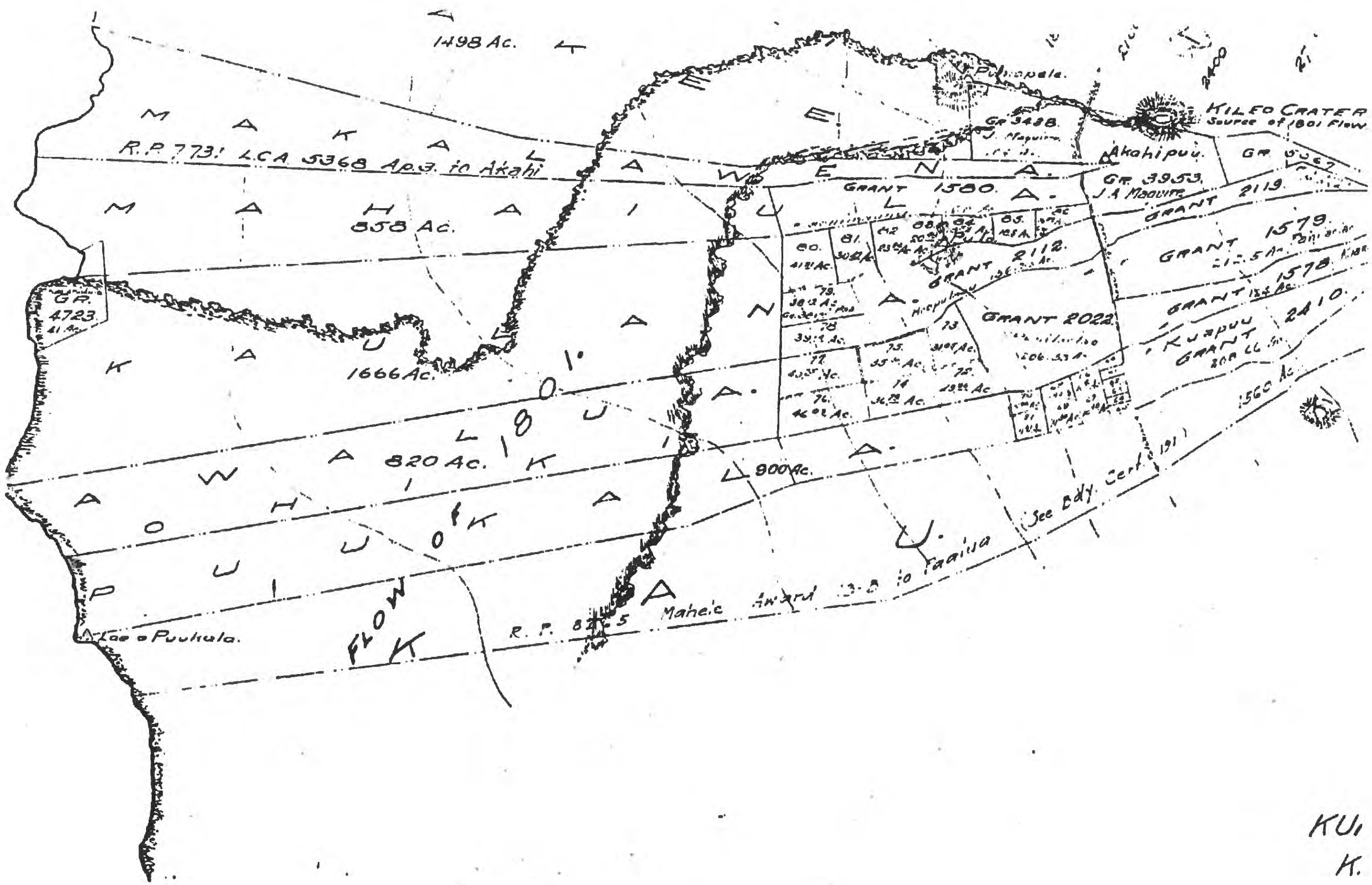
It is therefore adjudged and I do hereby decide and Certify that the Boundaries of the said land, are, and hereafter shall be as herein before set forth.

