

WRITTEN DIRECT TESTIMONY OF DEBORAH WARD

(EXHIBIT D-1)

My name is Deborah J. Ward. I am a graduate of the University of Hawaii at Manoa, Bachelor and Master of Science, and retired faculty member of the University of Hawaii Department of Natural Resources and Environmental Management with 23 years of service. I have been a member, and have served in leadership positions within Sierra Club (SC), Conservation Council of Hawaii (CCH), and Big Island Invasive Species Committee for many years. I administer grants and serve as Quality Control Officer for the Hawaii Organic Farmers Association. I grow and market organic fruit and foliage in upper Puna, and I have lived in Hawaii for more than forty-five years. I have spent much of my adult life working to protect and conserve natural habitats unique to Hawaii.

My involvement in issues regarding the management of Mauna Kea began in the 1970's. As a recreational hiker, I visited Mauna Kea with my father, a physicist and astronomer, when only one telescope, smaller than a garage, stood at the summit. The vast wilderness vistas from the highest peak in the Pacific, was awe-inspiring, breath-taking, and serene. The sound of silence remains with me today. I returned to Mauna Kea as a hike leader affiliated with Lorin Gill, and the Honolulu Botanic Gardens; witnessing the decline of the mamane forests due to sheep and mouflon browsing led to a photographic award for Mamane in Mourning from CCH in 1979, and chairmanship of the program committee of CCH in 1983, when I invited astronomers to present their plans for discussion at a public meeting. I followed the development of the Mauna Kea Science Reserve Complex Development Plan (MKSRCDP) in 1983, and remember the assurances regarding future compliance with administrative rules and limits on development.

I continued to use the trails, and visit the summit of Mauna Kea, during the 1970's through to present, for recreation, wilderness experience, unfettered vistas, silence, spiritual peace, natural beauty, and cultural significance. The cumulative impact of intensified industrial land use at the summit has impacted my recreational enjoyment and spiritual practice. The cumulative impact of the destruction of habitat, widespread waste accumulation, obstruction of viewplane, constant sound, alteration of the geology, and negative impact to the cultural practice of my colleagues is a source of personal grief. The summit would be silent if there was no development at all. It is not silent. The noise of observatory air conditioning, blowers, generators, associated vehicles and industrial activity is present and disturbing to

recreational users who hope for the pristine silence of wilderness. Development of six acres of industrial infrastructure ("new visual element on the northern plateau") on the last remaining unobstructed view plane facing Haleakala will significantly negatively affect my recreational practices. The view of Mauna Kea's summit, from my vantage point at my residence, from the beach at Hilo bay, from my hiking trails on Mauna Loa, all are fettered by the presence of multiple domes on the skyline; it is almost impossible to find a location on the island of Hawaii where one cannot see a telescope in one's view of Mauna Kea. I believe I am not alone in finding these visual obstructions a significant annoyance and an adverse impact.

A Hike with Friends Leads to A Shocking Discovery

On a recreational visit to the summit of Mauna Kea with Nelson Ho, and Fred Stone in 1996, we discovered actions by IfA and DLNR which directly violated conditions in the BLNR approved Mauna Kea Management Plan, (part of the 1983 MKSRCDP). Actions taken by the IfA and DLNR allowed Subaru Telescope developers to alter the slopes, fill the lower part of the inner cinder cone of Pu'u Hau Oki and trench into the outer slopes of the cone (both high quality Wekiu bug habitat) for optical and electrical cables. This discovery was the nexus for greater involvement in efforts to improve the management of this highly delicate and fragile natural environment.

The history of this incident, and the actions taken during the fifteen years that followed, represent a case study I will describe to provide evidence of continued dereliction of management responsibilities by DLNR. I will also point out decisions made by the University of Hawaii and its industrial partners, both past and present, that do not further the principles outlined in the State of Hawaii Constitution and Hawaii Administrative Rules to protect the natural and cultural resources of the Conservation District. I will then review the proposed project and follow the FEIS and CDUA documents reviewed by DLNR staff. I will point out the inconsistencies in information and the failure of staff to recommend or require implementation of DLNR's own recommendations and those of biologists hired to provide expert advice.

Following the development UH Board of Regents (BOR) approval of the 2000 Master Plan, and the initiation of the UH Hilo Office of Mauna Kea Management (OMKM), I have served at the request of OMKM on the OMKM Environment Committee since December 2000. I worked with a committee of scientists working in the fields of biology, geology and environmental management who formulated

recommendations for biological inventory and monitoring in 2002. In 2005, after a two year hiatus, new committee members identified natural resource monitoring and protection actions needed, and then requested proposals to hire a planning firm to construct a natural resources management plan for OMKM.

Meanwhile, the Keck Outrigger Telescope project had been proposed late in 1999, and the CDUA was considered by the BLNR in early 2003. My concerns led me to join a hui of participants, including Sierra Club, who took part in a contested case hearing and successful litigation to overturn the Department of Land and Natural Resources permit for Keck Outrigger telescope development, due to the absence of a current comprehensive development plan to address multiple uses on Mauna Kea. We were forced to intervene in the DLNR's management of Mauna Kea because BLNR abdicated its fiduciary responsibility under the law to preserve and protect the summit. The BLNR failed to comply with its own administrative rules requiring that it manage the natural resources of the conservation district pursuant to a comprehensive management plan. The BLNR actively opposed the appellants' efforts to bring BLNR into compliance with its own administrative rules. The DLNR administrative rules explicitly state that Astronomy facilities are among the uses requiring "approved management plans", and that management in the conservation district must address "reliance on management plans to address *cumulative land proposals*."

Eventually the Board's decision to allow construction of the Keck Outrigger Telescopes was overturned, but the need for a management plan was upheld. Judge Glenn Hara's Decision and Order (January 19, 2007) ruled that a comprehensive management plan that covers multiple land uses in the conservation district must be developed for BLNR approval.

The court order in *Mauna Kea Anaina Hou v. State of Hawai'i et. al.*, Third Circuit Court, Civil No. 04-1-397, requires the BLNR to prepare a comprehensive management plan for Mauna Kea and then act in accordance with that plan. The ruling challenged the legal status of the University of Hawaii's 2000 Master Plan—which was neither reviewed nor approved by BLNR.

The University has not demonstrated its expertise and experience in managing important natural and cultural resources, not does it have a history of protecting traditional and customary Native Hawaiian

practices. The BLNR-approved 1995 Mauna Kea management plan update states that "It was determined that management and enforcement responsibilities—unless they are directly related to astronomy facilities, including the Mauna Kea access road—should be transferred back to DLNR."

