Wëkiu Bug Mitigation Plan

California Association for Research in Astronomy
W. M. Keck Observatory

December 14, 2001

Wë kiu Bug Mitigation Plan

The following plan is based on recommendations provided by natural resource consultants at Pacific Analytics in the Wë kiu Bug Mitigation Report (revised November 4, 2000) to restore habitat, and to prevent and mitigate impacts to the cinder slopes below the W. M. Keck Observatory (WMKO) complex during on-site construction, installation, and operation, as appropriate, of the proposed Outrigger Telescopes (Pacific Analytics 2000). (Numbers in parentheses after each commitment refer to the corresponding Pacific Analytics recommendation number.) It is the intention and hope of the California Association for Research in Astronomy (CARA) that the Wë kiu bug population will actually **increase**, due to protection and restoration of potentially favorable habitat.

1. Wë kiu bug habitat will be restored in areas damaged by on-site Outrigger Telescope construction, and on the crater floor of Puÿ u Hau ÿ Oki. Restored areas will total at least three times the total area damaged by new construction. (IV-1)

Areas damaged by new construction will be restored to the extent possible. This will not be possible in areas where new construction covers existing Wë kiu bug habitat with concrete foundations of junction boxes, air pipes, light tunnels, and retaining walls. Restoration of habitat of an area at least three times the area newly damaged will aid in enhancing the Wë kiu bug population in the crater. Material obtained from project excavations not used for backfill will be trucked to the temporary stockpile area where it will be screened and washed and all suitable material returned to Puÿ u Hau ÿ Oki to be used for Wë kiu bug habitat restoration. All excavation material not directly used as fill or for Wë kiu bug habitat restoration will be dispersed on the mountain at locations to be determined after consultation with the State Historic Preservation Division (SHPD) and the Office of Mauna Kea Management (OMKM).

NASA and CARA have proposed Wë kiu bug habitat restoration within a portion of the crater bottom that was previously damaged by observatory construction on Puÿ u Hau ÿ Oki. The proposed crater bottom restoration area is almost large enough to accomplish the proposed 3:1 restoration goal. Restoration of this area would be followed by restoration of the sloped crater wall habitat that would be disturbed by on-site construction of JB-5 at Outrigger Telescope 2. A third potential habitat restoration area has been identified at Outrigger Telescope 1. This third potential restoration area could be used in future restoration efforts or if the crater bottom restoration effort does not yield sufficient area to attain the 3:1 goal.

Restoration habitat will be composed of screened cinder larger than 1.3 centimeters (cm) (1/2 inch), washed with water to remove ash. Cinder will be spread 30 cm to 46 cm (12 to 18 inches) deep in the restoration areas, and will form a complete interface with cinder in adjacent Wë kiu bug habitat. It may be necessary that cinder be spread more than 46 cm (18 inches) deep in some places, in order to assure the necessary contact with existing habitat.

Screened and washed cinder may be emplaced on the crater floor by partial tilting of the dump bed while the truck is slowly moving. No further working of the screened cinder is required; uneven deposition will make better habitat than an evenly spread or compacted surface. No preparation of the crater floor prior to deposition is required.

The non-permanent barrier blocking vehicle access to the crater floor will be removed to allow transport of the screened cinder into the crater floor. The barrier will be replaced after installation of the restored habitat.

Attractive, non-intrusive, educational signs will be installed near the crater access point along the adjacent service road, (see commitment 3). The signs will have information about Wëkiu bugs and their habitat. (Signs will help prevent unintentional disturbance of habitat by visitors to the summit.). Design of the signs will be consistent with the guidelines presented in the Mauna Kea Science Reserve Master Plan. Prior to installation, sign design and specifications will be submitted to both the Department of Land and Natural Resources (DLNR) and to OMKM for approval.

2. Under no circumstances during construction, installation, and operation will cinder or other materials be side-cast into Wëkiu bug habitat. Temporary barriers will be built along the slope breaks above the inner slopes of Puÿu Hauÿ Oki crater. (IV-2)

Prior to any construction activities, temporary 3-foot high silt fences will be installed along the rim of the Pu'u Hau Oki crater, where excavation or trenching is planned to take place within six feet of the slope to contain cinder on the site. The temporary silt fences will be maintained by the contractor on a daily basis to repair any damage to the fence.