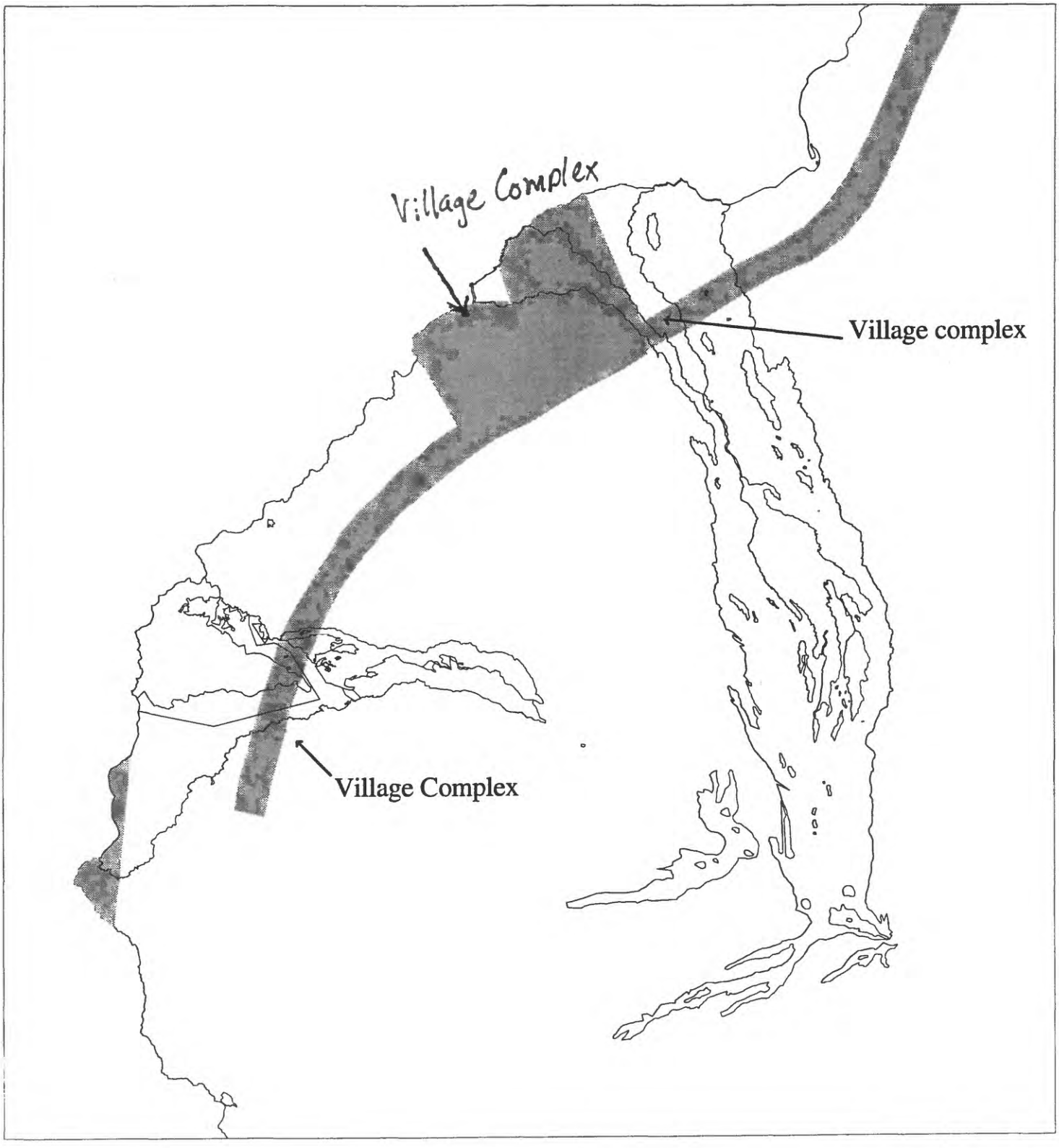
Given under my hand at Keauhou, North Kona, Island of Hawaii, the fifteenth day of June, A.D. one thousand eight hundred and eighty six.

F.L. Lyman
(11 folio - copy) Commissioner of Boundaries.


0
2.5
5
Kilometers
Lae Mano
Kiholo
Ka`upulehu
Ka`upulehu Flow
Mahai`ula
Hu`ehu`e Flow
Puhi-a-Pele
Kileo Cone Flow
Keahole Point
Middle Flow
Ka-iwi-o-Pele
Ka`upulehu Cone Flow


FLOW OF 1801
LCA 10474 Namauu no Kekuanaoa Aug 2
LCA 7715
LCA 7716 Kaelikolani
ANANAMANA
Kuwili Pt.
Amaloa Bay
Pahoehoe
First flow Smooth
Pahoehoe 1801
Second flow very rough
Pahoehoe old with vegetation
as very ancient
Pahoehoe very old
Kalihi Pt
thin forest
thick forest
Forest thick
Grant 2772 Kaapuu and Kamo in Kaloaa 8
Grant 1030 Kauhini
various lavas with vegetation
Akahipuu
Puu Mahoe
Pohoehoe
Pahoehoe


KILEO CRATER
Source of 1801 Flow
Puhipele.
Akahipuu.
GR 3438.
GR. 3953.
J. A. Maguire
GRANT 2119.
GRANT 1580 A.
GRANT 2112.
GRANT 1579.
GRANT 1578.
GRANT 2022.
GRANT 2410.
Kuapuu
1560 Ac.
1498 Ac.
R.P. 7731 L.C.A. 5368 Ap. 3. to Akahi
358 Ac.
1666 Ac.
820 Ac.
900 Ac.
GR. 4723
Lae o Puukala.
R. P. 8215 Mahele Award 13-B to Faaiua
(See Bdy. Cert. 191)
FLOW OF K
1801
KU
K.


Village Complex
Village complex
Village Complex