The Legislative Auditor reported in 1998 that "(DLNR) has failed to define its relationship with the university, allowing the institution to oversee its own activities and not provide a mechanism to ensure compliance with lease and permit requirements." The auditor reported that without permit conditions or controls to ensure implementation of management plans, the university was allowed to continue development without completing prior tasks outlined in management plans.

This UH "CMP", which references the 2000 Master Plan (2000MP) in dozens of instances, claims the 2000MP document provides the guiding principles for the CMP document. That MP development plan has never been scrutinized by the BLNR, and yet it is referenced as the determining document for future development. DLNR staff Sam Lemmo, in references to the 2000 MP in staff recommendations, stated that that future plans would be consistent with this document. Any incorporation of the 2000MP, which has never come before the BLNR for approval, into this UH "CMP" violates BLNR rules and public notice requirements. UH "CMP" is devoid of direct discussion of additional development, offering only references to the MP 2000.

To add one more inconsistency into the University approach, there appears to be a "new plan; that supersedes the one referenced. In the UHIfA report to the legislature in December, 2006, in which Dr. Rolf Peter Kudritski states that the University has modified the MP 2000, and that they are now offering a "new plan" for telescope expansion, yet this document, like the MP 2000, is not included in the public notice, nor has BLNR provided a review of the "new plan".

I noted in my testimony before the Board, prior to my request on behalf of Sierra Club for a contested case hearing, that the "CMP" the Board was considering did not contain the Natural Resources management plan that the Environment Committee had completed. Natural resources got short shrift in the "CMP" document: barely 24 pages of the 299 page document reflect NR issues. The CMP claims that rules are needed to limit impacts *by the public* on resources, while ignoring the "significant, adverse and substantial" cumulative impact of astronomy development over the past 40 years. After some

deliberation behind closed doors, the BLNR approved the "CMP" many proponents admitted was incomplete, and then required the inclusion of four sub-plans, including a natural resource sub-plan.

The natural resource sub-plan identifies a large number of data gaps that impede informed decision-making. A list of these gaps follows; however, the lack of funding, both historically, and at present, beg the question—how will these management priorities be addressed when the University has not designated staffing positions for management of the summit? UH currently operates the OMKM with an interim director, a secretary and up to five roving rangers. A minimum of two new full-time OMKM positions will be necessary to develop the natural resources management program: a natural resources manager and at least one field biologist. Currently there are no dedicated natural resources management personnel within OMKM. Funding has not been committed, and is not expected during this budget crisis. The Board of Regents did not make a commitment of funds when it approved the University version of the "CMP", and no commitment has been made in the future.

DLNR staff contends that a lack of staff and funding prevents them from carrying out management actions. This is because BLNR violated its fiduciary duties under Section 5(f) of the Hawaii Admission Act and its statutory duty under HRS § 171-33(5) by disposing of the Section 5(b) lands on Mauna Kea without a proper appraisal and at less than their independently appraised fair-market value. DLNR, by not collecting payment of lease rents at fair-market value, places an unacceptable burden on Hawaii taxpayers, who must subsidize international astronomy.

OCCL Staff Report for the TMT Cдуа (Page 62) states that

- "Environmental protection costs money. Protecting historic and cultural resources costs money. Education costs money. Maintaining public access and ensuring public safety costs money. Routine infrastructure maintenance costs money. Stopping TMT, and fighting all development will not restore the mountain to a pre-contact condition. The existing roads, electric lines, and facilities will not disappear. Rather, as funds dry up, active and strong management will become difficult, maintenance and renovations will slow, infrastructure will crumble—and the very cultural and environmental resources that Sierra Club et al purport to protect will suffer."

The claim that infrastructure is crumbling and active management of resources is constrained by lack of funds, bolsters the argument that Sierra Club, Mauna Kea Anaina Hou, KAHEA and others have made for years: payment of fair market rent for use of the world's premier astronomical location should pay for adequate resource management, infrastructure upkeep, and public safety. The idea that the only way to

fund good management is to degrade the resource, in order to collect rent from the new development to pay for the management mistakes of the past, is akin to a Ponzi Scheme; the additive insult to the resource will not reduce cumulative impact.

CASE STUDY IN FAILURE of DISCLOSURE, MANAGEMENT and DILIGENCE

Where Have All the Flowers Gone?

Wekiu bug (*Nysius wekiuicola*) was selected for this case study precisely because this species has garnered the most attention, through inventory, monitoring, autecology study, and public awareness, since its discovery over thirty years ago, to its designation as a candidate for federal protection status in 2002. Two of the two greatest threats to Wekiu bug identified by the multitude of scientists who have contributed to this study effort are habitat loss and predation by alien invasive ant species. Using this example, I will review the guidance documents provided by the developer to ascertain whether the developer has offered clear descriptions of its proposed plans and mitigation strategies.

Through examples of the inconsistencies and confusion in those documents, I will show that while DLNR has failed to exercise due diligence, it has, nevertheless, recommended approval of a project that utterly fails to meet the criteria for protection of natural and cultural resources in the conservation district.

DLNR Fails to Manage Development Activities on the High Elevation Cinder Cones and Ignores

Mitigation Conditions, Leading to Wekiu Bug Habitat Destruction

Wekiu bug (*Nysius wekiuicola*) is endemic (found nowhere else on earth) to Mauna Kea, and its habitat is limited to the upper slopes of Mauna Kea. It is a predator-scavenger which is dependent on insects and debris blown up from lower elevations. It was collected for the first time by Francis Howarth, Stephen Montgomery and William Mull, and reported in 1979. During the early 1980's the mountain was covered in a mantle snow during most of the year, and Wekiu bug populations were estimated in the hundreds of thousands. Found primarily in the slopes of cinder cones, the bug gained notoriety for its ability to thrive in frigid aeolian conditions, and became known as the insect with anti-freeze in its veins.

Francis Howarth and Fred Stone conducted an entomology study for the proposed telescope development area, in 1982, that study was incorporated into the FEIS for the MKSRCDP. They made

recommendations for biological inventory, habitat mitigation and monitoring which were approved in the Mauna Kea Management Plan by BLNR in 1985.