3. Educational signs will be placed along the slope break above Wëkiu bug habitat, and at the service road adjacent to the crater floor. (IV-3)

Many places along the WMKO leveled site provide special scenic vistas. There are foreground views into the Puÿu Hauÿ Oki crater, midground views of the summit area, and background views of the entire Island and beyond. These vistas are unique and among the reasons people visit the summit.

Attractive, non-intrusive, educational signs will be installed to inform people about Wëkiu bugs and their habitat. Signs will help prevent unintentional disturbance of habitat by workers and visitors. Design of the signs will be consistent with the guidelines presented in the Mauna Kea Science Reserve Master Plan. Prior to installation, sign design and specifications will be submitted to both the Department of Land and Natural Resources (DLNR) and to OMKM for approval.

4. Water will be applied to excavation sites and cinder stockpiles. (V-1)

Proposed excavation and construction activities will disturb less than one-half acre of the WMKO leveled site during the construction period. Water will be applied to excavation sites and cinder stockpiles during all earthmoving activities.

Construction contractors typically spray water as needed to minimize airborne particulate matter. Potable water is currently transported to the WMKO from Hilo in tankers capable of carrying up to 19 kiloliters (5,000 gallons) per trip. Potable water for dust suppression will also be transported to the site and applied as needed during trenching, bulldozing, or other soil disturbance activities.

The applied water is not expected to cause any negative impact to the Wëkiu bug, and may actually be beneficial. It is possible that the application of water to excavation sites could increase the amount of moisture available for Wëkiu bugs.

5. Dust-generating activities will be suspended during high winds. (V-2)

Storms and accompanying high winds can arise quickly at the summit. These winds are capable of raising dust from recently exposed cinder and ash. Dust-generating activities will be suspended during periods of high winds, and water will be applied to recently exposed cinder and ash.

6. Soil-binding stabilizers will be used sparingly, and will never be applied to Wëkiu bug habitat. (V-3)

Vehicle traffic to WMKO is expected to increase during and after construction of the Outrigger Telescopes. Environmentally-safe soil stabilizers may be applied to road and parking areas to reduce dust during and after on-site construction. Soil stabilizers may be needed to reduce dust during the excavation of Outrigger Telescope foundations and light tunnels. Environmentally-safe soil stabilizers will only be used where the application of potable water is inadequate for dust control. In no case will soil stabilizers be applied directly to Wëkiu bug habitat slopes, nor will they be applied to excavated cinder that is to be used in mitigation habitat. Application of soil stabilizers will be performed under light wind conditions to prevent drift into Wëkiu bug habitat.

Soil stabilizers are often applied to roads to improve stability and suppress dust. Generally, the stabilizers bind soil particles together to form a hard, protected surface. There are many commercially available dust control additives, each with characteristics specific for soil types, climate conditions, and road uses. They also differ in soil penetration potential, suppression duration, and costs. All of these factors will be considered before a soil stabilizer treatment is applied.

Several dust-suppressing soil stabilizers are considered "environmentally friendly" and appear to be free of residuals that can harm native arthropod populations. Most have been

tested for toxicity on micro-invertebrates, fish, and wildlife. Professional review before application of soil stabilizer products will reduce the chances of inadvertent impacts to Wë kiu bug habitat. An entomologist familiar with Wë kiu bug autecology will review the potential impacts of products being considered for use, and make recommendations. In no case will soil stabilizers be used indiscriminately, nor will they ever be applied beyond the slope break of the observatory site.

Soil stabilizers are not always appropriate for dust control. An alternative to soil stabilizers is the application of potable water to roads and construction site surfaces. Dust control watering could potentially increase water availability to Wë kiu bugs, enhancing survival and population growth.

7. The WMKO staff will continue to follow Federal guidelines specifying the use and disposal of substances used in the washing and recoating of observatory mirrors. (VI-1)

The WMKO 10-meter mirrors are made up of 36 segments, each approximately 1.8 meters (6 feet) in diameter. The proposed Outrigger Telescopes will use mirrors 1.8 meters (6 feet) in diameter. Under standard operating procedures, up to four mirror segments can be recoated in each month. Outrigger Telescope mirrors will be recoated on a similar schedule. The proposed additional four to six Outrigger Telescope mirrors will thus increase the total mirror surface area to be processed by 6 to 8 percent. Mirror recoating effluents at WMKO will be collected, and removed and transported off-site by a licensed waste handler.

