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Office of the Director

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May 30, 2001

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawai'i 96813

Subject: *Finding of No Significant Impact (FONSI) for the Faulkes Telescope Facility.*
TMK 2-2-07:08, Island of Maui, Hawai'i.

Dear Ms. Salmonson:

The University of Hawai'i has reviewed the comments received during the 30-day public comment period that began on January 23, 2001. The agency has determined that this project will not have significant environmental effects and has issued a FONSI. Please publish this notice in the June 23, 2001 OEQC Environmental Notice.

We have enclosed a completed OEQC Publication Form and four copies of the final EA. Please call Rolf-Peter Kudritzki, Director, University of Hawai'i Institute for Astronomy at (808) 956-8655 if you have any questions.

Sincerely,

Rolf-Pet Kudritzki

Rolf-Peter Kudritzki
Director

which silence prevails and the only thing heard are the *pule*. That is all. That is high *`awa* ceremony to the gods. And, then you go all the way down to personal — *`awa* ceremonies between you and your god, which you do as you see fit, along certain parameters that are for you. So, everything in between, there is variation. And, the variations come because of the occasion itself, that being "what is the purpose of the ceremony" and "who is the ceremony for" and, then, you have all the different variations and levels in between.

Some of how people do *`awa* today has a practical side to them and they include it as a practical side and some of it has traditional. Let's say, in a high ceremony, for me, there is no sound other than the *pule*. You don't talk, you don't clap, you don't do any of that for the high ceremonies.

CSH: **What would be an example of a high ceremony? Would that be something done in a halau or honoring a specific person perhaps?**

HHP: That would be something done when you are approaching your god alone. It has nothing to do with man. It has to do with the ceremony and the god. Man is only the facilitator of the ceremony. So, if you are in the ceremony, you are communing with you and your god. Man has no function in this. It is between you and your god. And, then what is the overall ceremony for? Is it a dedication of something, like a *heiau* or *ahu*, is it before offerings on a *lele*, etc. So, it depends. But, those kinds of levels are what I would call high ceremony where you're communing <u>through</u> the *`awa* to the god, and the men-persons, around you and with you, are not what matter. For that high ceremony, the *pule* and the *`awa* is the thing, is the communication. You don't have to say anything to the people around you or they don't have to hear your voice because your voice is not for them anyway. So, for me, that kind of high ceremony is in silence. The kind of *`awa* ceremony to honor man, to honor somebody, a person, persons, as a societal recognition of an honored person, talking can be heard if that is what has been directed. Sometimes, if it is in mixed company, and I say mixed company as far as people who may be well versed in *`awa*, as well as people who may not be well versed in *`awa*, in that kind of mixed company, sometimes clapping is done because it is the signal that you are finished. Because those who may not be well versed in *`awa* protocol, sometimes that is needed, otherwise, they don't know what else to do. What I do not do is I never throw my *`awa* cup. This is my thing, as well as what I teach my students. And, that is, if you believe this *`awa* cup is Kū, how can you toss it? How can you throw him on the ground if you are saying that Kū is in this coconut cup and Kāne and Kanaloa are in the water and the *`awa*? How can you throw those things? When you were brought up, you know you don't throw food, you don't throw nothing! How can you throw this? So, my reasoning, with my understanding of Hawaiian cultural practices, tells me I cannot throw that cup. I cannot

throw it on the ground, I cannot throw it at someone else. So, I don't. And, I don't care if they're going to sit in the middle of that circle for the next ten minutes. I will not throw it. But, that's my thing. So, to me, *`awa, pules* must be heard, the recognition that the gods are in presence must be had through either *pule* or whatever, because they are, then, a formal way to open and a formal way to close the communication with the gods must occur. Because, then after that, it is the communication with man. So, in its simple form, that's it. And, because we have the *pule* — we have many *`awa pule* (*`awa* prayers and chants), there is no excuse why we cannot use the *pule.* They are there.

CSH: So, the example you gave of going to have *`awa* with the *lehua* tree, that would not be as formal?

HHP: Not as formal. It is like honoring a *kupuna*, like honoring a person. So, the tree gets its *`awa.*

CSH: What about social *`awa*?

HHP: I do social *`awa.* There is also, however, a time of recognition that Kāne and Kanaloa are in presence and no matter what you say and do, the gods are there because *`awa* is there. And, so you must always have that recognition there. But, I do social *`awa.*

CSH: Was there anything else you wanted to add or comment on related to Haleakalā and cultural practices?

HHP: No. I think that's enough.

CSH: Mahalo for taking the time to share your thoughts and your own cultural practices with me.

[End of Interview]

APPENDIX B: Transcript of Interview with Kapi`ioho Lyons Naone

Interview with: Kapi`ioho Lyons Naone (KLN)
Project: Proposed Faulkes Telescope, Haleakalā
Interviewed by: Ka`ohulani Mc Guire (KM) for Cultural Surveys Hawai`i (CSH)
Place of Interview: Wailuku, Maui
Date: November 3, 2000

CSH: Can you start by telling me a little bit about yourself, your name, where you're from and your family background?

KLN: My full name is Kapi`ioho Lyons Naone. I was actually born 'Lyons Kapi`ioho Naone III', but I'm in the process of changing that. Mostly, people refer to me as *Kahu*. I was born in Kīpahulu and raised by my grandmother who was the practitioner, both a spiritual and healing practitioner. So, I lived between Kīpahulu and Hāna until 1958. Then, I went to boarding school in Honolulu — Kamehameha, and graduated in 1962. After highschool, I did the Western things. I went to Vietnam. After the Service, I lived in Los Angeles before I came back to live on Maui. About twenty years ago, through the urging of some *kūpuna* (elders), I decided to come back to the cultural and spiritual side of the culture. I've been doing it ever since. So, I teach and practice and do cultural, spiritual things — *lā`au lapa`au* (medicinal healing with herbs), *ho`oponopono* (traditional Hawaiian form of setting relationships right through prayer, mutual restitution and forgiveness), spiritual healing.

CSH: Who was your grandmother?

KLN: My grandmother was Julia Ka`alo Kapoi Naone.

CSH: When was she born?

KLN: Around 1887. She was in her mid-seventies when she passed away in 1962. And, of course, she married Naone. Naone came from Honolulu and my grandmother was from Kaupō/Kīpahulu — mostly "Big Island" connections.

CSH: What kind of cultural practices was your grandmother specifically trained in?

KLN: Well, you know, in those days there wasn't a specific thing — like you're a *lā`au lapa`au*, etc. When you were a practitioner, you practiced whatever was needed. When a person came to them, they couldn't say, "Well, I only do this or that." They had to do everything. So, I helped her practice *lā`au* (medicine), I helped her practice *kāhea* (calling medicine), *ho`oponopono*, *lomilomi* (massage), *hāhā* (one who diagnoses an illness by feeling the body)

and all different types of things.

CSH: So, you trained with your grandmother until what age?

KLN: I trained with her until about 14 years of age, when I went away to school. I lived with her that whole time until I went away. I'd say, at about 11 or 12 [years of age], I was at the point of actually making and preparing the medicines. I would check with her only if I needed help. She would say, "Go take care of Tūtū Pale. She needs this and that." So, I'd go do it. So, I was, sort of, on my own already, but still always under her direction until about 14, when I went to Honolulu to attend school.

CSH: So, when you needed lā`au, did you go out and gather it or did you grow some of it yourself?

KLN: We had to gather it ourselves. If any, very few things were intentionally planted because our belief was always that it was provided by a different source. We didn't control the plants and grow it — it was there. Her belief was that every *lā`au* (plant) we were going to use had somebody's name on it. We had to go out there and find it for that specific person and it had a higher power. Even though she was very Christian, she was part of the Kalawina (Congregational) Church, she really believed and did the protocols of the older ones. She didn't really believe in actually growing our medicine. It was provided from a different source greater than ourselves.

CSH: After you were done with Kamehameha School, what did you do?

KLN: I went into the military. I actually attended Mauna`olu College for one semester while I was still trying to decide what I wanted to do. I had planned to go back to Kīpahulu after graduation, but in August, after I graduated, my grandmother passed away. After one semester at Mauna`olu College, I decided I really wanted to get away from Maui. I felt kind of lost, so I went into the Service [military]. I got out of the Service in 1966. From there, I lived about a year or so in Los Angeles and a couple of years on Kaua`i. But, my yearning was always to come back home to Maui. So, since about 1969 or 1970, I've been home.

CSH: What did you do for a career, once you came back to Maui?

KLN: I did construction work. I did lots of subsistence gathering, but not really any spiritual work or healing work. By that time, I was well acclimated to the Western way of things. But, I did a lot of subsistence fishing and I worked construction. Then, I became a policeman for 12 years. Next, I joined the Federal service — U.S. Customs. I was the Director of U.S. Customs for 15 years. And, this year, I decided to leave and pursue cultural things. In about the late 1970's, I was approached by some elders I knew,

who used to live in Kīpahulu. They asked me to come back and help them with doing medicine, with the intention of eventually doing it full-time. Reverend Ka`alakea, who has since passed away, was a young cowboy in Kīpahulu when I was young. He was the one, along with Uncle Harry Mitchell, who came to me and asked me to go with them and to help them out with the *lā`au*. Eventually, they persuaded me to return to the healing arts on a full-time basis.

CSH: You haven't spoken much about your grandfather. Did he pass away when you were a young boy?

KLN: No. My grandfather was a policeman. He was like a Territorial sheriff. He was into fishing. He was a fisherman and he was also a *lua* (a form of traditional Hawaiian fighting art) practitioner. When I was very young, he and my grandmother separated and he moved to Kīhei. He passed away about 10 years ago.

CSH: Did you learn *lua* from your grandfather?

KLN: No. We weren't allowed to watch or participate. But, we used to sneak and watch him. I was fascinated by the moves and so it was always in me to want to learn. It wasn't until seven or eight years ago, when Richard Paglinawan organized a group, that I went back to learn *lua*. So, there are some things that I remember that they did.

CSH: In regards to Haleakalā, do you know of any traditions that you heard about or that your grandmother did up there? Did you folks access the crater or the summit area at all?

KLN: My grandmother, no. But, one of the things we did when we grew up was that we had to live by the moon calendar. And, there were some important parts of the moon calendar that we always honored. That was the solstices — most of the *heiau* (temples) are really aligned by the solstices, and what we call the *hālāwai* — the meeting or the zenith, when the sun was directly overhead, when we have the greatest amount of *hā* (spiritual breath or strength that comes from above). And, it was always believed that every *heiau* had its *`anu`u* (tower within the *heiau*) tower, of which there was the calabash bowl underneath and when the sun came directly overhead and there was no shadow, that was the most spiritual time of the *heiau*. And, that's also the most spiritual time of each mountain. So my grandmother never did anything on Haleakalā. But, in Kīpahulu, there was this special time that Grandma would always recognize, the fact that, "Okay, the sun is directly overhead, there's no shadow, these are some very sacred times." And, it should be a sacred time for Haleakalā and Halemahina [An old reference, not commonly heard today, to the West Maui mountains that was used when he was young.] and places like that. In those days, the late

1940's, if you practiced those things, you were looked at as "funny kine or peculiar". In fact, even when practicing medicine, we really had to hide it from the doctor. If we did it, it was like, "Don't tell the doctor what we did." Everything was *kahuna* (hidden), but we weren't practicing it like *hūnā* — as in a *hūnā* practice. It was hidden because it was frowned upon by the doctors. We used to hide it because it was against the law. Only since 1988, when the Native Hawaiian Healthcare Act came out, could we really practice openly. So, Grandma didn't openly practice too much. It was very private, so she never traveled outside to go and practice. It was only afterward that I started doing it. I would go up to Iwilele [commonly known as 'Leleiwi' today] — it's one of the *pu`u* up there around the Science City — Iwilele and Kianiau.

CSH: Do you mean "Leleiwi"?

KLN: Yes. Iwilele or Leleiwi. There's a place we call Iwilele. It's where the bones of the ancestors or the spirit of the ancestors fly. The two important places that I recognize are Leleiwi and Kianiau, because of the *hālāwai* or the meeting — the zenith — when the sun is directly overhead and you cannot see your shadow. We call this the *hālāwai* or the "meeting". Everything "meets" there. The way I looked at it, Leleiwi or Iwilele, was that point — like a *leina* (jumping-off place for spirits) which was the opening into *pō* (realm where spirits go after physical death) that the spirits jumped into. Kianiau is very close to Iwilele. Those are the two places that I recognize as the important places during the *hālāwai*. The *hālāwai* is in the month of Ikiiki, about the middle of May, probably about the 25th or 27th of May. It's not the same every year — it changes each year. That would be the time of *kau* (summer), when the sun is moving up towards the northern-most point. Then, it comes up and it stops over Mokumanamana, Necker Island, and it stays there for just a few days before it starts moving back down the island chain. Then, it passes over us again, in the middle of Ka`aona, which is around July 15, 16, or 17 — around there somewhere. It's really hard to say exactly which day because it changes from year to year. Those are the times when the sun passes directly overhead on Maui. And, to me, those are the two most important times on Haleakalā, as well as Haleki`i/Pihanakalani Heiau.

CSH: But, basically this practice can be done on any mountain on Maui or in Hawai`i?

KLN: Well, not on any mountain.

CSH: What about on prominent mountains within Hawai`i?

KLN: Yes, probably prominent mountains in Hawai`i such as Haleakalā, Halemahina — which is representative of all the mountains in West Maui,

Mauna Kea and Mauna Loa. Those are just a few examples of what I mean by "prominent mountains". I cannot tell you any other place because I don't do this anywhere else. I only do this on Haleakalā. I will make an attempt to get up there at that time and do something, leave some kind of *ho`okupu* (offering) up there. I will even take an *`umeke* (bowl, calabash) and attempt to sit there, with a sense of "sitting with the ancestors", we're all watching the bowl and to be able to say, "Ah, now, we have reached this point." What we actually practice — all I do is celebrate by doing a few chants and things like that to recognize that I am actually doing some of the things my ancestors did in both those times. But, usually, during Ikiiki, I'll try to practice there and during Ka`aona, I'll try to practice over here on the *heiau*. I'm the curator of Haleki`i/Pihanakalani Heiau. So I'll practice at those two places. Sometimes, I'll go to Kānekauila in Kīpahulu, because my great-grandmother is buried there. She was my grandmother's teacher. And, that's also where Parley Kanaka`ole is buried. That place was sort of like our family *heiau*. Kānekauila was where the former Catholic Church was built at one time. My grandmother told me that four churches were built on that *heiau* and four times, they were blown down by the wind that blows over Kānekauila. Do you know that song, "*Ka Makani Kā`ili Aloha*"? That song is about the wind that snatches. That wind is the "snatching" wind that blows right over Kānekauila. We always used to go there to do ceremonies and things. So, I practice between those three places. It's kind of hard — three days and only two places. So, the priority would be down here at Haleki`i/Pihanakalani because of traveling and scheduling. If I can make it up to Haleakalā, then that would be like a special time. This year, I went up there because I made a big change in my life. I will usually take one or two students, not many — just the really dedicated ones. Not the ones who are just curious and who might try to go up there later and do their own type of thing. Usually, I do it at one of those two places, either Leleiwi and Kianiau. Kianiau means the striving for knowledge, the persistence for learning.

CSH: The chants that you do, did you learn those from your grandmother?

KLN: No. See, Grandma never really taught us specific chants. She taught us what to chant about. She didn't want us to memorize this or memorize that. It was only recently that we'd use chants like Edith Kanaka`ole's chants — "*E Hōmai*" and those types of chants. It was good because those were safe chants. Normally, I would do a chant that I just felt like chanting from within my na`au (gut-feeling).

CSH: Haku wale [impromptu, composed on the spur of the moment]?

KLN: Yes. Just whatever you feel, whatever you think. If I was with my students, we would go through "*He Mū*" for cleansing, before we even got up there. We couldn't take the *`ōpala* (mental and spiritual clutter or rubbish, in the sense that extraneous things must be left behind so that one can be mentally and

spiritually focused to perform the ceremony) up there, so we'd have to *"He Mū"* down here, then go up. Then we'd do *"E Hōmai"*, *"Nā `Aumākua"* or something like that. Once there, I would do something and then I would ask them to *kūkulu kumuhana* (to pool thoughts and prayers), bring their own prayer or chant into the circle. I'd do mine out loud or we could go to different spots close by and send ours on the way, that type of thing.

CSH: Would you do any kind of *hi`uwai* (water purification ceremony done in the ocean) before you went up the mountain?

KLN: Usually, we would do that. Sometimes it's kind of hard because you have to dedicate and set aside the whole day. We would probably *hi`uwai* before sunrise and then go up. So, what we sometimes do is *pīwai* (to sprinkle with water for cleansing purposes) to help us out and then we'd go up. *Hi`uwai* is hard because you *hi`uwai*, then you get dressed and go eat breakfast and, this and that, the cell phone goes off, by the time you get up there you lose your focus. It's hard to maintain the focus. In *pīwai*, you can just say, "Okay, from this point, say ten 'o clock, we're going to meet here, close our cell phones, and from here on until we get back, this is it." Now, that I'm not working at a bureaucratic Western job, I can dedicate my days fully to certain practices.

CSH: When you said your grandmother used to observe these times in Kīpahulu, where did she go?

KLN: We'd go to Kānekauila. The solstices, yes, but more importantly — the *hālāwai*. The summer solstice is when the sun is at its northernmost point and the winter solstice is when the sun is at its southernmost point. That's north of us [during the summer] or south of us [during the winter]. But, the *hālāwai* was when it was completely overhead. When that spiritual *hā* is directly over our *manawa* (fontanel and directly overhead), it will flow right through us.

CSH: So, when you talked about the months of Ikiiki and Ka`aona, are those solstice times or hālāwai times?

KLN: No. The solstices <u>are</u> hālawai times when the sun is directly overhead. This only occurs two times per year, at Ikiiki and Ka`aona. As the sun is traveling to the north, the Ikiiki is when the sun is directly overhead. Once the sun reaches its northernmost point, it begins its journey back down to its southernmost point. On the way back down, during the month of Ka`aona, the sun will be directly overhead once again. These two times are the times of the most powerful *hā*. You see, those two months are right next to each other. So, the solstice is right about in the middle. The solstice would be about mid-June.

CSH: June 21st or so?

KLN: Yes. So, right in between those two times.

CSH: Would you do a different kind of ceremony for the solstice or would you do the same thing?

KLN: During the solstice, as the sun is moving northward, its pushing very hot. That's why about the time the sun reaches us, Ikiiki is the hottest time when all this hot air is being pushed up. When it reaches the solstice, it stays there a few days, then it starts coming down and it starts bringing in cool air. That's when you get Ikiiki, the real hot, stuffy time. And, then you get Ka`aona (lunar name of a month in the Hawaiian calendar)— the real luring, nice time. I guess you're familiar with Necker and all of the *marai*, and *heiau* on that place — it's the most spiritual island, Necker — and Tubuai, way down south in the Austral Islands, where the sun stops and comes back. We have to honor the sun for reaching its northernmost point and call it to come back and acknowledge its responsibility, acknowledge its journey up to here. It stops there and then it starts to come back. So, in the solstice, we're honoring the fact that the sun has made its journey and the sun has allowed us to do our farming, our harvesting and whatever we need to do. And, when it comes down and it reaches its southernmost point, we honor it for that. That's what we do during the solstice. We are honoring that part and everything in the middle is *Hāloa*, the great *Hā*. According to Tūtū Pale, an old Hawaiian woman I knew, *Hāloa* is the area between the two tropics of Cancer and Capricorn, where the sun never leaves. The people who live in this area of *Hāloa* are called *Hāmau*, in the sense of "a continual reverence". The area outside of *Hāloa* was called *Hā`ole*. She used the term *Hā`ole* to refer to the land area, as well as to the people who lived in this area which was outside of *Hāloa*.

So, when we stand on the *heiau* and we shoot our directions, when it reaches that point on the mountain or wherever, we honor the sun for moving up to there and, now, we need it to come back and bring the rain, bring the harvest, the planting seasons and that sort of thing. So, we honor the sun in that way. But, when the sun is overhead, we are honoring the fact that the strongest spiritual time is upon us at that exact moment. It's very different from it reaching one point to the other. The movement of the sun controls our harvesting, famine, no-famine, all of that. And, so we honor the sun for continuing to just stay overhead for us. But, when it is directly overhead, we honor it because that's the time of the greatest meeting of Kū, Hina, all the gods, everything, the greatest power that comes in through us. That's what we do.

CSH: Does that increase your personal *mana* (power) as well, or is the idea to honor the *mana* that is there within you?

KLN: Yes, it's to honor that. But, by just continuing to practice this, of course, rejuvenates your identity, your commitment, etc. So, the *hālāwai* is like a time of commitment.

CSH: When you do your *oli* (chants) and *pule* (prayers) what specific deities do you pray to?

KLN: I have to honor the six [deities] and all of them have to be honored during that time: Kūnuiākea, Lononuiākea, Kānenuiākea, Kanaloa, Kamakaokūkō`ai and Kamakanui`aha`ilono. I have to honor all of them. They all have a different part in this whole lifestyle that we live. It isn't just one or the other.

CSH: Can you talk about each deity and the parts they represent?

KLN: Kūnuiākea is the deity of destruction. It isn't really destruction. We call it creation. Because, anytime there's movement and there's violence or there's war or anything like that, it's a creation of something new. Our modern way of looking at it is destruction — dying and natural disasters. In the Hawaiian way, the indigenous way, it's not viewed as destruction. It's a form of creation and we just have to make way for it. So, that's Kū, the deity of creation, violence, earth-movement, war, protection and things like that. That is Kūnuiākea.

Lononuiākea is the deity of the clouds, the rains, of man's skills and knowledge. So, under Lono comes the *kahuna kālai wa`a* (expert canoe makers), the kapa makers, farming and those kinds of things.

Kāne is the deity of life and water, *ka wai ola a Kāne* (the life-giving water of Kāne). Basically, Kāne is the deity of life itself.

Kanaloa is the deity of the ocean, of the sea, the symbol of preservation, the deity of abundance of food, and so forth. Kanaloa is the symbol of preservation because the sea gives us salt which is a preservative. Through the ocean comes all of us. Our wisdom comes from the deep blue ocean.

Then, there's Kamakaokūkō`ai, the deity of illnesses and diseases.

And, Kamakanui`aha`ilono is the deity of healing. These six are the six sons of Hina`aimālama, the *wahine*, the female, which is the moon. And, the male is Kama`oa.

So, we have to honor each one of them because they play a big part in everything. It isn't just the time of Kū or the time of Lono. They have their own times — the *makahiki* (a season of sports and religious festivities which signaled the end of the harvest, the payment of taxes and so forth. The

makahiki usually lasted about four months.) and other times like that.

CSH: About how long does the ceremony last?

KLN: Maybe about an hour. I never thought about how long it takes. We go up there and we do what we have to do. Sometimes, we just go up there and sit. We'll do a ceremony and we'll sit. We don't want to leave *ho`okupu* visible. We hide it because we don't want other people to start going over there and using the place and thinking it should be used — like someone who would make up a story and people would start stacking rocks or something. Who knows what they'll do, right? We don't want it to be so conspicuous. It's not something we want to be public about. It's something that I just want to go there and do, to honor them. Also, I don't want to have to answer to people. There's some well-meaning people that are curious, but there's some that want to pursue, you know — is it in Kamakau, or is it this or that. It's not what this is all about. It's not something that I really care whether other people understand or believe in what I do. It is just something that I do. It's something that I think I need to honor.

CSH: At Leleiwi, there's a lookout spot that you can hike out to. Is that the same spot you're talking about?

KLN: I guess.

CSH: There's a small little parking area off to the right side of the highway. Is that where you go, down to the lookout, or do you go off the trail?

KLN: We go off [the trail]. It's kind of tough because you don't want to make the rangers or park people nervous about it. And, at the same time, you don't want to ask permission because, then, you feel like you're no longer in charge of doing your cultural practice. So, we just go. But, yes, it's around there that we'll do something.

CSH: Have you ever been stopped by any of the rangers or park people?

KLN: No, I've never been stopped by any park personnel. I've been stopped once in awhile at the park entrance. But, as soon as they see me and I say I'm going up for this and that, they usually let it go. I've never really been approached or stopped up there. We're not trying to hide anything, but we try not to be so conspicuous so that anyone would say, "Hey, what are you guys doing up here?" So, we never tell anyone that we're going up, when we're going up, or why we're going up. That's why I take only one or two people with me when we go up. It's more <u>my</u> thing that I think I need to do and honor.

I did the ceremony once in Mexico, at Teateajuaquan, an Aztec city just

outside of Mexico. They have a pyramid of the sun and a pyramid of the moon there, just like we have here. We have the pyramid of the sun, Haleakalā, and Halemahina, the pyramid of the moon — the male and the female. At Teateajuaquan, I went there for a study on medicinal medicines with a Canadian group. One of the reasons they went there is because Teateajeaquan and Maui are basically on the same latitude. I happened to be there during one of the *hālāwai* — I can't remember which one. It was about five years ago. I went on the sun pyramid and did the same ceremony on top of it. That was exciting! It was great!

CSH: Have you ever done any ceremonies at the actual summit of Pu`u `Ula`ula, at the very top of Haleakalā?

KLN: No. I've never done anything there.

CSH: Is that because it's not a very private place due to the amount of tourists and visitors that go up there?

KLN: It's because I've never recognized Pu`u `Ula`ula as a *leina* or being the most spiritual place. I recognize Leleiwi or Iwilele as the *leina*. And, then, Kianiau, the place of that learning. I had to decide on a place that I thought would be the best to suit the purpose and a place that would attract the least amount of attention. So, I picked those two places as the most sacred places of all. If one is crowded, I go to the other one. Then, maybe I'll just come back and leave a *ho`okupu* some place.

CSH: Have you heard of any other names for Haleakalā, from Uncle Kawika [Ka`alakea] perhaps or anyone else?

KLN: When I was about nine or ten years old, I used to take care of this woman. Her name was Tūtū Pale. She lived in Hāna, in Hāmoa. I used to make her medicine. I used to make her mush — her oatmeal, and I used to take it to her every day. Grandma would tell me what to do and I'd just do it, every morning and every evening. She was 106 years old, when I was taking care of her. And, she could speak only Hawaiian. I used to tell her, "You know, Tūtū, you're talking kind of crazy." She used to talk about all these things. And, she would refer to Haleakalā as the house of the male and, this one over here as Halemahina, the house of the female or the house of the moon. [If Tūtū Pale was 106 years old by 1958, when Kapi`ioho left Maui to attend school in Honolulu, this would place her birth around 1852.]

CSH: When you say "this one over here" what do you mean?

KLN: The West Maui mountains. The whole West Maui mountains, she considered the *piko ka honua*, the navel of the earth, the woman. She would tell me

that Maui was lucky because Maui had a male and female — Maui was complete. It wasn't all male and it wasn't all female. It was complete. And, so we would talk about Haleakalā as the male part of the island, and not that only certain things were supposed to be done there, but that it was complete. There was duality in it. So, just as its name means, Haleakalā was considered the house of the ascending sun. And, Halemahina was always the house of the moon. Olowalu was where the different months existed. Olowalu means "many hills". There's all these hills over there. There are only 13 hills or peaks there and each one represents a month. The one which stands alone, right behind Olowalu Store with all the petroglyphs on it, was the thirteenth month, the sacred month, which has no name. And, she would refer to that whole place over there as the female part of the island and this as the male part of the island. So, the name for this place was always Haleakalā and the West Maui mountains were always Halemahina.

CSH: Did she tell you any other stories about Haleakalā or did she talk about going up to the summit or into the crater?

KLN: No, she didn't. She talked about other things like migrations, birds and spiritual things.

CSH: In relation to Haleakalā or just in general?

KLN: No, just in general.

CSH: What did she say about migrations?

KLN: She said that there were some people that lived here before and that they left here about 2,000 years ago. They traveled eastward. Somewhere around 75 B.C., this is the time that I pinpointed from talking to her, Pleiades hit a certain point and about six migrations left the area of the Marqueses. And the warlike people were sent south and the peaceful people were sent north. The warlike people went to a place called Lukilani, which we now call Aotearoa. The peaceful people came and settled in a place called Kanaka or Naka, which is what we call Hawai`i. From then on, we lived our appropriate way of life, the war-like life and the peaceful life, until, I don't know how many hundreds of years later, she said people from Tahiti came up with a different form of *kahuna* practice and they made us more war-like. This was the basic [gist] of what she said. She also said that, one day (I was very small then), I would meet my cousins from the deep south who were the war-like people, but who now became more peaceful. She's talking about the *Maori* people. And, she used to teach me two *Maori* songs. She used to say, "You learn this song and when you meet these people, you sing this song and they're going to know that you are family to them." It was interesting. I thought she was *pupule* (crazy), or a little *`ano `ē* (peculiar or odd). But, I wish I had listened more. At the time, I wasn't into listening. I learned by

doing. I actually did all those things that I learned and absorbed. It wasn't like I was questing for knowledge back then.

CSH: What did she say about birds? The reason I'm asking is that there are *`ua`u* (petrel) at Haleakalā. They are supposed to be really good eating birds.

KLN: She didn't mention anything about that. She would talk a lot about Kīpahulu being abundant with birds. That's why the place is called Kīpahulu, the "invitation to the feathers" and that sort of thing. She would always tell me that they believed in the *lewas* (strata), where you belonged. You belonged in certain *lewa* and you have to stay in your *lewa*. Our *lewa* was from the bottom of our feet, touching the earth to the top of our heads. And, from the top of our heads to the top of the trees was what we would refer to as the *"lewalanilewa"*, where only the birds and people who wore feathers belonged. And, so the chiefs belonged in the higher *lewa* than we did and they were among the birds and that's why they wore feathers. She would talk about that and Kīpahulu was the place for the birds. Sometimes, it was like she was scolding me. But, she wasn't really scolding, she was just telling me things. She used to say, "You know, when you go get the birds," and I'd think [to myself], "Why would I go get birds?" She'd say, "When you go get the birds, don't use the *`ulu* (breadfruit). You gotta use this other one, this other glue that they used to get. Don't use the *`ulu*." I'd think, "What would I use *`ulu* for?" We use *`ulu* for the canoes, you know. We seal the canoes with the *`ulu*. Anyway, she would say things like that.

CSH: What did she say to use instead of *`ulu*?

KLN: She did tell me, but I can't remember what it is because I never used it. There's a lot of plants in Kīpahulu that they used for the glue for the birds. I forgot the name. It was never important to me at the time. I used to hang out more with guys that used to repair the canoes and we used the *`ulu*.

CSH: Did she ever talk about eating birds?

KLN: I can't remember anything about eating the birds. And, I can't remember us, as part of our diet, going after birds. It was always fish and pork and meat.

CSH: Do you have any navigational background?

KLN: No, I don't.

CSH: Did you ever sail on the Hokule`a or go on any long voyages?

KLN: No, not between here and Tahiti or anything — just here, locally. And, I didn't want to because my knowledge of the calendar and the stars are

related more to the star belts — not the individual navigational type of things. I didn't want to mix them up. I wanted to stay with what I knew. You know, you have the star calendar, the sun calendar, the moon calendar. Each one plays an important role in the whole community system. The star calendar tells us when the period of Pleiades is over and the period of another star appears so that we know when it's time for us to move on. In the indigenous calendar, we can only stay in one place about four to six thousand years, then we have to move so that the land can rejuvenate itself. That's what the indigenous people have been doing for the last 32,000 years — just moving and moving and moving, and the land rejuvenates itself. So, I'm trying to keep my concentration on that part of the stars rather than the navigational part of the stars. Every September, I meet in San Francisco at the State of the World Forum. It was started by Mikhail Gorbachev about six years ago. A lot of intellectuals come there. But, more importantly, there's a lot of traditional indigenous healers that attend — not the intellectual ones, but the ones who are really practicing traditional healing methods. What we've found out is that within the tropics around the world, all the calendars are exactly the same, except that we use different symbolisms. So, the Indian calendar, the Chinese calendar, the African calendar are all the same. They all follow the same star belt. They all recognize Pleiades as the period of today. We also know that all of our calendars, the indigenous calendars, tell us that a great period will come to an end in 2012. That's the millennium in the indigenous sense of the word. What happens there? We're not sure, because we lost the wisdom. But, what we found out is that every indigenous group lost a part of the calendar, but not everyone lost the same parts. So there's parts that still exist which have been lost in one calendar, but can be found [in another calendar]. For instance, the wisdom of the star belt was lost in our calendar. We don't know our star belts, as far as migrations. What's the next star? But, in Mozambique, they haven't lost it. But, they've lost other parts of their calendar. So, we're kind of getting together. All we have to do is take care of the language part. Yes, we understand certain things, but we need to get into the deeper part of the language so we can really begin to understand some of the deep meanings behind what is being said.

CSH: **What do you mean when you say "star belt"? Do you mean being able to follow in the sky, from one star to the next, to get to a certain place?**

KLN: What happens is that there's a star belt. We know that, but I don't have any specific wisdom in it. This star belt keeps moving. After a certain period, another star appears. The star that is out there now, that we all recognize, is Pleiades. The star before that was the one that Māui used — the magical hook. What is going to be the next one that follows this line of stars? There's a belt of some type. And, this next one is going to tell us when and where to go. Does it make sense?

CSH: It does, in an abstract way.

KLN: It's nothing that I've been able to find anything written about or expounding on that type of wisdom. I can see it in some of the different civilizations. I can see some traces of that, but to really turn it into something intelligent that we can follow, we've lost that. But, I think we can get it back among the practitioners if we keep meeting and comparing these things, we're going to start finding out and hopefully be able to reconstruct the entire *malama*, the entire calendar system. Right now, everybody refers to the moon calendar and they include the moon and sun because it's the months and the days. The moon is just the moon. It takes care of the emotions side, the deities. The sun takes care of the seasons, the movement of patterns. The moon takes care of the movement of individuals as they go through their emotions. Then, you have the stars which has to do with the movement of nations. So, we've sort of lost the whole star calendar, except that we have it in migrations. How can we interpret that from just the movement of now, to the movement of the past, the future and on?

CSH: Have you ever heard anything about Haleakalā being significant to navigators or being used for any kind of cultural practice relating to navigation?

KLN: Honestly, I don't know.

CSH: Do you see any connection between Haleaklā and Kaho`olawe?

KLN: Yes. But, I can't explain it. I know that many *heiau* are connected, interconnected on the Big Island and that sort of thing. I know that every *heiau* has something to do with the summer solstice and the winter solstice. I know that every *heiau* has something to do with the *hālāwai*, and I recognize that. I try to practice a form of that. But, yet, I know that whatever I'm doing is very amateur. Maybe somehow, by continuing to practice, the wisdom will somehow start coming back. Most of the *kūpuna* that I've been around don't even understand those things. They may be too Christianized. I don't know what it is. It's really unfortunate. There are no sources to go to. We have to just seek and hope that we will be granted the *`ike* (wisdom) to do this and that somehow we'll find pieces of the puzzle to make the process complete.

CSH: You said you were raised with the moon calendar. Can you explain what that meant from a practical basis of everyday life?

KLN: There was the spiritual, protocol side. On certain nights, you could do certain things. Certain nights were in honor of certain deities. And, certain nights were the *`Ole* nights (name of particular nights in the Hawaiian lunar calendar), which didn't mean that you couldn't <u>do</u> anything. It just meant

they weren't the productive nights. For example, if you went fishing, you were not going to get an abundance in fish. We planted based on the moon calendar. The saps and the adrenalin in the trees and the people were most active [on certain nights]. So, it didn't make sense to plant at certain times, even though you threw a lot of fertilizer in there. You had to plant in accordance with specific times of the calendar. My grandmother was very much into the *huelo* (the tail) and that sort of thing. If we planted right, the tails would appear. The month of Nānā (to observe) comes before the month of Welo. If you plant right, during Nānā, the little roots and sprouts are forming which don't yet penetrate into the ground. During the month of Welo, the roots penetrate the ground and then the young shoots or tails appear. During Nānā, you are watching and waiting for the tails to appear. This is a sign that you planted right and you would have enough food to eat. If the tails did not appear, it was a sign of famine. It was always that everything was based on feast or famine. If you did it right, you were always going to have feast. If you were lazy, if you didn't do it right, or you *hana ʻino* (were careless) , you fished when you weren't supposed to fish and so forth, you could be causing famine down the road — seven generations down the road. She would always say, "Remember, seven generations down the road. What you do today, seven generations down the road. What they did before, you have today because of seven generations before you, that type of thing. So, daily life was based upon where the moon was at. We recognize the fact that things happen within people and plants because of the position of the moon and its effect on the sap, on the adrenaline that flows within all living things.

CSH: Was there any correlation between illness and specific phases of the moon?

KLN: Not that I know of. I can't remember anything like that.

CSH: Were the planting times considered to have more *mana* or energy?

KLN: Well, the moon calendar is going to tell you when to plant — when to plant the trees, when to plant the fruits and so forth. That was the planting within the month. Within the year, the time of planting was based on the showers, and on the *wela ka ʻāina*, the heat of the land. If you plant when the ground is so hot that it cooks the plants, they grow stunted. So, you had to plant based on that calendar, the sun calendar, or else you had to mulch and water a lot. So, [for] some things, you couldn't do that so you didn't plant at certain times, otherwise, you'd have stunted plants. But, we weren't too much into planting. We were more into fishing. Then, we had the taro patches up in the mountains.

CSH: Dryland or wet?

KLN: Wet. It was all wet. In Kīpahulu and Hāna, there's constant water.

CSH: In your work with kūpuna, have you heard any other stories about Haleakalā or anything about place names or about cultural practices — have you ever heard anyone talk about the many *ahu* around the summit and in the crater?

KLN: No, I haven't. My only association with going up there and doing something was based on the position of the sun and because of the *leina* — a spiritual place for flying into *pō*.

CSH: In the literature, there are references to the people of Honua`ula being connected to Pele. Would you know anything about that.

KLN: No. I know that my grandmother's line comes from a Pele clan. I know that my cousin was named "Kamohoali`i", in honor of the brother of Pele. But, other than that, they never talked about Pele too much.

CSH: What about the deity, Lilinoe?

KLN: No. There was a lot of talk, especially in the Hāna area, about Ka`uiki, the birthplace of Māui. But, we lived in Kīpahulu, which is away from there. My grandmother had a house in Hāmoa, close to the mountain, Ka Iwi o Pele. I would hear some references of that, but, she never did get into the stories about deep, deep Pele, except to say that this was the time of Pele. We would be able to see the *pele* from Kīpahulu, we could sometimes see the reflection of the volcano erupting on the clouds as they reflect outwards and we could see it from Maui.

CSH: You mean the volcano on the Big Island?

KLN: On the Big Island. When it was really big and the clouds were a certain way, where you could see a reflection of the clouds, my grandma would sometimes go into a chant to Pele. But, because it was never really a part of our life, our constant practice, I never really paid much attention to it. When I was small, I wasn't paying attention to much. I wished I had. But, I feel kind of fortunate with the limited things I already know.

CSH: Can you talk a bit about view planes and their importance in Hawaiian culture?

KLN: I think that to have things obstructing the view is inappropriate. But, it's more to me a problem because it's non-cultural and it's distracting rather than is it actually spiritually preventing the flow of *mana* from one place to

another. For instance, I did a cultural assessment in Makena. They had a *heiau* in which they had said this would be the interment plan for this and that — the bones, if they found any *iwi* (bones), and this is how they were going to set the buildings. You know, I stood there and said, "The spirits need a free flow to the ocean, to the land — rather than boxing them in like that. So, in a sense, it wasn't bad that the buildings were in view. It was that they were obstructing the free flow of the spirits up and down to the *kahakai* (beach) or *uka*, to the mountains. So, I guess, what I'm saying is just the fact that there's something built and it's in sight, is it really blocking the flow, the movement of the spirits? I would be more concerned if there was an ancient trail there and the structure blocked the trail. Does that make sense?

CSH: **What I think you're saying is that the view itself is not as important as long as the spiritual energy can still move through the area freely without being blocked.**

KLN: Yes, it's not as important. And, if it's just the fact that it's in view, personally, it wouldn't be objectionable to me. What I'm saying is, I'm sure the observatories are important. There's knowledge we're gaining from it. Yet, we hope and wish that they would be very sensitive to our cultural beliefs. Cultural assessment studies at least forces developers to be aware of our beliefs. Am I totally objecting to Science City being up there? No, I'm not. Would I prefer that they not be up there? Yes. But, I have no real strong objection to something being built up there as long as cultural aspects are always taken into consideration — that we're not prevented from practicing what we believe in. I would object to a lot of lights at night, and constant noise which, to me, disrupts the place — the sound of the lights. The lights are disruptive. There are several points of view. Number one, the lights will always change the patterns of life. So, fish migration, the majority of plants are changed when you have lights. Mango season in Lahaina is supposed to be the same as mango season in Hāna but, because of the lights, mango season in Lahaina is different because of the heat from the lights. It's like when chickens lay eggs. If you put them in light, they lay eggs all the time. So, I'm always objecting to lights. If it's supposed to be dark, then it should stay dark. For example, if it's dark nights for *pō kāne* (nights of the month when the spirits walk the land), then it should be dark so that the spirits can walk. So, in that sense, yes, I object. But, in general, the fact that they have Science City up there, to me personally, I don't have any problem with it. If they were to ever stop me from doing something that I think I needed to do, then I would be pretty offended by that.

CSH: **Do you have any thoughts on the issue of "sacred space" and what that means to you, as far as people who believe the top of the mountain is sacred? Do you believe that Haleakalā is sacred?**

KLN: I believe it's sacred because it is Haleakalā. What does "sacred" mean? Does it mean that we can't go up there? Does it mean that we can't build up there? Does it mean that we shouldn't be doing certain things up there? I don't think so. I think it means that we should be allowed to do certain things up there. I do believe it is sacred. And, I believe there are some places that are very, very sacred where things should not be occurring. I really wish nothing modern was happening anywhere on all of the islands, but that's just not the way it is. So, how do we live with it? How do we adapt so that we can continue? And, how do we send a message so that, developers understand, "Don't overcrowd, don't overbuild, don't push us out — maybe you can somehow share, but give us our opportunity to believe and to practice." I believe more in that than just the idea that Haleakalā is a sacred place for only Hawaiians and everyone else should get off the mountain. Personally, I don't think too many other Hawaiians would feel that way, but I can't speak for them. I can only speak for myself.

CSH: Do you do any kind of gathering of plant materials in the park or anywhere on Haleakalā?

KLN: None. The reason is because my training was just with certain plants, at a certain elevation, from a certain area. I continue to use just that knowledge and wisdom. I don't take it beyond that. I trained under Papa [Henry] Auwae and under Papa Kalua Kaiahua. They come from the Big Island and O'ahu. But, I still practice based on what I learned back home in Kīpahulu. We never went up to Haleakalā to gather. There's nothing up there that I know of that I would use. So, there's no gathering of native plants or any other thing that I ever would gather up there. I just go up there and honor the *hālāwai*.

CSH: At what elelvation would you say that you do most of your gathering at?

KLN: I'd say up until about the 2,000 ft. elevation — from sea level up to 2,000 ft. Yesterday, I was offered a piece of property, twenty acres, up at 3,500 ft. elevation. Free land to grow my medicinal plants. I had to go up and look at the place and say, "It's a little too high for what I've been trained to use my plants for." There's nothing wrong with the place, but the climatic conditions were very different. The soil content was very different. So, I try to stay within that 2,000 ft. elevation. On this side of the island (Wailuku, Kahului, 'Īao,) it's more difficult because I wasn't raised in this area. In Kīpahulu and Hāna I know exactly where all the medicines can be found and what elevation they can be found at, what the cinder content or rock content is so that I can find these certain medicines with the right nutrients in it. Over here, it's tough because of fertilizers, pesticides and I'm not familiar with this area, meaning Kahului, Wailuku, the central area, and the Lahaina

area. If I have my way and if I need to get medicine, I always try to go back to Hāna to get the medicine.

CSH: Well, I really appreciate your taking the time to meet with me. *Mahalo* for doing this interview.

[End of interview]

APPENDIX J
PRESERVATION PLAN

CULTURAL SURVEYS HAWAII
January 2000

Historic Preservation Plan for
Sites 50-50-11-4835 and 50-50-11-4836 at the University of Hawai`i Facility at Haleakala, Papa`anui Ahupua`a, Makawao District, East Maui (TMK 2-2-07:8)

by

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and
Hallett H. Hammatt, Ph.D.

for
KC Environmental, Inc.

Cultural Surveys Hawaii, Inc.
January 2000

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A. Project Background

KC Environmental, Inc. has contracted Cultural Surveys Hawai`i, Inc. (CSH) to prepare an Interim Historic Preservation Plan for two sites within a 1.5-acre parcel of land located at Haleakalā in the *ahupua`a* of Papa`anui, Makawao District, Maui (TMK 2-2-07:8) (Figures 1-3). The 1.5 acre parcel is the proposed site for the development of the Faulkes Telescope and is part of the larger University of Hawai`i Facility located just outside of Haleakalā National Park on Kolekole Hill (Figure 2). The study area was subjected to an inventory level survey, the results of which are documented in a report (Bushnell and Hammatt 2000) that was accepted by the State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR January 4, 2001 Log. No. 26776, Doc. No. 0101MK01). The survey identified and described two historic properties, State Sites 50-50-11-4835 and 50-50-11-4836 (Figures 3-4). Both sites were assessed as significant under "D" criterion for their potential to yield information about historic activities at Haleakalā. In addition to the inventory survey, a traditional practices assessment was completed in order to consider the effects the proposed Faulkes Telescope project would have on native Hawaiians as it pertains to the culture and their right to practice traditional customs (Mc Guire.and Hammatt 2000). The assessment concluded it was unlikely the proposed development would impact native Hawaiian customs and practices in this area.

The purpose of this interim preservation plan is to protect the aforementioned sites while a long term preservation plan can be developed. The University of Hawaii is committed to preserving the two sites and construction plans for the project area have been developed allowing for their preservation.

B. Project Area Description

The project area is situated near the summit of Haleakalā on the southwest rift, in Papa`anui *ahupua`a*, Makawao District, at approximately 10,000 feet above mean sea level (Figure 1). The 1.5 acre study area is part of the 18-acre University of Hawai`i Research Facility, also known as "Science City". Located at Kolekole Hill, the 1.5-acre plot is a piece of undeveloped land on the west side of the UH Research Facility (Figure 2). The U.S. Air Force (USAF) also operates the Maui Space Surveillance Site (MSSS) from within the University's Research Station boundaries. Access to the project area is via Highway 378, Haleakalā Highway. Haleakalā Highway is a paved highway extending from Kula, up the western flank of Haleakalā to Haleakalā National Park. An extension of the highway runs beyond Park boundaries into Science City.

The terrain in the project area ranges from moderately sloped in the east to gradually sloped in the west. The dominant feature in the survey area is an exposed basalt rock outcrop approximately 20 m in length (N-S), 14 m in width (E-W) and 3 m in height centrally situated in the project area (Figure 4). This outcrop is composed of aerolite, a type of Hawaiite basalt with abundant olivine crystals. The outcrop is extremely weathered exposing large, blocky cobbles on the eastern half and cinder sized gravel on the western

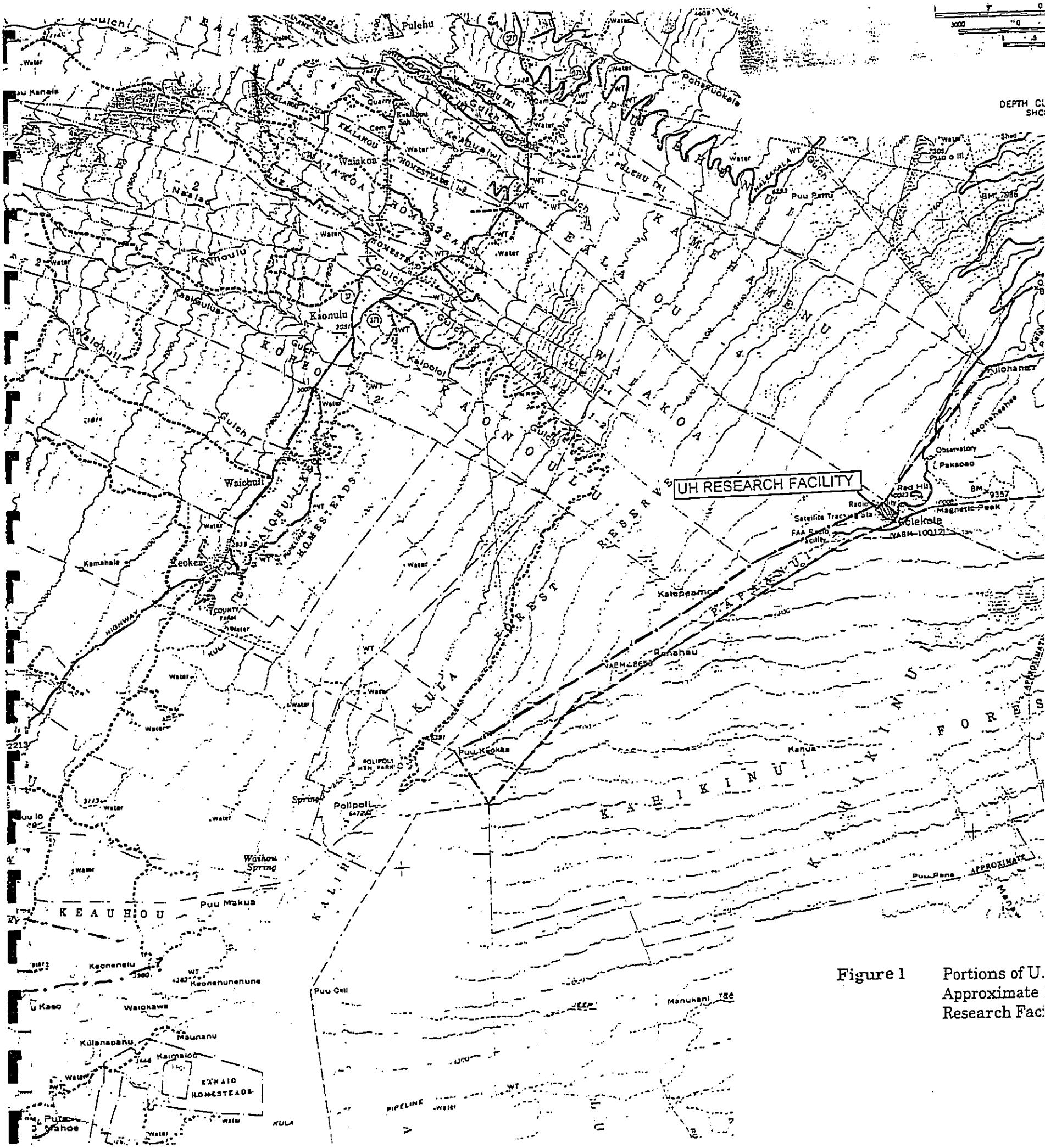
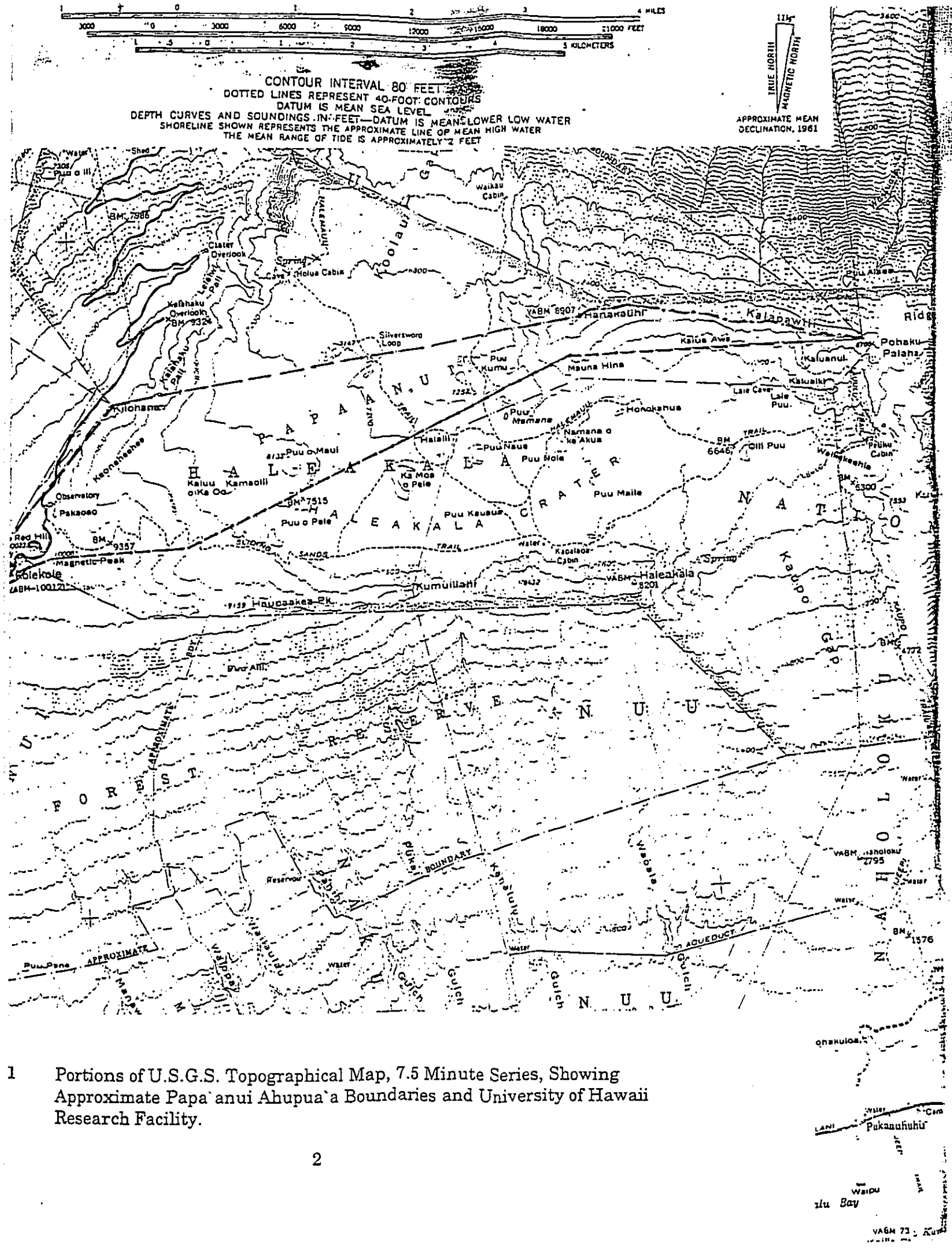


Figure 1 Portions of U.
Approximate
Research Faci



1 Portions of U.S.G.S. Topographical Map, 7.5 Minute Series, Showing Approximate Papa`anui Ahupua`a Boundaries and University of Hawaii Research Facility.

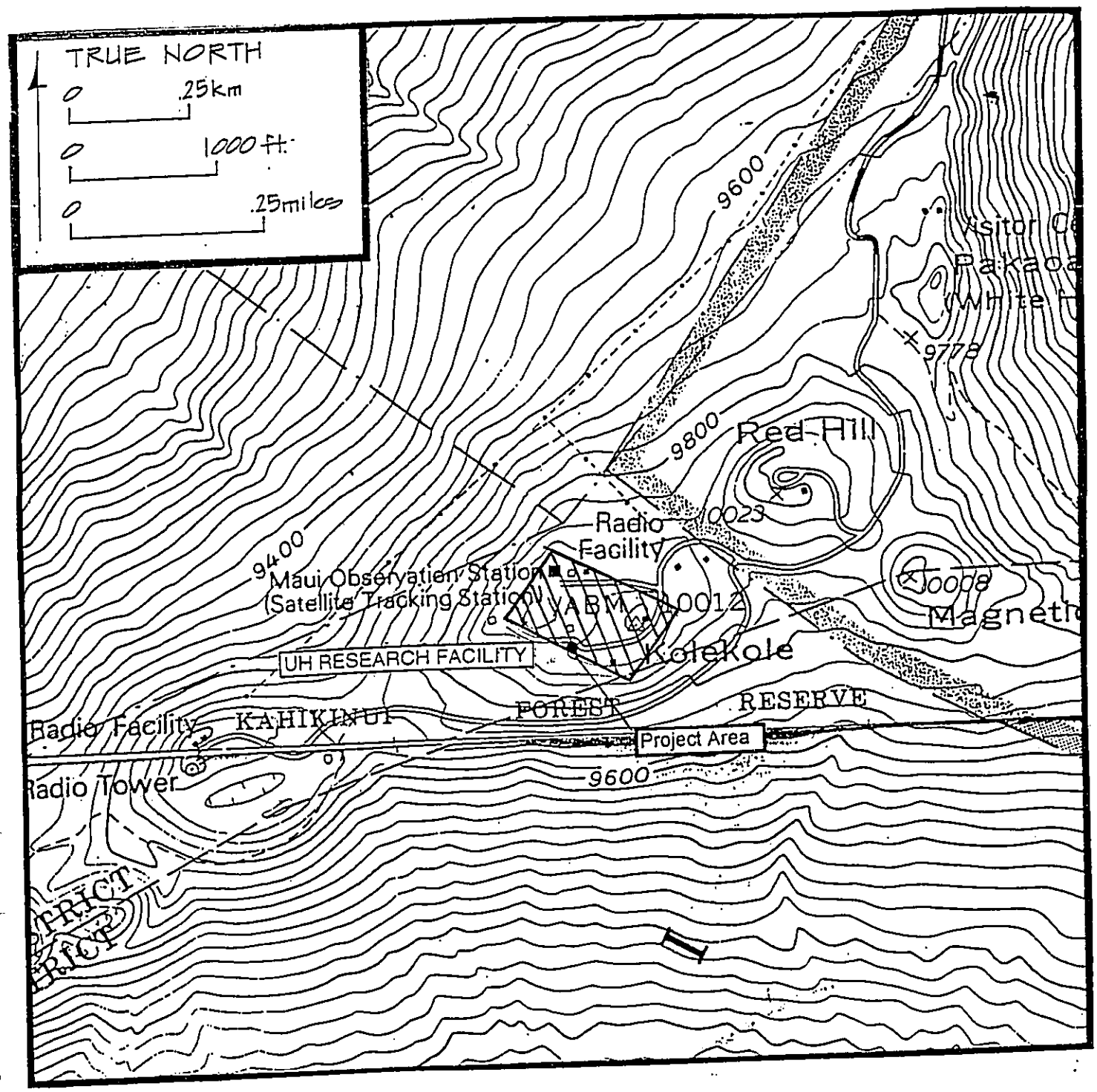


Figure 2 Map Showing University of Hawai'i Research Facility at Haleakalā and Project Area.

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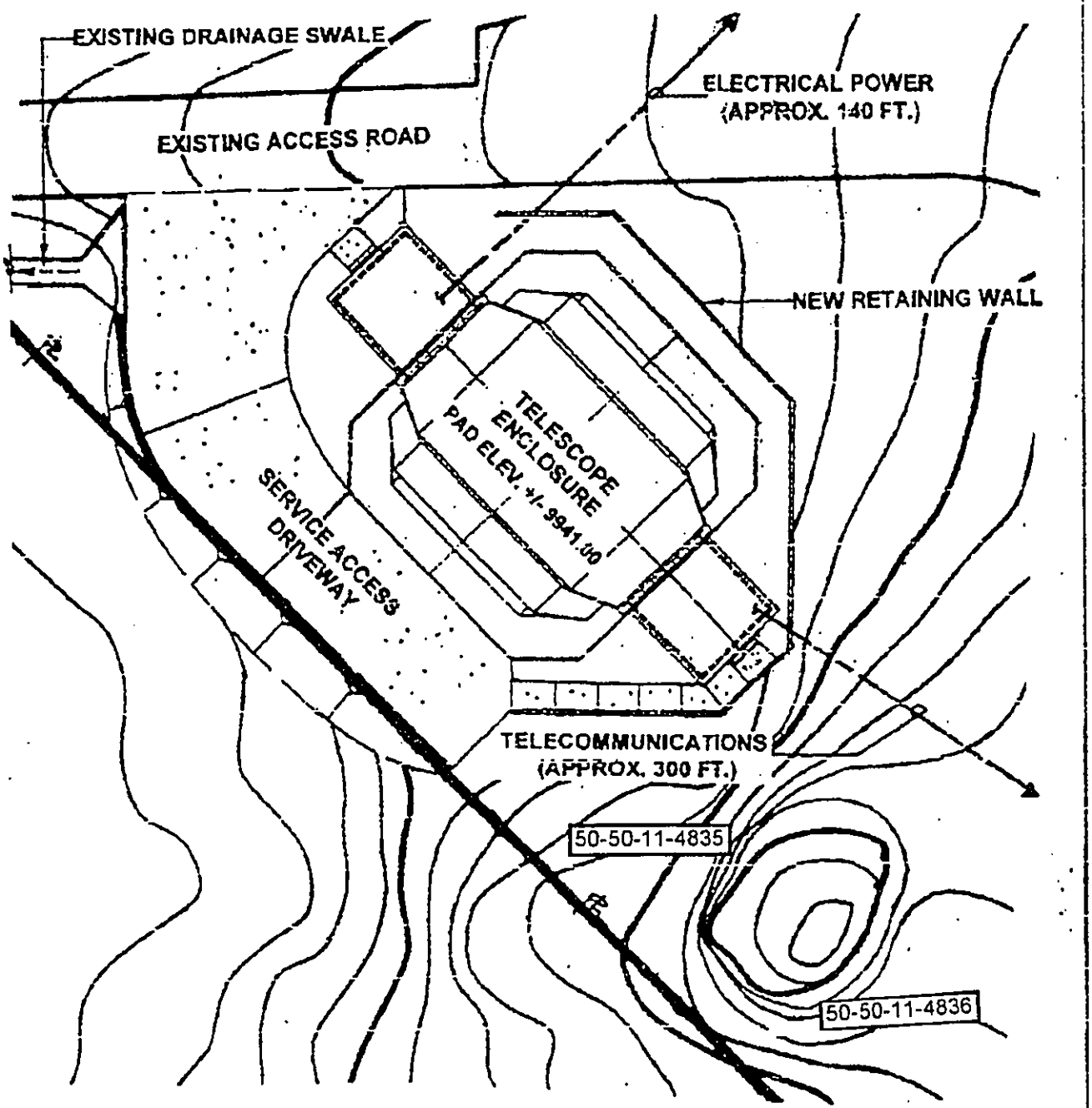
Project: FAULKES TELESCOPE SITE
HALEAKALA OBSERVATORY
ISLAND OF MAUI, HAWAII
Engineer: D. FERRELL
Date: 3/10/00 Sheet 1 of 2



SITE LAYOUT - FAULKES TELESCOPE

Figure 3 Map of Location of Sites 50-50-11-4835 and 50-50-11-4836 and Proposed Faulkes Telescope.

half. Surrounding the outcrop are scattered blocky cobbles and the remainder of the project area is covered with cinder. The ground to the NW of the outcrop has been disturbed with a bulldozer in the past. Modern trash including glass, metal and aluminum cans is scattered in this disturbed area. A paved road leading to the observatory lies to the north of the project area boundary and an old paved road (currently in a state of disrepair) lies to the south of the project area boundaries. A few plants were found in the study area, including various grasses and the shrub *kupaoa* (*Raillardia menziesii*).

II. HISTORIC BACKGROUND

There are few references in the literature specific to the *ahupua`a* of Papa`anui. Rather, the *makai* portion of Papa`anui *Ahupua`a* is better known as part of the Mākena area within the ancient district of Maui named Honua`ula. Because of its unique discontinuous nature (See figure 1), Papa`anui has two rather distinct settlement patterns, one relating to the *makai* portion of the *ahupua`a* and the second relating to the *mauka* portion of the *ahupua`a*, including a portion of the flanks, summit area and interior crater of Haleakalā. Because the preservation plan concerns the sites on top of Haleakalā, the historic background details the *mauka* portion of Papa`anui *Ahupua`a*.

Honua`ula District/ Haleakalā

A. Legendary Accounts

The name Haleakalā and its popular translation, The House of the Sun, is actually thought to be a misnomer. Earlier translations of Haleakalā include Aheleakala and Alehe-la, in reference to the demigod Maui, snaring the sun in his effort to change the sun's course so that his mother's *kapa* could have time to dry (Fornander, 1916/17:5:534,538). Haleakalā has always had a special significance for Hawaiians. Inez Ashdown (1971: 30) comments on the uniqueness of Haleakala: "Ha-le-a-ka-la means *consecrated* to, or by, the sun, or a sacred place of rejoicing because Wa-na-ao, the Dawn, brings the new day from the mountain mass. Life-beginning and Dawn are of the East or Ka-hi-ki-na. Day and light "die" in the west or Ko-mo-ha-na, and are synonymous with death. Both sunrise and soul-rising-again, at dawn, symbolized the new-birth of the immortal soul."

Haleakalā is also linked to the Goddess Pele. Several geographic landmarks in the crater make reference to Pele. Pele's oldest brother, the shark God Kamohoalii, was said to inhabit the highest cone in the interior of the crater (Cobb: in Sterling, 1998: 260). A cone in the crater is named Puu Pele and another, Ka- Moa-a-Pele. West of Halalii is Pele's pig pen (*Ibid:* 263). There is also reference to the residents of Honua`ula belonging to the "Clan of Pele". "The Maui people living on the semi-arid slopes (the great *`uala* area of Maui), who threw their bundles into the pit of the extinct volcano were presumably of the "Clan of Pele" (Handy and Handy, 1972: 336-337). The pit of the extinct volcano most likely refers to the Kaawa Burial Pit at Haleakalā, "a place for the common people to deposit the bodies of their dead, which served Makawao, Kula and Kaupo" (Kamakau: in Sterling, 1998: 265).

Legends of the historic period lava flows in Honua`ula also attest to a relationship between Pele and the Honua`ula inhabitants. One such legend refers to an old woman who appears before a family asking for a chicken to eat. The family refuses the old woman a chicken on the grounds they have made a vow that no one should eat a chicken until they had sacrificed some to Pele. The old woman (Pele in disguise), becomes furious and chases after the family in the form of a lava flow. Pele turns the family members into stone, the mother and daughter up *mauka* and the father and son *makai.*(Thurston: in Sterling, 1998: 225). The chicken in this legend may have some connection with the landmark in Haleakalā crater, Ka-Moa-a-Pele. These legendary accounts and placenames attest to relationships people maintained with Haleakalā mountain in the domain of the sacred, including death and ancestor worship.

B. Traditional Accounts

Haleakalā has long been recognized as a traveling route connecting East and West Maui. Kihapi`ilani, *ali`i nui* of a united Maui in the sixteenth century, completed the construction of a trail around the island, including over Haleakalā, thus uniting the politically important districts of Hana and Kaupō with West Maui. "This trail was used as a rapid communication network and to facilitate the movement of armies from one end of the island to another" (Fornander: in Kolb, 1997:19).

Traditional accounts also exist of the use of Haleakalā in rites of passage such as birth and death. Haleakala's connection to a symbolic rebirth is reflected in the traditional Hawaiian practice of *piko* storing. A pit at Haleakala named Na Piko Haua was still being used by Kaupo residents in the 1920s to store their offsprings' umbilical cords (Krauss, 1988). Peoples of Honua`ula buried their dead in Haleakalā crater (Handy and Handy, 1972). Several references specify burials of both chiefs and commoners in Haleakalā crater (Ka`ai`e, Kamakau: in Sterling, 264-265). One special place in Haleakalā crater was used to dispose of the dead and seems to be associated with burial of commoners:

> This pit of Kaaawa was, like that of Waiuli, a place for the common people to deposit the bodies of their dead, and served Makawao, Kula and Kaupo... (Kamakau: in Sterling, 1998: 265)

> The bodies are prepared thus, just as it has been described...Upon reaching the pit, the relative of the dead calls to a departed ancestor within, "So-and-so, here is your child." If the body (tossed in) falls into the water, he has no relative in this pit, but he who has a relative is caught as his corpse is thrown in. It lands on a ledge and does not drop into the water. After the corpse vanishes, the bearer returns home after which there is much crying and mourning...(Ka`ai`e : in Sterling, 1998: 264).

Descriptions of Haleakalā by early voyagers did not refer to Haleakalā's most majestic qualities. During one of Captain Cook's voyages, he writes a description of Haleakalā, "an elevated hill appeared in the country, whose summit rose above the clouds. The land, from this hill, fell in a gradual slope, terminating in a steep, rocky coast..." (Cook, 1993: 258). A second description written by Edward Bell on Vancouver's first voyage

is equally non-flattering: "...the south shore...had by no means a very inviting appearance, -it was remarkably high and seemed extremely barren; -from the top of the Mountains to the waters edge are deep Gullies or ruts form'd I suppose by the water running down, -and there appeared but little wood on this side (except towards the Top) and as little Cultivation, here and there we saw a few Huts and a small Village, several of which appeared half way up" (Bell: in Ruhle, 1959: 25).

Post-contact travel to Haleakalā by *haole* was mostly limited to expeditions and sight seeing. The first recorded ascent made by *haole* was in 1828 by three men associated with the Lahaina Mission, Richards, Andrews and Green (The Missionary Herald, 1829). They made general observations of the resources found along the way including timber and the famed silversword, which they referred to as "a plant which grew to the height of six or eight feet, and produced a most beautiful flower" (*Ibid*: 247). In 1841, a team from the United States Exploring Expedition ventured up Haleakalā studying and documenting the plants, natural landscape, geology and other ecological aspects of Haleakalā. The expedition team noticed evidence of travel near the summit in the form of bullock tracks (Wilkes, 1845: 252-256) suggesting the continued usage of Haleakalā for transport and traversing East Maui. Although, the *haole* continued expeditions up Haleakalā throughout the 1800s, there's was a pursuit of curiosity, and perhaps science. Meanwhile, there is evidence that Hawaiians continued to ascend Haleakalā throughout the 1800s not only for its popularity as a traveling route, but also for its ceremonial significance. Handy and Handy (1972: 336) report the residents of Kula and Honua`ula traveled to Haleakalā's summit "during the nighttime to toss into the crater the bones of their dead".

Cattle ranching occurred on the slopes of Haleakalā in the late 1800s. Louis von Tempsky, an immigrant of New Zealand of Scotch and Polish ancestry, managed the sixty thousand acre Haleakalā Ranch and drove his cattle to Haleakalā during the summer months to fatten them (von Tempsky, 1940). Apparently, von Tempsky had a stone corral built at the foot of Kolekole, in the vicinity of the current project area, however, there is no evidence the corral remains today. Also in the late 1800s, Haleakalā was recognized as a scenic feature and funds were raised to erect an overnight shelter. In 1916, U.S. Congress allotted 21,000 acres at the summit of Haleakalā as part of the Hawaii National Park. The Park officially opened in 1921 and operated peacefully for twenty years until the U.S. Army began seeking sites for "unspecified defense installations" in 1941 (Jackson, 1972: 130). There is some indication the Army was using the Kolekole site as early as 1941-2 (Personal Communication, Charlie Fein, April, 2000). After being granted a "Special Use Permit" the Army installed equipment at Red Hill. By 1945, the U.S. Army had installations on both Red Hill and Kolekole Peak, just outside of National Park boundaries. These installations were utilized until the end of World War II and intermittently thereafter including during the Korean War. Between 1955 and 1958, the University of Hawaii and the U.S. Air Force shared use of the Red Hill Facilities. By 1960-1961, University of Hawaii was operating its geophysical observatory at the Kolekole location (Jackson, 1972: 131).

Today, the University of Hawaii continues to operate its facilities on the 18 acre parcel including the MEES Solar Observatory, focusing on the energetic activity of the solar corona and the LURE Observatory, dedicated to using lasers to determine distances to

satellites (Murphy, 1995: 69). In addition, classified and defense related projects are currently directed by the U. S. Air Force, including the operation of MSSS (Maui Space Surveillance Site). The main objective of MSSS is to perform satellite imaging (Murphy, 1995: 70).

C. Settlement Patterns of Papa`anui/Haleakalā

Given its unique geography, the use of the *mauka* portion of Papa`anui Ahupua`a was probably not restricted to purely resource collection or to use by only Honua`ula residents. Although alpine resource exploitation and procurement of basalt material for tool manufacture may have tempted people to make the long trek, the spiritual element was also important, as reflected in the types of archaeological sites honoring birth and death. There is some indication that residents from all over East Maui were utilizing the same places at Haleakalā for traveling routes, disposing their dead, storing their children's umbilical chords, hunting birds, etc... This suggests that although Papa`anui may have extended into Haleakalā crater, the places of Haleakalā were used, traversed, collected, and honored by all of Maui and particularly by those of East Maui.

By far, the most ubiquitous features at Haleakalā are the enclosures and *ahus* or cairns. The prehistoric settlement pattern for the rim and crater of Haleakalā links these structures to travelers, warriors or hunters who used the *ahu* or cairns as markers, and the enclosures and walls as windbreaks and temporary shelters. The platforms found elsewhere in the crater are generally construed as altars for religious purposes or special places for hunting and gathering within the crater (*i.e.* adz material, birds, plants). Other landmarks, cinder cones, and caves on the crater rim and within the crater are also associated with religious activities.

In historic times, goat hunters have also built blinds and windbreaks in the crater and visitors are known to have built little cairns as mementos of their trip. It is often difficult to discern whether these structures are historic or prehistoric as there is no evidence of cultural material.

III. PREVIOUS DOCUMENTATION OF STATE SITES 50-50-11-4835 AND 50-50-11-4836

The archaeological inventory survey located two sites in the project area (Figures 3-4), State sites 50-50-11-4835 and 50-50-11-4836. Both sites were constructed against an exposed rock outcrop centrally located in the project area.

State Site #50-50-11-4835

General Description: Site 50-50-11-4835 consists of two features, two rock enclosures built against the west side of the exposed rock outcrop (Figure 4). The ground extending north and west of the enclosures has been disturbed by a bulldozer in the past and is strewn with modern trash such as glass, metal and aluminum cans.

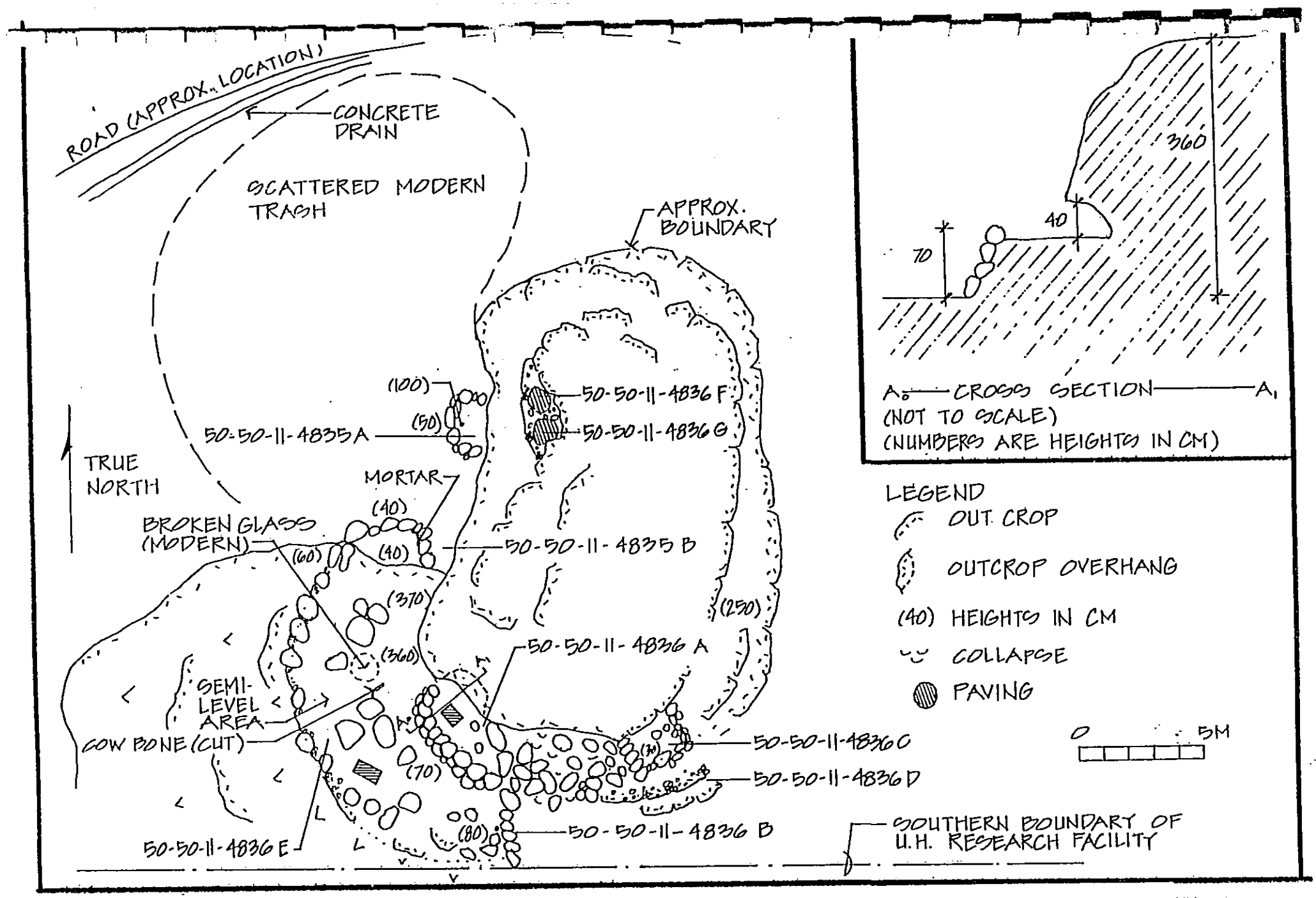


Figure 4 Plan View Map of Sites 50-50-11-4835 and 50-50-11-4836.