Dr. Stone was thus familiar with the approved conditions in the management plan, and could immediately ascertain deviations from the plan when the summit visit in 1996 took place. He identified the apparent violations to BLNR member Chris Yuen, UHIfA representative Robert McLaren, and to DLNR Chair Mike Wilson. A letter from Mr. Wilson outlined a series of errors by IfA and DLNR that led to Wekiu habitat destruction in several areas of Pu'u Hau Oki, a cinder cone with prime habitat for the Wekiu bug. Mr. Wilson stated, in part, the UH IfA failed to include the management plan conditions as part of the FEIS, and the department also failed to discover these omissions in its review of the respective CDUAs and plan approvals.

I accompanied representatives of DLNR and UHIfA on June 10, 1996 to view the damage reported by Dr. Stone. As a result, the Gemini Northern 8-meter telescope, Japan National Large Telescope (Subaru), and the Smithsonian (SMA) were all determined to have destroyed habitat beyond that disclosed in the FEIS or allowed in the approved management plan. In two cases, the construction of roadways which affected habitat is now proposed for use by the TMT project. Additionally, Wekiu bug habitat on the crater and slope of Pu'u Hau Oki was severely impacted by construction of the Keck I and II telescopes which resulted in removal of approximately 35 feet of the summit ridge of Pu'u Hau Oki and side-casting the material on the crater slopes.

Although these telescope construction activities and related infrastructure were completed under the 1983 EIS and 1985 Management Plan, the mitigation measures described in the plan were not implemented. The Department stated that it could pursue these matters as violations of the Conservation District regulations. Wilson stated that non-compliance with conditions requiring observance of EIS mitigation measures or disturbance of ground areas outside the limits of approved construction plans could serve as a strong basis for the enforcement of sanctions. However, the Department chair declined to administer penalties because permits had been issued for the construction activities. He also said that the CDUA permit applications by UHIfA did not disclose possible impact to Wekiu bug habitat, nor the required mitigation measures, so there was no way for DLNR and BLNR to know about or evaluate the potential impacts. Instead of impositions of sanctions, the Department

chose instead to work with the UHIfA to institute a more effective monitoring and enforcement program for the mountain.

Exhibits D-2, Mauna Kea Science Reserve Complex Development Plan sections relating to mitigation

Exhibit D-3, Letter to Mr. Mike Wilson, DLNR Director, dated 11 May, 1996

Exhibit D-4, Investigation of the Destruction of Wekiu Bug Habitat

Exhibit D-5, Letter to Mr. Mike Wilson, DLNR Director, dated 29 May, 1996

Exhibit D-6. Photographs of Wekiu Bug habitat alteration

Exhibit D-7, Letter from Mr. Mike Wilson, DLNR Director, dated 25 September, 1996

As a result of the violations identified, the University funded a study in 1997-8 that reported a 99.7% decline in the Wekiu bug numbers in comparison to the 1982 reports. Subsequent studies have modified this drastic assessment, and have identified additional habitat utilized by Wekiu bugs.

- It has been estimated that since 1963, approximately 62 acres (25 hectares) of potential arthropod habitat have been lost to astronomy-related development on the summit.
2.2.2.3 Threats to Invertebrate Communities on Mauna Kea CMP NRMP p 2.2-43
- "The Wekiu bug is currently a candidate for Federal listing under the Endangered Species Act" CDUA Section 2.3.

This listing is based on two criteria; its known threats are impacting the population of the organism, and evidence of significant population decline. The Wekiu bug was listed as a candidate for Federal protection on June 13, 2002.

"Cumulative" Means Impacts of Past, Present and Reasonably Foreseeable Future Actions

A review of cumulative impacts of telescope construction and related infrastructure on Wekiu bug habitat included in the December 1999 MK Science Reserve EIS for the 2000 Master Plan described only potential impacts looking forward (no review of cumulative impacts of past, present and reasonably foreseeable future actions).

The 2000 Master Plan (FEIS Volume I Section 6.1.3)

- "avoids facilities expansion into *Nysius* habitat wherever possible to avoid potential habitat disruption. In particular, observatory redevelopment will be limited within the existing site along the summit ridge to avoid expansion onto the surrounding cinder substrate. Mitigative Measure—the following measures *will be implemented*... 1) Minimize earthwork beyond existing disturbed sites... New facility development will also be contained to the smallest possible disturbance area to minimize impacts to endemic arthropods. 2) No new facilities on undisturbed cinder cone habitat."

The 2000 Master Plan (FEIS Volume 1 Section 6.2.4)

- Areas with cinder cone substrate will be avoided in long-term facility siting, and preserved from disturbance due to construction.

A New Paradigm for TMT?

The University of Hawaii, proposing to develop the Thirty Meter Telescope, would like to point to the "CMP", the FEIS, and the TMT CDUA, and claim that there is a new paradigm for the 21st century. The attorneys representing the UH/TMT in this case paint the petitioners as backward-looking. Sadly a new paradigm is not evident; lessons of the past could be repeated (but should not be), and we are compelled to point out the patterns we see, evidenced by the documents before us.

The University of Hawai'i at Hilo (University or UH) has not met the burden of demonstrating that its proposed land use -- the construction of the Thirty Meter Telescope (TMT) and related infrastructure on the summit of Mauna Kea -- satisfies the conservation district rules, including the permit criteria of HAR § 13-5-30(c).

I will provide example to demonstrate that The TMT project does not conserve, protect, preserve, or promote the long-term sustainability of natural resources in the Mauna Kea conservation district, and thereby, it does not meet the Eight Criteria of HAR § 13-5-30(c), in particular,

4) The proposed land use will not cause substantial adverse impact to existing natural resources within the surrounding area, community or region; The developers claim that the CMP and associated sub-plans are the guidance documents. Following are some excerpts from the document that indicate the spirit, language, and intent of the plan have failed to be considered in the proposal before the Board.

The Natural Resources Management Plan states:

- **One of the most efficient ways of preserving a sensitive ecosystem is to limit future development in the area.** An additional measure of protection for sensitive habitats can be achieved by prohibiting development of any currently undeveloped pu'u (or portion thereof) at the summit.
- All future developments in the Science Reserve and at Hale Pohaku should include mitigation plans for preventing or repairing damage to sensitive habitats caused by construction and development activities. Any habitat that will be permanently removed should be replaced on at least a one-to-one basis, through either creation of new habitat, restoration of degraded existing habitat, or by permanent protection of similar unique habitats. Mitigation plans should be paid for and prepared by the project proposer, but should be reviewed and approved by DLNR. If the disturbed habitat contains protected species or other critical habitats, mitigation

plans may also have to be approved by state and federal agencies. Mitigation projects should include a minimum of two to five years follow-up monitoring, to assess the results of the project. The length of time that monitoring must occur will depend on the scale of the project and the organisms for which the habitat is being mitigated. Mitigation projects on the summit should focus on protection of Wekiu bug habitat from alien species introduction and predation.