8. Contractors will be required to minimize the amount of on-site paints, thinners, and solvents. Painting and construction equipment will not be cleaned on-site. Contractors will be required to keep a log of hazardous materials brought on-site and report spills immediately to a designated WMKO representative. (VI-2)

Many components of the proposed Outrigger Telescopes will arrive at the site ready for installation. Some components may require painting. Paints, thinners, and solvents are toxic to Wë kiu bugs. The amounts of such substances transported to the summit will be those required to support the current activity. The amount required for the entire project will not be stockpiled on the summit.

Cleaning paintbrushes, rollers, and paint-spraying equipment requires the use of solvents and thinners. Having these substances on-site increases the risk of spills. Painting equipment will be cleaned off-site to reduce the risk of spills that could impact Wë kiu bug populations.

Contractors will be required to keep a weekly log of hazardous materials they bring to the site. The log will consist of a list of the substances that are being used, and the number

and size of the containers that arrive and leave the site. The log will be available for inspection by CARA representatives.

In the unlikely event of an accidental spill of hazardous materials, it will be reported immediately, and appropriate actions will be taken to limit the impact to Wēkiu bugs. Spills will be contained to limit the impact area, and if the spill results in soil contamination, the soil will be removed in a safe and effective manner. Logs and manifests can provide useful information regarding the hazardous materials on site, in case of an accidental spill.

9. Construction trash containers will be tightly covered to prevent construction wastes from being dispersed by wind. (VII-1)

Covering containers will decrease the amount of construction debris that could be blown onto Wēkiu bug habitat. "Roll off" containers will be equipped with secure tops and lids to ensure no debris escapes during high winds. Containers will be collected on a regular basis before they are completely full or overflowing. This could entail collection several times a week, particularly during periods of heavy use.

10. Construction materials stored at the site will be covered with tarps, or anchored in place, and not be susceptible to movement by wind. (VII-2)

Construction materials and supplies will be prevented from being blown into Wēkiu bug habitat by covering them with heavy canvas tarps. Steel cables, attached to anchors that are driven into the ground, can hold materials down.

Construction materials at the site will be tied down or otherwise secured during high winds and at close of work each day. Securing materials will reduce the chances of debris being blown off the site into Wēkiu bug habitat. Preventing debris from blowing onto the habitat slopes will reduce costs and potential habitat disturbance necessary to retrieve the items.

11. If construction materials and trash are blown into Wēkiu bug habitat, they will be collected to the extent practicable, with a minimum of disturbance to the habitat. (VII-4)

Despite efforts to prevent wind-blown construction materials and trash, some debris could end up in Wēkiu bug habitat. Retrieving this debris from sensitive areas will be done carefully and with minimum disturbance. Small pieces of debris will be allowed to blow out of Wēkiu bug habitat to spots where they can be collected safely. Larger debris will be removed with minimum disturbance to slope stability and structure. Methods for removal may vary depending on the material and its location. Contractors will be educated about appropriate debris retrieval methods.

12. Earthmoving equipment will be free of large deposits of soil, dirt, and vegetation debris that could harbor alien arthropods. (VIII-1)

(a) Contractors will be required to pressure-wash earthmoving equipment to remove alien arthropods.

Alien arthropods can arrive at the summit by two general pathways. First, alien species already on the Island can spread to new localities. Second, alien species can arrive with shipping crates and containers. In order to block the first pathway, heavy equipment, trucks, and trailers will be pressure-washed before being moved to the construction site at Puÿ u Hau ÿ Oki.

Earthmoving equipment and large vehicles and trailers often sit at storage sites for several days or weeks between jobs. Most of these storage sites are located in industrial areas and usually support colonies of ants and other alien arthropods. These species often use stored equipment as refuges from rain, heat, and cold. Ants will colonize mud and dirt stuck to earthmoving equipment and could then be transported to uninfested areas. Spiders occupy stored equipment, looking for food or escaping predation by hiding in protected niches. Once transported to the summit, these species could migrate to Wë kiu bug habitat.

Pressure-washing of equipment before transportation to the construction site at Puÿ u Hau ÿ Oki will remove dirt and mud and wash away ants, spiders and other alien arthropods, thereby reducing the chances of transporting these species to the summit area.

(b) Contractors will be required to inspect large trucks, tractors, and other heavy equipment before proceeding up the observatory access road.

Tractor-trailer rigs, earthmoving machinery, and other heavy equipment will be inspected for arthropods before proceeding up the observatory access road. This inspection will be recorded in the contractor's logbook.

13. All construction materials, crates, shipping containers, packaging material, and observatory equipment will be free of alien arthropods when delivered to the summit. (VIII-2)

(a) Contractors will be required to inspect shipping crates, containers, and packing materials before shipment to Hawaiÿ i.