Feature #: 50-50-11-4835/A
Feature Type: Rock Enclosure
Feature Function: Trash Burning Pit
Length: 2.5 m

Description: Feature 50-50-11-4835/A is a rock enclosure built against the east face of the exposed rock outcrop. The walls of the enclosure are loosely stacked 2-3 coarse high, small, angular basalt boulders. The floor consists of a relatively level mixture of cinder soil, ash and half burnt modern trash including rusted metal, nails, light bulbs, "no refund" bottles, aluminum foil and wire. The enclosure measures 2.5 m N/S and 1.85 m E/W and the walls range from 40-60 cm high. The enclosure is interpreted as a trash burning pit used from historic times up until modern times.

Feature #: 50-50-11-4835/B
Feature Type: *Rock Enclosure*
Feature Function: Trash Burning Pit
Length: 2.7 m

Description: Feature 50-50-11-4835/B is a rock enclosure which abuts a western extension of the basalt rock outcrop. The walls are loosely stacked, angular basalt boulders, 2-3 coarses high with some mortar reinforcement. The enclosure floor consists of a mixture of cinder soil, ash and modern trash including light bulbs, glass, aluminum cans, bottles, fiber glass, and plastic. The dimensions of the enclosure are 2.7 m E/W and 1.9 m N/S and the walls range from 35-40 cm high. This enclosure is interpreted as a trash burning pit used from historic times up until modern times.

State Site # 50-50-11-4836

General Description: Site 50-50-11-4836 consists of three terraces, a rock enclosure two leveled areas and a rock wall all constructed against an exposed rock outcrop (Figure 4). All the features are located on the south and southwest sides of the exposed rock outcrop, well protected from the prevailing northeast trade winds with the exception of the two leveled areas, which are located on the northwest side of the outcrop. The material used in construction of the features was derived from the exposed rock outcrop located in the center of the project area.

Feature #: 50-50-11-4836/A
Feature Type: Terrace
Feature Function: Temporary Habitation
Length: 4.5 m

Description: Feature 50-50-11-4836/A is a semi-circular terrace built into a slight overhang on the southwest face of the exposed rock outcrop (Figure 4). The outer wall construction of the terrace consists of stacked 2-3 coarse high small to medium sized, angular basalt boulders. The floor of the terrace was filled with soil, cinder and small angular cobbles and somewhat level with the outer walls of the feature. The terrace measures 4.5 m NW/SE, 2.0

m NE/SW and 70 cm high. Cultural material found on the terrace floor include modern trash such as metal banding, glass fragments, and a wooden post. This feature is interpreted to be a prehistoric temporary habitation feature.

One 50 cm² test unit was excavated in Feature -4836/A. The test unit was excavated by natural strata to 50 cm below surface. No cultural material or layers were discovered other than a modern nail at 2 cm depth. Stratum I was 2 cm in depth and consisted of 10YR 5/3 brown, loose, silty cinder with a few cinder pebbles and < 15% rootlets. One modern nail was discovered at 2 cm depth. Stratum II extended to 10 cm below surface and consisted of 10 YR 6/6 brownish yellow silty cinder with approximately 5-15% cinder pebble inclusions and < 10% rootlets. Stratum III extended from 10-15 cm below surface and was composed of 7.5 YR 3/2 dark brown loose cinder. Stratum IV extended from 15-50 cm below surface and was composed of 2.5 YR 4/4 reddish brown, 40-50% red cinder cobbles in a loose silty cinder matrix.

Feature #:	50-50-11-4836/B
Feature Type:	Wall
Feature Function:	Temporary Habitation
Length:	2.5 m

Description: Feature 50-50-11-4836/B is a rock wall jutting out from three large basalt boulders weathering out of the south side of the exposed rock outcrop (Figure 4). The rock wall extends 2.5 m N/S, has a width of 0.6 m and ranges from 80 to 100 cm high. The construction consists of 2-4 courses of stacked, angular, basalt boulders and cobbles. No cultural material was found in association with the wall segment. This feature is interpreted to be a temporary habitation feature associated with the Feature -4836/A.

Feature #:	50-50-11-4836/C
Feature Type:	Enclosure/ U-Shape
Feature Function:	Temporary Habitation
Length:	2.5 m

Description: Feature 50-50-11-4836/C is a U-shaped rock enclosure which abuts the south side of the exposed rock outcrop (Figure 4). The wall construction of the enclosure consists of roughly stacked and piled angular, basalt boulders and cobbles 2-3 courses high. The floor is rock outcrop that slopes slightly to the south. There are scattered basalt cobbles on the floor, probably from weathering of rock outcrop. The enclosure measures 2.5 m E/W and 2.2 m N/S with the height of 30 cm. No cultural material was found in the vicinity of the enclosure. This feature is interpreted as a temporary habitation feature.

Feature #:	50-50-11-4836/D
Feature Type:	Terrace
Feature Function:	Temporary Habitation
Length:	2.5 m

Description: Feature D is a terrace situated below Feature C. Feature D measures 2.5 m E/W by 1.8 m N/S. The terrace combines natural *in situ* bedrock boulders with cobbles and pebbles used to fill in cracks and crevices in between the bedrock boulders to create a retaining terrace wall. Behind this mainly natural retaining wall is a roughly level surface of cinder and loose rocks of various sizes. No midden or artifacts were observed. The feature is interpreted as an associated feature of Feature C temporary habitation shelter.

Feature #:	50-50-11-4836/E
Feature Type:	Terrace
Feature Function:	Temporary Habitation
Length:	13.0 m

Description: Feature E is a large natural terrace situated along the southwest corner of the large outcrop. The feature surrounds Feature A and abuts the west side of Feature B. Feature E measures approximately 13.0 m N/S by 7.5 m E/W. The terrace combines natural *in situ* bedrock boulders with possibly placed boulders an cobbles to create an irregular shaped retaining wall. The retaining wall, which may be natural, retains a semi-level area of cinder. On the surface of the terrace are a number of large boulders, which are scattered in an unorganized fashion. In addition a scatter of broken brown modern bottle glass, a piece of cut medium mammal bone, two tin cans, metal strapping, an aerosol can and pieces of wire were observed on the surface of the terrace. No midden or artifacts were observed. The feature is interpreted as an associated feature of Feature A temporary habitation shelter.

One 50 by 100 cm test unit was excavated in Feature -4836/E. The test unit was excavated by natural strata to a maximum of 75 cm below surface. No cultural material was discovered during excavation or on the surface of the unit prior to excavation. Stratum I was 3 cm in depth and consisted of 10YR 5/3 brown, loose, silty cinder with a few cinder pebbles. Stratum II extended to 20 cm below surface and consisted of 10 YR 6/6 brownish yellow silty cinder with approximately 5-15% cinder pebble inclusions. Stratum III extended from 20-35 cm below surface and was composed of 7.5 YR 3/2 dark brown loose cinder. Stratum IV extended from 35-75 cm below surface and was composed of 2.5 YR 4/4 reddish brown, 40-50% red cinder cobbles in a loose silty cinder matrix. No cultural material or layers were encountered during the excavation.

Feature #:	50-50-11-4836/F
Feature Type:	Leveled Area
Feature Function:	Indeterminate
Length:	0.8 m

Description: Feature F is a leveled area situated above Site 50-50-11-4835 Feature A (Figure 4). Feature F measures 0.8 m in diameter. The feature consists of a natural depression in the outcrop which has been filled with cinder to create a small level cinder surface. No midden or artifacts were observed. The function of the feature is indeterminate.

Feature #: 50-50-11-4836/G
Feature Type: Leveled Area
Feature Function: Indeterminate
Length: 1.0 m

Description: Feature G is a leveled area situated above Site 50-50-11-4835 Feature A. Feature F measures 0.8 m in diameter. The feature consists of a natural depression in the outcrop which has been filled with cinder to create a small level cinder surface. No midden or artifacts were observed. The function of the feature is indeterminate.

IV. PRESERVATION PLAN FOR SITES 50-50-11-4835 AND 50-50-11-4836

The following preservation measures for these sites were developed following the Draft Hawai`i Administrative Rules, Title 13, Sub-Title 13, Chapter 277 "Rules Governing Requirements for Archaeological Site Preservation Development", and in consultation with Ms. Melissa Kirkendall, Maui Island archaeologist for SHPD/DLNR. A suitable preservation plan must be approved by SHPD/DLNR before development of the project area can begin. The preservation plan should:

1) Identify for each significant historic property whether preservation will take the form of avoidance and protection (conservation) or exhibition (interpretation).

2) Specify the buffer zones around each significant historic property.

3) Specify short-term/interim protection measures for each significant historic property that will be within or near a construction area.

4) Discuss the agency or person's consultation process, for properties with traditional cultural significance. The agency or person shall consult with ethnic organizations and individuals for whom the historic properties are of cultural significance.

5) Specify the long term preservation measures to be undertaken at each significant historic property. This may be done with drawings or text, or both (Draft Hawaii Administrative Rules Title 13, Sub-Title 13, Chapter 277).

The project plans have not been finalized so only the short-term or interim protective measures of the overall preservation plan are being addressed in this report.

A. Interim Preservation Measures

The goal of interim preservation measures is to physically identify sensitive cultural resources slated for preservation and provide them with adequate preservation buffers for their protection during construction. The two sites to be preserved, Sites -4835 and -4836, will have construction buffer zones. These buffer areas will be designated with highly visible and brightly colored construction fencing, four to six feet in height, and at a distance

of fifty feet from sites -4835 and -4836. Interim preservation will be ensured by adopting the following protective measures:

Interim Site Protection:

1. All preservation areas will be plotted accurately on grading plans and construction plans prior to the initiation of any grading, grubbing, and/or construction activities.

2. Construction will not be allowed to occur within the 50 foot protective buffer zone. Buffer zones will be identified and mapped around all site perimeters. Installation of preservation buffer zones will be supervised by archaeologists and will include the installation of event fencing, four to six feet in height. DLNR-SHPD will be notified when buffer zones are set in place and may make a site visit to verify the completion of the buffer zone fencing and adequate protection to the historic properties.

3. Explicit notification will be provided to construction supervisors as to the nature and a location of the preservation zones, the significance of the buffer zones, and the color and meaning of any site perimeter and buffer zone fencing.

4. Archaeologists will provide on-site monitoring of initial construction grubbing and grading in the immediate vicinity of all sites to be preserved. Monitoring will also ensure that the use of equipment during construction activities in developable portions of the parcel will not adversely affect the cultural sites.

5. The protective buffer zone fencing will remain in place until construction and land movement activities are completed, and approval for their removal is obtained from DLNR-SHPD. Then the interim construction buffer will be removed and long term preservation measures implemented.

6. No stones may be removed from within the preservation zones. Stones broken during ground work construction will be kept on site for use in development of buffers and other park amenities.

7. Protection of Burial Sites. In compliance with Chapter 6E-43 (as amended by Act 306), should any burial remains be inadvertently discovered as a result of work on the property, all work in the area of the remains will cease and DLNR-SHPD will be notified within three days. Similarly, if remains should be exposed through natural processes or as a result of property maintenance activities, DLNR-SHPD will be notified as above. Disposition of any identified remains will be determined on a case-to-case basis by DLNR-SHPD, in consultation with the designated lineal descendants and the Hawaii Island Burial Council.

B. Long-term Preservation of Site 50-50-11-4835 and 50-50-11-4836

Following completion of construction of the project, long term preservation treatments need to be implemented. These long term preservation measures will be determined in consultation with ethnic organizations and/or individuals for whom the historic properties are of cultural significance as well as with DLNR/SHPD. Depending on the determination of the form of long term preservation, different conditions of preservation will be applied. If it is decided to protect Sites -4835 and -4836 by way of avoidance (conservation), specific conditions will detail how this is to be carried out. If it is decided to protect the sites through exhibition with interpretation of significance, long term preservation recommendations could include but need not be limited to 1) documentation of site conditions, 2) access to site, 3) site interpretation and 4) buffer zones (wall, plant, etc...).

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APPENDIX K
COMMENT LETTERS AND RESPONSES

05 February 2001

Dr. Rolf-Peter Kudritzki, Director
Institute for Astronomy
University of Hawaii
2680 Woodlawn Drive
Honolulu, Hawaii 96822

RE: Faulkes Telescope Project

Dear Dr. Kudritzki,

I must say that after reading Mr. Maxwell's Sr. Viewpoint in The Maui News, February 4th, I am enlightened and astonished that the educators of our students would be so uncaring as to neglect and dismiss the extreme cultural and spiritual implications of erecting yet another instrument on top of Haleakala. Goodness gracious, perhaps we should be researching and learning more about the land we choose to live on which has significant historical meaning to it and to the native born people.

It is my opinion that there already has been far too much construction in general on the island of Maui. Let us make way for appreciation of the old way and let Maui be without all this disruption. After all, Maui is actually in the shape of a woman and I think that with all the construction, the traffic, accidents, fatalities, road closures, unnecessary lawsuits (Barrett), inadequacies of teacher's salaries that she must have not only a headache, but a severe heartache!!!

The elegance and beauty of Hokule'a as it temporarily rests in the Lahaina Harbor is a true reflection of this island's magnificent Polynesian culture. Haleakala "...was and still is being used as a navigation point by voyaging canoes." stated Mr. Maxwell Sr. This is how we can teach students of all walks of life to learn about this precious culture, history, people, land and yes, astronomy.

In conclusion, for the few sound reasons mentioned herein, I beseech you to please NOT proceed forward with the Faulkes Telescope Project. Please kokua with the cultural consultants.

Thank you.

Sincerely yours,

Doreen A. Clyne

Doreen A. Clyne

P.O. Box 13233
Lahaina, HI 96761

Cc: The Maui News

UNIVERSITY OF HAWAI'I AT MĀNOA
Institute for Astronomy

April 17, 2001

Ms. Doreen A. Clyne
P.O. Box 13233
Lahaina, Hawai'i 96793

Subject: Comments on Draft Environmental Assessment for the Faulkes Telescope Facility at Haleakala, Maui, Hawai'i.

Dear Ms. Clyne:

Thank you for your letter of February 5, 2001, regarding the Draft Environmental Assessment for the Faulkes Telescope Facility at Haleakala, Maui, Hawai'i.

We appreciate the concerns expressed in your letter. The University of Hawai'i is committed to respecting the cultural and spiritual values of native Hawaiians. It is important to note that during the course of this project, no action will be taken that will impede worship or access to previously accessible sites for native Hawaiians. In addition, the Faulkes Telescope Corporation, its contractors, and the University of Hawai'i participants will be asked to complete a "Sense of Place" training prior to construction so that the cultural and religious values of the native Hawaiians will be appropriately identified and respected. A preservation plan has been implemented to protect Hawaiian archaeological resources in the project area.

We realize that some Hawaiians still believe that this project will impact the spirituality of Haleakala. The IfA has attempted to balance the needs of the Hawaiian community with those of the scientific community. At the same time, the UH is dedicated to advancing scientific knowledge and believes that the construction of the Faulkes Telescope Facility will provide Hawai'i residents and schoolchildren with an outstanding opportunity for education in science and astronomy.

Thank you.

Sincerely,

Rolf-Peter Kudritzki
Director

2680 Woodlawn Drive, Honolulu, Hawai'i 96822

ALLEN L. PRESTEGARD
502 PACIFIC DRIVE
KAPALUA, HI 96761-9000

February 7, 2001

Dr. Rolf-Peter Kudritzki
Director, Institute for Astronomy
University of Hawaii
2680 Woodlawn Drive
Honolulu, HI 96822

Dear Dr. Kudritzki:

I am writing you in response to a column by Charles Maxwell Sr. that was published in the Maui News on February 4, 2001. In his column, Mr. Maxwell objects to the Faulkes Telescope Project on a cultural basis and he appears to be soliciting readers to write you with their objections.

I am writing to let you know that not all of us who live on Maui agree with Mr. Maxwell's position. In fact, I fully support the Faulkes Telescope Project and believe that the potential benefits of the project far outweigh any potential cultural harm. I urge you and your colleagues not to be distracted by Mr. Maxwell's attempts to slow or halt the Project, but rather to proceed with all due haste to complete it.

Unfortunately, we have a number of people like Mr. Maxwell here on Maui, who appear to be so stuck in the past history of Hawaii that they seem to be unable to see the value of new projects or developments to the current citizens of Hawaii. The reaction of Mr. Maxwell and his associates is to object to such projects on cultural or spiritual grounds. While we should always respect people's spiritual beliefs, we cannot allow progress to stop in this State because of such beliefs. I see no damage that will be caused to Haleakala by the Faulkes Telescope Project and I urge you to proceed with it.

Sincerely,

Allen L. Prestegard

UNIVERSITY OF HAWAI'I AT MĀNOA
Institute for Astronomy

April 17, 2001

Mr. Allen L. Prestegard
502 Pacific Drive
Kapalua, Hawai'i 96761-9000

Dear Mr. Prestegard:

Subject: Comments on Draft Environmental Assessment for the Faulkes Telescope Facility at Haleakala, Maui, Hawai'i.

Thank you for your February 7, 2001 letter expressing support for the proposed Faulkes Telescope Facility on Haleakala, Maui. We appreciate your comments and are pleased to hear that you support our scientific efforts.

Sincerely,

Rolf-Peter Kudritzki

Rolf-Peter Kudritzki
Director

2680 Woodlawn Drive, Honolulu, Hawai'i 96822

JAMES "KIMO" APANA
Mayor

JOHN E. MIN
Director

CLAYTON I. YOSHIDA
Deputy Director

FEB 2 0 2001

COUNTY OF MAUI
DEPARTMENT OF PLANNING

February 14, 2001

Mr. Rolf-Peter Kudritzki, Director
Institute for Astronomy
University of Hawaii
2680 Woodlawn Drive
Honolulu, Hawaii 96822

Dear Mr. Kudritzki:

RE: Draft Environmental Assessment, Proposed Faulkes Telescope at Haleakala Summit

Thank you for the opportunity to review this document. While the Maui Planning Department (Department) has no objections to the project, we have several comments.

1. We are concerned about the introduction of additional alien species to the top of Haleakala. The ecology of the area is unique to the islands and the world. The draft document includes mitigation factors such as equipment cleaning prior to allowing it on the job site. We would like to see strict adherence to the mitigation measures.

2. We note that there has been considerable discussion with the Native Hawaiian Community regarding the project. We would hope that further discussions could take place to satisfy their concerns.

3. In addition to the use of the Conservation District, Hawaii Revised Statutes (HRS) 343-5(a)(4) also names the use of a historic district as one of the triggers for an Environmental Assessment. Haleakala Summit is listed on the National Register of Historic Places, Site No. 50-11-1739. We suggest that the applicant consult with the Maui County Cultural Resources Commission for

its review and recommendations on the project after initial consultation with the State Historic Preservation Division. Please contact this Department if you wish to schedule a presentation with this commission.

If further clarification is required, please contact Mr. William Spence, Staff Planner, of this office at 270-7735.

Very truly yours,

JOHN E. MIN
Planning Director

JEM:WRS:cmb
c: Clayton Yoshida, AICP, Deputy Planning Director
Don Hibbard, PhD., State Historic Preservation Division
William Spence, Staff Planner
Project File
General File
S:\ALL\WILL\AACORESP\2001\faulkes.wpd

UNIVERSITY OF HAWAI'I AT MĀNOA

Institute for Astronomy

April 18, 2001

Mr. John E. Min, Planning Director
County of Maui
Department of Planning
250 South High Street
Wailuku, Hawai'i 96793

Subject: Comments on Draft Environmental Assessment for the Faulkes Telescope Facility at Haleakala, Maui, Hawai'i.

Dear Mr. Min:

Thank you for your February 14, 2001 letter concerning the Draft Environmental Assessment for the Faulkes Telescope Facility at Haleakala, Maui, Hawai'i.

We are pleased that the Maui Planning Department has no objections to the project and we would like to address your concerns:

1. The Faulkes Telescope Corporation (FTC) is requesting assistance from Haleakala National Park to prevent the introduction of alien species to the summit area. The FTC will request that Haleakala's Resource Management personnel assist with inspection of trucks that will carry material through the National Park as well as the inspection of materials arriving at the harbor.

2. According to our research, the Crater Historic District does not include the area of the proposed Faulkes Telescope Facility (FTF) at Haleakala Observatories. We obtained a copy of the National Register of Historic Places Nomination Form for site 50-1739 from Haleakala National Park, and it states, "At the time of nomination, actual district boundary coincides with park boundary." There have been no amendments to the original nomination that would indicate a change of these boundaries, and the FTF is more than 600 meters from the nearest park boundary.

3. The DNLR State Historic Preservation Division (SHPD) has approved the Draft Environmental Assessment. At the SHPD's recommendation, a draft preservation plan was prepared and the FTF development will be monitored by an archaeologist. The SHPD did not recommend that the DEA be reviewed by the Maui County Cultural Resources Commission. Therefore we do not plan to schedule a presentation with the Commission.

Thank you for this opportunity to address your concerns.

Sincerely,

Rolf-Peter Kudritzki
Director

2680 Woodlawn Drive, Honolulu, Hawai'i 96822

FEB 26 2001

February 22, 2001

Rolf-Peter Kudritzki, Director
Institute for Astronomy
University of Hawaii
2680 Woodlawn Drive
Honolulu, HI 96822

Re: Draft Environmental Assessment for the Faulkes Telescope Facility Located at the Haleakala Summit, Island of Maui

Aloha Dr. Kudritzki:

Where people are not cognizant of the impacts of their acts, only intuition or a glimpse of what they are overlooking can be of immediate value in avoiding acts that may cause harm. Western society, being extremely rational, has developed schemes such as the environmental assessment that is being addressed by this letter as a way to invite analysis of avoidable harm. The problem, of course, is that the scheme used by the environmental assessment process is confined entirely within the rational mind's approach to analysis. Empirical analysis is perhaps allowed, but has less weight than the rational scheme favored by established authority.

Perhaps your intuition heard my point: I can see how a delightfully conceived adventure in astronomical teaching can be harmful to the summit of Haleakala and the Island of Maui. But I'm not at all sure that I can convey my perception to you in a manner that will allow you to avoid permitting that harm to occur. Regrettably, in my view of ethics, each person is in the end answerable to themselves for the ultimate evaluation of their life – it is regrettable in the sense that if I see harm in this project, and yet I cannot sufficiently inform you of that harm, then my failure may lead to your acting in manner that may cause regret.

The harm, as simply stated as I can, is this: world population growth is causing tremendous stress afflicting the ecology of the planet. We have been able as a species to organize tremendous scientific accomplishments, but – largely due to a failure of our empirical perceptions – we have not been able to organize the solutions to the simpler problems of hunger, homelessness and destitution that plagues so much of the world.[1] Our distraction by grander scientific schemes serves in part as a consolation and in part as a denial of those failures on simpler matters. Despite the dominance of the

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[1] Please consider the fact that as many as 1.2 billion people (one out of five on the globe) lack access to clean drinking water. Nearly 3 billion lack sanitation: no underground sewage, toilets, or even latrines. More than 5 million people a year die of easily preventable diseases such as diarrhea, dysentery, and cholera.

extremely rational ways of Western society in the world today, there are substantial numbers of people for whom the older ways of balancing the empirical and rational are still part of their way of life. Those people are subservient to the dominance of the West not only in their philosophy but also in their material strength. A respectable trait that is not uncommon in the philosophies of such people is a greater sensitivity for the natural environment. Hawaiians, for example, are possessed of a traditional value of aloha for the land, a value that could serve well in helping ameliorate the tremendous stress afflicting the ecology of the planet today. The connection between the values of empirical perception in relating to nature and the proposed Faulkes telescope may seem strained to you, but to me it is unavoidable and simple: adding another science device to the summit of Haleakala will have an adverse impact[2] on the empirical spirit of the place and contribute to the demise of values such as aloha aina, or love for the land, that are of such need in resolving obvious problems in the world today.

The area of science city is sacred and important in terms of traditional Hawaiian values, and the intrusion of astronomical facilities in that area has been viewed as a desecration by some. And there is a feeling of perceived insensitivity on the part of the Institute for Astronomy as to those traditional values.[3] Scientific development has been justified on several grounds – primarily, in political terms, on economic grounds, as a source of investment creating jobs and bringing money to Maui. However, the dispute is over values, and the traditional values elevate intrinsic natural virtues over economic benefits. The sale of virtue, in some circumstances, is called prostitution.

It may be valuable to teach school children how to appreciate astronomy.[4] But the value of that teaching must be contrasted with the cost. The cost is adverse impact upon an essentially spiritual place of the traditional culture of Hawai'i. Why do I have a feeling that this is not getting through to you? Probably because I suspect that you are

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[2] The Faulkes EA says, on page S-2, "When there is no cloud cover at mid- or upper-elevations on the mountain, the largest, existing structures of HO can be faintly seen from Maui's central-valley." The structures plainly stand out and can be felt at the summit and are obtrusively visible from the Kula area of Maui.

[3] "The absence of trees and the dark lava ground surface give the summit of Haleakala a barren appearance, particularly since it contrasts so sharply with the lush tropical environment one passes through from sea level up to the lower portion of the mountain leading to the summit." Faulkes EA, page S-12.

[4] The Faulkes EA says, "The No Project Alternative would deny students interested in the astronomical sciences access to a world-class, educational resource."

thinking how unfortunate it is that a spiritual place of the traditional culture of Hawai'i[5] could be adversely impacted by a scientific project that you so highly value. In other words, I suspect your rational mind is dominating your perception of these thoughts.

Have you had any spiritual experiences on Haleakala? I have. When you have felt the impact of a genuine epiphany that emanates so powerfully and obviously from this spiritual place of traditional culture, then your empirical perception overcomes the ordinary dominance of the rational mind and requires you to pay attention. However, in the absence of such an experience, there is nothing that requires you to pay attention to the comments of people whose experience differs from yours. Nothing other than the rationale of an environmental assessment process, that is. Ah, that is – that is the problem, isn't it. So, in view of the problem, allow me to make some more comments.

Everything that is built by your agency on the summit of Haleakala will someday rot away. Unless people continue to use the summit as a science city, eventually it will return to its natural condition and perhaps then its displaced spiritual mana may be restored. The spirituality of the summit of Haleakala is disturbed by the turbulence of science city activities, not to mention the hordes of tourists and commercial bike companies. It is turbulent in the sense that there is an energy alien to the spirituality that makes it necessary for the spirituality to retreat – that is how the spiritual value of the summit is adversely impacted. It probably would be possible to conduct activities such as those at science city and even the tourism activities in a manner that would be less turbulent in the spiritual sense, but it is not happening that way. Therefore, there is a greater likelihood that the things built by your agency will rot away, in part because there is a greater likelihood that the steps required to avoid the eventual demise of the world that enjoys such activities will not be taken, as the philosophies and traditions that are available to ameliorate the adversities already created by that world fall into further disregard and disdain from those in such great need of their teachings.

The Faulkes EA says on page II-2 that "there would be a six-foot lava safety barrier around the facility to prevent inadvertent contact with the remotely operated systems during their operation." Assuming the wall would circumvent the 75 foot diameter concrete base of the facility, the six-foot high lava safety barrier would be more than 250 feet long. That requires a lot of lava to make such a wall. The EA does not discuss where all that lava will come from or how the wall will be constructed. Both of those concerns are significant.

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5 "To many present-day native Hawaiians, the summit area of Haleakala is considered a spiritual resource and sacred site." Faulke ES, page S-17.

Why has the Institute for Astronomy failed to create a master plan for the summit of Haleakala? For many years the idea of creating such a plan has been discussed and held out as a good idea. There have been intimations that of course the University is going to make such a master plan some day. I followed the extended controversy in regard to a master plan for Mauna Kea. It took a really long time to get that done.[6] Is there ever going to be such a process for Haleakala? Why are you unwilling to do it now, before proceeding with even this project? Is it too much trouble to make a plan?

I have heard from reputable people that one reason the Institute for Astronomy has avoided a master plan for Haleakala is that a site characterization study would be obliged to disclose that temperature inversions or other atmospheric disturbances up there create conditions that are not favorable for astronomy.[7] In other words, if the master plan process was begun, the end result would probably be discouraging for future astronomical site development there. Now that sounds pretty bad, doesn't it. What sounds bad to me is not that the atmospheric conditions are not favorable for astronomy, but that the Institute for Astronomy for fear of obtaining such a result has avoided the master plan process to avoid the end result of discouraging development.[8]

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[6] Did you see the article in the July, 1999, issue of *Scientific American* magazine entitled *In Focus: Seeking Common Ground*, that said, "Balancing the needs of astronomy with environmental and cultural issues has moved to the forefront on perhaps the world's most coveted astronomical site, the 11,288-acre (4,571-hectare) science reserve atop Mauna Kea on Hawaii's Big Island." The article further said, "... Mauna Kea is also considered in oral Hawaiian traditions to be the first-born child of the gods of the sky and the earth, the most sacred place in all the islands. The University of Hawaii hurriedly commissioned the new master plan after a state audit last year found that the university's management of the mountaintop was 'inadequate to ensure protection of natural resources.' The audit's findings, many of which were contested by the university, made assertions about neglect of historical preservation and cultural sites . . ."

[7] The Faulkes EA crows about how, "Haleakala has some of the best viewing conditions available in the world. Conditions on Haleakala are predictable and consistent, providing good viewing for a majority of the time."

[8] The Faulkes EA begins by saying somewhat haughtily that "the summit area of Haleakala is one of the prime locations in the world for astronomical, space surveillance and atmospheric observations." It soon thereafter notes that "UH intends to continue its development of the site with astronomical and related projects."

There are many ways to rationalize such a fear of discouraging development – for example, the employees of the Institute for Astronomy working at the summit of Haleakala, and the employees of other facilities there, need the security of a good reputation for their workplace – and avoiding disclosures that might diminish that good reputation helps secure their economic future. Ah, rationalism.

Lets suppose, however, that the reputable people I have heard from are wrong, that the Institute for Astronomy values empirical truth way more than a false sense of economic security, and that there is nothing to suggest that atmospheric conditions are not favorable for astronomy at the summit of Haleakala. It is nonetheless important for your agency to proceed immediately with a master plan process before turning another single stone at the summit. In that process you will hear more of this stuff I am telling you now. You will hear more people speak of epiphanies and spirituality affecting them at the summit and elsewhere around Haleakala. Although you may never have such an experience yourself, and therefore you may doubt that these comments have as much weight as their proponents assert, the process will include those comments and in that way those comments will work their small magic on the process. The end result will be far better than doing nothing about making a master plan.

Some empirical perceptions affect people by intuition and glimpse. That effect is just as meaningful as rational perceptions. I hope my thoughts have come through to you in some way that allows you to appreciate that they are very meaningful to me.

Aloha,

Bill Smith

Bill Smith
P.O. Box 484
Kula, HI 96790

UNIVERSITY OF HAWAI'I AT MĀNOA
Institute for Astronomy

April 17, 2001

Mr. Bill Smith
P.O. Box 484
Kula, Hawai'i 96790

Subject: Comments on Draft Environmental Assessment for the Faulkes Telescope Facility at Haleakala, Maui, Hawai'i.

Dear Mr. Smith:

Thank you for your letter of February 22, 2001 regarding the Draft Environmental Assessment for the Faulkes Telescope Facility at Haleakala, Maui, Hawai'i. Complete responses to your comments are being provided below:

"Science City is sacred and important in terms of traditional Hawaiian values..."

The University of Hawai'i is committed to respecting the cultural and spiritual values of native Hawaiians. During the Environmental Assessment process, native Hawaiians were consulted and their insights about Haleakala were recorded. It is important to note that during the course of the Faulkes project, no action will be taken that will impede worship or access to previously accessible sites for native Hawaiians. In addition, project participants will be asked to complete a "Sense of Place" training prior to construction so that the cultural and religious values of native Hawaiians will be appropriately identified and respected. Furthermore, a preservation plan has been implemented to protect Hawaiian archaeological resources in the project area.

We realize that some Hawaiians still believe that this project will impact the spirituality of Haleakala. The IfA is working to balance the needs of the Hawaiian community with those of the scientific community. At the same time, the UH is dedicated to advancing scientific knowledge and believes that the construction of the Faulkes Telescope Facility will provide Hawai'i residents and schoolchildren with an outstanding opportunity for education in science and astronomy.

The source of lava rock for the barrier wall and how the wall will be constructed

The Faulkes Telescope Facility was designed to situate the buildings and structures within the contours of the existing terrain in order to minimize grading. It is expected, however, that some excess material will be generated during the construction process. This rock will be used for the exterior surfaces of the safety barrier around the facility. As in many of the natural appearing walls throughout Maui, the interior will be concrete to add strength. Therefore, in the unlikely event that extra material is necessary for facing, it will be taken from adjacent areas within the Haleakala Observatories site. When completed, the exterior of the safety barrier will be indistinguishable from a Hawaiian dry-laid wall and will harmonize with the natural environment.

"Why has the Institute for Astronomy failed to create a Master plan for the summit of Haleakala?"

The University of Hawai'i, Institute for Astronomy (IfA) is in the process of developing a Research and Development Plan (RDP) for the Haleakala High Altitude Observatory (HO) site. Since 1990, the IfA, operating under various grants and contracts, has been evaluating and characterizing the optical quality of HO. Meteorological and atmospheric data will help us evaluate what types of scientific and observational programs Haleakala Observatory site is best suited for. The RDP will serve as the road map for development of a Long Range Development Plan (LRDP). The LRDP will include a description of land use, details of existing conditions, and proposed land use. Under existing conditions, there is a need to identify the biological, archeological, and geological resources as well as the need to identify and evaluate any threatened or endangered species. The IfA is presently seeking funding to support these important studies.

"...one reason the Institute for Astronomy has avoided a master plan for Haleakala is that a site characterization study would be obliged to disclose...conditions that are not favorable for astronomy."

This is simply not true. The University of Hawai'i Institute for Astronomy (IfA) has been studying the "seeing" characteristics of Haleakala in comparison to other observatory sites around the world for several years and research continues. UH Scientists who recently analyzed Haleakala's seeing conditions wrote, "While there is a large body of astronomical evidence which suggests that Mauna Kea is perhaps the best astronomical site in the world, there is no clear reason why Haleakala should be qualitatively different as an observing site." These researchers noted that Haleakala has a more frequent convective penetration of clouds than Mauna Kea; however, both areas were "significantly above the stable layer in the atmosphere." The most recent UH study concluded that only one other site surpasses Haleakala, and that is Mauna Kea. Astronomers believe that the Haleakala Observatory site is among the best in the world for conditions necessary for astronomical research. You will find more information about seeing conditions at Haleakala in J. R. Kuhn et al., "A Comparative Look at the Atmospheric Optical Characteristics of Haleakala." University of Hawaii, Institute for Astronomy, http://ulua.mhpcc.af.mil/AMOS/1999_AMOSTechnicalConference/Kuhn_paper/Kuhn.html

Thank you for this opportunity to address your concerns.

Sincerely,

R.P. Kudritzki

Rolf-Peter Kudritzki
Director

David Henderson Brown, M.D.
2525 Kahekili Highway
Wailuku, Hawaii 96793-9233
808 244-5721

20 February 2001

Dr. Rolf-Peter Kudritzki
University of Hawaii Institute of Astronomy
2680 Woodlawn Drive
Honolulu, Hawaii 96822

Dear Dr. Kudritzki:

Concerning: DEA First Notice Faulkes Telescope Facility

I am AGAINST the Faulkes Telescope Project at this time.

There needs to be a MASTER PLAN for HALEAKALA crater summit area before there is any more construction. At the time that there is a master plan in place, I reserve my right to reevaluate my opinion on this project.

Sincerely yours,

David Henderson Brown,M.D.

UNIVERSITY OF HAWAI'I AT MĀNOA
Institute for Astronomy

April 17, 2001

David Henderson Brown, M.D.
2525 Kahekili Highway
Wailuku, Hawai'i 96793-9233

Subject: Comments on Draft Environmental Assessment for the Faulkes Telescope Facility at Haleakala, Maui, Hawai'i.

Dear Dr. Brown:

Thank you for your letter in response to the Draft Environmental Assessment for the Faulkes Telescope Facility at Haleakala, Maui, Hawai'i.

The University of Hawai'i, Institute for Astronomy (IfA) is in the process of developing a Research & Development Plan (RDP) for the Haleakala High Altitude Observatory (HO) site. Since 1990 the IfA, operating under various grants and contracts, has been evaluating and characterizing the optical quality of HO. Meteorological and atmospheric data will help us evaluate what types of scientific and observational programs the Haleakala Observatory site is best suited for. The RDP will serve as the road map for development of a Long Range Development Plan (LRDP). The LRDP will include a description of land use, details of existing conditions, and proposed land use. Under existing conditions, there is a need to identify the biological, archeological, and geological resources as well as the need to identify and evaluate any threatened or endangered species. The IfA is presently seeking funding to support these important studies.

Thank you for this opportunity to respond to your concern.

Sincerely,

Rolf-Peter Kudritzki
Director

2680 Woodlawn Drive, Honolulu, Hawai'i 96822

DRAFT ENVIRONMENTAL ASSESSMENT FOR THE FAULKES TELESCOPE FACILITY AT HALEAKALA, MAUI, HAWAII

COMMENTS FROM:

KAHU CHARLES KAULUWEHI MAXWELL SR.
(Hawaiian Priest, Cultural Practitioner, Cultural Consultant, Author & Songwriter)

Before I begin my comments, I would like to dispute the statement made on page 3 of the Introduction that I "declined to comment" on this project. Ms. Ka'ohulani McGuire contacted me on numerous occasions and I informed her that I expected to be paid for my interview, as my knowledge is money. Mr. Charles Fein of KC Environmental Inc. was told the same thing. At no time did I decline to speak and felt that I would speak at the right time, thus my comments will follow.

Rockwell International employed Mr. Fein and an elaborate Environmental Assessment was prepared for the Maui Space Surveillance Complex and the AEOS telescope. It contained all the same material and special care will be observed with the site, dust control and respect the cultural and spiritual essence of the site, very similar language that is in this report. All lies, because numerous promises about protection of the site were broken.

They even went as far as removing 111 tons of sacred rock from the site, took the boulders that they dug up from the site to the crusher, and crushed all the rock. I found out after this was done, and at first Mr. Fein did not know where the rocks were taken. After two days and numerous press releases, the rock was found at the Hawaiian Cement crusher in Pu'unene. Special ceremonies were conducted at the pile of crush rock and I made sure that all the rock was taken back to Haleakala National Park which was used in the crater to fill the hiking trails. It could not be taken back to the site because it had been crushed. Until today the Air force has not lived up to their promise of finding a

site for the Hawaiian People to worship, because the telescope now stands on the site that we use to worship at. Mr. Mike Mayberry tried to get a site through the Department of Land & Natural Resources, but it did not work out. I bring these facts up because some of the same people are involved in this project.

And now comes these esteemed researchers Ms. McGuire and Mr. Hammatt, who states that: Based on history of the land, talk-story with community members and interview informants, it is unlikely that native Hawaiian customs and practices will be affected by the proposed development.

It is the cumulative affect of "another structure" that ruins the sanctity and spirituality of the site. The mere fact that these artificial buildings obstruct the spirituality should be a signal to intelligent beings with B.A and Ph D after their names, that every building added to this site completely disrupts the cultural spirituality of this site. Numerous informants have spoke about the spiritual connection this site has to our people.

Haleakala is a *wahi pana* as expressed by the late Edward Kanahele in your report. Ed's expression was made about places like Haleakala and Maunakea, which in his statement he was makes reference to. I know this for a fact because up until his death, we were charter board members of Hui Malama I Na Kupuna. We have returned Iwi (bones) from all over the world back to the homelands of Hawaii. Several years ago, we reburied remains in Haleakala Crater.

I will now submit information that was shared to me over the last 63 years by my Kupuna while growing up on the slopes of Haleakala in Kula.

Since I was a teenager, I have been into Haleakala Crater and have helped the National Park over the last 40 years with locating the trail system in Haleakala, so it would not encroach on Hawaiian artifacts and burial in and around the crater.

Endangered Species, Endangered Culture

Every aspect of the ancient Kanaka Maoli culture was closely interconnected with the life forms of these islands. The saying "He Hawai`i Au" - I Am Hawai`i - reveals this basic truth: the people and their environment are one. All of the needs of the population (which numbered nearly as many as inhabit Hawai`i today) were provided for abundantly from the life of the land and ocean, passing on the *stored* energy of the sun La in multitudes of useful and beautiful forms.

Because of its geographic location as the most isolated land mass in the world, 5,000 miles from the nearest continent, the Hawaiian archipelago evolved incredibly diverse and unique ecosystems, with myriad species of flora and fauna found nowhere else on the planet.

The Kumulipo chant of creation, unique among the creation stories of the world, revealed the progressive development of increasingly complex orders of life long before Darwin introduced the idea of evolution to Europe.

Today Hawai`i is known as the extinction capital, with more extinct and endangered species than all the rest of the United States put together. More than sixty species of endemic Hawaiian birds have become extinct, and an additional 29 are endangered, totaling over 80 percent of Hawai`i's unique bird fauna. 10 new species on Maui

have just been nominated for the endangered species list this year.

This signifies a deep rending of the fabric of life which can never be repaired in human time frames, and vanishing with these species
are the cultural interrelations that developed with them through the
generations over hundreds of years.

In the delicate ecology of the alpine climate of Haleakala's mountaintop, there are over thirty plants, as well as seven birds and
numerous insects, listed as endangered species just within the National Park boundaries, with others listed as threatened species or
species of concern.

Plants found on Haleakala mountain, many of which are endemic (native
and unique) to this part of the island were used for a variety of cultural purposes.

A well-known tree is the sandlewood (Santalum freycinetianum), known
in Hawaiian as `Iliahi. The wood was traditionally used to scent tapa
cloth. It was sometimes used to make `ukeke, a musical bow, the only
traditional Hawaiian stringed instrument. The leaves and wood of Sandlewood trees were also used medicinally, often in combination
with `awa and other woods. One variety of Sandlewood occurs near the
Park headquarters and Hosmer's Grove. The lanaiense variety, with a
red flower, found only on East Maui and Lana`i, is endangered. Only

around 100 plants survive today, with a population found on the south
slope of Haleakala.

Other medicinal plants from this area include the `Ahina Kuahiwi (Gunnera petaloidea), also called Ka`ape`ape or `Ape`ape, and the Mau`u La`ili (Sisyrinchium acre), a crawling grass (native Iris) found on top of the mountain, which was used to treat skin disorders.

The durable wood of the golden-flowered lacy Mamane tree (Sophora
chrysophylla) was utilized to make o`o (digging sticks), house poles,
and holua sleds. One of the most outstanding examples of a holua
slide was just recently discovered on the southeast slope of Haleakala mountain.

Many plants found on Haleakala were traditionally, and are still, used in lei-making. The Pukiawe (Styphelia tameiameiae), the Park's
most abundant shrub, is a popular element in elaborate haku leis, as
well as being food for the endangered Nene (Nesochen sandvicensis),
the Hawaiian Goose, Hawai`i's state bird.

The famous `Ahinahina - Haleakala Silversword (Argyroxiphium sandwicense ssp. macrocephalum) - a variety found only on Maui, was
also used to make leis, but overexploitation by outsiders contributed
greatly to its near demise. Once numbering less than 100 plants, it
is now listed as threatened, with a recovering population of around
65,000 plants.

Ancient Kanaka Maoli were careful observers, developing deep knowledge of these island habitats. Indigenous science had a complex understanding of what modern science is just beginning to grasp. But hostile foreign forces have interrupted the passage of this cultural heritage down through the generations, and much, though not all, of this precious information already has been lost.

For some endangered flora and fauna, it may already be too late, as the web of life unravels beyond our control. However, as long as they continue to survive, we must do our utmost to protect and restore these species. Many may be brought back from the brink of extinction if their habitat is preserved and restored, and we can play a positive role to assist in their perpetuation. Both the Silversword and the Nene goose are examples of species on Haleakala that nearly became extinct from human exploitation, which are now increasing in numbers due to our positive intervention.

Similarly, the cultural knowledge of these myriad life forms and complex ecosystems, though it has been diminished, still continues in the wisdom and practice of our Kanaka Maoli elders and their families, and is growing stronger with the renaissance of Hawaiian culture, adapting and integrating the best of what modern life has to offer to restore balance and sustainability to our society as a whole.

Today it is essential that whoever intends to build on Haleakala and Maui learn to respect the unique ecosystems and interconnected culture of this island, and support the restoration of our irreplaceable natural and Cultural heritage. They should have the foresight and wisdom to take a "second look" at the cultural sanctity of this site and have the better sense to re-access their intentions of building at this site for cultural reasons.

ALA HEA KA LA
"The Path To Call The Sun"
Was the ancient name of Haleakala – Sacred House Of the Sun, a Place Of Prayer and Initiation rites for our Po'o Kahuna (High Priest) as stated by the late Papa Kawika Ka'alakea (a venerated Kahu & Kupuna of Maui)

Mo`olelo o Ala Hea ka La

Pele's going down to Hana, Maui, was said by the ancients to be her very first experience in going under the earth from Haleakala to the north-western side of the peak of Kahuakala (the Sun's nose). On the northwest side of the peak is Hale o Pele (Pele's House). From there she caused a flow of lava to pour as far as Kawaipapa, Wakiu, Honokalani, Ka`eleku and between Honoma`ele and Makapu`u in `Ula`ino and the bed of Akiala. During this flow she also made Olopawa, Hina`i, Kaiwiopele, Leho`ula and Alau. These are all consequence of and interrelated with the crater and its activities. She also

returned and died at Haleakala later in history in a battle between
her rival sister - where her and Hi`iaka-i-ka-poli-o-Pele's iwi (bones) were scattered through the crater and the hill at Aleamae
named Kaiwiopele.

During her first visit to Haleakala she began to dig a deep pit and made sixteen cinder cones that stand to this day. She went below
Paukela, Naholaku and Maua. From Kaumunui to Paukela. These Pu`u
(cones) are in a sacred alignment with the tip of Haneo`o for about
30 miles into the ocean. We are beginning to relearn the significance of the astro-archeology of that period and how these points are interrelated with the many Heiau. On the east side of Haleakala, there are over 300 Heiau - a higher concentration of ancient temples than any place else on the planet.

Haleakala, due to its density and iron content, is literally a vortex of gravity and electromagnetism, two fundamental forces which govern
the realm of our perception and hold together the universe. Atomic
particles move according to the force of electro magnetism and celestial bodies move according to the force of gravity. The Earth
itself is a huge magnet. From atoms to stars these fundamental forces
determine the shape of the world as we perceive it and as it is defined in western physics. The gravity of the Sun holds the earth
within its orbital grasp and due to the density of Haleakala, it acts
as a gravitational point of conduct for the planet, pulling and being
pulled on to a greater degree than any other point on our earth.

When we put the Indigenous wisdom and teachings into perspective with
western science, we further define our own cultural understanding of
our ancient knowledge, validating and strengthening the spiritual foundations of life as a Kanaka Maoli (a descendant of the real people). Of course Haleakala is the sacred home of our Sun, and the
ancient Path to Calling the Sun as depicted in its ancient name: Ala
Hea Ka La. Why is this critical to our survival?

The Sun's energy is the source of all life, and governs our most basic rhythm of day and night. Ancient cultures have venerated its
being, and we as a human race follow its course without thought and
are insignificant in respect of its power. However, our Native Hawaiian Culture praises its existence and chants E Ala E from sacred
points on Haleakala's rim to honor this ancient Path of Prayer.

The ancient spiritual use of the mountain is for meditation and receiving of spiritual information by Kahuna Po`o. It is a place where the tones of ancient prayer are balanced within the vortex of
energy for spiritual manifestations. In ancient times, only Kahuna
and their haumana (students) lived at Haleakala, for initiation rites
and practices. As one Native Hawaiian cultural expert - Charles Kauluwehi Maxwell Sr. says: "...anything foreign, added, taken or constructed - obstructs the necessary balance and interrupts the traditional religious practices as has been exercised for centuries."

It is no wonder the United States Air Force has identified this point
as a strategic scientific element in the star wars program for the Department of Defense. However, this is not in harmony with our culture - how do we address this problem? Short of removing all structures and restoring the natural condition of the summit, it is prerequisite for anyone who visits or works at the House of the Sun
to strive to become sensitized to the subtleties of nature and culture of the place - even in thoughts and intentions. It is a place of prayer - the Path to Calling the Sun.

I have always said "...anything foreign, added, taken or constructed - obstructs the necessary balance and interrupts the traditional religious practices as has been exercised for centuries."

Because Haleakala is so sacred I must talk about the goddess of the Volcano.

Pele
Haleakala is the first point of exit where Pele had traveled under ground between Halema`uma`u and Haleakala. She is also responsible
for digging and creating all the cinder cones and vents in the crater
all the way down past Alau. And, in the end she and Hi'iaka died at
Haleakala in a battle with a jealous sister from Kahiki.

Maui
The being responsible for bringing the relationship with the Crater
and the Sun together. Legend relates how he snared the Sun from
Haleakala to lengthen the day for drying the Tapa of Hina, his grandmother.

Hina-hanai-a-ka-malama
Legends hold that Hina would beat tapa in the Moon - the clouds are
her Tapa. However Maui's mother is:

Hina-i-ke-ahi
Daughter of Hina-ai-malama - wife of Akalana the father of Maui. Hina in the Fire.

Poliahu
The beautiful snow goddess of Mauna Kea on Hawai`i who sometime smote
Pele's fires. She has been known to be in residence at Haleakala through history. She is noted as the romantic rival of Hina of Hana.

Kahekili
During the rule of Kahekili - the last ruling chief of Maui, he used the trails within the crater for warriors to travel for strategic positioning in battle.

Runners
The trails were also used as a communication cross road between Hana
and Central Maui.

Ali`i
The trails were also used to transport fish between Hana and Ke`anae
for the chiefs.

In closing I would like to urge the reconsideration of building this observatory based on spiritual and cultural objections. Until the master plan of the entire top of Haleakala is made no further buildings, observatories etc should be constructed. After this plan is completed, we then could work together in trying to mitigate our spiritual and cultural concerns, with those of science and astronomy. Thank you

Kahu Charles Kauluwehi Maxwell Sr.
157 Alea Place, Pukalani, Maui 96768

UNIVERSITY OF HAWAI'I AT MĀNOA
Institute for Astronomy

April 18, 2001

Kahu Charles Kauluwehi Maxwell, Sr.
157 Alea Place
Pukalani, Hawai'i 96768

Subject: Comments on Draft Environmental Assessment for the Faulkes Telescope Facility at Haleakalā, Maui, Hawai'i.

Dear Mr. Maxwell:

Thank you for your letter in response to the Draft Environmental Assessment for the Faulkes Telescope Facility at Haleakalā, Maui, Hawai'i. Your comments regarding your sixty-three years of cultural experience at Haleakalā will be added as part of the record for the Final Environmental Assessment.

The University of Hawai'i (UH) is committed to respecting the cultural and spiritual values of native Hawaiians. As you are aware, during the Environmental Assessment process, native Hawaiians were consulted and their beliefs about Haleakalā recorded. This procedure was not required by state law as part of the environmental assessment process. According to oral historians, it is standard practice that informants/interviewees in oral history or oral tradition interviews share their knowledge. It is not a common practice to pay for interviews.

In response to the comments addressed in your letter, the University of Hawai'i Institute for Astronomy (IfA) emphasizes that during the course of the Faulkes project, no action will be taken that will impede worship or access to previously accessible sites for native Hawaiians. In addition, project participants will be requested to complete "Sense of Place" training prior to construction so that the cultural and religious values of the native Hawaiians who consider Haleakalā sacred will be appropriately identified and respected. Furthermore, a preservation plan has been implemented to protect Hawaiian archaeological resources near the project area. We realize that some Hawaiians still believe that this project will impact the spirituality of Haleakalā. The IfA has attempted to balance the needs of the Hawaiian community with those of the scientific community. At the same time, the UH is dedicated to advancing scientific knowledge and believes that the construction of the Faulkes Telescope Facility will provide Hawai'i schoolchildren and residents with an outstanding opportunity for education in science and astronomy.

In response to your comments regarding the need for a master plan for the summit area of Haleakala, the Institute for Astronomy is in the process of developing a Research and Development Plan (RDP) for the Haleakalā High Altitude Observatory site (HO). Since 1990, the IfA, operating under various grants and contracts, has been evaluating and characterizing the optical quality of HO. Meteorological and atmospheric data will help us evaluate what types of scientific and observational programs the Haleakalā Observatory site is best suited for. The RDP will serve as the road map for development of a Long Range Development Plan (LRDP). The LRDP will include a description of land use, details of existing conditions, and proposed land use. Under existing conditions, there is a need to identify the biological, archeological and geological resources as well as the need to identify and evaluate any threatened or endangered species. The IfA is presently seeking funding to support these important studies.

Thank you for this opportunity to respond to your concerns.

Sincerely,

Rolf-Peter Kudritzki, Director

2680 Woodlawn Drive, Honolulu, Hawai'i 96822

2001-06-23-MA-FEA -

FINAL ENVIRONMENTAL ASSESSMENT/ NEGATIVE DECLARATION for the FAULKES TELESCOPE FACILITY AT HALEAKALA, MAUI, HAWAI'I

Prepared for the:
UNIVERSITY OF HAWAI'I, INSTITUTE FOR ASTRONOMY
HALEAKALA FACILITY

Prepared by:
KC Environmental, Inc.
May, 2001

FINAL

ENVIRONMENTAL ASSESSMENT/ NEGATIVE DECLARATION

for the

FAULKES TELESCOPE FACILITY AT HALEAKALA, MAUI, HAWAI'I

Prepared for the:
UNIVERSITY OF HAWAI'I/INSTITUTE FOR ASTRONOMY
HALEAKALA FACILITY

Rolf-Peter Kudritzki, Director

Prepared by:
KC Environmental, Inc.
Makawao, Hawai'i 96768

May 2001

FINAL
ENVIRONMENTAL ASSESSMENT/
NEGATIVE DECLARATION

PROJECT:	FAULKES TELESCOPE FACILITY (FTF)
LOCATION:	Haleakala Summit Island of Maui State of Hawai'i Tax Map Key 2-2-07:8
PROPERTY OWNER:	The University of Hawai'i
LAND USE CLASSIFICATION:	General Subzone, State Conservation District
PROPOSING AGENCY:	The University of Hawai'i Institute for Astronomy
APPROVING AGENCY	Not Applicable
CONTACT:	Rolf-Peter Kudritzki, Director Institute for Astronomy University of Hawai'i 2680 Woodlawn Drive Honolulu, HI 96822

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SUMMARY AND DETERMINATION

INTRODUCTION AND PURPOSE

At an elevation of 10,023 feet, the summit area of Haleakala is one of the prime locations in the world for astronomical and atmospheric observations and space surveillance. The University of Hawai'i Institute for Astronomy (IfA), in cooperation with the Faulkes Telescope Corporation (FTC), proposes to construct the Faulkes Telescope Facility (FTF) at the University of Hawai'i Haleakala Observatories (HO) site on the summit of Haleakala. The facility would be financed through private funds from the Dill Faulkes Educational Trust in the United Kingdom (UK) and funds to be raised locally in Hawai'i and the United Kingdom.

Haleakala Observatories is the high altitude observatory site just southwest of Haleakala's summit that has been set aside by the State of Hawai'i for scientific research. The UH intends to use the site to develop astronomical and related projects that do not require the extreme altitude and conditions of the limited sites available on Mauna Kea on the island of Hawai'i.

In order to bring about a greater public understanding in the realm of science and astronomy, the FTF would be used for astronomical research and educational outreach. In the UK, FTF programs would be used to support all levels of students, from primary school to undergraduate college levels. In Hawai'i, educational outreach would initially focus on undergraduate and secondary school students. These students would use the telescope to conduct research projects under the mentoring of teachers and professional astronomers. The FTF would maintain the largest telescope in the world dedicated to educational and outreach programs.

The FTF would be owned and operated by the FTC, a Hawai'i non-profit corporation. The University of Hawai'i (UH) would participate in this project through the IfA. Bosworth Management of Leicester, UK would manage the construction of the telescope. FTC and other UK astronomy education organizations would manage operations in the UK.

In order to accomplish the objective of constructing and utilizing the FTF at a single location on Haleakala, extensive planning is necessary that includes the participation of both the UH and the FTC. The FTC is preparing this Environmental Assessment (EA) as the first step in the process. The UH is the applicant for a Conservation District Use Application (CDUA) for the site, although it would neither develop nor manage the FTF. Telescope Technologies, Ltd. from the UK and other contractors would build the FTF, and the FTC would manage it.

SITE SELECTION

Summit of Haleakala

The summit of Haleakala has been chosen to be the FTF site for a number of reasons:

a) **Benefits to the UH Institute for Astronomy, the State of Hawai'i and Maui County**

Haleakala Observatories was set aside for scientific research and the UH intends to continue development of the site with astronomical and related projects that do not require the extreme altitudes and conditions of the limited sites available on Mauna Kea, Hawai'i.

Recent trends in student test scores indicate that both Hawai'i and the UK have a need for improved education, particularly in the sciences. For the first time, students at various grade levels in Hawai'i and the UK would have complete access to a world-class astronomical instrument.

b) **Astronomical Viewing Conditions**

Along with Mauna Kea, Haleakala has some of the best viewing conditions available in the world. Conditions on Haleakala are predictable and consistent, providing good viewing for a majority of the time. The wind pattern is established, the air is clean and dry, and an inversion layer between the elevations of 5,000 and 7,000 feet keeps water vapor, aerosols and other particles that might interfere with seeing below the summit. The Haleakala summit, unlike other sites, is unaffected by light pollution.

c) **Accessibility**

Haleakala is easily accessible via an all-weather highway that facilitates the transport of people, supplies and equipment. In addition, a deep-draft harbor and airport are located in nearby Kahului.

d) **Infrastructure**

The island of Maui provides the types of facilities, utilities, communications systems and services needed to support an observatory. The existing astronomical and advanced space surveillance facilities located at Haleakala Observatories share successful histories as a result of this kind of support.

Alternative Sites

Potential alternative sites for the FTF exist elsewhere, and the FTC has considered Mauna Kea and Australia. Mauna Kea sites that become available in the future, however, will be allocated to larger telescopes. While sites in Australia are useful geographic locations for daytime control of

the telescope from the UK, locating the FTF in Australia would remove any opportunity for use of the telescope by Hawai'i students. The Australian sites are also inferior as locations for research-type telescopes such as the FTF, with as few as 50-60% clear nights, compared to more than 70% for Haleakala. In addition, the Australian sites are inferior to Haleakala with regard to the atmospheric stability required for high quality astronomical imaging.

Executive Order 1987 designated approximately eighteen acres on Haleakala's summit for the University of Hawai'i Haleakala High Altitude Observatory Site. Adjacent to this site are various State of Hawai'i conservation parcels, National Park Service land, and private properties. None of these properties are suitable for astronomical facilities due to land-use issues, inadequate access, lack of utilities, or degraded viewing conditions. Use of HO property for the FTF would retain the existing configuration of the HO site without expansion outside the boundaries of the eighteen acres.

THE PROPOSED PROJECT

The proposed project includes two components:

1) Construction of the FTF and,
2) Operation of the proposed facilities.

The project would include construction of a facility on a site of approximately 1.5 acres at the HO. The facility would be located along the southwestern edge of the HO property, on a concrete base approximately 75 feet in diameter. The facility would include a state-of-the-art, retractable "Portal" enclosure about 20 feet in height set atop a 10-foot high structure. The enclosure would house a 2-meter (80-inch) main mirror with a focal ratio of f/10. It would be on a mount that allows for the independent movement in both elevation and azimuth (bearing). Operation of the telescope would be directed through a control centers in the UK and in Hawai'i. The control centers would send instructions regarding observations via a high-speed fiber-optic phone line. The initial viewing instrument to be installed on the telescope would be a wide field-of-view digital camera. The project would also include the assembly and maintenance of one 515 square foot support building, which would be attached to the observatory structure. The building would house mechanical and computer systems that support operations of the telescope.

Overall Site Layout

The proposed FTF location within HO is illustrated in Figure S-1. Figure S-2 shows an aerial view of HO with an artist's rendering of the proposed FTF. An artist's rendering of the FTF and its surroundings is depicted in Figure S-3. The 1.5-acre project site is in close proximity to previously developed facilities used for astronomy and advanced space surveillance. The specific project site is undeveloped and generally unused.

Access to the facility would be via Haleakala Crater Road, a two-lane roadway through Haleakala National Park. Modifications to the present road would not be required, as the modular construction of the proposed facility can be accomplished by standard transport vehicles delivering materials and systems components. In addition, the FTF would be able to use infrastructure already in place at other nearby observatories.

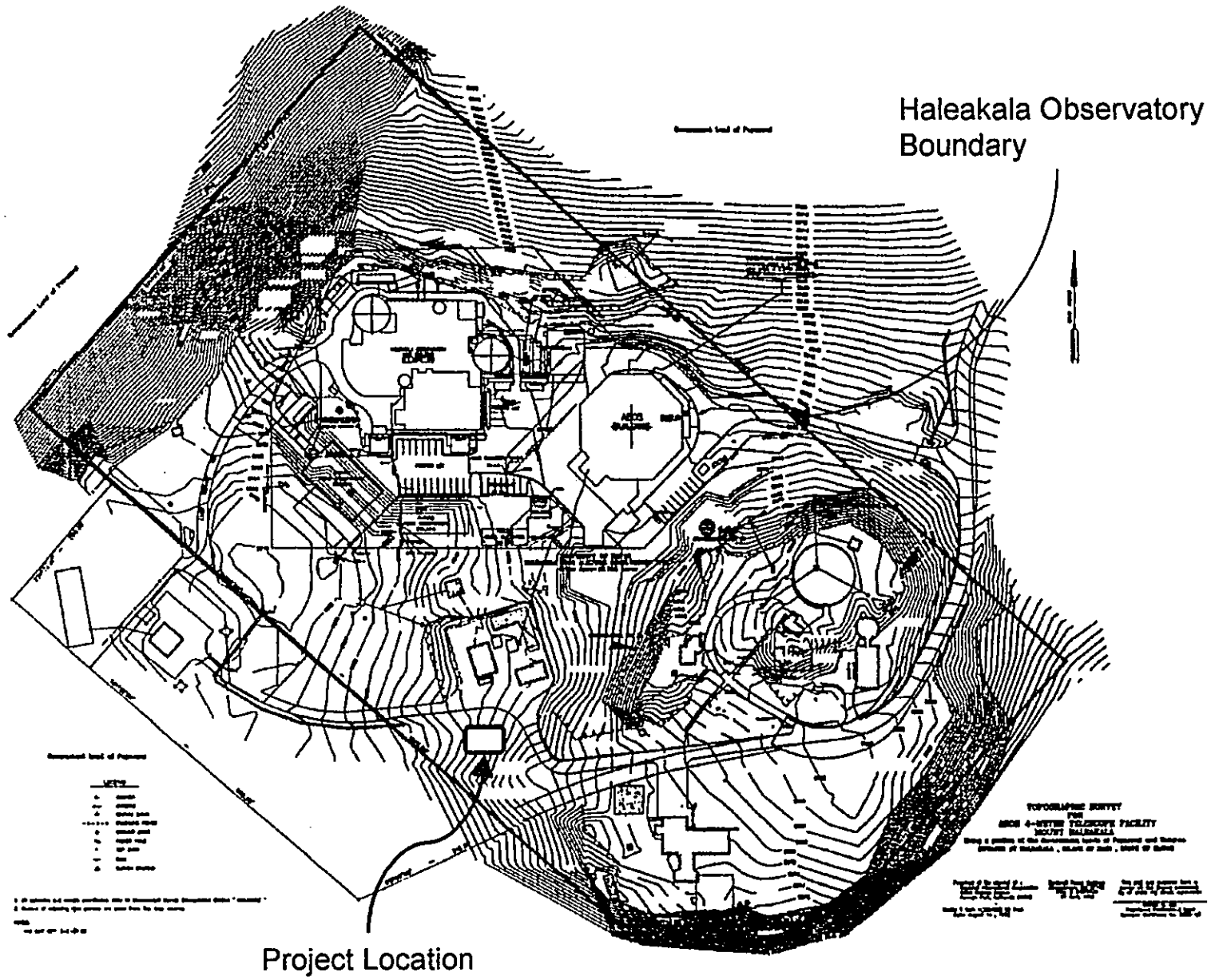

Figure S-1

FAULKES FACILITY LOCATION AT HALEAKALA OBSERVATORIES

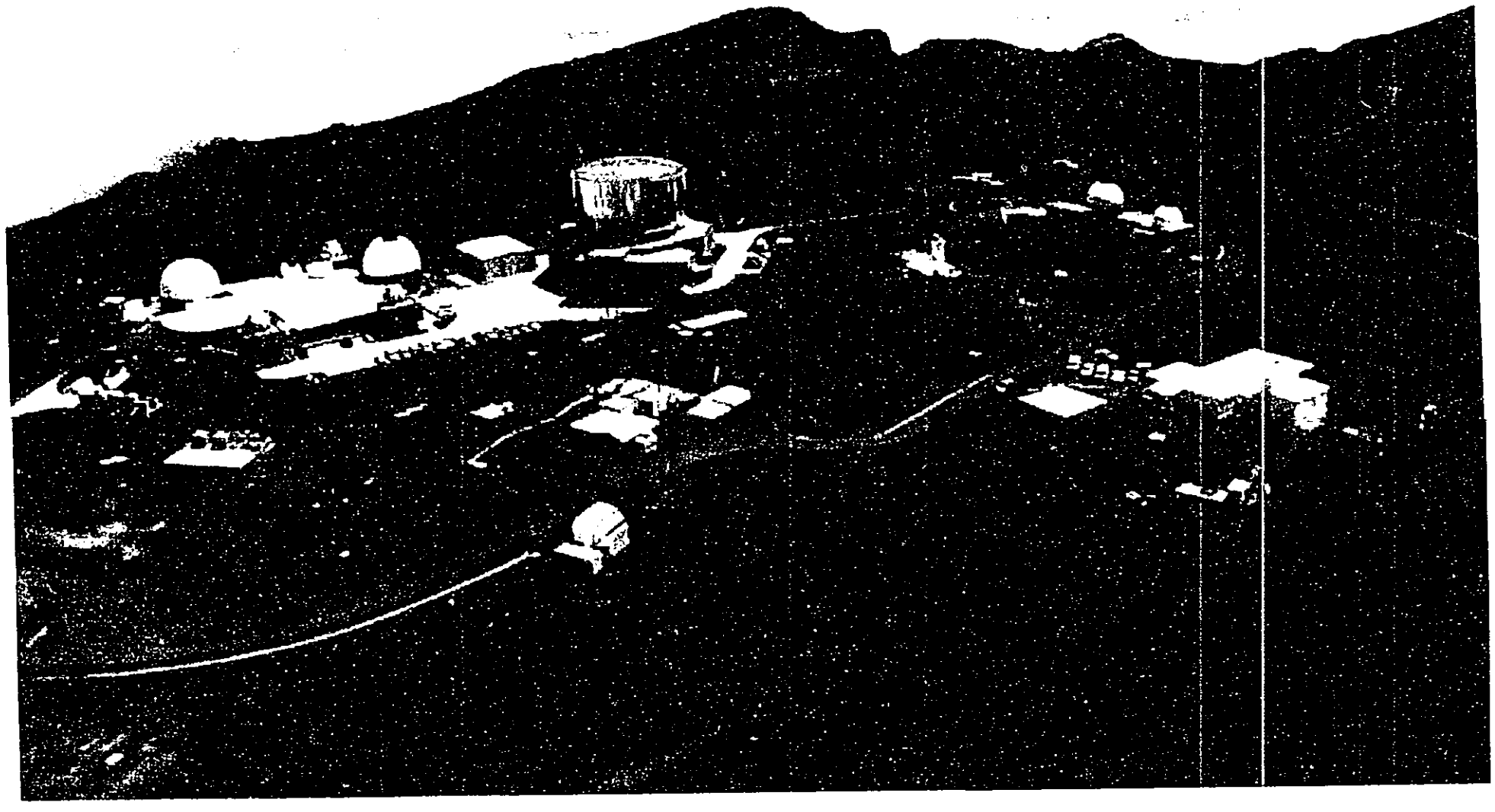

Figure S-2
AERIAL VIEW OF HALEAKALA OBSERVATORIES WITH FAULKES RENDERING

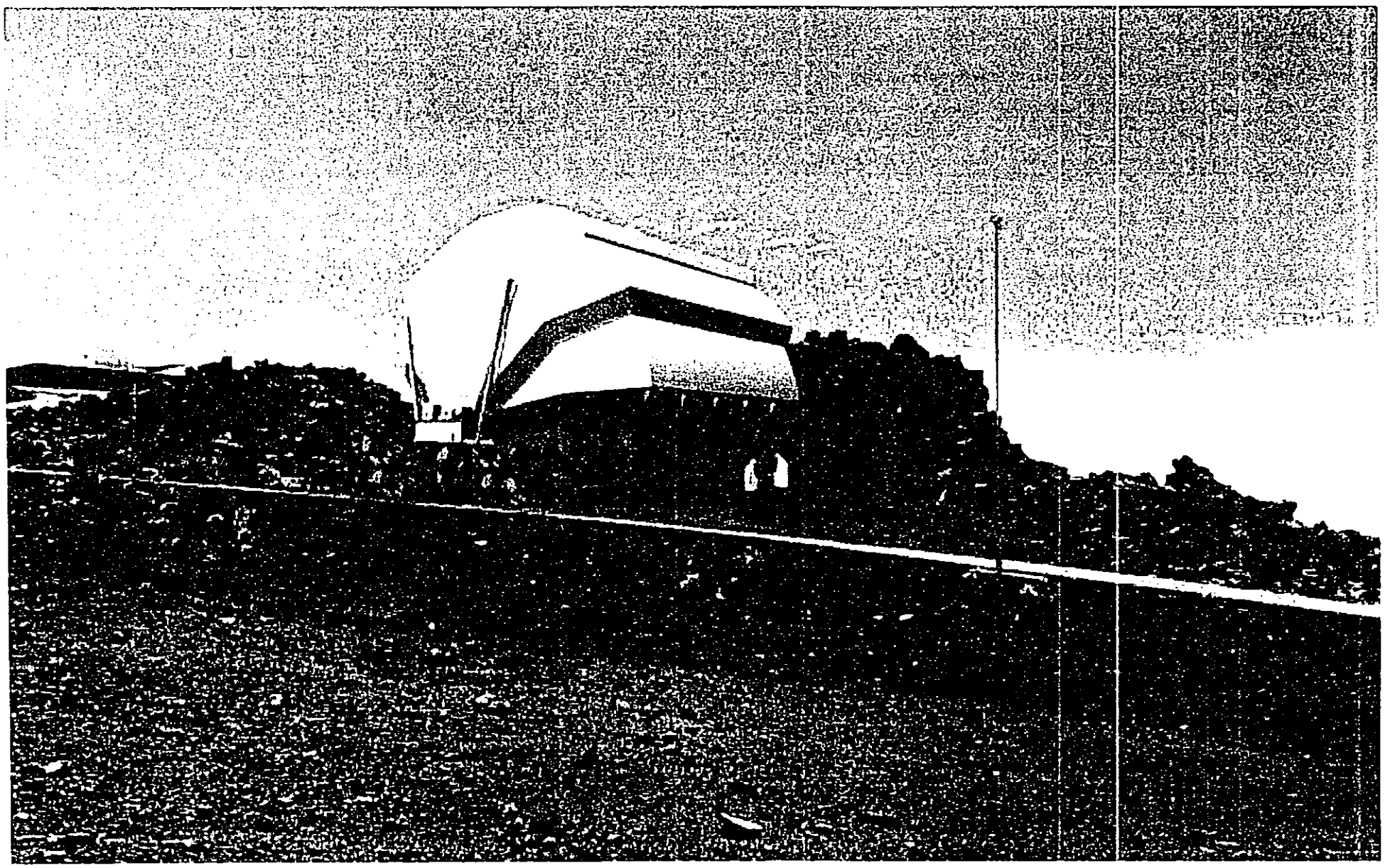

Figure S-3
ARTIST'S RENDERING OF FAULKES FACILITY AND SURROUNDINGS

Faulkes Telescope Facility

The proposed facility would consist of four distinct elements: 1) the facility structure, 2) the dome enclosure, 3) the telescope, and 4) the telescope-system support and utilities.

1) Facility Structure

The FTF would consist of a 3,300 square foot building that would be almost 60 feet square. The exterior walls would measure approximately 10 feet high and the building would be topped by a 20-foot high enclosure. It would be positioned on a concrete pad located to the northwest of the Mees Solar Observatory and across the road from the former Smithsonian facility. The building would serve as the support structure for the telescope enclosure and house the telescope mount. Since the external walls would be only about 10 feet in height, the structure would require a safety barrier around it to prevent mishaps when the enclosure opens or closes during remote operations. The attached support building would contain electronics and computers that are necessary to manage distribution and storage of astronomical images.

2) Dome Enclosure

The FTF design incorporates a collapsible hemispherical dome that would lower below the telescope line-of-sight for observations. This state-of-the-art enclosure would ensure the protection of the weather-sensitive telescope. The portal or "clam shell" design can be adjusted to either side to provide protection from sunlight and wind buffet. In its fully closed position, the top of the enclosure would be approximately 30 feet above ground level.

3) Telescope

Telescope Technologies, Ltd. in Birkenhead, Merseyside in NW England would build the telescope. The FTF is the second instrument of this design. Its "twin", the Liverpool Telescope, will become operational at one of Europe's premier observatories in the Canary Islands in mid 2001. Plans call for having the FTF operational on Haleakala by June 2002.

The telescope would consist of a 2-meter (80-inch) primary mirror with a focal ratio of f/10. The optics would be a Ritchey-Cretien design giving 12 arc minutes FOV for an uncorrected telescope with images of less than 0.4 arc seconds in diameter.

4) Telescope System Support and Utilities

Underground electricity and telephone service would be extended to the site from nearby facilities. Since no operators are required for remote operations, the FTF would have no source of potable water, washroom facilities or septic system. Because of the high altitude, equipment air conditioning would not be required in the enclosure, however, it would be needed in the support building.

The FTF would initially be operated by remote control from the UK, and later from the UK and UH. Existing UH/IfA personnel would visit the site about once a day for routine monitoring, maintenance and/or emergencies. These visits could occur at any time of day or night.

Construction Activities

Construction could begin as early as October of 2001, with the telescope being operational by June 2002. The proposed construction activities are described below.

A) The site of the proposed FTF would be prepared using bulldozers, graders and compactors. Backhoes and other equipment would be used to excavate trenches required for installing underground utilities. Additional equipment used during site preparation would include rollers, spreaders, water trucks, loaders, and dump trucks. Dust suppression in graded areas would use up to 500 gallons of water per day. It is not anticipated that any fill would be needed, but if necessary, fill would be taken from the HO area. Any materials brought to the site would inspected by Resource Management personnel of Haleakala National Park in order to prevent the introduction of alien species to Haleakala's summit area.

B) Cement, lime, and aggregate would be trucked from Kahului and foundations for the facility would be set using mixers, pumpers, trenchers and small compactors. It is anticipated that less than 500 cubic yards of concrete would be needed for the facility foundation and telescope pedestal.

C) The facility would be constructed using materials transported to the site in standard 40-foot shipping containers. The 2-meter telescope would be transported to the site in sections and installed using a crane to position the base.

Operation

The FTF represents a new generation of astronomical telescope. It would be operated remotely from a control center in the UK and later, from another in Hawai'i. No on-site operator would be required. The telescope's control system would determine if the weather is suitable for observations, point the telescope, take the images requested, and then begin the next observation. The telescope enclosure would automatically adjust one or the other side of its "clam shell" to protect the telescope from sunlight and buffeting by the wind. At the end of the requested observations, or if the weather deteriorates, the enclosure would be closed and the telescope shut down. Maintenance is expected to be limited and would include occasional cleaning and lubrication.

The initial instrument to be installed on the FTF would be a state-of-the-art electronic camera having more than 4 million individual picture elements, or pixels. Each image taken by the telescope would cover an area of sky about half the size of a full moon. As the project progresses, one of the IfA's electronic cameras would be adapted for use on the Faulkes Telescope. This second camera would be sensitive to infrared radiation, which would allow operation of the telescope during daylight hours.