DATA GAPS—A full assessment of environmental impacts can only be undertaken when data is available to review. In the case of Mauna Kea, the inventories and monitoring mandated as conditions in the 1983 MRSRCDP (referenced earlier) were not funded by the University, and as a result, baseline information required to manage and protect this fragile ecosystem from industrial development and visitor impact is still missing or incomplete, even 28 years after that plan was proposed.

- A prime example of habitat loss through development is the loss of Wekiu bug habitat on the summit through construction of telescope facilities. Wekiu bug habitat is easily altered by vehicular traffic and construction activity, as tephra cinders preferred by the bug are easily crushed into dust-sized particles. Prime habitat can be quickly degraded to compacted silt and mud by use of off-road vehicles. Wekiu bug habitat may also be altered by dust blown up from road grading and other construction activities on the summit. 2.2.2.3 Threats to Invertebrate Communities on Mauna Kea CMP NRMP p 2.2-43

DLNR staff and BLNR have responsibility to review EIS and CDUA documents carefully and thoroughly. Only with careful review can errors, omissions and self-serving obfuscations be avoided. An examination of descriptions in the TMT FEIS and the TMT CDUA regarding Wekiu bug habitat alteration (one of many instances) would lead a staff member responsible for oversight and enforcement at a loss to determine whether development or mitigation protections could be in compliance with Conservation District rules, or management plans and conditions.

In Weighing the Options, the Resource is Sacrificed for Expediency

Pu'u Hau Oki is prime Wekiu bug habitat, and it has been impacted again and again by errors of negligence and oversight. An Access Way (with three options) to the 13N site is proposed, each of which impact the habitat, but in different intensities.

In response to the TMT DEIS, DLNR Chair Laura Thielen wrote:

- "If a project is initiated, we strongly recommend Option 1. Option 1 imposes the least damage to Wekiu bug habitat. While the total length of the new road to be constructed (600 feet) is greater than Option 2 (275 feet), the proposed area is comprised of lower quality habitat types (4-6), which are less frequently used by Wekiu bugs, Option 2 is considerably less desirable, as the area proposed for construction contains Type 3 habitat, where Wekiu bugs have been found in abundance in recent years. Option 3 is

the least desirable route, as it requires the greatest habitat disturbance (780 foot length widening, 8 foot retaining wall) in Type 3 Wekiu bug habitat."

In spite of numerous recommendations to avoid the habitat, Option 1 (avoidance of Type 2 and 3 habitat) is rejected by the developers, and a hybrid of Option 2 and 3, impacting Pu'u Hau Oki cinder cone within the Kukahau'ula TCP, is imposed, despite the value of the sites selected for Wekiu bug habitat.

- The CDUA guidance details about the Access Way Option 2/3 hybrid cite only a footnote on page 3-9 "The access way design is a refinement of one of the routes covered in the EIS." "The University believes that the proposed Access Way is ...the best from the viewpoint of minimizing visual and physical impacts."

The choice of the Access Way Option by the developers **directly contradicts** the Mitigative Measures in the 2000MP FEIS "that will be implemented". The impact on the Kukahau'ula TCP and the impact to Wekiu bug habitat do not factor into the selection. It would appear that the mitigative measures in the plan and the strong recommendations by the DLNR were inconvenient to the developer.

The TMT CDUA and MP apparently do not reveal the details of the Access Way Option hybrid selected, it seems impossible to know how much of the cinder cone habitat is proposed for permanent destruction.

After learning of the Option chosen for the TMT Access Way, DLNR Division of Forestry and Wildlife Administrator Paul J. Conry, in his CDUA Comments for the Thirty Meter Telescope wrote, on November 29, 2010, in response to 2.4 Substantial Adverse Impact p. 2-6,

- "It should be noted here that the access way will alter, and destroy, known Type 3 Wekiu bug habitat."

Below please note descriptions in the guidance documents of the habitat affected: Underlined and **bold** areas are emphasized to assist the reader.

- The current context includes the presence of observatories and roads within the MKSR, including direct impacts to roughly 63 acres to Type 2 and 3 Wekiu bug habitat and developments at Hale Pohaku. Potential impacts associated with the Project include (a) the replacement of existing habitat with the TMT observatory, potential TMT mid-level Facility and Headquarters, (b) dust generated by vehicles traveling along the unpaved Access Way, and parking at the TMT Observatory and potential TMT Midlevel Facility; and (c) paving a roughly 300-foot section of the Access Way. TMT FEIS Page 155

- The southern-most roughly 700 feet of the Access Way would be located on the Pu'u Hau'Okī cinder cone TMT CDDA Page 141
- Approximately one-third of the existing Access Way has been graded during previous work in the area; this includes areas that were graded as part of the SMA Telescope project and others that were graded in the 1960s for site testing at the 13N site. TMT CDDA Page 143
- The Access Way (AW) will disturb a roughly 0.6 acre portion of Kukahau'ula of which a 0.4 acre portion has been previously disturbed by roads. The AW will result in a new disturbance of roughly 0.2 acre. TMT FEIS Page S-6
- Following construction of any AW option, Kukahau'ula would retain its current shape but a roughly 0.6 acre area will be graded and a section of new or existing unpaved road at its base will be paved, and a guard rail installed along the AW downslope side. TMT FEIS Page 116
- Roughly 5.6 acres of Type 4 Wekiu habitat (95 % of the area) and 0.3 acre of Type 5 Wekiu bug habitat will be displaced. As listed in Table 3-5, the various Access Way options would displace from 0.01 to .5 acres of lavaflow habitat (Wekiu bug Type 4 and 5 habitat) and 0.06 to 0.23 acre of alpine cinder cone habitat (Wekiu bug type 3 habitat). The alpine cinder cone habitat, Wekiu bug Type 3 habitat that would be displaced by the Access Way Options is considered to be good, but not optimal Wekiu bug habitat. TMT EIS Page 158

This assertion is contradicted by science reports in the document. Types 2&3 are considered optimal.

- Because the displacement is a relatively small area the impact to Wekiu bugs will be less than significant regardless of which Access Way Option is chosen. TMT EIS Page 158

The sections above describe disturbance of 0.06, 0.2, 0.23, or 0.6 acres of cinder cone substrate (it's impossible to determine which number is intended to be definitive), and 3.6 acres of total disturbance, but regardless of which Access Way Option was preferred, the impact is claimed less than significant. This convenient assertion is not justified; loss of habitat, and declining populations led to the listing for Federal protection.