Alien arthropods can be transported to Hawaiÿ i via crates and packaging. Contractors will be requested to use only high quality, virgin packaging materials when shipping supplies and equipment. Pallet wood will be free of bark and other habitat that can facilitate the transport of alien species. WMKO managers will communicate to shippers, and suppliers the environmental concerns regarding alien arthropods, and inform them about

appropriate inspection measures to ensure that supplies and equipment shipped to Hawaiÿ i are free of alien arthropods at the points of departure and arrival.

Shipping containers will be inspected and any visible arthropods removed. Construction of crates immediately prior to use will prevent alien arthropods from establishing nests or webs. Cleaning containers just prior to being loaded for shipping will also eliminate alien arthropod infestations.

Many arthropods may escape detection during shipping inspections. After arrival in Hawaiÿ i, crates or boxes to be transported to the summit will be re-inspected for spider webs, egg masses, and other signs of alien arthropods. Re-inspection prior to transport to the summit will reduce the potential for undetected alien arthropods reaching the summit.

(b) Contractors will be required to inspect construction materials before transport to the summit area.

Alien arthropods already resident in Hawaiÿ i are capable of hitchhiking on construction material such as bricks and blocks, plywood, dimensional lumber, pipes, and other supplies. Precautions will be taken to ensure that alien arthropods are not introduced to the Mauna Kea summit area.

Construction materials will be inspected before transport to the construction site. If any alien arthropods are discovered, the infestation will be removed prior to transport. Infestations of ants can be removed using pressure-washing. Infestations of spiders can be removed using brooms, vacuum cleaners, or other similar methods. Pesticide use on materials to be transported to the summit will be avoided.

14. Outdoor trash receptacles will be secured to the ground, have attached lids and plastic liners, and be collected frequently to reduce food availability for alien predators. (VII-3 & VIII-3)

Workers and visitors to the WMKO inevitably often bring some trash with them. Lunch bags, film canisters, wrappers, etc. can be easily blown into Wëkiu bug habitat. Receptacles will be provided to eliminate the dispersal of this kind of trash. The receptacles will be heavy and have attached lids so that they do not become flying objects in the high winds at the summit.

Readily available food supplies can facilitate the establishment of alien arthropods at the summit. Sanitary control of food and garbage will prevent access to food resources that could be used by invading ants and yellowjackets.

Refuse containers will be heavy and secured to the ground. Refuse will be collected on a regular basis before containers are completely full or overflowing. This could entail collection several times a week, particularly in eating areas and during periods of heavy use of the area.

Containers will be regularly washed using steam and/or soap to reduce odors that attract ants and yellowjackets. Plastic bag liners will be used in all garbage containers receiving food to control leaking fluids.

15. New alien arthropod introductions detected during monitoring will be eradicated. (VIII-4)

(a) Ant eradication

Sticky traps designed to capture ants will be deployed immediately after any ants are detected. Persistence of ant detections is indicative of larger infestations, and will prompt a search for and eradication of colonies. Bait and chemical control will be employed only when absolutely necessary and only by a certified pest control professional. In no case will pesticides be applied on or near restored habitat or crater slopes.

(b) Yellowjacket eradication

Traps will be deployed when yellowjackets are detected. Trapping yellowjackets is a useful method of control that does not require pesticides. Lures or baits will improve the effectiveness of traps. Localized yellowjacket populations can be reduced to non-threatening levels if trapping is employed immediately after detection. Traps will be maintained until yellowjackets are no longer detected.

(c) Alien spider eradication

Alien spider webs will be removed when detected. Native lycosid wolf spiders do not make webs. Native sheet-web spiders make tiny webs under the cinder surface. Only alien spiders make large spider webs at the WMKO site. Sweeping such webs away with a broom disrupts alien spider food capture success and destroys egg masses.

16. Construction contracts will ensure that compliance violations are corrected.

The commitments in this Mitigation Plan will become, as applicable, rules and guidance for contractors and operators during on-site construction, installation, and operation of the proposed Outrigger Telescopes, light tunnels, and retaining walls. This will be accomplished through appropriate contract provisions and CARA oversight of contractor activities. A well-designed monitoring plan will detect violation of the rules and guidance. Such a plan has been developed and will be implemented when construction begins. Violations or other errors will be corrected as soon as possible in a manner that protects and enhances Wë kiu bug population and habitat.