By directing the telescope's operation remotely over the Internet, students in Hawai'i and the UK would be able to access observation data in real-time from their classrooms and request observations in "robotic mode", much like professional astronomers do in working with NASA's Hubble Space Telescope.

In the UK, the FTF would also be operated from control centers in public visitor centers such as the Royal Observatory. A secondary control center would be established at Maui Community College. UH astronomers and their colleagues in the UK plan to engage students in research projects that would be published in scientific literature. Another goal is to encourage joint projects in which students in Hawai'i would collaborate over the Internet with their counterparts in the UK. The project would be sharing educational materials targeted to the specific needs of schools and colleges in Hawai'i and the UK. In addition to its direct educational mission, the FTF would be used as an outreach tool, providing observations to such users as the Bishop Museum and amateur groups in Hawai'i and the UK.

PROJECT ALTERNATIVES

No Project

The No Project Alternative would deny students interested in the astronomical sciences access to a world-class, educational resource. Young people worldwide are curious about astronomy and the Faulkes Telescope Facility would provide a tremendous opportunity for observing in real-time. This facility would afford institutions, which due to economic or geographic limitations cannot construct their own astronomical facilities, access to a facility of professional size and quality. For these reasons, a No Project Alternative is not considered further.

Alternative Sites

Possible alternative sites include Mauna Kea and Australia. The FTF does not meet the requirements of the master plan for the Mauna Kea summit. While alternative sites in Australia are useful geographic locations for daytime control of the telescope from the UK, location of the telescope in Australia would remove any opportunity for use of the telescope by Hawai'i students. The Australian sites are also inferior with respect to weather. For Hawai'i residents, an alternative site is effectively the same as the No Project Alternative, therefore, alternative sites are not considered further.

Alternative FTF Designs

The FTF design evolved from experience with earlier telescope facilities in the Canary Islands. The design was adapted for high-altitude use, and other building and enclosure configurations were considered. For example, various building shapes were assessed for wind stability. Other enclosure arrangements were also considered. One alternative design includes a standard shell dome with viewing slot. The building and enclosure alternatives were not considered further due to performance, cost, weight, potential visual impact, wind loading capability, and other considerations.

POTENTIAL IMPACTS

Construction Activities

Air Quality

Excavation and grading, construction equipment operations, and increased traffic along the unpaved access road would lead to the temporary generation of small dust particles. Mitigation measures, such as daily surface wetting, would minimize the amount of particulate generated by these activities. Based on prior experience at the HO, it would be relatively easy to control dust within the small area that would be under construction. Since the construction would be taking place adjacent to dust-sensitive optical systems at other facilities, dust control would be a high priority.

Noise

Construction activities would produce intermittent high noise levels at the project site. Most of the construction equipment would generate noise levels of 90 dB(A) or less at a distance of 50 feet. The loudest potential noise sources are concrete mixers, scrapers, pneumatic tools and trucks. Construction noises would be audible throughout the HO area, however, most personnel at facilities within HO are only outdoors for brief periods. Construction noises would be much attenuated within the facilities. The nearest public area is the Pu'u 'Ula'ula (Red Hill) Overlook in Haleakala National Park, which is approximately 2,000 feet away. It is possible that under certain wind conditions, construction noise might intermittently be heard at that site. At distances to the nearest inhabited areas, noise would not be measurable. Adhering to appropriate OSHA standards would mitigate any impacts of high noise levels on construction workers at the site.

Traffic

Vehicular traffic on Haleakala Crater Road would increase by about 5 percent during the construction period, but the level of service would remain at "A" (the highest possible level). The movement of large trucks would be scheduled during off-peak hours and truck drivers would be informed of the need to provide other motorists with passing opportunities to avoid undue delays. Because there would be no increase in personnel at the summit, no operational traffic impacts are expected.

When construction materials are transported through Haleakala National Park, the construction contractor would work with the National Park Service to notify the public in order to minimize traffic delays. This technique has worked effectively during prior construction projects at the summit and resulted in a minimal effect on visitors, businesses and summit employees. Disruption to the operations of the National Park and inconvenience to visitors and summit users is expected to be slight.

The maximum number of workers on site in any given day is estimated to be 15, therefore, a small increase in traffic would be unavoidable during construction. Construction-related traffic

would include workers' vehicles, various types of equipment, and deliveries of materials and supplies. Once mobilized to the site, equipment would likely remain for the duration of the construction period.

Affected Environment

Land Use

The FTF would be located within the University of Hawai'i 's Haleakala Observatories complex at the summit of Haleakala. Other facilities within HO complex include the UH LURE Observatory, a satellite laser-ranging facility that is under contract to NASA; the UH Mees Solar Observatory, a gamma-ray telescope operated jointly by the UH, Purdue University, the University of Wisconsin and the University of Georgia; and the Maui Space Surveillance Complex (MSSC), a U.S. Air Force facility.

Immediately east of HO are television transmitting and receiving stations on land that is managed by Hawaiian Broadcasting System, Ltd. A repeater station that is part of the Federal Aviation Administration's (FAA) air traffic control system and a U. S. Department of Energy (DOE) research facility are situated immediately to the west of HO. Also bordering the HO parcel is an area owned by the State of Hawai'i, which is controlled by the State Department of Land and Natural Resources.

The HO complex is situated in the General subzone of the State Conservation District (Fig.III-4). Other nearby conservation areas include the National Park Service's Haleakala National Park and four state forest reserves (Kula, Makawao, Ko'olau and Kahikinui) that function as watersheds and biological preserves. The forest reserves are also used for recreational purposes such as hiking, hunting and camping. Ranch lands used for cattle grazing border these conservation lands. Physical development (e.g., roads, buildings and water catchment projects) is minimal throughout these conservation and agricultural areas.

Visual Setting

The terrain around HO is rugged, sparsely vegetated, and covered with an abundance of lava rock. The summit area's appearance is a sharp contrast to the lower slopes of Haleakala and the more tropical environment at sea level. Scientific observatories and buildings are scattered across the summit landscape. Adjacent to HO, the cinder cones of Haleakala's summit dominate the panorama.

When there is no cloud cover at mid- or upper-elevations of the mountain, the largest existing structures at HO can be faintly seen from Maui's central valley. The FTF would not be visible from Upcountry Maui due to its proposed location and small size. On Haleakala's summit, the FTF structures would be hidden from most public viewpoints by the natural features of the terrain. The nearest public areas with views of the HO complex are Haleakala National Park's Pa Ka'oao (White Hill) Visitor Center and Pu'u 'Ula'ula (Red Hill) Overlook. The FTF would be located on the southwestern edge of the HO complex where the terrain slopes downward, therefore the FTF would not be visible from the public overlooks in Haleakala National Park.

Television and radio broadcast antennae would continue to dominate the vista to the southwest of Pu'u 'Ula'ula Overlook, with the LURE and Mees Observatories and Maui Space Surveillance Complex further away, but still visible. Analysis of topographic profiles between the proposed FTF and various locations below HO, such as Skyline Drive and Kahului, indicate that the proposed facility would not be visible from any hiking trail, inhabited area or from anywhere else within Haleakala National Park. Only the top of the FTF enclosure would be seen from the "Saddle Area".

Vegetation

The project site is sparsely vegetated, with about 5 to 10 percent plant cover. Endemic *Dubautia menziesii* and *Deschampsia nubigena* dominate the vegetation. No threatened or endangered species, or rare or vulnerable plants are found on the project site, access road corridor or surrounding areas. Construction of the proposed facilities should not have a significant adverse impact on botanical resources.

Some indirect impacts on biological resources are of concern, primarily the introduction of alien species. Mitigation measures would include inspection of equipment, supplies and construction material by a qualified biologist before access is permitted through Haleakala National Park. Construction activities would be restricted to the project site, access road and utility corridor only. If fill material were needed, it would come from the HO area.

Avifauna

'Ua'u (Hawaiian Dark-Rumped Petrel)

The endangered 'ua'u, or Hawaiian dark-rumped petrel, *Pterodoma phaeopygia sandwichensis*, occasionally flies over the proposed site. The number of birds flying over the site during the breeding season varies from year to year. 'Ua'u are prone to colliding with protruding foreign obstacles and it is presumed that 'ua'u may fly into the proposed facility. Overhead power lines are of special concern. Fences, particularly barbed wire, are also a problem.

Although the 'ua'u frequent the islands of Maui, Lana'i and Hawai'i , the only known breeding colony occurs on the summit of Haleakala (Simons 1985). Critical habitat has not been defined for this species. 'Ua'u can be found in deep burrows inside and outside Haleakala Crater from late February to early November. They spend the remainder of the year at sea. All known burrows are at elevations ranging from about 7,000 feet to 9,500 feet. About 77 percent are located in three sub-colonies along the inner wall of the west crater rim, approximately 3,200 feet northeast of HO.

Most 'ua'u arrive at the summit during March and April; egg-laying generally occurs in May. The eggs are incubated until July when hatching occurs. Adults that did not breed or whose eggs failed to hatch usually depart during August. 'Ua'u chicks are fed at approximately two- to three-day intervals for their first three months (July to September), then less frequently through October (Simons 1985). Fledgling occurs between mid-October and mid-November.

'Ua'u fly to and from their nests after dark (Simons 1985). Scientists believe the birds approach the crater from the west and leave through the Ko'olau Gap to the north, where rim elevations are less than 9,500 feet. Primary predators of the 'ua'u are thought to be rats, dogs and mongoose. Other principal threats to the birds are collapsing of burrows by feral goats, collision with artificial light sources, and disease (U. S. Fish and Wildlife Service, 1993).

'Ua'u flying at night have been known to collide with difficult-to-see objects such as power lines and utility poles. The most effective mitigation is to "underground" the utilities, therefore no new overhead power lines would be installed for this project. Because of concern for the endangered 'ua'u, design of an appropriate safety barrier for the FTF would be coordinated with the U.S. Fish & Wildlife Service (USFWS).

All construction activities would take place during daylight hours and would not require lights. As a result, there would be no significant adverse effect on the 'ua'u. Nests would be monitored during the site clearing, foundation, trenching and other work that incurs vibration, to ensure that neither the birds nor the burrows are disturbed. Site clearing, foundation and trenching work would not be done during the fledging period from July through October, so that neither the young birds nor the burrows would be disturbed. After construction, external lights would not be required. In addition, the access road would not be lighted.

Nene (Hawaiian Goose)

Another federally listed endangered species, the nene or Hawaiian goose, *Nesochen sandwicensis*, occurs only on the islands of Maui (on Haleakala) and Hawai'i (on Mauna Loa and Hualalai) above elevations of 4,000 feet. The nene sanctuary on Haleakala is located on the northeast slope between elevations of approximately 5,000 feet and 6,900 feet. Suitable habitat does not occur in the vicinity or elevation of the HO.

Hawaiian Hoary Bat

The endangered Hawaiian hoary bat, *Lasiurus cinereus semotus*, has occasionally been observed at elevations up to 13,000 feet (U.S. Air Force, 1988). National Park Service records indicate that one bat was found in the south park boundary fence and another near Kalahaku Overlook at an elevation of about 9,200 feet. Other individuals have been found dead at about the same elevation, and observations of the bat flying in the summit area have been reported. It is considered extremely unlikely that this species is a resident at the summit, however, because it is not suited to cold temperatures (Tomich, 1986; U.S. Air Force, 1988).

Invertebrate Fauna

Because of the lack of suitable habitat, the associated invertebrate fauna are somewhat depauperate in comparison to some other alpine sites. No locally unique taxa were found during a cursory inspection of the project site. An earlier survey at HO recorded similar findings. The direct impacts of the construction activities on both the project site and the access road would be ground disturbance, compaction and loss of microhabitats. Indirect impacts, especially the introduction of alien species, are of more concern. Mitigation measures would be established

and would include the inspection of equipment, supplies and construction material by a qualified biologist before access is permitted through Haleakala National Park. Fill material, if needed, would be obtained from adjacent areas.

Archaeological Sites

In 1991, J.C. Chatters conducted a cultural resource inventory and evaluation of 7.7 acres associated with the expansion of the MSSC (Chatters, 1991). Chatters' survey included the 1.5-acre parcel of the proposed FTF project area. He inventoried four sites around the location of the expansion, Sites 50-50-11-2805 through 50-50-11-2808. Although these recorded sites include 23 shelters and a wall segment, the site nearest the proposed FTF is approximately 90 feet away. No further work was done on this site because the proposed FTF would not affect the site.

In March 2000, Cultural Surveys Hawai'i conducted another cultural resource inventory, and two new sites were discovered. State Site 50-50-11-4835 consists of two rock enclosures interpreted as trash burning pits that were probably used by the U.S. Army in the 1940s (Fig. III-10). State Site 50-50-11-4836 consists of three terraces, two leveled areas, a rock wall, and a U-shaped rock enclosure (Fig III-10). This site was interpreted as a cluster of different types of prehistoric temporary shelters. All sites were built on the south or southwestern faces of the exposed rock outcrop to provide shelter from the prevailing northeasterly trade winds. One terrace (Feature A) exhibited the most substantial construction of the seven features in Site -4836, with stacked stone walls of 3 to 4 courses and a level cinder surface built into a small overhang. One 50 x 50 centimeter test unit was excavated into interior of the terrace, and one modern nail was recovered from the uppermost stratum. A 50 x 100 cm test unit was also excavated in Feature E. No other cultural material was revealed during the test excavations. There is no material evidence that this site was used in pre-contact times; however, the construction style and proximity to other pre-contact shelters on Kolekole, as well as references to Kolekole shelters in early twentieth-century accounts, suggest that these shelters are pre-contact in origin. Modern trash on the surface and top 2 centimeters of the terrace floor indicates that the site was probably used in modern times by travelers, ranchers and hunters. This site is considered significant under Criterion D for its potential to yield information important to the prehistory and history of Haleakala.

The DNLR State Historic Preservation Division (SHPD) recommended that the cultural sites be preserved. Sites 50-50-11-4835 and 50-50-11-4836 would therefore be protected during construction and in the future according to a preservation plan approved by the SHPD.

Visibility

The presence of construction equipment, construction materials and temporary structures would impact visual quality in the immediate vicinity of the project area. This effect would be temporary since these items would be removed when the project is completed.

Operations

Traffic

It is estimated that no additional vehicle trips per week would be necessary to maintain the facility, except in the event of an emergency. Maintenance personnel are presently located in the summit area, therefore, Haleakala Crater Road should experience no increase in traffic. Service trucks would occasionally deliver supplies and equipment to the site.

Energy

Maui Electric Company (MECO) would extend existing lines to the project site. The facility is expected to use 25 kW maximum power for its operations and environmental controls. Present MECO customers would not be affected by the project and the amount of electrical power required for the FTF would not adversely affect MECO's generating capacity.

Air Quality

There would be no additional effect on air quality from vehicular sources because the number of trips to and from the summit area would remain essentially the same. The FTF would not produce any air emissions; as a result, the facility would meet applicable air quality standards.

Infrastructure, Utilities and Services

There would be minimal impact on the existing water supply. No water or septic system would be required for the facility.

Solid waste generated at the site would be kept in covered refuse containers and carried out by facility workers. Non-hazardous trash would be disposed of off-site in a licensed landfill. Recyclable material would be handled in an appropriate manner.

At the present time, hydraulic fluid is the only hazardous product anticipated for use in the facility. On-site IfA personnel would have a HAZMAT Prevention, Planning, Training, Notification, and Reporting Plan that conforms with 29CFR 1910.38 (Employee Emergency Plans and Fire Prevention Plans). Hydraulic fluid and any other defined hazardous waste would be segregated and accumulated properly on site and then taken to Kahului for transport to an authorized Transport Storage and Disposal Facility.

The FTF would have an appropriate number of fire extinguishers and a fire escape plan. UH/IfA would provide security monitoring and safety procedures to comply with OSHA regulations. The FTF would be locked; entry would be by authorized personnel only. There would be no effect on the County of Maui Police Department.

Human Health and Safety

There are concerns about human safety at the FTF. The remotely operated enclosure could potentially injure someone who ignores the warning signs and safety barriers. The facility would use protective structures and signs to discourage the public from entering the area. The facility would be locked to prevent unauthorized personnel from injuring themselves and/or vandalizing the equipment. During operations of UH/IfA facilities, video surveillance could be employed to monitor the area.

Visibility

Scientific observatories and buildings are scattered across the HO landscape. Adjacent to HO, the cinder cones of Haleakala's summit dominate the panorama.

The Haleakala Observatories complex is closed to the general public; therefore, personnel at the other observatory sites would usually be the only people to see the FTF at close range. Outside the boundaries of HO, the FTF would only be visible from other facilities (such as the FAA and DOE) within the immediate area. The FTF would not be visible from Upcountry Maui due to its proposed location and small size. The color scheme of the FTF would blend with that of the nearby observatory facilities, and the lava rock security barrier would harmonize with the natural environment.

DETERMINATION

Chapter 343 HRS and the Environmental Impact Statement Rules (Title 11, Chapter 200), require an agency to assess proposed projects in order to determine whether the potential adverse impacts are significant according to the criteria set forth in Rules (11-200-11.1). In accordance with these regulations and the Office of Environmental Quality Control (OEQC) guidelines for preparing and Environmental Assessment, the University of Hawai'i Institute for Astronomy has evaluated the potential impacts of the project and determined a finding of no significant impact (FONSI).

After reviewing additional materials obtained during the comment period, the IfA determined that the proposed action would not have significant adverse effects and has filed a Negative Declaration for this project.

The significance criteria, and the project's relationship to them are presented below. These form the basis for the negative declaration.

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

The construction and operation of the proposed Faulkes Telescope Facility would not involve an irrevocable commitment to loss or destruction of any natural or cultural resource. The project area would have minimal impact on natural resources. Two documented archaeological shelter sites near the proposed FTF location would be preserved according to a preservation plan approved by the State Historic Preservation Division.

To many contemporary Native Hawaiians, the summit area of Haleakala is considered a spiritual resource and sacred site. They believe that Haleakala should be carefully protected to preserve its sacred nature. No action would be taken that would impede worship or access to previously accessible sites for Native Hawaiians.

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

The construction and operation of the facility would not have a significant adverse effect on other beneficial uses of the environment. It would not interfere with other activities in the area. The purpose of the project would be similar in nature to the other astronomical observatories in the surrounding complex in accordance with Governor's Executive Order 1987.

(3) *Conflicts with the state's long-term environmental policies or goals, and guidelines as expressed in Chapter 344, Hawai'i Revised Statutes, and any revisions thereof and amendments thereto, court decision, or executive orders.*

The proposed action does not conflict with the State's long-term environmental policies and goals. The facility would not pollute the air or water, nor disrupt communities or pose a health hazard to nearby populations. The proposed facility serves a public purpose and would not conflict with the State's interest in preserving Hawai'i 's unique social and natural environment.

(4) *Substantially affects the economic or social welfare of the community or State.*

The project would have a minimal effect on the State and County economies, based on estimated construction and operating costs. Most of the construction and operation costs are of private origin, and there are no anticipated large-scale economic benefits from this project. The project would not substantially affect the economic or social welfare of the community or state.

(5) *Substantially affects public health.*

The proposed project would not affect public health. Telescope operations utilize passive, non-polluting and non-invasive technologies that have no history of endangering or compromising public health.

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

The project would not generate substantial secondary impacts, such as population growth or the need to construct additional public facilities or infrastructure. It is estimated that a maximum of 15 construction jobs would be created. The project would provide two to ten positions for faculty members at the University of Hawai'i .

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

The project would comply with all existing environmental standards. It would not involve emissions or other activities with the potential to degrade environmental quality. Where

potential risks do exist, such as threats to endangered species, inspection of imported materials to prevent the introduction of alien pests together with design features that use natural materials (instead of fencing) would minimize the potential for adverse effects.

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

The purpose of the facility is to bring about a greater public understanding in the realm of science and astronomy. The FTF would be used as outreach for students, with astronomical research as a further objective. This commitment, which has been fully described in the EA, would be beneficial to all its users and does not involve any commitment to larger action.

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

Potential effects on the one endangered specie present in the vicinity of the proposed project, the ʻuaʻu, or Hawaiian dark-rumped petrel, have been investigated thoroughly. Measures such as scheduling certain construction activities (e.g., use of vibratory rollers) for periods when ʻuaʻu are not nesting would be incorporated into the bid specifications and permit conditions to avoid adverse effects on the birds. The FTC would implement the various protective measures set forth in this EA during the construction and operation of the facility. Strict adherence to these and other recommendations from the U.S. Fish and Wildlife Service would ensure that the potential impact is insignificant.

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

The project would not affect air or water quality. Appropriate noise abatement devices would be installed on equipment to mitigate construction noise. The operation of the facility would not appreciably increase noise levels in the area.

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

The project would not affect any of these environmentally sensitive areas. There is always a possibility of damage from earthquakes, which have historically occurred in this region. The facility would be operated remotely, therefore, an earthquake would not lead to loss of life. The FTF would be designed for survival in earthquakes potentially occurring in Seismic Zone 3 locations.

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

The proposed facility would not substantially affect scenic vistas identified in state plans or studies. The FTF would become a part of the existing HO complex of observatories. Colors that blend with the surrounding buildings would be used and a lava rock barrier wall (rather than a fence) would be constructed to harmonize with the environment. The FTF would not be visible from any inhabited areas, hiking trails or other areas accessed by the public within Haleakala National Park.

(13) Requires substantial energy consumption.

The proposed project would not use a substantial amount of energy. The anticipated maximum energy used at the new facility would be 25 kW, only a fractional increase above existing HO usage.

PERMITS AND APPROVALS

This proposed project will require a Conservation District Use Permit. The project has been reviewed and endorsed by Maui County Council (Appendix A) and the Maui Economic Development Board (Appendix B). To ensure community consultation, the following were contacted during the preparation of this environmental assessment:

Maui County Primary and Secondary Principals Annual Conference
Mr. Paul Brown, District Superintendent, Department of Education
American Association of Physics Teachers, Hawai'i Chapter
Cordy McLoughlin, Principal, Kamehameha Schools Maui Campus
Leean DeLima, Assistant Principal, Kamehameha Schools Maui Campus
Kamehameha School faculty, Maui campus
Lihikai Elementary School PTA Board of Directors
Lee Hoxie, Deputy District Superintendent, Department of Education, Maui District Office
Maui County Council Economic Development Board
Maui County Planning Department
TOPS workshops for Teachers, University of Hawai'i 1999, 2000
Friends of Haleakala National Park
Cathleen S. Hodges, Resource Management, Haleakala National Park
Maui Economic Development Board
Lyons Naone
Hokulani Holt-Padilla
Charles K. Maxwell

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CHAPTER ONE
INTRODUCTION, PURPOSE OF AND NEED FOR ACTION

1.1 OVERVIEW

The University of Hawai'i is actively and creatively advancing mankind's understanding of the physical universe through the operation of high altitude astronomical training and research facilities at Haleakala Observatories on Haleakala, Maui (Tax Map Key 2-2-7:08). At an elevation of 10,023 feet, Haleakala is one of the premier sites in the world for astronomical and related observations.

The summit of Haleakala offers an ideal location for astronomers for numerous reasons. The most important are:

a) it offers clean, dry air for good astronomical "seeing" conditions;
b) it has an existing infrastructure that includes adequate electrical and high technology fiber-optic communication links;
c) it has easy road access to the site as well as proximity to support facilities; and,
d) there are experienced operations and maintenance personnel as well as University faculty and staff at the site and on Maui.

1.2 BACKGROUND

In 1961, Governor's Executive Order 1987 conveyed approximately 18 acres of land located on the summit of Haleakala to the University of Hawai'i in order to establish the Haleakala High Altitude Observatory (Figure I-1). The University of Hawai'i (UH) Institute for Astronomy (IfA) is responsible for developing and managing the Haleakala Observatories (HO) property. Sites within HO are available to astronomical programs that do not require the extreme altitude and conditions of Mauna Kea.

From the beginning, HO has been considered an outstanding site for astronomical observations and high-resolution ground-based optical imagery. The first observatories on Haleakala studied radio waves from space and the glow of the night sky. Presently, facilities located within HO observe the sun, use lasers to measure the distance to satellites, track and catalogue man-made objects, and obtain detailed images of spacecraft. It is a principal site for optical and infrared surveillance, inventory and tracking of space debris, and active laser illumination of objects launched into the earth's orbit, all of which are activities crucial to the nation's space program.

Over the past 45 years, HO has experienced steady growth in scientific activities. UH IfA has operated the Mees Solar Observatory since 1964 as well as the Lunar and Satellite Ranging Facility (LURE), which was involved in the NASA Crustal Dynamics Project from 1972 until January 1993. UH IfA is currently supporting the NASA Space Geodesy and Altimetry Projects and is host to a number of temporary physics experiments. It also makes sites on Haleakala available for optical and infrared experiments and observations conducted by the U.S. Air Force (USAF) Space Command and Air Force Research Laboratory. The UH is the lessor of the USAF Maui Space Surveillance Complex (MSSC), which includes the AEOS telescope.

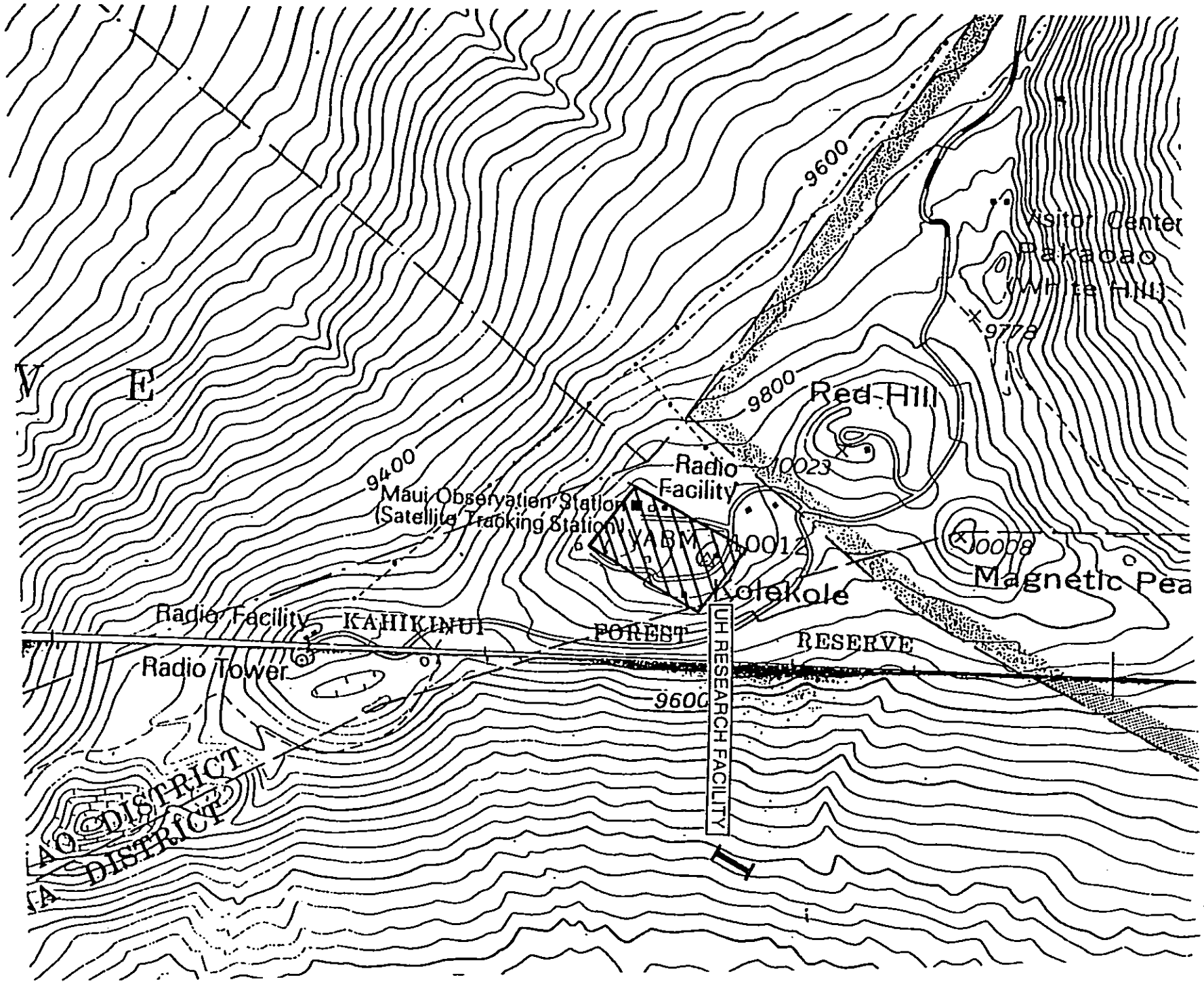


Figure I-1
HALEAKALA OBSERVATORIES

1.3 PURPOSE AND NEED FOR PROJECT

Haleakala Observatories was set aside for scientific research, and the UH intends to continue development of the site with astronomical and astronomy-related projects that do not require the extreme altitude and conditions of the limited sites available on Mauna Kea.

In order to bring about a greater public understanding in the realm of science and astronomy, the Faulkes Telescope Facility (FTF) would be used for astronomical research and educational outreach. In the United Kingdom (UK), the FTF would be used to support all levels of students, from primary school to undergraduate college levels. In Hawai'i, the educational programs would initially focus on undergraduate and secondary school students. The students in Hawai'i and the UK would use the telescope to conduct research projects under the mentoring of teachers and professional astronomers. The FTF would house the largest telescope in the world dedicated to educational and outreach programs.

1.4 ENVIRONMENTAL COMPLIANCE

Although the UH would neither develop nor manage the facility, the action that "triggers" Chapter 343 HRS and the EIS Rules (Section 343-5 (2)) and thereby necessitates this Environmental Assessment, is the proposed location of the Faulkes Telescope Facility. The proposed facility is located on land set aside for the University of Hawai'i under Executive Order 1987 and is within a State Conservation District. The Faulkes Telescope Corporation (FTC) would be responsible for obtaining the appropriate County and State building and operating permits. UH IfA is the applicant for a Conservation District Use Application (CDUA) for the site. Subsequent to obtaining a permit for the project, the FTC would build and manage the facility. The Office of Environmental Quality Control guidelines for preparation of an EA require the proposing agency to detail the determination. The IfA has evaluated the potential impacts of the proposed project and has filed a negative declaration for the Faulkes Telescope Facility.

1.5 AGENCIES AND INDIVIDUALS CONTACTED

The following were contacted during the preparation of this environmental assessment and were also provided copies of the Draft Environmental Assessment:

Maui County Primary and Secondary Principals Annual Conference
Mr. Paul Brown, District Superintendent, Department of Education
American Association of Physics Teachers, Hawai'i Chapter
Cordy McLoughlin, Principal, Kamehameha Schools Maui Campus
Leean DeLima, Assistant Principal, Kamehameha Schools Maui Campus
Kamehameha School faculty, Maui campus
Lihikai Elementary School PTA Board of Directors
Lee Hoxie, Deputy District Superintendent, Department of Education, Maui District Office
Maui County Council Economic Development Board
Maui County Planning Department
TOPS workshops for Teachers, University of Hawai'i 1999, 2000
Friends of Haleakala National Park

Cathleen S. Hodges, Resource Management, Haleakala National Park
Maui Economic Development Board
Lyons Naone
Hokulani Holt-Padilla
Charles K. Maxwell

An announcement of the availability of the Draft Environmental Assessment and its anticipated Finding of No Significant Impact (FONSI) was published in the January 23, 2001 *OEQC Bulletin*. Comment letters regarding the Draft Environmental Assessment and the Institute for Astronomy's responses have been included in this Final Environmental Assessment/Negative Declaration as Appendix K.

After reviewing comments, the IfA made no changes to the plans presented in the Draft Environmental Assessment.

CHAPTER TWO
PROJECT DESCRIPTION AND ALTERNATIVES

2.1 INTRODUCTION

The Faulkes Telescope Corporation (FTC) and the University of Hawai'i (UH) Institute for Astronomy (IfA) propose to construct a telescope facility on Haleakala Observatories (HO) property. The Faulkes Telescope Facility (FTF) would be used for astronomical education, outreach and research in both the United Kingdom (UK) and Hawai'i. The FTF would include the largest telescope in the world dedicated to educational and outreach programs.

This environmental assessment is based upon the initial design for the facility. Constraints for the physical and technical design criteria have been established (based upon environmental considerations) and this document uses reasonable and informed representations of how such a facility would appear and operate. The construction specifications for the proposed facility would incorporate physical and technical design criteria as well as mitigating measures to ensure environmental compliance. The University of Hawai'i would review and evaluate the FTF design to ensure that it is compatible with operations at HO.

The proposed FTF design is described in Section 2.2. Section 2.3 describes access and infrastructure. Sections 2.4 and 2.5 describe construction activities and operations respectively, and Section 2.6 describes the alternatives that were considered and the reasons for rejecting those alternatives in favor of the current proposal.

2.2 PROJECT OVERVIEW

The proposed FTF would be constructed on State land situated at TMK 2-2-07:08. It would be located at an elevation of about 9,941 feet on the southwest rift of Haleakala, approximately 200 feet northwest of the Mees Observatory (Figure S-1).

The project area is undeveloped and generally unused except for the shared road that provides access to the surrounding facilities. Although the project area encompasses approximately 1.5 acres in order to allow for siting flexibility, the completed FTF would cover less than one acre. A portion of the area immediately surrounding the FTF would be used for equipment lay-down during construction and for the entrance and entry pad of the facility.

Access to the FTF site from the Haleakala summit is via the existing road from Haleakala National Park into the HO complex. At the entrance to the HO, signs are posted restricting access to authorized personnel. At the present time, it is not anticipated that the road would require or undergo significant improvement.

Electricity service and communications would be extended to the site from nearby pre-existing utilities. The FTF would not have emergency power, and since it would not be manned, it would not require sewer and non-potable or potable water.

2.2.1 Facility Conceptual Plan

A physical design concept for the facility is presented in map and elevation views in Figures II-1 and II-2. The FTF would have a concrete base measuring approximately 75 feet in diameter. The facility would include a state-of-the-art, retractable "Portal" enclosure about 20 feet in height set atop a 10-foot high support building. The retractable portion of the enclosure would fully open, much like a clamshell, to expose the entire telescope. The telescope enclosure would be painted white for temperature control. The vertical walls of the support building would have aluminum cladding and would be painted brown. The facility would have lightning protection in the form of approximately ten air terminals a maximum of twelve inches above the roof.

The enclosure would house a telescope with a 2-meter (80-inch) main mirror with a focal ratio of f/10. It would be on a mount of altitude/azimuth design to allow for independent movement in both elevation and azimuth (bearing). The system would be capable of pointing to an accuracy of better than 2 arcseconds at elevations greater than 20 degrees. Operation of the telescope would be directed through a control center in the UK, and in the future, from a second center in Hawai'i. The control centers would send instructions regarding operations via a high-speed fiber-optic phone line. The initial viewing instrument to be installed on the telescope would be a wide field-of-view visible band camera employing a Charged Couple Device (CCD) with 2048 by 2048 pixels. The University of Hawai'i is planning to provide a second camera that operates in the infrared part of the spectrum, which would allow for daytime viewing. The telescope would be capable of mounting five sensors in total.

2.2.2 Attached Equipment Building

The proposed project would include the assembly and maintenance of a 515 square foot support building attached to the observatory facility. The support building would house mechanical and computer systems that support telescope operations. In addition, there would be a six-foot lava-rock safety barrier around the facility to prevent inadvertent contact with the remotely operated systems during their operation. Because there is concern that the endangered Hawaiian dark-rumped petrel would fly into a barrier, the final design of the safety barrier would be coordinated with the United States Fish and Wildlife Service (USFWS) and Haleakala National Park Resource Management. The FTF would not have windows, therefore, no light would emanate from the facility during night operations. External lights would not be required, as sensor lights on the access doors would provide any light needed.

2.2.3 Facility Technical Management

The FTF would be operated by remote control from the United Kingdom through the use of a computer network. FTC or UH personnel would probably enter the facility once a day for a routine check of systems or for emergencies. These visits would normally be during the day but could occur at any time of day or night.

The FTF would be used in two modes of normal operation. The first would be Full Robotic (off-line) Mode, in which the telescope would not be supervised either locally or remotely during routine operations. It would carry out a program of observations according to a schedule and

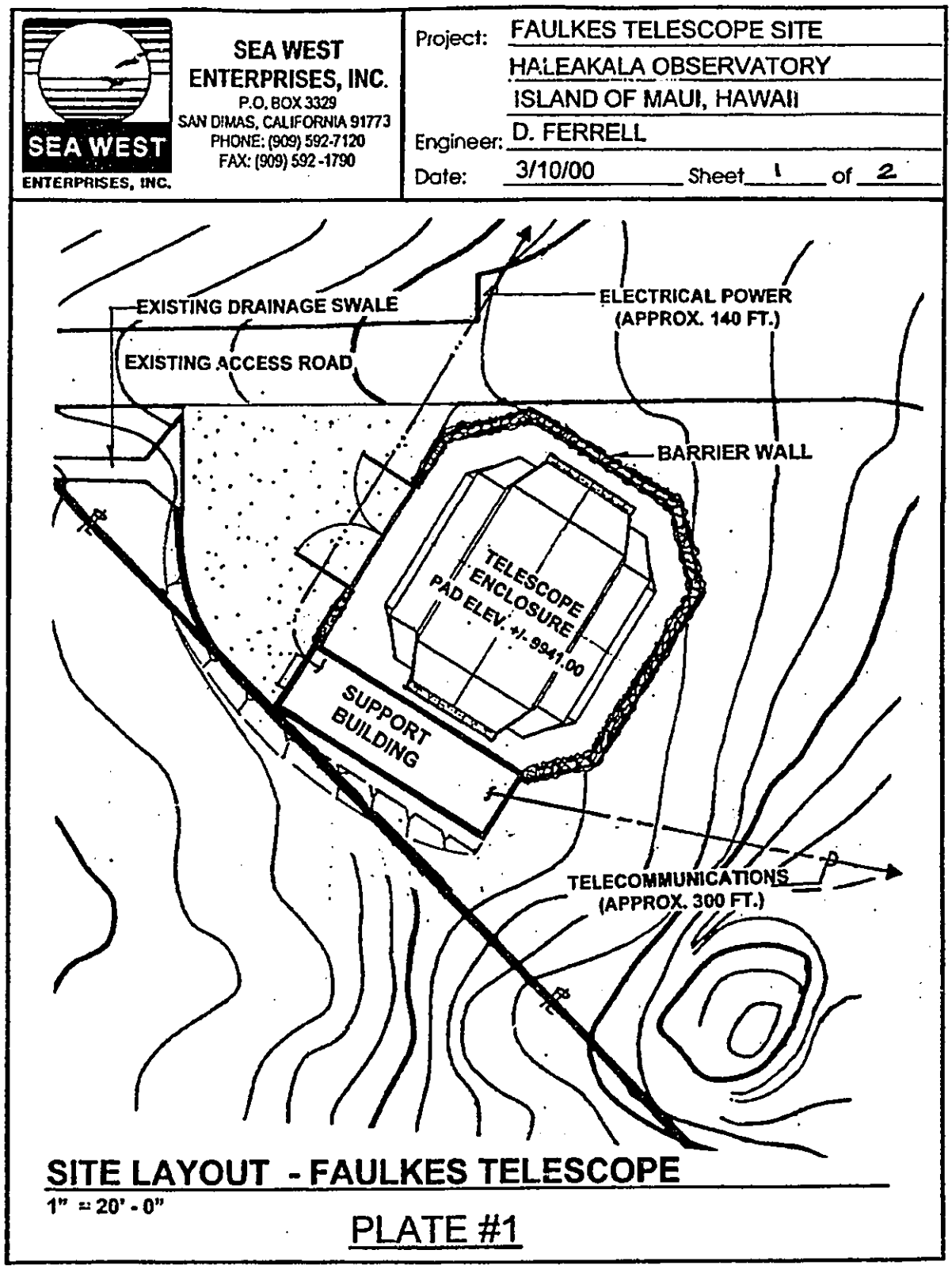
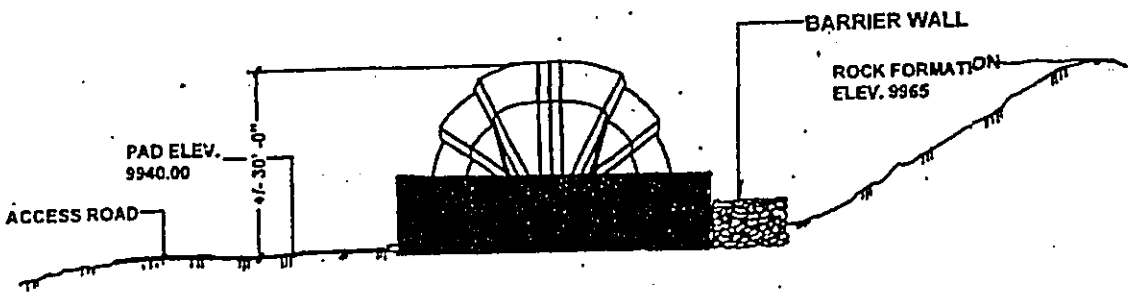


Figure II-1
MAP VIEW OF CONCEPTUAL FACILITY

SEA WEST ENTERPRISES, INC.

SEA WEST
ENTERPRISES, INC
P.O. BOX 3329
SAN DIMAS, CALIFORNIA 91773
PHONE: (909) 592-7120
FAX: (909) 592 -1790

Project: FAULKES TELESCOPE SITE
HALEAKALA OBSERVATORY
ISLAND OF MAUI, HAWAII
Engineer: D. FERRELL
Date: 3/10/00 Sheet 2 of 2



ELEVATION VIEW - FAULKES TELESCOPE
N.T.S

PLATE #2

Figure II-2
PLAN VIEW OF CONCEPTUAL FACILITY

return data to the observer either by the Internet or on CD. The control system would automatically perform all functions, including actual observations. The second mode of operation would be Real-Time Mode, in which an observer at a school or college could send commands to the telescope to make it immediately perform the observations required. The data would be instantaneously returned to the observer on the Internet.

Typically, the telescope would begin an observing session in the off-line mode, which would start the systems and establish that the weather is good enough to open the enclosure. Systems would then begin performing pre-programmed off-line observations. For observations conducted in Real-Time Mode, time slots would be programmed into the system and at the appropriate time, control would be handed over to the remote observer. At the end of the scheduled time slot, the telescope would revert to off-line mode. Operating systems would monitor weather and other factors at all times, and would place the telescope in a safe state or close the enclosure when necessary. The remote control center would not have to be manned for the telescope to be operational.

2.3 SITE ACCESS AND INFRASTRUCTURE

2.3.1 Site Access

Vehicular travel to the project area would be via the existing roadway through Haleakala National Park. Access from this road to the HO area is controlled by means of posted signage that restricts access to authorized personnel. There are no roadway improvements proposed for this project.

2.3.2 Electrical Power

The FTF would require a maximum power of 25kW. During operation an average of 15 kW would be required. No emergency electrical power is proposed for this facility. When power is lost during operations, hydraulic accumulators would shut the enclosure. The 3-phase primary electric power would be obtained from Maui Electric Company (MECO).

2.3.3 Communications

Communications to the site would be accomplished via fiber optic cable. The Verizon fiber optic line is already operational at the HO and would be employed for the FTF. There would be a need for voice phone service at the FTF for commissioning and fault-finding operations.

2.3.4 Water and Sewage Disposal

The FTF would not be manned. No potable or non-potable water would be required, nor would toilets or a sewage system.

2.3.5 Additional Services

Any solid waste generated at the site would be kept in covered refuse containers and carried out by personnel who regularly visit the site. The facility would have a standard smoke detection system in the telescope enclosure and support building. A smoke alert would be transmitted to a manned central location within the IfA facilities, and an auto-dialed message would be sent to the fire department as well. No fire suppression system would be installed at the FTF, although fire extinguishers would be placed in each area in accordance with OSHA regulations.

2.4 CONSTRUCTION

2.4.1 Construction Facilities

Approximately 0.75-acres at the development site would be used as a materials lay-down and assembly area. In addition, a temporary construction field office may be erected on site for use by supervisors during construction. The field office trailer would be removed when construction is complete. It is expected that heavy equipment would remain on site during the construction period.

2.4.2 Construction Activities

Construction of the FTF and its associated infrastructure is scheduled to begin after all approvals have been obtained. There would be three primary construction phases leading to an operational facility within one year. A description of the construction activities that would take place in each phase follows.

2.4.2.1 Phase I: Site Preparation

Site preparation would include grading, filling and leveling an area suitable for construction and/or placement of the facility. Excavation would be required for the structural foundations, utility trenches and concrete pad. A grounding system of copper straps would be installed at the bottom of excavations to ensure good electrical connections. It is anticipated that about 650 cubic yards of material would be excavated for the foundations, telescope pier, and the enclosure apron. Between 400 and 600 cubic yards of material would be needed for drainage structures, the enclosure apron and the access apron. Drainage improvements would be incorporated into the design of paved surfaces. Equipment used during this phase would include bulldozers, backhoes, graders, rollers, pavers, water trucks, loaders and dump trucks. For the concrete portion of the site preparation (i.e., construction of the drainage channels and preparation for power and communications), a portable generator, hoisting equipment, air compressors, welding machines, forklifts, concrete vibrators, concrete trucks and flatbed trucks would be required. The work force is expected to be local hires.

2.4.2.2 Phase II: Building Construction/Installation

The foundations for the FTF buildings would be concrete. Approximately 400 to 450 cubic yards of concrete would be necessary to build the foundations and telescope pier. Mixers,

pumpers, trenchers and small compactors would be needed during foundation construction. Flatbed tractor-trailers would deliver equipment and building materials. Tire-mounted cranes and an assortment of medium and lightweight trucks would be used to lift and erect the modular units of the facility and enclosure.

Both skilled and unskilled construction workers would be employed to erect the buildings. Primary trades would include structural concrete, finishing, mechanical and electrical. Although most of the labor is expected to be hired from Maui, it is possible that some of the structural framing and/or modular structural work would be done by O'ahu or West Coast contractors with experience working in Hawai'i.

Some of the technical personnel who would assemble and test the equipment, primarily electrical and mechanical technicians, would be hired locally. Qualified individuals from any location, however, may apply.

2.4.2.3 Phase III: Utilities

Underground utilities would be extended to the FTF site. Utility trenches would be excavated with a handhole and PVC conduits would be installed. In order to provide sufficient insulation and ensure minimal temperature variation, the conduits would be buried a minimum of 24 inches below grade. The width of the trench would be 24 inches. At least one two-foot by four-foot handhole would be provided along the trench alignment for ease of pulling the cables. The excavated material would be used to backfill the trench. Trenching for underground utilities may require the use of trenchers, backhoes, graders, compactors, water trucks, loaders and dump trucks. The work force is expected to be heavy equipment operators and laborers primarily from Maui.

The FTF would require a maximum power of 25 kW. During operation an average of 15 kW would be required. The 3-phase primary electric power would be obtained from Maui Electric Company (MECO). Installation of a 3-phase underground line would involve laying insulated conductors in two 4-inch-diameter PVC conduits in a trench from the Cosmic Ray Neutron Monitor Station across the road from the FTF. MECO would pull, own and maintain the cable for the underground system. No emergency electrical power is proposed for this facility. When power is lost during operations, hydraulic accumulators would shut the telescope enclosure.

Verizon fiber optic line is already operational at HO and would be employed for the FTF. Communications to the site would be established with an underground Verizon data communications line from Mees Observatory. The FTF would require voice phone service for commissioning and fault-finding operations.

2.4.3 Construction Costs

Construction costs for the complete FTF and associated infrastructure are estimated to be approximately $700,000. The facility would be financed through private funds from the Dill Faulkes Educational Trust in the United Kingdom. Funds for this project would also be raised in the UK and in Hawai'i.

2.5 OPERATIONS

It is estimated that no extra vehicle trips per week would be necessary to maintain the facility unless there is an emergency. Personnel currently on site at the HO would maintain and routinely check the FTF systems.

Although security can be an important consideration in remote operations, it is unlikely that this educational facility would require constant manned surveillance. A TV monitoring system based at the IfA would be employed to ensure that unauthorized tourists, hikers, hang-gliders, etc. do not occupy the area. The lava-rock security barrier would prevent direct contact with the moving parts of the FTF during operations.

2.6 PROJECT ALTERNATIVES

2.6.1 No Project Alternative

This alternative would not provide any of the benefits afforded by the proposed FTF. In addition, a "no project" alternative would likely result in the eventual diminution of the scientific programs conducted at HO. Use of a valuable scientific resource for the United States, the State of Hawai'i and the County of Maui would be seriously impaired or lost completely. For these reasons, the no action alternative is not considered further.

2.6.2 Alternative Actions

There are no alternative actions that would achieve the project's goal of providing a professional-class telescope for schools in the UK and Hawai'i. The FTF cannot be built on Mauna Kea as it does not meet the requirements of that site's master plan. Use of an alternative site outside Hawai'i would not allow the involvement of Hawai'i schools. There are no alternative sites that would produce the same result as construction of the FTF on Haleakala.

CHAPTER THREE
THE AFFECTED ENVIRONMENT

This chapter presents an overview of existing environmental conditions in the vicinity of the proposed Faulkes Telescope Facility (FTF). It provides the environmental context for the impact assessment presented in Chapter 4. Additional detail needed to understand specific potential impacts is also provided in this chapter.

3.1 THE REGION

Maui County consists of four major islands: Maui, Lana'i, Moloka'i and Kaho'olawe. It has a combined area of 1,160 square miles and a 2000 resident population of approximately 128,000 (U.S. Bureau of the Census, 2000). The island of Maui (Figure III-1) is the second largest in the Hawaiian chain and is surpassed in size only by the island of Hawai'i (about 729 square miles). Maui is comprised of two shield volcanoes joined by a low isthmus. The western volcanic mass is known as the West Maui Mountains, while its much larger counterpart towards the east is named Haleakala. Haleakala's summit rises to more than 10,000 feet ASL and has an erosional and collapse depression commonly known as Haleakala Crater.

A large percentage of Maui's population resides in the Central Maui towns of Kahului and Wailuku, which are located on the northwestern shore of the isthmus. This area supports an airport and seaport, and is the primary region for commerce and government. Historically, agriculture (sugar cane and pineapple production) was the major contributor to Maui's economy. In recent decades, however, agriculture has declined and tourism has become an increasingly important part of the island's economy. New economic growth sectors include scientific research, diversified agriculture and retail.

3.2 LOCATION AND LAND-USE

3.2.1 Location

The proposed FTF site is located near the summit of Haleakala within the Haleakala Observatories (HO) complex. The 1.5-acre project site is in close proximity to astronomical and advanced space surveillance facilities. The area proposed for the FTF is undeveloped and generally unused. Large and small-scale maps of the project area, situated at Tax Map Key 2-2-7:08, are presented in Figures III-2 and III-3.

3.2.2 Land-Use

The FTF would be located in the University of Hawai'i's Haleakala Observatories complex near the summit of Haleakala. Other facilities at HO include the UH LURE Observatory, a satellite laser-ranging facility that is under contract to NASA; and the UH Mees Solar Observatory, a gamma-ray telescope operated jointly by the UH, Purdue University, the University of Wisconsin and the University of Georgia. In addition, the U.S. Air Force operates the Maui

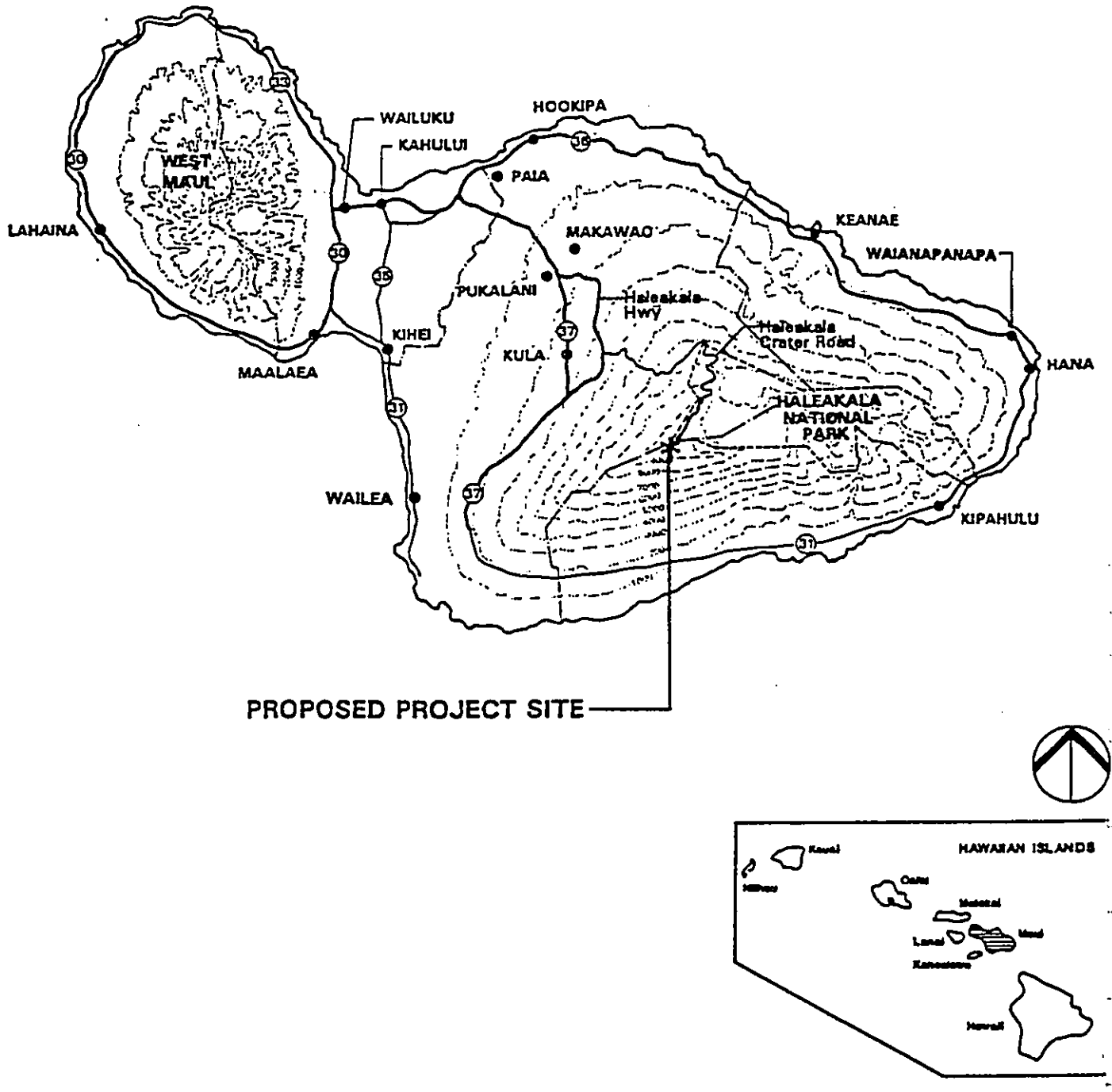
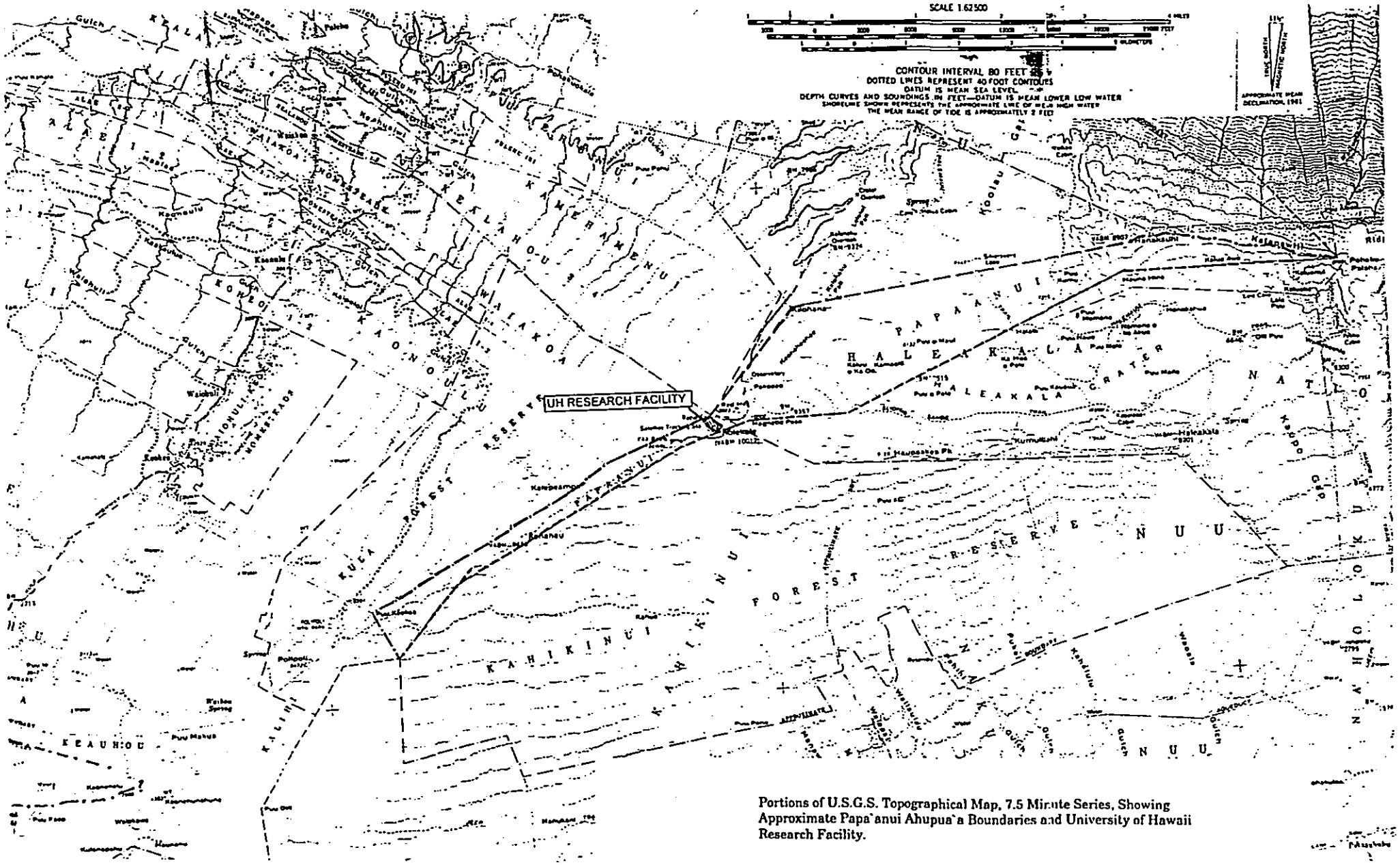


Figure III-1
ISLAND OF MAUI



Portions of U.S.G.S. Topographical Map, 7.5 Minute Series, Showing Approximate Papa`anui Ahupua`a Boundaries and University of Hawaii Research Facility.

Figure III-2
LARGE SCALE TAX KEY MAP SHOWING PROJECT AREA

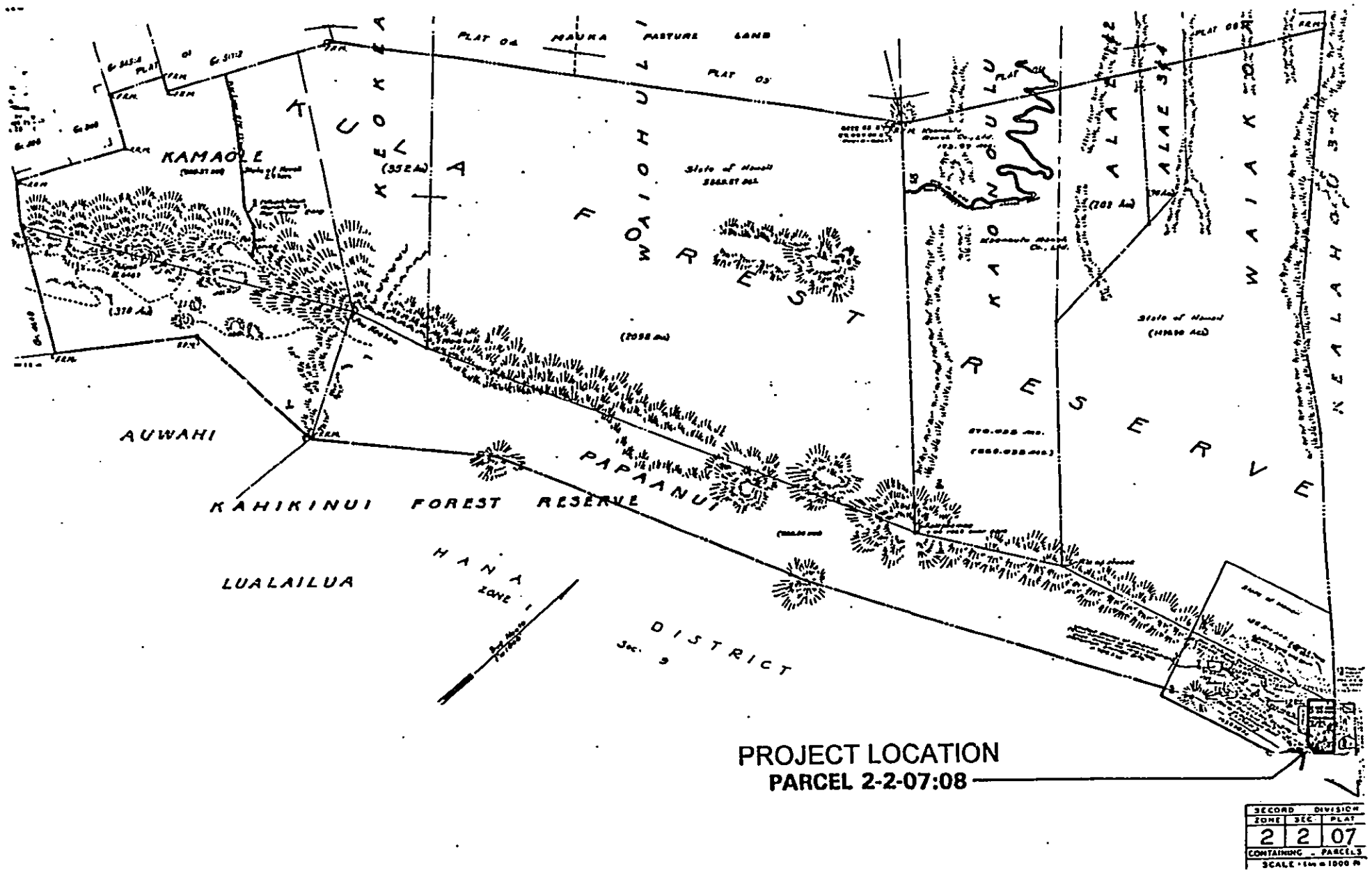


Figure III-3
TAX MAP KEY

Space Surveillance Complex (MSSC), which includes the Advanced Electro-Optical System (AEOS) 3.67-meter telescope.

The HO complex is situated in the General subzone of the State Conservation District (Figure III-4). Other nearby conservation areas include Haleakala National Park and four state forest reserves, Kula, Makawao, Ko'olau and Kahikinui. The forest reserves function as watersheds and biological preserves. They are also used for recreational purposes such as hiking, hunting and camping. Ranch lands used for cattle grazing border these conservation lands. Development (e.g., roads, buildings and water catchment projects) is minimal throughout the conservation and agriculture areas.

Immediately northeast of HO are television transmitting and receiving stations on land managed by Lee Enterprises, Inc. To the west there is a repeater station that is part of the Federal Aviation Administration's (FAA) air traffic control system and a U.S. Department of Energy (DOE) research facility. Other land adjacent to HO is owned by the State of Hawai'i and controlled by the State Department of Land and Natural Resources.

The following sub-sections give brief descriptions of each affected land-user and their main objectives and focus.

3.2.2.1 Other Facilities at Haleakala Observatories

In 1961, Governor's Executive Order 1987 conveyed about 18 acres of land located approximately 0.5 miles southwest of Haleakala's summit to the University of Hawai'i (Figure I-1). The Executive Order requires that the parcel be used for scientific purposes at the Haleakala High Altitude Observatory Site, or the land will revert to the State. The HO property is located within the Forest Reserve and the General subzone of the State Conservation District (Figure III-4). Various facilities have been constructed since 1961 to support astronomical and atmospheric research and space surveillance. These facilities are primarily utilized and maintained by the University of Hawai'i and the United States Air Force.

The major UH facilities at HO are the C. E. Kenneth Mees (Mees) Solar Observatory and the Lunar and Satellite Ranging (LURE) Observatory. The scientific programs at Mees emphasize studies of the solar corona and chromosphere. LURE, which is operated by UH IfA under contract to the NASA Goddard Space Flight Center, supports the NASA Space Geodesy and Altimetry Projects, and provides NASA with highly accurate measurements of the distance between LURE and satellites in orbit about the earth. The UH IfA has a support staff that serves HO facilities and programs. Services include administration, personnel and purchasing support, as well as vehicle and building maintenance functions. The support staff serves a total of 17 technical, scientific and engineering staff on Maui. A support facility located in Kula consists of an office building, electronics lab and vehicle maintenance shop.

Other facilities at HO include a Cosmic Ray Neutron Monitor Station operated in association with the University of Chicago Enrico Fermi Institute. The Haleakala Cosmic Ray Neutron Monitor is the only such station in the world. An atmospheric survey and seeing

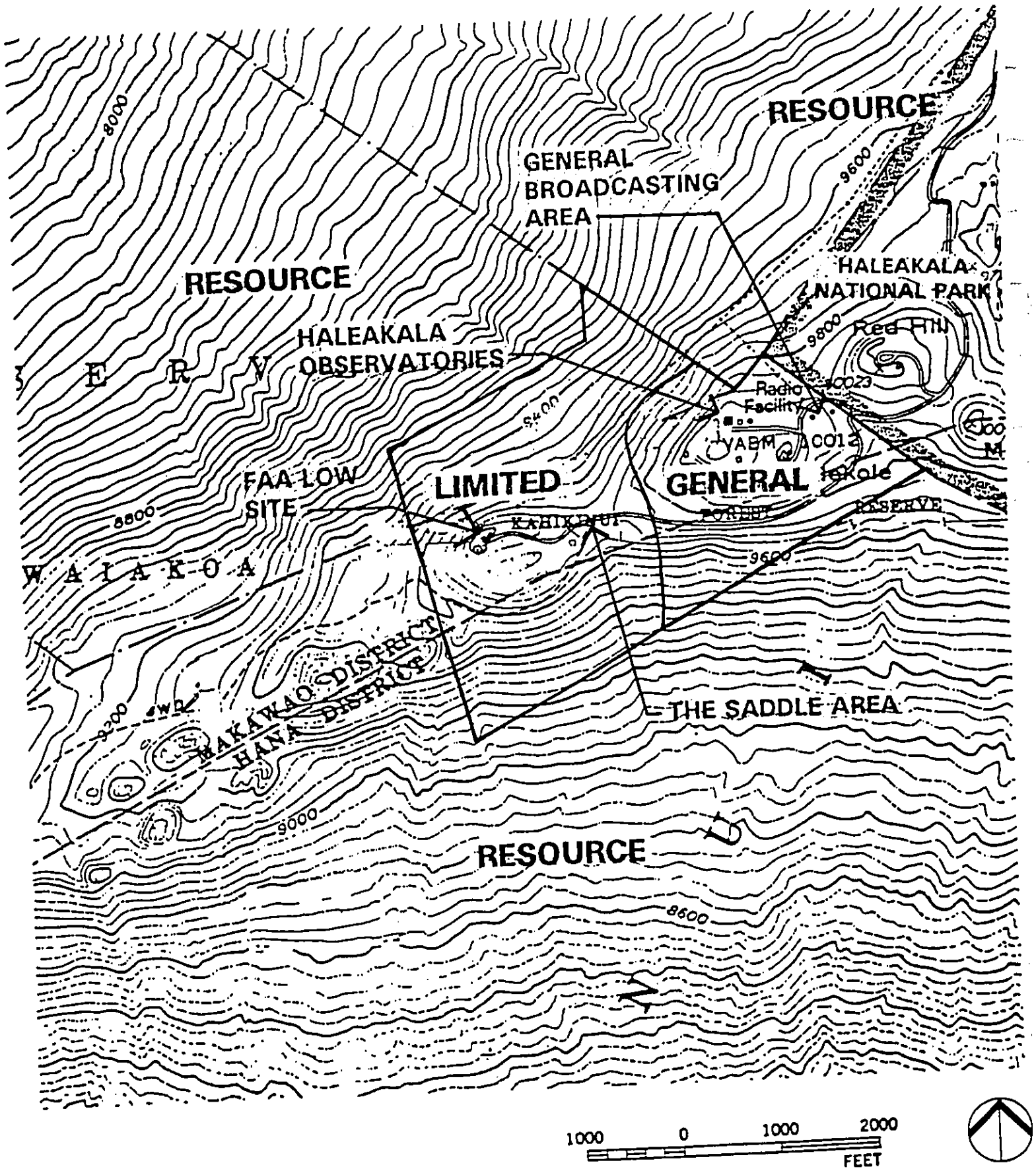


Figure III-4
STATE CONSERVATION DISTRICT SUBZONES

characterization program conducted by UH IfA, in association with the U.S. Air Force Research Laboratory, is also actively in progress at the present time.

The Maui Space Surveillance Complex (MSSC), a U.S. Air Force facility, is another integral component of HO. It is managed and operated for the U.S. Air Force Research Laboratory by its contractor, Boeing/Rocketdyne Technical Services. The U.S. Army Corps of Engineers leases a 4.43-acre parcel from UH for the Air Force. The primary mission of the MSSC is to conduct space surveillance activities for the U. S. Department of Defense (DoD). MSSC operations that support this mission include: (1) the research and development operations of the USAF Materiel Command's Air Force Research Laboratory; (2) the Ground-Based Electro-Optical Deep Space Surveillance System (GEODSS), which tracks and collects data from space objects; (3) the Maui Optical Tracking and Identification Facility (MOTIF) that detects, tracks and identifies all artificial objects in space, maintains a catalog of all artificial objects in space, provides information on space objects to authorized agencies, and supports space research and development operations; and (4) the recently completed Advanced Electro-Optical System (AEOS) facility, a 3.67-meter telescope and related equipment that provides higher resolution of space objects and enhanced infrared sensitivity.

3.2.2.2 Broadcast Transmitters and Communications Facilities

A variety of radio and television broadcast transmitters, microwave relay towers, and public service communications facilities are located on a ridge near HO. The mountain's summit offers an ideal location for broadcasters because it offers line-of-sight paths for signals to reach the populated areas in Maui County, windward O'ahu, and the Kona Coast of the Big Island. The 2.57-acre General Broadcasting Area (TMK 2-2-7:09), located to the northeast of HO, is leased to Lee Enterprises, Inc. by the State of Hawai'i. The site has been zoned as part of the General subzone of the State Conservation District.

The 2.96-acre Haleakala Peripheral FAA High Site is located in the General subzone of the Conservation District (TMK 2-2-7:11) and is used by the U.S. Government under the authority of Governor's Executive Order 1808. Site facilities include an FAA repeater station, which is part of the air traffic control system, and a U. S. Department of Energy (DOE) research facility. The northeast boundary of the FAA High Site is adjacent to the proposed FTF site.

The 1.7-acre FAA Low Site (TMK 2-2-7:07) is located in the Limited subzone of the Conservation District and was conveyed to the United States Government (administered by the FAA) under Governor's Executive Order 1410. The following facilities are located in this area: FAA Repeater Facility RTR; County Radio Tower/Facility, which provides antenna space for Emergency Medical Service MEDICOM 960 & 450 MHz, Maui County Police Department, Rainbow analog microwave--RACES 147 MHz, and Big Island Services; Civil Air Patrol; State Civil Defense; and DLNR Forestry Division.

3.2.2.3 Haleakala National Park

The southwestern boundary of Haleakala National Park is approximately 600 feet from the HO boundary. The Park covers 27 square miles of Haleakala and extends from the summit,

including Haleakala Crater, down the southeast flank through Kipahulu Valley, which is in the Resource subzone of the State Conservation District. The Park was established to preserve the outstanding features of Haleakala Crater. The Haleakala visitor center is 11 miles from the park entrance, near the summit of the mountain and Haleakala Observatories.

3.3 VISUAL SETTING

More than a million visitors each year are attracted to Haleakala National Park's various lookouts and vantage points for the spectacular vistas and astronomical views. Looking to the west, a majestic view of Central Maui's isthmus and the West Maui Mountains is afforded. To the east are the varied hues of the crater and on days of minimal cloud cover, the dark slopes of Mauna Kea and Mauna Loa. On a cloudless night, Haleakala serves as an outstanding platform from which to view the heavens, facilitated by its position above the cloud inversion layer, the clean atmosphere, and the lack of degrading light sources.

The terrain around HO is rugged, with sparse vegetation and an abundance of lava rock. Scientific observatories and buildings are scattered across the landscape. When mid- and upper-level cloud cover is absent, broadcast antenna towers and many of the existing structures at Haleakala Observatories are visible from many miles away. Some of the facilities can also be seen from public viewpoints and Crater Road (UH IfA, 1994). The domes of some facilities at HO are painted white, while others are aluminized. The AEOS telescope enclosure is coated with a mirror-like reflective material, which minimizes daytime heating of the telescope. The colors of the domes are a contrast to the cinders and lava of the natural landscape. All of the buildings under the domes at MSSC, however, have been painted cinder color to help them blend into the natural environment.

The nearest public viewpoints to the HO complex are Haleakala National Park's Pa Ka'oao (White Hill) Visitor Center and the Pu'u 'Ula'ula (Red Hill) Overlook. The FTF would be located on the southern edge of the HO complex; because the terrain slopes downward in that particular area, it would not be visible from these overlooks. The MSSC, particularly AEOS, would continue to be the dominating visual site from these vantage points.

3.4 TOPOGRAPHY, GEOLOGY AND SOILS

3.4.1 Topography

The island of Maui is comprised of two major volcanoes, West Maui and Haleakala. While the older West Maui appears to be extinct, Haleakala volcano's last eruption was only about two centuries ago, and the volcano is considered to be dormant.

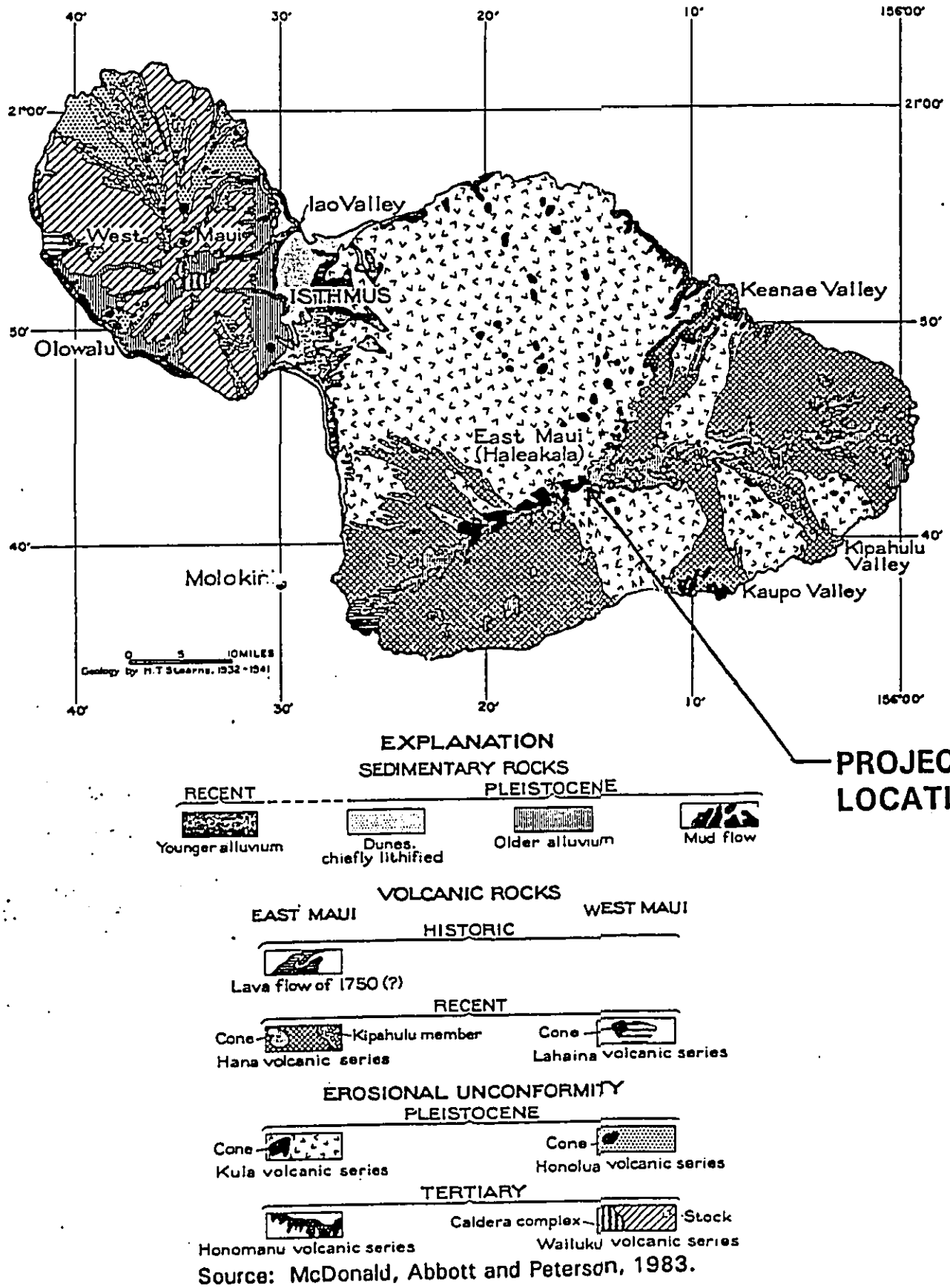
Haleakala is an oceanic-type shield volcano that forms the eastern half of Maui and rises to an elevation of 10,023 feet ASL. The summit area is rugged and sparsely vegetated, consisting of lava and pyroclastic materials. Within a 4-mile radius of HO, the elevation drops to approximately 3,600 feet, with an average slope greater than 30 percent.