Supersize That Disturbance

Based on information discovered in Appendix B Construction Plan, the habitat modification appears to include an area larger than described in previous text:

- Figure B-1 Cross Section of Access Way in Southernmost Cinder Section Overlapping 4-Wheel Drive Road TMT CDDA Appendix B-Construction Plan Page 228

(Exhibit D-8) Figure B-1 provides a visual demonstration of the actual plan to alter a significantly larger portion of the habitat than is described earlier in the text. The existing 4WD 8' road would be expanded to 16' and the "fill" covering the "existing ground surface", would cover a surface three times (24' total) as wide as the current roadway. "Fill" is noted in the graphic of the cinder cone section, and the "existing ground surface", being covered is optimal Wekiu bug habitat. The impact is not only two dimensional; trenching and emplacement of TMT utilities four feet deep into the habitat will inevitably impact the cinder cone structure, drainage characteristics, movement within the habitat.

- The 4-wheel drive road portion in the cinder cone section will have to be graded to a greater extent because it is not straight and the slope changes dramatically. The conduits will be encased in concrete. Excavated material will be used to raise the Access way road surface where required... TMT CDUA Appendix B-Construction Plan Page 229

Three dimensional grading and use of a foreign material (concrete) in the Wekiu bug habitat, and trenching leads to greater fragmentation, hindering movement of the species, both above and below the surface. The amount of displaced material from the trench is not quantified, nor is the amount of "fill" used for grading. The effect of the grading, and the dust generated from crushing of cinder particles, on the adjoining habitat is not addressed, nor is it mitigated.

Why Does a Chicken Cross the Road, or Why doesn't a Wekiu bug?

Some portions of the Access Way would be paved in this proposal. The area to be paved cannot be determined by reviewing the document. Below please note the area of paving of habitat is proposed in the guidance documents: Underlined and bold areas are emphasized to assist the reader.

- Potential long term impacts include displacement of existing species and habitat, dust generated by vehicle traffic along the unpaved project areas, and paving 750 feet of the Access Way. TMT FEIS Page S-6
- The current context includes the presence of observatories and roads within the MKSR, including direct impacts to roughly 63 acres to Type 2 and 3 Wekiu bug habitat and developments at Hale Pohaku. Potential impacts associated with the Project include (a) the replacement of existing habitat with the TMT observatory, potential TMT mid-level Facility and Headquarters, (b) dust generated by vehicles traveling along the unpaved Access Way, and parking at the TMT Observatory and potential TMT Midlevel Facility; and (c) paving a roughly 300-foot section of the Access Way. TMT FEIS Page 155
- Wekiu bugs have been seen crossing dirt roads, but none have been observed crossing paved roads. Only Wekiu bugs that occasionally cross the dirt road while dispersing during periods of high population could be impacted by the pavement. Therefore, the number of Wekiu bugs

likely to be impacted is small. Paving the Access Way through the SMA core area will not have a significant impact. In fact, paving the road could reduce dust generated by vehicle traffic on the road, thereby protecting nearby habitats. TMT FEIS Page 160

- CDUA page 82-83 The proposed Access Way leading to the TMT Observatory has been designed to minimize its effect on the Kukahau'ula TCP. ...it will be necessary to widen and pave roughly 1,100 feet of the existing 4-wheel drive road at the western side of Pu'u Hau'oki (ie the outermost edge of the TCP) CDUA page 82-83
- Potential long-term impacts include displacement of existing species and habitat; dust generated by vehicle traffic along the unpaved Project areas; and paving approximately 1,600 feet of the Access Way. CDUA page 45

If you were the DLNR staff person responsible for oversight and compliance, would you be able to determine what area of habitat destruction had been proposed/approved for paving/hardening? Would you be able to determine if 300', 750', 1,100' or 1,600 feet of paving were approved? What is the amount of hardened surface that could fragment the habitat of a Candidate Species given the fragile and limited nature of the habitat, given that no Wekiu bug has ever been recorded crossing a paved road?

The Humpty Dumpty Effect: Once Fragmented, Habitat May Never Be Restored

Fragmentation of Wekiu bug habitat has occurred in incremental steps, as the land use on Mauna Kea's highest peaks and slopes intensified, over the past forty years.

It has become clear that while Wekiu bugs can range broadly over the summit when food sources and climate are favorable, the prime habitat is rims and inner craters of cinder cones. These are ice-free areas that rose above the once surrounding glacier (nunataks), as described by Englund and Porter 2006, sometimes on the flanks and base where cinder has accumulated (Eiben 2010).

Habitat fragmentation has included five discreet phenomena; the reduction in area of prime habitat (Types 2 and 3), a decrease in the interior (unbroken) areas, an increase in edge ratio, the breakup of large patches into smaller patches, the decrease in size of each patch. While the species can move between patches in optimal conditions, roads, hardened surfaces and barriers impede movement. Habitat degraded by human impact such as dust, compaction, foot traffic, run-off and pollution from organic and inorganic sources can alter the physical environment for the species, though barely discernable to the casual observer. Spills of oil, sewage and hazardous chemicals have been repeatedly

reported by researchers working at the summit, and they note that oil, in particular, will take a long time to biodegrade because of cold and dry conditions (Howarth 2003). Paired with habitat fragmentation by human action, minor fluctuations in precipitation, duration of snowpack, wind (and windblown food sources), and temperature can have an additive effect on small isolated populations, and small populations are more vulnerable to extinction. Isolated populations may thrive or suffer losses independently, and barriers to expansion into nearby habitat may hinder repopulation. Viable habitat is critical to the survival of any species, and habitat fragmentation can lead to threatened or endangered status.

A Gang of Bullies on the Block

Invasions of non-native plants and animals can further degrade an fragmented habitat and altered landscape.