3.4.2 Geology

Over the course of Haleakala's formation, three distinct phases of eruption have taken place (Figure III-5). The first, known as the Honomanu Volcanic Series, is responsible for the formation of Haleakala's primitive shield and most likely its three prominent rift zones. Honomanu lavas are exposed over less than 1 percent of Haleakala, but are believed to form the foundation of the entire mountain to an unknown depth below sea level. The second series, or Kula Volcanic Series, overlaid the previous Honomanu Series with its lava flows. Eruptions of this series were considerably more explosive than its predecessor and led to the formation of most of the cinder cones along the three rift zones. A period of inactivity followed the Kula Series, during which erosion began to form Haleakala Crater and great valleys leading down to the coast. After this long period of erosion, the final volcanic eruptions, called the Hana Volcanic Series, partially filled the deep valleys. Several cinder cones and ash deposits lined the East and Southwest Rift Zones, ranging from a few feet high to 600 feet high and more than a mile across at the base. Lava flows within the Haleakala Southwest Rift Zone range from 200 to 20,000 years old. Six flows have erupted in this area within the last 1,000 years. During the latest eruption, which is believed to have occurred between 1700 and 1790, lava emerged from two vents and flowed into La Perouse Bay, where a small peninsula was formed. Although Haleakala volcano is considered dormant, in light of its eruption within historic times, renewed activity in the future is not improbable (Feldman and Siegel, 1980).

Dr. S. Bhattacharji surveyed the geology of the proposed FTF site in February 2000 (Appendix C). He found that the Kolekole area had been bulldozed and leveled to build various facilities, although there is still spatter lava of varying vesicularity and pyroclastic ejecta of various sizes around the site. There are lava tubes in the area that probably erupted from a nearby vent. The outcrop at the southwest border of the FTF site, which was also identified as having archaeological sites in the Cultural Surveys Hawai'i survey, shows prominently on topographic maps (Figure II-1). The outcrop consists of Ankramite lava that is jointed, tubular and vesicular. The geological survey strongly suggests that this outcrop is part of a larger flow, perhaps covered with cinders, with the steep dip of the structure plunging the lava to an unknown depth below the FTF site. Bhattacharji suggested that removal of the cinders on the northeast side of the FTF site could reveal Ankramite basalt that could serve as an "anchor" for the foundation of the FTF telescope.

Earthquakes in Hawai'i are mostly volcanic in nature, resulting from near surface magma movements, and have historically caused little direct damage to manmade structures. Larger earthquakes tend to be tectonic, generally resulting from the movement of large rock bodies. Tectonic activity potentially affecting the summit of Haleakala may originate in the Moloka'i Fracture Zone, a system of fractures in the sea floor that stretches from the Hawaiian Islands to Baja, California. Although the fracture zone is seismically inactive along much of its length, significant earthquakes are associated with the portion near Hawai'i. Furumoto (1991) estimated that there is a 90 percent probability that an earthquake with a magnitude of 7 or greater will be felt on Haleakala sometime within the next 75 years. Experts have recommended that facilities be constructed to withstand shaking from a 7.5 magnitude earthquake. The largest recorded earthquake in the State, magnitude 7.5, occurred on the island of Hawai'i in 1868 (Macdonald et.al., 1983).



Source: McDonald, Abbott and Peterson, 1983.

Figure III-5

SURFICIAL GEOLOGY OF MAUI

3.4.3 Soils

The Haleakala summit area is covered with volcanic ejecta consisting of lava, cinder and ash of the Kula and Hana Volcanic Series; there is no soil development in the immediate vicinity of HO. Soil development occurs with increased distance (greater than 1.5 miles) from the summit. Most of the area is situated on Cinder Land (rCl), which is thought to be of the Kula period of volcanism (US Soil Conservation Service, 1972). A foundation investigation conducted in 1985 in the HO area revealed that the cinder in this area is underlain by 5 feet of volcanic clinker and 16 feet of volcanic cinder (Dames & Moore, 1990). In the area of the proposed FTF, the ground is covered by broken and crushed cinders, bombs, and broken lava flows (Bhattacharji, 2000).

3.5 HYDROLOGY

3.5.1 Groundwater

Haleakala is underlain by a basal fresh water lens, which is tapped in nearshore areas by means of inclined shafts. Basal groundwater in Haleakala's rift zones is confined in permeable segmented dikes. Dike water is found in the southwest rift zone on which the summit facilities are located. This water is thousands of feet beneath the summit and is therefore far too deep to be economically tapped by wells (Feldman and Siegel, 1980). Figure III-6 is a map of Maui showing the approximate outline of groundwater reservoirs, recharge, 1975 groundwater draft, principal supply wells, and hydrographic areas representing major drainage basins (*Ibid.*, modified from Stearns and Macdonald, 1942). More recent investigations of Maui groundwater resources resulted in an Aquifer Code that confirms the basic classification system of Stearns and Macdonald (Mink and Lau, 1990).

Perched aquifers contain rainwater that has been retarded in its downward percolation by impermeable or low permeable structures such as intrusive rocks, ash beds and soil. These aquifers are relatively small compared to the basal or dike-confined aquifers. Most of the springs located on the middle and upper slopes of Haleakala are fed by perched water, but few exist in the crater area. No groundwater wells are used for drinking water within a 4-mile radius of the summit (Dames and Moore, 1989).

3.5.2 Surface Water

Most streams on Haleakala are intermittent, even on the rainy northeast slope, because of the steep, permeable lava terrain. Perennial streams that do exist occur at lower elevations and originate from groundwater springs. No perennial streams or other surface water bodies are located in the summit area near the existing facilities.

Surface-water runoff down the slopes of Haleakala is seasonal and sporadic. Heavy rain from impermeable surfaces drains onto the surrounding areas and quickly infiltrates into the highly permeable cinder surface. The volcanic topography is young and does not lend itself to the development of well-defined drainage courses (FAA, 1996).

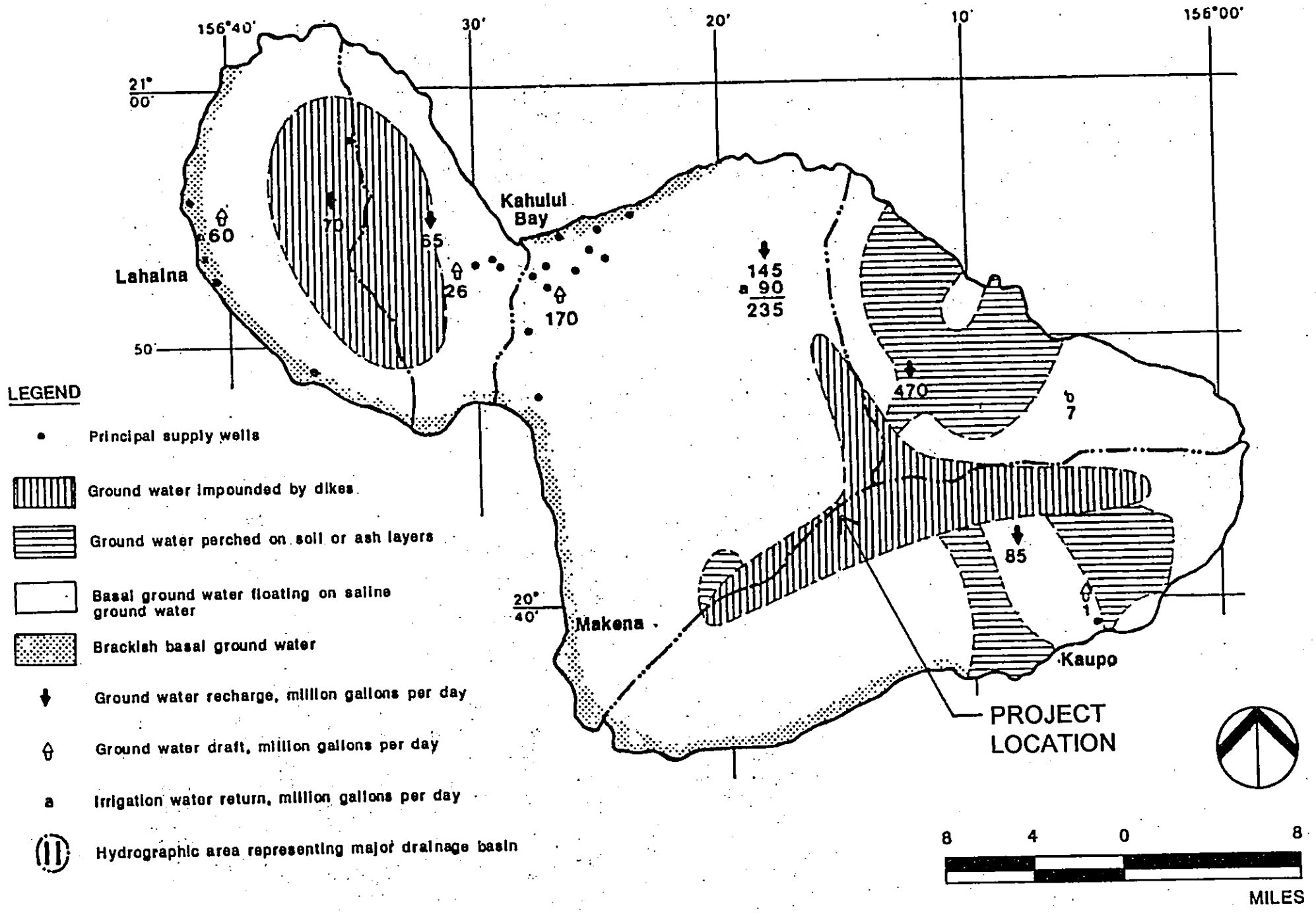


Figure III-6

WATER RESOURCES: ISLAND OF MAUI

Source: Feldman and Siegel (1980)

3.6 CLIMATOLOGY

Temperature data collected at MSSC between 1985 and 1991 is summarized by month in Figure III-7. The data shows that the lowest 7-year monthly average temperatures of about 42°F usually occur in December, January and February; and the highest 7-year monthly average temperatures, about 50°F, occur in August. During the winter months, sub-freezing temperatures and frost are common at higher elevations, with occasional sub-zero temperatures recorded. Between December and February, the summit area occasionally experiences snow, hail and sleet.

Rainfall on Haleakala is heaviest at elevations between 3,000 and 5,000 feet where the moisture-laden trade winds are cooled as they rise against the mountain. At higher elevations, the air is much drier, resulting in a low average of rainfall of about 40 inches per year (Giambelluca et.al., 1986).

Maui's winds are predominantly northeasterly trade winds, spurred by high-pressure anticyclones and ridges that occur several hundred miles to the north and northeast. These trade winds are most persistent from March to November. Conversely, southwesterly (Kona) winds occasionally occur in the winter months, and are usually accompanied by clear weather. Wind speeds can be extreme, with the greatest wind speed recorded at the summit over 125 miles per hour (mph). Gusts exceeding 60 mph are common throughout the year, as are sustained winds of 50 mph. Winter storm systems from the North Pacific have been known to bring the strongest winds through the island chain (Figure III-8, UH IfA, 1994).

3.7 AIR QUALITY AND NOISE

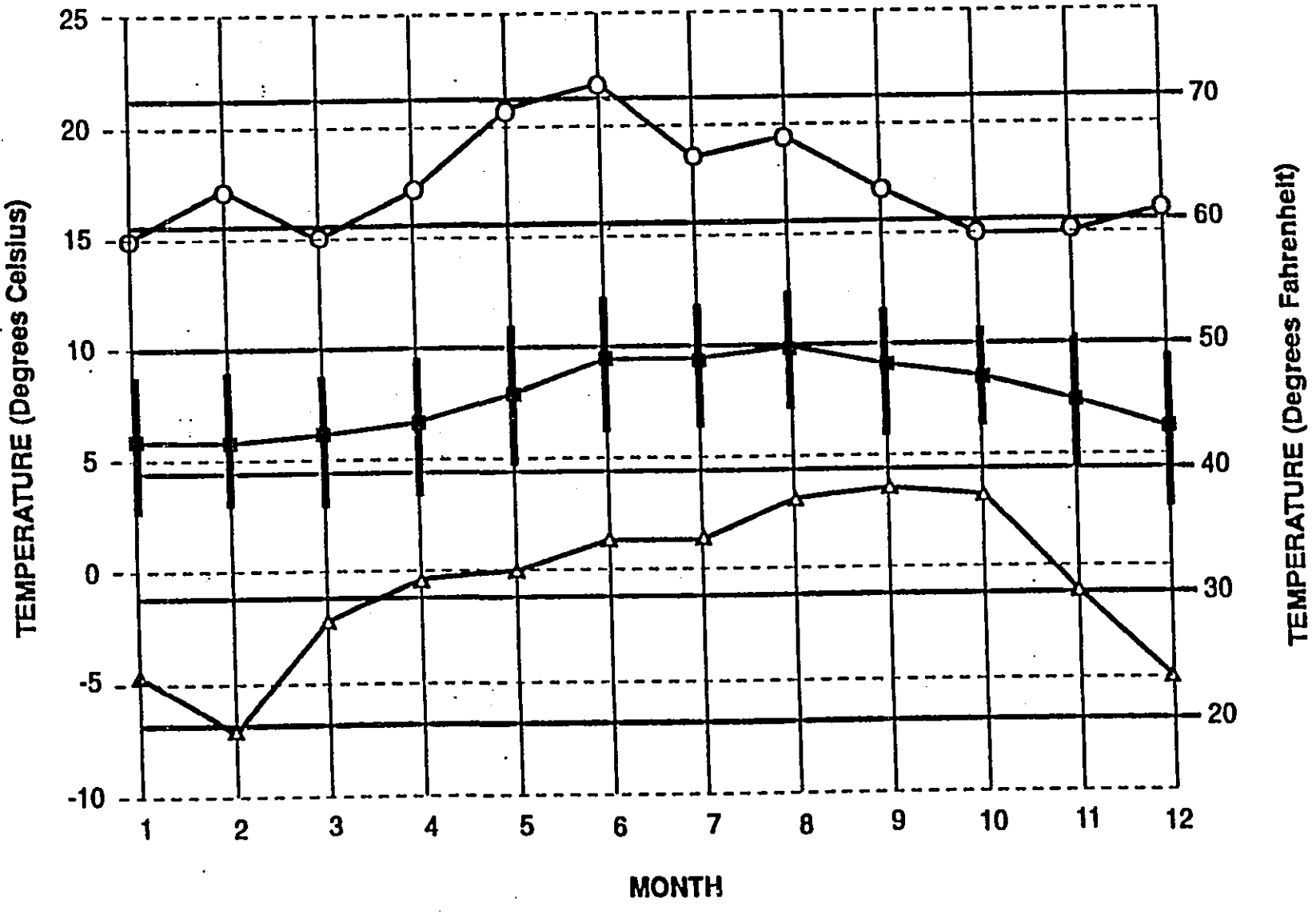
Air quality near the summit of Haleakala is excellent due to the lack of major stationary sources of emissions, few mobile emission sources (vehicles, etc.), favorable topography and persistent tradewinds. It is in an attainment area for U.S. Environmental Protection Agency (EPA) "criteria" pollutants. In addition, Haleakala is one of the few places in Hawai'i designated as a "Class 1" area (most restrictive) with respect to the EPA's "Prevention of Significant Deterioration" (PSD) regulations. These regulations are designed to maintain air quality in areas that are currently in attainment.

Existing noise levels at the summit are low, with wind noise accounting for the majority of background noise. Vehicles ascending to the summit, air conditioning compressors and exhaust fans are the loudest noise sources. Spot measurements made at the MSSC site on a day with moderate wind speeds indicated instantaneous noise levels on the order of 45 to 50 dBA.

3.8 BIOLOGICAL ENVIRONMENT

3.8.1 Flora

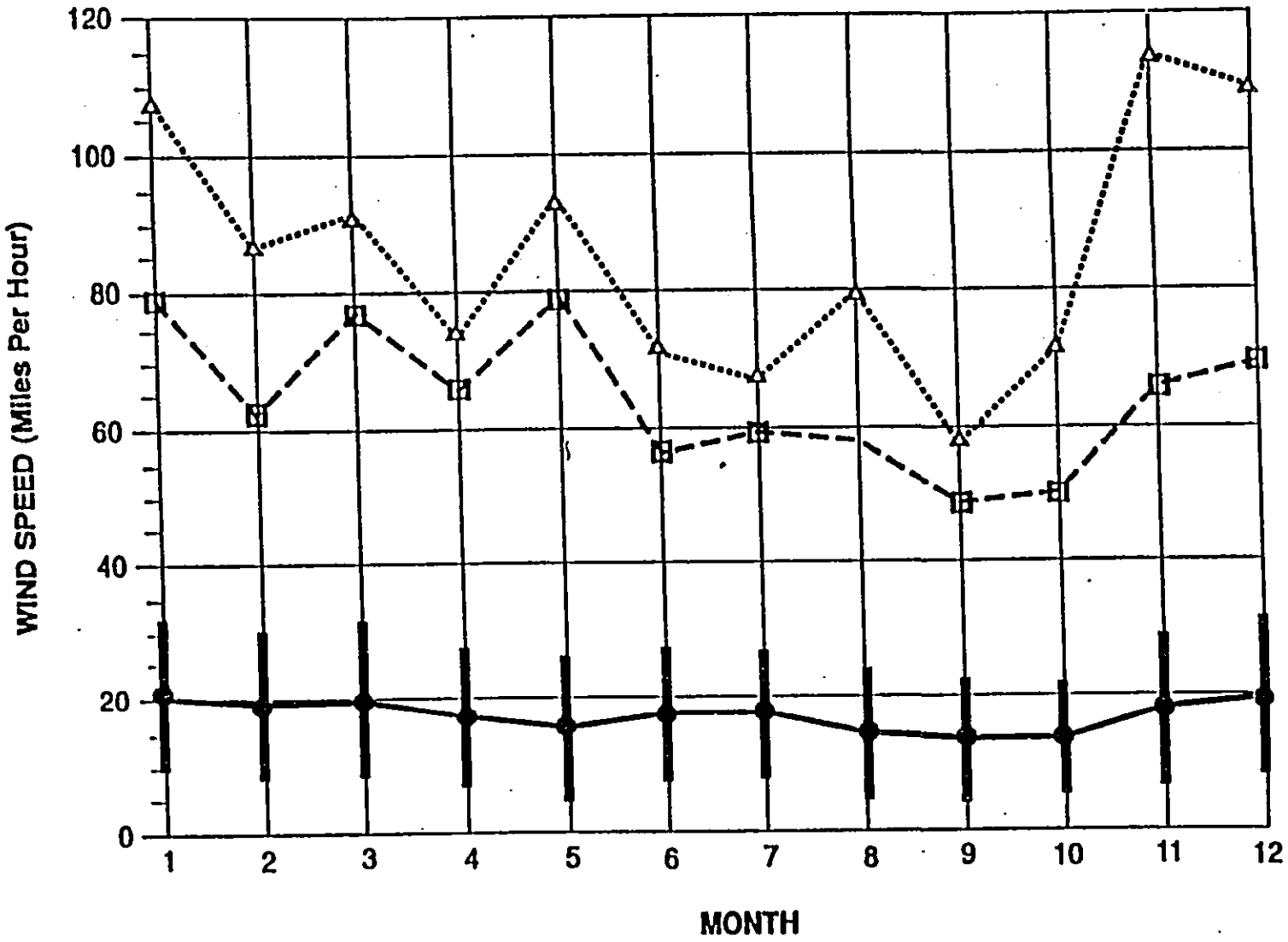
The plant community in the summit area can be characterized as an alpine dry shrubland with very sparse vegetation cover. Rock and cinder predominate the surface, giving the impression from afar that the area is almost barren (Whiteaker, 1980; Wagner et al., 1990). Although there is adequate rainfall (an annual average of 40 inches), the sparsely vegetated environment is a



Source: UH IfA, 1994.

Figure III-7

TEMPERATURES AT MSSC: 1985 THROUGH 1991



Source: UH IfA, 1994.

Figure III-8
WIND SPEED AT MSSC: 1985 THROUGH 1991

result of the summit's severe conditions, including strong winds and frequent nightly frosts that occur even in the summer months.

Medeiros and Chimera conducted a cursory survey of the project area in May 1995. Char & Associates surveyed the FTF site in April 2000 (Appendix D). The area contains primarily low shrubs of kupaoa, *Dubautia menziesii*, an endemic member of the daisy family that ranges from 1 to 3 feet tall. The kupaoa is a common species on the upper slopes of Haleakala and within the crater (Wagner et al., 1990). Also found at the site is the native bunchgrass, *Deschampsia nubigena*, a perennial grass that forms rounded tufts 6 to 12 inches high. It is the most commonly encountered grass species at this elevation. Only four other vascular plants occur on the project site: a few hairy cat's ear, *Hypochoeris radicata*; an endemic member of the daisy family, *Tetramolopium humile;* a few clumps of mountain pili or pili uka, *Trisetum glomeratum;* and a single pukiawe bush, *Styphelia tameiameiae*.

The 'ahinahina or silversword, *Argyroxiphium sandwicense macrocephalum*, also occurs within the summit area. The silversword is found only on Haleakala and on Mauna Kea on the Island of Hawai'i, growing at elevations between 7,000 and 12,300 feet. The variety found on Haleakala is designated threatened by the U.S. Fish and Wildlife Service (1992). The oldest silversword within the existing MSSC complex flourished until it bloomed and died, a natural part of its life cycle. Others originally growing within the complex were relocated to a site outside of HO by National Park Service personnel. No silversword were identified on the project site or adjacent areas during the April 2000 survey.

No threatened or endangered species (USFWS, 1994) or rare and vulnerable plants (Char & Associates, 2000) are found on the project site, access road corridor or surrounding areas. Table 3.1 lists the six vascular plants located during a cursory survey of the project area by Char & Associates during their April 2000 survey.

3.8.2 Fauna

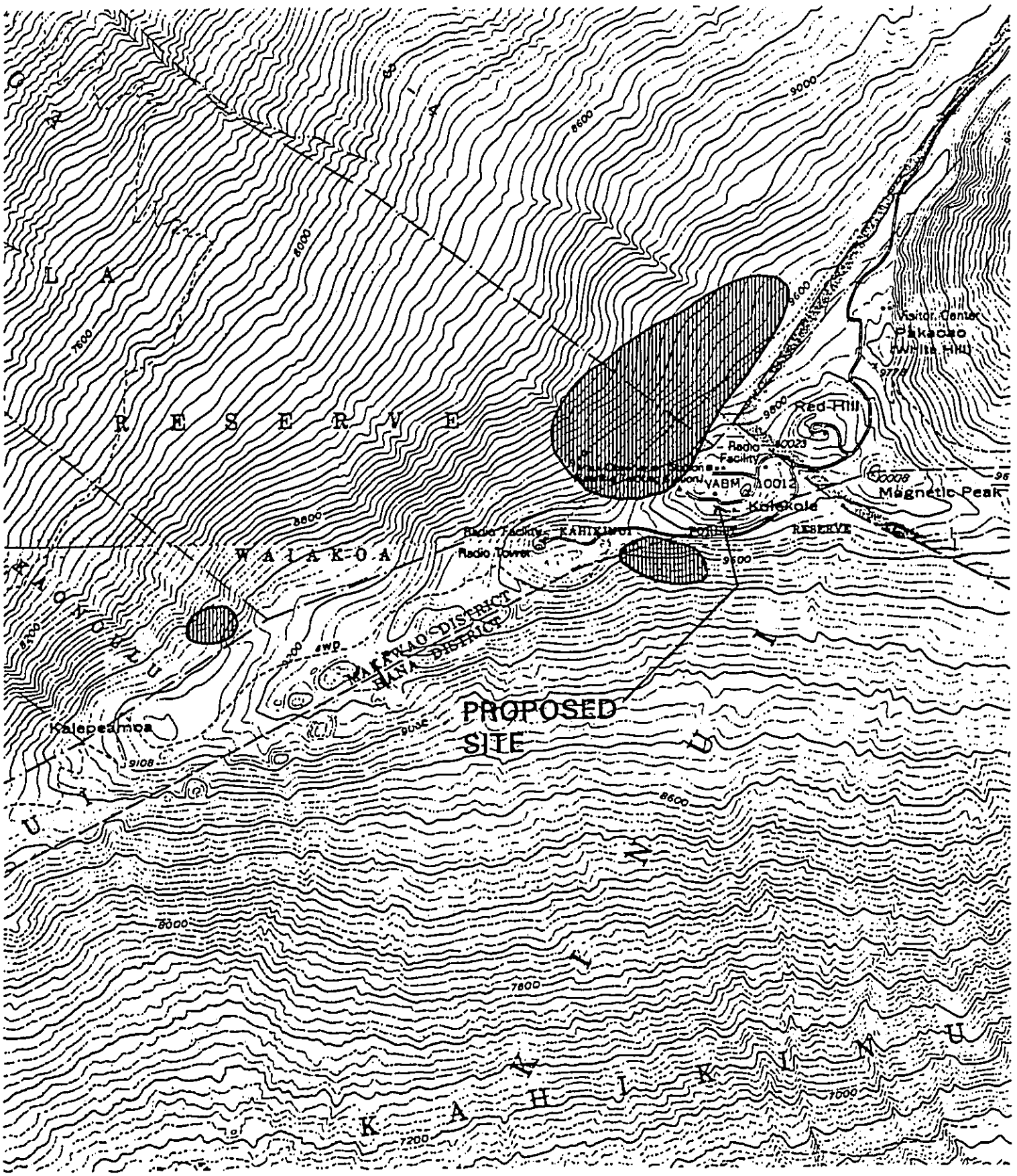
3.8.2.1 Avifauna

The 'ua'u or Hawaiian dark-rumped petrel, *Pterodoma phaeopygia sandwichensis*, is a federally listed, endangered pelagic seabird known to nest on the summit of Haleakala between the months of May and October (Conant and Stemmermann, 1979; NPS, 1994). The birds spend the remainder of the year at sea. Although they occur regularly on the islands of Maui, Lana'i and Hawai'i, the only known breeding colony is at the summit of Haleakala. The endangered seabird may be found in deep burrows inside and outside Haleakala Crater. Approximately 77 percent of the known burrows are located in three sub-colonies along the inner wall of the west crater rim, about 3,200 feet northeast of HO. Three other sub-colonies have been observed in the vicinity of HO, with a seventh on the outside of the Crater's west rim. The burrows immediately surrounding HO are shown in Figure III-9 (U.S. Air Force, 1991; UH IfA, 1994).

Surveys for incoming 'ua'u were conducted by C. N. Hodges, Haleakala National Park Research Associate, in May 1992, May 1995, and August 1995. During the May 1992 survey, a site located about half a mile downslope of the FAA facility appeared to be a heavily used flyway for

Table 3.1
List of Six Vascular Plants at Proposed Faulkes Site
(Compiled from Appendix D, Char & Associates, 2000.)

COMMON NAME	GENUS AND SPECIES	NATIVE STATUS
1. Kupaoa	*Dubautia menziesii*	Endemic
2. Perennial Grass	*Deschampsia nubigena*	Endemic
3. Hairy Cat's Ear	*Hypochoeris radicata*	Native to Eurasia
4. Daisy family	*Tetramolopium humile*	Endemic
5. Pukiawe	*Styphelia tameiameiae*	Indigenous
6. Pili Uka	*Trisetum glomeraturm*	Endemic



Source: C.N. Hodges, Haleakala National Park

Figure III-9

LOCATION OF KNOWN DARK-RUMPED PETREL (`UA`U) BURROWS IN PROJECT AREA

Legend

Burrow Location

incoming 'ua'u. Vocalizations were recorded and birds were observed flying within about 30 feet of the ground (Hodges Memorandum, June 10, 1992, in Char & Associates, Appendix E). At present, no colonies have been identified within the vicinity of proposed FTF site.

Hodges conducted two additional surveys in May and August of 1995. In the May survey only one call was heard emanating from below the study site. A Fujinon PS-910 Starscope was used during the two-night August survey. On the first night, the survey was conducted from 6:00 to 9:00 PM. A spotlight was used on the second night to enhance the Starscope's visibility; this survey was conducted from 7:00 to 9:00 PM. At least three 'ua'u were seen flying over the site on both nights between 7:30 and 8:30 PM, within 60 feet above the ground. There was no obvious direction or flight pattern for these sightings (Hodges in Char & Associates, Appendix E).

The nene, or Hawaiian goose, *Nesochen sandwicensis*, another federally listed endangered species, occurs only on the islands of Maui (atop Haleakala) and Hawai'i (atop Mauna Loa and Hualalai) above elevations of 4,000 feet. The nene sanctuary on Haleakala is located on the mountain's northeast slope between the 5,000-foot and 6,900-foot elevations. A suitable habitat does not occur in the vicinity of the project area and the nene is not known to occur at the summit.

3.8.2.2 Invertebrate Fauna

Due to the harsh environment, fewer insects are present at upper elevations on Haleakala than are found in the warm, moist lowlands. A unique assemblage of insects and spiders, however, makes its home on the mountain's upper slopes. Medeiros and Loope conducted a review of arthropod fauna at MSSC and surrounding areas in 1992 in conjunction with the AEOS Telescope Project (Appendix F). Table 3.2 lists the invertebrates identified in the immediate project site. The study concluded that the proposed site is a typical, but somewhat depauperate, example of Haleakala's aeolian zone. The reduced diversity of key invertebrate groups, such as carabid beetles and moctuid larvae, is thought to be due to previous construction on the site. No locally unique taxa were encountered, although several types of spiders, including a large (3.5 to 5.0 centimeter length) endemic wolf spider, *Lycosa hawaiiensis*, were identified. Ten species of native ground beetles have been recorded near the summit; five being restricted to within 150 feet of the summit. Several other types of native beetles have also been recorded from the aeolian region of the mountain. A number of noctuid moth species, many with radical feeding adaptations, exist at the summit, as does the endemic flightless moth, *Hodegia apatela*. Native invertebrates observed during the brief survey of the project site were the wolf or ground spider, *Lycosa* sp., and a vespid wasp, *Odynerus* sp. One dead individual of a possibly native seed bug, *Nysius* sp., was also seen. A few questionably native, small centipedes, Class Chilopoda, were uncommon under rocks. Several mites, Order Acarina, perhaps some of them native species, were also observed under the rocks. Alien invertebrates observed on the site include a comb-footed spider, *Theridion* sp., and a damsel bug, *Tropiconabis capsiformis* (Medeiros and Chimera, 1995).

Table 3.2
Invertebrate List For Proposed FTF
(Compiled from Medeiros and Chimera, 1995.)

Invertebrate Species	Order	Family	Notes
Lycosa sp.	Araneae	Lycosidea	native wolf spider
Theridion sp.	Araneae	heridiidae	non-native comb-footed spider
Centipede	Class Chilopoda		native? Uncommon under rocks
Mites	Acarina		Under rocks
Tropicondabis capsiformis	Hemiptera	Nabidae	Non-native damsel bug
Nysius sp.	Hemiptera	Lygaeidae	native? only one dead individual observed
Odynerus sp.	Hymenoptera	Vespidae	native vespid wasp

3.8.2.3 Mammals

The endangered Hawaiian hoary bat, *Lasiurus cinereus semotus,* has occasionally been observed at elevations up to 13,000 feet (U.S. Air Force, 1988). National Park Service records indicate that one bat was found in the south park boundary fence and another near Kalahaku Overlook at an elevation of about 9,200 feet. Other individuals have been found dead at about the same elevation, and observations of the bat flying in the summit area have been reported. It is considered extremely unlikely that this species is a resident at the summit because it is not suited to cold temperatures (Tomich, 1986; U.S. Air Force, 1988).

3.9 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

In pre-historic times, Haleakala Crater was used as a thoroughfare through East Maui and as a source of basalt for adze blade manufacture. Numerous archaeological sites have been recorded on the crest and in the crater, including in order of frequency, temporary shelters, cairns, platforms with presumed religious purposes, adze quarries and workshops, caves, and trails (Rosendahl, 1978). Many contemporary Native Hawaiians consider the summit area of Haleakala to be a spiritual resource and sacred site, thus they believe it should be carefully protected.

Archaeologists have discussed the prehistoric settlement pattern for the rim and crater of Haleakala since 1919 when Kenneth P. Emory of the Bishop Museum conducted an extensive survey and selected test excavations within the crater. Structures found within the crater include markers (*ahu* or cairns) and stone shelters built as windbreaks for travelers or hunters. Other structures within the crater area are associated with traditional Hawaiian practices such as umbilical cord offerings, burial rites, and collection of stones for adze making. In historic times, goat hunters have built blinds and windbreaks in the crater, and visitors are known to have built little cairns as mementos of their trip.

Several surveys have been completed for the Haleakala region, the most extensive being Kenneth P. Emory's "An Archaeological Survey of Haleakala", published by the Bishop Museum in 1921. In 1963, Lloyd J. Soehren conducted an archaeological survey of portions of East Maui.

In 1991, J.C. Chatters conducted a cultural resource inventory and evaluation of 7.7 acres associated with the expansion of the MSSC. Chatters' survey included the 1.5-acre parcel of the proposed FTF project area. He inventoried four sites around the location of the expansion, Sites 50-50-11-2805 through 50-50-11-2808. Although these recorded sites consist of 23 shelters and a wall segment, the site nearest the proposed FTF is about 90 feet away and consists of three shelters constructed against boulders and outcrops. No further work was done on this site because the proposed FTF would not affect the site.

In April 2000, Cultural Surveys Hawai'i conducted another cultural resource inventory (Appendix G) and two new sites were discovered. State Site 50-50-11-4835 consists of two rock enclosures that were interpreted as trash burning pits probably used by the U.S. Army in the 1940s (Figure III-10). State Site 50-50-11-4836 consists of three terraces, two leveled areas, a rock wall, and a U-shaped rock enclosure interpreted as a cluster of prehistoric temporary

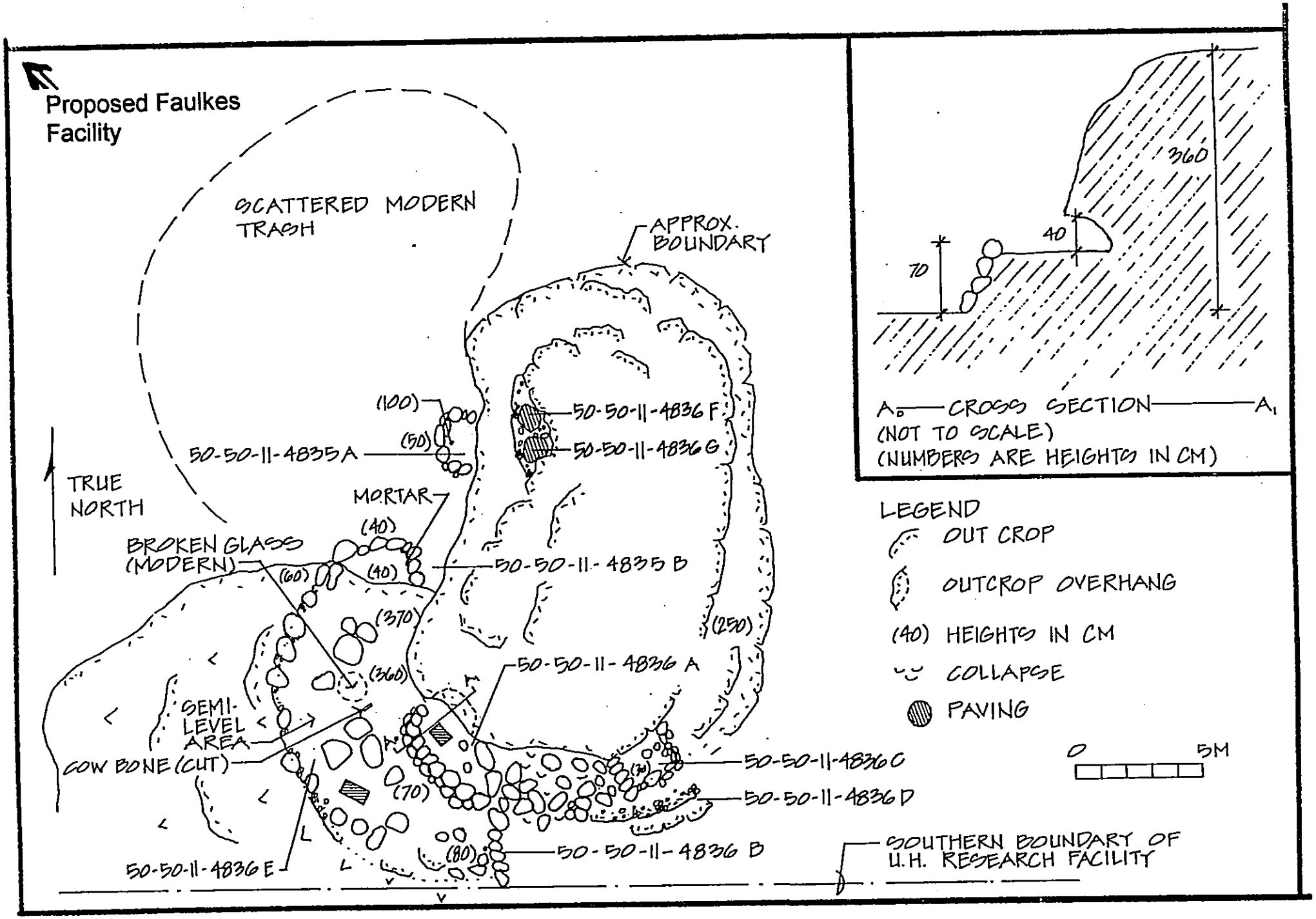


Figure III-10
ARCHEOLOGICAL SITES

shelters (Figure III-10). These sites were constructed on the south or southwestern faces of the exposed lava rock outcrop to provide shelter from the prevailing northeasterly trade winds. One terrace (Feature A) exhibited the most substantial construction of the seven features in Site -4836, with stacked stone walls of 3 to 4 courses and a level cinder surface built into a small overhang. One 50 x 50 centimeter test unit was excavated into the interior of the terrace, and one modern nail was recovered from the uppermost stratum. A 50 x 100 centimeter test unit was also excavated in Feature E. No other cultural material was revealed during the test excavation. There is no material evidence that this site was used in pre-contact times; however, the construction style and proximity to other prehistoric shelters on Kolekole, as well as references to Kolekole shelters in early twentieth-century accounts, suggest that these shelters are pre-contact in origin. Modern trash on the surface and top 2 centimeters of the terrace floor indicates that the site was used in modern times by travelers, ranchers, and hunters. This site is considered significant under Criterion D for its potential to yield information significant to the prehistory and history of Haleakala.

Cultural Surveys Hawai'i determined that the site map, descriptions and photographs obtained during the survey adequately recorded the significance of the archaeological sites. After reviewing the survey, the State Historic Preservation Division (SHPD) of the State DLNR concluded that Site -4836 was worthy of preservation. Based upon the SHPD consultation, an agreement was drafted to protect both sites. As such, a preservation plan was prepared and was later approved by SHPD (Appendix J).

The preservation plan provides that prior to construction, all preservation areas would be plotted on construction plans and all contractors would be made aware of their locations. Under the supervision of archaeologists, preservation areas would be enclosed in a buffer zone with four- to six-foot high construction-type temporary fencing. The fences would remain in place until all construction activities are complete and approval for their removal is received from the SHPD. Archaeologists would provide on-site monitoring during the initial grubbing and grading of the construction site. They would also ensure that other construction activities would not adversely impact the cultural sites. No stones would be removed from the preservation area. Stones broken during construction would remain on site. Any burial remains uncovered inadvertently during construction activities would be handled in consultation with the SHPD and in compliance with Chapter 6-E-43 HAR (as amended by Act 306).

3.10 TRADITIONAL PRACTICES ASSESSMENT

Haleakala has long been recognized as a traveling route through East Maui. Kihapi'ilani, *ali'i' nui* (high chief) of a united Maui in the sixteenth century, completed the construction of a trail around the island and through Haleakala, uniting the politically important districts of Hana and Kaupo with West Maui. Traditional accounts include the use of Haleakala in rites of passage such as birth and death. Haleakala's connection to a symbolic rebirth is reflected in the traditional Hawaiian practice of *piko* storing. A pit at Haleakala named Na Piko Haua was still being used by Kaupo residents in the 1920s to store their offspring's umbilical cords (Krauss, 1988). Peoples of Honua'ula buried their dead in Haleakala Crater (Handy and Handy, 1972). Several references specify burials of both chiefs and commoners in Haleakala Crater (Ka'ai'e, Kamakau; in Sterling, 1998:264-265).

Early post-contact travel to Haleakala by *haole* was limited to expeditions and sightseeing until the late 1800s. There is evidence that Hawaiians continued to use Haleakala throughout the 1800s as a traveling route and also for its ceremonial significance. Cattle ranching occurred in the late 1800s. In 1916 the U.S. Congress allotted 21,000 acres at Haleakala's summit as part of Hawai'i National Park, which opened in 1921. In 1941, the U.S. Army began seeking sites for "unspecified defense installations", and by 1945 had installations on both Red Hill and Kolekole Peak, which is located just outside Haleakala National Park boundaries. The installations were used until the end of World War II and intermittently thereafter, including during the Korean War. Grote Reber built a radio telescope on Kolekole in 1952, and radio and TV broadcasting began soon after from the summit area. Between 1955 and 1958, the University of Hawai'i and the U.S. Air Force shared the Red Hill facilities. By 1960-1961, the University of Hawai'i was operating its observatory at the Kolekole location (Jackson, 1972:131).

In October and November 2000, Cultural Surveys Hawai'i conducted a Traditional Practices Assessment for the proposed Faulkes Telescope Site (Appendix I). The purpose of this assessment was to consider the effects that the proposed development may have on Native Hawaiians as it pertains to their culture and their right to practice traditional customs. The Hawai'i State Constitution, Article XII, Section 7, protects "all rights" of Native Hawaiians that are "customarily and traditionally exercised for subsistence, cultural and religious purposes."

The assessment included an examination of historical documents, maps and Land Commission Awards. A review of existing archeological information was conducted to reconstruct traditional land-use activities and to identify and describe the cultural resources, practices and beliefs associated with the parcel. Two formal interviews were conducted with persons knowledgeable about the historic and traditional practices of the region. Interviewers also had informal talk-story sessions about the project area with other individuals and organizations on Maui.

The study did not identify any impacts to burials, Hawaiian trails, hunting and gathering practices for plant or animal resources, religious sites, archeological sites or historic properties. The report determined a "finding of no significant impact."

3.11 RECREATIONAL RESOURCES

The Haleakala National Park Visitor Center is located near HO and is one of the main attractions for park visitors. Besides boasting a magnificent view of the crater, the Visitor Center features exhibits on the area's geology, archaeology, ecology, and wilderness protection programs. Orientation panels and displays are located at Lele'iwi, Kalahaku and Pu'u 'Ula'ula (Red Hill) Overlooks along the park road between park headquarters and the summit. Kalahaku draws many nature enthusiasts who come to view the rare 'ahinahina (silversword) plants (NPS, 1991).

Many visitors are attracted to the summit and crater areas because of the excellent walking and hiking opportunities. Hikes can range from short self-guiding walks to rigorous multiple-day backpacking trips. Camp and picnic sites are available in the Park, and public cabins are available in the crater. In addition, concessionaires sponsor trips through the crater on a one-day or overnight basis. Hikers have also been known to traverse Skyline Drive, which begins at the 9,750-foot elevation at the lowest point of the paved access road near the Saddle Area, and

continues for about 6.5 miles, where it ends at the Polipoli Spring State Recreation Area. Trails throughout the area are open to the public for hiking and related recreational activities except during times of extreme fire danger. Camping is permitted at designated areas inside the crater, although the stay is limited to two nights.

3.12 INFRASTRUCTURE

3.12.1 Roads and Traffic

Presently, there is only one road to the summit of Haleakala. From Kahului, there are various route options to an intersection in Kula, from which a single two-lane state road ascends to Haleakala National Park. Inside the park the road continues as a two-lane thoroughfare that is owned and maintained by the National Park Service. The road continues to the park boundary adjacent to HO. From the park boundary, the State of Hawai'i maintains the non-exclusive access road to facilities in the Saddle Area and the FAA Low Site. Visitors to Haleakala National Park generate most of the traffic on Haleakala Crater Road. The highest traffic volumes occur in the early morning hours when visitors drive up the mountain to experience the picturesque sunrise. The high elevations, relatively steep grades, and numerous switchback curves on the road limit vehicle speeds, especially for trucks and tour buses.

The unimproved access road known as Skyline Drive originates at the Saddle Area and traverses the Southwest Rift zone, ultimately leading to Polipoli State Park. Its entire length is located on State land within the Forest Reserve, with approximately half of it in the Limited subzone of the State Conservation District and the remaining half in the Resource subzone (Figure III-4). A locked gate near the Saddle Area restricts vehicle access to the road from the Haleakala summit to those holding DLNR permits. Hikers, hunters and Haleakala National Park personnel primarily use the unpaved road. Slopes along the existing road range from flat to 28 percent. The surface area consists of small lava cinder rock that has been washed and weathered to a level approximately three feet below grade.

3.12.2 Water

There is no source or supply of water at the summit area of Haleakala. At various times during the year (particularly the winter months), rainwater is collected from building roofs and stored in water-catchment systems. To supplement this source, water is trucked to each user in certified tanks and stored on site. Users maintain their own collection systems and storage tanks for potable and/or non-potable water, as well as their individual pumping and distribution systems.

3.12.3 Sewerage and Waste Disposal

Septic tanks are the primary means of sewage disposal within the summit area. There is no central waste/sewage collection or storage system at the Haleakala summit. Each user provides for the collection and proper storage of wastewater and sewage generated by that site.

Trash collection is the responsibility of each facility. Non-hazardous trash is disposed of off-site in a licensed landfill, with computer paper and aluminum being recycled. Hazardous wastes and

petroleum product wastes are segregated at the generation point and handled separately. At MSSC, for example, the waste disposal contractor performs sampling and analyses of hazardous wastes prior to removal off-site for disposal. In addition, MSSC has a Hazardous Waste Management Plan to ensure that management procedures comply with the Resource Conservation and Recovery Act, as amended.

3.12.4 Electrical Power

Electrical power for existing summit facilities is obtained from Maui Electric Company's (MECO) Ma'alaea and Kahului power plants. Power is transmitted up the mountain by overhead 69 kV lines from the Wailea and Pukalani Substations to the Kula Substation. The Kula Substation reduces the voltage from 69 kV to 23 kV. The power splits off into four lines just below HO. One line goes to the Haleakala Substation, which further reduces the voltage to 4.16 kV, and from there an overhead line extends across the HO site to the FAA and HO facilities. A second line goes to the General Broadcasting Area and a third goes overhead to the FAA Low site. A spur provides power to the Saddle Area facilities. The fourth line goes to Red Hill in Haleakala National Park.

Power is distributed to various sites via a combination of underground conduits and overhead line conductors. Both 3-phase and single-phase AC electric power is available to sites at conventional voltages of 240 volts and 480 volts (3-phase AC). Transformers and service are provided by MECO and purchased by individual users.

3.12.5 Telecommunications

Equipment and services are provided by Verizon Corporation. The service is distributed to various sites via underground conduits. Each user deals directly with the telephone company to obtain service. Verizon recently constructed a fiber optic line to service the summit.

3.12.6 Protective Services

Because of the great distances to medical, police and fire assistance, all of the facilities in the summit area provide for their own fire, security and emergency medical services. The facilities are locked at all times, and entry is by prior authorization only. An emergency response plan has been established for each of the facilities in the HO area. For example, MSSC has an elaborate emergency response plan (Contingency Plan), which includes a fire prevention and response plan.

HO facilities also have an emergency plan that includes requesting National Park Service support in the event of natural disaster. In the event of a catastrophic event, injured and ill persons are transported to hospitals at sea level. In the past, HO personnel have also aided tourists with medical problems by utilizing cell phones and emergency equipment kept on site. All facilities in the HO area have fire hoses and extinguishers, and on-site personnel are capable of extinguishing small fires. Larger structural fires can result in severe damage, since the nearest professional fire-fighting equipment and personnel are located more than twenty miles away.

CHAPTER FOUR
ENVIRONMENTAL EFFECTS AND POTENTIAL MITIGATIONS

This chapter discusses the environmental effects that are likely to result from the construction and operation of the proposed Faulkes Telescope Facility (FTF). The potential impacts due to construction and operation are discussed below.

4.1 IMPACTS DURING CONSTRUCTION

This EA is based upon a representational concept of the FTF. The discussion of construction impacts will of necessity, be less detailed than for a completed design specification.

4.1.1 Visual Impacts

The presence of construction equipment, construction materials and temporary structures would impact visual quality in the immediate vicinity of the project area. The tallest of these would be seen from the Red Hill Overlook and also from lower elevations during construction. This effect would be temporary since these items would be removed when the project is completed.

4.1.2 Impacts to Geology and Soils

In order to minimize disturbance to the terrain, general grading for foundations, on-site infrastructure and electrical trenching would be limited to the smallest area possible that would meet design and technical requirements. Where feasible, trenches for power and communications would be constructed with the shortest traverse between existing utilities and the new facility. For aesthetic reasons, excavated material would be used for backfill and the trenches would be surfaced with similar materials.

Excavated material meeting gradation requirements for structural fill would be reused on site. It is unlikely that fill would have to be imported, but if the excavated material is very coarse and blocky, fill would come from a source within the construction or HO area.

The contractor and engineers, through proper design and construction practices, would be required to minimize disturbance to the existing terrain, as well as the visual impact on the roads and other facilities. In addition, construction activities would strictly adhere to Maui County regulations concerning grading and excavation.

4.1.3 Hydrologic Impacts

Construction of the proposed facilities would not significantly alter the surface drainage pattern in surrounding areas. It would slightly increase the extent of impermeable surface, and therefore, the surface runoff during storms. The increase, however, would be slight, and the additional water would be channeled away from the FTF into existing drainage culverts. Water would infiltrate the ground once it reaches the permeable surface that surrounds the man-made facilities. Because of this, no measurable effect on flooding or recharge is anticipated.

There is always a potential for accidental spillage of construction-related fuels and chemicals during construction. Although the probability for substantial spillage is low, a remediation plan would be included in the construction contract. The contractor would also be required to perform refueling activities in an area with an impermeable surface that is equipped with an oil-water separator system. This would eliminate significant potential for soil or water contamination.

4.1.3.1 Stormwater Runoff/Groundwater Recharge Volumes

Heavy rains of greater than one inch per hour produce overland flow. These rains are seasonal and sporadic, occurring primarily in the winter months. Ground infiltration from light rains onto the rocky cinder terrain is expected to be rapid and result in minimal erosional effects.

As a precaution against storms, the area would be graded to allow surface runoff to flow off the property. Runoff from paved surfaces would be directed into existing culverts, which already drain into permeable cinders. This would allow runoff to percolate into the subsurface and thereby prevent erosion. All construction would comply with Maui County drainage requirements. Because the disturbed area is less than five acres, a NPDES (National Pollutant Discharge Elimination System) permit for stormwater associated with construction is not required.

4.1.3.2 Water Quality

Construction is not expected to significantly impact water quality at the site, since no substantial water sources exist in the HO area.

4.1.4 Impacts to Air Quality

The summit area of Haleakala is usually well above the temperature inversion layer that limits the vertical convection transport of aerosols, and therefore, atmospheric pollutants in the area are normally generated locally. Some dust is expected to occur as a result of excavation and grading of the approximately one-acre site. In addition, heavy construction equipment operations in the project area and increased traffic along the unpaved access road would also lead to the temporary generation of small dust particles.

Both dust and emissions from vehicles and internal combustion engines on construction equipment may temporarily affect air quality. Engine emissions would be mitigated by the use of properly functioning emission-control devices as required by law. Dust control during construction would be maintained by exposing the smallest area possible at any time and halting construction during high winds and storms. The contractor would be required to sprinkle water on exposed surfaces to suppress dust. Since water must be hauled from sea level, it would be used sparingly. Dust mitigation would be attained through the contractor's strict compliance with State Department of Health "Rules and Regulations" (Chapter 43, Section 10).

4.1.5 Noise Impacts

Most of the construction equipment that would be used would generate noise levels of 90 dB(A) or less at a distance of 50 feet (UH IfA, 1994). The loudest potential noise sources include derrick cranes (88 dBA), concrete mixers (88 dBA), scrapers (93 dBA), pavers (88 dBA), pneumatic tools (88 dBA), and trucks (93 dBA) (Bolt, Beranek and Newman, 1971). Average noise levels during construction are expected to be at or below the following (*Ibid.*):

Ground Clearing	84 to 87 dBA
Excavation	74 to 89 dBA
Foundation Work	78 dBA
Building Erection	74 to 85 dBA
Finishing	75 to 89 dBA

Use of equipment with proper noise-muffling devices would minimize the impact of noise. Adhering to appropriate OSHA standards would mitigate impacts of high-noise levels on construction workers.

4.1.6 Biological Impacts

4.1.6.1 Flora

Construction of the proposed facilities should not have a significant adverse impact on the botanical resources of the Haleakala summit area, although some individual plants would be removed. Some indirect impacts of project construction are of concern, primarily the introduction of alien species. Introduced plants could pose a serious threat to the native ecosystems in the summit area and within the adjacent Haleakala National Park. Alien species such as the woolly mullein, *Verbascum thapsus*; fountain grass, *Pennisetum setaceum*; and cheat grass, *Bromus tectorum*; are of particular concern due to their potential introduction into the project area's pristine environment (Medeiros and Loope, 1992; Medeiros and Chimera, 1995).

Protective measures that proved successful during the U.S. Air Force AEOS telescope project (UH IfA, 1994) would be implemented for construction of the FTF. These measures would include inspection of equipment, supplies and construction material by a qualified biologist before access is permitted through Haleakala National Park. In addition, the project site, access road and utility corridors would be monitored for a minimum of one year to ensure that no alien plants have accidentally established themselves. Construction activities would be restricted to the project site, access road and utility corridor, thereby minimizing any disturbance to crucial microhabitats in the soils (Medeiros and Loope, 1992).

4.1.6.2 Fauna

The endangered 'ua'u, or Hawaiian dark-rumped petrel, has been observed flying over the HO area. The number of birds flying over the site during the breeding season varies from year to year. 'Ua'u are prone to collide into foreign, protruding obstacles and it is presumed that the birds may fly into the proposed Faulkes Telescope Facility. Fences, particularly barbed wire, are

especially hazardous. 'Ua'u carcasses have been found on barbed wire and also at the base of the hogwire fence along the national park's boundary. After the barbed wire was removed from the fence, 'ua'u deaths decreased significantly (See Appendix E, Hodges letter to R. Flagg, 15 September 1995).

Because of concern for the endangered 'ua'u, design of appropriate barriers would be coordinated with the U.S. Fish and Wildlife Service (USFWS). To reduce the chances of 'ua'u flying into the safety barrier around the FTF, the design would include building a lava rock safety barrier and a wooden gate.

All construction activities would take place during daylight hours and would not require lights that might disorient the 'ua'u. There would, therefore, be no significant adverse effect on the birds. After construction, external lights would not be required, as red sensor lights on the access doors would provide any necessary light. In addition, the access road would not be lighted.

'Ua'u flying at night have been known to collide with difficult-to-see objects such as power lines and utility poles. The most effective mitigation is to "underground" the utilities, as is planned for the proposed FTF.

Where construction activities must be conducted while the 'ua'u are present, steps would be taken to minimize the level of vibration. For example, every effort would be made to avoid using heavy equipment such as large bulldozers and pneumatic equipment (hoe ram) when the birds are present. The closest nests would be monitored during the site clearing, foundation work and trenching to ensure that neither the birds nor the burrows are disturbed. Corrective actions would be taken immediately if any adverse effects are observed.

All food items as well as their containers would be removed daily from the site during the construction phase and after each visitation when the facility is operational. These actions would discourage the presence of rodents and feral predators that harm indigenous species.

Prior to project construction, the USFWS would be consulted for additional mitigation measures. Even with the above-mentioned mitigation measures, it is possible that 'ua'u may fly into the area during construction. Dead or injured birds would be reported to the FCC and to the DLNR Maui District Forester. To date, no "bird bashes" have been reported to DLNR by facilities located in the Saddle Area (Personal Conversation, K. Hodges, 1998).

A. Medeiros and C. Chimera conducted a cursory survey of the invertebrate fauna on the project site on 26 May 1995 and found no locally unique taxa. Only a visual survey was made; no pitfall traps were set out. Because of the lack of suitable habitat in the project area, the associated invertebrate fauna is somewhat depauperate in comparison to other alpine sites. Identification of taxa to species level was not feasible within the time frame of this survey. Medeiros and Loope (1992) presented a more detailed discussion of the arthropod fauna in an earlier study for the nearby MSSC (Appendix F). Table 3.2 lists the invertebrates identified in the immediate project site. None of the invertebrates identified during the surveys are threatened or endangered species (USFWS, 1994).

The direct impacts of the construction activities on both the project site and the access road would cause ground disturbance, compaction and loss of microhabitats. Indirect impacts, especially the introduction of alien species, would be of more concern. The introduction of alien insect species to the summit area, including the Argentine ant, *Linepithema humile*, could threaten the existing native biological communities. The Argentine ant attacks native insects that pollinate indigenous plants such as the silversword.

Mitigation efforts similar to those employed for the AEOS telescope project (UH IfA, 1994) would be implemented. These measures include inspection of equipment, supplies and construction material by a qualified biologist before access is permitted through Haleakala National Park. If needed, fill material would be obtained from adjacent areas rather than from sites outside the summit area. Parking construction equipment and storage of construction materials would not be allowed outside of the project boundaries, access road and utility corridor. All excess construction material as well as food containers and other trash that might attract alien invertebrates and rodents would be removed daily.

No survey of mammals specific to the project site was conducted. The endangered Hawaiian hoary bat, *Lasiurus cinereus semotus,* has been reported near the summit (NPS, 1989). It is considered extremely unlikely that the bat is a resident at the summit because the animal is unsuited to the cold temperatures associated with the high elevation (Tomich 1986; USAF, 1988). Introduced mammals, including the mongoose, *Herpestes auropunctatus*; roof rat, *Rattus rattus rattus;* and Polynesian rat, *Rattus exulans hawaiiensis;* are present in Haleakala National Park (Shallenberger, 1986; Tomich, 1986). There would be no significant adverse effects on mammals in the area.

4.1.7 Human Health and Safety

Various construction activities at the summit of Haleakala have demonstrated that the most serious threats to human safety are the drive to and from the summit area and the effects of high elevation on the judgment and alertness of construction workers. These two issues would require that construction workers receive specialized training prior to working at the site. Training should include techniques for managing mountain driving in various weather conditions. In addition, personnel should receive training to learn to recognize diminished judgment and rapid onset of fatigue due to oxygen deprivation (hypoxia). These two altitude-related conditions occur in personnel working at the summit and are often a factor in summit area mishaps. Because construction personnel would usually be limited to small crews working at the remote, high altitude site, mishaps could occur due to poor planning, improper procedures or improper equipment use by inadequately cross-trained individuals. Checklists, buddy systems and personnel certification have effectively reduced the risk of accidents during other summit construction projects.

Appropriate measures would be used to protect the public and workers from construction hazards. Construction fencing would be used where necessary to segregate active hard-hat areas from public access. Approved signage would be employed to inform visitors to the construction area about hazards from high voltage, hazardous equipment, etc. Contractor management at the site would enforce OSHA guidelines for personal protective equipment, use of mobile

equipment, walking surfaces, scaffolding and other aspects of construction that require compliance with federal and state occupational, safety, and health regulations.

4.1.8 Impacts on Historical, Archaeological and Cultural Resources

An archaeological inventory survey was conducted by J.C. Chatters in 1994 and by Cultural Surveys Hawai'i in March 2000 (see Appendix G). The latter reported that construction of the FTF should not impact cultural resources. Based on DNLR State Historic Preservation Division recommendations and an agreement, State Sites 50-50-11-4835 and 50-50-11-4836 would be protected according to a DLNR-approved preservation plan developed by Cultural Surveys Hawai'i (Appendix J).

It is important to note that no action would be taken that would impede worship or access to previously accessible sites for Native Hawaiians. In addition, the FTC, its contractors and the UH participants would be asked to complete a "Sense of Place" training prior to construction of the FTF, so that the cultural and religious values of the Native Hawaiians who consider Haleakala sacred would be appropriately identified and respected.

4.1.9 Recreational Use Impacts

The location of the proposed FTF would be within the Haleakala Observatories complex, which is closed to unauthorized personnel. Signs that restrict access to authorized personnel are posted at the entrance to the HO complex. The area would not be impacted by recreational use, nor would any current recreational use be affected by the FTF.

4.1.10 Traffic Impacts

It is estimated that an average of 15 construction jobs would be provided during the one-year construction period. It is assumed that the maximum number of workers on site on any given day would also be 15. Most of the construction workers would only be on site during particular phases, meaning that only a fraction would be on site at any given time. An increase in traffic, however intermittent, would be unavoidable during construction. Construction-related traffic would include workers' vehicles, various types of heavy equipment, and deliveries of materials and supplies. Once mobilized to the site, equipment would likely remain for the duration of the construction period.

Any heavy construction equipment would be stored on site for the duration of the construction period. Of concern would be the effect of the large, heavy trucks carrying equipment and construction materials up the mountain to the summit. These movements inevitably cause some traffic slow-downs and queuing. The number of large, oversize loads that would be needed is anticipated to be small, and they would be mobilized during off-peak hours when other traffic is light. As a result, disruption to Haleakala National Park operations and the inconvenience to visitors is expected to be slight.

Other measures to mitigate traffic impacts would include contractor-provided transportation, scheduling truck trips for off-hours and, where possible, the use of helicopters to bring materials

to the site. Whenever possible, construction workers would car pool to further minimize traffic impacts.

4.1.11 Hazardous Materials and Waste Handling

Only small volumes of hazardous chemicals would be used during the construction of the FTF. These would be handled in areas designed to contain any spills, thus avoiding the potential for significant releases to the surrounding environment.

4.1.12 Socioeconomic Impacts

Construction of the facility and appurtenant infrastructure is expected to last about one year. Expenditures for construction are estimated at $700,000, based on an estimate from the Faulkes Telescope Corporation. Construction activity of this magnitude would provide about 15 jobs with an annualized payroll of $600,000 (based on an average salary of about $40,000 per job in Hawai'i). In addition, purchases of goods and services would be expected to support about 20 more jobs throughout the economy during the construction period (based on State economic multipliers).

4.2 IMPACTS FROM OPERATION

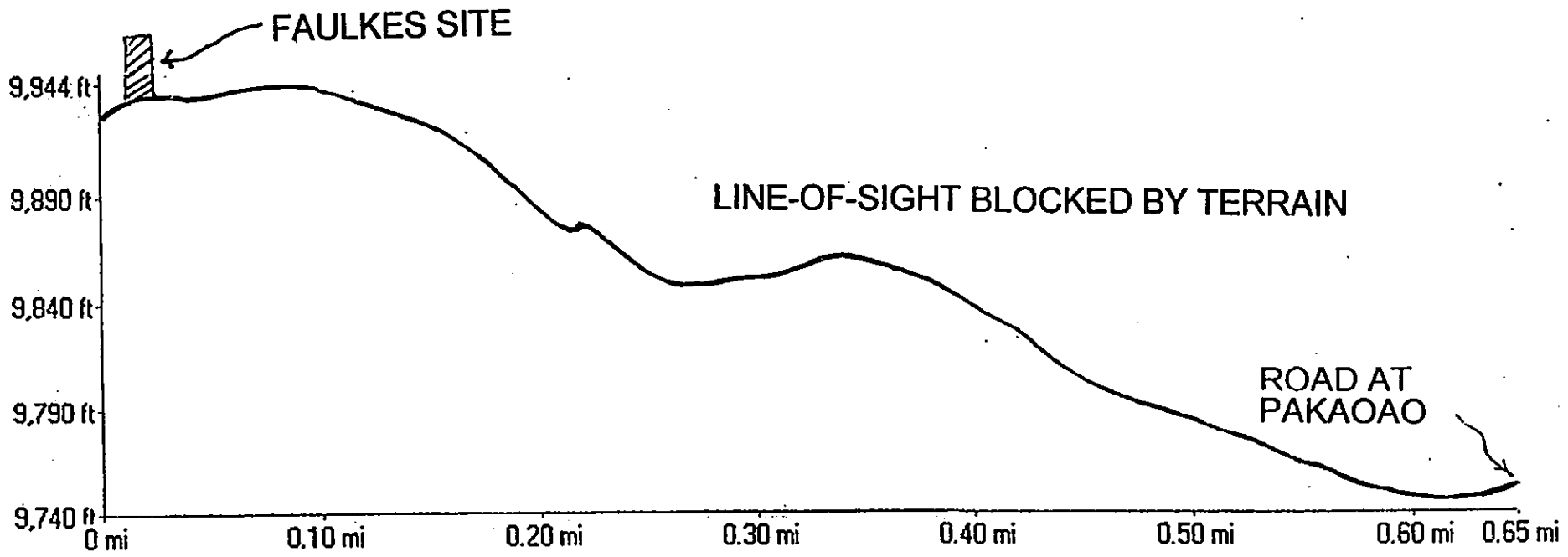
4.2.1 Visual Impacts

The proposed FTF would add one building to the HO complex. The proposed telescope dome enclosure would rise approximately 20 feet above the building, and therefore the total height of the FTF would be approximately 30 feet above the surrounding grade level.

Some of the existing facilities of the HO complex can be seen from Maui's central valley when clouds are absent and the air is clear. The proposed FTF would be located just below the larger U.S. Air Force and UH facilities. To the observer on site, the FTF would appear considerably smaller than the Air Force facilities. The visual impact of the structure would be further mitigated by building a safety barrier around the FTF with natural materials that harmonize with the environment.

For most of the distance of the road ascending Haleakala, the structures at HO are blocked from view by the terrain. The observatories first become noticeable approximately two miles below the summit, but appear relatively inconspicuous until about a mile from the summit. The proposed location of the FTF on the southwest end of HO would hide it from the roadway at any distance from the summit (Figure IV-1). Since the FTF would be located to the south and downslope of the MSSC, it would not be seen from any area in Maui's central valley or other populated areas (Figure IV-2). The greatest visual effect of the FTF would be from the "Saddle" area, where the very top of the FTF enclosure would be visible from the FAA access road.

Although few people would see the facility up close, it is assumed that the degree of negative reaction would relate to the degree that the viewer accepts the proposed project. Native Hawaiians, for example, may find the man-made structures intrusive on their mountain, which is



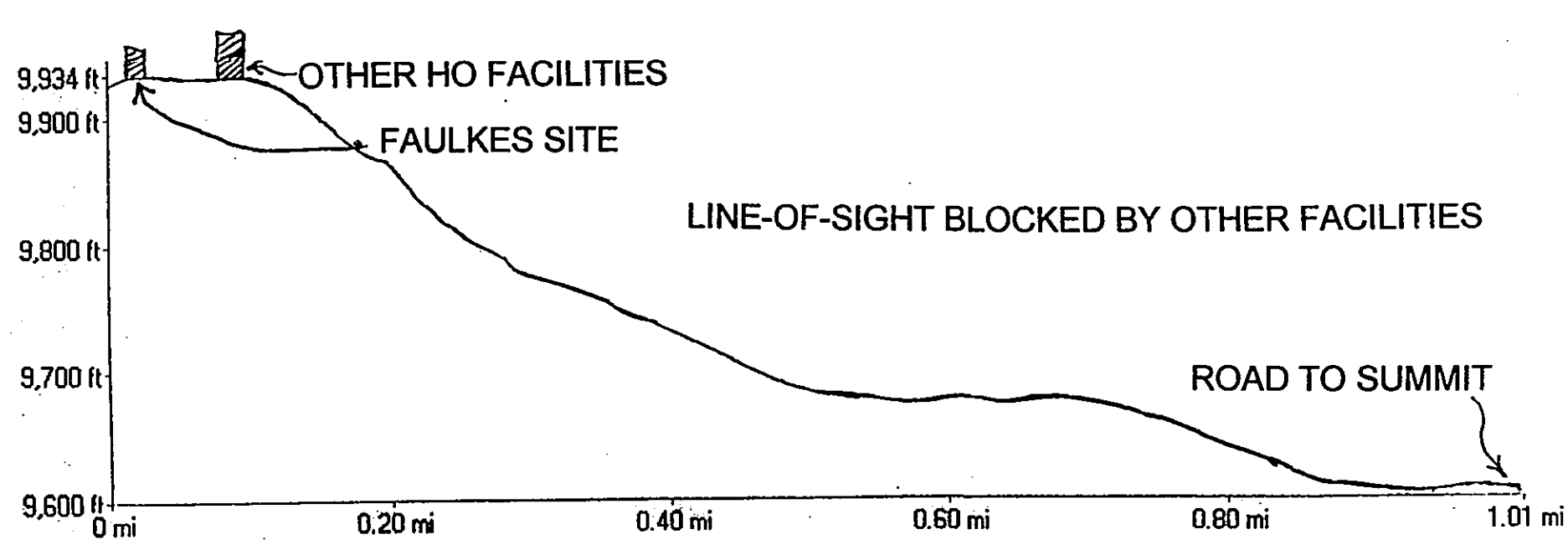


Figure IV-1
TERRAIN SHIELDING WITHIN HALEAKALA NATIONAL PARK

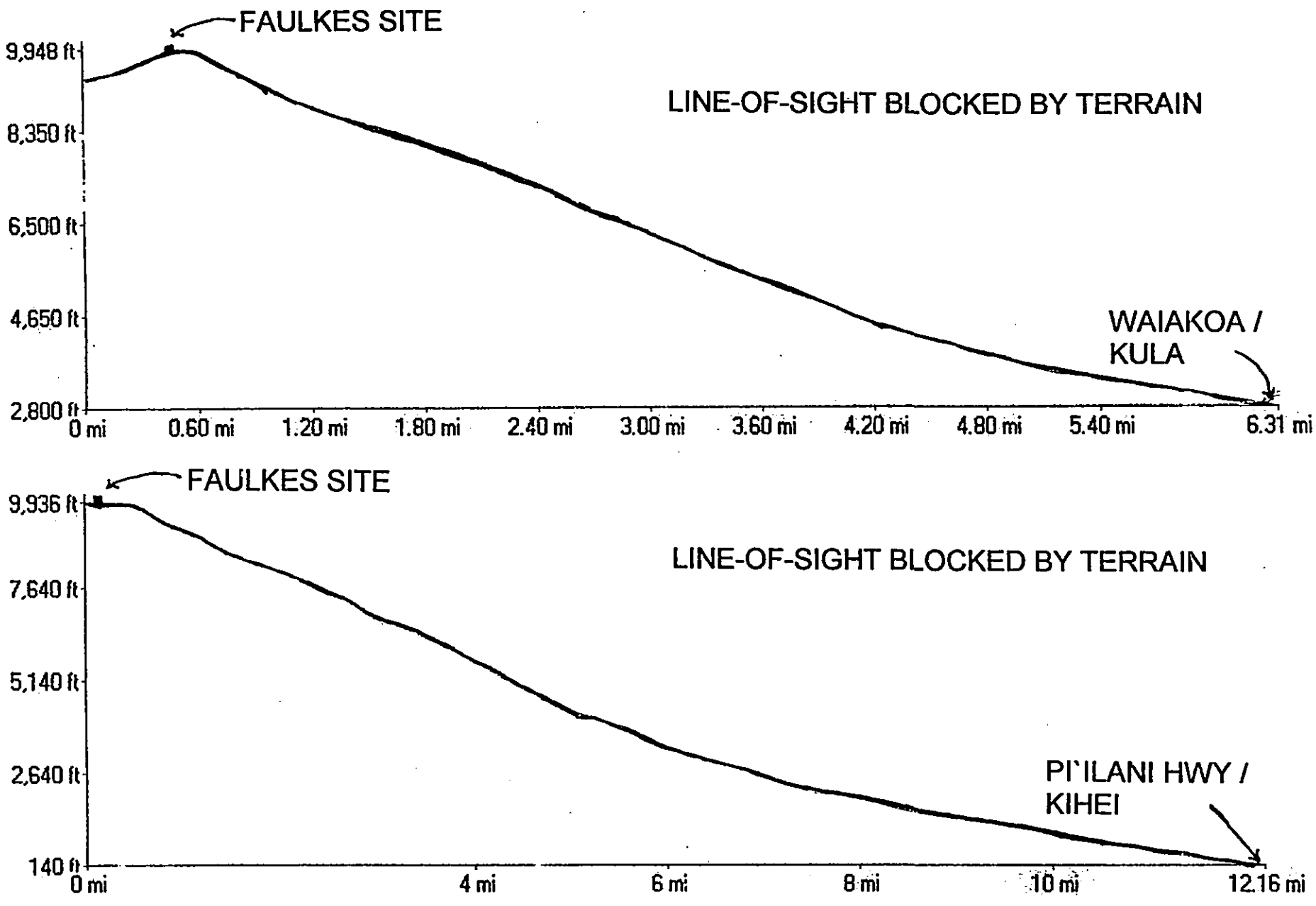


Figure IV-2
TERRAIN SHIELDING AT LONGER DISTANCE FROM PROPOSED FACILITY

a central element in their cultural practices. The evaluation of visual impact, therefore, is very subjective, and the significance of the impact would differ among individuals.

4.2.2 Impacts to Geology and Soils

The project area is vulnerable to catastrophic events such as volcanic eruptions and earthquakes. Although Haleakala volcano is considered dormant, an eruption within historic times (sometime between 1700 and 1790) suggests that renewed activity in the future is not improbable (Feldman and Siegel, 1980). Earthquake records indicate that internal adjustments are still taking place in the earth's crust. Haleakala National Park maintains a U.S. Geological Survey seismograph that monitors the seismic activity of the volcano (NPS, 1994).

In regard to potential seismic events, A.S. Furumoto estimated that there is a 90 percent probability an earthquake with a magnitude of 7 or greater will be felt on Haleakala sometime within the next 75 years (Furumoto, 1991). Based on this conclusion, and on the possibility that the summit of Haleakala will oscillate more than the lower elevations where the previous data had been collected, he recommended that structures planned for the summit be designed to resist a ground acceleration of at least 0.3 gravity (g). The impact of a magnitude 7 earthquake on the proposed FTF would be severe, but localized. All of Hawai'i is in Seismic Zone 3 for building design under the Uniform Building Code (UBC). Foundation and building design in accordance with the UBC, together with specific recommendations from structural engineers, is expected to be adequate for the FTF structures.

A volcanic eruption at or near the project site could have a serious impact on facility structures and operations. Notwithstanding the precautions described in the previous paragraphs, there is always a probability that under certain circumstances, facility property could be damaged or destroyed by an earthquake or volcanic eruption. The developer should obtain appropriate insurance to cover such contingencies.

4.2.3 Hydrologic Impacts

4.2.3.1 Stormwater Runoff/Groundwater Recharge Volumes

There are no known springs within several miles of the proposed FTF site. The depth to groundwater is unknown, but is in the range of thousands of feet. There should be no adverse effect on groundwater sources from the discharged effluents. No wastewater treatment facility would be needed.

4.2.3.2 Water Quality

There would be minimal impact on the existing water supply. No toilets or water would be specified for FTF. Since UH/IfA personnel already on-site would monitor the FTF, and since the UH/IfA facilities already have potable and non-potable water supplies, the proposed action would not impact the existing water supply.

4.2.4 Impacts to Air Quality

There would be no additional effect on air quality from vehicular sources because the number of trips to and from the summit area would remain essentially the same as existing HO operations.

There would be no emergency electrical power. The FTF would produce no air emissions of any kind.

4.2.5 Noise Impacts

The operation of the FTF would not have a significant noise impact on the summit of Haleakala. Vehicular traffic to and from the HO area would not increase significantly, so that no extra vehicle trips would be necessary to maintain the facility, except in the event of emergency. There would, therefore, be no substantial increase in roadside noise levels. The proposed FTF would not generate significant noise. The only potential for considerable noise would be the mechanical sounds of the enclosure opening and closing, which would be infrequent and for short periods of time. The closest public area is the Pu'u 'Ula'ula (Red Hill) Overlook, which is about 0.5 miles away, and the noise generated from the enclosure movement would not be audible from that distance. All other HO personnel would be in and around their respective facilities and any noise generated from the FTF would be considered normal and routine for those types of facilities.

4.2.6 Biological Impacts

4.2.6.1 Avifauna

The FTF would be constructed to minimize potential impact to the dark-rumped petrel or nene geese flying over the area. As recommended, there would be no overhead power lines, no fences around the facility, and no unshielded lights to disorient birds in flight.

4.2.6.2 Invertebrate Fauna

Once construction activities on both the project site and the access road are completed, the area would experience some loss of microhabitats. However, it is not anticipated that operation of the facility would have any further effect on invertebrate populations. Particular attention would be required to prevent any waste food products or other trash from attracting alien invertebrates and rodents to the site.

4.2.7 Human Health and Safety

The HO area is restricted to authorized personnel and not open to the general public. Despite such restrictions, it is possible that individuals would illegally access the proposed FTF site. In order to address possible concerns about the human health impacts at the FTF, the facility would use a protective lava rock safety barrier and signs to discourage the public from unauthorized entry. The facility would be monitored on video at UH or elsewhere at key times to prevent unauthorized personnel from injuring themselves and/or vandalizing the equipment.

4.2.8 Impacts on Historical, Archaeological and Cultural Resources

A preservation plan was prepared by Cultural Surveys Hawai'i and approved by the State Historic Preservation Division. The plan would ensure protection of the two archaeological sites adjacent to the FTF. All FTC construction and operations would comply with this plan.

4.2.9 Infrastructure Impacts

4.2.9.1 Traffic

The FTF would be operated by remote control and no full-time employees would work at the site. Technicians and engineers would probably visit the facility each day for the required routine monitoring and maintenance. In addition, unscheduled trips would be necessary for emergency maintenance. These visits could occur at any time of day or night. MECO and Verizon would come to the site periodically for regular and emergency maintenance on their lines.

Since tenants of the site would primarily be current UH/IfA personnel, Haleakala Crater Road should experience no increase in traffic above that of the current HO operations.

4.2.9.2 Electrical Power

MECO would extend existing lines to the project site. The facility is expected to initially use a maximum of 25 kW of power for its operations and environmental controls. Present MECO customers would not be affected by the project and the amount of electrical power required would not adversely affect MECO's generating capacity. Although electricity usage would increase from current values, particularly after the FTF is in operation, it should be emphasized that most of the existing tenants are already using power from the MECO grid, and the additional FTF needs would be a small fraction of the existing power use at HO.

Appropriate energy-efficient and conservation features suitable for reducing peak demand would be built into the project. These would include the use of energy-efficient light sources and equipment. To the extent possible, the building would be designed for energy efficiency.

4.2.9.3 Sewerage

There is no central waste/sewage collection or storage system at the Haleakala summit. Each facility maintains its own leach wells and septic systems. The FTF would have no water supply and therefore no sewage storage or waste system.

4.2.10 Hazardous Materials and Waste Handling

Solid waste generated at the site would be kept in covered refuse containers and carried out by facility workers. Non-hazardous trash would be disposed of off-site in a licensed landfill. Recyclable material would be handled in an appropriate manner.

The Resource Conservation and Recovery Act (RCRA) and the Hazardous and Solid Waste Amendments of 1984 established standards and requirements for the management of solid and hazardous wastes. According to RCRA regulations (42 USC 6903):

> The term "hazardous waste" means a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may
>
> (A) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or
>
> (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

40 CFR Part 261 defines hazardous wastes and also provides lists of hazardous wastes from specific and nonspecific sources. Materials that are neither solid, liquid nor gaseous hazardous wastes are exempt from all or part of the regulations. Any defined hazardous waste would be taken to Kahului for transport to an authorized Transport, Storage and Disposal Facility.

The foundation of the FTF would be designed to contain spills where hydraulic fluid might leak. This would include the machine room where the hydraulic pumps are located as well as the areas immediately below the four externally located hydraulic cylinders.

The sumps contained within the curbed areas would be of adequate volume to contain the amount of fluid that might accumulate in each area, given the leak rate the system would allow before automatically shutting down. The area around the telescope pier has been identified above as providing such a sump. Routing ducts in the foundation would act as drainage swales in the case of leaks in the hydraulic pipes to the telescope.

In the case of a major loss of hydraulic fluid into a sump area, the clean-up plan would be as follows: On-site IfA personnel would have a HAZMAT Prevention, Planning, Training, Notification, and Reporting Plan that conforms with 29CFR 1910.38, (Employee Emergency Plans and Fire Prevention Plans). The plan would consist of various elements to be employed during a spill emergency. For all spills, reportable or otherwise, the FTF clean-up response plan would include:

1) Site Isolation
2) Hazardous Material Identification
3) Hazard and Risk Assessment
4) Initiation of Protective Measures and Deployment of Equipment
5) Resource Coordination at the Site
6) Control Measures to Prevent Additional Contamination
7) Clean-up and Site Remediation (Technique Dependent on Scope of Spill)
8) Investigation
9) Post Incident Analysis

4.2.11 Socioeconomic Impacts

The FTF would constitute a new astronomical facility on Maui. Construction expenditure for the facility is estimated at $700,000, with at least 50% of this being spent on Maui. The facility's construction and installation period is expected to be approximately one year.

Construction employment on Maui as a result of this project is expected to average about 15 jobs during the construction period, with total annualized construction payroll averaging about $600,000, which is based on an average salary of about $40,000 per job. The number of construction jobs and the types of construction workers (e.g., heavy-equipment operators, cement workers, steelworkers, electricians, plumbers, roofers, painters, etc.) would vary, depending upon the phase of construction.

In addition to direct construction employment, purchases of goods and services are expected to support about 20 additional jobs throughout the economy during the construction period (based on State economic multipliers).

The estimated average annual operating cost of the scientific facility is $75,000, which would be spent in Hawai'i. New employment in Hawai'i after the scientific facility is in full operation would be between two and ten scientific positions for researchers and faculty. This figure could vary depending upon the size of the operation. Operations would also generate revenues to the state and county. The FTF would be charged rent in an amount which is yet to be determined.

4.2.12 Impact on Protective Services

All of the facilities in the summit area provide for their own fire, security and emergency medical services. The FTF would have an appropriate number of fire extinguishers and a fire escape plan. The FTC would be responsible for fire protection at the site. Because of the remote location of the facility, a major fire or natural disaster would probably cause extensive damage to the structures and ancillary equipment.

Security would be provided by the UH/IfA. Safety would be according to FCC and OSHA regulations. As with the other facilities in the summit area, the FTF would be locked, and entry would be by authorized personnel only. There would be no effect on the County of Maui police department.

4.2.13 Cumulative Impact of the Proposed Action

There would be a cumulative, but not significant, visual impact from the proposed facility. Observers from within the HO complex would see the new FTF adjacent to the Mees Solar Observatory and across the access road from other HO tenants.

The cumulative impact of the proposed facility on archeological, cultural and historic resources would be negligible. These resources would remain intact, with the exception of two small sites that have no prehistoric materials. It is acknowledged that the summit area of the mountain in its entirety is construed to be a cultural resource by some Native Hawaiians. When considered in

light of the numerous other facilities already present, some individuals may view the addition of another man-made structure near the summit area as having a cumulative impact.

The cumulative impacts on infrastructure would be minor. Utilities would be underground. MECO has the available resources to supply the additional 25 kW required for the FTF by utilizing the excess capacity of the Kula substation. Water supply for the area would not be impacted, since the facility would not be connected to any county water system. The telecommunication requirements can be met without impacting other requirements at the summit. The nearby fiber optic line would serve the facility, and communications by microwave transmission are also possible for the facility.

The Conservation District Use Permit for the FTF site would be prepared with the intent of minimizing cumulative impacts in the summit area. The CDUP would optimize planning for the proposed facility, so that the final design minimizes earthwork, building mass, and roadwork. The design would also optimize the facility's location, the color of visible structures, entry protection, etc., to ensure that the least visually obtrusive structures would be built. Requirements would be incorporated in the CDUP for the prevention of introduction of alien species, reduction of risk from pollution, and protection of cultural resources. With the appropriate constraints described in this document, the development of a FTF at the HO complex can be accomplished without significant adverse effects to the natural environment.

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CHAPTER FIVE
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APPENDIX A
MAUI COUNTY COUNCIL RESOLUTION – 00-174

Resolution

No. 00-174

SUPPORTING THE FAULKES TELESCOPE PROJECT, A JOINT EFFORT BY THE UNIVERSITY OF HAWAII'S INSTITUTE FOR ASTRONOMY AND THE FAULKES TELESCOPE CORPORATION

WHEREAS, the University of Hawaii through its Institute for Astronomy and the Faulkes Telescope Corporation, a new Hawaii nonprofit corporation, are collaborating to locate a two-meter telescope facility within the Haleakala High Altitude Observatory Site, known as "Science City", to be used for scientific education and outreach; and

WHEREAS, this project is financed through private funds from the Dill Faulkes Educational Trust of the United Kingdom; and

WHEREAS, students from the United Kingdom (UK) as well as Hawaii students from kindergarten through graduate school will use the telescope for astronomical education and research; and

WHEREAS, this new generation telescope will be operated at remote control centers in the UK and at Maui Community College so students from the UK and Hawaii will be able to access the telescope via the Internet to observe data in "real time" from their classrooms or request observations in "robotic mode"; and

WHEREAS, the project's objectives are threefold: (1) to put the Universe at the fingertips of students in schools; (2) to offer older students the thrill of scientific research at the frontiers of knowledge; and (3) to bring together students in different lands, in planned astronomical observations to pool knowledge and exchange ideas; and

WHEREAS, the visual nature of astronomy provides a powerful lure for students interested in science, in general, and supports projects that advance the interest and proficiency of Hawaii's students in technology and science; now, therefore,

Resolution No. 00-174

BE IT RESOLVED by the Council of the County of Maui:

1. That it hereby supports the joint effort by the University of Hawaii through its Institute for Astronomy and the Faulkes Telescope Corporation to initiate the Faulkes Telescope Project;

2. That it recognizes the Faulkes Telescope Project provides an unparalleled opportunity for the youth of Maui County to advance their interest in science and mathematics by conducting research projects under the mentoring of their teachers and professional astronomers and to potentially pursue scientific and technological endeavors; and

3. That certified copies of this resolution be transmitted to Dr. James N. Heasley, Faulkes Telescope Project Scientist; Dr. Rolf-Peter Kudritzki, Director, University of Hawaii, Institute for Astronomy; Mr. Mike Maberry, Assistant Director, University of Hawaii, Institute for Astronomy, Haleakala Division; Dr. Paul Murdin, President, Faulkes Telescope Corporation; and Dr. Clyde Sakamoto, Provost, Maui Community College.

ed:misc:reso02b:trk

COUNCIL OF THE COUNTY OF MAUI
WAILUKU, HAWAII 96793

CERTIFICATION OF ADOPTION

It is HEREBY CERTIFIED that RESOLUTION NO. 00-174 was adopted by the Council of the County of Maui, State of Hawaii, on the 1st day of December, 2000, by the following vote:

MEMBERS	Patrick S. KAWANO Chair	Dain P. KANE Vice-Chair	Robert CARROLL	Michael A. DAVIS	John Wayne ENDSLEY	G. Flint HOKAMA	Dennis Y. NAKAMURA	Wayne K. NISHIKI	Charmaine TAVARES
ROLL CALL	Aye	Excused	Aye	Aye	Aye	Aye	Aye	Excused	Aye

Jhiann A. Nakamatsu
DEPUTY COUNTY CLERK

APPENDIX B
LETTER OF SUPPORT FROM MAUI ECONOMIC DEVELOPMENT BOARD

MAUI ECONOMIC DEVELOPMENT BOARD, INC.

RESOLUTION IN SUPPORT OF THE

FAULKES TELESCOPE

Adopted by the

Maui Economic Development Board

October 26, 2000

Whereas, The University of Hawaii through it's Institute for Astronomy and the Faulkes Telescope Corporation, financed through private funds from the Dill Faulkes Educational Trust of the United Kingdom (UK), are collaborating to locate a 2-meter telescope facility within the Haleakala High Altitude Observatory Site, commonly referred to as "Science City", to be used for scientific education and outreach.

Whereas, the telescope will be operated remotely over the Internet so students from the UK and Hawaii will be able to access observing data in "real time" from their classrooms or request observations in "robotic mode," much as professional astronomers do in working with NASA's Hubble Space Telescope.

Whereas, the Faulkes Telescope will be operated from the National Maritime Museum, located at the original site of the Royal Greenwich Observatory, for UK's student's observations and from Maui Community College for Hawaii's student's observations.

Whereas, University of Hawaii astronomers and their colleagues in the UK plan to engage students in actual research projects that will be published in scientific literature and will encourage joint projects in which students in Hawaii will collaborate over the Internet with their counterparts in the UK.

Whereas, the visual nature of astronomy provides a powerful lure for students interest in science in general and

590 Lipoa Parkway, Suite 103 • Kihei, Maui, Hawaii 96753 • (808) 875-2300 • FAX (808) 879-0011 • info@medb.org

Whereas, supporting projects that advance the interest and proficiency of Hawaii's students in technology and science is consistent with the mission and goals of the Maui Economic and Development Board, Inc.

Now, Therefore, Be It Resolved As Follows: The board of directors of the Maui Economic Development Board resolves to support the development, construction and installation of the Faulkes Telescope facility at the summit of Haleakala within the Haleakala High Altitude Observatory Site and urges the Mayor, County Council, and Department of Education to facilitate its development as well.

The foregoing Resolution was duly adopted by the Board of Directors of Maui Economic Development Board, Inc. this 26th day of October, 2000, a listing of the members and directors of the organization being attached.

Michael H. Lyons, II
Chairman, Board of Directors

Jeanne Unemori Skog
President & CEO

APPENDIX C
GEOLOGICAL STUDY OF THE TELESCOPE OBSERVATORY SITE

S. BHATTACHARJI
February 5, 2000

GEOLOGICAL STUDY OF THE TELESCOPE OBSERVATORY SITE HALEAKALA SUMMIT REGION, EAST MAUI

Report prepared by:

S. Bhattacharji
Emeritus Professor of Geology
and Tectonophysics and Senior
Research Scientist, Applied Sciences Institute,
City University of New York, NY 11210

February 5, 2000

I. Introduction:

The Kolekole site, located in the Telescope Observatory area on the summit of Haleakala of East Maui, Hawaii, was examined to determine the geology and geostructural suitability of the site. The selected site was mapped in greater detail to analyze the geological (rock) materials, the geological structure and the suitability of exposed rock materials for a building site in the limited area assigned, adjacent to other telescope sites.

The present Kolekole site, like all other existing telescope sites in the restricted area on Haleakala's summit region, is located in proximity to the axis of the Southwest Rift Zone (Figure 1), which is geologically a structural weak zone associated with the Haleakala volcano in East Maui. This rift zone, like many others in the Hawaiian volcanoes (ex: active Kilauea volcanic East Rift Zone on the island of Hawaii), is characterized by parallel fissures of various length, width and depth, which were major eruptive passages and vents over a long geological time. The area has passed through many phases of Hawaiian volcanism. Most recently, explosive volcanism occurred along the southwestern slope of this shield volcano around 1790 (more recent isotropic age of volcanic rock is 1750). Lava flows, cinder cones and various pyroclastic ejecta, some as old as 0.56 to 0.36 million years, lie along the Rift Zone. The exact width of this structurally weak zone on Haleakala Volcano, and the exact timing and duration of different eruptive phases are not known. However, the telescope sites at the summit of Haleakala are all in an area covered mostly by cinder cones, volcanic bombs, blocks, welded spatter and lava flows, predominantly basaltic (Figures 2 and 3).

Because of recent volcanism (1790 or 1750) on the southwestern flank, the Haleakala volcano must be considered as dormant. All existing telescope sites on the southwestern flank on Haleakala volcano lie in proximity to a large cinder cone volcano (Figure 2). The area is largely covered by cinders, volcanic bombs and blocks with several exposures of basaltic lava flows (Figure 3).

This report discusses briefly the general geology of the southwestern flank of the east Maui Haleakala volcanic area, and specifically the geology of the Kolekole site and its surroundings.

II. General Geology of the Haleakala Volcano Surrounding the Kolekole Site and the Telescope Observatory:

Early volcanic Kula eruptions took place from three well defined Rift Zones (Figure 1). The most prominent are those extending southwestward and east-northeastward from the summit of Haleakala, forming a nearly straight line across the mountain. The third Rift Zone, extending north-northward from the summit, is less prominent. It is marked by a row of cinder cones that extends almost to the coast. Many large volcanic cones of the early eruptive series lie along the upper part of the southwest rift zone.

The Hana volcanic series is the name given to the lava flows, associated cinder cones and volcanic ash deposits that erupted after a long period of erosion following the Kula volcanic series. The rock types are the same as those in the earlier Kula series, but alkaline olivine basalt and basaltic hawaiites (Figure 3) predominate. Many flows contain large crystals of plagioclase. Ankramite lava, which is common in the upper summit area (Figure 3) and in the Kolekole site, is characterized by large crystals of augite(pyroxene) (Figure 5A). Associated with these Hana series lava flows are large cinder cones and welded spatters which now cover a large part of the southwest Rift zone. Across the top of the Haleakala volcano, this Rift Zone is entirely within the erosion depression. The floor of the depression is now covered by both lava and cinder cone deposits all along the southwest Rift Zone.

III. Geological Characteristics of the Kolekole Site:

The surface of the Kolekole site is covered by broken and crushed cinders, bombs and blocks of broken lava flows (Figure 5B). On the southern and eastern sides of the Kolekole site are exposures of Ankramitic lava flows (Figures 4A and 4B) containing abundant large crystals of augite (Figure 5A). The augite (pyroxene) crystals are large (from several millimeters to a centimeter) and relatively fresh. This gives the lava a binding property similar to concrete –cement containing fine-grained gravel. The lava flows (Figures 4A and 4B) exposed near the center of the

area are relatively unaltered except for the upper six to eight inches. The strike (the direction in which the rock exposure extends) of this exposed Ankramite lava is between North 20° East (N20°E) and North 35° East (N35°E). The width of the exposed outcrop is 35 to 40 feet. The lava is jointed (sheet-like Joints) dipping (inclined from the top surface) at an angle between 50° and 60°. The other set of joints, which is relatively steep (Figure 4B) generally dips between 65° and 70°. The strikes of these joints are from 70° to 75° NW. Because of these two prominent sets of joints, the lava flow eroded into large blocks (Figures 4A and 4B). The surfaces of the lava flows are vesicular (frothy) up to a depth of six to ten inches. Below this vesicular zone, the Ankramite lava is relatively fresh and hard. This crystalline Ankramite lava should have high compressive strength. However, the highly vesicular and tubular top surface is generally weathered to hematite and limonite (Figures 6A and 6B). This zone is considerably fractured and is characterized by nearly vertical and curved closely-spaced joints.(Figure 6B). This weathered and highly jointed upper surface of the Ankramite lava has a considerably lower compressive strength due to open pore (void) spaces, large cavities, tubes and parallel fractures.

The massive, relatively unaltered Ankramite lava in the Kolekole site should make a structurally stable platform for the telescope, provided any joint or fracture is properly sealed, and the top upper weathered surface is removed. It is important to note that the concentration of vesicularity and thin rope-like tubes in the upper horizon (Figures 6A and 6B) varies greatly from place to place within the Kolekole site. The structural strength of the Ankramite lava may change from one location to another. Thus the need to pay special attention to the depth of the weathered zone in the Ankramite lava in the site selected for the telescope.

IV. Geology of the Surrounding Areas of the Kolekole Telescope Site

Around the Kolekole site on the Hawaii Telescope Observatory Site, the surface has been bulldozed and flattened. However, spatter lava of varying vesicularity, and pyroclastic ejecta of various sizes are visible near the former Radio Telescope and Air Glow, VHF Homer Station sites. Surrounding the flank near the Zodiac Light site and further southwest near the concrete pad, the

lava is highly tubular with many open cavities and lava tubes of various dimensions. The orientations of the lava tubes and gas cavities and the gentle northeasterly dip of the flows in several nearby exposures northeast (NE) of the former Radio Telescope Site indicate that the lava flows were probably erupted from the nearby volcanic vent. Away from the Kolekole Telescope Site (near the former Radio Telescope Site), one might encounter unconsolidated cinder blocks, bombs and spatter of various dimensions. It is difficult to estimate the thickness and depth of such unconsolidated volcanic ejecta without bore hole data. These materials are similar to those on the Kolekole site (Figure 7).

V. Concluding Remarks and Recommendation:

On the basis of structural stability, the Ankramite exposure site (Figures 4A and 4B) in the Kolekole site appears to be the most promising. However, the jointed, vesicular and tubular upper layer of the Ankramite lava needs to be removed to gain access to the massive, unaltered crystalline lava. As the Ankramite lava with sheet joints (Figures4A and 4B) dips at relatively high angles, the Ankramite lava is likely to be covered by a thicker layer of loose cinder on the northwestern (NW) side of the Ankramite lava exposure (Figures 4A and 4B). The loose cinder and boulder bed (Figure 5B) on the north to northeastern (N to NE) side of the Ankramite lava exposure (Figures 4A and 4B) is likely to be less thick and can be removed to gain access to the more massive lava bed. Exploratory drilling will be necessary for the sub-surface geology of the Kolekole site and to determine the thickness of the massive Ankramite lava and pyroclastic ejecta. Such data will help to ascertain suitability of the massive Ankramite lava zone as an anchor site for a telescope. Five drill core sample sites are recommended, one at the northeastern edge of the exposed Ankramite exposure (figure 4B). Other core sample sites should be 30 to 35 feet from this central drill core sample site (close to the perimeter of the Telescope Building) at four different corners. This will help to obtain sub-surface engineering geological data for the construction of the building and selection of the telescope site.

Figure Descriptions

Figure 1: Map of the Haleakala volcano and location of southwest, east and north Rift Zones. Haleakala Volcanic Center and the Telescope Observatory are located in the southwest Rift Zone.

Figure 2: Aerial view of the chain of cinder cones within the Haleakala crater, and the location of Telescope Observatory sites.

Figure 3: Detailed geological map showing exposures of various types of lava's, welded spatter and cinder on the Southwest Rift Zone, at the Telescope Observatory sites and their surroundings.

Figure 4(A): Exposure of the Ankramite lava in the Kolekole Telescope site, showing inclined sheet-like joints, and broken Ankramite boulders on the NE side of the lava bed exposure.

(B): Close up view of the Ankramite lava exposure showing the upper horizon of broken fragmental lava and boulders, boulders at the base, and well developed sheet joints (dip 50° to 60° NW), and high angle (65° to 70°) vertical (extensional) joints. The width of the exposure is between 35 and 40 feet, and the height is about 20 to 25 feet at the northeast end.

Figure 5(A): Close up view of massive Ankramite lava showing spatter of augite (pyroxene) crystals. The hammer gives the scale.

(B): Pieces of broken boulders on the weathered cinder cone bed at the north to north-eastern end of the Ankramite lava exposure. At the far end (near the observatory

domes) is a thick layer of vesicular, broken fragmental bed of Ankramite lava exposure. The area is within and adjacent to the Kolekole Telescope site.

Figure 6(A): Vesicular, tubular, partly ropy lava in the Kolekole Telescope site. Thickness of the tubular and vesicular zones varies greatly.

(B): Highly vesicular lava in the upper horizon of the Ankramitic lava, showing near vertical to curved joints. This zone of lava is highly friable and weak.

Figure 7: Broken cinder cones, bombs, lapilli and fragmental cinder cones on the ground of the Kolekole Telescope site.

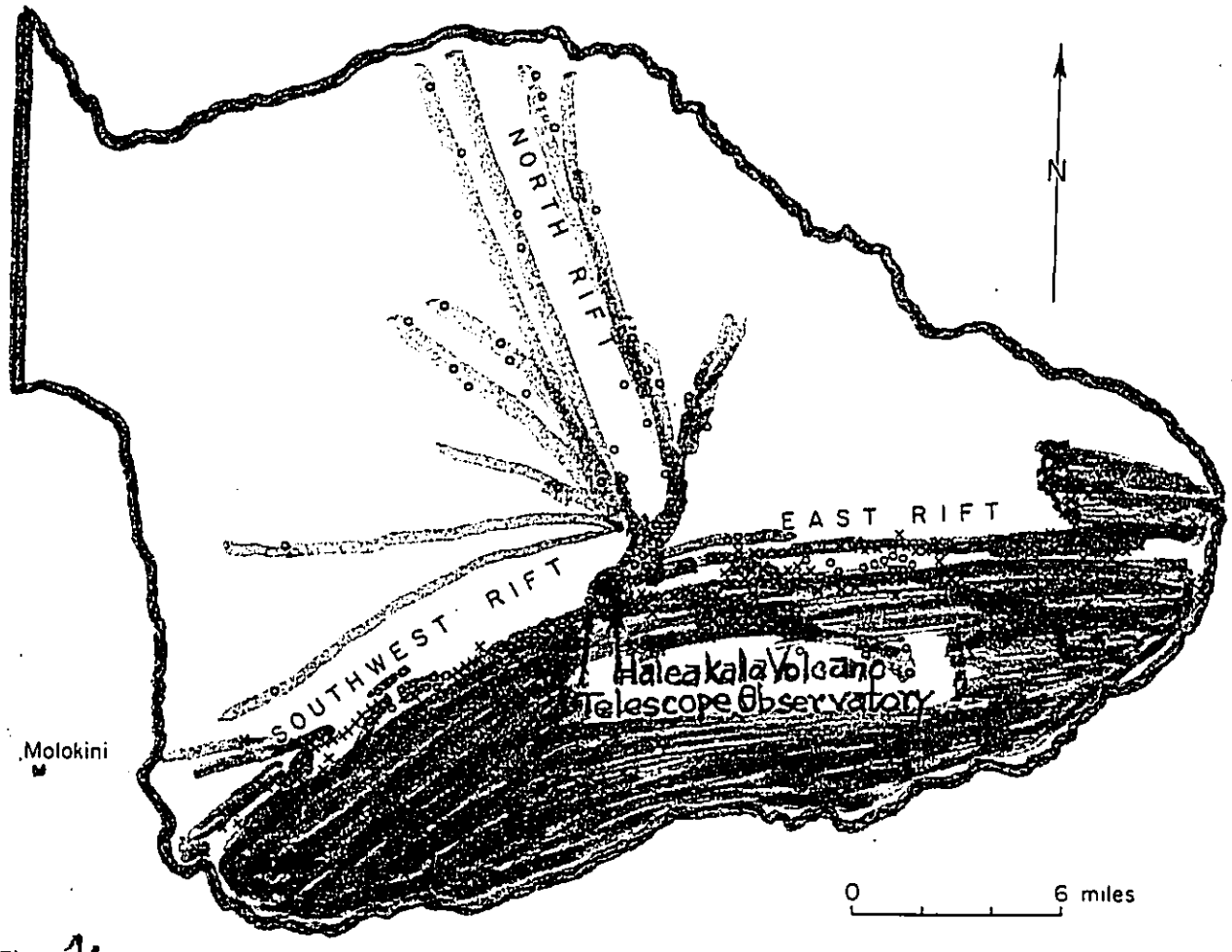
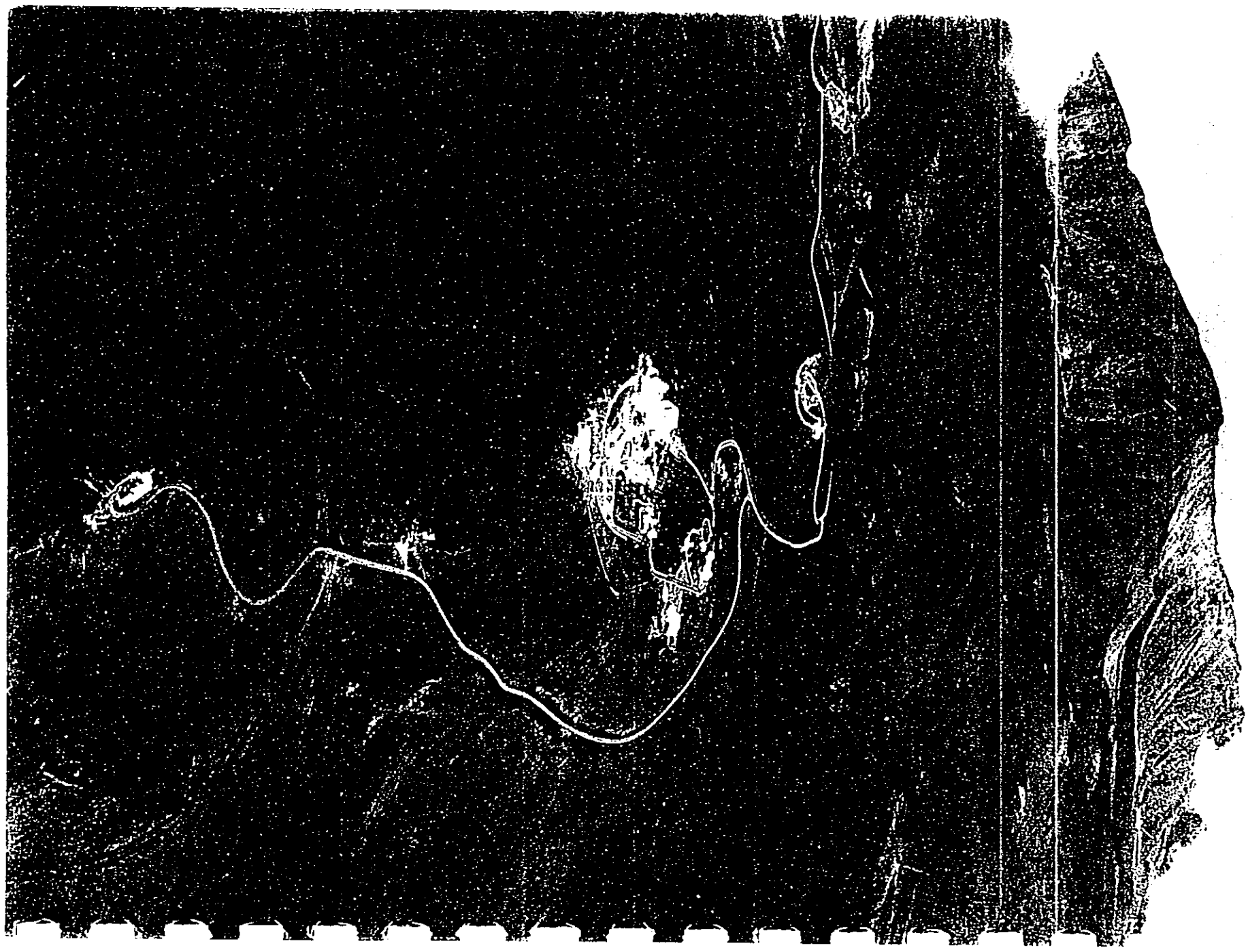


Figure 1. Map of Haleakala volcano, showing vents of the Kula *(circles)* and Hana *(crosses)* Volcanic Series. Molokini Islet is a tuff cone on the southwest rift zone of Haleakala. (After Stearns and Macdonald, 1942.)



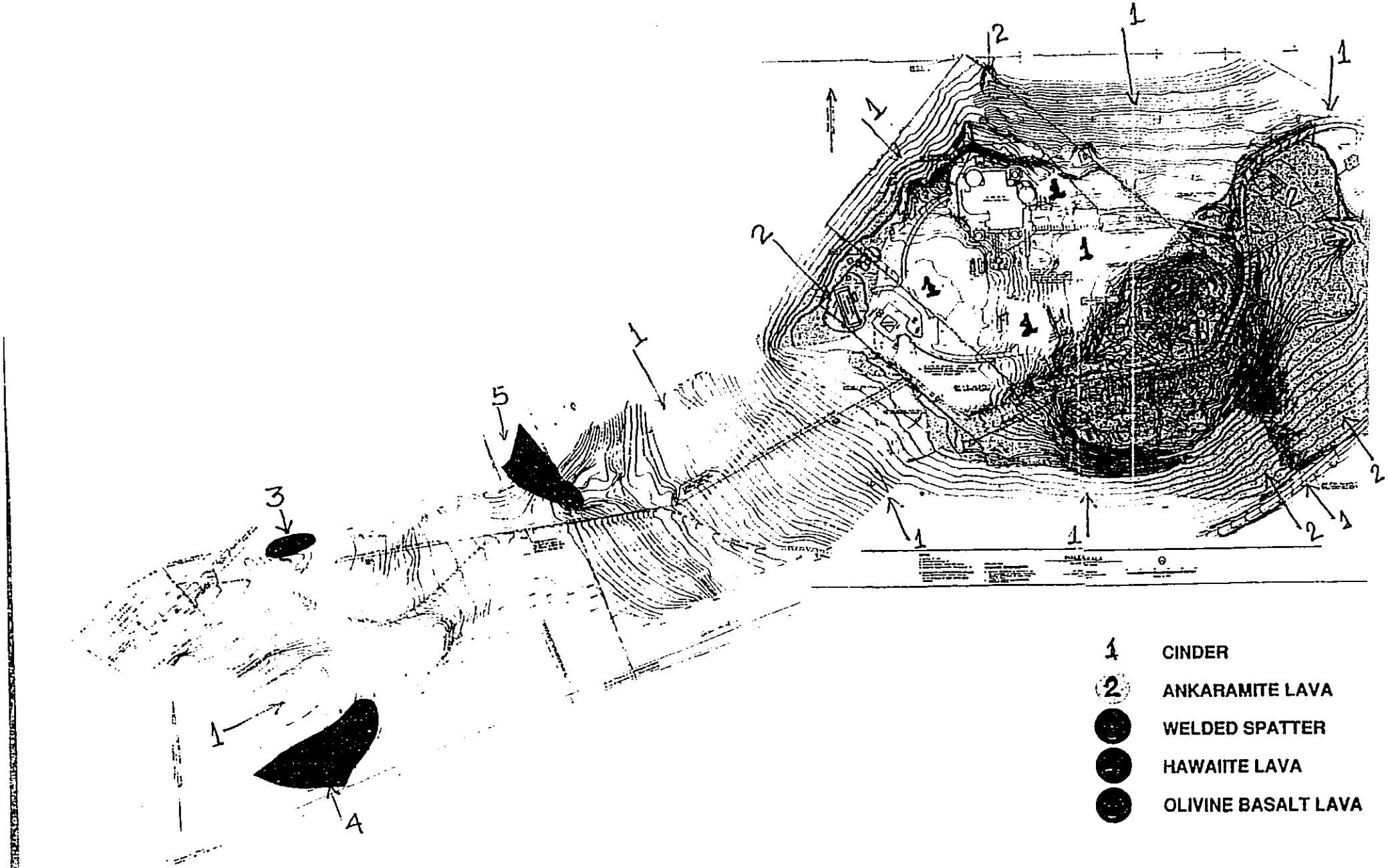


Figure 3

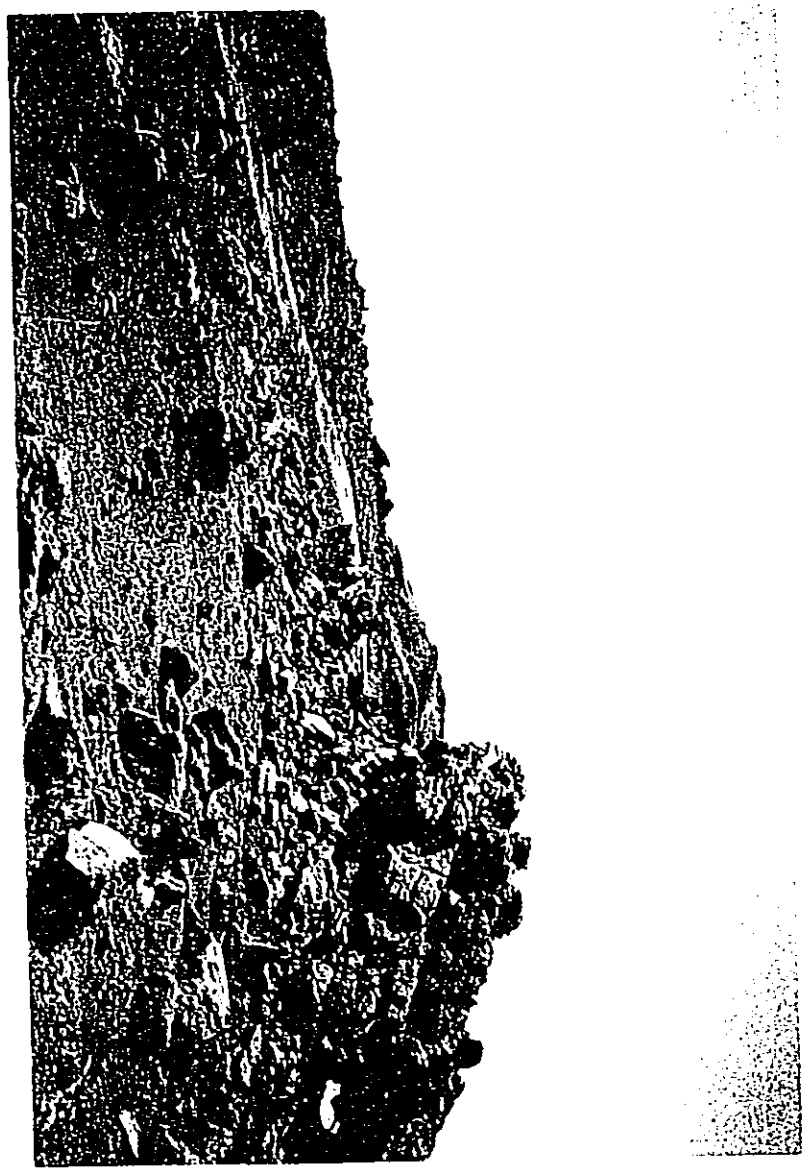
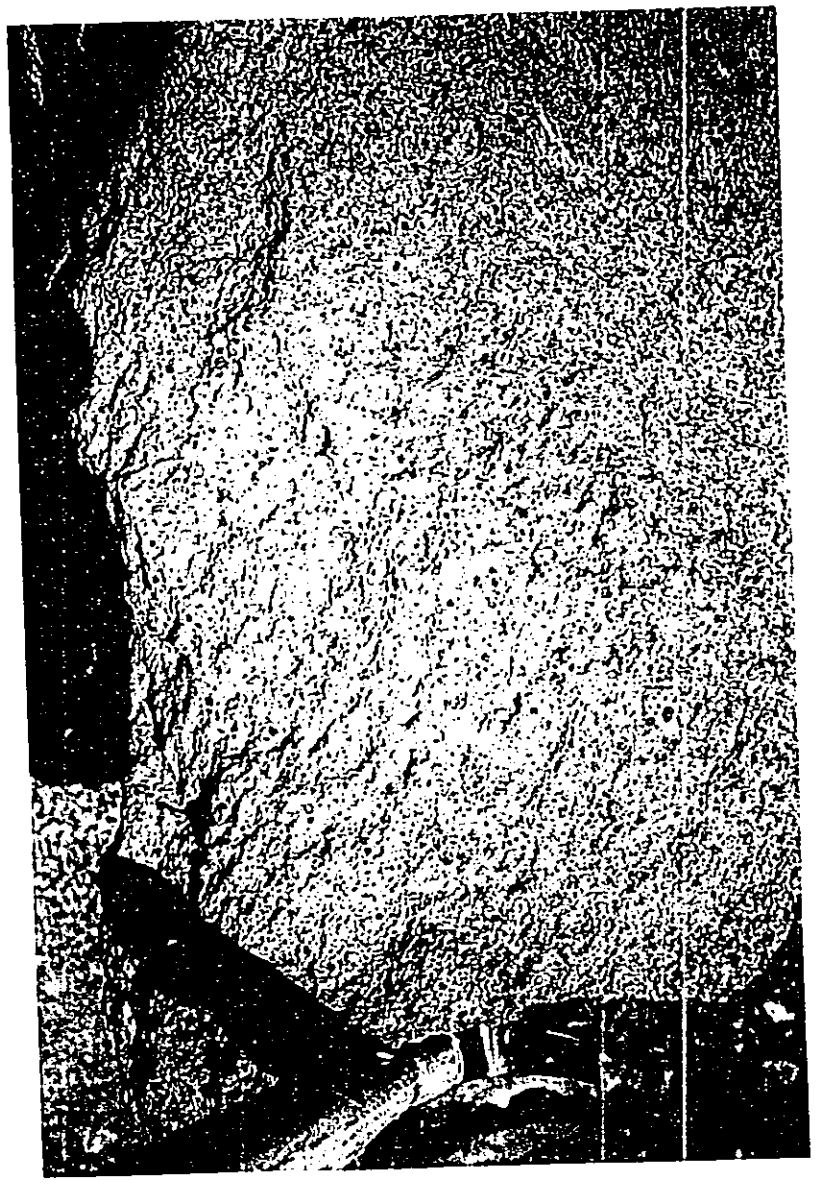


Figure 4

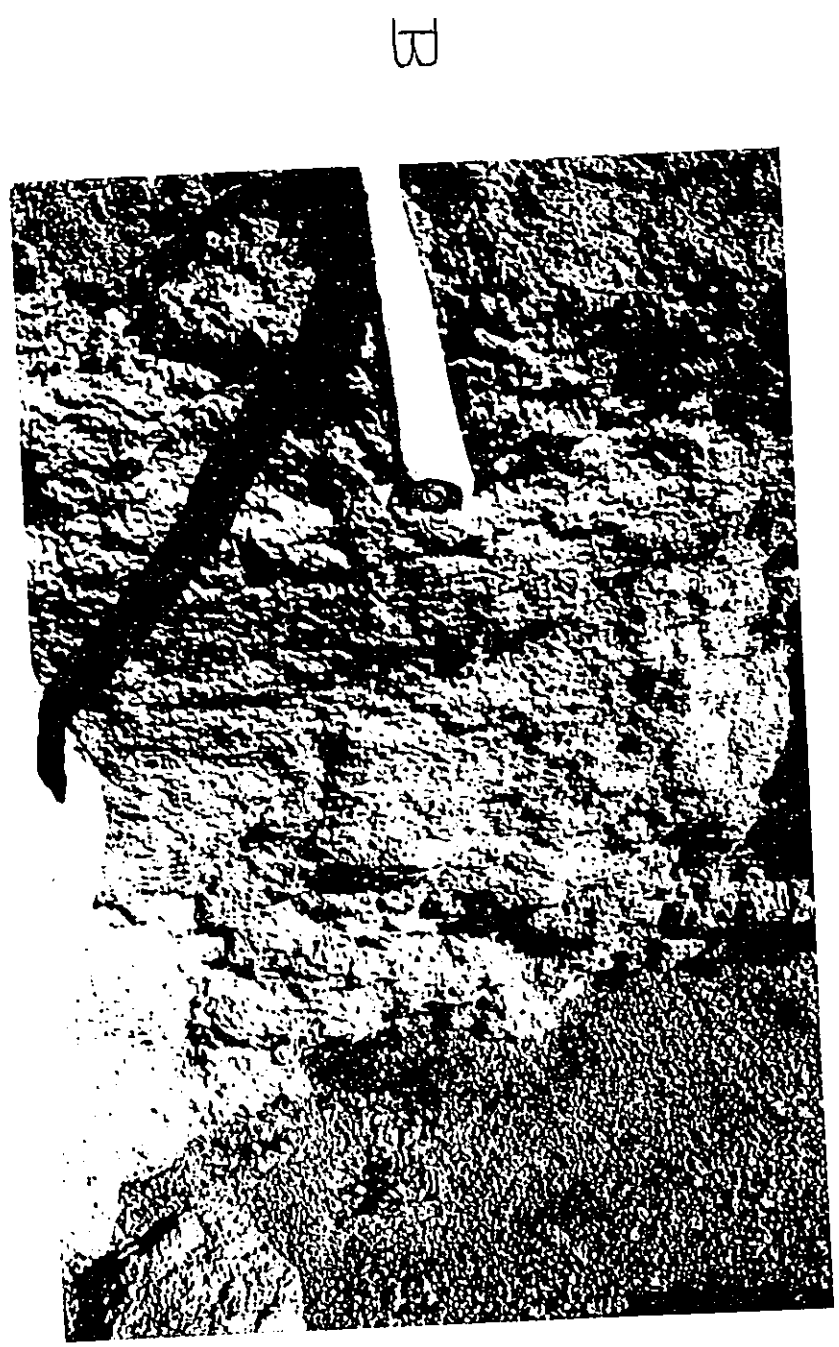
A

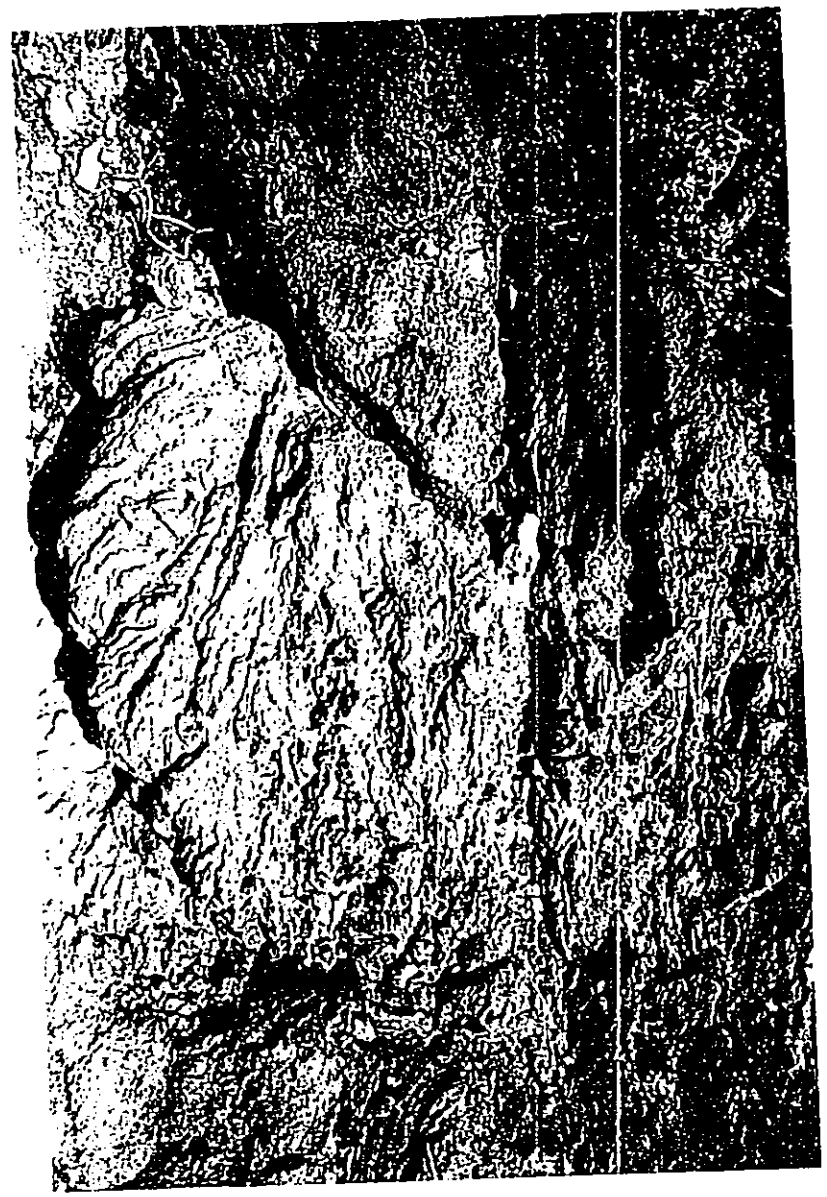


B

Figure 5

Figure 6





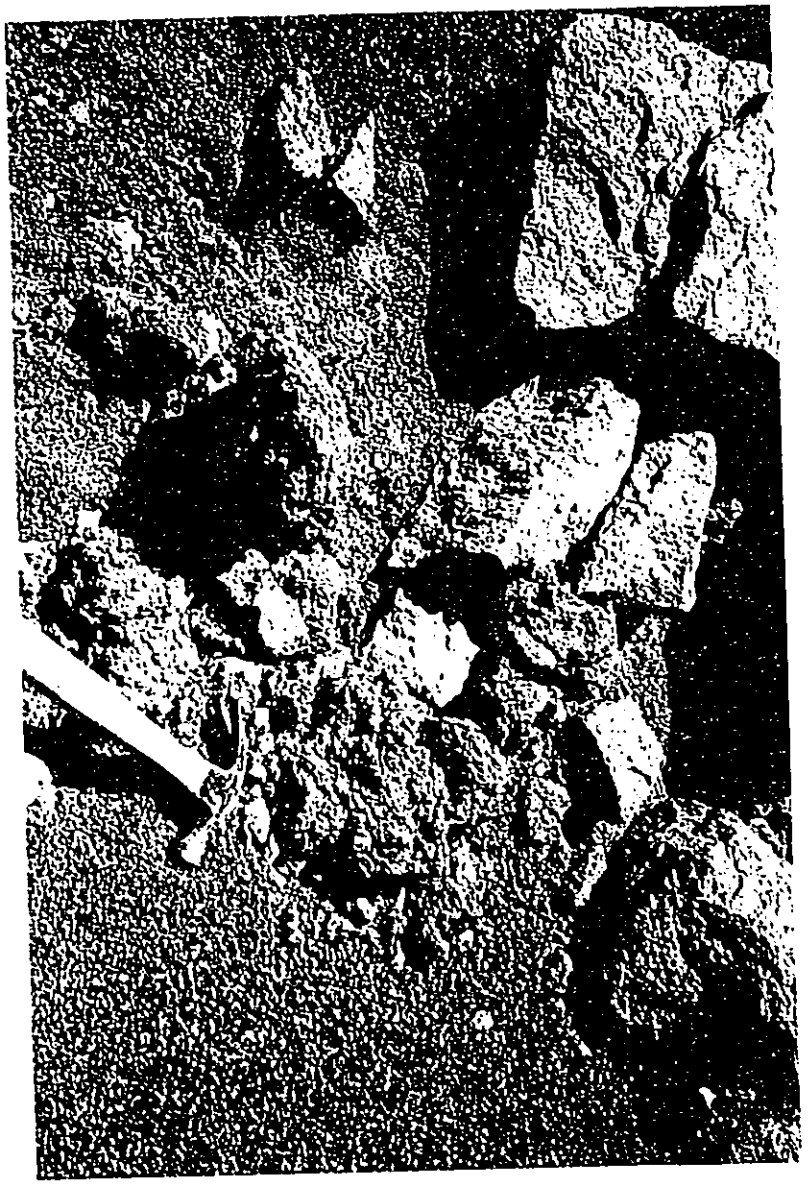


Figure 7

APPENDIX D
BOTANICAL RESOURCES ASSESSMENT

CHAR & ASSOCIATES
April 2000

CHAR & ASSOCIATES
Botanical/Environmental Consultants
4471 Puu Panini Ave.
Honolulu, Hawaii 96816
(808) 734-7828

April 2000

BOTANICAL RESOURCES ASSESSMENT
FAULKES TELESCOPE SITE
HALEAKALA OBSERVATORY, MAUI

INTRODUCTION

The Faulkes Telescope site is located at the Haleakala Observatory complex at about 9,940 feet elevation on a flat area between the existing access road and a small pu'u or rock formation. The substrate in this area is cinder with scattered boulders. Plant cover is sparse, about 5 to 10% cover.

On 13 April 2000 a survey was made of the botanical resources found on the 1.5-acre site. The primary objectives of the survey were to provide a general description of the vegetation on the site and to search for threatened and endangered species as well as species of concern.

The plant names used in the discussion follow Wagner et al. (1990).

DESCRIPTION OF THE VEGETATION

The sparse plant cover on the site consists primarily of low shrubs of kupaoa (Dubautia menziesii), 1 to 3 feet tall, and scattered clumps of Deschampsia nubigena. The kupaoa, an endemic member of the daisy family (Asteraceae), has stiff, upright,

branches and stiff leaves arranged in whorls around the branches; the yellowish orange, daisy-like flowers are arranged in compact clusters. The kupaoa is a common species on the upper slopes of Haleakala and within the crater (Wagner et al. 1990). Deschampsia is an endemic, perennial grass which forms rounded tufts, 6 to 12 inches tall with flowering stalks 1 to 2 feet tall. It is the most commonly encountered grass species at this elevation.

Other plants found on the flat area occur in smaller numbers. A few plants of hairy cat's ear (Hypochoeris radicata), a weedy herb native to Eurasia, are found scattered here and there. A few small tussocks of Tetramolopium humile, an endemic member of the daisy family, are found near the access road. Tetramolopium is a rounded, dwarf shrub, 3 to 10 inches tall, with leaves covered with whitish hairs and clusters of white flowers. One small bush of pukiawe (Styphelia tameiameiae), about a foot tall, is found among some boulders on the flat, cinder covered area. Near the base of the small pu'u, there are a few clumps of mountain pili or pili uka (Trisetum glomeratum), an endemic, perennial grass; the robust tufts are 6 to 12 inches tall with spike-like flowering stalks.

The small pu'u located nearby offers a few protected pockets and overhangs. These more protected areas support clumps of Tetramolopium as well as plants of hairy cat's ear. Plants of pukiawe, mountain pili, and kupaoa are also more numerous on the small pu'u.

DISCUSSION AND RECOMMENDATIONS

Plants of the endangered silversword (Argyroxiphium sandwicense subspecies macrocephalum) were found in the earlier studies for the Maui Space Surveillance Site expansion (U.S. Air Force 1991) and the AEOS Telescope site (Belt Collins & Associates 1994).

No silversword plants were found on the proposed Faulkes Telescope site during this study. Only six plant species were observed on the project site. Four of the species are endemic, that is, they are native only to the Hawaiian Islands; these are the kupaoa, mountain pili, Deschampsia, and Tetramolopium. The pukiawe is indigenous, that is, it is native to the Hawaiian Islands and elsewhere. The hairy cat's ear is an introduced species. The native plants are all widespread throughout the upper slopes of Haleakala. None of the plants is a threatened and endangered species or a species of concern (U.S. Fish and Wildlife Service 1999).

Given the findings above, the proposed use of the site for a telescope facility is not expected to have a significant negative impact on the botanical resources. There are no botanical reasons to impose any restrictions, conditions, or impediments to the development of the site.

Of some concern is the accidental introduction of non-native or introduced species (plants and animals) to the summit and upper slopes of Haleakala. Non-native species not already found on Haleakala could compete with and eventually displace the native plants and animals (Belt Collins & Associates 1994). It is recommended that the mitigation measures employed for the earlier AEOS and MSSS projects be followed. These measures included the inspection of contruction equipment and containers prior to their translocation to the summit area, and working closely with the National Parks Service in preventing non-native species introductions.

LITERATURE CITED

Belt Collins & Associates. 1994. AEOS Telescope Facility, Haleakala, Island of Maui, Hawaii. March 1994.

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U.S. Fish and Wildlife Service. 1999. U.S. Fish and Wildlife Service species list, plants. March 23, 1999. Pacific Islands Ecoregion Office, Honolulu, HI.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1990. Manual of the flowering plants of Hawai'i. 2 vols. University of Hawai'i Press and Bishop Museum Press, Honolulu. Bishop Museum Special Publication 83.

APPENDIX E
AVIFAUNAL RESOURCES SUMMARY

CHAR & ASSOCIATES
June 1996

AVIFAUNAL RESOURCES SUMMARY

INTRODUCTION

The 'Ua'u or Hawaiian Dark-rumped Petrel (Pterodroma phaeopygia sandwichensis), an endangered pelagic seabird, is known to nest on the summit of Haleakala between the months of May and October (Conant and Stemmermann 1979; U.S. Department of the Interior/ National Park Service 1994). 'Ua'u burrows have been recorded near the vicinity of the Haleakala observatories (U.S. Air Force 1991; Belt Collins Hawaii 1994). The observatories are located about 5,000 ft. northeast of the proposed broadcasting facility site. 'Ua'u may fly over the proposed facility.

Surveys for incoming 'Ua'u at the proposed broadcasting facility were conducted by C.N. Hodges, Haleakala Park Research Associate, and the results of the surveys are summarized below.

RESULTS

An earlier survey conducted on 28 May 1992 by Hodges and two endangered species personnel found that the proposed site was heavily trafficked by incoming 'Ua'u. Vocalizations were recorded from 7:50 pm to 9:00 pm and birds were observed flying within 10 meters of the ground (Hodges memorandum, 10 June 1992).

Two more recent surveys of the site were conducted by Hodges in 1995 (see memoranda dated 16 May 1995 and 31 August 1995). In the May survey only one call was heard at 7:45 pm, below the study site. A Fujinon PS-910 Starscope was used in the two-night August survey. On the first night (18 August), the survey was conducted from 6:00 pm to 9:00 pm. A spot light was used on the second night, 20 August, to enhance the Starscope's visibility; this survey was conducted from 7:00 pm to 9:00 pm. At least three

'Ua'u were seen flying over the site on both nights between 7:30 and 8:30 pm, within 20 meters above the ground. There was no obvious direction or flight pattern for the sightings.

DISCUSSION AND RECOMMENDATIONS

The endangered 'Ua'u fly over the proposed broadcasting facility site. The number of birds flying over the site during the breeding saeson will vary from year to year. 'Ua'u are prone to collide into foreign, protruding obstacles and it is presumed that 'Ua'u may fly into the proposed broadcasting facility.

The following mitigation measures are proposed to minimize the impact of the proposed facility on the endangered 'Ua'u.

Fencing -- No barbed wire should be used on the proposed facility. The chain-link fence surrounding the facility should be eliminated if possible. 'Ua'u carcasses have been found on barbed wire and also at the base of the hog wire fence surrounding the park's boundary. After the barbed wire was removed, 'Ua'u deaths decreased significantly (Hodges letter to R. Flag, 15 September 1995).

Lights -- No lights are required for the broadcasting towers by the FAA. If any outside lights are needed for the buildings, they should be fitted with shields to direct the light downwards. Unshielded bright lights are known to attract 'Ua'u fledglings as they embark on their first seaward flights in October and November.

Sanitation -- All food items as well as their containers should be removed daily from the site during the construction phase and later when the facility is in use. This will discourage the presence of rodents and feral predators.

Consultation -- The U.S. Fish and Wildlife Service should be consulted for additional mitigation measures. Hodges noted that 'Ua'u are sensitive to certain colors which they may see more readily at night; the Fish and Wildlife Service may have information on such studies.

Even with the above mentioned mitigation measures, it is possible that 'Ua'u may fly into the antennas of the facility.

LITERATURE CITED

Belt Collins Hawaii. 1994. Final Environmental Assessment/ Negative Declaration, Advanced Electro-Optical System (AEOS) Telescope and Related Improvements at the Maui Space Surveillance Site (MSSS), Haleakala, Maui, Hawaii. Prepared for U.S. Air Force Space Systems Command. March 1994.

Conant, S. and M. Stemmermann. 1976. Haleakala National Park Crater District Resources Basic Inventory: Birds. Technical report 26. Cooperative National Park Resources Studies Unit, University of Hawaii, Manoa. Contract No. CX 8000 7 0003.

U.S. Air Force (USAF). 1991. Biological Assessment for Maui Space Surveillance Site Expansion. U.S. Air Force, Air Force Maui Optical Station, Maui, Hawaii.

U.S. Department of the Interior/National Park Service. 1994. Draft General Management Plan/Environmental Impact Statement. February 1994.

FILE COPY

MEMORANDUM

August 31, 1995

TO: RM Chief, Nagata

FROM: RM Specialist, Hodges

SUBJECT: 'UA'U Observations at Proposed Antenna Sight

Two surveys for flying 'UA'U were conducted at night using a Fujinon PS-910 Starscope, on loan from Charlie Fein. The first survey was conducted on 18 August, from 6:00 pm to 9:00 pm. The second survey was conducted on 20 August from 7:00 pm to 9:00 pm. There was no moon on both nights. In order to enhance the Starscope's visibility, a spot light was used on the second night.

At least 3 'UA'U were seen flying over the proposed sight on both nights between 7:30 and 8:30 pm, within 20 meters above ground. There was no obvious direction or flight pattern for all sightings.

Our records show that 'UA'U are prone to collide into foreign, protruding obstacles. Carcasses have been found at the base of telephone poles and beneath telephone lines. Birds have been observed crashing into buildings, and have been found entangled on fences. It is possible for 'UA'U to fly into the proposed antenna facility.

I contacted Char and Associates to inform Ms. Char of our findings via phone on 8/27/95. A fax from the project's engineer, Richard Flagg, was subsequently sent. The fax included a "conceptual drawing of the proposed facility. Mr. Flagg asks if we can recommend any mitigation measures. I am working on a response to Mr. Flagg and will forward it to you for review before mailing.

United States Department of the Interior
NATIONAL PARK SERVICE
Haleakala National Park
P. O. Box 369
Makawao, Maui, HI 96768
Phone (808) 572-9306 FAX (808) 572-1304

FILE COPY

September 15, 1995

Richard S. Flagg
1721-I Young St.
Honolulu, HI 96826
Phone/Fax (808) 947-2546

Dear Mr. Flagg:

We received your fax concerning mitigation measures to minimize impact of the proposed antenna facility on the endangered Hawaiian Dark-rumped petrel ('UA'U). Upon reviewing the conceptural drawing, we offer the following comments.

- The fence surrounding the facility, particularly the top strands of barbed wire, are of extreme concern. As you know, the Park is surrounded by a boundary fence. This fence protects the entire crater ecosystem from feral animal intrusion, and was originally constructed of 47 inch hog wire, with two strands of barbed wire above the hog wire. 'UA'U carcasses have been found on the barbed wire. In these areas, the barbed wire has been removed and the number of 'UA'U deaths have decreased significantly. 'UA'U carcasses have also been found at the base of the hog wire, suggesting that the 'UA'U fly into the hog wire. How tall is the chain link(?) portion of your proposed fence? If it is the typical 8-feet tall barrier fence, it is possible that 'UA'U may fly into this portion of the fence. We suggest that the barbed wire **NOT be placed on the fence.**

- The two antenna are protrusions that are foreign to the 'UA'U. Since 'UA'U were seen flying over the site during night observation on 28 May 1992, and 18 and 20 August 1995, it is possible that the 'UA'U may fly into the antenna. Unfortunately, there is little in the way of mitigation. Lights on the antenna are <u>not</u> recommended. 'UA'U often are confused by bright lights and crash into the lights, especially in October and November when the fledglings are leaving the nests.

- Are external lights for the "box-type" structures (buildings) planned? If so, please consult us on lighting design, to avoid the possibility of 'UA'U crashing into the structures.

We hope that these comments are useful. If you have any questions, please contact me at (808) 572-9306 ext. 5960.

Sincerely,

Cathleen Hodges
Resources Management Specialist

cc: RM Chief, Nagata
USFWS Ecological Services

FILE COPY

MEMORANDUM

August 31, 1995

TO: RM Chief, Nagata

FROM: RM Specialist, Hodges

SUBJECT: 'UA'U Observations at Proposed Antenna Sight

Two surveys for flying 'UA'U were conducted at night using a Fujinon PS-910 Starscope, on loan from Charlie Fein. The first survey was conducted on 18 August, from 6:00 pm to 9:00 pm. The second survey was conducted on 20 August from 7:00 pm to 9:00 pm. There was no moon on both nights. In order to enhance the Starscope's visibility, a spot light was used on the second night.

At least 3 'UA'U were seen flying over the proposed sight on both nights between 7:30 and 8:30 pm, within 20 meters above ground. There was no obvious direction or flight pattern for all sightings.

Our records show that 'UA'U are prone to collide into foreign, protruding obstacles. Carcasses have been found at the base of telephone poles and beneath telephone lines. Birds have been observed crashing into buildings, and have been found entangled on fences. It is possible for 'UA'U to fly into the proposed antenna facility.

I contacted Char and Associates to inform Ms. Char of our findings via phone on 8/27/95. A fax from the project's engineer, Richard Flagg, was subsequently sent. The fax included a "conceptual drawing of the proposed facility. Mr. Flagg asks if we can recommend any mitigation measures. I am working on a response to Mr. Flagg and will forward it to you for review before mailing.

United States Department of the Interior

NATIONAL PARK SERVICE
Haleakala National Park
P.O. Box 369
Makawao, Maui, Hawaii 96768

IN REPLY REFER TO:

June 21, 1995

MEMORANDUM

TO: Superintendent

FROM: Chief, Resources Management

SUBJECT: 'UA'U Survey - Antenna Farm

Attached are two reports from Endangered Bird Species Specialist Hodges. One report is dated 06/10/92 and the other is 05/16/95.

We feel that the location for the proposed Antenna Farm is a flyway for the endangered 'UA'U but as to what extent (overall volume during the year) is unknown. We also do not know if an 'UA'U colony is within, adjacent to, near by, or absent from the proposed site. Ms. Hodges did not perform a follow up survey as mentioned in her 05/16/95 memo since I did not respond to her request.

Our recommendation is that the people preparing the environmental assessment or E.I.S. should consult the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act (P.L. 93-105 as amended) if federal funds are involved. They should contact the Honolulu U.S.F.W.S. Ecological Service Chief, Karen Rosa; we believe her phone number is (808) 541-2749.

Ronald J. Nagata, Sr.

attachments

cc: Hodges w/o attachments

United States Department of the Interior
NATIONAL PARK SERVICE
Haleakala National Park
Resources Management Division
P. O. Box 369
Makawao, Maui, HI 96768
phone (808) 572-9306 FAX (808) 572-1304

May 16, 1995

M E M O R A N D U M

TO: RM Chief, Nagata

FROM: RM Specialist, Hodges

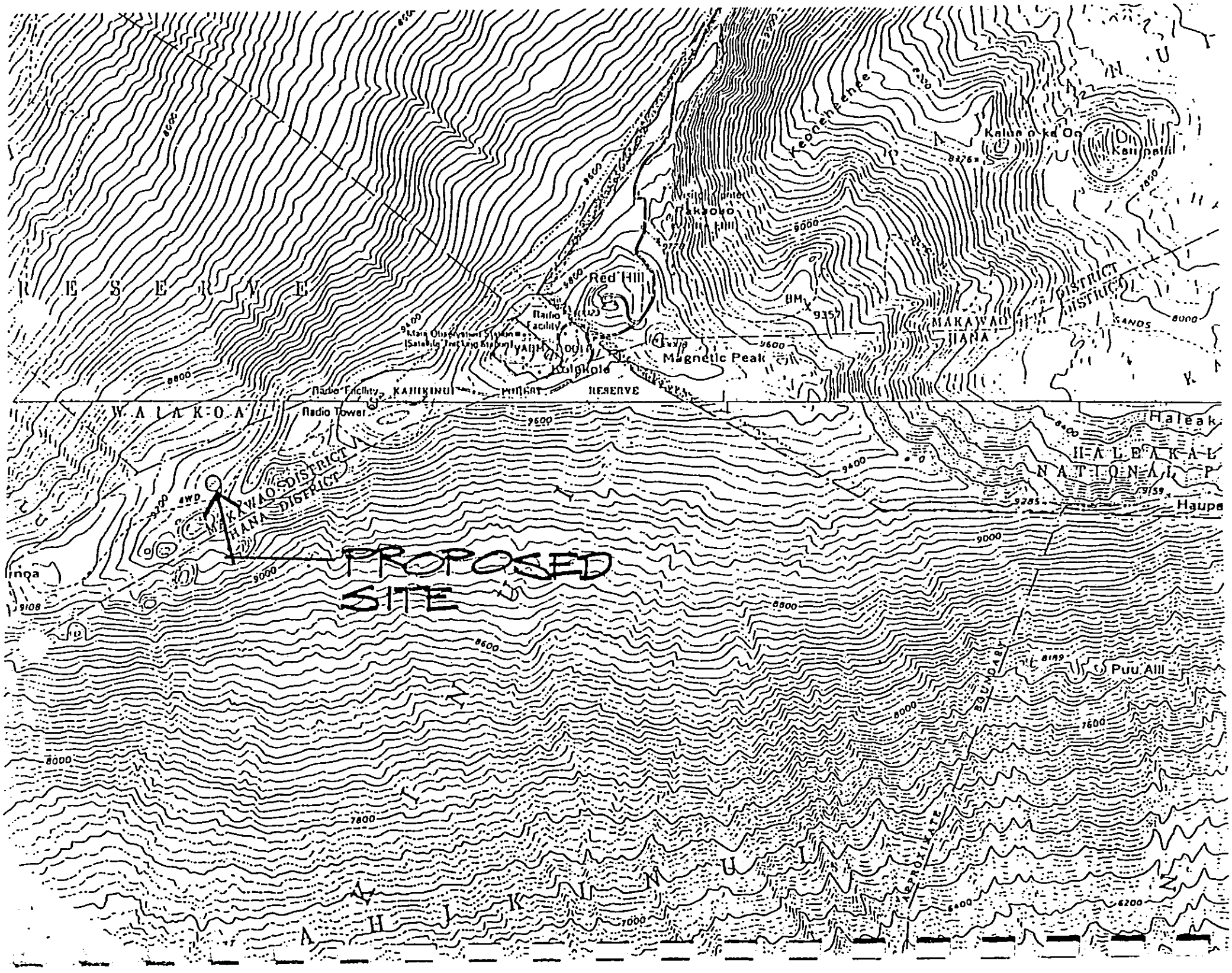
SUBJECT: Follow-up 'Ua'u Observations at Proposed "Antenna Farm" Site

I conducted a follow-up survey for *'Ua'u* at the proposed "Antenna Farm" site on 16 May 1995 from 1845 to 2035. The original survey was conducted on 28 May 1992 by myself and two other ESM assistants (see attached).

As opposed to the numerous detections observed in 1992, only one call was heard at 1945, below the proposed site during this survey. There were no other calls throughout the observation period. However, because the original survey detected numerous calls, I hesitate to dismiss the fact that *'Ua'u* do not use the proposed area. Calls may not have been heard because this survey was conducted slightly earlier in the year than last survey.

Another survey should be conducted before concluding *'Ua'u* use of the proposed area. I will be able to perform another survey during the week of 29 May through 2 June 1995.

Attachments


Red Hill
Magnetic Peak
Kalua o ke Oo
Kaupo Gap
Radio Facility
Radio Tower
KAHIKINUI
FOREST RESERVE
WALAKOA
MAKAWAO DISTRICT
HANA DISTRICT
PROPOSED SITE
Haleak
HALEAKALA NATIONAL P
Haupa
Puu Alii
KAHIKINUI FOREST RESERVE

IN REPLY REFER TO:

United States Department of the Interior
NATIONAL PARK SERVICE
RESOURCES MANAGEMENT
HALEAKALĀ NATIONAL PARK
P.O. BOX 369 MAKAWAO, MAUI, HAWAII 96768
TEL: (808) 572-9230 FAX: (808) 572-1304 (8am to 3pm)

June 10, 1992

M E M O R A N D U M

TO: Resources Management Chief, Nagata

FROM: Research Associate, Hodges

SUBJECT: 'Ua'u Observation at Proposed Site for "Antenna Farm"

A survey for incoming Hawaiian Dark-rumped Petrels or 'Ua'u (*Pterodroma phaeopygia sandwichensis*) at the proposed "Antenna Farm" site was conducted on May 28, 1992. Three Endangered Species personnel were positioned around the perimeter of the site from 1845 to 2100.

The proposed site is heavily trafficked by incoming 'Ua'u. Birds were heard at least every 2 minutes. In the nesting colony during nesting season, the frequency of calls is 5 to 10 minutes.

The first observation of an 'Ua'u was a visual at 1935. The bird flew directly over the proposed site, approximately 8 meters above ground, travelling up-slope from southwest (Makena area). No vocalization occurred.

Several observation of 'Ua'u vocalization were recorded from 1950 to 2100. Birds were heard over the sight during the observation period, flying within 10 meters of the ground. Vocalization over the site began decreasing at 2030 with the last observation at 2044. We continued hearing 'Ua'u below the site as we were leaving, flying toward the West Slope subcolony.

'Ua'u are thought to crash into foreign obstacles. Since 1990, seven 'Ua'u, thought to have collided into objects, were found along the outer west slope of Haleakala Crater: two in October 1990, two in March 1991, one in October 1991, and two birds in June 1992. All were adult carcasses found within 2 meters beneath the telephone lines, on the south side. Two carcasses were found within 5 meters of a telephone pole.

Cathy Hodges

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Blvd, Room 3108
P.O. Box 50088
Honolulu, HI 96850

phone: 808-541-3441; fax: 808-541-3470

In Reply Refer To: CAR

FEB 7 1997

Ms. Marilynn C. Metz
MCM Planning
703 Honua Street
Honolulu, HI 96816

Re: Draft Environmental Assessment and Anticipated Negative Declaration for a Coordinated Broadcast Facility at Haleakala, Maui

Dear Ms. Metz:

The U.S. Fish and Wildlife Service (Service) has reviewed the Draft Environmental Assessment (DEA) and Anticipated Negative Declaration for a Coordinated Broadcast Facility at Haleakala, Maui, Hawaii. The proposed project sponsor is the University of Hawaii Institute for Astronomy (UH IfA). The proposed project involves development of a coordinated broadcast facility on the Kalepeamoa ridge line of Haleakala. The Service offers the following comments for your consideration.

Radio and television transmitters currently located within and adjacent to the Haleakala Observatories (HO) will be relocated to the proposed facility to reduce the level of electromagnetic interference at HO. Installation of all future broadcast equipment on Haleakala may be restricted to the proposed facility site. The proposed facility will consist of two antenna towers, equipment building(s), powerline supports, powerlines, backup generator, above-ground fuel storage tank, transformer pad, and a small restroom. Two alternative design concepts are considered for the equipment buildings. Access to the facility from the Haleakala summit will be from an existing unimproved road, which will need improvement to allow construction equipment and service vehicles to access the site. Construction of the facility is expected to last about one year.

Federal Trust Resources

One Federally listed endangered species, the Hawaiian Dark-rumped petrel or 'Ua'u (*Pterodroma phaeopygia sandwichensis*) has been reported to fly over the proposed project site. 'Ua'u are prone to collide into man-made structures and/or become disoriented by night lighting, and it is likely that 'Ua'u may fly into the facility and collide with the proposed antenna towers, antennas, power line poles and guy wires, overhead powerlines, and/or fences. No other Federally protected animals or plants have been reported to occur at the project site.

Equipment buildings

The proposed building structure(s) will have no windows, and nighttime light from within the building(s) will not impact federally endangered 'Ua'u. However, external lights are known to attract seabirds, causing them

to become disoriented and collide with those lights or other structures. Therefore, the Service recommends that external sensor lights be directed downward, shielded to prevent light from escaping horizontally, and be as low-wattage as practicable.

Antenna Towers and Antennas

Up to two, free-standing antenna towers will be constructed on the site. No lights will be erected on the proposed towers. While the draft EA states that the Service will be consulted to determine the appropriate colors for the towers, we are currently unaware of documentation regarding the effectiveness of color in preventing or reducing collisions by seabirds. It is unclear what impacts the towers will have on the 'Ua 'u. Therefore, the Service recommends that protocols to (1) recover and rehabilitate injured birds that "fallout" due to collisions and (2) trap predators to reduce predation of downed birds be submitted for our review. The protocols should include the following:

1) Name and phone number(s) of person(s) responsible for receiving downed birds (Haleakala National Park (HALE) staff may be able to provide guidance).
2) Provision of at least one bird carrying case on site.
3) Annual training on how to handle downed birds (HALE staff may be able to provide guidance).
4) Completion of data sheets when birds are transported.
5) Arrangement with an appropriate state, federal, or private agency to provide them with the data sheet information.

The draft EA does not specify the number, type, or position of antennas to be placed on the tower(s). Therefore, the Service cannot comment, at this time, on the impact of the antennas on the 'Ua'u.

Fencing

The proposed antenna towers must be fenced or equipped with anti-climb devices to prevent unauthorized persons from injuring themselves and/or vandalizing the equipment. The Service recommends the installation of either a stone wall with gates around the facility or minimal chain-link fencing (*ie.* fence only around the towers). The Service concurs with the recommendation made by HALE staff that barbed wire and fences higher than 6 feet be prohibited as 'Ua'u carcasses have been found on barbed wire and at the base of hog wire fencing in the Park.