Incremental habitat fragmentation, exacerbated by biotic challenges, puts small isolated species at further risk of extinction. Invasions of non-native weeds can further degrade an altered habitat and landscape. Predatory insects, and those feeding on the same food sources as the species at risk, can have rapid and devastating consequences. Invasive invertebrates are perhaps the greatest threat to native invertebrates in Hawaii, through competition, predation, habitat alteration, and parasitism. At the summit of Mauna Kea the greatest threat to the arthropod populations is the introduction of invasive arthropods that are adapted to alpine conditions. The potential of introduction of new invasive species to Hale Pohaku and the summit through the importation of goods from similar climates (such as astronomical equipment), construction equipment and fill, road grading equipment and gravel accidental transport on vehicles, clothing and equipment, and biological control agents. (NRMP 2.2, 4.2)

DLNR Division of Forestry and Wildlife Administrator Paul J. Conry, in his CDUA Comments for the Thirty Meter Telescope wrote, on November 29, 2010, in response to 4.1.2 Natural Resource Management p. 4-13:

"It is possible that the introduction of an alien invasive species may occur in any area impacted by the construction process, and such invasion would ultimately impact the entire alpine ecosystem."

For this reason, a management plan must incorporate prevention, robust on-going monitoring and response actions and reliable funding. Early detection of invasive species, in hand with effective

mitigation measures, can halt or limit spread the before control becomes impossible. It is most cost effective to respond to invasive species while the populations are small or localized, and the probability of eradication is higher. Early detection and eradication is often the most neglected phase of the invasion process. The development of an Invasive Species Rapid Response Plan in conjunction with an Invasive Species Monitoring Plan for specific species considered to be the highest risk, referred to as Contingency Plans, should be in place for response to these species prior to detection. (NRMP 4.2-28-29)

The 1983 MKMP, approved in 1985, called for arthropod inventory and monitoring, but that effort did not begin until multiple examples of the Wekiu bug habitat destruction brought legislative attention to mis-management by DLNR and the lessee. (1998 Auditor's Report) Since 2005, several new alien predatory species that could adversely impact the Wekiu bug have been found, and Englund reported that alien ant species are the greatest potential threat in the summit area. Ants (family Hymenoptera) are already well-established at the summit regions of Haleakala National Park, and this elevational range is well-within the lowest elevation that Wekiu bugs have been found. Because of the predatory and social nature of ants, and because ants have caused the extinction and decline of native arthropods throughout Hawaii, both the endemic wolf spider (*Lycosa* sp.) and the Wekiu bug would be expected to precipitously decline if ants ever become established. (FEIS Englund Wekiu-Rep 12-9 p 29)

Ants at the Picnic

Failure to Mitigate for the Greatest Threat Could Lead to Extinction

The costly studies and commentary in the FEIS, NRMP, and CDUA outline some of the existing and potential risks to the natural resources in the Conservation District of Mauna Kea. Inexplicably, the documents fail to provide adequate guidance to the decision-makers who must evaluate the risks and avoid harm to the state's natural heritage held in trust for the people.

DLNR Division of Forestry and Wildlife Administrator Paul J. Conry, in his CDUA Comments for the Thirty Meter Telescope wrote, on November 29, 2010, in response to Table 2.1 p. 2-16, "*Arthropod monitoring will be performed prior to, during, and or two years following construction in the area of the access way on the alpine cinder cone habitat*"...

"The introduction of non-native species, specifically predators such as ants, is the greatest threat to the persistence of populations of native arthropods on Mauna Kea. It is imperative that general arthropod monitoring be performed on all alpine desert habitat affected by TMT

construction (access way, staging areas, and construction sites). The monitoring should be directed at finding incipient populations of alien species across the environment which is being modified. Monitoring directed at Wekiu bugs specifically should also be conducted in all habitat types where Wekiu bugs have been known to occur, per standard survey protocols approved by the Office of Mauna Kea Management Wekiu bug Scientific Committee."

The need for on-going monitoring, identified in 1983, took years to fund, in spite of promises by the University and conditions imposed by the BLNR. In the "new paradigm" we might expect that management has improved, but the following example highlights the inadequacy of the management plan provided by the developer to the decision-makers.

Close the Barn Door after the Horse Has Run Away

Invasive Species Prevention is Ineffective and Control is Postponed Indefinitely

The guidance documents promise mitigation repeatedly, but assign the details successively to the decision-makers of the future, in spite of strong recommendations from scientists and DLNR staff. The segments below exemplify the successive failure to provide the details required for effective management : Underlined and bold areas are emphasized to assist the reader.

- The Project, as required by the CMP NR-2 will reduce the probability for invasive species being introduced to the environment by implementing an Invasive Species Prevention and Control Program.will include Regular monitoring of the habitat along the Access Way and around the TMT, and eradication of such species when found using methods that will not impact indigenous resident species. TMT FEIS Page 161

Methods that include pesticides have inherent risks to indigenous resident species; viable alternatives that will not impact them are not presented in this document. Nevertheless, during the Keck Outrigger Telescope Contested Case Hearing, disclosure documents revealed that pesticides were in use to control insects such as ladybird beetles that number in the thousands, hindering telescope operation. It is unknown what effect the use of pesticides in the frigid alpine environment has on the native resident species. As noted by Dr. Francis Howarth in the Keck CCH hearing in 2004, Insecticides if used within and outside of the observatories to kill or stun undesirable insects could impact Wekiu bugs feeding on live or dead prey exposed to toxins. It's a windy environment subject to drift. The breakdown or deterioration of the toxin is affected by temperature, and could remain toxic for months in cinder in the cold environment of the summit. (Howarth Rebuttal testimony 2/24/03 p 41-43)

Thus the potential impacts due to non-indigenous species are likely to be less than significant.
TMT FEIS Page 161

There is no discussion of the justification for this statement.

- FEIS Page 162 Management Action NR-2: Implementation of an Invasive Species Prevention and Control Program. This program, detailed in Section 3.4.3, will outline steps to be taken to avoid potential impacts associated with invasive species.

A review of 3.4.3 (page 155-161) has no such detail.

- Jesse Eiben (communication) writes in Issue 3: There must be an invasive species rapid response eradication plan available for comment. Specifically, the response plan should detail the action that will take place in the event of a new noxious weed detection, or any ant species detection. All permits required for the plan (especially if herbicides/pesticides are to be used) must be approved and waiting for potential implementation. TMT FEIS Volume 2
- In FEIS Volume 2 the *reply* to Jesse Eiben's communication says the details of the Invasive Species Prevention and Control Program will be worked out during the CDUP process.
- In FEIS Volume 2, DLNR Chair Laura Thielen (communication) writes in Issue 13: An eradication protocol must be developed and in place (along with supporting supplies/trained personnel) if/when establishment of new invasive species is detected. The above tasks should not be completed by untrained personnel. Recommend that a biological technician or biologist be hired by the TMT project to complete surveys. And /or funding be provided to DLNR or an appropriate agency.
- FEIS *response* was: TMT generally agrees with these recommendations and the specific monitoring components will be part of a detailed management plan developed for the CDUP application.