Overhead Powerlines, Guy Wires and Anchors

The specific power line corridor for the facility has not been selected. The Service recommends that a qualified biologist survey the alternative corridor routes to determine which may be used by 'Ua'u as flyways or as nesting areas. Once the route is selected, the Service recommends that powerlines running from the existing facilities to the proposed facility be buried to eliminate potential collisions by the 'Ua'u. Trenching should not occur in areas of known nesting sites. The Service recommends that approved locally-obtained sand be used as fill and backfill material for any trenching to avoid the unintentional introduction of new alien species (plants or animals). If the powerlines cannot be buried along the entire selected corridor, the Service recommends that the powerlines be buried in areas that are known flyways. If overhead powerlines are constructed, the Service recommends that appropriate devices to visually discourage birds from flying into the powerlines or guy wires be installed.

Access Road
The present unimproved jeep road will be realigned and/or widened and paved. The specific route has not been selected and the proposed road has not been designed. The Service recommends that a qualified biologist survey the proposed road realignment alternatives for 'Ua'u nest burrows. The Service recommends that existing, nearby material be used for road fill to avoid the unintentional introduction of new alien species.

Construction
Most heavy construction equipment will be stored on site for the duration of the construction period, and workers will "car pool" to and from the construction site. The Service recommends that equipment, supplies and construction material be inspected by a qualified biologist before access is permitted through HALE, primarily to prevent the unintentional introduction of alien species. The Service also recommends that the project site, access road, and selected utility corridor be monitored during construction and for a minimum of one year following construction to insure that no alien species have accidentally become established. In addition, the Service recommends that active 'Ua'u nests in the construction areas be monitored during site clearing, foundation construction, trenching and/or power line construction, and access road work to ensure that neither the 'Ua'u nor their burrows are disturbed. Finally, the Service recommends that overhead cranes be fitted with appropriate devices to visually discourage birds from flying into them.

The Service appreciates the opportunity to provide comments on the Draft Environmental Assessment and Anticipated Negative Declaration for a Coordinated Broadcast Facility at Haleakala, Maui (internal draft #2). If you have any questions regarding these comments, please contact Fish and Wildlife Biologist Christa Russell at (808) 541-3441.

Sincerely,

for Brooks Harper
Field Supervisor
Ecological Services

cc: Cathleen Hodges, Haleakala National Park

APPENDIX F
ARTHROPOD FAUNA SUMMARY

A.C. MEDEIROS AND L.L. LOOPE
1992

A REVIEW OF THE ARTHROPOD FAUNA AT THE PROPOSED AIR FORCE FACILITY CONSTRUCTION SITE AT THE SUMMIT AREA OF HALEAKALA VOLCANO, MAUI, HAWAI'I

A.C. Medeiros and L.L. Loope
Research Division, Haleakalā National Park, P.O. Box 369, Makawao, HI 96768

INTRODUCTION

Despite the sparsity of vegetation, the highest elevations of Haleakalā volcano and non-weathered substrates of its crater support a unique and surprisingly substantial fauna of insects and spiders. Barren high mountain ecosystems are called "aeolian," a term which describes ecosystems largely devoid of vegetation and fueled primarily by windblown organic material. The term was originally applied to include snow, meltwater, and barren rock. In Hawai'i, however, "aeolian" is primarily applied to non-weathered lava substrates, mostly but not exclusively at high elevations.

Aeolian and sub-aeolian ecosystems of Haleakalā volcano are located above 2300 m elevation in the cinder-dominated crater, above 2600 m on the older, outside, western slope, and extend to the mountain's summit at 3056 m. These areas are characterized by little vegetation (generally 0-5% cover), widely varying daily temperatures, generally dry surface conditions, and an apparent lack of food. Haleakalā National Park contains approximately 50-60% of the aeolian and sub-aeolian areas found on Haleakalā volcano; the remainder is owned by the State of Hawai'i and private landowners. Because of drier climate on the leeward slopes, aeolian systems extend to lower elevations when compared to wetter windward slopes.

The seasonal upslope movement of insects to the summits of high mountains of Hawai'i is a critical source of food for the native predator-scavenger arthropods restricted to aeolian areas. This phenomenon has been relatively well documented on Mauna Loa and Mauna Kea volcanoes, where taxa in several arthropod orders have made adaptive shifts to exploit windblown organic matter.

The climate of the summits of the high volcanic mountains in Hawai'i is one where extremes of temperature and moisture act in concert with high radiation to produce a unique and sparsely colonized ecosystem. Precipitation at the summit (primarily rain and mist, rarely snow) ranges from 1000 to 1500 millimeters annually with the majority occurring in the winter months from December through April. Freezing occurs on many nights, often followed within hours by relatively high daytime temperatures. Tropical alpine zones have been described as having "summer every day and winter every night." This applies also to Hawai'i's high mountains which are exposed to tremendous daily fluctuations. These areas are extremely xeric, a condition created by relatively low rainfall, very porous lava substrates with little water retaining capacity, low plant cover, and high solar radiation compounded by predominantly dark (heat-absorbing) volcanic substrates. Thermal and moisture regulation are critical factors guiding the adaptation of arthropods to this unique habitat.

SITE DESCRIPTION AND METHODS

Observations were made in June and July of 1992. The site consists of a gentle slope intersected by a rock outcrop. The slope is covered with loose cinder with scattered rocks. The site has been impacted previously in construction of adjacent sites (C. Fein, Rockwell Power Systems, pers. comm.). Damage to the site included compaction and removal of cinder substrates by heavy equipment which in turn has caused changes in water drainage patterns and erosion, as well as the presence of cables, foot paths, and discarded items in the study area. Visual surveys were made under rocks that were appropriate for colonization by invertebrates. Twenty pitfall traps, glass jars sunk in the substrate, were left in the study site for one month (June 22-July 23, 1992). With a bait of fermenting fish paste spread on the upper inside of each jar just below the ground surface, the jars contain a water-preservative mix with surfactant and comprise an excellent method for sampling many invertebrates. Identification to species level for all specimens collected was not feasible within the time frame of this project. However, specimens belonging to key invertebrate groups, especially Coleoptera, were forwarded to the B.P. Bishop Museum Entomology Department for identification and curation.

DISCUSSION OF INVERTEBRATE FAUNA AT THE PROPOSED SITE

Discussion of the arthropod fauna of the study site will be organized along phylogenetic groups.

ARANEIDA - Spiders

Spiders, especially *Lycosa*, are a dominant component of the arthropod fauna. The dominant invertebrate predator of Haleakalā's aeolian ecosystem is the endemic wolf spider, *Lycosa hawaiiensis* Simon (Lycosidae) whose size (3.5-5.0 cm length) makes it one of largest of true spiders (Suborder Labidognatha). Occurring only near and at the mountain's summit at 2400-3056 m, these ground-hunting spiders construct shallow burrows under rocks cementing windblown *Dubautia* leaves and other detritus together with silk to form a circular refuge that protects them from the extremes of desiccation and cold. They are notable among spiders for their maternal care, carrying the silk egg sac (larger than their own body) beneath them attached to their spinnerets. As the young hatch, they climb atop their mother's back while she hunts. As spiderlings become larger (> 1 cm), they disperse widely on the open cinder plains colonizing unoccupied under-rock habitats.

Lycosa spiders were relatively common at the study site. A number of large adult females were taken in pitfall traps and several nests were observed in under-rock surveys.

Other spiders noted belonged primarily to the family Linyphiidae. Although few individuals were taken in pitfall traps, this method may provide an underestimate of their true abundance at the site. Though the webs of these species are small and inconspicuous, a number were noted between and under rocks at the study site. Factors

that could account for low numbers in pitfall traps could include their lack of movement away from established web sites and low attraction of fermented baits.

COLEOPTERA - Beetles

Carabidae - Carabid beetles

Ten species of native ground beetles have been recorded within the aeolian zone of upper Haleakalā (Table 1), with nine of these (including two monotypic genera) endemic to the volcano. Of these, five are entirely restricted to the upper 150 m elevation occurring just below the summit. In his unpublished field notes, the noted Hawai'ian naturalist R.C.L. Perkins noted this greater abundance: "...I began to work for Coleoptera, which I found most plentiful from 9500 [feet elevation] to the top, or to within 100 to 200 ft. short of the top." One species, *Pseudobroscus lentus*, is the sole member of this endemic genus which has only been collected at the very summit of the mountain at 3050 m. (G.A. Samuelson, *in litt.*). The five aeolian carabid beetle species are flightless scavenger-predator specialists that are extremely rare; little is known of their current status or biology. The other five species are found both in aeolian as well as lower elevation habitats. Due to the degradation of lower elevation habitats, some of these species are now apparently restricted to aeolian or sub-aeolian sites; their lower elevation distribution is confirmed only by historical collections.

At the study site, the only carabid beetle species encountered was *Barypristus rupicola*. This is the largest of the native carabids and is the most common of the native carabid species on upper Haleakalā (ACM, pers. observation).

Other Coleoptera

Of other Coleoptera, a single species of dermestid beetle (*Dermestes* sp.; Dermestidae) was taken in pitfall traps. Low numbers of several species of small native rove beetles (Family Staphylinidae) were collected in pitfall traps in the study area. Staphylinid specimens have been forwarded to Dr. Al Samuelson, coleopterist at the B.P. Bishop Museum.

LEPIDOPTERA - Moths

Noctuid moths (Noctuidae: undescribed *Agrotis* species) seasonally constitute a large proportion of the biomass of the native arthropod fauna on upper Haleakalā volcano. These are biologically unique species that have radically modified their diet to exploit the peculiar characteristics of the nearly vegetationless lava and cinder plains of upper Haleakalā. The abundance of the larval form of these endemic moths is especially surprising considering the sparsity of vegetation in these areas.

Throughout the world with very few exceptions, Lepidoptera larvae are plant feeders. However, examination of the alimentary canals of these large (to 5 cm length) larvae has revealed a partially carnivorous diet, an extraordinary adaptation. Foraging actively at night, the noctuid moth larvae are eating other arthropods (either dead or in a stupor

Table 1. List of high-elevation carabid beetles (Carabidae) of Haleakalā volcano, East Maui, Hawai'i, and their status within their entire range and at the study site.

1) *Barypristus rupicola* Blackburn - Haleakalā, 4200-10,000 ft. Relatively common locally, not collected at study site.
2) *Mauna frigida* (Blackburn) - Haleakalā, 4000-10,000 ft. Relatively common locally, not collected at study site.
3) *Mecyclothorax apicalis* (Sharp) - Haleakalā, 9500-10,000 ft - Status unknown, perhaps extinct, not collected at study site.
4) *Mecyclothorax inicans* (Blackburn) - Haleakalā, 6400-10,000 ft. - Rare but extant, not collected at study site.
5) *Mecyclothorax montivagus* (Blackburn) - Haleakalā, 4000-10,000 ft. - Rare but extant, not collected at study site.
6) *Mecyclothorax pusillus* Sharp - Haleakalā, 9500-10,000 ft. - Status unknown, perhaps extinct, not collected at study site.
7) *Mecyclothorax rusticus* Sharp - Haleakalā, 9500-10,000 ft. - Status unknown, perhaps extinct, not collected at study site.
8) *Mecyclothorax subconstrictus* (Sharp) - Haleakalā, 9500-10,000 ft. - Status unknown, perhaps extinct, not collected at study site.
9) *Mecyclothorax uncus* (Blackburn) - Haleakalā, 4000-9500 ft.. - Status unknown, perhaps extinct, not collected at study site.
10) *Pseudobroscus lentus* Sharp - Haleakalā, 10,000 ft.. - Status unknown, perhaps extinct, not collected at study site.

due to the low temperatures), as well as leaves of the few plants that occur in the area. The substantial biomass comprised by these noctuid larvae in their relatively barren environment leave little doubt that their carnivorous adaptation plays a crucial role in the ecology of this species.

Although common at the study site, the larvae of noctuid moths collected in pitfall traps were not found in the abundance nor in the larger size classes as at nearby Red Hill site within Haleakalā National Park. At the Air Force study site, an average of 5.9 specimens of noctuid larvae were collected in each pitfall trap, while in the nearby Red Hill site, 28.8 specimens were collected in each trap. Gravid females and deposited eggs of these moths were found in the study area. The explanation for the lower number and smaller size of noctuid moths encountered is most likely due to lower quality of the habitat of the study site, perhaps due to past grading and compaction.

One of the most famous invertebrates of Haleakalā volcano is the endemic flightless moth *Hodegia apatela* (Howarth 1976). This small ½-inch moth has dagger-shaped wings, cannot fly (but rather walks and hops), is restricted in distribution only to the upper barren lava slopes of Haleakalā, and is the sole member of an endemic genus. It was rare at the study area and only a single adult specimen was collected in pitfall traps.

HYMENOPTERA - Bees & Wasps

Hymenoptera were relatively uncommon at the study site. Few parasitoid wasps were captured in pitfall traps. No Argentine ants (*Iridiomyrmex humilis*) were encountered in pitfall traps or in ground checking. Western yellowjacket (*Vespula pensylvanica*)

populations were quite low; however, this species is highly seasonal and may be a local hazard in September through November. None were seen on ground checking; a single worker was caught in pitfall traps. The endemic bees *Nesoprosopis* spp., which are important pollinators, were seen at low numbers in the study site; none were caught in pitfall traps and no nests found in under-rock surveys.

DIPTERA - Flies

Compared to comparable sites at nearby Red Hill within Haleakalā National Park, the study site yielded many more individuals and species of large alien flies, especially in the families Muscidae, Tachinidae, and Calliphoridae. In pitfall traps 5 to 10 times the number of large alien fly individuals were collected at the study site compared to those within Haleakalā National Park.

In addition, some native species of *Drosophila* were present in the pitfall traps.

SUMMARY OF THE INVERTEBRATE FAUNA OF THE PROPOSED SITE

The study site is basically a typical but somewhat depauperate example of Haleakalā's aeolian zone. The reduced diversity of key invertebrate groups such as carabid beetles and noctuid larvae is presumably due to the compaction and degradation of the site previously. No locally unique taxa were encountered in this survey.

CONCLUSIONS

Until recently, barren areas in Hawai'i such as bare lava flows and mountaintops, devoid of vegetation, were considered lifeless and abiotic. Recent research has revealed a unique locally endemic arthropod fauna on otherwise barren lava flows and mountaintops. The native ecosystem of upper Haleakalā volcano is currently one of the least degraded ecosystems in the Hawai'ian Islands. Despite some apparently serious threats (ants, rodents, parasitoids), the native arthropod fauna of the aeolian and sub-aeolian zone appears to still be relatively intact. This integrity is due to its harsh environment which makes it relatively resistant to invasions of alien species which have decimated the endemic arthropods of Hawai'i's lowlands.

The primary threats to the long term conservation of aeolian ecosystems are the direct actions of man and the invasion of alien species into this habitat. Increasingly, the perpetuation of this ecosystem's near-pristine status will depend on careful management to mitigate accelerating Park visitation and (outside the Park) the increasing demand for summit areas as sites for observatories and communication structures.

RECOMMENDATIONS FOR PROTECTION OF NATIVE ARTHROPODS AND PREVENTION OF SPREAD OF ALIEN ARTHROPODS AND PLANTS

1. Take precautions to prevent transport of alien ant species into the site. One of the greatest threats to native arthropods on upper Haleakalā is the gradual spread and establishment of the Argentine ant (*Iridomyrmex humilis*) in high elevations (Cole *et al.* 1992). This invasive species establishes high population densities on Haleakalā, devastating native insect populations, and has the potential to completely change the ecology of the subalpine shrublands and sub-aeolian regions by eliminating most native arthropod species including essential pollinators of the silversword (*Argyroxiphium sandwicense* subsp. *macrocephalum*) and other locally endemic plant species. The Argentine ant has established a population on the edge of the Haleakalā aeolian zone at 2880 m. Experimental control of these populations with a carefully selected insecticide has promise, but nas not yet been realized, since no effective chemical is approved for use against ants in wildland situations in Hawai'i.

Recommendations:

1) Pressure wash all equipment prior to entering the National Park and inspect and remove any remaining organic matter.

2) Do not import fill material to the site.

2. Take precautions to prevent transport of alien plant species into the site. Certain alien plant species that do not currently occur on the island of Maui but do occur on neighbor islands (especially the Big Island) and on the continental United States could pose a serious threat to all native ecosystems on Haleakalā. Fountain grass (*Pennisetum setaceum*), mullein (*Verbascum thapsus*), and cheat grass (*Bromus tectorum*) are alien plant species warranting special concern.

Recommendation:

1) Pressure wash all equipment (prior to entering the National Park) and inspect and remove any remaining organic matter.

3. Remove imported organic materials and foodstuffs. Importation of food and garbage may act to keep rodent (especially the house mouse, *Mus domesticus*) populations at artificially high levels. On sparsely vegetated Hawai'ian volcanoes, these small alien mammals have highly insectivorous diets and reach high population densities during warm dry summers (Cole, Loope, and Medeiros in press). Peak mouse populations levels coincide with the time when native arthropods are in their adult actively-reproducing stages and at their most active and conspicuous. Although mouse populations are lower in winter months, arthropods comprise most of the diet during this period. Such predation can have a devastating effect on all native arthropods, but especially so for rare and/or flightless species.

Recommendation:

1) Remove all foodstuffs and organic materials imported to the site.

4. Minimize substrate compaction and modification of nearby areas. Compacting lava substrates and disturbing crucial microhabitats (under rock surfaces) by construction, vehicle usage, and even walking can cause permanent degradation to these sites. The sensitivity of these cinder areas requires adequate information conveyed to construction workers to avoid permanent degradation of the areas that surround the construction site.

Recommendations:

1) Well-conceived worker awareness must be in place before work begins to minimize unnecessary impacts.

2) Parking of heavy equipment and storage of construction materials prior to use should not be on adjacent cinder surfaces that are not being directly used for construction.

3) After construction is finished, remove excess materials to reduce overall biological impacts.

5. Institute an ongoing monitoring program. Such a program should insure that precautions taken are effective in preventing establishment of alien species, especially ants and weeds of concern.

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APPENDIX G
ARCHEOLOGICAL INVENTORY SURVEY

CULTURAL SURVEYS HAWAII
April 2000

An Archaeological Inventory Survey of 1.5 Acres of the University of Hawai`i Facility at Haleakalā Papa`anui *Ahupua`a*, Makawao District, East Maui (TMK 2-2-07: 8)

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Cultural Surveys Hawaii
April 2000

ABSTRACT

At the request of KC Environmental Inc., Cultural Surveys Hawaii conducted an archaeological inventory survey of an approximately 1.5-acre parcel of the 18 acre University of Hawaii Research Facility near the summit of Haleakalā, Maui. The survey was completed as part of an environmental assessment for the proposed construction of the Faulkes Telescope. The project area is near the summit of Haleakalā mountain, on the southwest rift, in Papa`anui *Ahupua`a*, Makawao District at approximately 10,000 feet elevation (a.m.s.l.).

Two archaeological sites were identified during the inventory survey, State Sites 50-50-11-4835 and 50-50-11-4836. Site -4835 consists of two rock enclosures which are interpreted as trash burning pits and are associated with military use of Kolekole in the early 1940s and subsequent University of Hawaii Research use. Site 50-50-11-4836 consists of three terraces, an enclosure two leveled areas and a wall segment. A 50 cm^2 test unit was excavated into the terrace, Feature 50-50-11-4836/A, and a modern nail was recovered from the upper-most stratum. A 100 by 50 cm test unit was excavated into Feature 50-50-11-4836/E. No cultural material or deposits were encountered during the excavation. No other cultural material or layers were identified during either test excavation. Site 50-50-11-4836 is interpreted as a cluster of associated temporary habitation shelters which are probably prehistoric in age. The features in site -4836 are consistent with numerous other features found on Haleakalā rim, particularly surrounding the cinder cones, and probably served as temporary shelters for travelers or hunters in prehistoric and historic times.

Sites 50-50-11-4835 and -4836 were assessed significant under "D" criterion for their potential to yield information about historic activities at Haleakalā. Site 50-50-11-4836 was determined significant under the "D" criterion for its potential to yield information about the prehistory and history of Haleakalā. Planned construction designs for the project area allow for the preservation of the two sites and associated outcrop.

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I. INTRODUCTION

At the request of KC Environmental Inc., Cultural Surveys Hawaii conducted an archaeological inventory survey and limited testing of an approximately 1.5-acre parcel of the 18 acre University of Hawaii Research Facility near the summit of Haleakalā, Maui (Figures 1-4). The survey was completed as part of an environmental assessment for the proposed construction of the Faulkes Telescope.

A. Project Area Description

The project area is situated near the summit of Haleakalā on the southwest rift, in Papa`anui *ahupua`a*, Makawao District, at approximately 10,000 feet above mean sea level (Figure 1). The 1.5 acre study area is part of the 18 acre University of Hawaii Research Facility, also known as "Science City". Located at Kolekole Hill just outside the Haleakalā National Park boundary, the 1.5 acre plot is a piece of undeveloped land on the west side of the UH Research Facility (Figures 3, 7). The U.S. Air Force (USAF) also operates the Maui Space Surveillance Site (MSSS) from within the University's Research Station boundaries. Access to the project area is via Highway 378, Haleakala Highway. Haleakala Highway is a paved highway extending from Kula, up the western flank of Haleakala to Haleakala National Park. An extension of the highway runs beyond Park boundaries into Science City.

The terrain in the project area ranges from moderately sloped in the east to gradually sloped in the west. The dominant feature in the survey area is an exposed basalt rock outcrop approximately 20 m in length (N-S), 14 m in width (E-W) and 3 m in height centrally situated in the project area (Figure 7). This outcrop is composed of aerolite, a type of Hawaiite basalt with abundant olivine crystals. The outcrop is extremely weathered exposing large, blocky cobbles on the eastern half and cinder sized gravel on the western half. Surrounding the outcrop are scattered blocky cobbles and the remainder of the project area is covered with cinder. The ground to the NW of the outcrop has been disturbed with a bulldozer in the past. Modern trash including glass, metal and aluminum cans is scattered in this disturbed area. A paved road leading to the observatory lies to the north of the project area boundary and an old paved road (currently in a state of disrepair) lies to the south of the project area boundaries. A few plants were found in the study area, including various grasses and the shrub *kupaoa (Raillardia menziesii).*

B. Scope of Work

The following Scope of Work was utilized to complete the survey:

1. A complete ground survey within the project area - 1.5 acres within the UH Research Facility - for the purpose of site inventory. All sites within the project area were located, described, and mapped with evaluation of function, interrelationships, and significance. Documentation includes photographs and scale drawings of these sites. Three sites outside of the project area were also inspected. All new sites identified were assigned State Site Numbers.

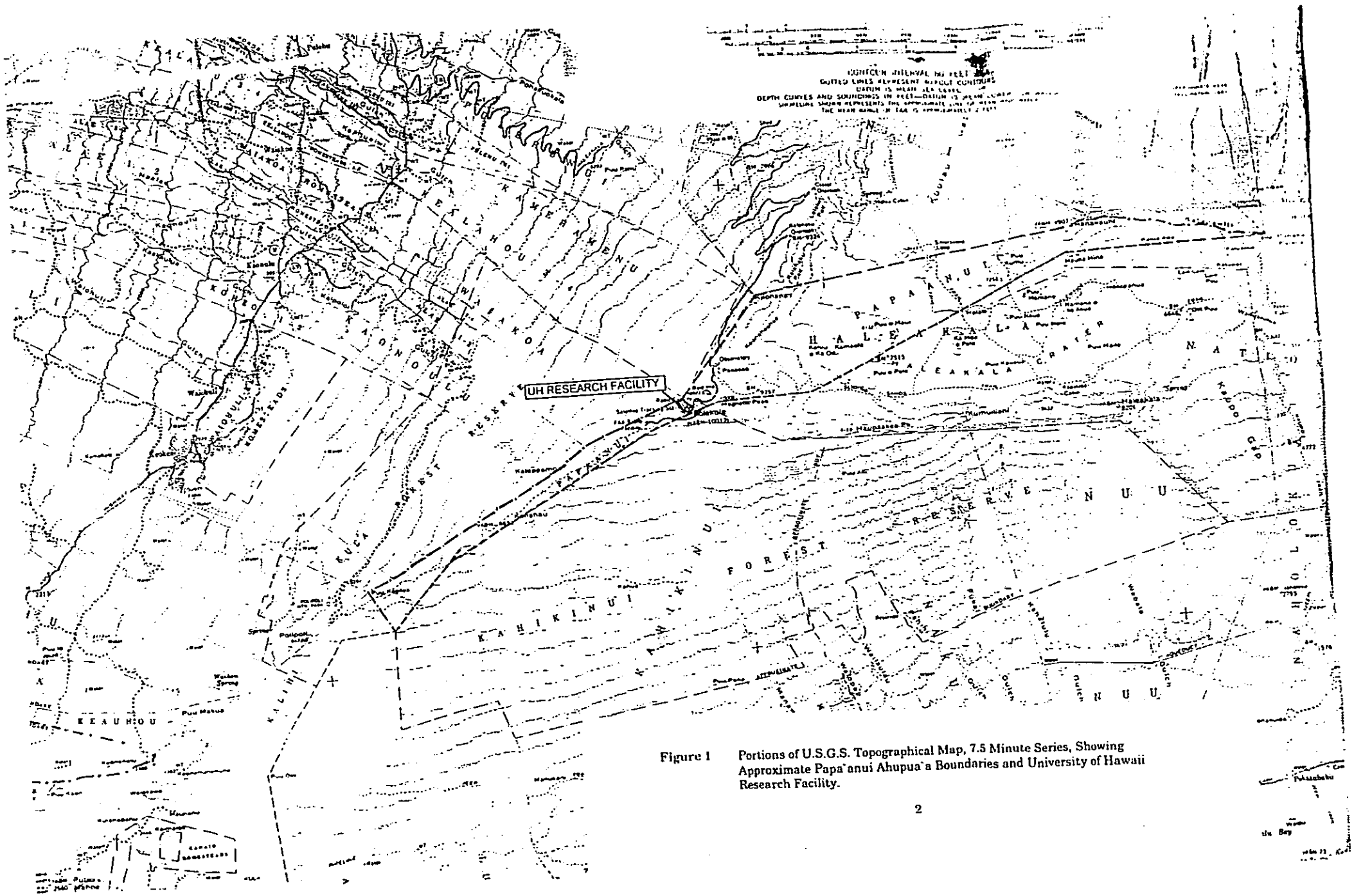


Figure 1 Portions of U.S.G.S. Topographical Map, 7.5 Minute Series, Showing Approximate Papa'anui Ahupua'a Boundaries and University of Hawaii Research Facility.

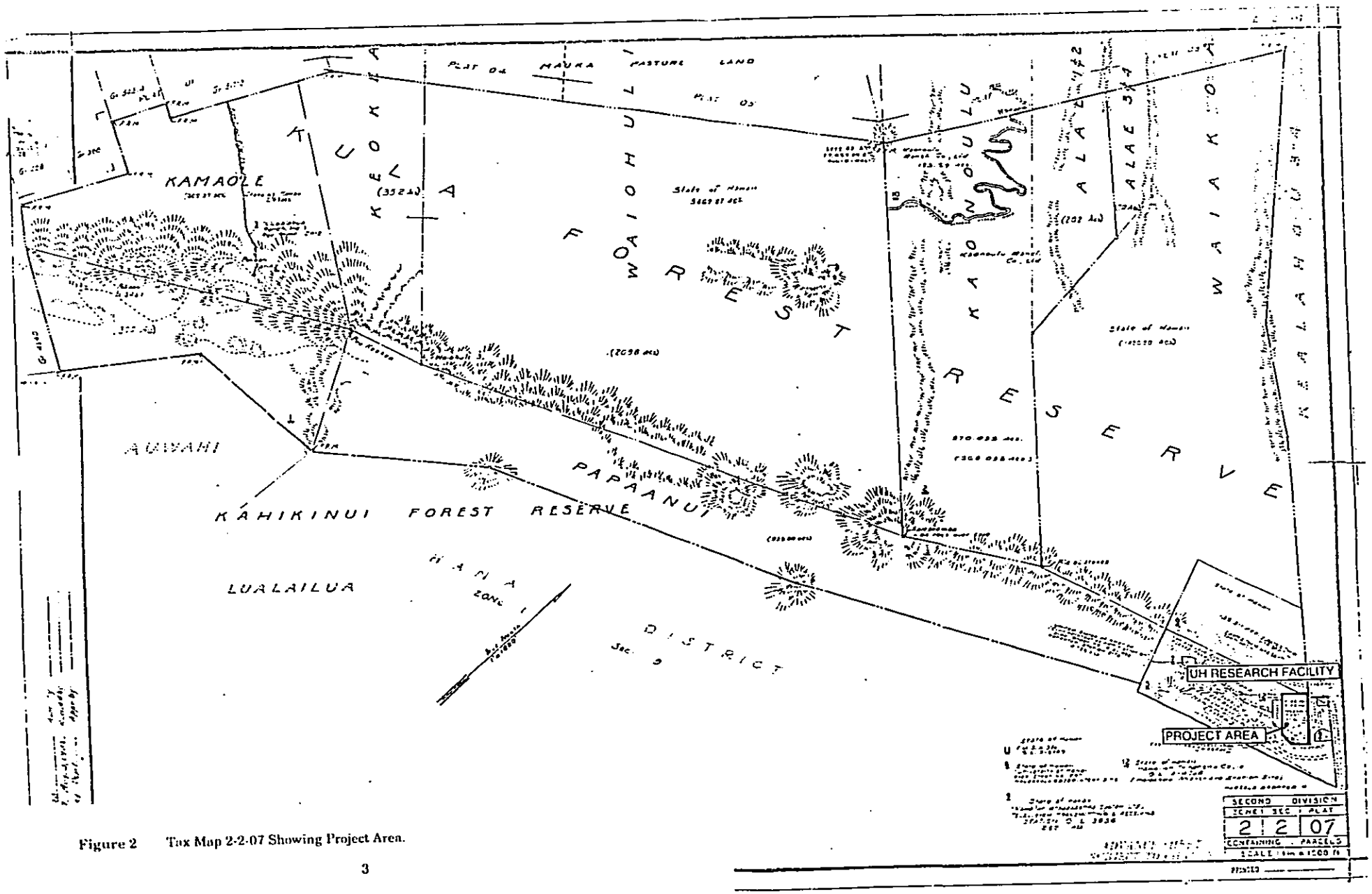


Figure 2 Tax Map 2-2-07 Showing Project Area.

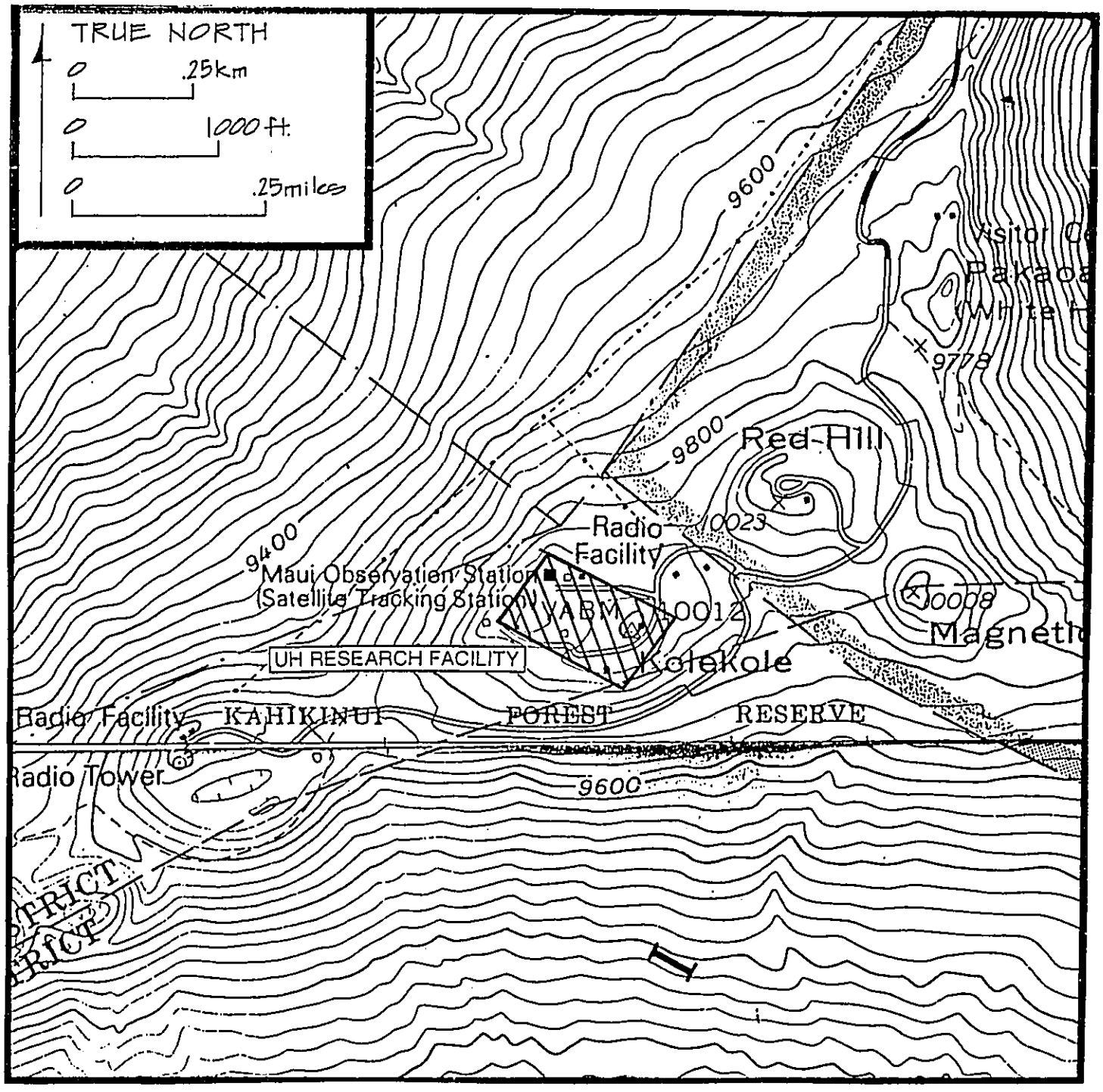


Figure 3 Map Showing the University of Hawaii Research Facility at Haleakalā

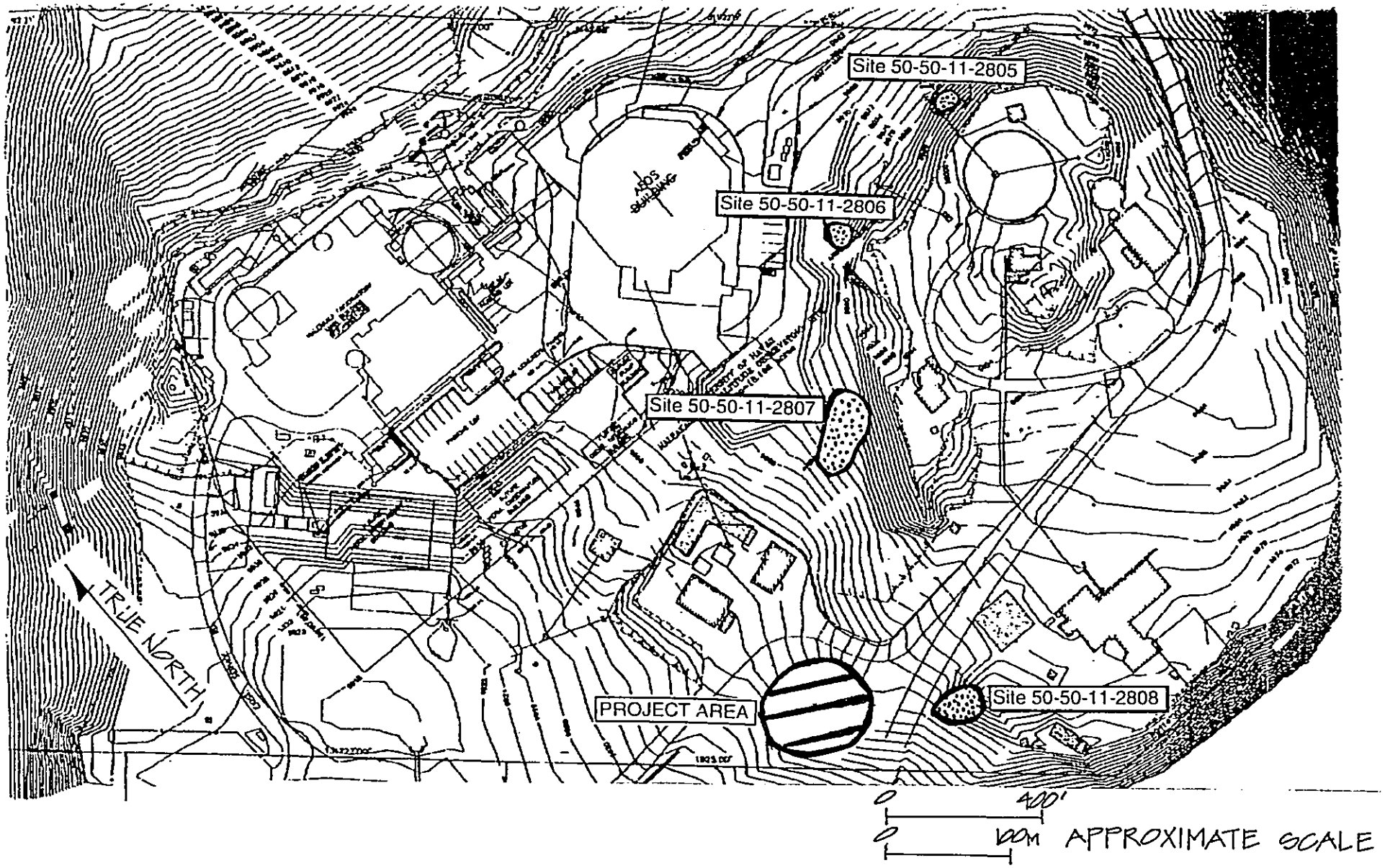


Figure 4 Project Area Map Showing Previously Recorded Sites in the Immediate Vicinity.

2. Limited subsurface testing was conducted in site 50-50-11-4836 to determine location, boundaries, depth and quantity of cultural materials, if any, within the archaeological site, and to ascertain if datable samples for chronological information were available.

3. Research on historic and archaeological background, including a search of historic maps, written records, and Land Commission Records was undertaken. The research focuses on the specific area of the project with general background on the *ahupua`a* and district and emphasizes settlement patterns.

4. Preparation of a survey report including:

    a. A topographic map, if available, of the survey area showing all archaeological sites and site areas;

    b. Description of all archaeological sites with selected photographs, scale drawings, and discussions of site function;

    c. Historical and archaeological background sections summarizing prehistoric and historic land use as they relate to the archaeological features;

    d. A summary of site categories, their site significance in an archaeological and historical context;

    e. Recommendations based on all information generated which specify what steps should be taken to mitigate impact, if any, of development on archaeological resources, such as data recovery (excavation) and preservation of specific areas. These recommendations will be developed in consultation with the client and the State agencies.

C. Methods

The archaeological inventory survey was conducted on March 31, 2000 and December 7, 2000 by Cultural Surveys Hawaii archaeologists, Douglas Borthwick, B.A., Ka`ohulani McGuire, B.A., Brian Colin, B.A. and Tom Devereaux, B.A. They were met by Dr. Charlie Fein of KC Environmental, Inc. who oriented them to the project area on the UH Research Facility. 100 % of the 1.5 acre study area was traversed by foot by the field archaeologists spaced 5 m. apart. The survey was begun around the perimeter of the project area and radiated inwards towards the basalt rock outcrop. Visibility was high due to good atmospheric conditions and the sparse vegetation.

The sites identified were recorded and mapped in accordance with standard archaeological guidelines. The records consisted of descriptions of the features and the mapping included a plan view, to scale map of the features. A 50 cm^2 test excavation was placed in one feature, 50-50-11-4836/A. A 50 by 100 cm test excavation was placed in 50-50-11-4836/E. The test units were excavated by stratum, given the strata measured no more than 10 cm in depth. Soils were described and Munsell color descriptions were given for each stratum. The units were excavated to sterile soil and a profile of the test unit was drawn. Photographs were taken to

document the project area, surrounding areas, archaeological features and the test excavation.

During the survey, two previously documented sites (State Site #s 50-50-11-2807 and -2808; Chatters, 1991) were relocated near the project area. The single limpet shell observed during Chatter's survey at Site 50-50-11-2808 was again noted during the present survey.

II. NATURAL SETTING

Papa`anui Ahupua`a and Haleakalā

The present project area is within the *ahupua`a* of Papa`anui. Papa`anui is a discontinuous *ahupua`a* extending from the shore at Mākena, upslope to Keonehelu summit at about 4000 feet amsl. The boundary then picks up at Pu`u Keokea (7200 feet amsl) on the southwest flank of Haleakalā and continues to the crater rim, across the crater floor, along Kalapawili Ridge, and ends at Pohaku Pahala on the northeastern rim of Haleakalā crater above Paliku. At Pohaku Pahala, Papa`anui Ahupua`a meets with eight *ahupua`a*, one from each district of East Maui (Sterling, 1998:3).

The boundaries of the *makai* portion of Papa`anui Ahupua`a are uncertain. There are no indicated boundaries on the U.S. Geological Survey Maps between Papa`anui and three *ahupua`a* situated to the north, Waipao, Kalihi and Keauhou. Cordy (1978) suggests that only two *ahupua`a* exist in the Mākena area, Ka`eo and Papa`anui, the adjacent place names referring to *`ili* of the two main *ahupua`a*. For the purposes of this study, we will be referring to Papa`anui Ahupua`a as its own *ahupua`a* without the adjacent *`ili/ahupua`a* of Waipao, Kalihi and Keauhou.

Situated on the leeward side of the island, the climate of Papa`anui Ahupua`a is very arid and the lands are subject to *kona*, or south blowing winds and storms. Rainfall in Papa`anui ranges from 40 cm annually in the coastal lowlands to 75 cm in the uplands to 100 cm near Haleakalā summit (Giambelluca *et al.* 1986).

Soils in the project area are classified as Cinder land (rCl) and are typical of the Haleakalā National Park area. These soils are bedded magmatic ejecta associated with cinder cones such as Pu`u Kolekole, the location of the project area. The soils consist of a mixture of cinders, pumice and ash, are multi-colored, jagged and sharp in texture (Foote *et al.*, 1972).

Haleakalā is an oceanic type shield volcano. The shield building lavas are known as the Honomanu Volcanic Series (Macdonald and Abbott 1970), are tertiary in age, and are exposed today in only a few localities along the north and northeast sea cliffs and in Ke`anae Valley. Elsewhere, including in the project area, lavas of the Honomanu Series are buried deep beneath lavas of the Kula Volcanic Series, of Pleistocene age. The Kula series is composed predominantly of *`a`a* lava flows 20 feet to 50 feet thick, and eruptions were explosive to the extent that many large cinder cones were formed and beds of ash are common. More recent rocks of the Hana Volcanic Series mantle the Kula Series at the east and southwest ends of Haleakalā, in the project area. Cinder and spatter cones along the rift zone and pyroclastic debris from the rejuvenated volcanics of Haleakalā (the Kula and Hana Volcanic Series's) have completely covered the terrain, the debris ranging in size from Pele's tears to huge boulder bombs.

III. HISTORIC BACKGROUND

A. Honua`ula District, Mākena Area

1. Pre-Contact and Early Contact Periods

There are few references in the literature specific to the *ahupua`a* of Papa`anui. Rather, the *makai* portion of Papa`anui Ahupua`a is better known as part of the Mākena area within the ancient district of Maui named Honua`ula. Because of its unique discontinuous nature, Papa`anui Ahupua`a has two rather distinct settlement patterns, one relating to the *makai* portion of the *ahupua`a* and the second relating to the *mauka* portion of the *ahupua`a*, including a portion of the flanks, summit area and interior crater of Haleakalā.

Very little is known of the early post-contact period of Honua`ula. As in neighboring Kula District and throughout Hawai`i, those of Honua`ula were sure to have suffered depopulation and demographic shifts brought on by disease and the changing economy introduced by the *haole* (Kolb and O'Clary, 1997). Based on missionary censuses, Honua`ula suffered a 43% population decline, from 3,340 inhabitants in 1832 to 1,911 in 1835-36 (Woodbridge, 1832: 190-191). Internal warfare, begun prior to western contact, seemed to have affected the settlement of Honua`ula as well. "In the year 1776 Ka-lani-`opu`u and the chiefs returned to war on Maui, and in the battle with Ka-hekili's forces at Wailuku were completely overthrown. The army landed at Keone-`o`io, their double canoes extending to Mākena at Honua`ula. There they ravaged the countryside, and many people of Honua'ula fled to the bush" (Kamakau, 1961:85). The abandoned village of Keone-`o`io, recorded during Walker's survey of Maui in the 1920s (Walker, 1931), may have been one of the results of the upheaval. Whichever the factors leading to depopulation of the area, even as early as the 1790s, the Honua`ula lands were described as appearing "barren and thinly inhabited" (Menzies: in Sterling, 1998:215).

During the Mahele, ten people claimed lands within Papa`anui. Although, only two were awarded lands, Nahualaalau (LCA 2566) and Ohule (LCA 2505), the number of claimants suggests Papa`anui lands were in demand during this period. These LCAs record the continued cultivation of indigenous crops such as taro and sweet potato as well as the adoption of the newly introduced Irish potatoes. Numerous references to pasture lands infer that by 1847 there were large numbers of cattle ranging in Papa`anui and adjacent *ahupua`a*. In addition to agricultural use, one award claims a house site in Papa`anui indicating some were still inhabiting the areas they were cultivating.

Environmental degradation in Honua`ula also played an important role in determining post-contact land use patterns. Deforestation, begun in pre-contact times and aggravated by the indiscriminate clearing of sandalwood and the introduction of cattle led to the decline in cultivation practices in the Honua`ula district. Handy (1940) documents the decrease in dry taro production in east Honua`ula and the decrease in sweet potato cultivation at Mākena:

> Makena is today a small community of native fishermen who from time to time cultivate small patches of potatoes when rain favors them. Formerly, before deforestation of the uplands, it is said that there was ample rain in favorable

> seasons for planting the sweet potato, which was the staple here. A large population must have lived at Makena in ancient times for it is an excellent fishing locality, flanked by an extensive area along shore and inland that was formerly very good for sweet potato planting and even now is fairly good, despite frequent droughts (Handy and Handy, 1972: 159)

A resurgence of sweet potato production occurred in the adjacent Kula District with the onset of the whaling industry and the California Gold Rush in the mid-nineteenth century (Kolb and O'Clary, 1997). Despite its restrictive climatic conditions, the residents of Mākena and neighboring areas most likely benefitted from these industries particularly given their proximity to the Mākena Landing, which was used to ship produce to Honolulu (Kolb and O'Clary, 1997: 62). Built by `Ulupalakua Ranch's first owner, Linton L. Torbert, between 1845 and 1850, the Mākena Landing and `Ulupalakua-Mākena road became symbols of economic prosperity in the last half of the 19th century (Dobyns, 1988: 13). Apparently, the Landing and the road were constructed in Ka`eo, but later were moved to Papa`anui for unknown reasons (Cordy & Stephens, 1985:13). This infrastructure led to new schools and churches, the introduction of new ethnic groups to labor on the `Ulupalakua Ranch, a lucrative inter-island trade network and generally a "sustained ranch-coastal interaction" (Cordy & Stephens, 1985: 13-14). Under new owner James Makee, sugar cane became big industry at `Ulupalakua (renamed Rose Ranch) by 1858. After years of unpredictable weather conditions and drought, sugar cane was replaced by cattle ranching in the 1880s. Ranching continued into the 20th century as `Ulupalakua Ranch passed through many hands. After World War II and Statehood in 1959, the Mākena area turned to tourism.

B. Honua`ula District/ Haleakalā

1. Legendary Accounts

The name Haleakalā and its popular translation, The House of the Sun, is actually thought to be a misnomer. Earlier translations of Haleakalā include Aheleakala and Alehe-la, in reference to the demigod Maui, snaring the sun in his effort to change the sun's course so that his mother's *kapa* could have time to dry (Fornander, 1916/17:5:534,538). Haleakalā has always had a special significance for Hawaiians. Inez Ashdown (1971: 30) comments on the uniqueness of Haleakala: "Ha-le-a-ka-la means *consecrated* to, or by, the sun, or a sacred place of rejoicing because Wa-na-ao, the Dawn, brings the new day from the mountain mass. Life-beginning and Dawn are of the East or Ka-hi-ki-na. Day and light "die" in the west or Ko-mo-ha-na, and are synonymous with death. Both sunrise and soul-rising-again, at dawn, symbolized the new-birth of the immortal soul."

Haleakalā is also linked to the Goddess Pele. Several geographic landmarks in the crater make reference to Pele. Pele's oldest brother, the shark God Kamohoalii, was said to inhabit the highest cone in the interior of the crater (Cobb: in Sterling, 1998: 260). A cone in the crater is named Puu Pele and another, Ka- Moa-a-Pele. West of Halalii is Pele's pig pen (*Ibid:* 263).

There is also reference to the residents of Honua`ula belonging to the "Clan of Pele". "The Maui people living on the semi-arid slopes (the great *`uala* area of Maui), who threw their bundles into the pit of the extinct volcano were presumably of the "Clan of Pele" (Handy and Handy, 1972: 336-337). The pit of the extinct volcano most likely refers to the Kaawa Burial

Pit at Haleakalā, "a place for the common people to deposit the bodies of their dead, which served Makawao, Kula and Kaupo" (Kamakau: in Sterling, 1998: 265).

Legends of the historic period lava flows in Honua`ula also attest to a relationship between Pele and the Honua`ula inhabitants. One such legend refers to an old woman who appears before a family asking for a chicken to eat. The family refuses the old woman a chicken on the grounds they have made a vow that no one should eat a chicken until they had sacrificed some to Pele. The old woman (Pele in disguise), becomes furious and chases after the family in the form of a lava flow. Pele turns the family members into stone, the mother and daughter up *mauka* and the father and son *makai.*(Thurston: in Sterling, 1998: 225). The chicken in this legend may have some connection with the landmark in Haleakalā crater, Ka-Moa-a-Pele. These legendary accounts and placenames attest to relationships people maintained with Haleakalā mountain in the domain of the sacred, including death and ancestor worship.

2. Traditional Accounts

Haleakalā has long been recognized as a traveling route connecting East and West Maui. Kihapi`ilani, *ali`i nui* of a united Maui in the sixteenth century, completed the construction of a trail around the island, including over Haleakalā, thus uniting the politically important districts of Hana and Kaupō with West Maui. "This trail was used as a rapid communication network and to facilitate the movement of armies from one end of the island to another" (Fornander: in Kolb, 1997:19).

Traditional accounts also exist of the use of Haleakalā in rites of passage such as birth and death. Haleakala's connection to a symbolic rebirth is reflected in the traditional Hawaiian practice of *piko* storing. A pit at Haleakala named Na Piko Haua was still being used by Kaupo residents in the 1920s to store their offsprings' umbilical cords (Krauss, 1988). Peoples of Honua`ula buried their dead in Haleakalā crater (Handy and Handy, 1972). Several references specify burials of both chiefs and commoners in Haleakalā crater (Ka`ai`e, Kamakau: in Sterling, 264-265). One special place in Haleakalā crater was used to dispose of the dead and seems to be associated with burial of commoners:

> This pit of Kaaawa was, like that of Waiuli, a place for the common people to deposit the bodies of their dead, and served Makawao, Kula and Kaupo... (Kamakau: in Sterling, 1998: 265)

> The bodies are prepared thus, just as it has been described...Upon reaching the pit, the relative of the dead calls to a departed ancestor within, "So-and-so, here is your child." If the body (tossed in) falls into the water, he has no relative in this pit, but he who has a relative is caught as his corpse is thrown in. It lands on a ledge and does not drop into the water. After the corpse vanishes, the bearer returns home after which there is much crying and mourning...(Ka`ai`e : in Sterling, 1998: 264).

Descriptions of Haleakalā by early voyagers did not refer to Haleakalā's most majestic qualities. During one of Captain Cook's voyages, he writes a description of Haleakalā, "an elevated hill appeared in the country, whose summit rose above the clouds. The land, from this hill, fell in a gradual slope, terminating in a steep, rocky coast..." (Cook, 1993: 258). A

second description written by Edward Bell on Vancouver's first voyage is equally non-flattering: "...the south shore...had by no means a very inviting appearance, -it was remarkably high and seemed extremely barren; -from the top of the Mountains to the waters edge are deep Gullies or ruts form'd I suppose by the water running down, -and there appeared but little wood on this side (except towards the Top) and as little Cultivation, here and there we saw a few Huts and a small Village, several of which appeared half way up" (Bell: in Ruhle, 1959: 25).

Post-contact travel to Haleakalā by *haole* was mostly limited to expeditions and sight seeing. The first recorded ascent made by *haole* was in 1828 by three men associated with the Lahaina Mission, Richards, Andrews and Green (The Missionary Herald, 1829). They made general observations of the resources found along the way including timber and the famed silversword, which they referred to as "a plant which grew to the height of six or eight feet, and produced a most beautiful flower" (*Ibid*: 247). In 1841, a team from the United States Exploring Expedition ventured up Haleakalā studying and documenting the plants, natural landscape, geology and other ecological aspects of Haleakalā. The expedition team noticed evidence of travel near the summit in the form of bullock tracks (Wilkes, 1845: 252-256) suggesting the continued usage of Haleakalā for transport and traversing East Maui. Although, the *haole* continued expeditions up Haleakalā throughout the 1800s, there's was a pursuit of curiosity, and perhaps science. Meanwhile, there is evidence that Hawaiians continued to ascend Haleakalā throughout the 1800s not only for its popularity as a traveling route, but also for its ceremonial significance. Handy and Handy (1972: 336) report the residents of Kula and Honua`ula traveled to Haleakalā's summit "during the nighttime to toss into the crater the bones of their dead".

Cattle ranching occurred on the slopes of Haleakalā in the late 1800s. Louis von Tempsky, an immigrant of New Zealand of Scotch and Polish ancestry, managed the sixty thousand acre Haleakalā Ranch and drove his cattle to Haleakalā during the summer months to fatten them (von Tempsky, 1940). Apparently, von Tempsky had a stone corral built at the foot of Kolekole, in the vicinity of the current project area, however, there is no evidence the corral remains today. Also in the late 1800s, Haleakalā was recognized as a scenic feature and funds were raised to erect an overnight shelter. In 1916, U.S. Congress allotted 21,000 acres at the summit of Haleakalā as part of the Hawaii National Park. The Park officially opened in 1921 and operated peacefully for twenty years until the U.S. Army began seeking sites for "unspecified defense installations" in 1941 (Jackson, 1972: 130). There is some indication the Army was using the Kolekole site as early as 1941-2 (Personal Communication, Charlie Fein, April, 2000). After being granted a "Special Use Permit" the Army installed equipment at Red Hill. By 1945, the U.S. Army had installations on both Red Hill and Kolekole Peak, just outside of National Park boundaries. These installations were utilized until the end of World War II and intermittently thereafter including during the Korean War. Between 1955 and 1958, the University of Hawaii and the U.S. Air Force shared use of the Red Hill Facilities. By 1960-1961, University of Hawaii was operating its geophysical observatory at the Kolekole location (Jackson, 1972: 131).

Today, the University of Hawaii continues to operate its facilities on the 18 acre parcel including the MEES Solar Observatory, focusing on the energetic activity of the solar corona and the LURE Observatory, dedicated to using lasers to determine distances to satellites (Murphy, 1995: 69). In addition, classified and defense related projects are currently directed

by the U. S. Air Force, including the operation of MSSS (Maui Space Surveillance Site). The main objective of MSSS is to perform satellite imaging (Murphy, 1995: 70).

IV. PREVIOUS ARCHAEOLOGICAL WORK

A. Papa`anui/Mākena

Most of the previous archaeology in the Mākena area is concentrated in the *ahupua`a* adjacent to Papa`anui, Ka`eo, Waipao, Kalihi and Keauhou. Early archaeology in Maui addressed the larger sites like *heiau* and fishponds. During Walker's survey of Maui sites, he recorded a *heiau* in Papa`anui, Pohakunahaha Heiau, Site 50-50-14-197 (Walker, 1931). Coastal development in the 1970s precipitated numerous archaeological surveys and small data recovery projects in the Mākena region, though just a few incorporated portions of Papa`anui (Sinoto, 1978a; Sinoto, 1978b; Sinoto and Rogers-Jourdane, 1979). No sites were located in Papa`anui, though several were recorded in adjacent Waipao and Kalihi Ahupua`a. Site types included walls, midden scatters, enclosures, platforms, terraces, a cemetery and a canoe shed. Preliminary archaeological testing in the area indicated frequent, periodic utilization of coastal areas starting from late prehistoric period and continuing into historic times (Sinoto and Rogers-Jourdane, 1979). Further excavation work of the same parcel provided evidence for permanent or semi-permanent coastal residence focusing on obtaining marine resources and cultivating small agricultural plots (Dobyns, 1988). An inventory survey conducted in Papa`anui (in this report Papa`anui is considered to encompass the "`ili" of Waipao and Kalihi) yielded six sites, 50-50-14-3513-3518 (Chaffee and Spear, 1994). These sites were consistent with other sites identified in the general Mākena area in that they constituted temporary and permanent habitation areas, agricultural areas and activity areas. In our research, no record of archaeological work in the uplands of Papa`anui was found.

B. Papa`anui/Haleakalā

Several surveys were completed for the Haleakalā Region, the most extensive being Kenneth P. Emory's *An Archaeological Survey of Haleakala* (Bishop Museum: 1921). Emory recorded 58 terraces and platforms, 9 groups of shelters, several hundred *ahu*, and a section of ancient paved road (Emory, 1921: p.256), mostly within Haleakalā crater, but some on the crater rim. A group of 8 or 9 shelters and many small *ahu* were identified between Red Hill and Kolekole Hill, although their exact locations remain unknown (Emory, 1921: 254). Emory suggested one function of the terraces and platforms may have been as altars peculiar to the Haleakalā region.

Approximately 35 of the archaeological sites identified during Bishop Museum's survey are found in Papa`anui Ahupua`a. These are distributed along the crater rim and within the crater. Several walled shelters were found on White Hill (Pakaoao) and Red Hill, such as State Site # 50-50-11-3637 (White Hill) described as partially terraced enclosures covered with slingstones. Predominantly cairns (e.g. Site # 50-50-11-3658) and enclosures (e.g. 50-50-11-3661) were identified along the Crater Rim. A series of *ahu* and shelters were (State Site # 50-50-11-3609) recorded along the portion of Halemauu Trail which traverses Papa`anui. Several platforms, such as State Site 50-50-11-3611, are scattered along the paved Kihapi`ilani Trail (State Site # 50-50-12-3610) in Papa`anui. The Ka`a`awa burial pit

(50-50-12-3640) and what is today known as "Hunter's Cave" (50-50-11-3624) are also sites located within Papa`anui Ahupua`a along the Haleakalā crater floor.

Winslow Metcalf Walker, in his survey entitled the *Archaeology of Maui* (Bishop Museum: 1931), discusses a heiau on Summit 1 (named Haleakalā) on the southern ridge of Haleakalā Crater in the neighboring *ahupua`a* of Kahikinui. A trail from the Nu`u district, discussed in Emory's report, leads to the same peak on which the *heiau*, identified as Kemanono by Emory (Heiau site 229; State site 50-50-16-3626; Bishop Museum number MH-41), is located.

In 1963, Lloyd J. Soehren conducted *An Archaeological Survey of Portions of East Maui* (Bishop Museum: 1963). This report calls Emory's work "extensive", and focuses on the structural and functional interpretations of the sites within and around the perimeter of Haleakalā crater. Based on an early radiocarbon date obtained from Holua Cave (located along the Halemau`u Trail on the north side of the interior of the crater), Soehren suggests this region was being used prior to 1000 A.D. The Haleakalā region is described as being primarily used as a traveling route from one side of the island to the other, although Soehren also mentions bird hunting, and place of refuge for war victims as possible uses. He points toward the numerous *ahu* and stone shelters as evidence for cairns, markers, shrines and wind breaks associated with traveling. Several archaeological sites were ascribed with such traditional Hawaiian practices as umbilical cord offerings, ritual and family burial rites and the collection of raw materials for adze making (Soehren, 1963: 111-116).

Inez Ashdown describes eleven Emory sites she visited within Haleakalā in her account *Ke Alaloa O Maui* (Ashdown: 1971). Paul Rosendahl (1975) completed an archaeological reconnaissance for the proposed Haleakala Highway Realignment Corridor. He reported 7 sites along the highway realignment corridor including cave shelters, a platform, cairns and walled shelters (Rosendahl 1975: 4). None of the sites found is in the present project area.

In 1991, J.C. Chatters conducted a cultural resource inventory and evaluation for 7.7 acres associated with the expansion of the Maui Space Surveillance Site located in Science City (Chatters, 1991). Chatters' survey included the 1.5 acre parcel of the present project area. J.C. Chatters inventories four sites at the proposed location for MSSS expansion, Sites 50-50-11-2805 through 50-50-11-2808. Although, the sites at Science City show archaeological resources in the immediate vicinity, no sites were identified in the current project location. The recorded sites consist of 23 shelters and a wall segment. A slingstone was found at site 50-50-11-2807 and a limpet shell was identified at site 50-50-11-2808 (Chatters, 1991:13). The site nearest the present project area (approximately 45 m away) consists of three shelters constructed against boulders and outcrops with leveled, rectangular to trapezoidal shaped floors (Chatters, 1991: 10). Archaeological sites located at the summit region are interpreted as prehistoric temporary shelters made by travelers passing through the region. No further archaeological work was deemed necessary because the proposed construction was not to affect the newly recorded sites.

Further work was conducted in Papa`anui in 1995 (Fredericksen *et al.*, 1996). During an archaeological inventory survey of the GTE Hawaiian Telephone Haleakala Fiber Optics Ductline, Phase III proposed easement corridor, four sites were located. None of the sites were found near the project area nor were any found in the surveyed portion of Papa`anui Ahupua`a.

Field inspection of localities at Haleakalā for the installation of Remote Weather Stations included one locality within Papa`anui Ahupua`a (Folk, 1997). A low L-shaped wall was identified on the north slope of Hanakauahi. This was interpreted to be temporary shelter or hunting blind for goat hunters and the REMS installation was not to impact the shelter.

The principal site types at Haleakalā such as trails, platforms, adze quarries, caves, temporary shelters and cairns, seem to be associated with topographic or geomorphic locations (Chatters, 1991). Platforms are predominantly found along the crater floor. Caves are often found on the crater rim. Temporary shelters built against rock outcrops or boulders are found scattered along the crater rim and within the crater, but are concentrated on the leeward sides of cinder cones such as Pakaoao. Cairns are scattered over Haleakalā.

V. SETTLEMENT PATTERNS AND EXPECTED FINDS

A. Papa`anui/Mākena

The archaeological record of the Mākena area suggests that settlement had spread to the leeward Honua`ula region by the Consolidation Period (AD 1400-1500) [Kolb *et al.*, 1997]. Several significant features identified along the coast such as *heiau*, fishponds, permanent habitation sites and associated burials suggest large scale settlement along coastal regions of Honua`ula (Hayden, 1997). However, the lack of upland archaeological studies in addition to the presence of numerous upland *heiau*, foot trails, and extensive upland, dryland field systems in adjoining districts point towards a settlement pattern based on the permanent use of both the upland and coastal environments.

B. Papa`anui/Haleakalā

The relationship between the *makai* and *mauka* portions of Papa`anui Ahupua`a is uncertain. The popular understanding of an *ahupua`a* as a radial land division providing resources from the forested uplands, the agricultural lands and the ocean does not readily apply to Papa`anui Ahupua`a, particularly the Haleakala region. Given its unique geography, the use of the *mauka* portion of Papa`anui Ahupua`a was probably not restricted to purely resource collection or to use by only Honua`ula residents. Although alpine resource exploitation and procurement of basalt material for tool manufacture may have tempted people to make the long trek, the spiritual element was also important, as reflected in the types of archaeological sites honoring birth and death. There is some indication that residents from all over East Maui were utilizing

the same places at Haleakalā for traveling routes, disposing their dead, storing their children's umbilical chords, hunting birds, etc... This suggests that although Papa`anui may have extended into Haleakalā crater, the places of Haleakalā were used, traversed, collected, and honored by all of Maui and particularly by those of East Maui.

By far, the most ubiquitous features at Haleakalā are the enclosures and *ahus* or cairns. The prehistoric settlement pattern for the rim and crater of Haleakalā links these structures to travelers, warriors or hunters who used the *ahu* or cairns as markers, and the enclosures and walls as windbreaks and temporary shelters. The platforms found elsewhere in the crater are generally construed as altars for religious purposes or special places for hunting and gathering within the crater (*i.e.* adz material, birds, plants). Other landmarks, cinder cones, and caves on the crater rim and within the crater are also associated with religious activities.

In historic times, goat hunters have also built blinds and windbreaks in the crater and visitors are known to have built little cairns as mementos of their trip. It is often difficult to discern whether these structures are historic or prehistoric as there is no evidence of cultural material.

Because the entire 18 acre University of Hawaii parcel has been previously surveyed (Chatters, 1991), we do not expect to find archaeological material. However, if archaeological sites are found, they will most likely be associated with the Kolekole "shelters" discussed in early twentieth century references or with U.S. Army use of the site in the 1940s. Temporary shelters with walls constructed on the leeward faces of boulders and cliffs are common to cinder cones on Haleakalā Crater Rim, such as Pakaoao where there are five clusters of walled shelters (State Site #s 50-50-11-3637, 50-50-11-3645-3648). One group of walled shelters (State Site # 50-50-11-3644) was found at nearby Red Hill during the Bishop Museum survey in the 1920s (Emory, 1921). Chatters (1991) identified four such shelters during her survey of Kolekole Cinder Cone and the UH Research Facility (State Site #s 50-50-11-2805-2808).

VI. SITE DESCRIPTIONS AND TEST EXCAVATION

The archaeological inventory survey located two sites in the project area (Figure 5), State sites 50-50-11-4835 and 50-50-11-4836. Both sites were constructed against an exposed rock outcrop centrally located in the project area.

State Site #50-50-11-4835

General Description: Site 50-50-11-4835 consists of two features, two rock enclosures built against the west side of the exposed rock outcrop. The ground extending north and west of the enclosures has been disturbed by a bulldozer in the past and is strewn with modern trash such as glass, metal and aluminum cans (Figure 5).

Feature #:	50-50-11-4835/A
Feature Type:	Rock Enclosure
Feature Function:	Trash Burning Pit
Length:	2.5 m

Description: Feature 50-50-11-4835/A is a rock enclosure built against the east face of the exposed rock outcrop. The walls of the enclosure are loosely stacked 2-3 coarse high, small, angular basalt boulders. The floor consists of a relatively level mixture of cinder soil, ash and half burnt modern trash including rusted metal, nails, light bulbs, "no refund" bottles, aluminum foil and wire. The enclosure measures 2.5 m N/S and 1.85 m E/W and the walls range from 40-60 cm high. The enclosure is interpreted as a trash burning pit used from historic times up until modern times.

Feature #:	50-50-11-4835/B
Feature Type:	Rock Enclosure
Feature Function:	Trash Burning Pit
Length:	2.7 m

Description: Feature 50-50-11-4835/B is a rock enclosure which abuts a western extension of the basalt rock outcrop. The walls are loosely stacked, angular basalt boulders, 2-3 coarses high with some mortar reinforcement. The enclosure floor consists of a mixture of cinder soil, ash and modern trash including light bulbs, glass, aluminum cans, bottles, fiber glass, and plastic. The dimensions of the enclosure are 2.7 m E/W and 1.9 m N/S and the walls range from 35-40 cm high. This enclosure is interpreted as a trash burning pit used from historic times up until modern times.

State Site # 50-50-11-4836

General Description: Site 50-50-11-4836 consists of three terraces, a rock enclosure two leveled areas and a rock wall all constructed against an exposed rock outcrop. All the features are located on the south and southwest sides of the exposed rock outcrop, well protected from the prevailing northeast trade winds with the exception of the two leveled areas, which are located on the northwest side of the outcrop. The material used in construction of the features was

derived from the exposed rock outcrop located in the center of the project area (Figures 5, 7).

Feature #:	50-50-11-4836/A
Feature Type:	Terrace
Feature Function:	Temporary Habitation
Length:	4.5 m

Description: Feature 50-50-11-4836/A is a semi-circular terrace built into a slight overhang on the southwest face of the exposed rock outcrop (Figures 5, 10). The outer wall construction of the terrace consists of stacked 2-3 coarse high small to medium sized, angular basalt boulders. The floor of the terrace was filled with soil, cinder and small angular cobbles and somewhat level with the outer walls of the feature. The terrace measures 4.5 m NW/SE, 2.0 m NE/SW and 70 cm high. Cultural material found on the terrace floor include modern trash such as metal banding, glass fragments, and a wooden post. This feature is interpreted to be a prehistoric temporary habitation feature.

One 50 cm^2 test unit was excavated in Feature -4836/A. The test unit was excavated by natural strata to 50 cm below surface. No cultural material or layers were discovered other than a modern nail at 2 cm depth. Stratum I was 2 cm in depth and consisted of 10YR 5/3 brown, loose, silty cinder with a few cinder pebbles and < 15% rootlets. One modern nail was discovered at 2 cm depth. Stratum II extended to 10 cm below surface and consisted of 10 YR 6/6 brownish yellow silty cinder with approximately 5-15% cinder pebble inclusions and < 10% rootlets. Stratum III extended from 10-15 cm below surface and was composed of 7.5 YR 3/2 dark brown loose cinder. Stratum IV extended from 15-50 cm below surface and was composed of 2.5 YR 4/4 reddish brown, 40-50% red cinder cobbles in a loose silty cinder matrix (Figures 6, 11).

Feature #:	50-50-11-4836/B
Feature Type:	Wall
Feature Function:	Temporary Habitation
Length:	2.5 m

Description: Feature 50-50-11-4836/B is a rock wall jutting out from three large basalt boulders weathering out of the south side of the exposed rock outcrop (Figures 5, 12). The rock wall extends 2.5 m N/S, has a width of 0.6 m and ranges from 80 to 100 cm high. The construction consists of 2-4 courses of stacked, angular, basalt boulders and cobbles. No cultural material was found in association with the wall segment. This feature is interpreted to be a temporary habitation feature associated with the Feature -4836/A.

Feature #:	50-50-11-4836/C
Feature Type:	Enclosure/ U-Shape
Feature Function:	Temporary Habitation
Length:	2.5 m

Description: Feature 50-50-11-4836/C is a U-shaped rock enclosure which abuts the south side of the exposed rock outcrop (Figures 5, 13). The wall construction of the enclosure consists of

roughly stacked and piled angular, basalt boulders and cobbles 2-3 courses high. The floor is rock outcrop that slopes slightly to the south. There are scattered basalt cobbles on the floor, probably from weathering of rock outcrop. The enclosure measures 2.5 m E/W and 2.2 m N/S with the height of 30 cm. No cultural material was found in the vicinity of the enclosure. This feature is interpreted as a temporary habitation feature.

Feature #:	50-50-11-4836/D
Feature Type:	Terrace
Feature Function:	Temporary Habitation
Length:	2.5 m

Description: Feature D is a terrace situated below Feature C. Feature D measures 2.5 m E/W by 1.8 m N/S. The terrace combines natural *in situ* bedrock boulders with cobbles and pebbles used to fill in cracks and crevices in between the bedrock boulders to create a retaining terrace wall. Behind this mainly natural retaining wall is a roughly level surface of cinder and loose rocks of various sizes. No midden or artifacts were observed. The feature is interpreted as an associated feature of Feature C temporary habitation shelter.

Feature #:	50-50-11-4836/E
Feature Type:	Terrace
Feature Function:	Temporary Habitation
Length:	13.0 m

Description: Feature E is a large natural terrace situated along the southwest corner of the large outcrop. The feature surrounds Feature A and abuts the west side of Feature B. Feature E measures approximately 13.0 m N/S by 7.5 m E/W. The terrace combines natural *in situ* bedrock boulders with possibly placed boulders an cobbles to create an irregular shaped retaining wall. The retaining wall, which may be natural, retains a semi-level area of cinder. On the surface of the terrace are a number of large boulders, which are scattered in an unorganized fashion. In addition a scatter of broken brown modern bottle glass, a piece of cut medium mammal bone, two tin cans, metal strapping, an aerosol can and pieces of wire were observed on the surface of the terrace. No midden or artifacts were observed. The feature is interpreted as an associated feature of Feature A temporary habitation shelter.

One 50 by 100 cm test unit was excavated in Feature -4836/E. The test unit was excavated by natural strata to a maximum of 75 cm below surface. No cultural material was discovered during excavation or on the surface of the unit prior to excavation. Stratum I was 3 cm in depth and consisted of 10YR 5/3 brown, loose, silty cinder with a few cinder pebbles. Stratum II extended to 20 cm below surface and consisted of 10 YR 6/6 brownish yellow silty cinder with approximately 5-15% cinder pebble inclusions. Stratum III extended from 20-35 cm below surface and was composed of 7.5 YR 3/2 dark brown loose cinder. Stratum IV extended from 35-75 cm below surface and was composed of 2.5 YR 4/4 reddish brown, 40-50% red cinder cobbles in a loose silty cinder matrix (Figures 7). No cultural material or layers were encountered during the excavation.

Feature #: 50-50-11-4836/F
Feature Type: Leveled Area
Feature Function: Indeterminate
Length: 0.8 m

Description: Feature F is a leveled area situated above Site 50-50-11-4835 Feature A. Feature F measures 0.8 m in diameter. The feature consists of a natural depression in the outcrop which has been filled with cinder to create a small level cinder surface. No midden or artifacts were observed. The function of the feature is indeterminate.

Feature #: 50-50-11-4836/G
Feature Type: Leveled Area
Feature Function: Indeterminate
Length: 1.0 m

Description: Feature G is a leveled area situated above Site 50-50-11-4835 Feature A. Feature F measures 0.8 m in diameter. The feature consists of a natural depression in the outcrop which has been filled with cinder to create a small level cinder surface. No midden or artifacts were observed. The function of the feature is indeterminate.