One would expect that based on this statement, the CDUA and/or conditions imposed by DLNR would detail these plans, but the CDUA fails to provide the detailed eradication protocol as requested by the DLNR Chair.

- An Invasive Species Prevention and Control Program will be implemented with plans that include materials control and reduction, washing/cleaning, inspections, monitoring, control, and education/training. CDUA Page 55
- Limit damage caused by invasive species through creation of an invasive species prevention and control program. CDUA Page 165

- Although OMKM will be developing a mountain-wide Invasive Species Prevention and Control Program, in relation to the TMT Project, TMT would develop an Invasive Species Prevention and Control Program to aggressively reduce the potential for invasive species introduction, especially during construction of the TMT Project. This Program will be developed in coordination with OMKM.... Regular monitoring of the habitat along the Access Way and around the TMT observatory and the interior of the TMT Observatory for invasive species, and eradication of such species when/if found. Inspection, by a biologist, of major shipments of new equipment bound for the TMT Observatory prior to transportation beyond the TMT Headquarters. CDUA Page 174

This statement does not address the DOFAW's Paul Conry communication request by DLNR, for monitoring should be directed at finding incipient populations of alien species across the environment, in all alpine desert habitat affected by TMT construction (access way, staging areas, and construction sites. Nor does it describe how eradication of a found species would be accomplished.

- TMT would develop and implement an Invasive Species Prevention and Control Program to address the potential impact for the introduction of invasive species during construction. CDUA Page 182

Development of a plan during construction is too late, akin to closing the barn door after the horse is gone. All respondents who addressed this issue urged that the plan be in place, and available. The developer promised that specific monitoring components would be part of a detailed management plan developed for the CDUP application, but DLNR failed to insure that the plans were in place.

Components of the program during the construction phase of the Project will include:
Monitoring. Construction areas above Saddle Road, including the Batch Plant Staging Area, Access Way, and TMT Observatory sites will be monitored regularly based on a schedule developed with OMKM. The monitoring will be carried out by a trained biologist.

Control. Invasive species identified during monitoring will be controlled to prevent spread. Control measures will be developed and approved by OMKM and implemented by staff trained by a trained biologist, selected by OMKM. CDUA Page 182

- OMKM 2010 Annual Report, A-3:
NR-2 Limit damage caused by invasive species through creation of an invasive species prevention and control program, Immediate Initiation of Action (dated April 8 2010)
NR-10 Incorporate mitigation plans into project planning and conduct mitigation following new development. (As needed).

Funded since 2000 and tasked by the University with management oversight, OMKM has yet to develop such measures for the MKSR, nor is a trained biologist on OMKM staff. The OMKM Environment Committee recommended a rapid response plan in 2005, but to date, no plan exists.

- The Invasive Species Prevention and Control Program will be further developed and expanded as necessary and will be part of project plans and specifications for construction bidding.
- CDUA Page 182

The FEIS response, and the CDUA response, demonstrate that the developers are attempting to kick the can down the road. Putting the planning off until the proposed construction bidding process for the TMT demonstrates the failure of management in the present, regardless of future development. If these plans are not available for the scientists, public, and decision-makers to review at the time of FEIS/CDUA permitting, would they be available for review during specification for bidding?

- Implementation of an Invasive Species Prevention and Control Program. This program will outline steps to be taken to avoid the potential impacts associated with invasive species. CDUA Page 191 Section 4.3.3 Management Action NR-2
- Invasive Species Prevention and Control Program. This program is described in Section 4.4.3 below and will be further refined by the selected contractor. This plan will comply with CMP Management Action C-9. CDUA Page 186

Great, let's look at the detail in Section 4.4.3. Hmmm, there is no Section 4.4.3.

That's all folks! There is no Invasive Species Control Program.

Invasive species control and eradication is difficult, expensive, and may carry unforeseen risks. This is why concerted planning, material, funding and staffing must be dedicated to the effort, or we risk losing precious life-forms for all eternity. If planning, permits, materials and funding are not in place, we all have to live with the consequences (the coqui frog, for example), and some species may, in fact, not survive at all.

In this instance, by kicking the can down the road, the EIS consigns the planning to the CDUA process, and the CDUA postpones the effort, delegating it to the construction specifications crew. Relegating the hard decisions to a future date, with no detail, no review, and no comment opportunity, we have little hope that a rapid response would (or will) ever be mounted.

There's No Place Like Home

The two greatest threats to Wekiu bug are habitat loss and predation by alien invasive ant species.

As I noted at the outset, the species selected for this case study was chosen because this species has garnered the most study and public awareness since its discovery. The two greatest threats to Wekiu bug identified by the multitude of scientists who have contributed to this study effort are habitat loss and predation by alien invasive ant species. The doubts raised by scientist respondents apparently led the developers of the FEIS to withdraw their initial proposal to restore Wekiu bug habitat. Now they say they would work with OKMK to plan to implement. Monitoring (as proposed) for only a two year period following construction in a limit area near the access way and observatory building would not provide adequate mitigation, because monitoring must be uninterrupted and broad in scope to be effective. Impacts could occur throughout the lifetime of the telescope, and monitoring would have to continue during the entire period of the impact.

Meanwhile, we know virtually nothing about the other native species that inhabit the alpine region, both flora and fauna. Nor do we understand the relationships between them. How would loss of 6 acres of lava substrate, host to lichen, moss and algae that is the food source of the native *Agrotis* moth, affect its long-term survival? No one can begin to answer that question. The FEIS cites the presence of the Douglas bladder fern, a species of concern, in the areas contemplated for development. Nowhere in the documents provided can we find communication, consultation or concurrence with US Fish and Wildlife Service regarding species of concern, nor their recommendations for protection of these species.

Extinction is forever. There is effectively no mitigation proposed at all for the habitat destruction and fragmentation proposed by the developers, and incomplete, non-existent, or truncated planning for risk management.

National Natural Landmark at risk due to cumulative and incremental destruction of unique geologic features on Mauna Kea

- The National Natural Landmarks Program was established under the authority of the Historic Sites Act of 1935 (16 U.S.C. 461-467). Mauna Kea Summit Region, designated as a national natural landmark, is a national significant natural area that has been designated to the Secretary of the Department of the Interior. To be nationally significant, a site must be one of the best examples of a type of biotic community or geologic feature in its bio-physiographic province. Examples of the natural diversity include terrestrial and aquatic ecosystems, fossil evidence of biological evolution, as well as features, exposures and landforms that record active geologic processes, such as the Mauna Kea NNL. The determination that a site is one of the best examples of a particular feature in a natural region or bio-physiographic province is based on primary criteria of illustrative value and condition of the specific feature; secondary criteria include rarity, diversity, and value for science and education (Federal Register-title 36 Chapter 1 Part 62.)
 - In the case of Mauna Kea, it met this test in 1972, when it was added to the National Registry of Natural Landmarks. In fact few sites possess better credentials to justify their national significance than does Mauna Kea and the criterion still holds today. The Mauna Kea National Natural Landmark is held in trust by the State of Hawaii and its 83,900-acre boundary incorporates the lands within the Conservation District, including the Mauna Kea Science Reserve, Ice Age Natural Area Reserve, and the Mauna Kea Forest Reserve.
 - First and foremost, Mauna Kea is the exposed portion of the highest insular mountain in the United States, rising up over 30,000 feet above its submerged base in the Pacific Ocean. Second, on its slopes is found Lake Waiau, the highest lake in the United States. Third, though located in the tropics, indisputable evidence of glaciations is present above the 11,000 foot level. Lastly, possibly transcending all of these nationally significant qualities is the fact that Mauna Kea is the most majestic expression of shield volcanism in the Hawaiian Archipelago if not in the world.
 - "The National Park Service contends that the permanent destruction of any surface geologic structures within the Mauna Kea NNL is significant and it denigrates from its overall status as a national natural landmark."
 - "...the review of the DEIS has brought to our attention the incremental addition with resultant impacts of ten observatories to Mauna Kea NNL since its establishment as a national natural landmark in 1972. Realizing that additional observatories may be a consideration in the future, the NPS intends to review the current NNL designation and at the very least may consider removal of the 525 acre Astronomy Precinct for the current MK NNL designation."
- Rory Westberg, NPS Acting Regional Director, TMT DEIS

Not only has overdevelopment put our unique biota at risk, it has adversely impacted a national treasure. The cumulative, incremental and additive damage to our natural resources has wide-ranging and irreversible impacts, not only to the state of Hawaii, but to the nation.

The risk extends outside the Mauna Kea Science Reserve into the Mauna Kea Ice Age Natural Area Reserve as well. The effect of development adjacent to the Mauna Kea Ice Age Natural Area Reserve has significant potential to harm resources in the Conservation District that extend beyond the area leased by the University. For example, a staging area referred to in the proposal as a Batch Plant has been graded and used for dumping fill material for roads in recent years. The archaeologist's inventory indicated that that 90% of the site had been previously graded, although plans to expand the site were not revealed elsewhere in the TMT proposal. The figure in the report shows a Figure 21 (Volume 3 page 585 p 51) shows a map with a boundary larger than the graded area on the photo underneath. This suggests proposed intensification of land use by enlargement of graded area, with no mention in the document of the expansion except in the archaeologist's report. Considerable trash and debris surround the area. On a recent visit to the summit, a stop at the area revealed that extensive trash deposits blow into the natural geologic features. Run-off from the sloping graded area cut an erosional gully into the substrate, leading out of the science reserve in into the natural area reserve (NAR) downhill. The pathway over the slope led directly to Lake Waiau, and our visitors felt acutely aware of the potential impact to the highly regarded cultural feature.

The replacement of lines within a utility corridor through the NAR was cited as a source of concern by DOFAW administrator Paul Conry, because DLNR had no record of the meets and bounds survey (that was required as a condition of the CDUP in 1985). The replacement of electrical lines as proposed could have unknown impacts to cultural and natural features in the NAR, requiring remediation. Conry, in his CDUA Comments for the TMT wrote, in response to 2.4 Substantial Adverse Impact p. 2-6, "the power line passes through the Mauna Kea Ice Age Natural Area Reserve in more than one location... Pu'u Hau Kea is known Wekiu bug habitat and there is potential that the power line corridor has been repopulated with Wekiu bugs over the past twenty years."

At Hale Pohaku, a "potential" TMT mid-level facility is briefly described. Would that proposal be submitted as a separate CDUA, segmenting the project and adding an additional increment to land use intensity?

The statement in the CDUA that potential impacts to cultural, archaeological, and historical resources (omitting biological and natural) would cease upon decommissioning (to the extent practicable) is illogical. No decommissioning project will restore the cultural and natural landscape that has been altered. The impact is irrevocable.

In summary, the plans proffered by the University to justify its request to intensify the land use on Mauna Kea do not address cumulative adverse impact to the natural and cultural resources, they do not provide effective, appropriate or sufficient mitigation for significant and substantial cumulative impact that has already impacted the resource, much less describe mitigation that would address new development, and they do not meet the criteria for protection of natural and cultural resources of the Conservation District as required by statute and by the Constitution of the State of Hawaii. For this reason, it is the duty and responsibility of the Board of Land and Natural Resources to deny this proposal.

Curriculum Vitae
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DEBORAH J. WARD

P.O.Box 918
Kurtistown HI 96760 USA
808-966-7361
808-769-2403
dward@hawaii.edu

FORMAL EDUCATION

University of Hawaii at Manoa: Master of Horticultural Science (M.S.) 1981

46 additional credits beyond the Masters Degree: UH Hilo 1985-01, UH Manoa 1987-01

University of Hawaii at Manoa: Bachelor of Horticultural Technology (B.S.) 1979

Award: Gamma Sigma Delta, Honor Society of Agriculture

Windward Community College: Associate of Arts, 1975, with Honors

Specialized Training

IOIA Organic Inspector Training Courses: Certificate in Organic Farmer Education 2001, Certificate in Organic Processing and Handling Inspection 2007, Certificate in Organic Livestock Inspection 2007

PROFESSIONAL EXPERIENCE:

Hawaii Organic Farmers Association: **Quality Control Officer:** September 2006-October 2007, August 2008 to present

Hawaii Organic Farmers Association: **Certification Coordinator:** October 2007-August 2008

Extension Educator, NREM Faculty, Full Professor: October 1982-June 2005

University of Hawaii at Manoa, College of Tropical Agriculture and Human Resources, Natural Resources and Environmental Management, Cooperative Extension Service

Research Associate: 1981-82 UH Manoa, Department of Horticulture

Research Associate: 1981, Lyon Arboretum, via central Java, Indonesia

Research Assistant: 1979-81 UH Manoa, Department of Horticulture

Technical Assistant: 1977-78

Teaching Assistant: 1973-75 Windward Community College

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