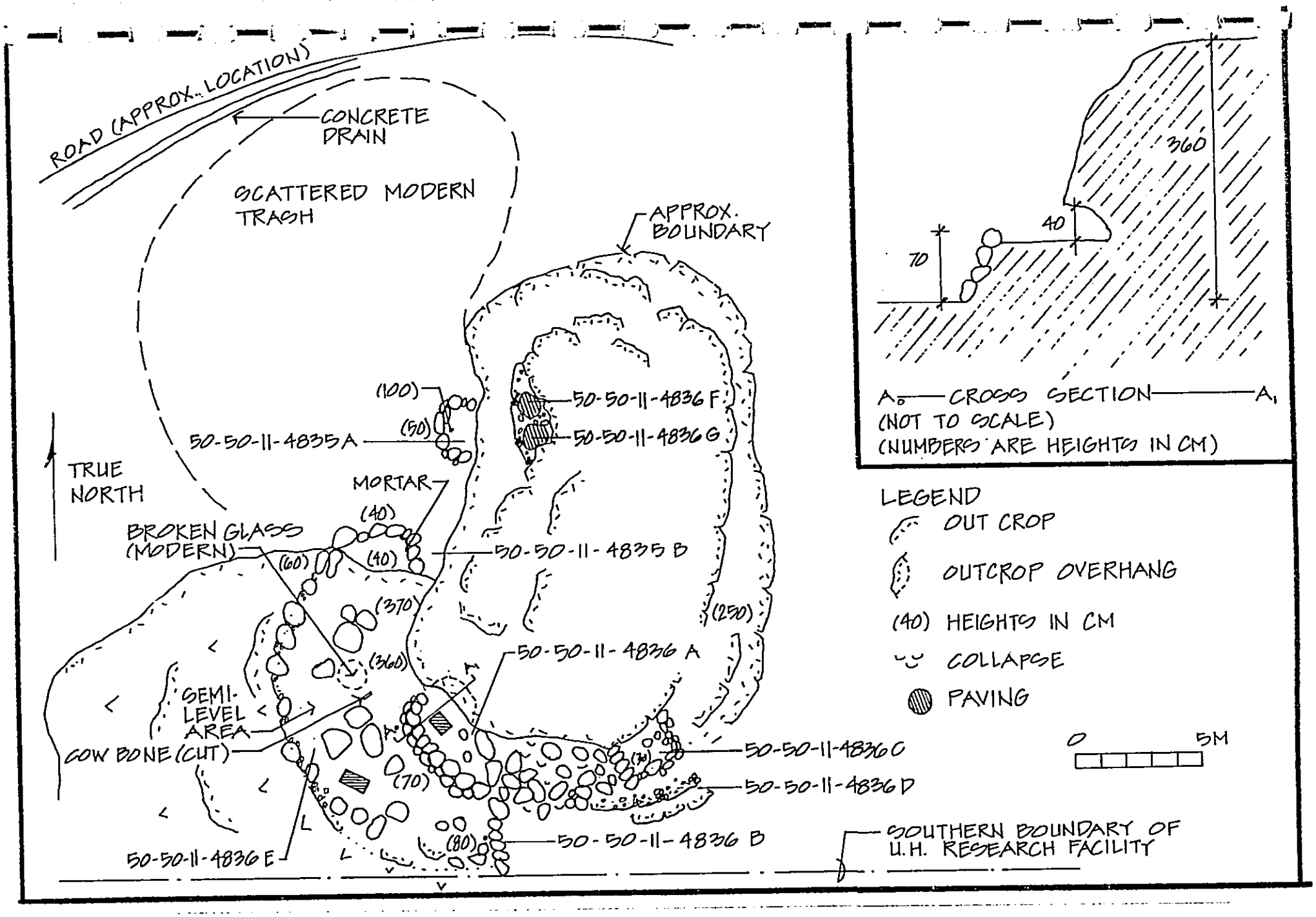
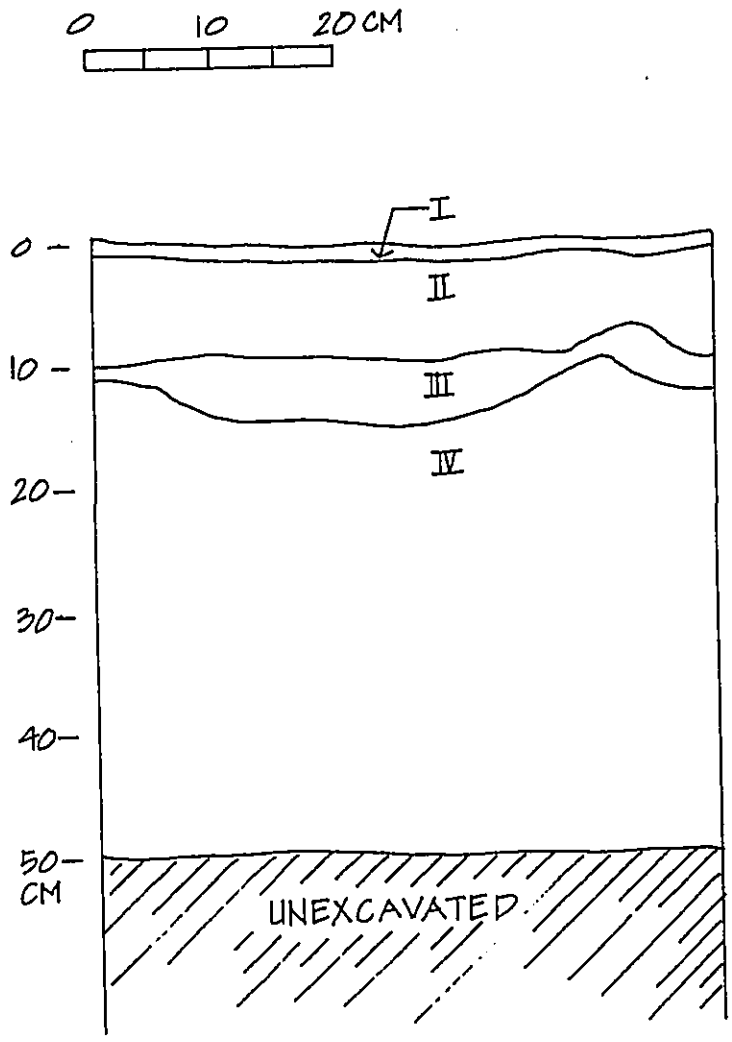


Figure 5 Map of Sites 50-50-11-4835 and 50-50-11-4836



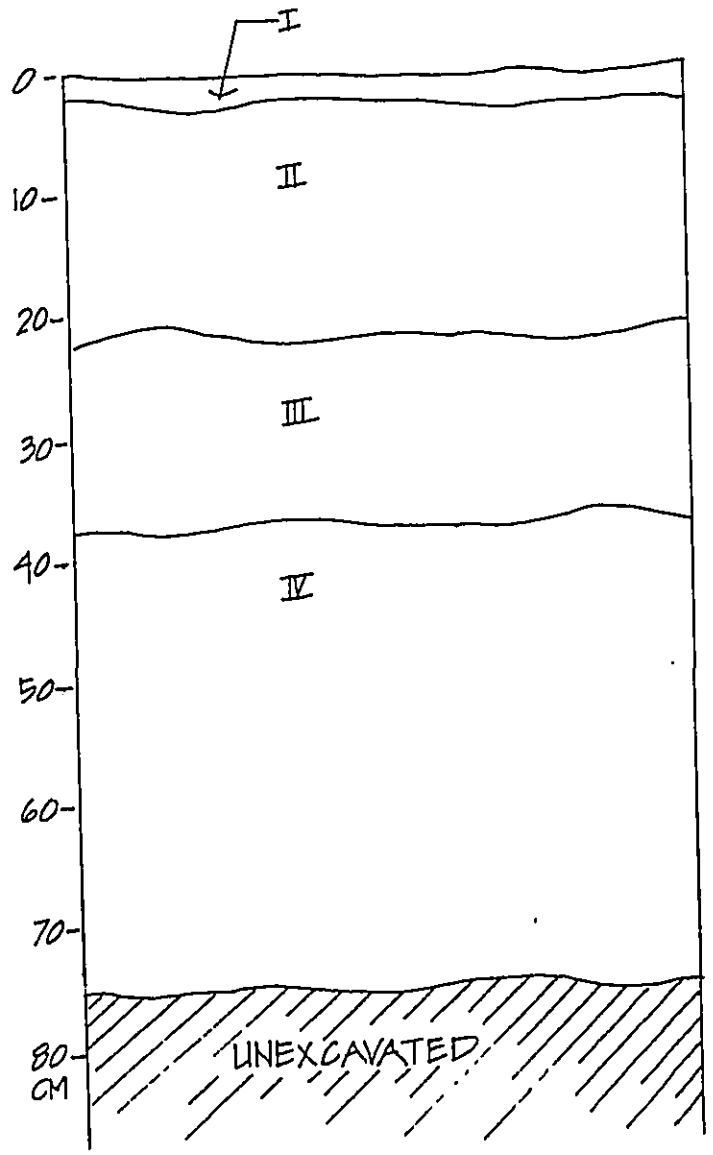
Stratum I: (0-2 cm) 10YR 5/3 brown, loose, silty cinder with few cinder pebbles and < 15% rootlets.

Stratum II: (2-10 cm) 10 YR 6/6 brownish yellow silty cinder with approximately 5-15% cinder pebble inclusions and < 10% rootlets

Stratum III: (10-15 cm) 7.5 YR 3/2 dark brown, loose cinder

Stratum IV: (15-50 cm) 2.5 YR 4/4 reddish brown, 40-50% red cinder cobbles in loose, silty cinder matrix

Figure 6 Profile of 50 cm² Test Unit in Feature 50-50-11-4836/A



Stratum I: (0-3 cm) 10YR 5/3 brown, loose, silty cinder with few cinder pebbles and < 15% rootlets.

Stratum II: (3-20 cm) 10 YR 6/6 brownish yellow silty cinder with approximately 5-15% cinder pebble inclusions and < 10% rootlets

Stratum III: (20-35 cm) 7.5 YR 3/2 dark brown, loose cinder

Stratum IV: (35-75 cm) 2.5 YR 4/4 reddish brown, 40-50% red cinder cobbles in loose, silty cinder matrix

Figure 7 Profile of 100 by 50 cm Test Unit in Feature 50-50-11-4836/E

VII. SUMMARY

An archaeological inventory survey was conducted on an approximately 1. 5-acre parcel at the University of Hawaii Research Facility (TMK 2-2-07:8) near the summit of Haleakalā at Kolekole Hill. The survey, conducted on March 31, 2000, revealed two archaeological sites in the project area, State Sites 50-50-11-4835 and 50-50-11-4836. State Site 50-50-11-4835 consisted of two rock enclosures and State Site 50-50-11-4836 consisted of three terraces, two leveled areas, a rock enclosure and a rock wall. The sites were recorded, mapped, and photographed and two terraces of site 50-50-11-4836 were test excavated. One modern nail was recovered from the test unit at 2 cm depth from the test unit at Feature A.

VIII. SIGNIFICANCE

The two rock enclosures, site 50-50-11-4835, are interpreted as trash burning pits where 55 gallon drums were probably placed and the trash was burned inside the drums, probably used by the U.S. Army in the 1940s and intermittently thereafter including by the University of Hawaii in modern times. The trash remnants appear to post-date 1940. This site is considered significant under "D" criterion based on its information content about historic military activities at Kolekole.

Site 50-50-11-4836, consisting of three terraces, two leveled areas, wall and an enclosure, are interpreted as a cluster of different types of prehistoric temporary shelters. All are built on the south or southwestern faces of the exposed rock outcrop providing shelter from the prevailing northeasterly tradewinds. The terrace, 50-50-11-4836/A, exhibited the most substantial construction of the seven features with walls of 3-4 courses of stacked stone and a level cinder surface partially under a small overhang. One 50 cm² test unit was excavated in the interior of the terrace and one modern nail was recovered in the uppermost stratum. There were no culture bearing strata other than Stratum I which contained a modern nail. In addition a 100 by 50 cm test unit was excavated in Feature E. No cultural material was encountered during the excavation. Natural cinder layering was observed in both units. There is no material evidence this site was used in pre-contact times, however the construction style and proximity to other pre-contact shelters on Kolekole and references to Kolekole shelters in early twentieth century accounts, suggest that these shelters are pre-contact in origin. The basalt rock outcrop in the project area is a substantial landmark on Kolekole and would have been a favorable location for temporary shelters. Continued use of this site probably occurred into historic times with travelers, ranchers and hunters. Modern trash identified on the surface and in the top 2 cm of the terrace floor indicates the site was utilized into modern times, probably in association with military or UH research activities. Site 50-50-11-4836 is considered significant for its information content (criterion "D"), because it has and may continue to provide information on the prehistory and history of Haleakalā.

IX. RECOMMENDATIONS

In consultation with the State Historic Preservation Division, the University of Hawai'i Institute for Astronomy is committed to the preservation of the two sites 50-50-11-4385 and 50-50-11-4386 and the associated outcrop. Site 50-50-11-4385 consists of two features understood as modern. Based on the information gathered no further archaeological research appears warranted. Site 50-50-11-4586 has been interpreted as a probable pre-historic temporary habitation site with a number of associated features. Though two test units did not reveal subsurface deposits future research may provide additional information. The specifics regarding preservation of the two sites will be addressed in a preservation plan.

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1973 *Soil Survey of the Island of Hawai`i*, U.S. Government Printing Office, Washington, D.C.

Von Tempsky, Armine
1940 *Born in Paradise*, Duell, Sloan and Pearce: New York.

Walker, Winslow
1931 *Archaeology of Maui*, Manuscript at B.P. Bishop Museum, Honolulu, HI.

Woodbridge, W. C.
1832 *He Hoikehonua* (Geography). Oahu: Nana (sic) Misionari i Pai

1836 *He Hoikehonua* (Geography). Oahu: Mea Pai Palapala a na Misionari.

XI. PHOTO APPENDIX

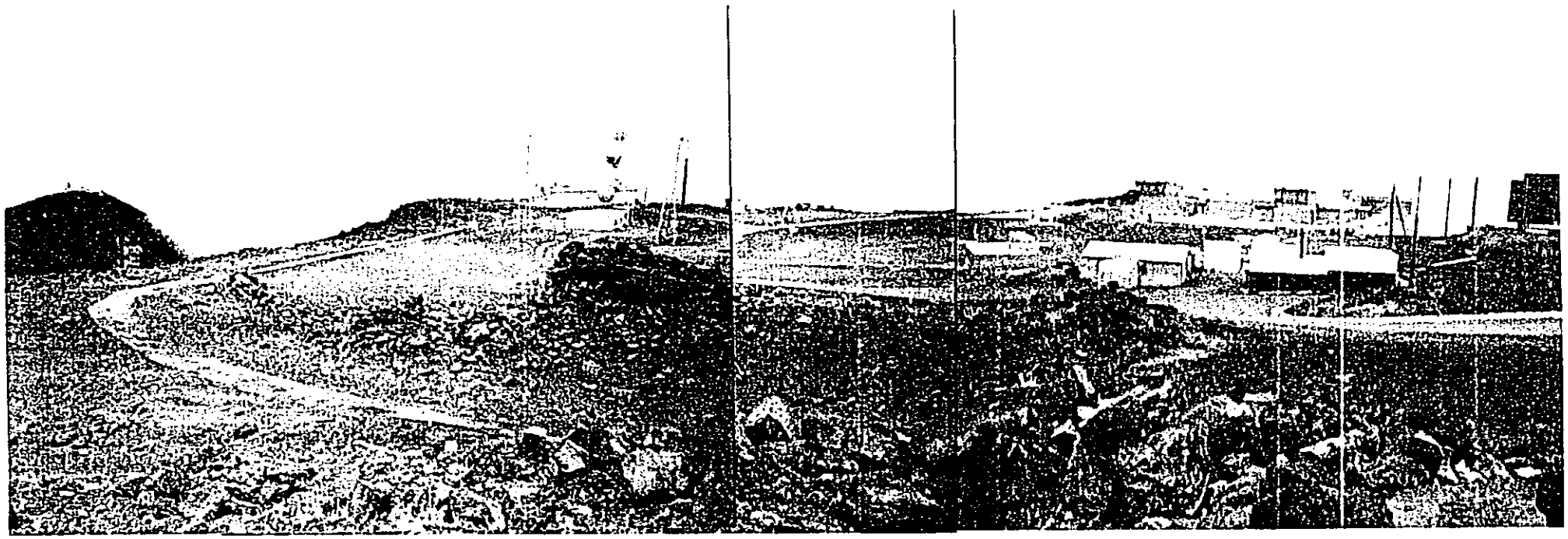

Figure 8 Panoramic View of Project Area Showing Basalt Outcrop and UH and Air Force Facilities in Distance

Figure 9 Photo of Site 50-50-15-4098/A, a Rock Enclosure.

Figure 10 Photo of Site 50-50-15-4098/B, a Rock Enclosure with Mortar Reinforcement and Burnt Modern Trash.

Figure 11 Photo of Site 50-50-11-4836/A, Terrace with Filled Floor.

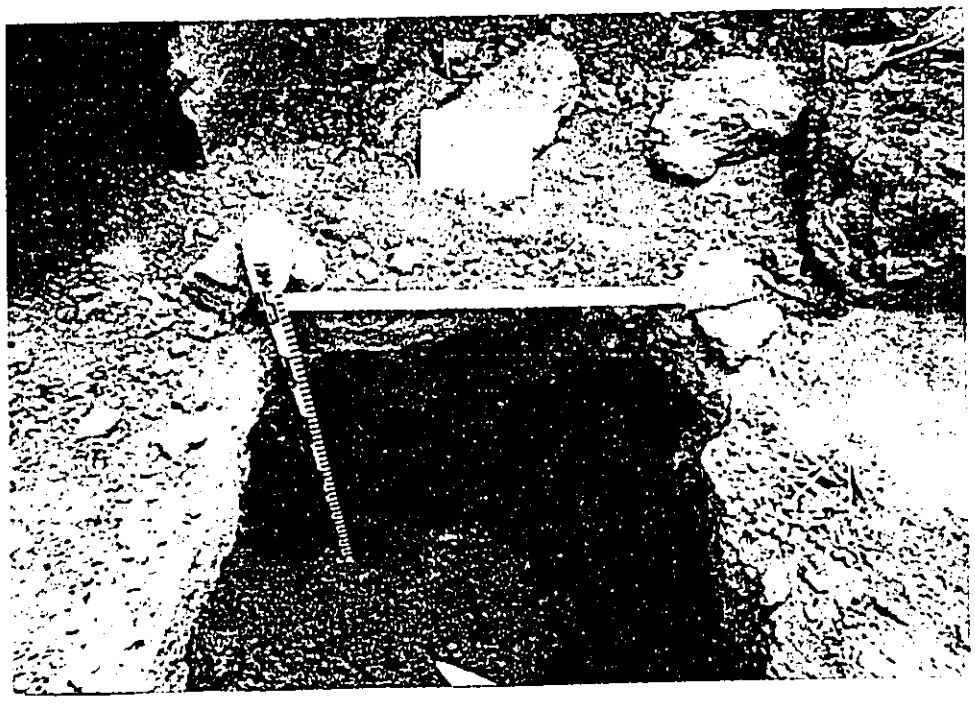

Figure 12 Photo of Profile of Test Excavation in Terrace, Site 50-50-11-4836/A.

Figure 13 Photo of Site 50-50-11-4836/B, Rock Wall Segment.

Figure 14 Photo of Site 50-50-11-4836/C, U-Shaped Rock Enclosure.

APPENDIX H
DLNR REVIEW OF ARCHEOLOGICAL INVENTORY SURVEY

D. HIBBARD
November 29, 2000-May 10, 2001

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

GILBERT S. COLOMA-AGARAN, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DEPUTIES
JANET E. KAWELO
LINNEL NISHIOKA

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS

May 10, 2001

Hallett H. Hammatt, Ph.D.
Cultural Surveys Hawai'i
733 North Kalaheo Avenue
Kailua, Hawaii 96734

LOG NO: 27460
DOC NO: 0105MK03

Dear Dr. Hammatt,

SUBJECT: **Review of Interim Historic Preservation Plan for Sites 50-50-11-4835 and 50-50-11-4836 at the University of Hawai'i Facility at Haleakala, Papa'anui Ahupua'a, Makawao District, Maui**
TMK 2-2-07:8

Thank you for the opportunity to review this plan which was sent to our office on April 17, 2001 (Bushnell and Hammatt 2001, *Interim Historic Preservation Plan for Sites 50-50-11-4835 and 50-50-11-4836 at the University of Hawai'i Facility at Haleakala, Papa'anui Ahupua'a, Makawao District, East Maui, TMK 2-2-07:8*)...CSH ms.

The two sites are recommended for passive preservation. Short term preservation measures are addressed in this report and include the following. Prior to an construction activities in the project area, orange plastic construction fencing will be erected surrounding the site, and no construction will occur within the 50 foot protective buffer. No alteration to the sites will occur.

Long term preservation treatments will be implemented following completion of construction and will be determined in consultation with SHPD as well as members of the local community. It is not necessary to address these issues at this time.

The plan is acceptable. If you have any questions, please contact Dr. Melissa Kirkendall at 243-5169.

Aloha,

Don Hibbard, Administrator
State Historic Preservation Division

MK:jen

DRAFT

Hallett H. Hammatt, Ph.D.
Cultural Surveys Hawai'i
733 North Kalaheo Avenue
Kailua, HI 96734

LOG NO:
DOC NOC: 0101MK01

Dear Dr. Hammatt,

Subject: Review of Revised Archaeological Inventory Survey of 1.5 Acres of the University of Hawai'i Facility at Haleakala
Papa'anui Ahupua'a, Makawao, Maui
TMK 2-2-07:8

Thank you for the opportunity to review the revised report which our staff received on 21December 2000, (Bushnell and Hammatt, 2000, *An Archaeological Inventory Survey of 1.5 Acres of the University of Hawai'i Facility at Haleakala, Papa'anui Ahupua'a, Makawao District, East Maui, TMK 2-2-07:8*).. CSH ms.

This report was revised to address our review letter of 29 November 2000 (Log No 26516, Doc No. 0011MK03). The revisions have adequately addressed our concerns. The report is now acceptable.

Aloha,

Don Hibbard, Administrator
State Historic Preservation Division

cc: John Min, Director, Department of Planning, County of Maui, FAX 270-7634
Ben Rafte, County of Maui, Land Use and Codes, FAX 270-7972

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

TIMOTHY E. JOHNS, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

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WATER RESOURCE MANAGEMENT

November 29, 2000

Hallett H. Hammatt, Ph.D.
Cultural Surveys Hawai'i
733 North Kalaheo Avenue
Kailua, HI 96734

LOG NO: 26546 ✓
DOC NO: 0011MK03

Dear Dr. Hammett,

SUBJECT: Review of An Archaeological Inventory Survey of 1.5 Acres of the University of Hawai'i Facility at Haleakala Pap'anui Ahupua'a, Makawao, Maui TMK 2-2-07:8

Thank you for the opportunity to review this report which our staff received on October 5, 2000 (Bushnell and Hammatt, 2000, *An Archaeological Inventory Survey of 1.5 Acres of the University of Hawai'i Facility at Haleakala, Papa'anui Ahupua'a, Makawao District, East Maui, TMK 2-2-07:8*...CSH ms). We apologize for the delay in response.

The background section acceptably provides a summary of the precontact *ahupua'a* settlement pattern and likely site patterns in the project area. The summary of previous archaeological work in the area is detailed and provides an excellent baseline for the current work.

We believe that the survey adequately covered the project area, finding 2 historic sites. One (4835) is a set of World War II era pits, and the other (4836) is a set of pre-contact temporary shelters. The survey has adequately described and interpreted these sites, with three exceptions. One, the excavation at Feature A of site 4836 found IV layers, and it needs to be clear which layers are considered to be cultural (even if artifacts were not found in them). Two, please add north arrows and scales to Figures 3 and 4 (pages 4 and 5). Three, on October 31, 2000, Dr. Melissa Kirkendall (SHPD Maui) conducted a site visit with Cultural Surveys Hawaii representative, Ms. Ka'ohulani McGuire. During the visit, a couple additional features were identified on the rock outcrop. These features must be adequately described and plotted on the current site map. Please send replacement pages with this information.

We agree with the significance assessments that Sites 4835 and 4836 are significant under Criterion D (information content).

Your mitigation proposals for these two sites are not clear on page 21, and this page needs revision. You seem to be claiming that the two sites were significant solely for their information content and that an adequate and reasonable amount of this information has been collected. Thus, the sites need no mitigation and no further protection. Is this what you are claiming? Be clear. We would agree with the conclusion for the World War II era site (4835), but we would

tend to disagree with this evaluation of site 4836 (the pre-contact site), since deposits were present and only one test unit was excavated. Datable material could conceivably be present. We wonder if preservation of this site might not be possible since the building plans do not appear to infringe upon the site boundaries. An alternative might be data recovery. Until you send revisions for this mitigation issue, we cannot conclude the historic preservation review.

We recommend that you send the needed replacement pages for the site descriptions and the mitigation. At that time we should be able to conclude our review. As always, if you disagree with our comments or have questions, please contact our review staff as soon as possible, so these concerns can be resolved. Should you have questions, please contact Dr. Melissa Kirkendall (Maui/Lana'i SHPD 243-5169).

Aloha,

Don Hibbard, Administrator
State Historic Preservation Division

MK:jen

c: John Min, Director, Department of Planning, County of Maui, FAX 270-7634
Bert Ratte, County of Maui, Land Use and Codes, FAX 270-7972

APPENDIX I
TRADITIONAL PRACTICES ASSESSMENT

CULTURAL SURVEYS HAWAII
December 2000

A Traditional Practices Assessment for the Proposed Faulkes Telescope on 1.5 Acres of the University of Hawai'i Facility at Haleakalā, Papa`anui Ahupua`a Makawao District, Island of Maui (TMK 2-2-07:8)

by

Ka`ohulani Mc Guire, B.A.

and

Hallett H. Hammatt, Ph.D.

Prepared for

KC Environmental, Inc.

Cultural Surveys Hawai`i
December, 2000

ABSTRACT

A traditional practices assessment for the proposed Faulkes Telescope was requested by KC Environmental, Inc. The proposed project area (TMK 2-2-07:8) is located near the summit of Haleakalā on approximately 1.5 acres of an 18-acre parcel which comprises the University of Hawai'i Research Facility. The actual project area is situated on the southwest rift, in Papa`anui Ahupua`a, in the Makawao District at approximately 10,000 ft. a.m.s.l.

This study attempted to look at the potential impact the proposed project might have on traditional cultural practices: burials, religious sites, archaeological sites, historic properties, pre-historic and historic trails, hunting and gathering for cultural resources. Two formal interviews were conducted as part of this study. This traditional practices assessment did not identify any impacts to native Hawaiian cultural practices as it pertains to the project area.

Based on the history of the land use, talk-story with community members and interview informants, it is unlikely that native Hawaiian customs and practices will be affected by the proposed development.

Note: Throughout this report the spelling of Hawaiian vocabulary and place names has been standardized to present orthography.

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I. INTRODUCTION

At the request of KC Environmental, Inc., Cultural Surveys Hawai`i (CSH) conducted a Traditional Practices Assessment for approximately 1.5-acres of an 18-acre parcel of the University of Hawai'i Research Facility, more commonly known as 'Science City' on the summit of Haleakalā. The Faulkes Telescope Corp. (FTC) and the University of Hawai`i Institute for Astronomy jointly propose to construct the Faulkes Telescope Facility (FTF) on the 1.5-acre

The purpose of this Traditional Practices Assessment is to consider the effects the proposed development may have on native Hawaiians as it pertains to the culture and their right to practice traditional customs. The Hawai`i State Constitution, Article XII, Section 7 protects "all rights" of native Hawaiians that are "customarily and traditionally exercised for subsistence, cultural and religious purposes".

This assessment is meant to be informational for the purpose of disclosing any impacts the proposed development might have on native Hawaiian culture and to meet the requirements of the Office of Hawaiian Affairs (OHA), the Office of Environmental and Quality Control and any other state and county agencies involved in the review process for the proposed development.

In 1997, the Office of Environmental and Quality Control issued Guidelines for Assessing Cultural Impacts. The Guidelines discuss the types of cultural practices and beliefs that might be assessed.

> The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs. The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man-made and natural, including submerged cultural resources, which support such cultural practices and belifes.

It should be remembered that these are "suggested" guidelines and not actual law.

Most recently, H.B. No. 2895 was passed by the 20th Legislature, and approved by Governor Cayetano as Act 50 on April 26, 2000. The bill acknowledges that

> ". . . the past failure to require native Hawaiian cultural impact assessments has resulted in the loss and destruction of many important cultural resources and has interfered with the exercise of native Hawaiian culture. The legislature further finds that due consideration of the effects of human activities on native Hawaiian culture and the exercise thereof is necessary to ensure the continued existence, development, and exercise of native Hawaiian culture."

This bill makes it clear that ". . . environmental assessments or environmental impact statements should identify and address effects on Hawai`i's culture, and traditional and customary rights."

The process for evaluating cultural impacts is still evolving and Public Access Shoreline Hawai`i (PASH) issues pertaining to traditional access and gathering rights continue to be unresolved. In light of the current legislation, what continues to be unclear is the "official and designated" agency to review and comment on assessments of this nature. Should the review fall under the OEQC because they wrote the Guidelines? Or should the review fall under the State Historic Preservation Division (SHPD) because they routinely assess traditional cultural properties, archaeological and historic sites, burials, etc. Other questions arise regarding the proper and acceptable level of effort that should be put forth when conducting these kinds of studies, i.e., how many interviews to conduct in relation to the size of the project area. A small project area could be very rich in cultural resources and practices while a project area of much greater magnitude could be virtually devoid of cultural resources, customs and practices. Are there situations where a Cultural Assessment may not be deemed appropriate or necessary, such as along a highway corridor or a bulldozed and developed project area? These are just a few of the many issues that are yet to be resolved in relation to conducting Traditional Practices Assessments and studies of this nature.

Scope of Work

In addressing any Hawaiian customary and traditional rights and their applicability to the project area, the following scope of work was followed:

1) Examination of historical documents, Land Commission Awards, historic maps, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal and other resources, burial patterns, and places of particular cultural import as may be indicated in the historic record.

2) A review of the existing archaeological information pertaining to any sites on the property as they may allow us to reconstruct traditional land use activities and identify and describe the cultural resources, practices and beliefs associated with the parcel, and identify present uses.

3) Conduct two formal interviews with knowledgeable persons about the historic and traditional practices in the project area and region, as well as informal talk-story with other individuals and organizations on Maui about the project area and surrounding vicinity.

4) Preparation of a report on the above items summarizing the information gathered related tc traditional practices and land use. The report will assess the impact of the proposed action on the cultural practices and features identified in the project area.

Methodology

Historical documents and maps were researched at the Hawai`i State Archives, the Bernice Pauahi Bishop Museaum Archives, Maui Historical Society at Bailey House Museum, as well as the library of Cultural Surveys Hawai`i.

Hawaiian organizations, agencies and community members were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the project area and the surrounding vicinity. Some of these agencies and organizations include the Office of Hawaiian Affairs, Alu Like, Inc., Hawaiian Civic Clubs, Maui Community College, Haleakalā National Park and the State Historic Preservation Division.

Identification of Knowledgeable Interview Informants

As partial fulfillment for the Scope of Work (SOW), formal, taped interviews were conducted with two cultural practitioners who currently access and use Haleakalā for cultural practices. Prior to this, Hawaiian organizations and community members were contacted to identify types of cultural practices and current users of Haleakalā, especially in the area of the summit. As a result, several names of community members were mentioned over and over again as people who might be knowledgeable about cultural practices at Haleakalā. These community members were Charles Maxwell, Sam Ka`ai, Hōkūlani Holt-Padilla and Kapi`ioho Lyons Naone.

Charles Maxwell is a cultural practitioner and chairs the Maui Island Burial Council. His name was mentioned most frequently as a potential knowledgeable informant regarding Haleakalā. When contacted about this project, Mr. Maxwell indicated he had cultural knowledge of Haleakalā, however, he declined to officially comment or be formally interviewed.

Sam Ka`ai is also a cultural practitioner, whose family comes from Kaupō. Informal talk-story with Mr. Ka`ai indicated he does have knowledge of place names, legends and cultural practices within the greater Haleakalā region, some of which has been passed down through his family (the Marciels). Likewise, when Sam Ka`ai was contacted, he declined a formal interview.

The Interview Process

As partial fulfillment for the Scope of Work (SOW), formal, taped interviews were conducted with two cultural practitioners who currently access and use Haleakalā for cultural practices. These two practitioners were Hōkūlani Holt-Padilla and Kapi`ioho Lyons Naone. The interviews were conducted between November 2-3, 2000, on Maui, where both informants currently reside. The interviews lasted approximately 1½ - 2 hours. Both interviews were transcribed. The informants were allowed the opportunity to review the transcriptions for editing and to approve the final transcript. Both informants signed an "Authorization Release" form giving permission for the interview to be used as part of this study. Excerpts from the interviews are used throughout this report, wherever applicable. The full transcripts of both interviews are appended to this report.

Biographical Sketches of Interview Informants

Following are brief biographical sketches of the two interviewees, listed in alphabetical order.

Hōkūlani Holt-Padilla

Hōkūlani Holt-Padilla was born in 1951 at Honolulu, O`ahu. She is the daughter of Leiana Long Woodside and Harry Hi`ileiali`i Holt Jr. Though born in Honolulu, Aunty Hōkūlani, as she is affectionately called by the community, was raised on Maui by her grandparents, Henry and Ida Long, until the age of five. When she became of school-age, she returned to Honolulu to live with her birth-parents. Aunty Hōkūlani credits her knowledge and expertise of Hawaiian culture to her grandparents and her early formative years on Maui.

A graduate of Kamehameha Schools and the University of Hawai`i, Hōkūlani Holt-Padilla is a Hawaiian culture and language specialist. She was one of the founders of Pūnana Leo o Maui and served as the school's director for three years, from 1990-1993. Prior to 1993, Aunty Hōkūlani worked as an artist and teacher for the State Foundation on Culture & the Arts, and as a cultural specialist for the Maui Historical Society at Bailey House Museum. Hōkūlani Holt-Padilla is currently the Manager for the Culture Education Program for the Kaho`olawe Island Reserve Commission (KIRC) and has served in this capacity since 1997.

Coming from a line of *kumu hula*, Hōkūlani Holt-Padilla was raised and trained in the *hula* (traditional art of dance) tradition. In 1976, she founded her *hālau hula* (school), Pā`ū o Hi`iaka and has been teaching *hula* ever since. Aunty Hōkūlani, is considered a master *kumu hula* (teacher of *hula*), as well as a respected *mele* (song) and *oli* (chant) composer.

Aunty Hōkūlani graciously consented to a taped interview. The interview was conducted in Wailuku on November 2, 2000 by Cultural Surveys Hawai`i representative, Ka`ohulani Mc Guire.

Kapi`ioho Lyons Naone

Kapi`ioho Lyons Naone was born in 1944 in Kīpahulu. He was raised by his grandmother, Julia Ka`alo Kapoi Naone, who was a "spiritual and healing practitioner". From his grandmother, Kapi`ioho learned the traditional arts of *lā`au lapa`au* (medicinal healing with herbs), *ho`oponopono* (setting relationships right through prayer, mutual restitution and forgiveness), *lomilomi* (massage), and other forms of healing such as *lā`au kāhea* (calling medicine), and *hāhā* (diagnosing an illness by feeling the body). Of his training, Kapi`ioho relates:

> . . . I'd say, at about 11 or 12 [years of age], I was at the point of actually making and preparing the medicines. I would check with her only if I needed help . . . So, I was, sort of, on my own already, but still always under her direction until about 14, when I went to Honolulu to attend school.

After graduating from Kamehameha School, Kapi`ioho made plans to return to Kīpahulu to live with his grandmother, but she passed away shortly after his graduation. Kapi`ioho briefly attended Mauna`olu College before deciding to join the Service. He returned to Maui around 1970 and has lived there ever since. The early years of his return was spent doing construction work and "a lot of subsistence fishing". Kapi`ioho also served in the Police Force for twelve years and, most recently, as Director of U.S. Customs for 15 years. Though not openly practicing *lā`au lapa`au*, Kapi`ioho never forgot his early training and the knowledge he gained from his grandmother in the healing arts. He explains:

> In about the late 1970's, I was approached by some elders I knew, who used to live in Kīpahulu. They asked me to come back and help them with doing medicine, with the intention of eventually doing it full-time. Reverend Ka`alakea . . . He was the one, along with Uncle Harry Mitchell, who came to me and asked me to go with them and to help them out with the *lā`au*. Eventually, they persuaded me to return to the healing arts on a full-time basis.

In 1992, Kapi`ioho started a non-profit organization called "Kumu A`o". In March of this year, Kumu A`o started the "Indigenous Healing Institute" which encompasses and promotes global indigenous healing practices, as well as basic, traditional Hawaiian healing techniques. Besides teaching cultural classes at Maui Community College, he is also the curator of Haleki`i/Pihanakalani Heiau. Kapi`ioho is currently self-employed. In his own words, "I teach and practice and do cultural, spiritual things . . . ".

Kapi`ioho Lyons Naone was interviewed in Wailuku on November 3, 2000 by Ka`ohulani Mc Guire, CSH representative.

II. DESCRIPTION OF THE PROJECT AREA AND TRADITIONAL CUSTOMS AND PRACTICES REGION

Project Area

The Faulkes Telescope site is located near the summit of Haleakalā at approximately 9,940 feet AMSL on the southwest rift, in the *ahupua`a* of Papa`anui, Makawao District, Maui (Figures 1-4). The actual summit of Red Hill, is 10,023 feet (3055 meters) AMSL. Most visitors to Haleakalā National Park associate Red Hill with the Visitor Center situated at the summit. The project area is located nearby at Kolekole Hill, southwest of Red Hill and just outside of the National Park boundary. The Faulkes Telescope site comprises 1.5 acres within an 18-acre parcel designated as the University of Hawai'i research facility. The facility is commonly referred to as "Science City" which encompasses the University of Hawai`i Haleakalā Observatory (HO) site.

An exposed basalt rock outcrop is a dominant feature centrally located within the project area. The extremely weathered outcrop measures approximately 20 m long (N-S), 14 m wide (E-W), and 3 m high (Figure * see Tina's Figure 7). The outcrop is composed of aerolite, a type of Hawaiian basalt containing abundant olivine crystals. Blocky cobbles from the exposed outcrop are scattered around the outcrop base and cinder covers the remainder of the project area. The ground to the NW of the outcrop has been disturbed with a bulldozer in the past. Modern trash (glass, aluminum cans, and metal) is scattered in this disturbed area. To the north of the project area boundary, there is a paved road leading to the observatory. An old paved road (currently in a state of disrepair) lies to the south of the project area boundary.

The plant cover within the project area is sparse (5-10% cover) consisting primarily of *kūpaoa* (*Dubautia menziesii*), an endemic member of the daisy family (Asteraceae), and Deschampsia nubigena, an endemic, perennial grass commonly found at this elevation. Also found within the project area were hairy cat's ear (*Hypochoeris radicata*), *pili uka* (*Trisetum glomeratum*), *pūkiawe* (*Styphelia tameiameiae*) and *Tetramolopium humile*, another endemic member of the daisy family (Char & Associates, April, 2000:1-3). None of the above plants are threatened or endangered (U.S. Fish and Wildlife Service 1999). No endangered silversword (*Argyroxiphium sandwicense* subspecies *macrocephalum*) plants were found within the proposed Faulkes Telescope site.

As the entire region of Haleakalā extends from sea level to 10, 023 ft. AMSL at its highest point it was necessary to delimit the land area for purposes of this study. In discussions with Melissa Kirkendall of the Maui Office, State Historic Preservation Division, it was determined this study would be confined to the upper lateral regions of Haleakalā — from approximately the Park entrance at 6800 ft. AMSL to the summit at 10,023 ft. AMSL.

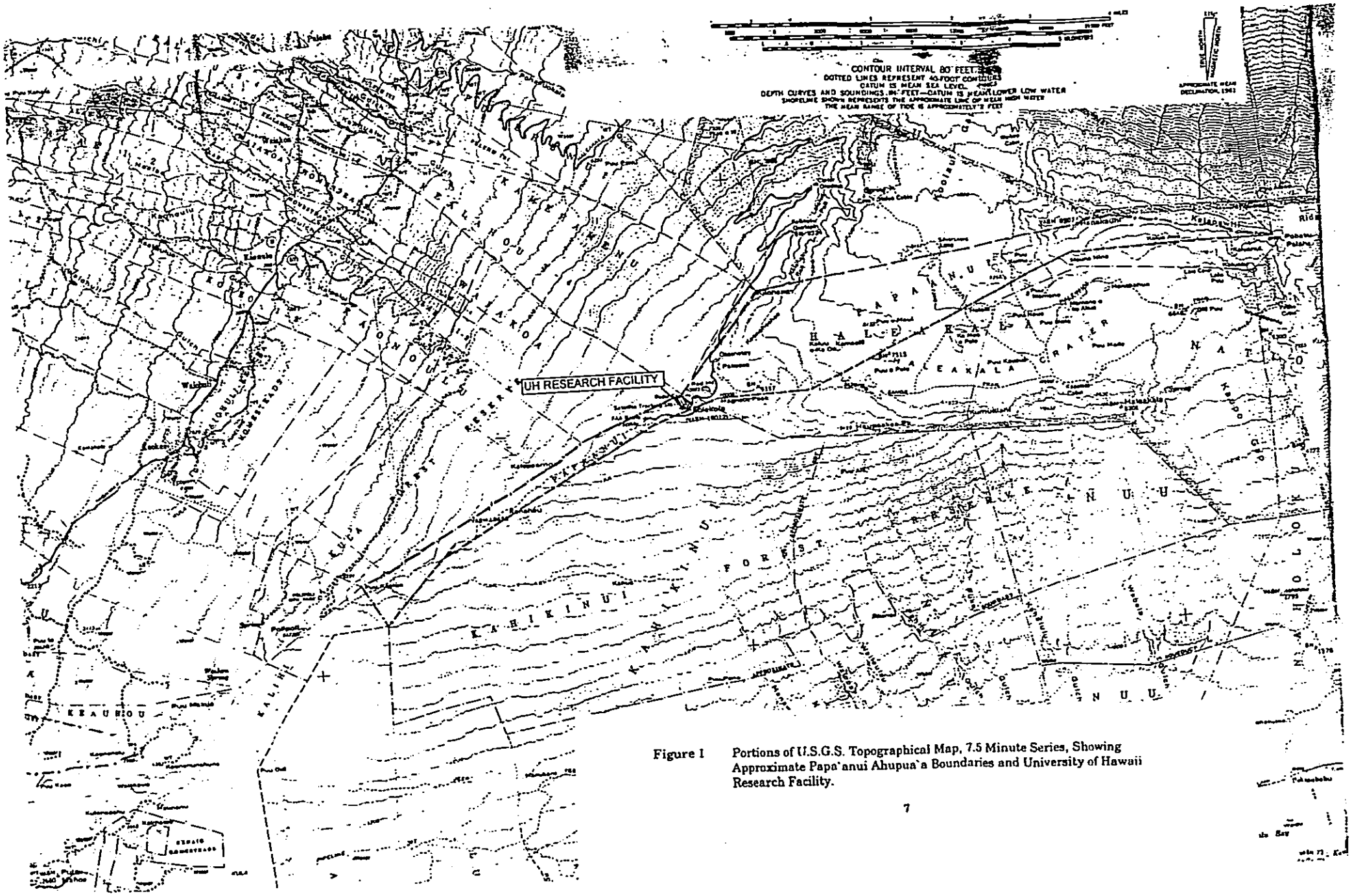

Figure 1 Portions of U.S.G.S. Topographical Map, 7.5 Minute Series, Showing Approximate Papa'anui Ahupua'a Boundaries and University of Hawaii Research Facility.

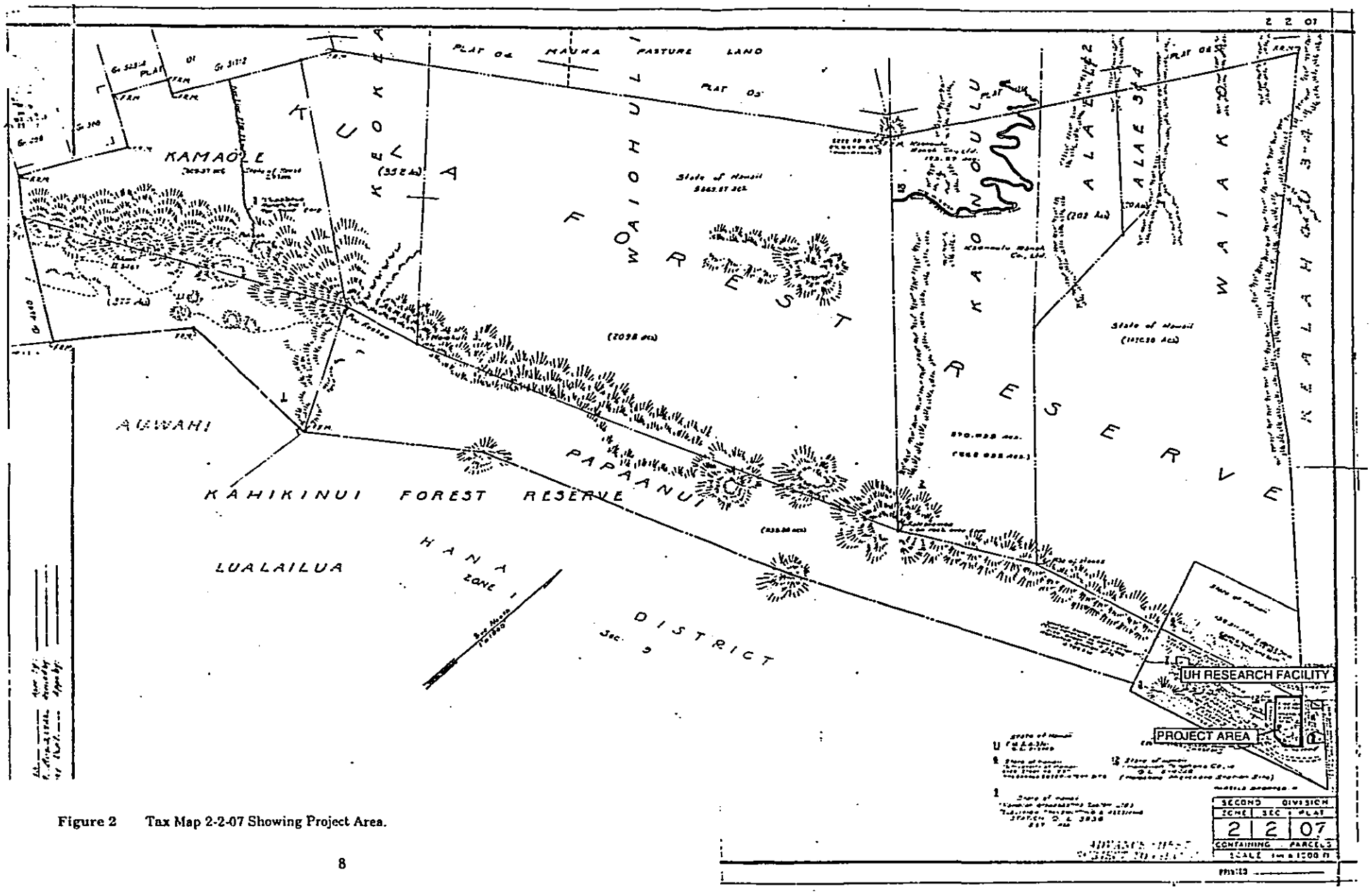

Figure 2 Tax Map 2-2-07 Showing Project Area.

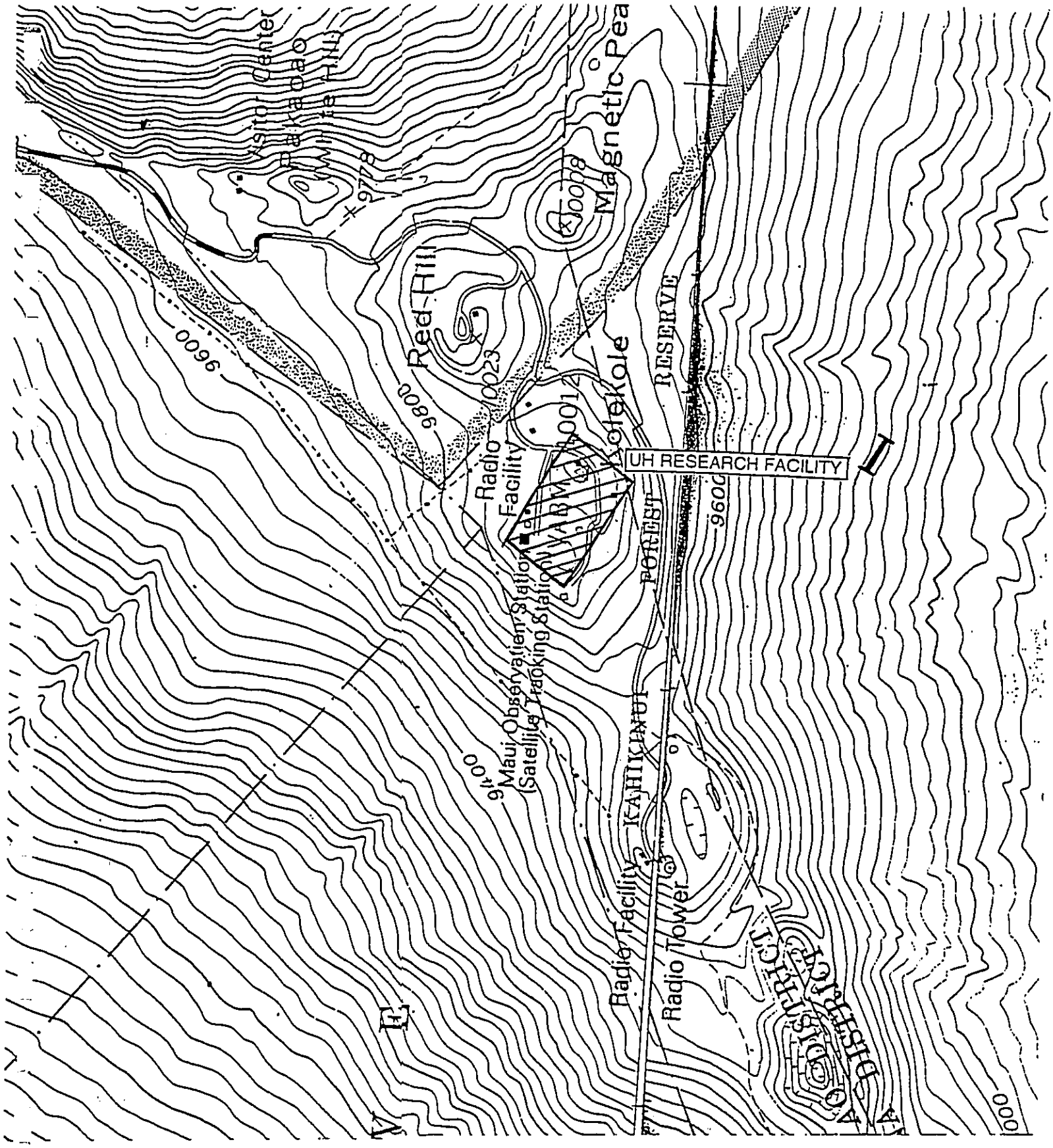

Figure 3 Map Showing the University of Hawaii Research Facility at Haleakalā

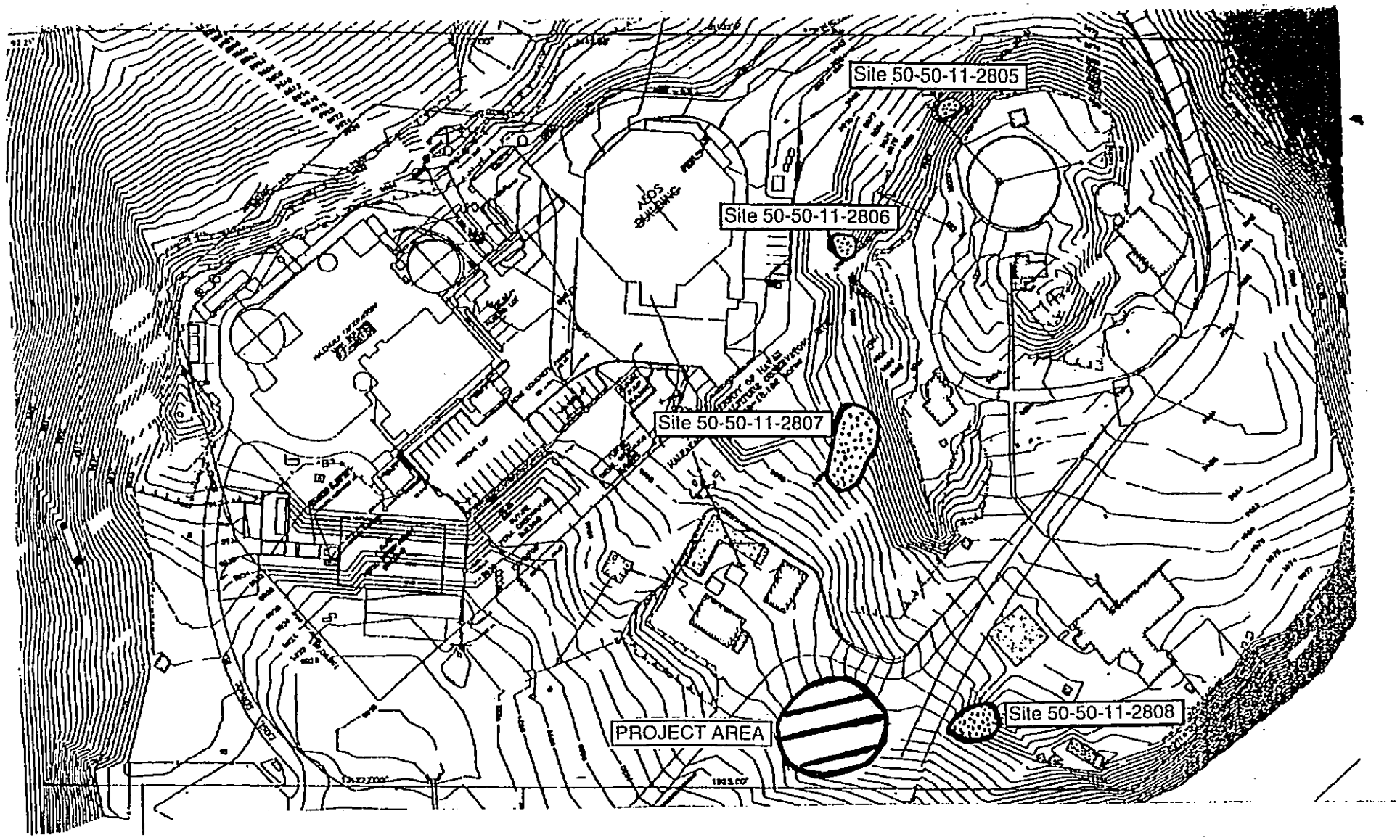

Figure 4 Project Area Map Showing Previously Recorded Sites in the Immediate Vicinity.

Natural Setting

The island of Maui is basically two shield volcanoes, Pu`u Kukui on West Maui and Haleakalā on East Maui, that are joined together by a central plain or isthmus. Though dormant for over two hundred years, technically, Haleakalā is still considered geologically active. The last eruption was in 1790, on the flanks above La Pérouse Bay (Juvik, *et al.* 1998:14).

Climatically, Haleakalā is similar to Mauna Loa and Mauna Kea on Hawai'i Island. The windward slopes are moist and wet due to maximum rains that fall along the slopes rather than at the summit. The leeward slopes are influenced by breezes from the sea or valleys. Changes between these two types of climate occur along the northern and southern slopes.

The "Maui Vortex" is a strange feature caused by the interaction of trade winds between the two mountains. In effect, the trade winds from the northern slopes of Haleakalā are diverted through the central valley. Encountering the west Maui mountains, the winds are deflected southward, through Ma`alaea Harbor and McGregor Point and then move southeast up the west slope of Haleakalā. Cloud films have shown a spinning vortex with a clear "eye". This vortex is significant in recirculating air pollutants, such as smoke from cane fires and mills, which normally would be blown out to sea (Sanderson 1993:34-35).

The rainfall pattern on Maui is dominated by its two highest mountain peaks, Pu`u Kukui (5,788 ft AMSL) and Haleakalā (10,023 ft AMSL). On east Maui, the area of maxima rainfall occurs in Hāna, on the northeastern slope of Haleakalā, while the area of minimum rainfall occurs at the summit of Haleakalā (Giambelluca, *et al.*, 1986:15). At the actual summit, the rainfall ranges from less than one inch (June) to approximately seven inches (January), with a yearly average of 55 inches (Juvik *et al.*, 1998:56).

The yearly mean temperature (based on a standard 30-year period from 1961-1990) at the Haleakalā Research Station is 52.4°F, with a yearly maximum temperature of 62.6°F and a yearly minimum temperature of 44.1°F (Sanderson 1993:51).

Soils in the project area are classified as Cinder land (rCl) and are representative of soil types found at Haleakalā National Park between 8,000 and 10,000 feet AMSL. Cinder land consists of "areas of bedded magmatic ejecta" and are unusual for their colors which can be variegated or red, yellow, black and brown. These magmatic materials are a mixture of cinders, pumice and ash and are typically associated with cinder cones such as Pu`u Kolekole. The only other place in Hawai'i where this kind of soil is found is near Mount Tantalus on O`ahu. Because cinders are loose in nature, this type of land is considered unfit for grazing. Typically, lands with this classification are used for wildlife habitat and recreational areas (Foote, *et al.* 1972:29, Sheet #117-118). The East Maui lands best suited to agriculture are found between Makawao and Ulupalakua, above the 2000 ft. elevation (Sahara *et al.*, 1967:3).

III. CULTURAL SETTING

The Greater Region of Maui

An ancient name for Maui is `Ihikapalaumaewa which is alluded to in the genealogical chant of *"Mele a Paku`i"*. The name infers sacred reverence and respect (from *hō`ihi*). The chant recounts how Wākea Kahiko Luamea (k) and Papa o Walinu`u (w) gave birth to the Hawaiian islands. Maui was the second child born to Wākea and Papa. Likewise, Maui is the second largest island in the Hawaiian archipelago. It is believed this pair are the parents of the chiefly lineages and the Hawaiian race.

In former times, Maui was also known as Kūlua, a probable reference to the East and West Maui districts, which were separate polities by A.D. 1400-1500 (Sterling 1998:2; Kolb *et al.* 1997:16).

Some of the more prominent chiefly names associated with Maui are Pi`ilani, along with his son, Kīhāpi`ilani, whom the ephitet "Nā Honu a Pi`ilani" honors; Kahekili, known for his `ālapa regiment of warriors, and Ka`ahumanu, the favorite wife of Kamehameha I. Other notable Maui chiefs are:

> `Aikanaka was the chief of Kowali, Muolea, Hāna.
> Hema was the chief of Ka`uiki in Hāna.
> Kaha`i was the chief of `Īao in Wailuku.
> Laka was the chief that was born at `Alae in Kīpahulu.
>
> Hua was chief of Lahaina
> Kapuaimanaku was the chief who builot the *heiau* of Luakona in Lahaina.
> Palena was a chief. His house was at Hananaiku by Ka`uiki Hill. He ruled on O`ahu.
> These were the chiefs of Maui in the period between Hanala`anui and Hikauake. (Henriques-Peabody [N.D.]; HEN: Vol I: 985)

Haleakalā

The actual mountain mass of Haleakalā covers a huge land area and is unique in that eight *ahupua`a* (one in each district of East Maui) meet at the northeast edge of Haleakalā Crater at a rock called Pōhaku `Oki `Āina on older 19th century maps, but more commonly known as Pōhaku Pālaha (Sterling 1998:3). Logically, this would make Haleakalā accessible to a large number of potential users from diverse communities, as well as potential available cultural resources and practices. Indeed, Haleakalā is rich in lore, legends, cultural sites and practices.

The Name "Haleakalā"

According to Abraham Fornander, the name "Halekalā" is said to be a "misnomer" and is incorrect. He explains that Ahelekalā is:

> The ancient name of Maui's famous crater, which means, "rays of the sun," and it was these which the demigod Maui snared and broke off to retard the sun in its daily course so that his mother might be be able to dry her kapas. (1916-1920:V:534-36)

Fornander goes on to say that the correct name is Alehelā "on account of Maui's snaring the rays of the sun (*Ibid*:538). The word *`alehe* is a variant form of *`ahele*. Both words literally mean "to snare". "Haleakalā" refers to not only the literal meaning, but the fact that the sun's path passes through Haleakalā each morning, thus the common interpretation of the name, "house of the rising sun". Today, the practice of driving up to the summit of Pu`u `Ula`ula to see the sunrise, by both tourist and *kama`āina*, serves to reinforce this perception of the name "Haleakalā".

Inez Ashdown (1971:68) disagrees with Fornander and writes that "Aleha-ka-lā" (Sun-snarer) is a more recent name attributed to the Māui traditions and Māui's feat of slowing the sun. She goes on to say that the name is really "Hale`a-ka-lā" which refers to the "entire east *mountain* of Maui", while "Hale-a-ka-lā" is the peak over by Kaupō Valley. She writes:

> The proper name means *Consecrated to, or by the sun* and is poetically associated with Nā Mele o Nā Māhele of that mountain of legends and creation. (*Ibid.*)

> . . . or a sacred place of rejoicing because Wa-na-ao, the Dawn, brings the new day from that mountain mass. (*Ibid.*:30)

The idea of Haleakalā being a reference to all of the East Maui mountains was brought out in an interview with Kapi`ioho Naone, who was an informant for this study. He related that when he was a young boy, he used to care for an old Hawaiian woman named Tūtū Pale who lived to be 106 years old. Her birth date is estimated to be around 1852. According to Naone, she always referred to Haleakalā as the entire East Maui mountains and to Halemahina as the entire West Maui mountains. He goes on to say in the interview:

> . . . she would refer to Haleakalā as the house of the male and, this one over here as Halemahina, the house of the female or the house of the moon . . . The whole West Maui mountains, she considered the *piko ka honua*, the navel of the earth, the woman. She would tell me that Maui was lucky because Maui had a male and female — Maui was complete. It wasn't all male and it wasn't all female. It was complete. And, so we would talk about Haleakalā as the male part of the island . . . (Interview, 11/3/2000)

Sam Ka`ai also indicated that Haleakalā was "male" and related that the best adze material comes from a cliff at Nu`u where Māui's *ule* (penis) struck the side of the mountain (Personal Communication, 10/31/00)

Folklore and Mythological Traditions Pertaining to Haleakalā

Hawaiian legend tells us that Pele and her family were chased from Kahiki by her sister, Namakaokaha`i, the sea goddess. During her travels throughout the island chain in search of a home, she stops for a brief period on the Island of Maui. Here, she digs a pit with her magical *pāoa* (divining rod) and starts a fire. This pit is the crater of Haleakalā. The crater was so large, it was difficult to maintain her continual fires and keep warm. Sometime later, on the western slope of Haleakalā, Namakaokaha`i challenges Pele to hand-to-hand combat. During the battle, Pele's body is torn to pieces and scattered along the coast of Kahikinui. The large amounts of broken lava there are called *Nā Iwi o Pele* or "the bones of Pele" (Emerson 1915:xxx; Westervelt 1916:11). Though Pele's body is destroyed, her spirit lives on and can sometimes be seen floating above Kīlauea.

Within Haleakalā, other land features are evidence of Pele's presence: *Pu`u Ka Iwi o Pele, Ka moa o Pele* (the chicken of Pele), *Pā pua`a o Pele* (Pele's pig pen) and *Pu`u o Pele*, a cinder cone within the crater. The large hump on Leleiwi Ridge is said to look like the head of Poki, Pele's faithful dog who created *Pu`u Ka Iwi o Pele* with Pele's bones after her battle with Namakaokaha`i (Ashdown 1971:160). Pele's oldest brother, the shark god, Kamohoali`i, was said to inhabit the highest cone in the interior of the crater (Cobb *in* Sterling 1998:260). Handy and Handy make a reference to the residents of Honua`ula belonging to the "Clan of Pele" (1972:336-37).

Poli`ahu, the snow goddess and Pele's rival, is another Haleakalā tradition, even though her permanent home is at Mauna Kea and Mauna Loa on Hawai`i Island. Westervelt writes about the tradition of Poli`ahu and the nature of snow goddesses.

> There were four maidens with white mantles in the mythology of the Hawaiians. They were all queens of beauty, full of wit and wisdom, lovers of adventure, and enemies of Pele. They were the goddess of the snow-covered mountains. They embodied the mythical ideas of spirits carrying on eternal warfare between heat and cold, fire and frost, burning lava and stony ice. They ruled the mountains north of Kīlauea and dwelt in the cloud-capped summits. (1916:55)

This tug-of-war between opposites is a prevalent idea in Hawaiian culture. In everything, there is always dualism and an attempt to maintain harmony and balance — male/female; sun/moon; *kai/uka* (ocean/mountain); hot/cold; and so forth. The *Kumulipo* is a wonderful example of this dualism.

In times past, Poli`ahu used to be a more frequent visitor at Haleakalā. Occasionally, Poli`ahu can still be seen at Haleakalā in her *kino lau* form of snow. Hokulani Holt-Padilla commented on the frequency of snow at Haleakalā and the importance of going there to acknowledge its presence. She explains:

HHP: . . . whenever it snowed, we tried to go up there as well. It hasn't snowed so much on Haleakalā in recent years but, when I was small, it used to snow quite often. When it snowed, we tried to go up to the summit as well.

CSH: Did you go just to see the snow, because it's unusual in Hawai`i to see snow?

HHP: To see the snow because it's unusual to play in it but, also to be awed by it, to be grateful for it. I'm not sure what the right word is, but, to be grateful that this is happening once again.

The Hawaiian attitude of respect and "awe" of the physical landscape is evident in her words. Older *kama`āina* residents of Maui have commented there were times when Haleakalā would be covered with snow near the summit year-round. This rarely occurs today and is a sure sign of environmental changes over the years.

The tradition of Lilinoe, the goddess of the mists and the younger sister of Poli`ahu, is still prevalent at Haleakalā today. About Lilinoe, Westervelt writes:

> Lilinoe was sometimes known as the goddess of the mountain Haleakalā. In her hands lay the power to hold in check the eruptions which might break forth through the old cinder cones in the floor of the great crater. She was the goddess of dead fires and desolation. She sometimes clothed the long summit of the mountain with a glorious garment of snow several miles in length. Some legends give her a place as the wife of the great-flood survivor, Nananu`u, recorded by Fornander as having a cave-dwelling on the slope of Mauna Kea. Therefore she is also known as one of the goddess of Mauna Kea. (1916:56)

Lilinoe is mentioned in chants and songs and her presence is still recognized by Hawaiians today. When asked about traditions that came down through her family, Hokulani Holt-Padilla commented that the knowledge of Lilinoe was a cultural tradition passed down to her.

CSH: Was there anything else that came down through your family?

HHP: The knowledge of Lilinoe.

CSH: Can you talk about Lilinoe and what you know?

HHP: The knowledge that there was a goddess or personage whose place was Haleakalā as much as Poli`ahu's place is Maunakea and that they were sisters. Lilinoe, particularly, was more of the mist because the snow didn't always come to Haleakalā,

> but Lilinoe was always at Haleakalā. And, when the heavy mists came down, that was her. And, pretty much, that was about it. If there were particular stories about what she did or where she went, I don't recall those things — just the knowledge that she did exist.

The heavy mists which represent Lilinoe continue to be a common occurrence at Haleakalā. Kenneth Emory, in his survey of Haleakalā, suggests that many of the smaller platforms and *`ahu* (as small as three stones stacked one on top of the other) might be altars to a local deity, such as Lilinoe (1921:23).

Haleakalā is perhaps most commonly associated with the adventures of the demi-god Māui. The legends of Māui span Polynesia, as well as Micronesia and Melanesia (Luomala 1949:3). But Māui is best known throughout Polynesia for his mischievous tricks and supernatural powers.

In Hawai`i, Māui stories can be traced to Kaua`i, O`ahu, Maui Island and Hawai'i Island. W. D. Westervelt (1910:vii) writes that "The Māui legends form one of the strongest links in the mythological chain of evidence which binds the scattered inhabitants of the Pacific into one nation." While in Tahiti in 1769, Captain Cook was the first European to record anything in writing about Māui (Luomala 1949:13). Throughout Polynesia, there are many similarities with only slight variations of a theme when discussing Māui's adventures.

The exploits of Māui are recorded in one of the oldest genealogical chants, the *Kumulipo*. In the fifteenth epoch of the *Kumulipo*, Māui, the youngest of four sons, is born to Akalana (k) and Hinaakeahi (w). In the sequence of Hawaiian genealogies, Māui is associated with the line of Ulu and the sons of Ki`i (Westervelt 1910:4). Māui's home was said to be at Ka`uiki, in the lee of Haleakalā. Thus, Haleakalā is mentioned in several of the Māui stories. From these stories, we learn that Māui's grandmother lived at Haleakalā and maintained an oven near a *wiliwili* tree where she baked bananas to feed the sun.

In Hawai`i, Māui is best known for his supernatural and wondrous feats: snaring the sun, lifting the sky, discovering the secret of fire, fishing up the islands, destroying Kuna Loa — the eel, kite-flying, and so forth. These stories have been well documented by Thomas Thrum, W. D. Westervelt, Katherine Luomala and others. It is not the intent to retell them here.

Haleakalā is mentioned in other folklore such as the story of Halemano, Lāieikawai, Hua and Kīhāpi`ilani. In the story of Hua, a *kahuna* sends his sons up to Haleakalā to escape Hua's wrath. The cave of Lāie is said to be the temporary home of Lāieikawai. See the following Table of Legends which lists the myths and folk-lore associated with Haleakalā.

Table 1: Legends That Mention Haleakalā
(Listed by story topic)

Legend	Source	Page #	Comments
How Māui snared the sun	Armitage, George T. & Henry P. Judd (Ghost Dog & Other Hawaiian Legends)	p. 61	Reference to the sun rising through Ko`olau Gap. ("He made a trip over the mountain ridges & across the plains until he came to Mount Haleakalā. He first saw the sun through the Ko`olau Gap, & then, like a giant disc, it wheeled over the top of the black crater walls & thence up into the heavens.") Also says that Māui's grandmother lives at Haleakalā Crater & has an oven near a *wiliwili* tree where she bakes bananas to feed the sun.
Māui snares the sun	Colum, Padriac	p. 22, 26	Māui observes the sun rising over Haleakalā through a break in the chasm sides. The correct name for Haleakalā is "*A-hele-a-ka-lā* (rays of the sun)". As the sun comes through the chasm, it eats the bananas cook by Māui's grandmother who lives at Haleakalā. Māui makes an agreement with the sun, which explains why their are two seasons: longer days in the summer & shorter days in the winter.
How Māui snared the sun to slow it down so his mother could dry her *kapa*	Colum, Padriac (Legends of Hawai`i)	p. 47-52	"A-hele-a-ka-lā" (rays of the sun) the old name for Haleakalā; Māui's grandmother lived on the side of Haleakalā; explains why winter has shorter day & summer has shorter days.
Legend of Māui snaring the sun	Fornander, Abraham (Hawaiian Antiquities & Folk-lore)	p. 538	Māui climbs Haleakalā to slow the sun. Correct name is "`Alehelā" which means to snare. *`Ahele* is a variant of *`alehe*.
Māui conquers the sun	Hapai, Charlotte ("Legends of the Wailuku" & "Hilo Legends")	p. 4-6	Māui travels to Haleakalā (from Rainbow Falls, Hilo) to battle the sun. Gives explanation for two seasons of the year.
How Māui Snared the Sun	Knudsen, Erik (Teller of Tales)	p. 168-174	Māui observes the path of the sun rising over Haleakalā, House of the Sun. His grandmother lives "on the other side of Haleakalā". Explains shorter & longer days for seasons of year. The sun rises "through the break in the mountain".

Māui slows the sun	Lyons, Barbara (Māui Mischievous Hero)	p. 15-19	From the tip of Mauna Kahalawai (the meeting place between heaven & earth), one could look across the water & see Haleakalā, House of the Sun. Māui's grandmother lives at the edge of Haleakalā Crater, near a *wiliwili* tree (with red seeds).
How Māui snares the sun	Metzger, Berta (Tales told in Hawai`i)	p. 81	General reference to Māui climbing Haleakalā to snare the sun.
Slowing the sun	*Collected by:* Pukui, Mary Kawena (Tales of the Menehune)	p. 19-21	As told by Harriet Coan in "Hawai`i's Young People". Mentions sun rising through an opening in Haleakalā & explains summer/winter seasons.
How Māui slows the sun	Thrum, Thomas G. (Hawaiian Folk Tales)	p. 31-33	Māui observes the sun rises directly over Haleakalā & battles the sun to make it slow down so Hina can dry her *kapa*. "`Alehekalā" (sun snarer) [also *`ahele* according to Pukui & Elbert] the correct name for Haleakalā.
Māui destroys Kuna Loa	Armitage, George T. & Henry P. Judd (Ghost Dog & Other Hawaiian Legends)	p. 72-73	Māui is resting near *wiliwili* tree on Haleakalā & sees a warning cloud (*ao `ōpua*) over his mother's cave.
Māui & Kuna Loa, the long eel	Colum, Padriac (At the Gateways of the Day)	p. 34	From Haleakalā, Māui sees the *ao `ōpua* (warning cloud) over his mother's cave at Wailuku
Māui & the eel, Kuna Loa	Lyons, Barbara (Māui Mischievous Hero)	P. 25-29	Māui makes "the long trip up Haleakalā" to visit his grandmother. (Remoteness of Haleakalā inferred.) From Haleakalā, sees the "*ao `ōpua*" which signifies a warning/danger.
Kana, the youth who could stretch himself upwards	Colum, Padriac (At the Gateways of the Day)	p. 145	A "groove" was made in Haleakalā by Kana, as he stepped over the sea and mountain to reach his grandmother's door. The groove is "there to this day".
Legend of Kana & Niheu	Fornander, Abraham (Hawaiian Antiquities & Folk-lore)	Vol. IV: 448	Kana bends himself "over the top of Haleakalā, over the mountain whereby a groove was formed across Haleakalā which can be seen to this day."
Story of the flood	Fornander, Abraham (Hawaiian Antiquities & Folk-lore)	p. 526	A flood accompanies the arrival of Pele & her family to the islands. "She went to live at Haleakalā; she also dug there."

Pele & the deluge (*Kai a Kahinali`i*)	Thrum, Thomas G. (Hawaiian Folk Tales)	P. 36-38	Pele travels to Hawai'i in search of a new home. A flood is attributed to her arrival in the islands. The sea rises & only the tops of the highest mountains (Haleakalā) can be seen. Haleakalā Crater dug by Pele.
How Māui lifted the sky	Armitage, George & Henry P. Judd (Ghost Dog & Other Hawaiian Legends)	p. 49	Mentions Haleakalā in reference to the storm clouds & storms being of short duration, fearing Māui will push them back even further. ("Dark storm clouds gather & hide the long slopes of Haleakalā . . .")
Māui lifts the sky	Knudsen, Erik (Teller of Tales)	p. 18-22	No mention of Haleakalā or other specific place names.
Māui lifts the sky	Lyons, Barbara (Māui Mischievous Hero)	p. 7-9	Māui lifts the sky above the top of Haleakalā.
Lifting the sky	*Collected by:* Pukui, Mary Kawena (Tales of the Menehune)	p. 22	Taken from Westervelt's "Māui, the Demi-god"
Māui fishes for an island	Armitage, George & Henry P. Judd (Ghost Dogs & Other Hawaiian Legends)	p. 51	Mention of Haleakalā in the distance. ("The green slopes of Haleakalā grew longer and hazier.")
Māui's fishing	*Collected by:* Pukui, Mary Kawena (Tales of the Menehune)	p. 24-25	Taken from Westervelt's "Māui, the Demi-god"
Māui discovers the secret of fire.	Armitage, George & Henry P. Judd (Ghost Dogs & Other Hawaiian Legends)	p. 66, 68	Māui sees smoke rising from the slopes of Haleakalā & discovers how to make fire. Also explains why *`alae* birds have red marks on their head.
The secret of fire-making	*Collected by:* Pukui, Mary Kawena (Tales of the Menehune)	p. 26-32	From a translation by A. O. Forbes in "Hawaiian Annual". Tells how man accidentally discovered lava/fire could cook food (*'ulu, mai`a*); but did not know how to make fire. Mention of making an offering to Kū`ula for a good catch. Explains the red marks on the head of the *`alae* bird.

Keoua, a story of Kalawao	Gowan, Herbert H., Rev. (Hawaiian Idylls of Love & Death)	p. 106	Keoua goes to Kalawao, Kalaupapa in search of his wife, Luka, a leper. From the top of the lookout, "the sun was just rising from the clouds & revealing one after another the majestic ridges of Haleakalā and the rock-bound coasts of Māui & Lāna`i.
The Tomb of Pu`upehe	Thrum, Thomas G. (Hawaiian Folk Tales)	p. 181-185	A comparison is made of Pu`upehe's beauty: "Her glossy brown, spotless body 'shone like the clear sun rising out of Haleakalā.'"
Halemano & Princess Kama	Colum, Padriac (At the Gateways of the Day)	p. 102	While at a grove at "Ke-a-kui", Halemano makes a maile lei ("wreath") and sees Haleakalā which is described "like a pointed cloud in the evening" & he is reminded of his wife and the places they traveled together
Legend of Halemano	Elbert, Samuel H., Ed. (Selections from Fornander's Hawaiian Antiquities & Folk-Lore)	p. 266-68; 274	Mention of Haleakalā: from Lele on Maui, Halemano saw "the top of Haleakalā . . . floating above the clouds". Halemano moves to Kaupō to be closer to Haleakalā. Halemano "saw the top of Haleakalā in Maui as it appeared amongst the clouds, like a pointed cloud in the evening, as the other clouds drifted above it."
Legend of Halemano	Fornander, Abraham (Hawaiian Antiquities & Folk-lore)	p. 238, 240	From Lele (old name for Lahaina), Halemano sees Haleakalā "as though floating above the clouds" and "he wished to move to Haleakalā and live in Kaupō, Maui.
The Jealous Wife	Metzger, Berta (Tales Told in Hawai`i)	p. 81	Story of Aukele: mentions Pele's travels for a new home & her stay at Haleakalā, Maui, but the crater was too large to heat & she moved on to Hawai'i Island.
Legend of Pu`ulaina	Fornander, Abraham (Hawaiian Antiquities & Folk-lore)	p. 534-36	Aheleakalā (rays of the sun), the ancient name for Haleakalā. Mentions that Pele travels there.

The great famine. (The story of Hua, unjust king of Maui.	Skinner, Charles M. (Myths & Legends of Our New Possessions & Protectorate)	p. 243	A *kahuna* [Luaho`omoe] sends his sons to Haleakalā to escape the wrath of Hua. Drought & famine follow Hua's unjust killing of Luaho`omoe. Hua flees to Hawai'i Island, where he dies. Thus, the saying, "The bones of Hua rattled in the sun." (*Ko`ele nā iwi o Hua i ka lā.*) [Also: *Nakeke nā iwi.*]
Travels of Pele & Hi`iaka	Emerson, Nathaniel B. (Pele & Hi`iaka)	p. XIV-XV	Pele tries to make her home in Haleakalā. The crater was so large, Pele could not keep it warm. Pele fights with Namakaokaha`i.
Travels of Pele & Hi`iaka *in* "Legend of Aukelenuiaiku"	Fornander, Abraham (Hawaiian Antiquities & Folk-lore)	Vol. IV: 104-106	Pele digs a pit at Haleakalā & starts a fire there. Pele battles with Namakaokaha`i & is killed, but comes back to life in spirit form.
Story of Pele & Hi`iaka (*by* L.K. Kalawe of Kapoho)	Green, Laura S. (Hawaiian Stories & Wise Sayings)	p. 18-19	Reference to Pele's travels through the islands looking for a home and her short stay at Haleakalā. Focus is on Puna & her adventures there.
Dwelling Places of Pele	Lawrence, Mary Stebbins (Stories of the Volcano Goddess)	p. 63	Reference to Pele looking for a home at Haleakalā (". . . East Maui & began building up a mighty crater of Haleakalā.")
Pele, goddess of volcanos	Nakuina, (Hawai`i, Its People, Their Legends)	p. 25	Mention of Pele living at Haleakalā for awhile.
Pele came to Hawai'i	*Collected by:* Pukui, Mary Kawena (Tales of the Menehune)	p. 43-44	From Westervelt's "Hawaiian Legends of Volcanoes" & Fornander's "Hawaiian Antiquities". In search of a home, Pele & her family dig a pit at Haleakalā.
How Pele came to Hawai'i	Westervelt, W. D. (Hawaiian Legends of Volcanos)	P. 11	Pele digs a crater with her *pāoa* at Haleakalā. Pele & her sister Nakamaokaha`i fight on the western slope of Haleakalā. Pele's body is torn to pieces & thrown along the coast of Kahikinui. Thus, the large amounts of broken lava are called "*Nā iwi o Pele*" (the bones of Pele).
Legend of Kihapi`ilani	Fornander, Abraham (Hawaiian Antiquities & Folk-lore)	Vol. V: 180	Ho`olae was killed on the eastern side of Haleakalā by Umi & his men. (". . . *a loa`a i ke kuahiwi o Haleakalā, ma ka huli hikina o Maui, pepehi `ia ihola a make iā Umi mā.*")

Story of the `Ōhelo	Fornander, Abraham (Hawaiian Antiquities & Folk-lore)	p. 576	Ka`ōhelo killed by Pele & parts of his body thrown to Haleakalā, among other places.
Around the poi bowl	Westervelt, W. D. (Around the Poi Bowl & Legend of Pa`ao)	p.64	Reference to: "the blue waters of the Pacific stretch away to the island of Maui & wash the foot hills of the great mountain, 'the house of the sun,' the largest extinct volcanoe [*sic.*] in the world."
Burials: Relating to the Dead in Ancient Times	Fornander, Abraham (Hawaiian Antiquities & Folk-lore)	p. 572	The grave of Kaawa is hidden at Haleakalā. Haleakalā is listed as one of the places where the "secret graves" of the chiefs of Nu`u are buried.
Battle/fighting (The `Ālapa Regiment)	Westervelt, W. D. (Hawaiian Historical Legends)	p. 135	Reference to fighting: "They landed wherever any little valley on the rugged slope of Mt. Hale-a-ka-lā — "House of the sun" — afforded soil sufficient to give life or foothold. They destroyed the villages & drove the terrified defenceless people up the lava cliffs to mountian hiding-places." Also a reference to the "two great Maui mountains — Mt. Hale-a-ka-lā & Mt. Iao."
Pele & the snow-goddess	Westervelt, W. D. (Hawaiian Legends of Volcanos)	p. 56	Lilinoe, goddess of Haleakalā. Power to stop eruptions, goddess of dead fires & desolation; also one of the four snow-goddesses.

Haleakalā Place Names

The concept of *wahi pana* (a place with a story or legend attached to it) in Hawaiian culture is important because it is a connection to the past and, therefore, the ancestors. From the name of a place one can know intimate details about the people who lived there, the environment, cultural practices and historical events which took place. In Hawaiian culture, if a particular spot is given a name, it is because an event occurred there which has meaning for the people of that time. Because Hawaiian culture was an oral tradition, place names and their stories were an important way of remembering these traditions and ensuring these stories would be passed on to future generations. In Hawaiian thinking, the fact that a place has a name deems it important. Often, spiritual power or *mana* is attached to a place which increases its importance. On the subject of *wahi pana*, Edward Kanahele writes:

> As a native Hawaiian, a place tells me who I am and who my extended family is. A place gives me my history, the history of my clan, and the history of my people. I am able to look at a place and tie in human events that affect me and my loved ones. A place gives me a feeling of stability and of belonging to my family, those living and dead. A place gives me a sense of well-being and of acceptance of all who have experienced that place. (Kanahele *in* Van James 1995:6)

The following list of place names for Haleakalā was compiled and wherever possible, derivations and annotations are given. The list is based on Kenneth Emory's survey of 1920 and Thomas Maunupau's "Visit to Kaupō, Maui" in 1922. The list is by no means complete.

Abbreviations
EM = Emory 1921 Survey of Haleakalā
FOR = Fornander
MAU = Maunupau (Huaka`i Māka`ika`i a Kaupō, Maui)
PE = Pukui & Elbert (Hawaiian Dictionary)
PEM = Pukui, Elbert, Mo`okini (Place Names of Hawai`i)
ST = Sterling's "Sites of Maui"

Ana ma ka Uahi — Cave by the smoke (Em:256). According to Elspeth Sterling (1998:267), the spelling is "Ana-maka-uahi", which means "Bubble Cave". It is on the way to Kapalaoa Cabin after descending Halali`i, near Kawilinau.

**Hələli`i** — A cinder cone in Haleakalā Crater. Listed in Emory's 1921 survey. Probably a contracted form of *"hala"* and *"ali`i"*. Variant spelling: Hālāli`i [See Juvik, *et al.* 1998:15 & Mau:145].

Haleakalā — A volcano, crater, peak on East Maui and most commonly associated with Māui, the demi-god. Today, the name is commonly translated as "House of the sun. Pukui gives the translation of "house [used] by the sun". Fornander (V:534,536) relates that the name, Haleakalā, is a misnomer and the older name is *"Aheleakalā"* or *"Alehekalā"* in reference to Māui's snaring the sun. [*`Alehe* means "to snare" and is a variant form of *'ahele*, which means the same thing.]

Halemau`u — A trail in Haleakalā Crater. Emory (1921:22) notes that this refers to a "Grass house situated north of Leleiwi", which was incorrectly located on the Hawaiian Government Survey map. *Lit.*, grass house (PEM 38).

Hanakauhi — A peak in Haleakalā Crater. *Lit.*, the cover bay (PEM:40). Emory (1921:22) postulates several possible meanings, "maker of mists" or "giver of protection". *Uhi* means a covering, veil or to protect, as in "hide". [See PE:364.]

**Haupa`akea** — A spot often mist covered and snow covered sometimes. *Lit.*, white, thick snow. (MAU *in* Kū`oko`a; 6/20/1922).

Hōlua — A cabin and cave on the Halemau`u Trail, Haleakalā Crater. *Lit.*, the sled. Emory (1921:21) and Thrum seem to disagree on the probable meaning. Thrum associates the name with "playing the ancient sliding game, *hōlua*". Emory gives the meaning as "Cave of the north wind". It is possible that this is, perhaps, an older meaning of the name. The word "*hōlua*" is a contracted form of "*ho`olua*". "*Ho`olua*" is a name for a "strong northerly wind" and also the name of the rain which accompanies this wind (Kent 1986:438).

Honokahua	Cinder cone (8907 ft AMSL)Haleakalā Crater. *Lit.*, sites bay. Thrum (*in* Emory 1921:21) gives the translation as "joined foundation".
Ilailau	A "sleeping cave" noted by Emory in his 1921 survey of Haleakalā Crater. Not referenced in *Place Names of Hawai`i*. Also not listed in the *Hawaiian Dictionary*. According to Emory, *ilailau* is an edible plant.
Kahuina o ke One	Place where the sands meet (Emory 1921:21). Not referenced in *Place Names of Hawai`i*.
Kalahaku	Cone, cliff, and overlook at Haleakalā Crater. *Lit.*, proclaim [the] lord. Also, the "meeting place of leaders" (Emory 1921:22).
Kalapawili	Winding or twisting ridge (Emory 1921:22). Not listed in *Place Names of Hawai`i*.
Ka lua o ka Oo	Probably, the pit of the `ō`ō (Thrum *in* Emory 1921:21). Noted as "*Ka lua o ka Aawa*" on the Hawaiian Government Survey map.
Ka lua o Umi	Umi's pit (Thrum *in* Emory 1921:21). Incorrectly designated as Halāli`i on the Hawaiian Government Survey map. Not listed in *Place Names of Hawai`i*.
Ka lua māhoe	The twin pit[s] (Emory 1921:21). So named because "the two pits at the same place looked so much alike" (Maunupau 1998:144). Not listed in *Place Names of Hawai`i*.
Ka lua iki	A cinder cone. *Lit.*, the small pit (PEM).
Ka lua nui	A cinder cone. *Lit.*, the big pit (PEM).
Kamoali`i	Contraction of *"moa"* and *"ali`i"*, also the name of one of the Pele family (Thrum *in* Emory 1921:21). It is interesting to note that the name "Kamoali`i" is not listed in Place Names of Hawai`i, but "Kama`oli`i" is listed as being a cinder cone in Haleakalā Crater. The literal translation for Kama`oli`i is "the small *ma`o* shrub *or* a thrush" (PEM:81). Juvik (1998:15) also lists Kama`oli`i.
Ka moa o Pele	Cinder cone, Haleakalā Crater. *Lit.*, the chicken of Pele.
Kapalaoa	A cabin at Haleakalā Crater. *Lit.*, the whale *or* the whale tooth. (Emory:22 - the ivory ornament. Maunupau also says that Kapalaoa is a pool (1998:48).

Kaulupō — Described by Maunupau (1998:146) as "a small cone" "Between Pele's pig pen and Ka-Moa-a-Pele". "This was where the nights began, said the natives, and that was why the ancients named it Ka-ulu-pō. Upon the side of this cone stands a stone pile, seven feet square and four feet high. Near to this rock pile are fifteen small ones only a foot high." Thrum (*in* Emory 1921:21) gives the literal translation as "The night growth." Not listed in *Place Names of Hawai`i.*

Kawilinau — Maunupau describes this as ". . . a bottomless pit just on the upper side of Hālāli`i. This pit faces directly the Ko`olau Gap" (1998:146). *Lit.*, The twist of pain (Thrum *in* Emory 1921:22). Emory explains, "Perhaps the twisting of an object let down into the pit by a thread." *Wilinau* means "to writhe, twist, wriggle (PE 1986:385).

**Ke`ākū** — A large cave on the south slopes of Haleakalā (PEM:101). No translation for the meaning of the name is given by PEM. Thrum (*in Emory*:22) gives the definition as "standing clear or universally white". Speaking of Ke`ākū in reference to Haleakalā, Maunupau writes, "After leaving Haleakalā one comes to a place named Palikū; Ke`akū comes next, then one reaches Kaupō Gap." [Note: spelling differs between PEM & Maunupau.]

Keonehe`ehe`e — Sliding Sands Trail, leading into the crater from the summit of Haleakalā. *Lit.*, the sliding sand. (*In* Maunupau: "The melting cinders".)

Keonehili — *Lit.*, braided sand (Emory:22). Maunupau (p.146) describes this as a cinder bed, "A little way further up . . ." from Keonekapu. Not listed in PEM.

Keonekapu — *Lit.*, the sacred sand. "To scratch or pollute these sands is supposed to bring down the fog and cause one to lose his way and perish, as did the woman and two men whose traditional grave is a few feet east of Pā Pua`a o Pele."

Maunupau (p. 146) further explains, "Fifty feet away on the cinder bed is a big heap of stones, 9 feet long and 5 feet wide. This cinder bed is called Ke-one-kapu. The natives of Kaupō said that this rock pile marked the graves of people who died there. This is the story of how they met with death.

Two men and a woman came here on a visit. This was a strange cinder bed, that it, it was *kapu* to scratch on it or dig. When they arrived there they scratched on the cinder and as a result they were surrounded by thick fogs and covered up by the cinder. Their bones were left there in the cinders of Ke-one-kapu."

Emory excavated the structure but no burials were found "in or under the structure." He adds, "It is quite likely that natives perished here but the story of their burial is probably an attempt to explain the existence of the structure." (1921:12)

Not listed in PEM.

Ki`iki`i — Spelled Kiki`i in Maunupau, but probably the same. A cave in Haleakalā Crater, situated east of Honokahua cone (Maunupau:144). Thrum (*in* Emory:22) gives the meaning as "To make hair artificially white". Not listed in PEM.

Kuiki — *Lit.*, stand a while (Thrum *in* Emory:22). Not mentioned in MAU and not listed in PEM.

Kumuiliahi — Named after a large sandalwood tree which grew there (MAU *in* Kū`oko`a; 3/20/1862). Area, Kilohana or Luala`ilua Hills quad (PEM:124). *Lit.*, sandalwood tree.

**Lā`ie** — Cave and hill, Haleakalā Crater. *Lit.*, *`ie* leaf.

**Lau`ulu** — Trail, Haleakalā Crater (PEM:130). "From Hānakahi to the end of the row of mountains on Haleakalā, to the gap at Ko`olau, the ancients called the place Lau`ulu" (MAU:144). *Lit.*, breadfruit leaf.

Māmane Cone — (TM:142; Sterling:262) See MAU:144 - "These pits [Lua Māhoe] are close to the pit Māmane and to Pu`u Nole."

Mauna Hina — Cinder cone, Haleakalā Crater. *Lit.*, gray mountain. Emory translates Mauna Hina as Mount Hina, in reference to Hina, Māui's mother (EM:21).

Nā Piko Haua — "Hiding place for navel strings" (EM:22). Not listed in PEM.

Nā Mana o ke Akua — Cinder cone, Haleakalā Crater, East Maui. *Lit.*, the powers of the god (PEM:161). Thrum gives the meaning as "wonders of the evidences of the deity" (EM:21).

**`Ō`ili Pu`u** — Cinder cone, Haleakalā Crater, Maui. *Lit.*, hill appearing (PEM:168). "Hill shot out (Thrum). To be distinguished from Pu`u `Ō`ili (EM:21).

Pā Pua`a o pele — The pig pen of Pele (EM:22).

Pakaoa`o — Sleeping shelters built under the supervision of Aoao (Mr. L. A. Thurston *in* EM:22).

Pālaha — *Lit.*, Spread out flat (Thrum *in* EM:22).

Paliku	Area and cabin, Haleakalā Crater. *Lit.*, vertical cliff (PEM:177). "Standing cliff. Term used for several different cliffs" (EM:22).
Pū`ali o Koa Nui o Kāne	"Company of big soldiers of Kāne. Or: if Pū`ali means here a gap in a ridge, gap (guarded by) of the big warrior Kāne" (EM:22). Also: Puali-nui-a-Kāne (Kāne's big depression), named after a depression on the mountain (MAU *in* Kū`oko`a; 3/20/1862). Not listed in PEM.
Pu`u Hele	Moving hill (Thrum *in* EM:21). Probably means the hill where people pass (Emory:21). PEM: *Lit.*, traveling hill. Refers to Pu`uhele, a cemetery and hill behind Mā`alaea, believed once to be a *mo`o*.
Pu`u Kauaua	(Ka-u-au`a). The haughty one (EM:21). Not listed in PEM.
Pu`u Kumu	Cinder cone, Haleakalā Crater. *Lit.*, foundation hill (PEM:200)
Pu`u Maile	Cinder cone, Haleakalā Crater. *Lit.*, *maile* vine hill. Thrum says, "Named for the fragrant evergreen vine" (EM:21).
Pu`u Naue	A cinder cone in the middle of Haleakalā Crater, rising 250 ft. above the crater floor. The actual crater is 198 ft. deep and 750 ft. in diameter (EM:4). *Lit.*, earthquake hill (PEM:202). (Red Hill - another name? See Atlas, p. 308)
Pu`u Nole	Cinder cone, Haleakalā Crater. *Lit.*, weak hill. "Nole means to chide, to grumble secretly (Andrews)" (EM:21).
Pu`u o Māui	Hill (8,133 ft. AMSL), Kilohana quad. *Lit.*, hill of Māui (the demigod) (PEM:204)
Pu`u o Pele	Cinder cone, Haleakalā Crater. *Lit.*, hill of Pele (PEM:204). "Pele is supposed to have made the crater one of her abodes" (EM:21).
Waikau	Not listed in PEM. EM: no meaning given.
Waikeke`ehia	*Lit.*, Crooked waters (EM:22).

The above list of place names, judging by the amount of names and their meanings, indicate that in traditional times, Haleakalā was very significant and frequently used. Many of the names have legends related to them. Cultural practices inferred by the place names include prehistoric trails, temporary habitation caves and sites, Pele, Hina and Māui traditions, burials, depositing the umbilical cord of newborns and mo`o traditions. Several plant and animal resources are also inferred such as, *ilailau*, an edible plant, *ma`o* (either the plant or the bird), sandalwood, breadfruit, and the fragrant *maile*. Several possible water sources are also mentioned. A possible wind and rain name are also inferred in the name Hōlua, which is a contracted form of Ho`olua, the name for a strong northerly wind and the accompanying rain. These traditions will be discussed in more detail below.

Pre-Contact Period

The division of Maui's lands into political districts occurred during the rule of Kaka`alaneo, under the direction of his *kahuna*, Kalaiha`ōhi`a (Beckwith 1940:383). This division resulted in twelve districts during traditional times: Honua`ula, Kahikinui, Kaupō, Kīpahulu, Hāna, Ko`olau, Hāmākua Loa, Hāmākua Poko, Ka`anapali, Lahaina and Kula.

During the historic period, these twelve districts were consolidated into four districts: Lahaina, Wailuku, Hāna and Makawao (Coulter 1935:216-17). The project area is located in the Makawao District.

During pre-contact times, the upper slopes of Haleakalā Crater were probably exploited for resources such as bird hunting for food and for feathers, logs for canoes and timber for other supplies, sandalwood and rock for adze materials and possibly weapons such as sling stones. The elevation above 7,000 ft. would not have been well-suited for agriculture.

The following shrubs are examples of what probably existed during pre-contact times. These vegetative types can still be found above the 7000 ft. elevation today: *māmane (Sophora chrysophylla), pūkiawe (Styphelia tameiameia), `a`ali`i (Dodonaea viscosa) `ōhelo (Vaccinium reticulatum) `ōhi`ia lehua (Metrosideros collina)* and, of course, the renown silversword or *`āhinahina (Argyroxiphium sandwicense* subsp. *macrocephalum.* Some of the native lobelias, which attract the native birds and the sandalwood would have grown there as well.

About the uplands, Handy and Handy write, "But there never were extensive upland plantations here [Haleakalā] comparable to those on Hawai`i" 1972:276. They go on to say:

> Maui, despite the high mountains forming the west and east sections, had an even more extensive dry area than Hawai`i. All the country below the west and south slopes of Haleakalā, specifically Kula, Honua`ula, Kahikinui, and Kaupō, in old Hawaiian times depended on the sweet potato. The leeward flanks of Haleakalā were not as favorable for dry or upland taro culture as were the lower forest zones on the island of Hawai`i. However, some upland taro was grown, up to an altitude of 3,000 feet. (*Ibid.*)

While on a survey of Maui, Handy and Handy also note that they found "groves of wild bananas . . . along the north, east, and south slopes of Haleakalā, the gigantic volcanic cone of East Maui; sometimes there were extensive groves, as above Hāna Bay at Maui's easternmost point (*Ibid*:169). They also make a passing reference to the "tall luxuriant taro growing in forest humus or planted in decomposed lava on the slopes of Haleakalā . . ." (*Ibid*:313). Though not specifically stated, they are no doubt referring to the lower slopes of Haleakalā, below 3,000 ft.

IV. HISTORICAL SETTING

Early Historic Period

The first known early explorer to document seeing Maui was Captain James Cook on November 26, 1778. Though he did not make a landing during this first sighting, he recorded what he saw:

> At daybreak . . . land was seen extending from South, Southeast to West. In the country was an elevated saddle hill whose summit [Haleakalā] appeared above the clouds. From this hill the land fell in a gentle slope and terminated in a steep rocky coast against which the sea broke in dreadful surf . . . The country seemed to be both well wooded and watered and running streams were seen falling into the sea in various places. (1785:Vol 2:529)

However, the Frenchman, John La Perouse, was the first early explorer to actually land on Maui in May of 1786. Sailing up the western coast of Maui, La Perouse landed at Keone`ō`io (La Perouse Bay). He writes:

> The island of Mowee afforded a most fascinating prospect. I ranged along it at the distance of a league, where it runs into the channel to the S.W. by W. We beheld the torrents rushing in cataracts from the proud summits of the lofty mountains, and discharging themselves into the sea, after watering the habitations of the natives, which are so numerous, that a space of three or four leagues appears to form only a single village. But all the houses are situated by the seaside, and the mountains are so near them that the inhabitants skirt seemed to be less than half a league in breadth. (1798: Vol. 1:89-104)

Other explorers followed: Capt. King, Nathaniel Portlock, George Dixon, but for the most part, these early explorers commented on Haleakalā from a distance.

Post-contact travel to Haleakalā by *haole* was mostly limited to expeditions and sight seeing. The first recorded ascent by *haole* was in 1828 by three men associated with the Lahaina Mission: Richards, Andrews and Green (*The Missionary Herald,* 1829) They made general observations of the resources found along the way, including timber and the famed silversword (*Ibid*:247).

In 1840, the U.S. Exploring Expedition, led by Lt. Charles Wilkes, made a nondescript comment on viewing Haleakalā from Mauna Loa. It was not until the following year, 1841, that the Expedition sent a mapping team up into Haleakalā. Gerrit P. Judd, Lorrin Andrews — the missionary map maker from Lahainaluna and Joseph Drayton were among the ascending party. Wilkes notes:

> Mr. Drayton made an accurate drawing or plan of the crater, the distances on which are estimated, but the many cross-bearings serve to make its relative proportions correct. (Wilkes *in* Fitzpatrick 1981:Vol 1:97.

The Expedition team only spent three days at Haleakalā as opposed to 20 days at Mauna Loa. Drayton's 1841 map is the first map of the crater. The team noticed evidence of travel near the summit in the form of bullock tracks (Wilkes 1845:252-256) suggesting the continued usage of Haleakalā for transport and traversing East Maui.

Meanwhile, there is evidence that Hawaiians continued to ascend Haleakalā throughout the 1800's not only for its popularity as a traveling route, but also for its ceremonial significance. Handy and Handy (1972:336) report the residents of Kula and Honua`ula traveled to Haleakalā's summit "during the night time to toss into the crater the bones of their dead."

Mid-1800's: Land Commission Awards

There are few references that specifically mention Papa`anui. The *ahupua`a* of Papa`anui, where the project area is situated, does not fit the typical *ahupua`a* model of being pie-shaped and extending continuously from the sea up into the mountains. Instead, Papa`anui Ahupua`a is a discontinuous *ahupua`a*, extending from the shore at Mākena, upslope to Keonehelu summit at about 4,000 ft. AMSL. The boundary then begins again at Pu`u Keokea (7,200 ft. AMSL), on the southwest flank of Haleakalā, and continues to the crater rim, across the crater floor, along Kalapawili Ridge, and ends at Pōhaku Pālaha (8,105 ft. AMSL). It is here at Pōhaku Pālaha, that 8 of the *ahupua`a* boundaries meet (Sterling 1998:3) (See Figure 1). On some 19th century maps, this rock is named "Pōhaku `Oki `Āina". The Boundary Commission Records state that Pōhaku `Oki `Āina is located "at a place called Pālaha."

During the *Māhele*, ten claims for land in Papa`anui were made. However, only two of these claims were actually awarded. These claims were LCA 2566 to Nahualaalau and LCA #2505 to Ohule.

> <u>LCA 2566 to Nahualaalau</u> (N.R. 558-559, Vol. 3)
> . . . Also, at Papa`anui are 2 sections of grassland, a taro patch, and a sweet potato patch. The witness is Ohule. Also, the *`ili* of `Ōhi`a, at Papa`anui. On the north is Pūhale, on the east, one boundary of Kekoa, the *haole*, south is Papa`aiki, west is only *kula*. The witness is Ohule. Also, there are 2 Irish potato patches. One is at Keauhou and one is at Papa`anui. The witness is Nika. I believe I have a claim to all these.
>
> Farewell to You,
> Nahualaalau

LCA 2505 to Ohule, Honua`ula, December 26, 1847 (N.R. 529, Vol. 3)
Greetings to the Land Comissioners: I, Ohule, hereby state my claim at Papa`anui, my *`ili*. Pi`ihale is on the north, Waipao is on the east, the boundary of the sugar cane field of the *haole* is on the south, Papa`aiki is on the west, the sea. The witness is Nika . . .

(N.T. 118-119, Vol. 7)
Nika, sworn, he has seen Ohule's land - eight sections . . . Section 8 - House site, Nahuna *`ili* of Papa`anui Ahupua`a . . . *mauka* by Government Trail, Makawao by papa`anui Pali, *makai*, Kahikinui by Sea.

It is not known exactly where these two awarded LCA's are located. Judging from the descriptions of the land use (grasslands, taro, sweet potato, house site) they most likely are below the 7000 ft. elevation.

No land claims were found within the proposed project area. It seems the land has been in government hands since the modern land management system was instituted. Noting the elevation of the project area (9,940 ft.) and the soil type as cinder lands, the land use would probably be limited to cattle grazing and wildlife habitat. Classified as such, these lands would not be best suited to agriculture.

In 1853, the first census was taken by the Government. John Coulter did a study of population density in relation to land use. He found that:

> Unpopulated lands on Maui included the highlands of east and west Maui and smaller areas near the coast where agriculture was impracticable. The districts of Kaupō and Kahikinui, dissected uplands of little rainfall on the lee side of Mount Haleakalā, were almost uninhabited . . . (1931:23)

Late 1800's - Present

In the 1880's sugar cane was replaced by cattle ranching which continued into the 20th century. Armine von Tempski recollects that her father, Louis von Tempski, built a stone corral at the foot of Kolekole:

> Each year when the round-up was over, Dad and half-a-dozen *paniolos* drove a hundred steers up Haleakalā and through the vast pit to a small forest nestling at the eastern end, and herded them for awhile. When the cattle were more or less at home on their new environment, they were drifted up a thread-like trail leading to a lush plateau eighteen hundred feet above the crater floor, where they were left to fatten until the first winter rains fell . . . (von Tempski 1940:259)

Mr. von Tempski managed the sixty thousand-acre Haleakalā Ranch. Remnants of the stone corral is still visible today.

Speaking of the ranch leases and cattle grazing, Mr. H. Powers relates:

> The cattle trail zig-zagged up from down at the Palikū area up the face of this thing that they built. The ranch that ran cattle on the outside of the crater up here and in the ranch had pasture rights until 1936. I think their pasture rights expired in 1936. So there were still white-faced cattle in the early 30's up in there but there weren't very many. They were bringing them out but they did have them running on the outside of the crater rim on this side so they built this trail for bringing the cattle up and down . . . they brought them out on Halemau`u. I think that was the origin of the Halemau`u trail — the original Halemau`u.
>
> They [the cattle] would have concentrated where there was most feed which of course was the Palikū end or up on the banks where there was vegetation and the outside of the ridge. There was nothing up in here [center of the crater]. (H. Powers *in* Rosendahl 1978:58)

In the late 1800's, Haleakalā was recognized as a scenic feature and funds were raised to erect an overnight shelter. In 1916, the U.S. Congress allotted 21,000 acres at the summit of Haleakalā as part of the Hawai`i National Park. The Park officially opened in 1921 and operated peacefully for twenty years until the U.S. Army began seeking sites for "unspecified defense installations" in 1941 (Jackson 1972:130). There is some indication the Army was using the Kolekole site as early as 1941-42 (Personal Communication, Dr. Charlie Fein, October, 2000). After being granted a "Special Use Permit", the Army installed equipment at Red Hill (Pu`u `Ula`ula). Bu 1945, the U.S. Army had istallations on both Red Hill and Kolekole Peak, just outside of the National Park boundaries. These installations were utilized until the end of World War II and intermittently thereafter, including the Korean War. Between 1955 and 1958, the University of Hawai`i and the U.S. Air Force shared the use of the Red Hill facilities. By 1960-61, the University of Hawai`i was operating its geophysical observatory at the Kolekole location (Jackson 1972:131).

Today, the University of Hawai`i continues to operate its facilities on the 18-acre parcel, including the MEES Solar Observatory, focusing on the energetic activity of the solar corona and the LURE Observatory, dedicated to using lasers to determine distances to satellites (Murphy, 1995:69). In addition, classified and defense related projects are currently directed by the U.S. Air Force, including the operation of the MSSS (Maui Space Surveillance Site). The main objective of the MSSS is to perform satellite imaging (*Ibid:*70).

V. Previous Archaeology

Papa`anui/Haleakalā

Several surveys were completed for the Haleakalā Region, the most extensive being Kenneth P. Emory's *An Archaeological Survey of Haleakala* (Bishop Museum: 1921). Emory recorded 58 terraces and platforms, 9 groups of shelters, several hundred *ahu*, and a section of ancient paved road (Emory, 1921: p.256), mostly within Haleakalā crater, but some on the crater rim. A group of 8 or 9 shelters and many small *ahu* were identified between Red Hill and Kolekole Hill, although their exact locations remain unknown (Emory, 1921: 254). Emory suggested one function of the terraces and platforms may have been as altars peculiar to the Haleakalā region.

Approximately 35 of the archaeological sites identified during Bishop Museum's survey are found in Papa`anui Ahupua`a. These are distributed along the crater rim and within the crater. Several walled shelters were found on White Hill (Pakaoao) and Red Hill, such as State Site # 50-50-11-3637 (White Hill) described as partially terraced enclosures covered with slingstones. Predominantly cairns (e.g. Site # 50-50-11-3658) and enclosures (e.g. 50-50-11-3661) were identified along the Crater Rim. A series of *ahu* and shelters were (State Site # 50-50-11-3609) recorded along the portion of Halemauu Trail which traverses Papa`anui. Several platforms, such as State Site 50-50-11-3611, are scattered along the paved Kihapi`ilani Trail (State Site # 50-50-12-3610) in Papa`anui. The Ka`a`awa burial pit (50-50-12-3640) and what is today known as "Hunter's Cave" (50-50-11-3624) are also sites located within Papa`anui Ahupua`a along the Haleakalā crater floor.

Winslow Metcalf Walker, in his survey entitled the *Archaeology of Maui* (Bishop Museum: 1931), discusses a heiau on Summit 1 (named Haleakalā) on the southern ridge of Haleakalā Crater in the neighboring *ahupua`a* of Kahikinui. A trail from the Nu`u district, discussed in Emory's report, leads to the same peak on which the *heiau*, identified as Kemanono by Emory (Heiau site 229; State site 50-50-16-3626; Bishop Museum number MH-41), is located.

In 1963, Lloyd J. Soehren conducted *An Archaeological Survey of Portions of East Maui* (Bishop Museum: 1963). This report calls Emory's work "extensive", and focuses on the structural and functional interpretations of the sites within and around the perimeter of Haleakalā crater. Based on an early radiocarbon date obtained from Holua Cave (located along the Halemau`u Trail on the north side of the interior of the crater), Soehren suggests this region was being used prior to 1000 A.D. The Haleakalā region is described as being primarily used as a traveling route from one side of the island to the other, although Soehren also mentions bird hunting, and place of refuge for war victims as possible uses. He points toward the numerous *ahu* and stone shelters as evidence for cairns, markers, shrines and wind breaks associated with traveling. Several archaeological sites were ascribed with such traditional Hawaiian practices as umbilical cord offerings, ritual and family burial rites and the collection of raw materials for adze making (Soehren, 1963: 111-116).

Inez Ashdown describes eleven Emory sites she visited within Haleakalā in her account *Ke Alaloa O Maui* (Ashdown: 1971). Paul Rosendahl (1975) completed an archaeological reconnaissance for the proposed Haleakala Highway Realignment Corridor. He reported 7 sites along the highway realignment corridor including cave shelters, a platform, cairns and walled shelters (Rosendahl 1975: 4). None of the sites found is in the present project area.

In 1991, J.C. Chatters conducted a cultural resource inventory and evaluation for 7.7 acres associated with the expansion of the Maui Space Surveillance Site located in Science City (Chatters, 1991). Chatters' survey included the 1.5 acre parcel of the present project area. J.C. Chatters inventories four sites at the proposed location for MSSS expansion, Sites 50-50-11-2805 through 50-50-11-2808. Although, the sites at Science City show archaeological resources in the immediate vicinity, no sites were identified in the current project location. The recorded sites consist of 23 shelters and a wall segment. A slingstone was found at site 50-50-11-2807 and a limpet shell was identified at site 50-50-11-2808 (Chatters, 1991:13). The site nearest the present project area (approximately 45 m away) consists of three shelters constructed against boulders and outcrops with leveled, rectangular to trapezoidal shaped floors (Chatters, 1991: 10). Archaeological sites located at the summit region are interpreted as prehistoric temporary shelters made by travelers passing through the region. No further archaeological work was deemed necessary because the proposed construction was not to affect the newly recorded sites.

Further work was conducted in Papa`anui in 1995 (Fredericksen *et al.*, 1996). During an archaeological inventory survey of the GTE Hawaiian Telephone Haleakala Fiber Optics Ductline, Phase III proposed easement corridor, four sites were located. None of the sites were found near the project area nor were any found in the surveyed portion of Papa`anui Ahupua`a.

Field inspection of localities at Haleakalā for the installation of Remote Weather Stations included one locality within Papa`anui Ahupua`a (Folk, 1997). A low L-shaped wall was identified on the north slope of Hanakauahi. This was interpreted to be temporary shelter or hunting blind for goat hunters and the REMS installation was not to impact the shelter.

The principal site types at Haleakalā such as trails, platforms, adze quarries, caves, temporary shelters and cairns, seem to be associated with topographic or geomorphic locations (Chatters, 1991). Platforms are predominantly found along the crater floor. Caves are often found on the crater rim. Temporary shelters built against rock outcrops or boulders are found scattered along the crater rim and within the crater, but are concentrated on the leeward sides of cinder cones such as Pakaoao. Cairns are scattered over Haleakalā.

VI. SETTLEMENT PATTERNS AND EXPECTED FINDS

Papa`anui/Haleakalā

The relationship between the *makai* and *mauka* portions of Papa`anui Ahupua`a is uncertain. The popular understanding of an *ahupua`a* as a radial land division providing resources from the forested uplands, the agricultural lands and the ocean does not readily apply to Papa`anui Ahupua`a, particularly the Haleakala region. Given its unique geography, the use of the *mauka* portion of Papa`anui Ahupua`a was probably not restricted to purely resource collection or to use by only Honua`ula residents. Although alpine resource exploitation and procurement of basalt material for tool manufacture may have tempted people to make the long trek, the spiritual element was also important, as reflected in the types of archaeological sites honoring birth and death. There is some indication that residents from all over East Maui were utilizing the same places at Haleakalā for traveling routes, disposing their dead, storing their children's umbilical chords, hunting birds, etc... This suggests that although Papa`anui may have extended into Haleakalā crater, the places of Haleakalā were used, traversed, collected, and honored by all of Maui and particularly by those of East Maui.

By far, the most ubiquitous features at Haleakalā are the enclosures and *ahus* or cairns. The prehistoric settlement pattern for the rim and crater of Haleakalā links these structures to travelers, warriors or hunters who used the *ahu* or cairns as markers, and the enclosures and walls as windbreaks and temporary shelters. The platforms found elsewhere in the crater are generally construed as altars for religious purposes or special places for hunting and gathering within the crater (*i.e.* adz material, birds, plants). Other landmarks, cinder cones, and caves on the crater rim and within the crater are also associated with religious activities.

In historic times, goat hunters have also built blinds and windbreaks in the crater and visitors are known to have built little cairns as mementos of their trip. It is often difficult to discern whether these structures are historic or prehistoric as there is no evidence of cultural material.

Because the entire 18 acre University of Hawaii parcel has been previously surveyed (Chatters, 1991), we do not expect to find archaeological material. However, if archaeological sites are found, they will most likely be associated with the Kolekole "shelters" discussed in early twentieth century references or with U.S. Army use of the site in the 1940s. Temporary shelters with walls constructed on the leeward faces of boulders and cliffs are common to cinder cones on Haleakalā Crater Rim, such as Pakaoao where there are five clusters of walled shelters (State Site #s 50-50-11-3637, 50-50-11-3645-3648). One group of walled shelters (State Site # 50-50-11-3644) was found at nearby Red Hill during the Bishop Museum survey in the 1920s (Emory, 1921). Chatters (1991) identified four such shelters during her survey of Kolekole Cinder Cone and the UH Research Facility (State Site #s 50-50-11-2805-2808).

VII. NATIVE HAWAIIAN CUSTOMS PERTAINING TO THE PROJECT AREA AND POSSIBLE CULTURAL IMPACTS

Burials

It is documented that there are many known burials within Haleakalā Crater and its associated *pu`u* (cinder cones) (Emory 1921). An 1862 newspaper article in *Ka Hōkū o ka Pākīpika* indicated:

> There are secret burial places on the cliffs or on level places. There is a pit on Hale-a-ka-lā called the Pit-of-Kaawa (Lua-o-Ka`awa), directly above Nu`u, on Maui . . . Upon reaching the pit, the relative of the dead calls to a departed ancestor within, "So-and-so, here is your child." If the body (tossed in) falls into the water, he has no relative in this pit, but he who has a relative is caught as his corpse is thrown in. It lands on a ledge and does not drop into the water. After the corpse vanishes, the bearer returns home after which there is much crying and mourning. (S.W. L. Ka`ai`e; "No ke Kupapa`u", 20 Malaki, 1862)

Another newspaper article about this same pit appeared in the Kū`ōko`a on October 6, 1870 and reads:

> The disposal pit of Ka`a`awa is a deep disposal pit in the crater of Haleakalā. It is on top of a vocanic hill inside the crater, on a volcanic hill on the north side (of the crater) close to Wai`ale`ale and the rock that divides the lands (Pōhaku Pālaha), and on the eastern edge of the gap opening at Ko`olau (to) Ke`anae.
>
> It is a deep cave or a "bottomless pit", opened up perhaps from the foundations of the island by the force of the heaping lava, and may be several miles deep, with fresh or sea water at the bottom. People have guesses that the waters of Waiu and Waipu at Kaupō have their source in Ka-lua-o-Ka`a`awa because of the insipid taste of the waters, or that they come from the burial pits *mauka* of pu`u-mane`one`o. Ka-lua-o-Ka`a`awa was like Waiuli; it was the disposal pit for the people of Makawao, Kula, and Kaupō. These pits could be visited in broad daylight because no cruel marauder could get at the bones and take them away to work mischief.

On the subject of burials, Fornander writes:

> Here are the secret graves wherein the chiefs of Nu`u were buried: Makaopalena, Kealaohia and Puukelea, all on the side of Haleakalā on the eastern side of Maui . . . There is no living man who knows any of these secret burial places, so well hidden are they. (1916-1920 Vol. V: 572)

In discussing traditional burials, Fornander writes:

> The burial is done at night, however, not in the day time . . .The people thought that if the burial place was known, the bones would be taken for fish hooks, and the flesh for shark bait. There are some hidden graves among the precipice; others are on the plains. (1916-1920 Vol. V: 570)

In communication with Clifford Nae`ole, of the Maui Island Burial Council, no lineal descendants have ever been identified or have stepped forward to make a claim to any burials within Haleakalā. In recent years, *iwi* originally from Haleakalā that were housed at the Bishop Museum were repatriated by the Maui Island Burial Council, as no lineal descendants were identified.

This study failed to turn up any indication of possible burials within the project area and was unable to locate anyone who had knowledge of any burials within the project area or the nearby vicinity. Given the location and terrain of the project area, the possibility of finding any inadvertent burials within the project area seems unlikely.

Hawaiian Trails

Traditionally, the trail through Haleakalā Crater was used as a short-cut to traverse between east and west Maui. In the 16th century, Kīhāpi`ilani, *ali`i nui* of Maui, completed the construction of a trail around the island, including one over Haleakalā. This feat united the politically important districts of Hāna and Kaupō with West Maui. "This trail was used as a rapid communication network and to facilitate the movement of armies from one end of the island to another" (Fornander *in* Kolb 1997:19). During the time of Kamehameha, one at least one particular occasion, he moved his army, under the leadership of Kamohomoho, through Haleakalā: "It was said that this great army of Kamohomoho ascended Haleakalā, descending at Kaupō, and from Kaupō moved to Kīpahulu" (Desha 2000:219).

In traditional times, there was a trail coming up from Kaupō to Haleakalā. In the early 20th century, this trail was also used to deliver mail via horse back (Personal Communication, Sam Ka`ai, 10/31/2000). This is the same trail that Handy and Handy make reference to:

> There is a horse trail today which passes from Makawao up over the western side of Haleakalā (where there is now an automobile road), down into the crater, through it, and on down through the Kaupō Gap to Kaupō. Since there are remains of shrines in the crater we presume this is an old Hawaiian trail . . . It would have been a means of much easier and more direct travel and communication between West Maui, the western slope of Haleakalā and Kaupō, than the *Alaloa*. (1972:491)

This study did not locate any ancient Hawaiian trails through the project area.

Native Hunting Practices

During traditional times, bird catchers would have ascended Haleakalā for edible birds such as the *nēnē* and *ʻuaʻu*. A Hawaiian newspaper article indicates that *ʻuaʻu* is by far the tastiest of all birds, even better than the tastiest fish in the sea (HEN 1062). The honey eaters and honeycreepers would have been valuable for their feathers, as well.

> "The crows, thrushes, geese, seabirds, and extinct honeyeaters and honeycreepers discovered in lava tubes on privately-owned ranch land on leeward Haleakalā likely occurred within park boundaries as well. In recent explorations of lava tubes in the rain forests of the park in Kīpahulu Valley, it was discovered that both the *nēnē* and the *ʻuaʻu* formerly occurred in the rain forests as well as in the upper-elevation lava and cinder area of the park. (Medeiros & Loope 1994:5)

There were no *ʻuaʻu* burrows found in the rock outcrop within the project area. However, *ʻuaʻu*, the Hawaiian dark-rumped petrel, can be found in burrows in the cliff face, nearby the project area. In a conversation with Kathleen Hodges, a Park environmental specialist, she indicated that the nearest burrow was approximately 300 ft. away and she felt this would not be an impact to their daily patterns. The issue of noise and lights would need to be mitigated with Park staff.

This study did not locate any knowledgeable informants or information about native hunting practices within the project area in the past or during the present time.

Native Gathering Practices for Plant Resources

A Botanical Resources Assessment was conducted by Char & Associates (April, 2000). Their assessment identified only six plant species within the project area. Of the six plant species, four are endemic or native only to the Hawaiian Islands. These four plants are: *kupaoa*, mountain *pili*, Deschampsia and Tetramolopium. The two other plants identified were pūkiawe (native to the Hawaiian Islands) and hairy cat's ear, an introduced species. None of the plants are a threatened or endangered species. In an interview with Hokulani Holt-Padilla, she indicated that she does do some plant gathering within the Park boundaries, though not within the actual project area.

> As far as cultural practice, I continue to do plant collection in the park area and, you know, hide my bag when other people are coming. [An example of some of the things I gather are] *pūkiawe* (*Styphelia tameiameiae*), some *lehua*, *māmane* (*Sophora chrysophylla*) and, when nobody's looking, a little bit of *ʻiliahi* (*Santalum* spp.; sandalwood) blossoms because, you know, there's just something about adding them in there that just makes it very special.

The Char assessment indicates that the plant cover is sparse, about 5-10% cover. Gathering for plant materials within the project area does not pose a potential problem.

Religious Shrines and Archaeological Sites

An archaeological inventory survey conducted by Cultural Surveys Hawai`i in April, 2000 identified two archaeological sites (State Sites 50-50-11-4835 and 50-50-11-4836 within the project area.

Site #4835 consisted of two rock enclosures interpreted to be trash burning pits and are associated with the military use of Kolekole in the early 1940's and subsequent University of Hawai`i Research use.

Site #4836 consisted of a terrace, an enclosure and a wall segment. The terrace was tested and revealed a modern nail which was recovered from the upper-most stratum. No other cultural material was identified during the test excavation. This site was interpreted as a cluster of different temporary shelter types, probably prehistoric in age. The features in this site are consistent with numerous other features found on Haleakalā rim, particularly surrounding the cinder cones and probably served as temporary shelters for travelers or hunters in prehistoric and historic times.

Both site #4835 and site #4836 are being recommended for preservation and the client has agreed to a preservation plan which is currently under preparation.

There were no other historic properties identified within the project site.

This study did not identify any traditional religious practices specific to the project area.

Concerns

Removal of Rock and Cinder

Because many Hawaiians believe that Haleakalā is "sacred", and the cinder and lava rock is, in its basic form, representative of Pele, it is recommended that any rock or cinder dug up during the construction phase be kept and used on site rather than removing it from the mountain.

VIII. SUMMARY AND RECOMMENDATIONS

Summary

This assessment has attempted to look at the effects the proposed Faulkes Telescope Facility may have on Hawaiian culture relating to specific practices and traditions. The specific areas studied were burials, Hawaiian trails, hunting and gathering practices for plant and animal resources, religious sites, archaeological sites and historic properties. Other than the potential impact to the *ʻuaʻu* (dark-rumped petrel) and their nesting patterns, this study did not identify any potential impacts to the above cultural practices. Two archaeological sites were identified during an archaeological inventory survey. Both sites were mapped and documented. One site was test excavated with only a modern nail being recovered from the upper-most stratum. Both sites #4835, #4836 and the associated outcrop on which both sites are located are slated for preservation. The client has agreed to develop a preservation plan which is currently being developed.

During the *Māhele* period, there were no *kuleana* (commoner) claims awarded within the project area or the upper slopes (above 7000 ft. elevation) of Papaʻanui.

The proposed Faulkes Facility site has been utilized by the military since the early 1940's and by the University of Hawaiʻi since the early 1960's.

A finding of "no significant impact" is determined for the proposed Faulkes Telescope Facility.

Recommendations

It is recommended that any potential impact to the *ʻuaʻu* (noise, light, any disturbances) be mitigated with the expertise of the Park Cultural Resources Management staff. Conversations with KC Environmental, Inc. and the University of Hawaiʻi Research Facility staff indicate this is currently being done. It is also recommended that all rock and cinder disturbed by the construction phase remain and/or be utilized on site.

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APPENDICES

Preface to Interview Transcriptions

As part of this project, two formal interviews, conducted by Ka'ohulani Mc Guire for Cultural Surveys Hawai`i, were taped and transcribed. Transcripts of the interviews are included in their entirety below.

The reader is reminded that the information shared in the interviews are the express opinions and views of the informants, much of which relates to their personal experiences as cultural practitioners and their own family traditions. These are their words, their experiences and their stories. Please respect them by not using portions of the interviews out of context or quoting from the interviews without giving proper credit to the interviewees. These interviews may not be used in their entirety in any publications unless the written authorization of the interviewee is obtained.

Cultural Surveys Hawai`i is very grateful to the interviewees, Hokulani Holt-Padilla and Kapi`ioho Lyons Naone, for sharing their thoughts and for giving so willingly of their time. It is hoped that the value of documenting their *mana`o* (thoughts) will be understood and appreciated by future generations of Hawaiians and that it will serve to perpetuate the Hawaiian culture, not only for Hawaiians, but also for those who seek to understand the depth and wealth of this rich, cultural heritage.

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Ua lehulehu a manomano ka `ikena a ka Hawai`i.
(Great and numerous is the knowledge of the Hawaiians.)
O.N. #2814

APPENDIX A: Transcript of Interview with Hokulani Holt-Padilla

Interview with: Hokulani Holt-Padilla (HHP)
Project: Proposed Faulkes Telescope, Haleakalā
Interviewed by: Ka`ohulani Mc Guire (KM) for Cultural Surveys Hawai`i (CSH)
Place of Interview: Wailuku, Maui
Date: November 2, 2000

CSH: Can you give me some background about yourself, where you're from, where you grew up, have you always lived on Maui?

HHP: I was born [in 1951] in Honolulu, but was raised here on Maui with my maternal grandparents in Wai`ehu. They were Henry and Ida Long. And, from when I was a baby, until I was five, I lived continuously here on Maui with my grandparents. The understanding was, when I was old enough to go to school, I would return to my parents in Honolulu. So, that's what I did. But, every vacation, long holiday, summers, I was here on Maui. I got my first work experience at the cannery here and lived here like that until my grandmother passed away when she was 86. I believe that was in [19]74. So much of my Hawaiian cultural awareness came because of living with my maternal grandparents here on Maui. My *tūtū* man (grandfather) died when I was ten, so the remainder of my time was spent with my *tūtū* lady — my grandmother. And, she was Maui, for generations upon generations, she has come from Maui people. So, we were primarily ocean [people]. We lived on the beach in Wai`ehu. But, the other thing that was a tradition in our family was *hula* (art of traditional Hawaiian dance). So, because of that, we also accessed different areas on the island. My grandfather's sister lived in Kula. Her family still lives there in Waiakoa. So, we spent some time up there in Kula, especially during the summers visiting with my grandfather's sister. I attended Kamehameha and graduated in [19]69, [then] went to UH-Mānoa, fooled around for two years and then went to work. And, in the course of that work time, I worked for the State Foundation for Culture and the Arts. [Then,] I moved back to Maui and, among other things, worked for Pūnana Leo o Maui. Because I went to school in Honolulu, I moved back to Maui in 1975 and have been living here ever since. For the first ten years, [I lived] up in Kula and, since then, down here in the area not so commonly known as Kauahea, but more commonly known as Paukūkalo Hawaiian Homes, which is only a stone's throw away from where I was raised when I was young.

CSH: Where was your grandfather from?

HHP: Actually, from Kaua`i. His family is from Kaua`i, but he came here when he was 19 and lived here ever since. He came here to visit his brother who was living on Maui.

CSH: Did your grandmother's family always live in Wai`ehu?

HHP: No. Well, Kahului. Actually, the family comes from Kaupō, from Nu`u. And, then moved out here about the same time that many of the Kaupō families left Kaupō, which was after the sugar cane started going down, they had a big plague where a lot of people died, so, right around that time the family moved out here to Kahului. My great-grandfather was a fisherman, so he moved out here to Kahului. This was where my grandmother was born. She was raised in an area that is not so commonly known as Lamali`i, but now more commonly known as Wailuku Community Center. So, we have, for several generations, lived within view of Haleki`i and Pihana Heiau.

CSH: What about your hula background? Did you *`ūniki* (formal graduation ceremony) with anyone?

HHP: My grandmother was a *kumu hula* (teacher of *hula*). Of her seven daughters, three are *kumu hula* and, of her grand-daughters, only me thus far and, now, my cousin, Maelia, who is the next generation, is also a *kumu hula*. So, it has been for several generations within the family. In addition to that, I learned from Hoakalei Kamau`u in Honolulu when I was there working and going to school. That was for about five years. I was with her from when I was about 18 until I got married, which was in [19]74. So, in the sense that most people are familiar with, as far as *`ūniki* goes, as which comes from the school of Maiki Aiu Lake, my answer would be, "No." Did I have permission to teach and to start my *hālau* (school)? Yes.

CSH: Does your family have any connection to Haleakalā, especially because your *`ohana* is from Nu`u in Kaupō?

HHP: It was a common practice for my *tūtū* lady and my *tūtū* man to go to Haleakalā, at least on a yearly basis and, sometimes more often, depending on — you know, I was kind of little at that time, but I do know we used to go there. Number one, on the lower slopes, to Waiakoa to visit my grandfather's sister. They had a small ranch and we'd take the horses up *mauka* (mountainward) and along those Kula slopes. But, two, to go up to the summit to — what's a good word, I don't know, to "pay respects" or to "make the pilgrimage" or to do a regular thing that they always did. I'm not sure what the right words are, but, on a regular basis, we'd go up there and my aunties' and cousins' family would always go to see sunrise, during the summer particularly, and, whenever it snowed, we tried to go up there as well. It hasn't snowed so much on Haleakalā in recent years but, when I was small, it used to snow quite often. When it snowed, we tried to go up to the summit as well.

CSH: Did you go just to see the snow, because it's unusual in Hawai`i to see snow?

HHP: To see the snow because it's unusual to play in it but, also to be awed by it, to be grateful for it. I'm not sure what the right word is, but, to be grateful that this is happening once again. And, how that would occur is that my grandmother, as far as I can remember, did not do any particular "ceremonies", but would often, when we went up there, we all had to have quiet time, alone time, respectful silence — I don't know what you call it.

CSH: Group time as well as individual time?

HHP: Yes. And, then, we can go play in the snow.

CSH: But, first was the quiet time?

HHP: Yeah.

CSH: Did they say any kind of *pule* (prayer) or chant?

HHP: I don't recall. I can ask my Aunty because she also lived with my grandparents. [At the submission date of this report, Aunty Hōkūlani was unable to verify this with her Aunt.] Of course, when you're young, you just want to play in the snow.

CSH: What part of the summit did you go up to?

HHP: I believe we went up where the Visitor Center is.

CSH: So, that's by Sliding Sands, Keonehe`ehe`e. So, you didn't go to the very top of the summit, to Pu`u `Ula`ula?

HHP: No. Because I don't know when that was built.

CSH: I believe the CCC built the original building at Keonehe`ehe`e. The present building, at Pu`u `Ula`ula, was constructed in the early 1960's [1962] by the National Park Service. Prior to that, the military (Army and Air Force) utilized Pu`u `Ula`ula. By 1956, the radio tower and all buildings had been removed from Pu`u `Ula`ula.

HHP: So, we may have gone all the way up there.

CSH: How would you get up there? The highway was officially opened in 1935, but it went only as far as Keonehe`ehe`e, then. [It wasn't until 1941, six years later, that the military extended the road from the visitor's center, at Keonehe`ehe`e, to the summit area of Pu`u `Ula`ula.]

HHP: Well, I would have been there after that. I was born in [19]51, so we went up by road. But, it seemed a whole lot more winding to me than it does now. The same thing when we used to go Kula.

CSH: Do you remember your grandparents talking about going up a trail or by horseback?

HHP: Yes. My grandfather and my grandmother, but it was just mentioned in passing with no details given.

CSH: Was there anything else that came down through your family?

HHP: The knowledge of Lilinoe.

CSH: Can you talk about Lilinoe and what you know?

HHP: The knowledge that there was a goddess or personage whose place was Haleakalā as much as Poli`ahu's place is Maunakea and that they were sisters. Lilinoe, particularly, was more of the mist because the snow didn't always come to Haleakalā, but Lilinoe was always at Haleakalā. And, when the heavy mists came down, that was her. And, pretty much, that was about it. If there were particular stories about what she did or where she went, I don't recall those things — just the knowledge that she did exist.

CSH: Did they talk about going into the crater at all? Some of the practices that have been documented within the crater are related to burials and depositing the piko at Nā Hale Naua.

HHP: Our family *pikos* go to Nu`u. Our family *pikos*, as far down as my sister, have gone to Nu`u — not inside the crater.

CSH: And, there were no family burials at Haleakalā?

HHP: No, not that I know of and not from what I've been told.

CSH: Did they talk about any sites or *heiau* either within the crater or at the summit?

HHP: No.

CSH: There's a lot of *ahu* within the crater, as well as at the summit. Do you have any knowledge as to why they were built? Have you heard anything about that from anyone?

HHP: You know, it's always amazing to me that it's such a cold place, as well as Mauna Kea, that they would have so many *ahu* there. The only things that I

can think of on a little more practical basis had to do with stone work and things. But, it seems to me that, you know, when you talked about *pu`u's* a little earlier [referring to an earlier conversation which is not part of this transcript], just doing things on or in *pu`u's* are a little "uji" (strange and unsettling) to me because it is a recognition of, you know, that's where the lava comes from. And, that's where the beginnings of the earth, of our homeland comes from. And, that is like a birthing place because the lava

comes out of the center of the island and creates more land. So, maybe, some of it has to do with that kind of recognition, that it is a place of life where the life blood of the land comes out of. This is a funny kind of analogy. I don't want people to get the idea, you know, bleeding into the land. But, it is where that life force or life blood comes from that will then become the land itself. So, perhaps also knowing that there is great power and great life in a crater as well, even though it may not look like it, it is that kind of symbol that could also draw the traditional Hawaiian to recognize that position in their whole scheme of life.

CSH: Do you believe the whole mountain, itself, is sacred?

HHP: Certainly, for all those reasons. And, for all those little *pu`u* that come down along the flank of Haleakalā and any of the major islands, it is the same thing. It is where that eruption comes out that more land is formed and we have a small glimpse into the inner workings of creation. And, because I also work on Kaho`olawe, I continue to see the *pu`u* line up, all the way up the flanks of Haleakalā, going across into Moa`ula Nui and all the way down through Keālialalo, and etc. They all line up. All those *pu`u* line up to the top of Kaho`olawe. So, to me, they're all connected because they come off of Haleakalā. So, yes, the whole mountain is sacred because that's where that half of the island came from.

CSH: So, can tell me again where you're standing on Kaho`olawe to see all the *pu`u* line up?

HHP: Moa`ula Nui. You can see all the *pu`u* — Pu`u Māhoe and going all the way up to the top of the mountain.

CSH: Is there a connection between Kaho`olawe and Haleakalā — *heiau* or related ceremonies, etc?

HHP: In contemporary time, we have. In traditional times, I'm not sure. I wouldn't doubt it, but I cannot say for sure that it's so. I also do know that there are *ko`a* or *ahu* that ring Moa`ula Nui, the highest part of Kaho`olawe, as well as Moa`ula Iki, which is the next highest part — the same thing, that there are *ahus* or or *ko`as* that are around these *pu`us*. When we see that constantly happening on the high points of our islands, yes, we have to look

at that.

CSH: Can you talk about the importance of view planes from a Hawaiian perspective?

HHP: Oh, yes. View planes are the emotional, physical, visual connection to the place of importance. So, those view planes need to be uninterrupted because that is how the personal connection to the physical connection occurs. The person's connection to that visual place itself occurs. And, without the view

planes being there, the personalization of the worshiper, of the believer, of the doer, to the important spot does not occur. When we created the *ahu* on Kaho`olawe, and we have one on Pu`u Māhoe, those view planes were very important. And, those lineal connections were important because that is what keeps — I hate to put it like this, but it's like "connect the dots". What keeps them all connected is being able to stand at this *ahu* and see that *ahu* and see that mountain and see that connection to the *pule* that you are doing to the "whichever god" you want it to go to. The mountain also represents that god, or the *ahu* represents that god or the forested area represents that god or whoever you may be talking about.

CSH: So, if the view plane is obstructed, would that take away from the *mana* of that particular place?

HHP: Oh, definitely! It's like saying that between the pew of a cathedral and the front of the cathedral, you have put up a screen. The people sitting in the pews do not have the same connection with the front sanctuary part. It's not the same. It's like putting up a screen in front of it. You can worship without that. Certainly. But, with it there, you need to make the connection. And, I use the example of a cathedral because it's a big place and there's lots of space.

CSH: Can you talk about the issue of "sacred space" and what that means to you as a Hawaiian practitioner? Is it important to Hawaiians and how is it important?

HHP: You know, anyone can worship anywhere and does not have to go to a spot to worship. You can worship anywhere as an individual. But, as a Hawaiian, the worship is connected to our environment because that <u>is</u> us. And, that environment is where the gods live and how they are manifested to the vision of the person. It is also the family connection to the person themselves. So, the environment, our surroundings, <u>is</u> the place that we worship. Yes, again, you can do that anywhere. But, when you talk about needing to do the prayers to bring rain, you need to be outside to talk to those clouds and to talk to those god beings that will hear you and know why you need this. When you need to give offerings at a *ko`a* so that you can have an abundance

of fish, you need to be out there to talk about how the ocean is, how the sky is, where it is located and who you are trying to access because it is the environment that we are trying to access and we are trying to bring life to it and, therefore, it will bring life to us. So, when you are out in the environment, just like people who need churches to worship in, we need to be surrounded with those items or icons or whatever thing it is that helps us to focus on what we have to pray for and what we are looking at to remind us. It's the same with those who need to pray outside or need to have those sacred spaces because those icons are our environment. Those icons are our environment. Those remembrances are our environment and those direct connections to the environment are our

gods. So, without being able to see, touch, feel, smell, taste all of that, it's really difficult and you do not see the return of your prayers so easily. What you're hoping for is the life of your environment and, therefore, the life of you.

CSH: And, it's difficult because you can't make that connection?

HHP: You can't make that connection. Yes, "some" of that can be brought into a building — like a *kuahu* (altar) for *hula*, but it must exist outside to be able to brought inside. If there are no *lehua* trees [*Metrosideros polymorpha*] outside, we cannot bring the *lehua* tree to the *kuahu*. If there are no *hala pēpē* [*Pleomele* spp.] outside, we cannot bring the *hala pēpē* to the *kuahu*. If there's no fresh water outside, we cannot bring the *wai ola* (water of life; healing waters) to the *kuahu*. So, yes, we can do it inside, but that's only because we have brought the outside in. The outside must be healthy, too.

CSH: So, in places like Haleakalā, where that "sacred space" has been invaded by buildings, observatories and telescopes, can you suggest any ways this can be mitigated? Do you have any solutions or ideas on how to best mitigate this issue of dealing with "sacred space"?

HHP: For Hawaiian religious practice?

CSH: Yes. And, also, for cultural practices.

HHP: You don't want to hear what I think. Let them fade away! You know, as an educator also, I fully know that the increase of knowledge by ourselves and by our young people and the children to follow will help our homeland. But, then my views are very narrow in that "help our homeland" — what does this mean? How is this going to help our homeland? If it does, well, I might be a little bit more open to seeing this. But, for a place like Haleakalā, on a smaller basis, their suggestion to have the colors of the building fit in with the surrounding area and the surrounding environment, that is very helpful. But, I cannot see why it has to stick up into the middle of the air. So, in

looking at this new project, it looks to me, more in line of, if it has to happen and, you know, that's an "iffy" and I'm not here or there on that, if that has to happen, a place like that or a structure or a design like the new design would probably be more acceptable to me because it is not so obtrusive. Will the *mana* of that Science City area ever be mitigated? Not until all of that is gone. To me, not until all of that is gone. But, if it must happen, the least obtrusive way that we can do it would be the most acceptable.

CSH: Do you see any value in science, as far as Haleakalā goes?

HHP: For general purposes, I would have to say there is a great deal of value in science. But, the science that's being done at Haleakalā from a cultural practitioner's point of view, does not serve my purpose.

CSH: Have you heard of Haleakalā being used for any kinds of navigational traditions?

HHP: No. I haven't heard. As a matter of fact, I haven't done much research about Haleakalā. So much of my knowledge of it comes from what I have done personally there, as well as, perhaps, the connections that can be made of what I know of other places, as it might be similar to Haleakalā.

CSH: You indicated that you have done contemporary practices at Haleakalā. Can you tell me about that?

HHP: Yes. I think it was about 1978 when the "Year of the Hawaiian" occurred. And, there were a few of us who did a January 1st sunrise "thing" there. And the "thing" was doing a small ceremony with *pule* and *hula* and *pū* (blowing the conch shell), etc. on the very top.

CSH: Pu`u `Ula`ula [Red Hill]?

HHP: Yeah, Red Hill, at the very top. Participating there was myself, Uncle Les Kuloloio, I believe, Uncle David Ka`alakea was there, and my *halau*. Also, Pia Aluli was there because he ran from the base, from Kanahā Beach Park, up to Haleakalā. And, so we did a small ceremony to welcome in the year and to see the dawning at the top of Haleakalā. Then, the closing for me was done at Kaho`olawe — one year later, at dawn, up there as well. And, that was myself, Keali`i Reichel, Burt Sakata. At that time, it was considered "special permission" to go over to Kaho`olawe.

CSH: What part of the summit did you perform the ceremony at?

HHP: Right at the top, the small hill to the right of the parking lot [across from the present structure].

CSH: Was there anything else that you've done up there?

HHP: As far as ceremonies go or cultural practice?

CSH: Both.

HHP: Let me start here. As far as cultural practice, I continue to do plant collection in the park area and, you know, hide my bag when other people are coming. [An example of some of the things I gather are] *pūkiawe* (*Styphelia tameiameiae*), some *lehua*, *māmane* (*Sophora chrysophylla*) and, when nobody's looking, a little bit of *`iliahi* (*Santalum* spp.; sandalwood) blossoms because, you know, there's just something about adding them in there that just makes it very special. We have done *`awa* (*Piper methysticum*) ceremonies in the park area itself, over by Hosmer's Grove [just inside the

park entrance at 6800 ft elevation]. There's one lone *lehua* tree on the trail. The rest are all aliens. So, we have gone to do *`awa* with that one *lehua* tree on the trail going into Hosmer's Grove, quite often — to remember, "Okay, you're the *kupuna* (elder; in this sense, the only native plant amongst introduced alien plants) in here and we come to say 'hello' to you because all the others are newcomers." So, we go there and we do *`awa* with that tree every so often. And, that's pretty much it.

CSH: Do you do any *pule* or chanting?

HHP: There?

CSH: Yeah.

HHP: Oh yeah. Primarily [I do] those things that help me to make my connection to Laka — because I'm a *hula* person. I'm also a Kāne person, so that which makes my connection to Kāne as well. So, yes.

CSH: Are there any other cultural practices that you do in relation to Haleakalā?

HHP: Collection, *`awa* ceremony and I don't hike anymore. I don't know if that's a cultural practice.

CSH: Do you still go up there to do the "pilgrimage"?

HHP: Yeah. I've taken my children when they were young. We'd go up. We sometimes suck in the other kids — same thing, you know, they're over there thinking, "Okay, Aunty gotta do her thing." Then, they get to go and play. And, now my grand daughter. I continue to go.

CSH: I've read in the literature that there's a connection between Honua`ula people and Pele. Would you know anything more specific about that?

HHP: I wouldn't doubt it because those *pu`us* come right down into the Honua`ula District, part of the stories of Pimoe and Pu`u Māhoe and all those that come down into the Honua`ula area is because that's where the last lava flow was. So, where all those *pu`us* come down that rift zone. But, as far as what, particularly other than what was in the literature, no.

CSH: What about any ceremonies related to summer and winter solstice?

HHP: Traditionally or now?

CSH: Traditionally and do you know anyone that does practices related to

the solstices?

HHP: I do. I go. Especially in the winter. That's what I call "lock jaw" cold. When you're so cold that your jaws lock. Over there, I like to particularly do spring and winter. Mostly, because in Haleakalā, it is its coldness that makes it special in that when you're there during the cold time, it is when lots of people are not [there]. And, so, I like to go there then because it's when the air feels thin, the air feels clear and it is the time for the physical body to truly experience a different environment, which is the cold. And, you know, when I go there — we go there during the summer, too and that's when I usually take the kids. But, I don't usually take the kids during the winter time, unless it snowed, which it hasn't done in a long time. But, it is a time for me to recognize that no matter what the environment may be, there is a reason why these times of year are important to *kupuna* around the world. And, so by being there and by recognizing it, I somehow am in that time and place that they were in at one time. And, although I may not know for a surety what they were looking at and what they were experiencing, I can build my own data bank for that. So, that's what I try and do.

CSH: Do you go up there at a certain time of day?

HHP: Morning — sunrise. And, sunset. I have done some sunset things, especially over there by Red Hill because you can see the sun set from over there, too. And, for myself, it's just like gaging where the sun is going down in relationship to Maui, to the West Maui mountains or to the ocean. Where is it coming up in relationship to the Gaps (Ko`olau and Kaupō) that are there in the Haleakalā Crater or coming off of Haleakalā Crater and the different *pu`us* that may or may not be seen at a particular time. But, again, it is, number one, to be grateful that I can do that. So, when I do *pule* or when I do chants, they are those that recognizes my connection to my *kūpuna*, therefore, their representation or, who they are as the *akua,* and, then, to ask that I "see" or not what they may have seen or not. And, that's all.

CSH: Are you familiar of any chants that talk about Haleakalā?

HHP: You may want to look at this. This is through the Alu Like library project. In [19]83 or [19]85, we did a library project for Alu Like and collected chants about Maui. Those were put into this book and we also did some cassettes of these chants. So, I think they still have it in the Mapunapuna office and they're called "Maui Chants". There are several that are in there.

CSH: Can you think of any other issues that could be culturally sensitive for native Hawaiians regarding Haleakalā that we haven't talked about?

HHP: You know, first we had talked about the burials that were there, the *ahu*

that are there and what they may have meant and what we may have to yet discover about them [a reference to an earlier conversation that was not taped]. I know for myself, the thing that is always disturbing is the ability to be in touch with, commune with, whatever you what to call it, the *kūpuna*, the gods, the environment, the place itself without interruption. And, that's why I go there when I go because other people don't go there then. They all want to go at summertime when it's not so cold. So, you have "choke" (lots of) people up there at the top! Among other things, the sensitive issues are being able to access, worship, whatever, without interruption. That is not always possible in Haleakalā. And, interruption by people, as well as now, interruption by the Science City things and the view plane. I fully realize that when you allow access to a place for either religious or cultural practice or whatever, you also open the door to those that take and do not return. Those who have no reciprocation with the place or with the plants or with the resources that the particular cultural practice may impact upon. As the numbers of people in our community grow and, as the sheer numbers wish to access and do cultural practice at a place, this causes impact upon a place and, therefore, if people are responsible in their part of the *kuleana* (accepting responsibility for their actions) — what can they give back to the place, you run the risk of destroying that "thing" that helped you in your cultural practice in the first place. As a *hula* person, I see that happening in the forests.

CSH: You're not only talking about tourists, you're talking about Hawaiians as well?

HHP: Hawaiians as well. And, our community as a whole, Hawaiian and non-Hawaiian who see Haleakalā as part of their home. No, not only the tourists, but those who see Haleakalā, our forests, our ocean as part of their home. Yes, they don't always do their part of the *kuleana*, their reciprocation.

CSH: So, for someone who goes to Haleakalā to practice, how can one restore or give back *mana* to that place?

HHP: The best way is *pules*. To do the cultural practice that you do so that it is not broken, so that the continuity of that is not broken. We fully know that as much as *mana* can be taken and sucked out of a place, it can be returned. But, as with all things that must be redone, it takes twice as long and twice as much effort. When you lose the use of a forest it takes twice as long and twice as much effort to get it back as how long it took to ruin it. Same thing with *mana*. It takes twice as long and twice as much effort to bring it back. So, let's say the Science City as an example. I don't know how long it's been there but, let's say, Science City has been there for 50 years.

CSH: It's been there since the about the mid-1960's.

HHP: Okay. Let's say it's been there for 40 years. It's going to take stopping it for 80 years to regain its *mana* because it still gets sucked out by whatever is there all the time. So, can one little *ahu* place being accessed and utilized once a year return the *mana* to the place? I believe, "No, it is not enough."

CSH: Are you familiar with any cloud names or rain names associated with Haleakalā?

HHP: The one that I am most common with is *nāulu* that comes off Haleakalā and heads towards Kaho`olawe. It's a wind and a cloud formation. The *nāulu* is that wind that brings the cloud formation that makes the band, about — I don't know what the elevation is.

CSH: Does the cloud formation go all the way around the summit?

HHP: Yeah, but primarily on the `Ulupalakua side. Actually, the two clouds come from two ends. When you watch the clouds on Haleakalā, in the morning, one band comes from Ha`ikū and comes around towards the front towards Makawao and Pukalani. The other one comes from Kahikinui side and comes around and they meet. And, it varies where they meet. Depending on weather conditions, they can meet right above Pukalani. They can meet maybe further around by Keokea. So it varies, where they meet. But, for the *nāulu*, the *nāulu* comes off of `Ulupalakua, around Pu`u Māhoe side and goes across the `Alalākeiki Channel towards Kaho`olawe. And, when the *nāulu* forms in the `Ulupalakua Ranch area side, it often rains. And, then if it begins, which is kind of quite often, it begins making a cloud bridge from right along that flank where Pu`u Māhoe is, heading towards Kaho`olawe. And, most afternoons, I'd say around three 'o clock or maybe two 'o clock on, you will see the cloud bridge begin to form as it then starts heading out towards Kaho`olawe.

I am also aware of the *kēhau*. It's a wind that comes off of the slopes of Haleakalā, down towards Makena. It's the cold wind in the morning that sometimes comes off the slope of Haleakalā and down into Makena. Because I was there when it was happening. I don't know if it happens in other places, but I know it happens there. Of course, things like the *`ulalena*. It's not really up at the top. It's in Pi`iholo, on that side of Haleakalā, is the rain known as *`ulalena*.

CSH: How would you describe that rain?

HHP: That rain really cannot be seen from there. That rain has to be seen from here, from Kahului and Wailuku. It occurs somewhere between 4:30 to 5:30 in the afternoon as the sun is going into `Īao and when the mist and rain is just right, on that side of the mountain, the rain turns predominantly a yellow and red shade. So, you're not <u>in</u> it. You can't see it when you're <u>in</u> it.

You can only see it from away.

CSH: What about old place names that aren't used anymore?

HHP: I'm more familiar with down here [Kahului and Wailuku]. I know the place names people don't usually use down here where I live and where I grew up. You gotta talk to people who lived and grew up, up there.

CSH: Do you have any knowledge of old trails surrounding Haleakalā or going through the crater?

HHP: No. You know, it's kind of interesting to me, when you first called, to think about that which you first brought out, which is the burials and the *ahu* that are up there. That, for the most part, we have always thought of Haleakalā as being so far away and so high and so cold and kind of uninviting. But, it was not so with the *kūpuna*. That is a very interesting thing to think about.

CSH: I've thought about it and I can't imagine them going up there in traditional dress. Some of the literature says they went up there at night. And there are many *ahu* up there and hundreds within the crater.

HHP: It must have been what I call "lock-jaw" cold up there. And, that's why when I go up there in the winter, I think about those things. I'm not saying they went up there in the winter. They may have gone up there in the summer when it was less difficult. But, when I go up there in the winter, because it's so difficult, I think about that. "Why did you do that?"

CSH: It seems like they used the crater as a short-cut between East and West Maui.

HHP: And, no matter when you go up there, in the middle of summer, it's still cold. It's still in 30° weather or 56° or something. It's still cold. When you're thinking they have primarily *malos* and *kīhei* or *`ahu ulas* — but the *`ahu ula* is only for the big guys. The rest of the army is using *kīhei*. It's cold!

CSH: Is there anything else that perhaps we haven't touched on that you wanted to add in relation to Haleakalā, especially in regard to cultural practices?

HHP: Just to reiterate that cultural practices happen or continue because of the culture itself and what the culture believes is important. Or, what the culture does because of this belief. Perhaps, there has been a discontinuation or a break-down between some of the practices before and

the practices today. I do not believe that it has to remain that way. I believe that if people have a true desire for the cultural practices to return, regain, flourish, whatever; they must be given the opportunity to do so in the way that it flourished in the culture previously. So, I know this is a difficult subject because, what I always say is, "A little bit of knowledge is a dangerous thing," that sometimes, a little bit of cultural knowledge makes the whole thing go screwy and get out of hand. But, conversely, the opportunity must always be there for that time and place that a cultural practitioner wishes to revitalize it, wishes to redo it and wishes to reach into their intellect, as well as into their spiritual self, to know what might have been done and to continue that. And, it must, must continue. The opportunity must always be there. Just because it hasn't happened in the last 80 years, doesn't mean that it cannot happen again. So, the opportunity must still be there for it to happen again. Think of all those things that have been brought back from almost extinction because people have wanted it so and have done it. And, the *`ie`ie* (*Freycinetia arborea*) was able to be brought back because *`ie`ie* still existed in the forest. *Olonā* (*Touchardia latifolia*)was able to be brought back because *olonā* still existed. If they do not exist, we cannot bring it back. So, those places have to exist in a way that will help the cultural practice to revitalize again.

CSH: What about a cultural practice that has been discontinued, and maybe there's very little knowledge about it, and people trying to recreate that practice in contemporary times? Is there value in that?

HHP: There is. I believe there is because we still have road maps to how it may have been or how it has been. And, many of the road maps are in our stories and *mele*. And, until people desire to search it and unlock those pieces of information, it sits there and waits. My encouragement has always been these phrases, "As long as it is connected to a traditional cultural practice and we do not try to "recreate" by using these kinds of thoughts, 'You know, that culture did it like this, so Hawaiians must have done it like this.'" Well, not necessarily so, unless there are ways for us to think so, in the *mele* (songs/chants)or in the *mo`olelo* (stories). Some say, "You know, Hawaiians are Polynesians and the Maoris do it like this, so Hawaiians must have done it like this." Well, maybe not. But, I do believe that contemporary use of traditional practices can be done. It can be done.

CSH: A question about the *`awa* ceremony that you do for the *lehua* tree. Do you have a specific protocol that you follow when you're doing it? For example, clapping. Some people say it's a Hawaiian tradition, some people say it's not.

HHP: For me, as with all things Hawaiian, there are levels. And, there are behaviors that are appropriate for certain occasions and behaviors that may not be appropriate for certain occasions. There is high ceremony *`awa* in